جامعة طنطا
كلية العلوم
إدارة الدراسات لعليا والبحوث

الدليل الشامل
للوائح البرامج الخاصة بالدراسات العليا
كلية العلوم
(ساعات معتمده)





2026/2027

تحت إشراف

****

ا.د / عبير عبد الحميد علم الدين **ا.د/ امجد سالم سلام**

((عميد الكلية)) **((وكيل الكلية لشئون الدراسات العليا))**

اعداد الدليل

أ / محمد إبراهيم السعداوي

((المراجع بإدارة الدارسات العليا))

اللوائح الداخليه للبرامج الخاصة

((ساعات معتمده))

- برنامج دبلوم الكيمياء الحيويه التحليلية
- برنامج دبلوم المهني في الميكروبيولوجي
- برنامج الماجستير المهني في علوم المساحة والتعدين
- برنامج دبلوم كيمياء الغذاء والتغذيه
- برنامج دبلوم الجيولوجيا الصناعية والبيئية
- برنامج دبلوم المهني في الفيزياء الاشعاعيه
- الائحه الداخليه للدراسات العليا (ماجستير - دكتوراه) ساعات معتمده



كلمة

السيدة الأستاذ الدكتور / عبير عبد الحميد علم الدين

عميد الكلية

الحمد لله والصلاة والسلام على رسول الله، وعلى آله وصحبه ومن والاه، وبعد:

تعمل الكلية على تحقيق عدد من الأهداف والغايات يأتي في مقدمتها التميز فى العملية التعليمية طبقا للمعايير الاكاديمية القومية والعالمية وكذا تطوير منظومة البحث العلمي وتعزيز المشاركة المجتمعية فيما لا يمس ثوابت المجتمع. وتحدونا آمال كبيرة بأن تنطلق الكلية في رؤيتها إلى تحقيق الريادة على المستوى المحلي والإقليمي والدولي في مجال العلوم الأساسية. كما تسعى الكلية في إطار رسالتها إلى إعداد كوادر تتميز بالعطاء والإبداع في مجالات التخصص وإثراء البحث العلمي المبتكر المدعم ببرامج الدراسات العليا المتقدمة والإسهام في خدمة المجتمع وبناء شراكات مجتمعية متميزة مع الأخذ في الاعتبار متطلبات منظومة الجودة الشاملة بما يحافظ علي تحقيق الاعتماد الأكاديمي.



كلمة

السيد الأستاذ الدكتور / امجد سالم سلامه

وكيل الكلية لشئون الدراسات العليا البحوث

بسم الله الرحمن الرحيم

(وقل أعملوا فسيرى الله عملكم ورسوله والمؤمنون)
صدق الله العظيم

يعتبر البحث العلمي من أهم ركائز رؤية مصر 2030م، كذلك يعتبر البحث العلمي من أهم القضايا الرئيسية في شتي جوانب الحياة فهو الركيزة الاساسية للانطلاق إلى المستقبل لتحقيق ما تسعي الدول إليه من تقدم ورفاهية وحل للمشكلات الحالية والمستقبلية وخدمة للمجتمع، فالتطور البشري يعود الي القدرات الذهنية والعقلية للإنسان وقدرته للاكتشافات العلمية وذلك من خلال البحث العلمي في شتي مجالات الحياة. وقطاع الدراسات العليا هو حلقة الوصل بين الباحث وعملية الابتكار والتواصل مع العالم الخارجي، وتحمل الدراسات العليا والبحوث رسالة فكرية مباشرة وهي الارتقاء بالبحث العلمي والحرص على تطويره والنهوض به والسعي إلى كل ما هو جديد في مجالات العلوم الأساسية والتطبيقية.

((المقدمة))

يعد البحث العلمي قاطرة للمجتمع حيث يتفاعل مع المجتمع لبحث حاجاته وتوفير متطلباته، بل والعمل علي رفعة شأنه ومكانته بين الأمم. وتعد الدراسات العليا أحد أهم الركائز في منظومة التعليم الجامعي.

تقدم الجامعات برامج أكاديمية من شأنها اكتشاف وتطوير المعرفة بكافة أنواعها وابتكارها، وكذلك إعداد وتأهيل الكوادر البشرية تأهيلا عاليا ذو قدرة تنافسية في كافة المجالات العلمية المتخصصة لتلبية احتياجات التنمية وتمشيا مع خطط الدولة الطموحة لبنا ء مصر الحديثة، بالإضافة الى إثراء البحث العلمي وتطويره من خلال تقديم برامج علي كافة المستويات من الدبلوم والماجيستير ودكتور الفلسفة ودكتوراه العلوم لتلبية كافة احتجاجا ت الدولة التنموية.

وتعتبر الدراسات العليا في كليات العلوم الأساسية أهم دعائم منظومة البحث العلمي وذلك من خلال تحقيقه إنجازات علمية تقوم عليها البحوث التطبيقية التي من شأنها تحقيق التنمية والرفاهية في مختلف مناحي الحياة، ومن ناحية أخرى المساهمة في تلبية احتجاجا ت مؤسسا ت التعليم العالي ومؤسسات البحث العلمي من أعضاء هيئة التدريس وكوادر قادرة علي تحقيق إنجازات علمية تسهم في التنمية الشاملة، ويجب أن يعمل نظام الدراسات العليا في الجامعات علي أن يطور أهدافه ونظم القبول والدراسة به وبمناهجه، وكذلك لوائح الإشراف عليها ومراعاة الطلب المحلى والإقليمي والدولي بما يتوافق مع حاجات التنمية الاقتصادية والعلمية والثقافية والمعلوماتية .

ولعل تطبيق برامج الدراسات العليا بنظام الساعات المعتمدة اصبح ضرورة ملحة لتحقق جودة الدراسات العليا باستمرار، ومن أجل التوافق الضروري بين لوائح الدراسات العليا بكليات العلوم الأساسية وذلك لتحقق جودة الرسائل العلمية والأبحاث، بما يتفق مع المستويات الدولية.

- بدأت الدراسات العليا في كلية العلوم- جامعة طنطا بإصدار القرار الوزاري رقم 654 بتاريخ 22 / 1969/12 للائحته الداخلية بنظام الفصلين الدراسين ثم تم إجراء بعض التعديلات الداخلية على اللائحة بقرار وزاري رقم 1696 بتاريخ12/ 11/ 1994 م ٠

كما تقرر تعيين أول وكيل للكلية يختص بشئون الدارسات العليا والبحوث في 4/ 1982/10م

((شكر وامتنان))

يتقدم السيد الأستاذ الدكتور / عبير عبد الحميد علم الدين عميد الكلية بخالص الشكر والامتنان لكل من ساهم واجتهد وبذل مجهود لإعداد الدليل الشامل للبرامج الخاصة بالدراسات العليا والبحوث بالكلية وأخص بالشكر والامتنان للمجهود الكبير الي كلا من:

- **السيد الأستاذ الدكتور / امجد سالم سلامه د**

وكيل الكلية للدراسات العليا والبحوث

- **السيد الاستاذ/ محمد ابراهيم السعداوي**

المراجع بإدارة الدراسات العليا والبحوث

(أولا)

برنامج

دبلوم الكيمياء الحيويه التحليلية

((ساعات معتمده))

جمهورية مصر العربية

وزارة التعليم العالي

الوزير

قرار وزاري
رقم (٦٥٧) بتاريخ ١ / ١١ / ٢٠٢١
بشأن تعديل اللائحة الداخلية لكلية العلوم
جامعة طنطا (مرحلة الدراسات العليا)
بنظام الساعات المعتمدة

وزير التعليم العالي والبحث العلمي ورئيس المجلس الأعلى للجامعات

** بعد الاطلاع على القانون رقم (٤٩) لسنة ١٩٧٢ في شأن تنظيم الجامعات والقوانين المعدلة له.
** وعلى قرار رئيس الجمهورية رقم (٨٠٩) لسنة ١٩٧٥ بإصدار اللائحة التنفيذية لقانون تنظيم الجامعات والقرارات المعدلة له.
** وعلى القرار الوزاري رقم (٦٥٤) بتاريخ ١٩٦٩/١٢/٢٢ بشأن إصدار اللائحة الداخلية لكلية العلوم جامعة طنطا والقرارات المعدلة له .
** وعلى القرار الوزاري رقم (٥١٤٩) بتاريخ ٢٠١٤/١٢/٤ بشأن إضافة دبلوم الكيمياء الحيوية التحليلية باللائحة الداخلية لكلية العلوم جامعة طنطا والقرارات المعدلة له
** وعلى موافقة مجلس جامعة طنطا بجلستيه بتاريخ ١/٢٣ والممتدة الى ٢٠١٩/١/٣١، ٢٠١٩/٢/٤، ٢٠٢١/٥/٣١ .
** وعلى موافقة لجنة قطاع العلوم الأساسية بجلساتها بتاريخ ١/٣٠ ، ٢/٢٧ ، ٢٠٢١/٦/٢٤، وموافقة ا.د/ رئيس لجنة قطاع العلوم الأساسية بالتفويض من لجنة القطاع بتاريخ ٢٠٢١/٣/٢٥ .
** وعلى موافقة المجلس الأعلى للجامعات بجلسته بتاريخ ٢٠٢١/١٠/٢٤ .

قرر
(المادة الأولى)

يعمل باللائحة الدراسية المعدلة والخاصة ببرنامج دبلوم (الكيمياء الحيوية التحليلية) والملحق باللائحة الداخلية لكلية العلوم جامعة طنطا الصادرة بالقرار الوزارى رقم (٦٥٤) بتاريخ ١٩٦٩/١٢/٢٢ ويلغى كل نص يخالف أحكامها .

(المادة الثانية)

يلحق باللائحة الداخلية المشار إليها بعاليه اللائحة الدراسية المعدلة والمرفقة والخاصة ببرنامج دبلوم (الكيمياء الحيوية التحليلية) .

(المادة الثالثة)

على جميع الجهات المختصة تنفيذ هذا القرار .

وزير التعليم العالي والبحث العلمي
ورئيس المجلس الأعلى للجامعات

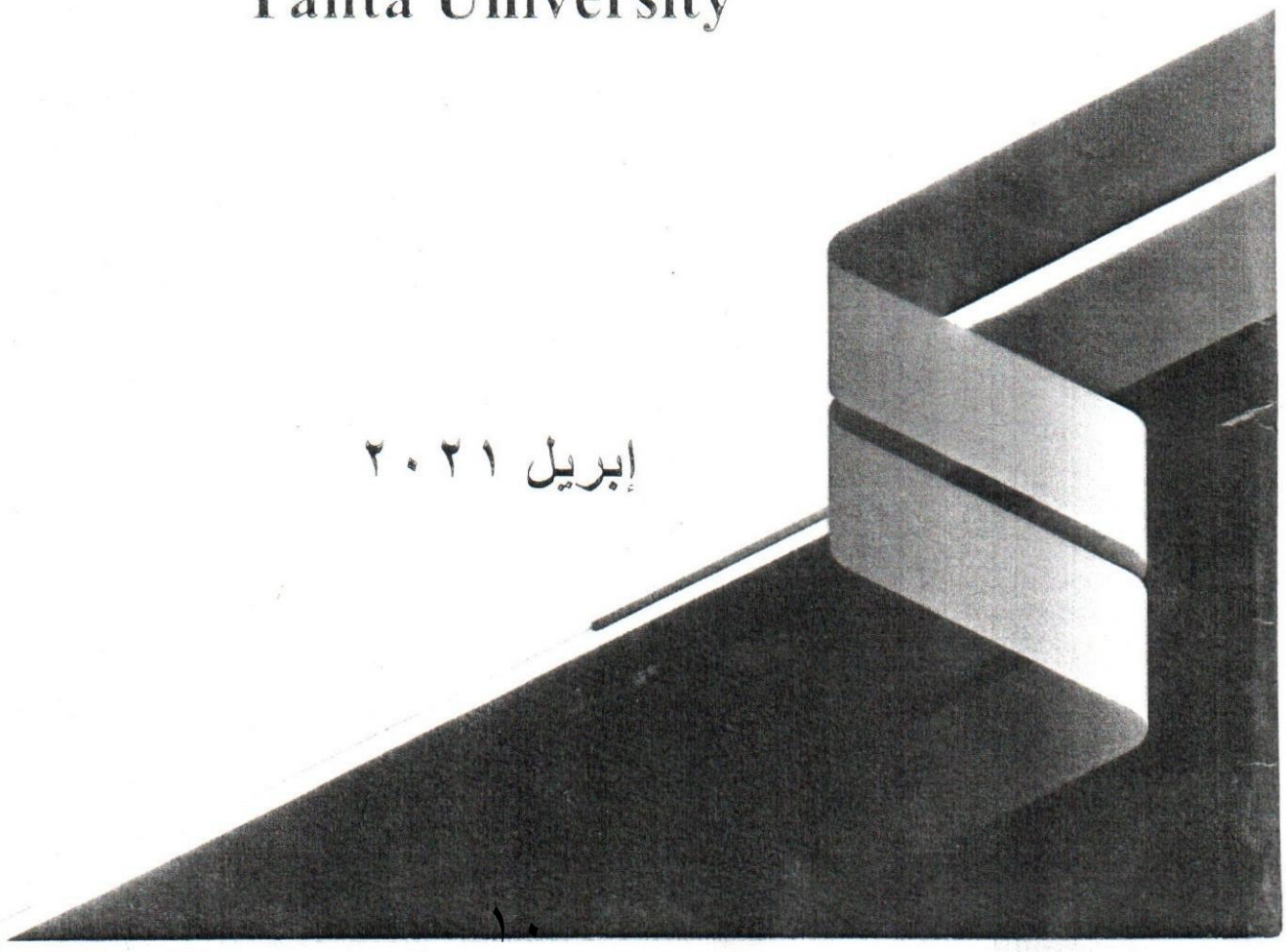
(أ.د/ خالد عبد الغفار)

لائحة دبلوم الكيمياء الحيوية التحليلية

كلية العلوم
جامعة طنطا

Diploma of Analytical Biochemistry

Faculty of Science
Tanta University



إبريل ٢٠٢١

لائحة دبلوم الكيمياء الحيوية التحليلية

كلية العلوم
جامعة طنطا

Diploma of Analytical Biochemistry

Faculty of Science
Tanta University

إبريل ٢٠٢١

دبلوم الكيمياء الحيوية التحليلية

مقدمة

تم تصميم برنامج دبلوم الكيمياء الحيوية التحليلية للدراسات العليا بكلية العلوم لحاجة سوق العمل في مصر ، وارتباطه بحركة التجارة العالمية. وتسعى كلية العلوم إلى تحقيق ما يلي :

أن تقوم الكلية بأعضاء هيئة التدريس المؤهلين إلى جعل طلابنا قادرين على المنافسة بمستوى عالي والنجاح على المدى الطويل في الكيمياء الحيوية التحليلة، لتكون مصدرا رئيسيا لتدريس الكيمياء الحيوية وإجراء البحوث في مجال التحاليل المختلفة. وأن تكون مصدرا رئيسيا لتزويد الطلاب بالمعلومات في مجال العلوم الحديثة. من حيث المعايير القياسية والمناهج الدراسية التي تعتمدها علميا للمجتمع المحلي والخارجي.الهدف من الدبلومة هو تخريج طلاب الدراسات العليا ملمين بالمعرفة السليمة للكيمياء الحيوية التحليلية، حيث أن دبلومة الكيمياء الحيوية التحليلية يتطي الجوانب والمهارات اللازمة لإجراء البحوث الفردية والتعاونية في هذا المجال. وقد تم تصميم هذه الدبلومة للطلاب الذين يرغبون في العمل في مهنة التحاليل الحيوية، في مجالات الكيمياء الطبية والصيدلانية والصناعية والأكاديمية أو في أي ميدان لمجال الكيمياء الحيوية حيث أن التحاليل الكيميائية الحيوية أمر مرغوب فيه.

الرؤية:

تطمح الدبلومة إلى تخريج طلاب الدراسات العليا ملمين بالمعرفة فى الكيمياء الحيوية التحليلية التي تنمى المهارات اللازمة لإجراء البحوث الفردية والتعاونية في هذا المجال لتغطى جميع التحاليل الحيوية في المجالات المختلفة.

الرسالة:

تعمل الدبلومة على تأهيل الطلاب في الكيمياء الحيوية وتزويدهم بالنظريات الحديثة والمهارات التقنية في مجال الكيمياء الحيوية التحليلية كما نسعى على متابعة التطورات فى هذا المجال. كما تقوم بتزويد الطلاب بالمهارات الأساسية المهنية والتقنية والأكاديمية بما يكفي لتأهيلهم للعمل في مختلف مجال التحاليل الحيوية.

الوضع الإستراتيجى للبرنامج

١- البرنامج خاص بمصروفات مقدم من قسم الكيمياء – كلية العلوم – جامعة طنطا وهو برنامج يخدم منطقة وسط الدلتا فى عمليات التحاليل الحيوية خاصة وجود عديد من معامل التحاليل الطبية و شركات الأدوية وأرتباط كثير من الطلاب بالمجالات الأكاديمية للتحاليل الحيوية.

٢- تمتلك الكلية وقسم الكيمياء البنية التحتية والأساسية والتقنيات الحديثة للأنشطة الطلابية والتعليمية المختلفة والتعليم المتقدم والتى تؤدى إلى جودة تعليمية متميزة. توافر البنية التحتية للمعامل الطلابية والبحثية والموارد البشرية المؤهلة والألكترونية والتى تساعد على الإرتقاء بالمهارات العلمية والعملية لطلاب الدراسات العليا.

٣- يوجد تكامل متميز بين تخصصات العلوم بالكلية و كليات الجامعة و خاصة العملية.

٤- توجد مدارس بحثية متميزة فى قسم الكيمياء قادرة على المنافسة فى مجال البحث العلمى وتقديم خدمات مجتمعية عالية المستوى وتقديم خريج متميز الدراسات العليا على معرفة سليمة بالكيمياء الحيوية التحليلية.

الغايات والأهداف الإستراتيجية لبرنامج الكيمياء الحيو ية التحليلية

تتصف الخطة الإستراتيجية للبرنامج المقدم من قسم الكيمياء – كلية العلوم – جامعة طنطا بحزمة من الغايات النهائية والتى تغطى مجالات ومحاور جودة البرامج الأكاديمية التطبيقية ومن ثم الإعتماد الأكاديمى للبرنامج والتى تتحقق من خلال محورين أساسيين هما:

١- محور إدارة البرنامج والذى يتضمن الاتفاق مع رسالة ورؤية الكلية والجامعة وتوافر قيادات أكاديمية وإدارية ذات كفاءة متميزة. موارد بشرية ومادية داعمة لتحقيق رسالة البرنامج.

٢- دور الفاعلية التعليمية للبرنامج والذى يتضمن معايير أكاديمية للبرنامج وتقييم للمخرجات به وللطلاب وأعضاء هيئة التدريس ونظم إدارة جودة البرنامج والتقييم.

وعلى ذلك فالغايات النهائية للبرنامج هى:

١- تعزيز وتطوير إدارة البرنامج.

٢- تعزيز وتطوير إستراتيجيات التعليم والتعلم.

٣- تعزيز وتطوير برامج الخدمات المجتمعية وتنمية البيئة.

٤- تنمية الموارد الذاتية للبرنامج لدعم العملية التعليمية والتدريب.

٥- تعزيز سياسات وآليات ربط الخريج بسوق العمل لضمان فرص التوظيف والمنافسة.

٦- الحصول على الإعتماد الأكاديمى المحلى للبرنامج.

أهداف البرنامج

١- إكساب الخريج معارف ومهارات علمية وفنية فى مجال الكيمياء الحيوية التحليلية.

٢- تأهيل الطلاب في الكيمياء الحيوية وتزويدهم بالنظريات الحديثة والمهارات التقنية في مجال العلوم ، وفقا لاحتياجات المستقبل والتطورات الأخيرة في مصر والعالم.

٣- إعداد الطلاب لمواصلة التعليم العالي والبحوث في مجال التحاليل.

٤- تزويد الطلاب بالمهارات الأساسية المهنية والتقنية والأكاديمية بما يكفي لتأهيلهم للعمل في مختلف مجالات الكيمياء الحيوية التحليلية.

٥- إثراء المعرفة والمساهمة في التطورات العلمية في مجال الكيمياء الحيوية من خلال البحوث العلمية ومتابعة التطورات في مجال العلوم .

٦- اكساب الطلاب مجموعة من المهارات العامة لتنمية مهاراتهم الشخصية.

٧- اجراء التجارب وتفسير النتائج الخاصة بعمليات التحاليل الحيوية.

٨- استعمال المهارات النظرية والعملية من خلال التعلم فى مجموعات ومواجهة مشاكل التحاليل مستخدما المنهج العلمى السليم لحل المشاكل.

٩- استغلال امكانات قسم الكيمياء بكلية العلوم – جامعة طنطا المعملية والعلمية للوفاء بمتطلبات هذا البرنامج وبخاصة امكانيات أعضاء هيئة التدريس به وكذلك الاستعانة بالخبرات الأخرى فى مجال البرنامج من داخل وخارج الجامعة إذا لزم الأمر.

١٠- الاستفادة من المعامل المركزية بجامعة طنطا لتوافر العديد من الاجهزة المتطورة في المجالات المختلفة.

المخرجات التعليمية المستهدفة من البرنامج

أ- المعرفة والفهم

فى نهاية البرنامج يكون الطالب قادرا على فهم :

١- المعلومات والمعارف الاساسية لطرق التحاليل الحيوية.

٢- المفاهيم العلمية للتطبيقات العملية فى مجال التحاليل الحديثة.

٣- المهارات التحليلية و مواجهة مشاكل التحاليل الحيوية.

٤- معرفة طرق وأساليب البحث العلمى .

ب- القدرات الذهنية

فى نهاية البرنامج يكون الطالب قادرا على :

١- تلخيص وتفسير المعلومات التراكمية المتعلقة بعلم التحاليل .

٢- حل المشاكل المتعلقة بالتحاليل الحيوية.

٣- تكامل المهارات النظرية والعملية فى الابحاث العلمية المتعلقة بالتحاليل الحيوية.

٤- القدرة العملية والمهنية في عمليات التحاليل الحيوية المختلفة.

ج- مهارات مهنية وعملية

فى نهاية البرنامج يكون الطالب قادر على:

١- الالمام بمختلف الطرق والأدوات المستخدمة فى مجال الكيمياء الحيوية.

٢- تصميم التحاليل الحيوية وتفسير مختلف النتائج.

٣- الألمام بالطرق المعملية لأنواع التحاليل.

٤- تقييم المخاطر الخاصة بالتطبيقات العملية .

د- مهارات عامة

بانتهاء دراسة هذا البرنامج يكون الطالب قادراً على:

١. القدرة المثلى لعمل التحاليل المختلفة باستخدام الطرق المختلفة والحديثة ويكون قادراً على تقييم التحاليل وتفسير النتائج.

٢. الاستخدام الجيد للأجهزة المختلفة و طرق الحفاظ عليها.

٣. استخدام تكنولوجيا المعلومات مع التحاليل و الأجهزة الحديثة .

٤. العمل منفرداً، وكجزء من فريق، والتعلم الذاتي بعقل متفتح وتحري الدقة.

مواد اللائحة

مادة (١) الدرجة العلمية

تمنح جامعة طنطا بناء على توصية مجلس كلية العلوم دبلوم الكيمياء الحيوية التحليلية للدراسات العليا خاص بمصروفات.

مادة (٢) نظام الدراسة

نظام الدراسة بالدبلومة هو نظام الساعات المعتمدة (Credit hours system) فى اطار الفصل الدراسى، بما لا يقل عن ٢٤ ساعة معتمدة موزعة على فصلين دراسيين بواقع ١٢ ساعة معتمدة لكل فصل دراسى.

مادة (٣) الشروط العامة للقبول و التسجيل:

تقبل دبلوم الكيمياء الحيوية التحليلية الطالب الحاصل على درجة بكالوريوس العلوم من إحدى كليات العلوم بالجامعات المصرية أو ما يعادلها من اى معهد علمي آخر معترف به من المجلس الأعلى للجامعات وذلك في التخصصات الكيمياء الحيوية الخاصة أو المزدوج أو الكيمياء الخاصة أو الميكروبيولوجى أو الحيوان او الحشرات او النبات الخاص او التخصصات المزدوجة من التخصصات المذكورة سابقا ومتضمنة كيمياء جيولوجيا، ويجوز قبول الطلاب المتقدمين للدبلوم من غير الحاصلين على بكالوريوس العلوم في التخصص المطلوب مع تحميلهم بمقررات تكميلية طبقا لمتطلبات القسم المختص ولا تحسب هذه الساعات ضمن الساعات المذكورة. يجوز للجنة التنفيذية دراسة حالة كل طالب بناء على راي المنسق والمقررات التي درسها الطالب في قبول الطالب من عدمه وتقرر اللجنة التنفيذية مقررات تكميلية للطلاب من غير شعب بكالوريوس العلوم تخصص الكيمياء الحيوية (الخاصة والمزدوج) يدرسها الطالب ويؤدى فيها الامتحان بنجاح ولا تحسب درجاتها ضمن المعدل التراكمى للطالب. ويجب على الطالب أجتياز المقررات التكميلية التي تحددها اللجنة التنفيذية بعد توجيه المنسق مع منح تقديرات للمقررات التكميلية.

مادة(٤) مدة الدراسة

- مدة الدراسة لنيل الدبلوم فى الكيمياء الحيوية التحليلية عام دراسى جامعى (فصلان دراسيان) ويلغى قيد طالب الدبلوم إذا لم يحصل على الدبلوم في مدة ستة فصول دراسية من تاريخ قيده. ولا تحتسب الدراسات التكميلية من ضمن المدة المقررة .
- مدة الفصل الدراسى خمسة عشر أسبوعا موزعة على النحو التالى:
  - فترة التسجيل مدتها أسبوع ولا تحتسب من مدة الدراسة.
  - فترة الدراسة مدتها إثنى عشر أسبوعا.
  - فترة الأمتحانات فى نهاية الفصل الدراسى و مدتها أسبوعان.

  ويجوزللجنة التنفيذية أن توافق على فتح فصل دراسى صيفى مكثف مدته ثمانية أسابيع.
  - فترة التسجيل ٤ أيام.
  - فترة الدراسة ستة أسابيع.
  - فترة الأمتحان عشرة أيام .

مادة (٥) الانسحاب من المقرر:

- فى حالة انسحاب الطالب من بعض أو كل المقررات المسجلة فى خلال أسبوعين من بدء الدراسة ويتم رد رسوم الدراسة التي تحددها اللجنة التنفيذية وتعتمدها اللجنة العليا للبرنامج.
- يجوز للطالب الأنسحاب من أى مقرر بعد موافقة منسق البرنامج وذلك حتى نهاية الأسبوع الرابع من كلا الفصلين الأول والثانى ونهاية الأسبوع الثالث من الفصل الصيفى بشرط ألا يكون

قد تجاوز نسبة الغياب المقررة قبل الأنسحاب ولا تدخل تلك المقررات فى حساب معدل الطالب.
وإذا تم الإنسحاب بعد الفترة المحددة يعتبر الطالب راسبا فى المقرر .

مادة (٦) متطلبات التخرج:

متطلبات التخرج لنيل دبلوم الكيمياء الحيوية التحليلية هى اربعة و عشرون ساعة معتمدة

- يسجل الطالب حد اقصى ١٢ ساعة معتمدة للفصل الدراسي الواحد من مقررات الدبلوم ومايفرض عليه من مقررات تكميلية.
- يسمح بالتسجيل ٤ ساعات اضافية لدواعي التخرج على ان لا يقل المعدل عن ٢,٣٣
- الطالب الذي لم يتمكن من الحصول على معدل تراكمي ٢ فأكثر في التقدير العام (CGPA) يمكن له تحسين مقررات على ان يلغي الرصد التاريخي لهذه المقررات وتحتسب مقرر مرة واحدة في حالة نجاحه في المقررات المحسنة.

مادة (٧) الأرشاد الأكاديمى

المرشد الأكاديمى، عضو هيئة تدريس تتم تسميته بترشيح منسق البرنامج و موافقة اللجنة التنفيذية للبرنامج وذلك لمساعدة الطلاب فى أختيار المقررات الدراسية والتسجيل وحل مشاكله الأكاديمية. ويقسم الطلاب الى مجموعات بحد أقصى ٢٥ طالب لكل مرشد أكاديمي.

مادة (٨) وثائق الألتحاق بالدبلومة:

- أصل شهادة المؤهل البكالوريوس.
- بيان تقديرات جميع سنوات الدراسة لمرحلة البكالوريوس.
- المحتوى العلمى للمقررات من غير خريجى بكالوريوس العلوم – جامعة طنطا.
- أصل شهادة الميلاد .
- عدد اربعة صور مقاس 4 x6 حديثة.
- سداد الرسوم الدراسية مقابل الساعة المعتمدة المسجلة.
- أستمارة ألتحاق بالدراسات العليا بعد أستيفائها.
- يتم التقدم لأدارة الدراسات العليا بالكلية مباشرة خلال شهر اغسطس من كل عام.

مادة (٩) إيقاف و إلغاء القيد

يوقف قيد الطالب فى أى فصل دراسى بناء على طلبه و بعد تقديم عذر تقبله اللجنة التنفيذية و يلغى قيده فى الحالات الأتية:

- إذا تقدم الطالب بطلب بألغاء قيده.
- إلغاء قيد الطالب بناء على تقرير المرشد الأكاديمى و بموافقةاللجنة التنفيذية.
- إذا حصل الطالب على إنذارين متتاليين من الأنذارت الأكاديمية للفصل الدراسى الواحد (أن يرسب فى الفصل الدراسى مرتين متتاليين).
- إذا رسب للمرة الثالثة فى أجتياز أمتحان أحد المقررات.
- وفى كل الأحوال تعرض حالات الإيقاف و ألغاء القيد على اللجنة التنفيذية.

مادة (١٠) قواعد دراسة مقرر

- الطالب الذى يحصل على أقل من ٢ نقاط التقدير لا يحسب له هذا المقرر من الساعات للحصول على الدرجة ما لم يحسنه.
- أما بالنسبة للمقررات الأختيارية فيجوز إعادة التسجيل فى ذات المقرر و تكون الإعادة أو أستبداله بمقرر إختيارى أخر و بحيث لاتزيد عدد مرات الإعادة عن ثلاث مرات بمقابل مادى للمقرر بعد تسديد الرسوم التى تقرها اللجنة التنفيذية.
- في حالة رسوب الطالب اكثر من مره في المقرر تحسب له في المعدل التراكمي لمرة واحدة فقط ساعات الرسوب .

مادة (١١) الأنذارات الأكاديمية

أ- يوجه للطالب إنذار أكاديمى إذا حصل على معدل تراكمى لنقاط التقديرات أقل من ٢ لأى فصل دراسى و لا يسجل فى الفصل الدراسى الثانى إلا فى الحد الأدنى لعدد الساعات (ثماني ساعات معتمدة فى الفصل الدراسى) فى حالة حصول الطالب على معدل أقل من ٢ فى المعدل التراكمى.

ب- الطالب الذى حصل على إنذار أكاديمى يسجل فى الحد الأدنى للعبء الدراسى فى الفصل الدراسى لايجوز تجاوز ذلك إلا بموافقة اللجنة التنفيذية بناء على توصية منسق البرنامج.

مادة (١٢) الانسحاب من الفصل الدراسى

- يجوز للطالب الأنسحاب الكلى من الفصل الدراسى بعد أخذ رأى منسق البرنامج وموافقة اللجنة التنفيذية على ألا يتجاوز ذلك نهاية الأسبوع الثامن من بداية الفصل الدرا سى الأول أو الثانى و نهاية الأسبوع الرابع من بداية الفصل الصيفى.
- تنظر اللجنة التنفيذية فى طلبات الإنسحاب التى تقدم بعد نهاية الفترة المسموح بها وللجنة التفيذية اتخاذ القرار المناسب.
- الطالب الذى يقبل بالبرنامج و لم يسجل خلال أسبوع التسجيل يعتبر منسحبا من الفصل الدراسى وإذا لم يسجل فى الفصل الذى يليه يلغى قبوله.
- الطالب المستمر الذى لم يحضر للتسجيل خلال فترتى التسجيل والحذف والاضافة من الفصل الدراسى يسمح له بالتسجيل في الفصل الدراسي التالي.
- يجوز تأجيل قبول الطالب لفصل دراسى واحد فى نفس العام الميلادى إذا تقدم للجنة التنفيذية خلال أسبوع التسجيل وتوافق عليه اللجنة التنفيذية وفى هذه الحالة يعتبر الطالب غير مطالب بدفع مصاريف دراسة ، أما إذا تكرر التأجيل لأكثر من عام دراسى ففى هذه الحالة يطلب منه بدفع المصاريف . الطالب المستمر وانقطع و لم يقدم طلب الأنسحاب يعامل معاملة الغائب.

مادة (١٣) التقييم

- يتم تقييم كل مقرر من ١٠٠ (مائة) درجة .
- يتم تقييم الطالب فى المقررات النظرية والعملية والتطبيقية بناء على العناصر التالية:

أ- فى حالة المقررات التى تشتمل على دراسة نظرية فقط يخصص (١٠%) للإمتحانات الشفوية، (٢٠%) للإختبارات الدورية، (١٠%) عن التكليفات، وإمتحان تحريرى درجته (٦٠%) من الدرجة الكلية للمقرر .

ب- فى حالة المقررات التى تشتمل على دراسة نظرية ودراسة عملية تطبيقية يخصص نسبة ٢٠% من درجة المقرر للإختبارات الدورية والتكليفات، ٢٠% من درجة المقرر للتقييم المستمر بالعملى، ١٠% للإمتحانات الشفوية، ٥٠% للإمتحان التحريرى النهائى.

ج- تكون الأمتحانات الفصلية والنهائية للمقرر من خلال لجنة مشكلة من السادة أعضاء هيئة التدريس بالقسم وتتولى ادارة البرنامج تنظيم الأمتحانات وإعداد أوراق أسئلة الأمتحانات بالتنسيق مع إدارة الكلية.

د- يعتبر الطالب الغائب فى الامتحانات النظرية لأى مقرر للفصل غائبا فى المقرر.

مادة (١٤) الدلالات الرقمية و الرمزية للدرجات و التقديرات

تقدير الطالب	النسبة	الرمز	النقاط
ممتاز	90 and more	A+	4.000
	85 to < 90	A	3.667
جيد جدا	80 to < 85	B+	3.333
	75 to < 80	B	3.000
جيد	70 to < 75	C+	2.667
	65 to < 70	C	2.333
مقبول	60 to < 65	D	2.000
راسب	0 to < 60	F	0.000
يرصد للطالب المنسحب من مقرر W ----- Withdrawal			
يرصد للطالب المنسحب إجبارياً من مقرر FW ---- Forced Withdrawal			
يرصد للطاب الذي لم يكمل متطلبات المقرر IC----- Incomplete			
يرصد للطالب المسجل مستمع AU------ Audit			
يرصد للطالب الذي اجتاز مقرر مستمع AUP------ Audit Pass			
يرصد للطالب الذي لم يجتز مقرر مستمع AUF------ Audit Fail			
يرصد للطالب المسجل لساعات الرسالة العلمية ولم تكتمل بعد IP---- In Progress			
يرصد للطالب عند مناقشة الرسالة العلمية بنجاح AP---- Approved			
يرصد للطالب عند رسوبه في مناقشة الرسالة العلمية NAP---- Not Approved			

(١) يمنح الطالب شهادة بتقديرات المواد، باللغة العربية أو اللغة الإنجليزية بناءً على طلبه يذكر فيها إسم المادة والتقدير والنسبة المئوية وكذلك الساعات المعتمدة .

(٢) تحسب النقطة النهائية للمقرر والمعدل الفصلى والتراكمى للمقررات الدراسية كما يلى :

النقاط النهائية للمقرر = قيمة رمز التقدير × عدد الساعات المعتمدة للمقرر

المعدل الفصلى = مجموع النقاط النهائية التى حصل عليها الطالب فى جميع مقررات الفصل الواحد

مجموع الساعات المعتمدة لهذه المقررات فى الفصل الواحد

المعدل التراكمى العام: هو متوسط ما يحصل عليه الطالب من نقاط خلال الفصلين الدراسيين و يقرب إلى رقمين عشريين فقط و يحسب كما يلى:

المعدل التراكمى = مجموع (حاصل ضرب نقاط كل مقرر تم دراسته x عدد ساعاته المعتمدة)

حاصل جمع الساعات المعتمدة لهذه المقررات التى تم دراستها

- الحد الأدنى للنجاح فى المقرر هو (٦٠%) = (٢) مقبول

- الحد الأدنى للمعدل التراكمى هو عدد نقاط (٢)
- تمنح التقديرات التى يحصل عليها الطالب عند تخرجه كما يلى:

تقدير الطالب	الرمز	النقاط	النسبة
ممتاز	A+	4.000	90 and more
	A	3.667	85 to < 90
جيد جدا	B+	3.333	80 to < 85
	B	3.000	75 to < 80
جيد	C+	2.667	70 to < 75
	C	2.333	65 to < 70
مقبول	D	2.000	60 to < 65
راسب	F	0.000	➢ 60 %

المادة (١٥)

يجوز للجنة التنفيذيه العليا بناءً على إقتراح منسق الدبلومه و مجلس القسم وتوصية اللجنه التنفيذيه إحتساب مقررات على مستوى الدراسات العليا سبق للطالب دراستها بالكلية أو في أى معهد علمي معترف به من المجلس الأعلى للجامعات خلال الثلاث سنوات السابقة لقيده بالدبلوم.

مادة (١٦) إلغاء القيد:

يلغى قيد طالب الدبلوم إذا لم يحصل على الدبلوم في مدة ستة فصول دراسية من تاريخ قيده و يجوز إعادة القيد بناء على موافقه اللجنة التنفيذيه للبرنامج .

المادة (١٧)

تطبق أحكام تنظيم لوائح الكلية والجامعة وقانون تنظيم الجامعات ولائحتة التفيذيه واي تعديلات تطرا عليه فيما لم يرد فيه نص في هدة اللائحة.

Diploma of Analytical Biochemistry

Chemistry Department
Faculty of Science, Tanta University

A- Introduction/ Background

The Diploma of Analytical Biochemistry is designed according to the need of the local market in Egypt and the Follow up of world trade agreement. Faculty of science aims to achieve the following:

To be employing qualified faculty members dedicated to prepare our students to compete at a high level and long-term success in the bioanalytical science. The development field of section is to be a major source of teaching biochemistry and conducting research of various analyses, and to be a major source of the section to provide students with the information in the field of modern science. Comply with the standards and curriculum standard adopted by the local scientific community and external community.

The aim of the analytical biochemistry diploma is to produce postgraduate students with a sound knowledge of analytical biochemistry; the diploma covers the aspects and the necessary skills to undertake individual and collaborative research in this field. This diploma has been designed for students wishing to make a career in the biochemistry, pharmaceutical industry, medical and academic or any field where knowledge of biochemical analysis is desirable.

Vision

This diploma aspires to produce postgraduate students with a sound knowledge of analytical biochemistry; the diploma covers the aspects and the necessary skills to undertake individual and collaborative research in this field to cover pharmaceutical industry, medical and academic fields.

Mission:

This Diploma seeks student in biochemistry for Rehabilitation and provide them with modern theories and technical skills in field of analytical of biochemistry and pursue higher education and research in this field. Also, it provides students the basic professional skills, technical and academics enough to qualify them to work in various fields of analytical biochemistry.

B- Aims/ Objective

1. Rehabilitation of student in biochemistry and provide them with modern theories and technical skills in science, according to the needs of recent developments and future in Egypt.
2. Prepare students to pursue higher education and research in the field of biochemical analysis.
3. Provide students the basic professional skills, technical and academic enough to qualify them to work in various fields of analytical biochemistry
4. Enrich the knowledge and contribute to scientific developments in biochemistry through scientific research and follow developments in the science.

The strategic situation of the program

1- The program submitted by the Department of Chemistry - Faculty of Science – Tanta University, a program serving the middle area of Delta's in analytical biochemistry process in the presence of many of the medical laboratory and pharmaceutical companies and correlation of many students' academic in Analytical biochemistry.

2- Faculty of science and the Department of Chemistry had an infrastructure and basic and modern instruments for student activities and various advanced education, which leads to a distinguished educational quality.

3- There is a distinct integration between the disciplines of faculty of science and University faculties' especially experimental faculties.

4- There are many distinguished schools research in the Department of Chemistry in the competitive field of scientific research and can provide community services to provide high-level graduate students with a proper knowledge in the analytical biochemistry.

5- The availability of financial and material resources through exchange for educational services provided.

6- The availability of infrastructure for laboratories and research students and highly qualified human resources and electronics that help lead to the upgrading of skills and scientific process for the graduate students.

2- The analysis of the internal environment of the program and Their relation to community service and development environment

It is important to analyze of internal environment to demonstrate the strengths and weaknesses and weakness and the points that need to **be improved. Statement as well as potential opportunities and threats for the establishment of the program will be observed.**

Points of Strengths	Points need to be improved
- There are a sufficient number of highly qualified faculty members in the field of specialty program analytical biochemistry. - There is good infrastructure and suitable to the educational process of the student labs and lecture halls and research laboratories. - There is an effective system of academic counseling for students of the program. - Faculty available electronic infrastructure and electronic library and halls for study and quiet lines allow students access to the Internet, adopted a strategy of self-education. - Faculty introduced academic accreditation from the National Accreditation and quality.	- Limited some books and references. - Upgrading of professional technicians and engineers of instruments and workers. - Elevating the level of classrooms and modernize equipment and means to display them. - Upgrading the professional side of the application of quality standards and the development of faculty members in this area. - Lack of some chemicals, which may be available from the program - Accredation of the faculty from the National Accreditation and Quality.

3- <u>The analysis of the external environment of the program and link them to community service and development environment</u>

Opportunities	Potential challenges
- The faculty is characterized by strategically place amid population density and diversity of the industrial, agricultural and Technology in the Delta governorates. - The program is characterized by binding directly to the labor market, allowing employment opportunities for graduates. - The existence of a labor market of local, Arab and international based on the technology of biochemical analysis. - Take advantage of the community service program and the development of the surrounding environment in the conclusion of agreements analyzes vital for the environment and pharmaceutical companies and medical laboratory. - The lack of efficiency of the two works medical analysis the labor market and the urgent need for them in the high efficiency	- Upgrading professional graduate program through interaction with the surrounding environment - The need to use the strategies for continuing education, modernization and measure the impact of the results of input regularly to ensure competition in the labor market and employment opportunities. - Increase the relationship between the college and the business owners and the pharmaceutical companies and medical laboratory.

From the above, the internal of the environmental analysis the results of an external environmental analysis can conclude the following:
The strengths to create a program in analytical biochemistry far superior points on the potential challenges when creating the program by more than 80% and then the program strategy is a strategy of growth and expansion and the introduction of new programs needed by the labor market.

Strategic goals and objectives of the program of analytical biochemistry

The strategic plan of the program sponsored by the Department of Chemistry - Faculty of Science –Tanta University is characterized by a package and ultimate goals, which covers the areas of axes and quality of academic programs and then applied academic accreditation, which is achieved through two main goals:

1- Program management, which includes an agreement with the mission and vision of the faculty and University leaders and the availability of academic and administrative efficiency with distinct. Finally, human resources, financial and material support to achieve the program's mission.
2- The role of the effectiveness of the educational program, which includes the academic standards of the program and an evaluation of its outputs and students and faculty members and quality management systems and program evaluation.

Therefore the goals at the end of the program are:

1- Strengthening the management and development of the program.
2- Promote and develop teaching and learning strategies.
3- The promotion and development programs and the development of community-based services environment.
4- Development of own resources for the program to support the educational process and training.
5- Strengthening the policies and mechanisms linking the graduate labor market to ensure employment opportunities and competition.
6- Obtaining academic accreditation of the local program.

Aim of the program

1- Give graduates the knowledge and skills of scientific and technical in the field of analytical biochemistry.
2- Qualifying students in biochemistry and provide them with modern theories and technical skills in the field of science, according to the needs of the future and recent developments in Egypt and the world.
3- Prepare students to pursue higher education and research in the field of analysis.

4- Provide students with the basic skills of professional, technical and academic enough to qualify them to work in different areas of analytical biochemistry.
5- Enriching the knowledge and contributing to the scientific developments in the field of biochemistry through scientific research and to follow developments in the field of science.
6- Provide students with a set of generic skills to develop their personal skills.
7- Testing and interpretation of the special problems of vital operations analysis.
8- The use of theoretical and practical skills through learning in groups and address the problems of analysis, using the proper scientific method to solve problems.
9- Exploit the potential of the Department of Chemistry, Faculty of Science – Tanta University and scientific laboratory to meet the requirements of this program and in particular the potential of faculty members do not mind the use of the expertise of the other inside and outside the university if necessary.

Intended Learning outcomes

A. Knowledge and understanding:

At the end of the program the student will be able to demonstrate knowledge and understanding of:

1- The information and basic knowledge of the methods of analysis vital.
2- The scientific concepts for practical applications in the field of modern analysis.
3- The analytical skills and face the vital problems.
4- Methods and techniques of scientific research.

B. Intellectual skills:

Students should also acquire the ability to:

1- Summarize and interpret information related to the cumulative knowledge of the tests.
2- Solving problems related to Biochemical analyzes.
3- Integration of theoretical and practical skills in scientific research related analyzes vital
4- Practical ability and professional in various biochemical analysis.

C. Professional and practical skills:

By the end of the Program, the students should be able to:

1- Analyze various methods and tools used in the field of analytical biochemistry.
2- Design analysis and interpretation of the different results.
3- Discuss the familiarity with the ways of the types of laboratory tests.
4- Apply specific risk assessment process.

D. General and transferable skills:

1- The ability to optimize the different analysis and use modern technique of analysis to evaluate and interpret the results.
2- Prepare different devices and methods of preservation.
3- Use information technology and analysis with modern appliances.
4- Work individually, and as part of a team, and self-learning with an open mind and accuracy.

E. Content:

The diploma is structured around a series of two semester modules covering the core skills required by analytical chemists, a specialist skills module Students have an opportunity to specialize through options in the specialist module and by the choice of project topic.

Semester 1		Course title	Hours		
Code	Preq	Obligatory	Lec.	Prac.	Cred.
CH5101	---	Analytical methods	1	3	2
CH 5103	---	Instrumental analysis	1	3	2
BC5101	---	General metabolism	2	3	3
BC5103	---	Proteomics : Principle and techniques	1	3	2
	---	**Elective**: select Three credits hours from the following modules			
BC5107	---	Hormones and Enzymes	2		2
BC5113	---	Nutritional analysis	2		2
CH5105	---	Water analysis and treatment	1		1
CH5107	---	Polymers in medicine	1		1
					12

Semester 2		Course title	Hours		
Code	Preq	Obligatory	Lec.	Prac.	Cred.
CH5102	---	Spectroscopy	2	--	2
BC5102	---	Clinical Biochemistry	2	3	3
BC5104	---	Experimental Techniques in Biochemistry	1	3	2
MA5102	---	Biostatistics	1	2	2
	---	**Elective**: select Three credit hours from the following modules			
BC5106	---	Biotechnology	1	--	1
BC5114	---	Clinical quality control	1	--	1
BC5116	---	Immunochemical and Biopharmaceutical Analysis	2	--	2
BC51118	---	Biochemical Toxicology and Regulation metabolism	2	--	2
CH5108	---	Polymeric drug delivery system	1	--	1
					12

Table of distribution of Marks for analytical biochemistry

Total exam hours	Total	Oral Marks	Assignments Marks	Periodical exams Marks	Lab Marks	Written exam marks	Total credit Hours	Laboratory	Lectures	Diploma Students	
Semester1											
2	100	10	10	10	20	50	2	3	1	Analytical methods	1
2	100	10	10	10	20	50	2	3	1	Instrumental analysis	2
2	100	10	10	10	20	50	3	3	2	GeneralMetabolism	3
2	100	10	10	10	20	50	2	3	1	Proteomics : Principle and techniques	4
Elective course (3 credit hours only) for the first semister											
2	100	10	10	20	--	60	2	--	2	Hormones and Enzymes	5
2	100	10	10	20	--	60	2	--	2	Nutritional analysis	6
1	100	10	10	20	--	60	1	--	1	Water analysis and treatment	7
1	100	10	10	20	--	60	1	--	1	Polymers in medicine	8
Semeste2											
2	100	10	10	20	--	60	2	--	2	Spectroscopy	9
3	100	10	10	10	20	50	3	3	2	Clinical Biochemistry	10
2	100	10	10	10	20	50	2	3	1	Experimental Techniques in Biochemistry	11
2	100	10	10	10	20	50	2	2	1	Biostatistics	12
Elective course (3 credit hours only) for the second semister											
1	100	10	10	20	-	60	1	--	1	Biotechnology	13
1	100	10	10	20	--	60	1	--	1	Clinical quality control	14
2	100	10	10	20	--	60	2	--	2	Immunochemical and Biopharmaceutical Analysis	15
2	100	10	10	20	--	60	2	--	2	Biochemical Toxicology and regulation metabolism	16
1	100	10	10	20	--	60	1	--	1	Polymeric drug delivery system	17
--	1200		--		--	--		--	--	Total Marks for diploma	

Course Description:

1- Analytical methods

Chromatography methods and its applications. Introduction of electrochemistry. Electro-analytical techniques. Potentiometric analysis

2- Instrumental analysis (1)

1. Spectrophotometrical analysis- Fluorometry- Thermal analysis- Electrophoresis. The advanced instrumental methods which may be used for determination of nutrients, major ions and trace elements.

3- General Metabolism

A study of the metabolism of carbohydrates, lipid, proteins and nucleic acid. , enzyme kinetics and enzyme mechanisms. There is especially focus on the different tools of metabolic process, overview of biochemical pathways. Energetics. Regulation of pathways.

4- Proteomics : Principle and techniques

An introduction to proteomics: Basics of protein structure and function, An overview of systems biology, Evolution from protein chemistry to proteomics; Abundance-based proteomics: Sample preparation and fractionation steps, Gel-based proteomics - two-dimensional gel electrophoresis (2-DE), two-dimensional fluorescence difference in-gel electrophoresis (DIGE), Staining techniques.

5- Spectroscopy

The use of ultraviolet, visible spectroscopy as tools for the identification of organic compounds. Applications of various spectroscopic methods in quantitative analysis of environmental samples

6- Clinical Biochemistry

The course will outline the biochemical mechanisms for controlling different pathways under different physiological and nutritional conditions and the importance of diseases arising from defects in these pathways. Particular emphasis will be placed upon the etiology, symptoms and treatment of diseases such as Type I and II diabetes mellitus; atherosclerosis and other lipid disorders and inborn errors of carbohydrate and amino metabolism. In addition the importance of how our knowledge of nucleotide metabolism has led to the development of different chemotherapeutic approaches to the treatment of cancer will be discussed.

7- Biotechnology

The aim of this course is to provide scientists with an understanding of how their skills may be used in society. The course explores the applications of biotechnology, its products and processes. It examines the mechanisms through which biotechnology is commercialized, such as university-industry links, spin-off firms and corporate alliances. The role of regulatory and ethical debates in the development of biotechnology is also explored.

8- Experimental Techniques in Biochemistry

The goal of this study is to bring the student in contact with the basic and modern techniques in the field of practical biochemistry. Subjects include: basic and modern techniques for the isolation, purification and characterization of biological molecules.

9- Biostatistics

The aim of the course is to apply the law of statistics in biochemistry researches. Subjects include: experimental design, describing and summarizing the data, estimation and hypothesis tests, the analysis of variance, analysis of regression and correlation and the analysis of categorical data.

10- Hormones and Enzymes

The Course hormone is intended to cover the major endocrine systems which regulate metabolism, reproduction, growth and development. This includes chemistry of hormones endocrinology of the Hypothalamo/pituitary axis and its integration with the adrenal, thyroid, Parathyroid, ovary, testis. Additional systems include the control of salt balance, pancreatic control of carbohydrate metabolism, and the control of growth. Reproduction will be covered in detail including fertilization, implantation, placental function, maternal adaptation to pregnancy, parturition, and lactation.

The purpose of this study is how enzymes utilize binding interactions directed to non-reacting parts of substrate molecules to catalyze the chemical transformations of the reacting parts of substrates. Subject include: Nomenclature and classification of Enzyms, Physical and chemical characteristic of Enzymes, Coenzymes, Specificity of Enzymes, Transition state theory, Enzyme mechanism and kinetics, Enzyme regulation and medical and pharmaceutical application of enzymes.

11- Nutritional analysis

Survey of the structure, analysis and function of biological macro-molecules including proteins, carbohydrates, lipids, and nucleic acids.Analysis of foods, meat and milk.

12- Water analysis and Treatments

Physical ; chemical and biological characterization of water analysis—Physical; Chemical and biological water treatments (precipitation, flotation, chlorination, ozonolysis)

13- Polymers in medicine

- Introduction to polymers
- Application of polymers
- Antimicrobial polymers
- Wound dressing

14- Clinical quality control

A study of the design and operation of a quality control program in a clinical laboratory. The course will include all those action necessary to provide adequate confidence that test results satisfy given requirements and standards. Such areas as statistics, patient's preparation, specimen integrity, external proficiency control, internal quality control, analytical goals and laboratory management will be covered (Enrollment limited to clinical chemistry majors).

15- Immunochemical and Biopharmaceutical Analysis

Overall view of biotechnology and bioprocessing. It will cover molecular theories for biotherapeutics, the engineering and applicable sciences behind bioprocess development, and the latest advancements in bioprocessing and bioanalytical technology. Structure and function of immune system innate and acquired immunity, different functions and mechanisms.

16-Biochemical Toxicology and regulation metabolism

The goal of this study is to provide extensive knowledge on the biochemical basis of toxicity. Subjects include: basis concepts in toxicology, history and branches, dose – response curves, statistically defined expression in toxicology, classification of toxicants and their mode of action, mutagens, and carcinogen, phytotoxins, zootoxin and environmental toxicants.

The purpose of this course is to provide through description of the mechanism of metabolic regulation. Subject include: Regulation of Carbohydrate, Lipid and protein.

Hormonal action of metabolic control.Regulation of metabolism in starvation and obesity.

17-Polymeric drug delivery system

- Drug Discovery, Drug.
- Approach, source of drugs.
- Pharmatokinetic and pharmato dynamic.
- Polymers in drug delivery.
- Requirements of drugs.
- Requirements of polymers.
- Advantages of drug delivery systems (DDS)
- How to make DDS.
- DDS in market.

C- Role of Organization

Teaching postgraduate students .

a- Preparing the required courses
b- purchase the experiments and tools related to the diploma
c- setup and testing the experiments
d- teaching courses
e- Buy text books
f- Establishing web site
g- Preparing technician to repair technical problems

2- Quality Control and Monitoring

Monthly regular meeting for the staff t members

General conditions for admission and registration

Accept the diploma Analytical biochemistry student winning a bachelor's degree, Tanta University, or a university recognized by the Supreme Council of Universities that have obtained a bachelor's degree in biochemistry Special, Major or Special chemistry or the Major from the students of chemistry / Botany or Chemistry / Zoology or Chemistry / Microbiology or Microbiology or Zoology special who also received the Diploma degree graduates from faculties of veterinary medicine and pharmacy and some division of agriculture faculty after the acceptance of special committee from the department . The board of the to decide other courses for students

other than Bachelor of Science Biochemistry (Major and Special) to study by the student and lead successful and the exam grades are not calculated in the GPA of the student with grade addition for this complementary course.

Students should have obtained a bachelor's degree form

From Tanta University or an equivalent qualification with the accumulated grade of " pass" in the following Subjects form an institute accepted by supreme council of Universities or from Al- Azhar University. For the non- Egyptian Students, the application rules of University regulations also apply.

Subjects:

1- Special or major biochemistry.
2- Major or special chemistry.
3- Major form students of chemistry.
4- Zoology/ Entomology.
5- Botany.
6- Microbiology.
7- Biotechnology.
8- Double Major:
   Chemistry/ Microbiology.
   Chemistry/ Botany.
   Chemistry/ Zoology.
   Chemistry/ Entomology.
9- Chemistry/ Geology.
10- Pharmacey.
11- Veterinary Medicine

- Students Who graduated from double Program with minor chemistry with minor chemistry are also accepted to the Program after acceptance of the coordinator of the programmers and the executive committee of the Program.
- Eradicates certain deportments from Faculty of Agriculture may be admitted to The Program after agreement of the coordinator and the committee.
- In the last two cases of admission, the committee must decide, additional courses for students with additional fees and there hours are not added to the GPA of the students.
- The committee is responsible for any modification of their admission rules and for everything concerning This Diploma Such as Time tables for study exams, selecting Professors for teaching in This program, etc.

اللائحة المالية

المقترح بلائحة دبلوم الكيمياء الحيوية التحليلية

Diploma of Analytical Biochemistry

Biochemistry Division
Chemistry Department
Faculty of Science
Tanta University

اللائحة المالية

مادة (1)

تبدأالسنة المالية لحساب البرنامج اعتبارا من أول يوليو وتنتهى بنهاية شهر يونيو من العام التالى

مادة (٢) إيرادات البرنامج

تتكون ايرادات البرنامج مما يلى :-

١- الرسوم والمصروفات الدراسية

٢- المقابل المادى لطلب الالتحاق بالبرنامج

تودع جميع ايرادات البرنامج في كلية العلوم - جامعة طنطا حساب مستقل ولا يجوز الصرف من هذه الايرادات إلا فى الاغراض المخصصة طبقا للائحة المالية للبرنامج ويكون الصرف بناء على مستندات مستوفاه ومعتمدة من عميد الكلية أورئيس اللجنة التنفيذية .

مادة (٣) : توزع إيرادات البرنامج على النحو التالى:-

١- المخصصات المالية السيادية والذاتية :

١٠% من إجمالى الايرادات تخصص لصالح ايرادات الموازنة العامة للدولة.

١٢% من إجمالى الايرادات تخصص لتنمية الموارد الذاتية للجامعة

١% من إجمالى الايرادات تخصص لدعم صندوق الخدمات الصحية والاجتماعية للسادة أعضاء هيئة التدريس.

٢% من اجمالى الايرادات تخصص لادارة البرامج الجديدة بوزارة التعليم العالى .

٢- باقيإجمالي ايرادات المقابل المالي توزع على النحو التالى :

10 % حصة الجامعة

٦٥% حصة الكلية توزع كالاتى:

أ- ٦٥% لمستحقات التدريس وأعمال الامتحانات والكنترول وإدارة االبرنامج

ب- ٣٥% خدمة العملية التعليمية للبرنامج.

مادة (٤) الرسوم والمصروفات الدراسية :

- تكون الرسوم الدراسية بمبلغ ٢٥٠٠ جنية في الفصل الدراسي الواحد بالإضافة الى رسوم الجامعة والكلية ويجوز تغير قيمتها بعد موافقة اللجنة التنفيذية بالكلية واللجنة العليا بالجامعة واعتماد مجلس الجامعة.
- تسجيل الساعة المعتمدة ٢٠٠ جنية للساعة المعتمدة التكميلية او المقرارات التي تم الرسوب بها والتي يقوم الطالب بتحسينها.
- تسجيل الساعة ٣٠٠ جنية للساعة المعتمدة لمقرارات الفصل الدراسي الصيفي.

مادة (٥) أجور وبدلات ومكافآت المشاركين في البرنامج

١- بدل حضور جلسات اللجنة العليا واللجنة التنفيذية للبرنامج وتصرف بواقع ٢٠٠ (مائتان جنيها) لكل عضو عن الجلسة الواحدة وبحد اقصى (١٢) جلسة فى العام ويجوز تعديلها بعد موافقة اللجنة التنفيذية واللجنة العليا.

٢- مكافآت إدارة وتشغيل البرنامج (التسجيل والتنسيق والارشاد الاكاديمي والدراسات العليا ومراقبة الحسابات وغير ذلك من الاعباء الادارية تحدد بمعرفة اللجنة التنفيذية)

٣- مستحقات التدريس وتحسب مقابل ساعات تدريس المحاضرات والمعامل والتمارين والاعمال المعانة طبقا للجدول التالى :

الدرجة الاكادمية	مقابل ساعة المحاضرة	مقابل ساعة التمارين والمعامل
الاستاذ	١٢٠ جنيه	١٢٠ جنيه
الاستاذ المساعد	١٠٠ جنيه	١٠٠ جنيه
المدرس	٨٥ جنيه	٨٥ جنيه
المدرس المساعد		٦٠ جنيه
المعيد		٥٠ جنيه
فنى المعمل		٣٠ جنيه
عامل		٢٠ جنيه

ويخصص عضو هيئة تدريس لكل ٢٥ طالب ويخصص معيد أو مدرس مساعد لكل ٢٥ طالب ، ويخصص فنى معمل لكل ٥٠ طالب، ويخصص عامل لكل ٥٠ طالب .

٤- مستحقات الامتحانات

أ- الامتحانات التحريرية.

تشكل لجان وضع الامتحان وتصحيح أوراق الامتحان التحريرى بحد أدنى (٢) مصححين وبحد أقصى عدد (٤) مصححين للمقرر ، وصرف لكل عضو ٢٠٠ جنيه (مائتان جنيه)

ب- الامتحانات الشفهية

تشكل لجان الامتحانات الشفهية بواقع ٣ ممتحنين لكل ٥ طلاب، وتحدد قيمة اللجنة بمعرفة اللجنة التنفيذية على ان تكون حسب الدرجة العلمية لعضو هيئة التدريس.

ج- الامتحانات التطبيقية

تصرف مستحقات الامتحانات التطبيقيةطبقا للنظام المتبع في الامتحانات الشفهية.

٥- مستحقات الكنترول ولجان رصد الدرجات :

تشكل لجان الكنترول ورصد الدرجات بواقع عضو لكل ٢٥ طالب بخلاف رئيس اللجنة بحيث لا يقل عدد أعضاء الكنترول عن اثنين ويتم الصرف حسب قرار رئيس اللجنة التنفيذية.

٦- الاشراف على الامتحانات واعمال المراقبة والملاحظة والخدمات المعاونة :

أ- تخصص مكافئة لكل من السيد الأستاذ الدكتور عميد الكلية بصفته رئيس عام الامتحانات والسيد وكيل الكلية لشئون الدراسات العليا والبحوث بصفته نائبا عن رئيس عام الامتحانات بمعرفه رئيس اللجنة التنفيذية.

ب- تشكل لجنة الاعداد ولجنة للأسئلة الخاصة بامتحانات لكل فصل دراسي وتصرف مكافئة بمعرفة رئيس اللجنة التنفيذية.

ت- يخصص مراقب لكل ٢٥ طالب فى الامتحانات التحريرية ويصرف لكل منهم مكافئة عن اليوم حسب ما يقرره رئيس اللجنة التنفيذية.

ث- يخصص عامل خدمات معاونة لكل ٥٠ طالب وتصرف له مكافأة عن أعمال الامتحانات حسب ما يقرره رئيس اللحنة التنفيذية.

مادة (٤)

- يعين عميد الكلية مراقبا لحسابات البرنامج يتولى متابعة جميع إيرادات البرنامج ومصروفاته أولا بأول وعرض تقرير شهرى على اللجنة التنفيذية ببيان الايرادات والمصروفات بالاضافة الى إعداد حساب ختامى البرنامج يظهر فيه بيان الايرادات التى حصلت وبيان المنصرف الفعلى، ويرحل الفائض من سنة إلى اخرى.

(ثانيا)

برنامج
دبلوم المهني في الميكروبيولوجي

ساعات معتمده

جمهورية مصر العربية
وزارة التعليم العالي
الوزير

قرار وزاري
رقم (٢٥٥٩) بتاريخ ٨ / ٨ / ٢٠١٧
بشأن تعديل اللائحة الداخلية لكلية العلوم
جامعة طنطا (مرحلة البكالوريوس والدراسات العليا)

وزير التعليم العالي والبحث العلمي ورئيس المجلس الأعلى للجامعات

بعد الاطلاع على القانون رقم (٤٩) لسنة ١٩٧٢ في شأن تنظيم الجامعات والقوانين المعدلة له.
وعلى قرار رئيس الجمهورية رقم (٨٠٩) لسنة ١٩٧٥ بإصدار اللائحة التنفيذية لقانون تنظيم الجامعات والقرارات المعدلة له.
وعلى القرار الوزاري رقم (٦٥٤) بتاريخ ١٩٦٩/١٢/٢٢ بإصدار اللائحة الداخلية لكلية العلوم جامعة طنطا (مرحلة البكالوريوس ، والدراسات العليا) والقرارات المعدلة له .
** وعلى موافقة مجلس جامعة طنطا بجلسته بتاريخ ٢٠١٦/١١/٣٠ ، وموافقة السيد الاستاذ الدكتور القائم بعمل رئيس جامعة طنطا بتاريخ ٢٠١٧/٣/٢٦ .
** وعلى موافقة لجنة قطاع العلوم الأساسية بجلساتها بتاريخ ٢٠١٦/١٢/٢٢ ، ٢/١٦ ، ٢٠١٧/٤/٢٠
** وعلى موافقة المجلس الأعلى للجامعات بجلسته بتاريخ ٢٠١٧/٥/٢٠ .

قرر

(المادة الأولى)

يضاف بند جديد (ص) لنص المادة (٢١) من اللائحة الداخلية لكلية العلوم جامعة طنطا (مرحلة الدراسات العليا) بنظام الساعات المعتمدة الصادرة بالقرار الوزاري رقم (٦٥٤) بتاريخ ١٩٦٩/١٢/٢٢ نصه التالي : -

مادة (٢١) : تمنح جامعة طنطا بناء على اقتراح كلية العلوم دبلومات الدراسات العليا الآتية : -

أ - .....

ب - .....

ص - برنامج الدبلوم المهني في الميكروبيولوجي .

(المادة الثانية)

تلحق باللائحة الداخلية المشار إليها بعاليه اللائحة الدراسية المرفقة والخاصة ببرنامج الدبلوم المهني في الميكروبيولوجي .

(المادة الثانية)

على جميع الجهات المختصة تنفيذ هذا القرار .

وزير التعليم العالي والبحث العلمي
ورئيس المجلس الأعلى للجامعات

(أ.د/ خالد عبد الغفار)

برنامج الدبلوم المهنى فى الميكروبيولوجي

Professional Microbiology Diploma

جامعة طنطا Tanta University

كلية العلوم Faculty of Science

قسم النبات Botany Department

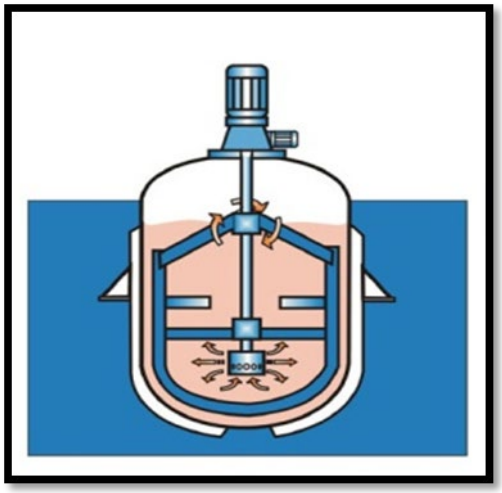
برنامج الدبلوم المهنى فى الميكروبيولوجي

Professional Microbiology Diploma

Credit Hours System

اللائحة الداخلية والتوصيف





منسق البرنامج

ا.د.ايمان حسن فتحى عبد الظاهر

رئيس قسم النبات

ا.د.سعيدة عامر

الدبلوم المهنى فى الميكروبيولوجي

2023/2022

برنامج الدبلوم المهنى فى الميكروبيولوجي بنظام الساعات المعتمدة

اللائحـــة الداخليـــة للبرنامج

مقدمة:

برنامج الدبلوم المهنى فى الميكروبيولوجي هو برنامج يُلبي طموحات الطلاب، ويُشبع تطلعاتهم إلي تطبيق ما يدرسونه، ويدربهم على الابتكار. ويهدف إلي الحصول علي خريج مُلم بالمفاهيم النظرية لعلم الميكروبيولوجى، وتطبيقاتها التكنولوجية في الصناعة، والاستفادة منها في خدمة البيئة والمجتمع الذي يعيش فيه.

فهذا البرنامج يهدف إلي إعداد خريج مُزود بالمهارات والقدرات التي تُؤهلة للمنافسة في سوق العمل علي الفرص المتاحة بمصانع المنتجات الغذائية والكيميائية والصناعية المعتمدة في إنتاجها علي الكائنات الحية أو مكوناتها. كما تؤهلة للعمل في معامل التحاليل، المستشفيات، بنوك الدم، مصلحة الطب الشرعي، هيئة المصل واللقاح، شركات الأدوية، فروع جهاز شئون البيئة، محطات معالجة المياة، الجامعات الحكومية و الخاصة، ومراكز البحوث المنتشرة بأنحاء الجمهورية.

والأهم من ذلك هو أن البرنامج يهدف إلي إعداد خريج مُدرب ومُجهز لتطبيق ما يدرسه في تأسيس مشروع خاص به من أجل إنتاج أوصناعة منتجات جديدة باستخدام تطبيقات التقنية الحيوية التي يدرسها بتعمق، ويتدرب عليها بكفاءة من خلال الدراسة النظرية والعملية والتدريب الميداني الذي يتلقاه على مدارالدراسة.

صمم هذا البرنامج الدراسى بحيث يتم التعلم عن طريق المحاضرات والدروس العملية التطبيقية والتدريب فى المصانع ومراكز البحوث والمعامل الحكومية والخاصة فى مجال الميكروبيولوجية التطبيقية الى جانب حلقات النقاش واجراء مشاريع التخرج التطبيقية بالأضافة الى التعاون مع المجتمع الخارجى.

مادة (1): تمنح جامعة طنطا الدبلوم المهنى فى الميكروبيولوجي بناءعلى اقتراح مجلس كلية العلوم.

مادة (2) قواعد القبول:

أولا: يُشترط في من يتقدم للالتحاق بالبرنامج أن يستوفي الشروط الواردة بقانون تنظيم الجامعات ولائحته التنفيذيةعلى النحو التالى:

الحصول على بكالوريوس العلوم فى أحد التخصصات الآتية: الميكروبيولوجى – النبات – نبات/ كيمياء – ميكروبيولوجى / كيمياء- كيمياء/ نبات – كيمياء/ ميكروبيولوجى - الكيمياء الحيوية – جميع الخريجين من الكليات الأخرى اللذين درسوا مقررات الميكروبيولوجى أثناء دراستهم الجامعيه.

ثانياً: يتم قبول الطلاب بالبرنامج سنوياً وتحدد اللجنة العليا للبرنامج أعداد المقبولين في ضوء اقتراح اللجنة التنفيذية بعد أخذ رأي مجلس القسم المختص.

مادة (3) نظام الدراسة:

١) مدة الدراسة بالبرنامج عام دراسى واحد (فصلين دراسيين) كل فصل دراسى 16 أسبوعاً تشمل الأعمال الإمتحانية وفق نظام الساعات المعتمدة. ويُسمح للطالب الذي تمتد فترة دراسته أكثر من سنة جامعية أن يتخرج إذا حقق متطلبات التخرج في أي من الفصلين الدراسيين لعام التخرج أو الفصل الصيفى.

٢) يجوز طرح بعض المقررات في فصل دراسي صيفي مدته ثمانية (8) أسابيع من الدراسة المُكثفة شاملة الإمتحانات (بعد أخذ رأى محلس القسم).

٣) الساعة المعتمدة هي وحدة قياس دراسية وتُعادل ساعة دراسية نظرية، أو ساعتين لكل درس عملي أسبوعياً لمدة أربعة عشر (14) أسبوعاً، وتُدرس على مدى فصل دراسي واحد.

٤) يجب على الطالب متابعة المحاضرات والإشتراك فى التمرينات العملية أو قاعات البحث. وللجنه العليا للبرنامج بناء على اقتراح اللجنه التنفيذيه وموافقة مجلس القسم أن يحرم الطالب من التقدم إلى الإمتحان كله أو بعضه إذا رأى أن مواظبته غير مرضيه وفى هذه الحالة يعتبر الطالب راسباً فى المقررات التى حرم من التقدم للإمتحان فيها.

مادة (4) لغة الدراسة:

الدراسة في هذا البرنامج باللغة الإنجليزية.

مادة (5) متطلبات الحصول على الدبلومة:

١) يتطلب الحصول على الدبلوم المهنى فى الميكروبيولوجي استيفاء عدد 24 ساعة معتمدة خلال عام جامعى موزعة إلى 20 ساعة معتمدة أساسية مقسمة على فصلين دراسيين + 4 ساعات معتمدة إختيارية مقسمة على الفصلين الدراسيين، كما هو مبين بجداول توزيع المقررات.

٢) تُرقم المقررات المختلفة بالبرنامج والمبينة بجداول المقررات الدراسية بحروف يتبعها ثلاثة أرقام، ومدلولاتها من اليسار إلي اليمين علي النحو التالي:

أ) الحروف تدل علي اسم البرنامج والقسم العلمي الذي يتبعه هذا المقرر.

ب) يمثل الرقم الأول من اليسار المستوى الدراسي الذي يُقدم فيه هذا المقرر، ويمثل الرقم الثانى الفصل الدراسى، و يمثل الرقمان الثالث والرابع من اليسار تسلسل المقرر في المستوى الدراسي، بحيث ترمز الأرقام الفردية لمقررات الفصل الدراسي الاول، والأرقام الزوجية ترمز لمقررات الفصل الدراسي الثاني.

مادة (6) التسجيل و الحذف و الإضافة :

١) تقوم إدارة الدراسات العليا بالكلية بعد مراجعة المرشد الأكاديمي بتسجيل المقررات إلكترونياً في الأسبوع الأول بكل فصل دراسي لكل طالب.

٢) يُشترط لتسجيل المقرر أن يكون الطالب قد اجتاز بنجاح المتطلب السابق لهذا المقرر (إن وُجد).

٣) لا يُسمح للطالب بالتسجيل المتأخر إلا بموافقة عميد الكلية، علي ألا تزيد مدة التأخير عن أسبوعين من نهاية فترة التسجيل.

٤) يجوز للطالب بعد إستكمال إجراءات التسجيل أن يحذف أو يضيف مقرراً أو أكثر مع مراعاة الحد الأدنى و الحد الأقصى للعبء الدراسي، و ذلك حتي نهاية الأسبوع الثانى من بدء الدراسة.

مادة (7) التقييم:

١) النهاية العظمى لدرجات كل مقرر دراسي هي 100 درجة ويتم توزيعها وفقاً للعناصر التالية.

نوع المقرر	أعمال فصلية	شفوي	تطبيقي	عملي/تمارين تطبيقيه	نظري
مقررات بها محتوى نظري وعملي	%10	%5	%5	%20	%60
مقررات نظريه فقط	%20	%10	-	%10	%60

٢) الحد الأدني للنجاح في أي مقرر هو 60% من النهاية العظمي لدرجة المقرر.

٣) مدة الإمتحان النهائي النظري للمقرر ساعتان.

٤) يعتبر الطالب الغائب بدون عذر في الامتحان النهائى النظري للفصل راسباً في المقرر.

٥) إذا تقدم الطالب بعذر مقبول خلال المدة المحددة وفقاً للقواعد المقررة للأعذار باللآئحه التنفيذيه لقانون تنظيم الجامعات تكون نتيجة الطالب فى هذا المقرر (غير مكتمل)، ويستكمل الطالب متطلبات المقرر في الفترة التي يُعقد بها الامتحان النهائي للمقررات غير المكتملة و هي امتحانات الفصل الدراسي التالي مباشرة، و يُعتبر الطالب راسباً في هذا المقرر و يُرصد له تقدير (غير مكتمل).

مادة (8) الدلالات الرقمية والرمزية للدرجات والتقديرات:

١) تُقدر الدرجات والنقاط التي يحصل عليها الطالب نجاحاً ورسوباً في كل مقرر دراسي علي النحو التالي:

حساب النظام الأكاديمى (التقديرات) للمقرر الدراسى:

التقدير	الرمز	النسبة المئوية	عدد النقاط
ممتاز	A	90 ≤	5
	B+	90 > -85	4.5
جيد جداً	B	85> -80	4
	C+	80> -75	3.5
جيد	C	75> -70	3
	D+	70 > -65	2.5
مقبول	D	65 > -60	2
راسب	F	60>	0

٢) المعدل التراكمي GPA:هو متوسط ما يحصل عليه الطالب من نقاط خلال الفصول الدراسية ويقرب إلى رقمين عشريين فقط ويُحسب كما يلي:\

$$\text{المعدل التراكمي (GPA)} = \frac{\text{مجموع (حاصل ضرب نقاط كل مقرر تمت دراسته X عدد ساعاته المعتمدة)}}{\text{حاصل جمع الساعات المعتمدة التى درسها الطالب نجاحاً ورسوباً}}$$

٣) الحد الأدني للمعدل التراكمي للتخرج هو (2.0) مقبول.

٤) تمنح التقديرات التي يحصل عليها الطالب عند تخرجه كما هو مبين بالجدول التالي الذى يوضح العلاقة بين التقدير العام للتخرج والمعدل التراكمي GPA:

التقدير	الرمز	GPA	النسبة المئوية للمعدل التراكمى
ممتاز	A	5	90 ≤
	B+	5> - 4.5	90 > - 85
جيد جداً	B	4.5> - 4	85> - 80
	C+	4> - 3.5	80> - 75
جيد	C	3.5> - 3	75> - 70
	D+	3> - 2.5	70> - 65
مقبول	D	2.5> - 2	65> - 60
راسب	F	0	60 >

حالات الطالب غير الناجح:

عدد النقاط	الرمز	الحالة
-	W	منسحب Withdrawn
-	WE	منسحب بعذر مقبول Withdrawn Excuse
0	WF	منسحب برسوب Withdrawn Fail
-	I	غير مكتمل Incomplete

- ويبين في شهادة تخرج الطالب النقاط المكتسبة إلي جانب التقدير العام للتخرج.

مادة (9) الرسوب في المقررات:

أولاً: يعتبر الطالب راسباً في المقرر في الحالات الأتية:

١) إذا تغيب الطالب بدون عذر مقبول عن الامتحان النظري النهائي أو حرمانه من أداء الامتحان النظري النهائي في المقرر.

٢) إذا حصل الطالب علي أقل من 60% من النهاية العظمي لمجموع درجات المقرر.

ثانياً: إذا رسب الطالب في أي مقرر أساسى في أي فصل دراسي فعلية إعادة دراسة ذات المقرر والامتحان فيه. أما إذا رسب في مقرر اختياري فيمكنه إعادة دراسته أو دراسة مقرر اختياري أخر بديل لإكمال متطلبات التخرج وذلك بعد موافقة المرشد الأكاديمي وعميد الكلية.

ثالثاً: عند إعادة الطالب لمقرر رسب فيه، سواء مقرر إجباري أو اختياري، يرصد فى سجله الدراسى جميع تقديرات المقررات الحاصل عليها فى جميع محاولاته وتدخل جميعا فى حساب متوسط نقاط التقدير التراكمى للدرجات.

مادة (10) التعثر الأكاديمى:

ينذر الطالب أكاديمياً إذا حصل على معدل تراكمى أقل من 1 للترم ويسجل الحد الأدنى من عدد الساعات المعتمدة (8 ساعات).

مادة (11) الانقطاع عن الدراسة:

يعتبر الطالب منقطعاً عن الدراسة إذا لم يسجل مقررات في أي فصل دراسي، أو انسحب من الفصل بعد نهاية المواعيد المقررة بدون عذر مقبول. (يعتبر منسحب برسوبWF)

مادة (12) الفصل من الدراسة:

يُفصل الطالب من البرنامج إذا تجاوز الحد الأقصى لمدة الدراسة بالبرنامج وهى 3 أعوام دراسية متتالية.

برنامج الدبلوم المهني في الميكروبيولوجي بنظام الساعات المعتمدة

أولاً: النظام الإدارى للبرنامج

مادة(1):

تشكل اللجنة العليا للإشراف العام على برنامج الدراسة للحصول على الدبلوم المهني في الميكروبيولوجي بكلية العلوم على النحو التالي:

1. السيد أ.د/ رئيس الجامعة رئيساً
2. السيد أ.د/ نائب رئيس الجامعة للدراسات العليا والبحوث نائب للرئيس
3. السيد أ.د/ عميد كلية العلوم عضواً
4. السيد/ مدير عام الدراسات بالجامعة عضو إداري وأمين اللجنة

مادة (2):

يصدر بتشكيل اللجنة العليا قرار من رئيس الجامعة ويتم عرض قراراتها على مجلس الجامعة لإبداء الرأى فيها.

مادة (3) اختصاصات اللجنة العليا:

تختص اللجنة العليا بالإشراف العام على برنامج الدراسة وعلى الأخص المسائل التالية:

1- التخطيط لتحقيق الأهداف التى من أجلها أنشئ برنامج الدراسة.

2- توفير كافة الإمكانات المادية والبشرية اللازمة لتسيير شئون برنامج الدراسة.

3- تنظيم وإدارة ما يرتبط بنظام الدراسة بالبرنامج وما يرتبط به من أعمال الإمتحانات.

4- تحديد عدد الطلاب المقبولين بالبرنامج، واعتماد قبولهم.
5- وضع النظام المالى الذى يحقق حسن الاستفادة من الإيرادات المالية الذاتية للبرنامج.
6- وضع نظام الحوافز والمكافآت المالية.
7- اعتماد الميزانية والحساب الختامى لإيرادات ومصروفات البرنامج.

مادة (4):

تشكل اللجنة التنفيذية للبرنامج على النحو التالى:

1. السيد أ.د/ عميد الكلية رئيساً
2. السيد أ.د/ رئيس مجلس قسم النبات والميكروبيولوجى عضواً
3. المنسق الأكاديمي للبرنامج (أحد السادة أعضاء هيئة التدريس بقسم النبات والميكروبيولوجى) عضواً
4. السيد/ مدير عام إدارة الدراسات العليا بالكلية عضو إداري وأمين اللجنة
5. أحد الممثلين لأحد المؤسسات الصناعية ذات الصلة ويكون من ذوى الخبرة عضواً

مادة (5):

يكون تشكيل اللجنة التنفيذية بقرار من رئيس الجامعة بناء على عرض عميد الكلية وتعرض قراراتها على اللجنة العليا.

مادة (6) اختصاصات اللجنة التنفيذية:

تختص اللجنة التنفيذية للإشراف على برنامج الدراسة بإدارة شئون البرنامج العلمية والمالية والإدارية، ومن أهم تلك الاختصاصات ما يلى:

1. إقتراح عدد الطلاب المقبولين سنوياً بالبرنامج.
2. إستلام أوراق الطلاب الراغبين فى الالتحاق بالبرنامج ومراجعتها والتأكد من سلامتها.

3. إعداد كشوف وقوائم بأسماء الطلاب المقيدين بالبرنامج.
4. وضع الجداول الدراسية واعتمادها من جهة الاختصاص.
5. متابعة سير الدراسة والتأكد من توافر كافة الإمكانات اللازمة لحسن سيرها (مادية/ بشرية).
6. اقتراح القواعد التنظيمية لتحديد موقف الطلاب في حالات (إيقاف القيد/ الانسحاب من البرنامج/ الحرمان من الدراسة/ تحصيل الرسوم والمصروفات الدراسية.... إلخ)
7. متابعة سداد الطلاب للمصروفات الدراسية المستحقة عليهم وفقا لنظام التحصيل المقرر.
8. دراسة وعرض المشكلات التى تواجه الطلاب واقتراح الحلول المناسبة لها.
9. دراسة وعرض كافة المعوقات التى تواجه سير وانتظام الدراسة واقتراح كيفية إزالة أسبابها.
10. وضع جداول الامتحانات واعتمادها من جهة الاختصاص.
11. النظر في قبول إعتذار الطلاب عن عدم حضور الامتحانات.
12. تشكيل لجان الممتحنين والمصححين والمراقبة والملاحظة ولجان الكنترول وإعداد النتائج.
13. اتخاذ الإجراءات الإدارية والفنية لمنح الطلاب الناجحين بالبرنامج الدرجة العلمية المنصوص عليها بعد التأكد من استيفائهم كافة متطلبات التخرج وإصدار شهادات التخرج.
14. الإشراف على إعداد الميزانية والحساب الختامى لإيرادات ومصروفات البرنامج واعتمادها من جهة الاختصاص.
15. الإشراف على إعداد تقرير ختامى في نهاية كل فصل دراسى عن نشاط اللجنة التنفيذية فى مجال الأعمال الإدارية والمالية والدراسية والامتحانية للعرض على اللجنة العليا.

مادة (7) المنسق الأكاديمي للبرنامج:

يتم تعيين المنسق الأكاديمى للبرنامج بقرار من رئيس الجامعة لمدة عام قابل للتجديد بناء على ترشيح عميد الكلية لأحد السادة أعضاء هيئة التدريس بقسم النبات وفقاً لمعايير تضعها اللجنة التنفيذية للبرنامج.

مادة (8) اختصاصات المنسق الأكاديمي للبرنامج:

1. تلقى طلبات الإلتحاق بالبرنامج من خلال إدارة تسجيل الطلاب.
2- المشاركة فى وضع الجداول الرئيسية وجداول الامتحانات.
3- التواصل مع رؤساء مجالس الأقسام العلمية لتحديد القائمين بالتدريس للمقررات المختلفة قبل بدء الفصل الدراسي.
4- تلقى الأعذار المقدمة من الطلاب عن الدراسة أو الامتحانات وعرضها على اللجنة التنفيذية.
5- بحث إمكانية تأجيل سداد جزء من المصروفات الدراسية للحالات الخاصة بعد دراستها.
6- تلقى شكاوى الطلاب والعمل على حلها وتذليل أى عقبات دراسية.
7- التواصل مع رؤساء مجالس الأقسام العلمية لتحديد المقررات التى يتم طرحها فى الفصل الدراسى الصيفى.
8- إقتراح المستحقات المالية مقابل التدريس لأعضاء هيئة التدريس والهيئة المعاونة لعرضها على اللجنة التنفيذية.
9- التنسيق مع الكنترول وإدارة الكلية لعقد لجنة الممتحنين واعتماد النتيجة فى اللجنة التنفيذية ومجلس الكلية.

ثانياً: النظام المالى للبرنامج

مادة (1):

تبدأ السنة المالية لحساب البرنامج اعتباراً من أول يوليو وتنتهى بنهاية شهر يونيو من العام التالي.

مادة (2) إيرادات البرنامج:

تتكون إيرادات البرنامج مما يلى:-

1- الرسوم والمصروفات الدراسية.
2- المقابل المادى لطلب الالتحاق بالبرنامج.
3- التبرعات والهبات التى تقدم لدعم البرنامج.
4- عائد الإيرادات الذاتية لموارد البرنامج.

5- عائد الساعات المعتمدة للدراسة فى الفصل الدراسى الصيفى.

6- أى موارد مالية أخرى تخصص لدعم البرنامج.

7- تودع جميع إيرادات البرنامج فى حساب مستقل بالكلية ولا يجوز الصرف من هذه الإيرادات إلا فى الأغراض المخصصة طبقا للائحة المالية للبرنامج ويكون الصرف بناء على مستندات مستوفاة ومعتمدة من عميد الكلية ورئيس اللجنة التنفيذية.

مادة (3):

تُوزع إيرادات برنامج الدراسة على النحو التالى:

1- المخصصات المالية السيادية والذاتية:-

- 15% من إجمالى الإيرادات تخصص لصالح إيرادات الموازنة العامة للدولة.
- 12% من إجمالى الإيرادات تخصص لتنمية الموارد الذاتية للجامعة.
- 1% من إجمالي الإيرادات تخصص لدعم صندوق الخدمات الصحية والاجتماعية للسادة أعضاء هيئة التدريس والسادة العاملين.

2- باقي إجمالي إيرادات المقابل المالي على النحو التالي:

- 20% حصة الجامعة.
- 80% حصة الكلية تقسم على النحو التالي 70% مكافأت المشاركين في تنفيذ البرنامج (مكافآت التدريس والتصحيح وأعمال الامتحانات) ، 30% شراء مستلزمات وأجهزة وقطع غيار وخلافه.

مادة (4) المصروفات الدراسية:

تشمل المصروفات الدراسية ما يلى:

- 6,000 (ستة آلاف جنيه مصري) سنوياً شاملة المصروفات المقررة ومقابل أداء الامتحان والبطاقة الجامعية واستخدام المعامل.
- 500 جنيه مقابل تقديم طلب الالتحاق بالبرنامج ولا تسترد فى حالة رغبة الطالب بإلغاء طلب الالتحاق.

- 300 جنيه مقابل كل ساعة معتمدة بالفصل الدراسى الصيفى شاملة رسوم التسجيل ودخول الامتحان ولا يسمح بتسجيل الطالب إلا بعد سداد هذه الرسوم وبحد أقصى (9) ساعات معتمدة.
- ويتم إعادة النظر فى المبالغ السابقة كل عام بمعرفة اللجنة التنفيذية.

مادة (5) نظام سداد المصروفات الدراسية السنوية:

تؤدى المصروفات الدراسية للبرنامج دفعة واحدة (ستة آلاف جنيه مصري) أو على دفعتين قيمة كل منهما ثلاثة ألاف جنيه تسدد كل فصل دراسى.

مادة (6) أُجور ومكافآت المشاركين في البرنامج:

تُخصص أجور ومكافآت المشاركين فى البرنامج على النحو التالى:

1- مكافآت حضور جلسات اللجنة العليا واللجنة التنفيذية للبرنامج وتحدد باقتراح اللجنة التنفيذية وتعرض على اللجنة العليا وتقر بموافقة مجلس الجامعة.

2- مكافآت إدارة البرنامج وتشغيل البرنامج (التسجيل والتنسيق والإشراف الأكاديمي ومراقبة الحسابات وغير ذلك من الأعباء الإدارية) تحدد باقتراح اللجنة التنفيذية وتعرض على اللجنة العليا.

3- مكافآت التدريس: تحتسب مكافآت ساعات تدريس المحاضرات والمعامل والتمارين والجلسات الشفهية وأعمال الامتحانات طبقا لاقتراح المنسق الأكاديمى للبرنامج والذى يعرض على اللجنة التنفيذية ثم اللجنة العليا لإقراره واعتماده من مجلس الجامعة.

مادة (7):

يختار عميد الكلية مديراً مالياً للبرنامج من بين أعضاء الجهاز الإدارى بالكلية يتولى متابعة جميع إيرادات البرنامج ومصروفاته أولاً بأول وعرض تقرير شهرى على اللجنة التنفيذية ببيان الإيرادات والمصروفات بالإضافة إلى إعداد حساب ختامى للبرنامج يظهر فيه بيان الإيرادات التى حصلت وبيان المنصرف الفعلى.

برنامج الدبلوم المهنى فى الميكروبيولوجي

Professional Microbiology Diploma

توصيف البرنامج

الأهداف وتوزيع المقررات بالبرنامج

Tanta University, Faculty of Science

Diploma program specifications of Professional Microbiology

Program parent Department	Botany Department
Academic year	2016/2017
Date of specification approval	9/2016

A- Basic Information:

Program title:	Diploma in Professional Microbiology.
Program type	Single.
Coordinator:	Head of Botany Department.
QAA Benchmarking Standards	Academic Reference Standards (ARS)
Date of Delivery	Every year in June
Review Date	Internal Periodic Review, every Summer

B- Professional Information

1. Program aims

برنامج الدبلوم المهنى فى الميكروبيولوجي

Professional Microbiology Diploma

1. Deliver students with a broad understanding of the fundamental principles of Professional Microbiology emphasizing its impact on human, animals and plants.
2. Study the diverse aspects of the field of microbiology, including biochemistry, ecology, genetics, molecular biology, pathogenicity, phylogeny, Applied applications of micro-organisms in different fields.
3. The program aimed to prepare the students to diploma program in the field of Professional microbiology or to the professional employment.
4. Equip students with IT and statistical parameters to present and edit their data.

2. Intended learning outcomes of course (ILOs)

a- Knowledge and understanding

By the end of the diploma program the graduate must be able to :

a1. List knowledge of different topics of microbiology.

a2. Define in depth new trends in the different branches of Professional microbiology.

a3. Mention concepts as well as the tools and indicators of evaluating sustainability.

a4. Explain the field works in (data collection, sampling and working with portable apparatuses).

a5. Trace the relevant and recent laboratory methodology; the safe and proper operation of large scale techniques and instruments.

a6. Describe the methods of data management and analysis.

b- Intellectual skills

By the end of the Diploma program, the graduate must be able to:

b1. Link between knowledge and concepts in the modern trends to solve problems.

b2. Analyze what is relevant to scientific problems in the field of Professional microbiology.

b3. Evaluate scientific evidence, both quantitative and qualitative, in order to arrive at evidence based conclusions.

b4. Conclude not only the theoretical underpinnings of the discipline but also how that theory influences practice.
b5. Evaluate the applications, progress and outcomes of suggested solutions.
b6. Evaluate critically published information.
b7. Analyze criteria and specifications appropriate to specific problems at different levels, and propose options for their solution.

c- Professional and practical skills

By the end of the diploma program, the graduate must be able to:
c1. Dissect research results objectively.
c2. Run instruments with accuracy in experimental data.
c3. Collect data from a variety of sources concerning scientific reports.
c4. Implement annual management plans based on scientific observation.
c5. Write professional report
c6. Assess existing method and tools of the microbiological research

d- General and transferable skills

By the end of the Microbiology diploma program the graduate must be able to:
d1. Express ideas through structure, writing essays and oral modes using it.
d2. Manage self development skills including time management and organization.
d3. Use in safe and effective manner the scientific systems and tools.
d4. Possess good project management and business skills.
d5. Identify personal learning needs.
d6. Be aware about the basic and ethics of scientific research.

برنامج الدبلوم المهنى فى الميكروبيولوجي

Professional Microbiology Diploma

Diploma in Professional Microbiology

Semester I (12 hours)

Code	Course title	Lec.	Pract.	Cred.
Obligatory				
PMBO5101	**Virology and Advanced Immunology** **الفيروسات وعلم المناعة المتقدم**	1	2	2
PMBO 5103	**Fermentation Chemistry** **كيمياء التخمرات**	1	2	2
PMBO 5105	**Medical Microbiology** **الميكروبيولوجيا الطبية**	1	2	2
PMBO 5107	**Biostatistics** **الإحصاء الحيوى**	2	-	2
PMBO 5109	**Microbial Food Technology** **تكنولوجيا الأغذيةالميكروبية**	1	2	2
Optional (select 2 credit hours)				
PMBO 5111	**Microbial methodology** **الطرق الميكروبيولوجية**	1	2	2
PMBO 5113	**Industrial microbiology and quality control** **الميكروبيولوجيا الصناعية ومراقبة الجودة**	1	2	2

برنامج الدبلوم المهنى فى الميكروبيولوجي

Professional Microbiology Diploma

Semester II (12 hours)				
Code	**Course title**	**Lec.**	**Pract.**	**Cred.**
Obligatory				
PMBO 5202	**Diagnostic microbiology** **ميكروبيولوجيا تشخيصية**	1	2	2
PMBO 5204	**Advanced microbial physiology** **علم فسيولوجيا الميكروبات المتقدم**	1	2	2
PMBO 5206	**Microbial biotechnology** **التقنية الحيوية الميكروبية**	1	2	2
PMBO 5208	**Microbial biofuels and renewable energy** **الوقود الحيوى الميكروبى و الطاقة المتجددة**	1	2	2
PMBO 5210	**Biochemistry** **الكيمياء الحيوية**	1	2	2
Optional (select 2 credit hours)				
PMBO 5212	**Molecular biology** **البيولوجيا الجزيئية**	1	2	2
PMBO 5214	**Microbial bioremediation of environmental pollutants** **المعالجة الحيويه الميكروبيه لملوثات البيئة**	1	2	2

برنامج الدبلوم المهنى فى الميكروبيولوجي

Professional Microbiology Diploma

Course Description of the Diploma Program of Professional Microbiology

PMBO 5101: Virology and advanced immunology:

Lectures syllabus:

This course aims to study the various groups of viruses particularly associated with major diseases of man, and provide awareness of the transmission, epidemiology, pathogenesis and control of these virus groups. The course also embraces the basic specific and non-specific host defense mechanisms associated with these infections, the interaction of viruses with these defenses, and the principles concerned with the diagnosis of viral infections by laboratory procedures. The nature of animal viruses are considered along with a range of associated phenomena - basic immunity, pathogenic mechanisms, modes of transmission, epidemiology, viral latency and viruses and carcinogenesis, among others. Finally antiviral chemotherapy, viral vaccines and the underlying mechanistic rationale for their use is discussed.

Practical syllabus:

Sterilization and laboratory safety protocols; handling of specimen, types of viral culture and viral diagnosis.

PMBO 5103: Fermentation Chemistry

Lectures syllabus:

This course cover the fermentation processes currently utilized in the pharmaceutical and food industries and illustrates the range of technologies involved in large-scale commercial growth of microorganisms and higher eukaryotic cells. Part of the module will be devoted to open topics and visits to biotechnological factories.

Practical syllabus:

Methods of culture preservations, criteria for selection of microorganisms for fermentation. Detection and production of some enzymes. Production of microbial products, methods of strain improvement organic acid production. Polysaccharides production. Recent approaches in microbial production of antibiotics.

PMBO 5105: Medical microbiology:

Lectures syllabus:

This course deals with the pathogenesis of medically important microorganisms including bacteria, fungi, viruses, rickettsia and protozoa. The symptoms of diseases caused by microbial pathogens and their diagnosis will be addressed. In addition, the immune-biology of the major microbial diseases, with emphasis on their ways and means of their prevention will be studied.

Practical syllabus:

Collection of clinical samples; types of media; isolation of gram positive and gram negative pathogens. Studying types of superficial fungi, Candida – Cryptococcus – Pityrosporum and studying types of dimorphic fungi, Paracoccidiodes – Geotrichum – Histoplasma.

PMBO 5107: Biostatistics

This course is designed to introduce the student to data analytic and applied statistical methods commonly used in Applied and scientific applications. The course will focus on computer-aided data analysis using comparisons between batches, analysis of variance, regression and correlation. The course will also deal with estimation and

hypothesis testing, multivariate analysis, and nonparametric techniques; approximations and errors (accuracy and precision; errors, blunders, formulation error, and data uncertainty).

PMBO 5109: Microbial food technology:

Lectures syllabus:

This course deals with the microorganisms that contaminate food and study the effects of microbial growth on food quality. The methods used to control, detect, and enumerate microorganisms in food will be addressed. Special emphasis will be devoted to the identification and management of food microorganisms and the ways to protect the consumers of microbes in food.

Practical syllabus:

This course provides students with the opportunity to manufacture processed food on a laboratory scale under simulated industry conditions. Students will be involved in production runs of different food products. Students will learn controlling food contamination and different processing techniques for the production of food products. Quality management and food safety principles also involved.

PMBO 5111: Microbial methodology:

Lectures syllabus:

This course will be focused on the methods of isolation and purification of fungi and bacteria and study the basis for identification. Also this course deals with the following methods and instruments used in microbiology: methods of microbial growth study, microbial cell breakage methods, study of microbial structure details (bright field, dark field, phase contrast, fluorescence, transmission electron and scanning electron microscopes), gel filtration, ion exchange chromatography, affinity

chromatography, gel electrophoresis technique and antimicrobial compounds assay, PCR techniques.

Practical syllabus:

Methods of isolation of fungi and bacteria from soil, air, water and diseased human samples; purification of the isolated fungi and bacteria and identification of the isolated fungi and bacteria. Study the methods of microbial growth and structure using dark and bright field, fluorescence, electron microscope, gel filtration and PCR techniques.

PMBO 5113: Industrial microbiology and quality control:

Lectures syllabus:

This course deals with the role of microbes in different industrial process are covered in two parts: the first one will focus on the different microorganism that have industrial importance; their isolation, identification and different methods of its growing. However, the second part deals with some models of different substances production by microbes like amino acids, enzymes, antibiotics, microbial proteins and bio-fertilizers. In addition, the course will include visits to factories. Quality control deals with the optimization of production conditions of many microorganisms to gain high rate of the desired products with high purity levels. Also it deals with the optimization of extraction methods and packaging of the end product of the fermentation process.

Practical syllabus:

This course covers practical in the application of microbes in industries. Emphasis will be given on techniques for screening of potential industrial microbes (like yeast, molds, bacteria and Actinomycetes) and selection of microorganisms for useful

products; microbiological production of foods (SCP, baker's yeast, food additives fermented sausage); beverage production (beers, wines and distilled spirits); production of industrial chemicals and pharmaceuticals (organic acids, acetate, citrate lactate and amino acids, solvents, alcohol, butanol, enzymes, antibiotics, steroids).

PMBO 5202: Diagnostic microbiology:

Lectures syllabus:

This course deals with the symptoms of diseases caused by microbial pathogens and their diagnosis. In addition, ways of lab cultivation and identification methods of microbial pathogens will be studied.

Practical syllabus:

Examination of sputum, urine, stool, wound, pus swabs, vaginal swabs and throat swabs and examination of oral swabs, wounds, vaginal swabs eye , ear and hair for fungal infection.

PMBO 5204: Advanced microbial physiology:

Lectures syllabus:

This course deals with aspects related to the physiological processes in microorganisms. It may deal with metabolism of proteins and lipids. Additional topics are the fungicides and their mode of action. It also deals with the bioenergetics, metabolic diversity, environmental stress tolerance, Endophytic fungi, Some

applications of chitosan, growth and cellular differentiation of microorganisms.This course also discuss modern articles in microbial physiology.

Practical syllabus:

Effect of different conditions on growth of microorganisms. Production of enzymes by microorganisms. Optimization of production of different secondary metabolites by microorganisms. Recent topics in practical physiology of microorganisms.

PMBO 5206: Microbial biotechnology:

Lectures syllabus:

The aim of this course is to introduce students to areas of microbial biotechnology that are either currently being exploited commercially or that are likely to lead to commercial ventures in the near future. The first part of the course covers the fermentation processes currently utilized in the pharmaceutical and food industries, based on microbial fermentation and illustrates the range of technologies involved in large-scale commercial growth of microorganisms. The second part of the course covers the utilization of gene technology for the production of new products from micro-organisms and micro-algae.

Practical syllabus:

Studying physiological, chemical, biological and environmental factors affecting microbial growth; types of microbial cultures; fermentation and large scale production; production of antibiotic and detection of its therapeutic effect. The role of biotechnology in dairy industry and the role of genetic engineering in enhancement of microbial products.

PMBO 5208: Microbial biofuels and renewable energy:

Lectures syllabus:

Biofuels are produced from living organisms or from metabolic by-products (organic or food waste products). In order to be considered a biofuel the fuel must contain over 80 percent renewable materials. It is originally derived from the photosynthesis process and can therefore often be referred to as a solar energy source. There are many pros and cons to using biofuels as an energy source. This course contains articles that explore the many biofuel technologies.

Practical syllabus:

The practical course will cover the process of biofuel production using microorganisms. The course will emphasize on major classes of biofuels including bioethanol, biogas and biodiesel. Screening of microorganisms (mainly bacteria and fungi) for biofuel production from different residues (mainly agricultural wastes and agro industrial wastes).Direct and indirect fermentation of residue. Optimization of the fermentation process and different methods of downstream.

PMBO 5210: Biochemistry:

Lectures syllabus:

This course presents an advanced overview of the principles and application of recent methods in biochemistry including protein modification, protein cross-linking, protein staining, antibody modification, immune-precipitation and metabolic labeling. An emphasis will be given to the principles of the affinity chromatography technique including matrices and preparation, coupling of ligand and detection of reactive groups.

Practical syllabus:

The practical sessions of this course will include studying of the detailed procedures of affinity chromatography, protein attaining techniques and the trouble-shootings engaged in these techniques.

PMBO 5212: Molecular biology:

Lectures syllabus:

The aim of this course is to provide an introduction to the overall structures of prokaryotic and eukaryotic cells; organization and function of biological membranes; compartmentalization of eukaryotic cells and the functions of the major types of organelle; the main elements of the cytoskeleton and their functions; intercellular and intracellular communication.

Practical syllabus:

Methods in molecular biology such as DNA and RNA isolation, PCR, sequencing, recombinant DNA technology, and real time PCR will be demonstrated.

PMBO 5214: Microbial bioremediation of environmental pollutants:

Lectures syllabus:

This course should include the description of modern pollution problems and potential microbiological remediation techniques The course also will introduce the students to the regulation and regulatory framework of the environmental and hazardous waste law; Definitions; policy guidance vs. regulations; role of the states, municipalities and the EEAA, compliance issues; case studies. The course will also give knowledge about the environmental management system (EMS) understanding ISO 14000 scope and definitions; EMS requirements and environmental policy; cost benefit analysis; environmental planning; implementation and operation; checking

and corrective action; environmental auditing and the environmental management system in Egypt. The course will further describe the objective and needs of environmental impact assessment (EIA); activities involved in EIA, characteristics of impacts; EIA methods.

Practical syllabus:

Isolation of microorganisms from different environmental polluted sites, identification of the isolated microorganisms. Detection of microorganism ability to eliminate pollution; assessment of different mechanisms that involved in microbial bioremediation: a- Hydrolytic enzymes e.g. amylase, lipase; b- Oxidation reduction enzymes e.g. catalase, oxygenase; c- Bio-sorption of heavy metals on microbial cell wall.

(ثالثا)

برنامج

الماجستير المهني في علوم المساحة والتعدين

ساعات معتمده)

جامعة طنطا
قطاع الدراسات العليا والبحوث

برنامج الماجستير المهني

في

علوم المساحة والتعدين

Professional Master of Surveying and Mining Sciences

PMSMS



٢٠١٦-٢٠١٧

٥٢

جمهورية مصر العربية
وزارة التعليم العالي
الوزير

قرار وزاري
رقم (٢٥٠٦) بتاريخ ٢ / ٧ / ٢٠١٧
بشأن تعديل اللائحة الداخلية لكلية العلوم جامعة طنطا (مرحلتي البكالوريوس و الدراسات العليا)

وزير التعليم العالي والبحث العلمي ورئيس المجلس الأعلى للجامعات

** بعد الاطلاع على القانون رقم (٤٩) لسنة ١٩٧٢ في شأن تنظيم الجامعات والقوانين المعدلة له.
** وعلى قرار رئيس الجمهورية رقم (٨٠٩) لسنة ١٩٧٥ بإصدار اللائحة التنفيذية لقانون تنظيم الجامعات والقرارات المعدلة له.
** وعلى القرار الوزاري رقم (٦٥٤) بتاريخ ١٩٦٩/١٢/٢٢ بشأن إصدار اللائحة الداخلية لكلية العلوم جامعة طنطا (مرحلتي البكالوريوس والدراسات العليا) والقرارات المعدلة له .
** وعلى موافقة مجلس جامعة طنطا بجلسته بتاريخ ٢٠١٥/٧/٣٠ .
** وعلى موافقة لجنة قطاع العلوم الأساسية بجلستيها بتاريخ ١/٢١ ، ٢٠١٦/٣/١٦ .
** وعلى موافقة اللجنة التنسيقية العليا للجان القطاعات بجلستيها بتاريخ ٤/٦ ، ٢٠١٦/١١/٩ .
** وعلى موافقة المجلس الأعلى للجامعات بجلسته بتاريخ ٢٠١٦/١٢/٢٤ .

قرر

(المادة الأولى)

يستبدل بنص المادة (٢) من اللائحة الداخلية لكلية العلوم جامعة طنطا (مرحلتي البكالوريوس والدراسات العليا) والصادرة بالقرار الوزاري رقم (٦٥٤) بتاريخ ١٩٦٩/١٢/٢٢ النص التالي :-

مادة (٢)

تمنح جامعة طنطا بناء على طلب كلية العلوم الدرجات العلمية الاتية : -
- درجة البكالوريوس فى العلوم فى إحدى مجالات التخصص المبينة فى المادة (٣) من هذه اللائحة .
- درجة الماجستير فى العلوم .
- درجة الماجستير المهنى فى (علوم المساحة والتعدين)
- درجة دكتور الفلسفة فى العلوم .
- درجة دكتور فى العلوم .

كما تمنح الجامعة بناء على طلب الكلية دبلومات الدراسات العليا فى أحد فروع التخصص المبينة فى المادة (٢١) من هذه اللائحة .

(المادة الثانية)

تلحق باللائحة الداخلية المشار إليها اللائحة الدراسية المرفقة والخاصة ببرنامج الماجستير المهنى فى (علوم المساحة والتعدين) – **برنامج مبنى بين كلية العلوم الأساسية والآداب فقط** .

(المادة الثالثة)

على جميع الجهات المختصة تنفيذ هذا القرار .

وزير التعليم العالي والبحث العلمي
ورئيس المجلس الأعلى للجامعات

(أ.د/ خالد عبد الغفار)

رؤية البرنامج

الرؤيـة أن يكـون لبرنـامج "الماجسـتير المهنـي-علـوم المسـاحة والتعـدين" الريادة علي المستوي المحلي والإقليمي في جودة التعليم التقني المتميز في مجالي المساحة والتعدين .

رسالة البرنامج

الرسـالة أن يقـدم هـذا البرنـامج دعـائم وأسـس متطـورة لتأهيـل خـريجين و متخصصين أكفاء في مجال علوم المساحة والتعدين قادرين علي المنافسة داخل وخارج الوطن وخاصة في مجالات الكشف والتنقيب عن الثروات المعدنية والارتقاء بمفهوم الدعم التطبيقي للبحث العلمي المتميز.

الأهداف

- إعداد كوادر مهنية متخصصة وتأهيل خريجين مؤهلين جيدا عن طريق دراسة مقررات مختصة متخصصة طبقا للائحة برنامج علوم المساحة والتعدين.
- إرساء المفهوم العصري لمهنة المساحة والتعدين في الممارسة الميدانية والمعملية والبحث العلمي المتميز.
- تطبيق أحدث النظم التفاعلية في التدريس ومشاركة طلاب الدراسات العليا في التعليم والتعلم.
- تعميق التعاون المستمر البناء بين كليتي العلوم والآداب (أقسام الجيولوجيا- الجغرافيا – شعبة المساحة) في التدريب والمشاركة في التدريس.

- الإرتقاء بالمستوي المهني للخريج بعد حصوله علي مخرجات البرنامج وزيادة الخلفية العلمية التطبيقية.

- الاندماج في مشاريع متخصصة مع المراكز البحثية المتميزة مثل أكاديمية البحث العلمي والتكنولوجيا، هيئة الثروة المعدنية، مركز بحوث وتطوير الفلزات- حلوان، شركات التعدين والهيئات المساحية الكبرى.

اللائحة الداخلية للبرنامج

مادة (١) مقدمة:

- برنامج الماجستير المهني- علوم المساحة والتعدين يساير ميول ورغبات كثير من الخريجيين ويبرز طاقتهم الإبداعية ويهدف في الدرجة الأولي إلي تأهيل مهنيين أكفاء ملمين بكافة متطلبات المهنة وأحدث فروع العلوم المرتبطة بالمساحة والتعدين (جيولوجيا التعدين) بكل التقنيات والتطبيقات الحديثة التي تجعل منه مهنيا متميزا وتؤهله للعمل في مجال شركات التعدين الكبرى.

- الجديد الذي يضيفه هذا البرنامج هو التركيز علي الجوانب العلمية والتطبيقية والتدريب المتميز في شركات التعدين والمؤسسات المساحية خلال فترة الدراسة بالإضافة إلي إعداد مشروع تخرج تطبيقي في مجالي علوم المساحة والتعدين.

مادة (٢) شروط الألتحاق بالبرنامج

- يمنح مجلس الجامعة بناء علي طلب كلية العلوم-جامعة طنطا درجة الماجستير المهني في علوم المساحة والتعدين للخريجين من هذا البرنامج.

- يشترط في من يتقدم للالتحاق بالبرنامج أن يستوفي الشروط التي يحددها المجلس الأعلى للجامعات والحصول علي بكالوريوس علوم (جيولوجيا خاص- جيولوجيا/جيوفيزياء- كيميا/جيولوجيا)، ليسانس آداب (قسم الجغرافيا – شعبة المساحة) بتقدير جيد على الأقل.

- يجوز لكلية العلوم عقد أمتحانات داخلية للطلاب قبل التحاقهم للبرنامج لقياس الجانب المعرفي والتفكير العلمي.

- أستيفاء طلب الألتحاق بالبرنامج من أدارة الدراسات العليا بكلية العلوم وتقديمه الى أدارة الدراسات العليا بالجامعة لأعتماده طبقا للشروط والقواعد المقررة .

مادة (٣) نظام الدراسة:

- الساعة المعتمدة هي وحدة قياسية تتألف من ساعة واحدة من المحاضرات النظرية أو ساعتين أو ثلاث ساعات من الدراسة العملية أو التمارين لمدة ١٢ أسبوع وتدرس علي مدي فصل دراسي واحد.

- يعتمد البرنامج على نظام الساعات المعتمدة.

- مدة الدراسة بالبرنامج أربعة فصول دراسية وفق نظام الساعات المعتمدة (٦٠ ساعة معتمدة).

- ينقسم كل عام دراسي إلي فصلين دراسيين ومدة كل فصل دراسي ١٢ أسبوعا كما يجوز طرح بعض المقررات في فصل دراسي صيفي للراسبين والراغبين في تحسين درجات المقررات التي حصلوا فبها على أقل من "C"

فـي أحـد فصـول الدراسـة (٦ سـاعات معتمـدة) مدتـه ٦أسـابيع مـن الدراسـة المكثفة.

- العبء الدراسي هو عدد الساعات المعتمدة التي يقوم الطالب بتسجيلها في الفصل الدراسي ويجب مراعاة أن يكون العبء الدراسي في أي فصل دراسي ١٢ ساعة معتمدة.
- العبء الدراسي خلال الفصل الصيفي ٦ ساعات معتمدة لعدد ٦ اسابيع دراسية.

مادة (٤) تصميم البرنامج الدراسي :

- صمم البرنامج الدراسي حيث يتم التعلم عن طريق المحاضرات والدروس العملية التطبيقية والتدريب في الشركات والمؤسسات في مجال المساحة والتعدين بجانب حلقات النقاش وإجراء مشاريع التخرج التطبيقية .
- **تم ابرام بروتوكول تعاون بين الجامعة وهيئة الثروة المعدنية المصرية لتدريب الطلاب ميدانيا، مذكرة تعاون تدريبي بين الجامعة وشركة مناجم السكري للذهب، معهد التبين للدراسات المعدنية، مركز بحوث وتطوير الفلزات-حلوان، هيئة المواد النووية المصرية، هيئة المساحة المصرية.**

مادة (٥) التسجيل:

- تقوم إدارة شئون الدراسات العليا-كلية العلوم-جامعة طنطا بتسجيل المقررات الكترونيا في كل فصل دراسي لكل طالب مع مراجعة منسق البرنامج.
- يشترط في التسجيل المتأخر موافقة مجلس كلية العلوم حيث أن الكلية هي المنوطة بالتسجيل وتفعيل البرنامج ومنح الدرجة العلمية بناء على طلبها، علي ألا تزيد مدة التأخير عن أسبوعين من نهاية فترة التسجيل .

مادة (٦) المواظبة:

- يستلزم البرنامج أن يواظب الطالب علي حضور المحاضرات النظرية والدراسات العملية وحلقات النقاش.
- يحرم الطالب من التقدم للامتحان إذا تجاوزت نسبة الغياب ٢٥% من إجمالي الساعات المقررة.
- يجب علي الطالب أداء الامتحانات النهائية في المواعيد المقررة لها ويعتبر المتغيب عن الامتحان النهائي راسب في المقررات التي تغيب عن أداء الامتحان فيها بدون عذر.

مادة (٧) لغة الدراسة:

- الدراسة في هذا البرنامج باللغة الانجليزية.

مادة (٨) التدريب الميداني:

- علي الطالب أن يكمل فترة تدريب ميداني بما لا يقل عن ١٢ ساعة معتمدة (تحسب بواقع ٣ ساعات تدريبة تكافئ ساعة واحدة معتمدة) بمعنى أن تكون عدد الساعات التدريبية الفعلية ٣٦ ساعة تحت إشراف عضو هيئة تدريس مختصص ومشاركا في التدريس بالبرنامج ومسئول التدريب في الجهة ذات العلاقة ، يجب أن يكون ذو خبرة متميزة لا تقل عن ١٥ سنة خبرة وذلك في إحدي المؤسسات المعنية بالبرنامج والتي يقرها لجنة أعداد البرنامج.
- التدريب الميداني سيكون طبقا لجوال زمنية محددة في كل فصل دراسي (زيارات علمية لهيئة الثروة المعدنية، هيئة المساحة المصرية: معهد التبين للدراسات الفلزية) ، مركز بحوث وتطوير الفلزات-التبين-حلوان، رحلات حقلية علمية لمناجم الحديد في الواحات البحرية، مناجم الذهب بالسكري،

مصـانع الأسـمنت بالعامريـة وطريـق القـاهرة –السـويس، مصـانع السـيرميك بالعاشر من رمضان،.....

- يقدم الطالب تقريرا معتمدا من الجهة المتدرب بها مرفقا بنموذج كتابي موقعا من مسئول التدريب بمدى التزام الطالب وكفاءته وتعاونه أثناء التدريب.

مادة(٩) نظام التقييم:

- تتكون الدرجة النهائية من مجموع درجات الأعمال الفصلية والعملية والتطبيقية والتحريرية والشفهية كما هو موضح بالجدول المرفق.
- الحد الأدنى للنجاح في أي مقرر، حصول الطالب علي تقدير (D) ,بعدد نقاط (١).
- اذا قل تقدير الطالب عن (D) بعدد نقاط (١) يحصل على تقدير ضعيف (راسب) ويرمز له بالرمز (F).
- أذا حصل الطالب على اقل من "C" في مقرر دراسي يعطى الفرصة في الفصل الدراسي الصيفي التالي لتحسين المستوى وعدم التخرج الا بعد حصوله عل التقدير التراكمي "C " كحد ادنى للتخرج.

قوائم الدرجات:

توزع الدرجات كالتالي:

- الأمتحان النظري النهائي: ١٠٠ درجة (٦٠ درجة للأمتحان التحريري + ٢٠ درجة شفهي + ٢٠ درجة أعمال فصلية)
- الأمتحان العملي: ١٠٠ درجة (٧٠ درجة تطبيقيا ومتابعة معمليا + ٣٠ درجة عمليا)

ملاحظة: عدد الساعات العملية (ساعتان أو ثلاثة) حسب المحتوى العلمي للمقرر الدراسي تحتسب بساعة معتمدة واحدة.

النسبة المئوية	عدد النقاط	الرمز	التقدير
٩٠ فأكثر	٤	A^+	ممتاز
٨٥ لأقل من ٩٠	٣,٧	A^-	
٨٢,٥ لأقل من ٨٥	٣,٣	B^+	جيد جدا
٧٧,٥ لأقل من ٨٢,٥	٣	B	
٧٥ لأقل من ٧٧,٥	٢,٧	B^-	
٧٢,٥ لأقل من ٧٥	٢,٣	C^+	جيد
٦٧,٥ لأقل من ٧٢,٥	٢	C	
٦٥ لأقل من ٦٧,٥	١,٧	C^-	
٦٢,٥ لأقل من ٦٥	١,٣	D^+	مقبول
٦٠ لأقل من ٦٢,٥	١	D	
أقل من ٦٠	صفر	F	ضعيف
منسحب	-	W	منسحب

❖ يتم حساب المعدل التراكمي (GPA) للطالب علي النحو التالي :-

أ- يتم ضرب قيمة تقدير كل مقرر دراسي (النقاط الموضحة بالجدول) في عدد الساعات المعتمدة لهذا المقرر لنحصل علي عدد النقاط الخاصة بكل مقرر دراسي.

ب- يتم جمع نقاط كل المقررات الدراسية التي سجل فيها الطالب.

ت- درجة التدريب الميداني ١٠٠ درجة (٥٠ درجة لمسئول التدريب الميداني، ٥٠ درجة للمشرف الأكاديمي للطالب بناء على تقرير مقدم على طبيعة النشاط والمكتسبات المهنية للطالب).

ج- يتم قسمة مجموع النقاط علي إجمالي الساعات المسجلة للطالب لنحصل علي المعدل التراكمي كما يلي :-

المعدل التراكمي (GPA) = مجموع النقاط / إجمالي الساعات المسجلة

مادة (١٠) الرسوب في المقررات:

- في حالة تغيب الطالب عن الامتحان النهائي.
- الحصول على تقدير (F) (راسب) وهو أقل من ٦٠% .

مادة (١١) التعثر الأكاديمي:

- ينذر الطالب الذي يحصل علي معدل تراكمي (CGPA) أقل من ١و٧٥ وفي حالة التكرار لمدة فصلين دراسيين متصلين يفصل من البرنامج.

مادة (١٢) الانقطاع عن الدراسة:

- يعتبر الطالب منقطعا عن الدراسة إذا لم يسجل في فصل دراسي أو انسحب من الفصل بدون عذر ويعتبر منسحبا أذا كان الآنقطاع بعذر.
- يجوز للطالب أن ينقطع عن الدراسة فصلا دراسيا واحدا كحد أقصي بشرط الحصول علي موافقة مجلس أدارة البرنامج ويفصل من البرنامج في حالة انقطاعه مدة أطول بدون عذر.

مادة (١٣) متطلبات الحصول علي درجة الماجستير المهني في علوم المساحة والتعدين:

يتطلب الحصول علي درجة الماجستير المهني في برنامج علوم المساحة والتعدين مايلي:-

- أجتياز بنجاح عدد ٦٠ ساعة معتمدة تشمل مقررات البرنامج والتدريب الميداني متى أستوفى ما يلي:

- متطلبات كلية العلوم (٢٥ساعات معتمدة) لمقررات التعدين-قسم الجيولوجيا.

- متطلبات كلية الأداب (٢٠ ساعة معتمدة) لمقررات المساحة- قسم الجغرافيا

- متطلبات مساندة للبرنامج (٣ ساعة معتمدة)- قسم أدارة الأعمال-كلية التجارة.

- درجة الماجستير المهني في علوم المساحة والتعدين درجة منتهية ولا يحق للطالب التسجيل لدرجة فلسفة الدكتوراه الأكاديمية، ولكنه يمكنه التسجيل لدرجة الدكتوراة المهنية للمساحة والتعدين (تحت الأعداد) في حالة أعتماد هذ البرنامج.

- تدريب ميداني لا يقل عن ٣٦ ساعة فعلية بواقع ١٢ ساعة معتمدة (كل ٣ ساعات فعلية تكافئ ساعة واحدة معتمدة) يبدأ مع نهاية الفصل الدراسي الثاني

- اجتياز المستوي المطلوب للغة الأنجليزية وفقا للقواعد التي يحددها مجلس الجامعة كشرط لمنح الدرجة.

- يلتزم مجلس أدارة البرنامج في بداية الفصل الدراسى الثالث بإختيار مشرفا علميا لكل طالب يتولى الأشراف عليه في مقرر مشروع تطبيقي (PMSMS 2206). من الصعب جدا انجاز رسالة علمية في هذا الكم المكثف من المقررات الضرورية للمساحة والتعدين، وتم الأكتفاء بمشروع تخصصي لكل طالب ، وسوف يقدم الطالب المشروع مكتوبا ومجلدا وتتم مناقشة المشروع علانية في تواجد لجنة علمية من عدد ٣ أساتذة في تخصص المشروع.

- يبين في شهادة الماجستير المهني-علوم المساحة والتعدين التي حصل عليها الطالب المقررات الدراسية والدرجات والمعدل التراكمي والتقدير العام وتستخرج الشهادة من كلية العلوم-جامعة طنطا.

مادة (١٤) نظام تأديب الطلاب:

- الطلاب المقيدون بالبرنامج خاضعون للنظام التأديبي المبين في قانون تنظيم الجامعات المصرية (قانون ٤٩ لعام ١٩٧٢م) ولائحته التنفيذية.

قواعد الامتحانات

1-امتحان نظري يبدأ بعد نهاية الأسبوع الرابع عشر في كل من الفصول الدراسية فيما عدا الفصل الدراسي الصيفي .

2-اختبارات دورية تتم خلال كل فصل دراسي مستقل.

3-اختبارات عملية وتطبيقية لكل فصل دراسي .

4-امتحان شفهي في نهاية كل فصل دراسي .

الأمكانات المتاحة للبرنامج

- سوف يتيح البرنامج المدرجات والمعامل الطلابية والبحثية الجديدة لطلاب البرنامج في كليتي العلوم والآداب بالجامعة.
- رحلات ميدانية دراسية للمناجم المصرية وهيئة الثروة المعدنية والمعاهد المتخصصة للدراسات المعدنية وهيئة المساحة المصرية. سوف تتحدد الزيارات الميدانية والحقلية في جدول منفصلة في بداية كل فصل دراسي.

- تتوافر أحدث أجهزة مساحية في معامل كلية الآداب-قسم الجغرافيا، كما يتضح في الجدول الأتي:

List of Surveying Devices

Geography Department-Faculty of Arts

Device	Number of devices	Model	Accuracy	Manufacturer
Level	1	C410		Sokkia
	2	AL132		FOIF
	1	AL220		Spectra
	2	Fuji		Fuji
Total	6	---	---	---
Electronic Theodolite	1	DT 405L		FOIF
	1	DT405		FOIF
	1	Carl Zeiss	"1	Carl Zeiss
	2	Carl Zeiss	20”	Carl Zeiss
	1	Carl Zeiss	10”	Carl Zeiss
Total	6	---	---	---
Total Station	1	SET 3X		Sokkia
	1	SET 650X		Sokkia
	1	CX107		Sokkia
	1	610		Sokkia
Total	4	---	---	---
GPS Station	1	GRX2		Sokkia

يتوافر بكلية العلوم أجهزة معملية وميكروسكوبات عاكسة حديثة لدراسة الخامات الأقتصادية وعينات متعددة لأهم الخامات المعدنية في مصر والعالم حيث يضم متحف قسم الجيولوجيا بكلية العلوم الآف العينات اليدوية الكودية.

List of Mineralogy Equipments

Geology Department-Faculty of Science

Device	Number of devices	Model	Accuracy	Manufacturer
Reflected Microscope	20	Carl Zeiss		Carl Zeiss
Total	20	---	---	---
Total Station	1	SET 3X		Sokkia
GPS	6	Mgalan		

- يقترح أن يكون عدد المقبولين للبرنامج ١٠٠ طالب، ويتكرر القبول كل عام.

المقررات الدراسية لبرنامج الماجستير المهني

(علوم المساحة والتعدين)

PMSMS

هيكل ومكونات البرنامج:

(أ) مدة البرنامج: سنتان (أربعة فصول دراسية بواقع ١٢ ساعة معتمدة في كل فصل دراسي بالأضافة الى ١٢ ساعة معتمدة للتدريب الميداني).

(ب) هيكل البرنامج:

نوع المقررات	عدد الساعات المعتمدة
مقررات البرنامج التخصصية	٤٥
المقررات المساندة للبرنامج	٣
التدريب الميداني	١٢
أجمالي عدد ساعات البرنامج	٦٠

جدول كود التخصصات العلمية المنوط بها تدريس المقررات

Professional Master Program Code: PMSMS

Mining Courses Code: PMPM (25 Credit hours)

Surveying Courses Code: PMPS (20 credit hours)

Field Training Code: PMFT (12 credit hours)

Management Courses Code: MANG (3 credit hours)

Program Curriculum

First Year-Semester 1

Course Title	Course Code	Credit hours			Prerequisite
		Lect.	Pract.	Total	
Fundamentals of Mining Geology	PMPM 1101	2	2	3	----------
Introduction to Mine Surveying	PMPS 1101	2	3	3	----------
Rock Mechanics	PMPM 1102	2	2	3	----------
GIS and Digital Mapping	PMPS 1102	1	3	2	----------
Principals of Management	MANG 1101	1	----	1	----------
Total		8	10	12	

Lect. = Lecture
Pract. = Practical

First Year-Semester 2*

Course Title	Course Code	Credit hours			Prerequisite
		Lect.	Pract.	Total	
Structural Geology and Mineralization	PMPM 1202	2	3	3	PMPM 1102
Rock Blasting & Mine Planning	PMPM 1204	2	3	3	----------
GPS Technique and applications	PMPS 1202	2	3	3	---------
Topographic Surveying & Photogrammetry	PMPS 1204	2	3	3	PMPS 1101
Total		8	12	12	

***Field Training (PMFT)**

Twelve credit hours (actual 48 hrs.) must be applied for every student.

Second Year-Semester 1

Course Title	Course Code	Credit hours			Prerequisite
		Lect.	Pract.	Total	
Economic Mineral Deposits of Egypt and Arab Countries	PMPM 2101	2	3	3	----------
Mineral Exploration Methods	PMPM 2103	2	2	3	PMPM 1202
Remote Sensing & Mineralization	PMPS 2101	2	3	3	----------
Advanced Surveying	PMPS 2103	2	2	3	PMPM 1204
Total		8	10	12	

Lect. = Lecture

Pract. = Practical

Second Year-Semester 2

Course Title	Course Code	Credit hours			Prerequisite
		Lect.	Pract.	Total	
Mining Economics and Reserve Estimation	PMPM 2202	2	2	3	PMPM 1204
Applications of Geodetic Surveying	PMPS 2202	2	3	3	PMPS 2103
Mining Laws, Safety and Environmental Impacts	PMPM 2204	1	----	1	----------
Applied Project of Mining and Surveying	PMPMS 2206	2	3	3	----------
International Marketing and Marketing Research	MANG 2202	2	----	2	----------
Total		9	8	12	

Lect. = Lecture

Pract. = Practical

Course Description

First Year (Semester 1)

1. PMPM 1101: *Fundamentals of Mining Geology* (2 lectures + 2 practical hours; 3 credit hours)

Course Description: Importance of minerals- Past mining activities- Present production and supplies- Mineral resources- Exploration and classifications- Ore grades and recoveries- Mine equipments and advanced techniques- Concept of ore upgrading, metals recovery and refining- Mine environment and safety-Mining stages – mineral prospecting and exploration- Mine development – Mine exploitation – Drilling types –Sampling QAQC – Mining Techniques – Open Pit mining – underground mining - Load and Haul – Dumping Areas. Quarry and mine rehabilitations; Defining the context of the rehabilitation plan- Setting objectives for the rehabilitation plan- Developing the rehabilitation plan- Implementation of the rehabilitation plan- Management & monitoring- Financial planning.

Practical: Multimedia and Pc for each student to facilitate active cooperation learning.

2. PMPS 1101: *Introduction To Mine Surveying (2 lectures; 3 practical hrs; 3 credit hrs)*

Course Description: Principals of surveying science- Shape of the Earth-Cartesian and geographic coordinate systems- Basics and definitions- Scales design-Length measurements and observation obstructions-Field work for laying out and setting off projects-Corrections for length measurements-Leveling-Compass observations and azimuths-Verniers-Areas calculations- Production and understanding of contour maps-Volume computations-Map ordering-Apply the theory of errors and probability in mine surveying- Application of mine surveying in tunnels construction-Quantity Calculations.

Practical: Computer applications in mine surveying.

3. PMPM 1102: *Rock Mechanics (2 lectures; 2 practical hrs., 3 credit hours).*

Course Description: Introduction- Physical properties of rocks-Engineering properties of rocks- Failure criteria of rocks- Rock testing-Stress distribution around underground openings-Rock quality and design of rock supporting system-Principal of rock slopes. Geotechnical applications.

Practical: Lab measurements of rock strength-Computer applications in rock mechanics and lab measurements.

4. PMPS 1102 *GIS and Digital mapping (1 lecture; 3 practical hrs., 2 credit hrs.*

Course Description: Principles of GIS-Data management and processing systems-Geo- referencing and positioning- Data entry and preparation- Spatial data analysis-Data visualization and digital mapping-GIS and mineralization. Digital Map Comparison between Analog Maps (paper Maps) and Digital Maps- Classification of Digital Map -Types of Spatial Data- Requirements of digital Map Design – Digital map' Geodatabase - Georeferencing –Digitizing Types - Features Symbology – Map Layout .

Practical:
Introduction to GIS software● Input data and visualizations● Editing tools ● Map projections● Data classifications● Data mathematical measurements● Information extractions, statistics and graphs representations ● Making digital distribution maps ● buffering the mineralization zones ● writing data reports ● maps outlets ● Layer Manage &BGDB-Applied project to mineralized area in Egypt.

5. MANG 1101: *Principals of Management (one lecture; one credit hr.)*

Course Description: This course covers the basic principles of management. Topics covered include; management functions (planning, organizing, decision making,

leading and controlling), environmental analysis,(SWOT and PESTL analysis),change management and temporary issues in management (online, mobile and social media).

First Year (Semester 2)

1. PMPM 1202 *Structural Geology and Mineralization* (2 *lecture hrs.; 3 practical hrs.; 3 credit hrs.)*

Prerequisite: PMPM 1102

Course Description: Principals-Interpretation of maps from simple and complex deformed areas- Distribution of different mineralized shear zones and structural control- Mineral exploration and planning for drilling in mineralized rock bodies- Technical study that involves pre-feasibility and feasibility studies and how to write a report based on the World Code before marketing.

Practical: How to make base and detailed mapping using Landsat images and ARCGIS program- Structural maps Geologic profiles- How to measure strike and dip during a field trip for one day. How to design a plan for drilling in the mineralized zones during the field trip to accessible areas in the Eastern Desert of Egypt.

2. PMPM 1204 *Rock Blasting and Mine Planning (2 lecture; 3 practical hrs; 3 credit hrs.)*

Course Description: Fragmentation principals-Types of explosives-Properties and characteristics of explosives-Blasting agents— Use of explosives and accessories-Blasting theory-Practical usage of explosives; quarries, shaft, tunnels, stop operation and in coal mines. Storage and transport-Accident prevention- Design and planning of mine operation including surface layouts-Main access entire and secondary development openings and underground layout- Long and short-term planning.

Practical: Field Mine trips and problems.

3. PMPS 1202 *GPS Technique and Applications (2 lecture hrs., 3 practical hrs; 3 credit hrs.).*

Course Description: GPS Basic Facts-GPS Surveying- GPS & Other positioning system GPS Modernization-GPS Applications-Using for ground Mining Surveying

Practices:(collecting data with GPS - Averaging and storing apoint with GPS - Building a standard data coding system - Data uploading & Downloading using Spectrum Survey office.)

4. PMPS 1204 *Topographic Surveying & Photogrammetry (2 lectures hrs.; 2 practical hrs.; 3credit hrs.)*

Prerequisite: PMPS 1101

Course Description: Theodolites -Measuring vertical and horizontal angles-Traverses- Adjustment of traverse observation-Principals of photography-Aerial cameras-Aerial photography-Photographic measurements- Vertical photographs-Flight plan-Sources, types and formate of digital images-Geometric, radiometric, spectral and temporal resolution-Ground control-Radiometric and geometric corrections of digital imagery.

Practical: Aerial photographs and satellite images scale and resolution●Locating the principal point●Types of aerial photographs and Stereoscopic vision

Second Year (Semester1)

1. PMPM 2101 *Economic Mineral Deposits of Egypt and Arab Countries (2 lecture hrs., 3 practical hrs., 3 credit hrs.)*

Course Description: Mineral economics- Geographic Distribution of metallogenic belts in the world-Processes of mineral deposits-Precious metals (gold-silver-Pt.GP.)-Iron-Zinc-Copper mineralization-Phosphate deposits-Coal deposits-Ceramic

materials-Radioactive minerals- REEs and RM-bearing minerals-Structural and Building stones- Ore deposits in Egypt and Arab Countries (case study).

Practical: Metallogenic maps- Hand specimens of the most common economic minerals and rocks- Ore treatment and dressing methods. Study of polished sections for the most common ore deposits.

2. PMPM 2103 *Mineral Exploration Methods (2 lecture hrs., 2 practical hrs., 3 credit hrs.)*

Prerequisite PMPM 1202

Course Description: Introduction, How to collect ore samples- Geochemical exploration methods-Geophysical exploration methods- Prospecting for iron, Prospecting for ferrous Metals (Mn, Ni, W, Cr), Prospecting for non-ferrous Metals (Cu, Sn, Pb), Prospecting for light Metals (Al, Be, Ba), Prospecting for precious Metals (diamond, gold, silver), Prospecting for radioactive elements (U&Th)- Prospecting of REEs & RM-bearing minerals-Sampling types – grab samples- Chip Samples – Bleg Samples – Channel samples (techniques-importance) – interpretation of samples and how to simulate ore body- Mapping techniques for big concessions - drilling types – Building wireframes for ore body.

Practical: Field trips to mines and quarries- problems- Geochemical maps of ore concentration- Isocheimal maps of Precious metals- Radioactive concentration maps.

3. PMPS 2101 *Remote Sensing and Mineralization (2 lectures hrs.;3 practical hrs., 3 credit hrs.*

Prerequisite PMPS 1204

Course Description:

Principles of Remote Sensing-Satellite Systems- Image Processing-Remote Sensing and GIS in Geological Mapping and Mineral Exploration- Environmental Planning-Management and Reporting for Mineral Exploration.

Practical:

Introduction to ENVI software ●Satellite images cropping●Satellite images radiometric corrections●preprocessing process●Visual image interpretation Image classification methods (supervised and unsupervised) ●Detect the mineralization zones in satellite images ● applied project to mineralized area in Egypt.

4. PMPS 2103 *Advanced Surveying (2 lecture hrs.; 2 practical hrs., 3 credit hrs.)*

Prerequisite PMPS 1204

Course Description: Automatic level; applications-Optical and digital Theodolites; applications- Electronic distance measurements (EDM); applications-Total station instruments; applications - how to plot drilling holes –Mine background for CMS (Camera scanning) – Quantity Calculation.

Practical: Applications of optical & digital surveying instruments in mine problems.

Second Year (Semester2)

1.PMPM 2202 *Mining Economics and Reserve Estimation (2 lecture hrs.; 2 practical hrs.; 3 credit hrs.).*

Prerequisite PMPM 1204

Course Description: An overview of mining economics- Resources and reserves- Pattern of production- Consumption, transportation and marketing- Perspective of the past, present and future supplies of minerals worldwide and in Arab countries- Finance and economic analysis and interpretation- The concept of cash flow and time value and risk analysis techniques- Spatial variability of volumes, tonnage and grade- Mining losses, dilution, bulk density, cut-off grades and head grades-Estimation and reverse model simulation (JORC code)-Grade control and mine-to-mill- Reports and preliminary feasibility study reports using spreadsheet computer applications.

Practical: Calculation methods of ore reserve-Multimedia and Pc applications.

2.PMPS 2202 *Applications of Geodetic Surveying (2credit hrs+ 2 practical hours; 3 credit hours)*

. Prerequisite PMPS 2103

Course Description: The Geoid-The ellipsoid-The meridian area- Latitude and longitude-Azimuth radius of curvature along meridian- Length of meridian arc-Arc distance along latitude-Area between two latitudes and two longitudes-Calculation of the spheroid-Curves on the spheroid-Field observations for horizontal and vertical control surveys-Precies traverse-Computation for geodetic positions- Geodetic coordinate systems- Types of geodetic networks- Methods to adjust geodetic networks-Adjustment of precise leveling networks.

Practical: Applications of GPS in mining surveying.

3.PMPM 2204 *Mining Laws, Safety and Environmental Impacts (one lecture hr.; one credit hrs.)*

Course Description: Legal and political context of mines and quarries in Egypt-Principals of sustainable development- Company-based initiatives in environmental management- Principals and practices of mine waste disposal-Pre-mining assessments and plans-Stream bed restoration– Design of settling and tailing ponds-State of the art techniques in environmental management of mine sites -Major issues associated with social/ community impacts of mines in Egypt and internationally. Environmental impact of mine disposal- The possibility of climate change exists- Hazard management- Safety measures. The Mining code of Egypt- A comparative study of mining laws of Egypt and well-developed countries, e.g. USA and UK and Germany-Mineral concession and conservation laws-Mine labor and safety laws-Management structure-Human relations-Disputes-Industrial efficiency-Application of operation research in mining.

4.PMPMS 2206 *Applied Project of Mining and Surveying (Two lecture hrs., 3 practical hrs., 3 credit hrs.)*

Course Description: This course provides the main topics of the senior projects in Mining Geology and Surveying: Exploration and prospecting of precious elements- Planning and development of mines- Infrastructure requirements-Environmental assessment-Ore body parameters for surface and subsurface mines- Stratified and massive deposits- Gold and Pt group potentiality in Egypt- Mine layout for surface and underground operations-Underground access- Processing of minerals- Disposal of overburden and rejects-Site rehabilitation. Recent trends in surface and subsurface surveying-Total station and GIS applications.

5. MANG 2202 *International Marketing & Marketing Research (2 lecture hrs.,2 credit hours)*

Course description: this course covers the importance of international marketing research activities for companies in recent years. Topics include; introduction to international marketing, analyzing the international marketing environment, international market intery, developing marketing research in international companies, international marketing mix, collecting international market data and analyzing the data for international marketing decisions.

PMFT Field Training (12 credit hours):

Visit to labs of Egyptian Mineral Resources Authority (EMRA),- visit to Tabeen Institute for Metallurgical Studies- Visit to ceramics plants, 10th of Ramdan city-Visit to Cement plants, Cairo-Suez Road & Alexanderia-Field training in Gold Mine of Sukkari- Field training of Phosphate mines of Abu Tartour-Field training to Iron mines of Bahariya Oasis.

مواصفات الخريج

يهدف برنامج الماجستير المهني-علوم المساحة والتعدين الى اعداد منتسبي البرنامج بما يلي:

١.اكتساب خلفية علمية نظرية وتطبيقية متميزة في مجالي المساحة والتعدين.

٢.أدراك دور منتسبي البرنامج في التطوير والأبتكار في مجالي المساحة و جيولوجيا التعدين.

٣.تصيميم مشروع تطبيقي مبتكر في مجالي المساحة والتعدين.

٤. المشاركة الفاعلة في التقدم العلمي والتكنولوجي لخدمة ورقي المجتمع.

٥.الدراية الخلاقة بالممارسة العملية والتطبيقية في مجالي المساحة والتعدين من خلال التزود باليات البرنامج الذي يعتمد على مايلي:

- المعلومات والأليات المتقدمة في المساحة التعدينية.

-الطرق الحديثة للتعدين والصناعات والمجتمعات التعدينية.

-الطرق الحديثة للتسويق الدولي للتعدين وطرق ادارة المناجم.

-الدراية الكاملة بقوانين ولوائح التعدين في المناطق التعدينية الكبرى والصغرى في مصر والأقطار المجاورة.

-الدراية الكاملة بقوانين الحماية والتأثيرات البيئية للمناطق التعدينية.

وتتم هذه المنظومة في أطار برنامج حديث ومتفرد على مستوى الجامعات المصرية والعربية بما يلي:

- نظام الساعات المعتمدة بالتعاون المتميز بين كليات العلوم والآداب والتجارة بجامعة طنطا.
- الأعتماد على تنمية مهارات التعلم الذاتي والأبتكار لمنتسيي البرنامج.
-

دراسة الجدوى

أهمية وأستراتيجية البرنامج:

- البرنامج مقدم من كليتي العلوم (قسم الجيولوجيا) والآداب (قسم الجغرافيا- شعبة المساحة)-جامعة طنطا.. وهو برنامج متفرد ومتميز على مستوى كل الجامعات المصرية والعربية.

- توجد في منطقة الدلتا العديد من مصانع الطوب الطفلي والحراري وصناعات الأسمنت والسيراميك التابعة للقطاع العام والخاص.. مما يتيع لمنتسيي البرنامج فرص التدريب العملي والتطبيقي وكذلك تكون فرص التعيين في تلك الشركات واعدا.. بجانب التعاون المؤكد بهيئة الثروة المعدنية المصرية، معهد التبين للدراسات المعدنية، مركز بحوث وتطوير الفلزات-التبين-حلوان من ناحية التدريب الميداني والتطبيقي في مناطق التعدين الكبرى في صحاري مصر.

- تحظي كليات العلوم والآداب والتجارة بنخبة متميزة من السادة أعضاء الهيئة التدريسية في مجالي المساحة والتعدين والأدارة بجانب الأجهزة العالية التقنية في المساحة، بالأضافة لأنتداب خيرة علماء مصر في مجالي التعدين والمساحة للمشاركة في التدريس والمشروعات التطبيقية لمنتسي البرنامج.

- يوجد تكامل متميز بين مجلس ادارة البرنامج المكون من نخبة متميزة من كليتي العلوم والآداب .

-توافر البنية التحية الألكترونية والموراد البشرية ونظم العلومات المؤهلة التي تساعد منتسيي البرنامج لأستخدام أحدث اساليب البحث العلمي والتكونولوجي.

ولكن توجد بعض نقاط تحتاج الى تحسين الأداء ينبغي تناولها كما يلي:

- محدودية الكتب والدوريات العلمية الحديثة في مجالي علوم المساحة والتعدين
- ضرورة الأرتقاء بالمستوى المهني للفنيين والأداريين والعمال.
- ضرورة الأرتقاء بمستوى القاعات التدريسية بأحدث التجهيزات ووسائل العرض.
- ضرورة الأرتقاء بتطبيق معايير الجودة وتنمية مهارات بعض أعضاء الهيئة التدريسية في هذا المجال.

تحليل البنية الخارجية للبرنامج والتحديات المحتملة وربطها بخدمة المجتمع وتنمية البئية

- تتميز جامعة طنطا بموقع أستراتيجي (وسط الدلتا) فهي ملتقي محافظات دلتا مصر وتترتبط بهم بشبكة مواصلات ممتازة.. وتمتاز محافظة الغربية بالتنوع الزراعي والصناعي والتكونولوجي.
- يتميز البرنامج بأرتباطه المباشر بسوق العمل في مجالي المساحة والتعدين.
- تم التنسيق بين الجهات المعنية بسوق العمل وأدارة البرنامج مما يؤدي الى الأرتقاء بالمستوي المهني لمنتسبي البرنامج.

- وجود سوق عمل محليا ودوليا في مجالات المساحة والتعدين (سلطنة عمان-المملكة العربية السعودية- ألامارات العربية المتحدة-المغرب-الجزائر-السودان-الأردن).
- ندرة تواجد برنامج علوم المساحة والتعدين وحاجة سوق العمل الملحة لهم لتفردة بين كل الجامعات المصرية والعربية.
- يمكن ان يواجة البرنامج بعض التحديات مثل الأرتقاء المستمر بالمستوى المهني للجهازين الفني والأداري للبرنامج وضرورة أستخدام أستراتيجيات للتحديث وقياس الأثر للنتائج لضمان المنافسة في سوق العمل وفرص التوظيف.
- الأستفادة من قطاعات الدراسات العليا والبحوث لكليتي العلوم والآداب في أبرام اتفاقيات للتدريب الميداني لمنتسبي البرنامج في الشركات التعدينية والمساحة الكبرى.

- وعلى ذلك نجد أن الغايات والأهداف النهائية للبرنامج هي:

١.تعزيز وتطوير ادارة البرنامج

٢.النهوض باستراتيجية التعليم والتعلم.

٣.تنمية الموارد الذاتية للبرنامج لدعم العملية التعليمية والتدريب.

٤.تعزيز سياسات وآليات ربط الخريج بسوق العمل للمنافسة وضمان فرص التوظيف.

٥. الحصول بأسرع وقت ممكن على الأعتماد الأكاديمي المحلي والدولي للبرنامج.

تم الموافقة على البرنامج في مجلس الجامعة

بتاريخ

٢٠١٥/٧/٣٠

تم الموافقة على البرنامج من لجنة القطاع للعلوم

بتاريخ

٢٠١٦/٣/١٧

التوفيق من الله.. نعم المولى ونعم النصير





(رابعا)

برنامج

دبلوم كيمياء لغذاء والتغذية

(ساعات معتمده)

جمهورية مصر العربية

وزارة التعليم العالي

الوزير

قـــرار وزاري
رقم (٤٠٣) بتاريخ ٧ / ٢ / ٢٠٢٢
بشأن تعديل اللائحة الداخلية لكلية العلوم جامعة طنطا (مرحلة الدراسات العليا) بنظام الساعات المعتمدة

وزير التعليم العالي والبحث العلمي ورئيس المجلس الأعلى للجامعات

** بعد الاطلاع على القانون رقم (٤٩) لسنة ١٩٧٢ في شأن تنظيم الجامعات والقوانين المعدلة له.
** وعلى قرار رئيس الجمهورية رقم (٨٠٩) لسنة ١٩٧٥ بإصدار اللائحة التنفيذية لقانون تنظيم الجامعات والقرارات المعدلة له.
** وعلى القرار الوزاري رقم (٦٥٤) بتاريخ ١٩٦٩/١٢/٢٢ بشأن إصدار اللائحة الداخلية لكلية العلوم جامعة طنطا والقرارات المعدلة له .
** وعلى موافقة مجلس جامعة طنطا بجلستيه بتاريخ ٢٠٢١/٥/٣١، وموافقة ا.د/ رئيس الجامعة بالتفويض من مجلس الجامعة بجلسته بتاريخ ٢٠٢١/٥/٣١ .
** وعلى موافقة لجنة قطاع العلوم الأساسية بجلساتها بتاريخ ٦/٢٤ ، ٧/٢٩ ، ٢٠٢١/١٢/٣٠ .
** وعلى موافقة المجلس الأعلى للجامعات بجلسته بتاريخ ٢٠٢٢/١/٢٢ .

قـــرر

(المادة الأولى)

إضافة بند جديد (ث) الى نص المادة (٢١) الواردة باللائحة الداخلية لكلية العلوم جامعة طنطا الصادرة بالقرار الوزاري رقم (٦٥٤) بتاريخ ١٩٦٩/١٢/٢٢ على النحو التالي :-

مادة (٢١) : تمنح جامعة طنطا بناء على اقتراح كلية العلوم دبلومات الدراسات العليا الآتية :-

أ- .....

ث- دبلوم كيمياء الغذاء والتغذية .

(المادة الثانية)

يلحق باللائحة الداخلية المشار إليها بعاليه اللائحة الدراسية الخاصة ببرنامج دبلوم (كيمياء الغذاء والتغذية) .

(المادة الثالثة)

على جميع الجهات المختصة تنفيذ هذا القرار.

وزير التعليم العالي والبحث العلمي
ورئيس المجلس الأعلى للجامعات

(أ.د/ خالد عبد الغفار)

لائحة برنامج دبلوم كيمياء الغذاء و التغذية

كلية العلوم
جامعة طنطا

Diploma of Food and Nutritional Chemistry

Faculty of Science
Tanta University

دبلوم كيمياء الغذاء و التغذية

مقدمة

علم التغذية هي أحد العلوم الأساسية التي تكمن وراء الفهم الصحيح للصحة والعلوم الطبية والإنسانية والطرق التي يتفاعل بها البشر وبيئتهم حيث ان للطعام الذي نتناوله تأثير كبير على صحتنا الجسدية والنفسية.

تم تصميم برنامج التغذية بكلية العلوم للدراسات العليا لحاجة سوق العمل في مصر ، وارتباطه بالتثقيف الغذائى لعامة الناس الذين يعانون من امراض ومشاكل صحية مختلفة . وتسعى كلية العلوم إلى تحقيق ما يلي :

أن تقوم الكلية بأعضاء هيئة التدريس المؤهلين إلى جعل طلابنا قادرين على المنافسة بمستوى عالي والنجاح على المدى الطويل في مجال التغذية، لتكون مصدرا رئيسيا لتدريس هذا التخصص وإجراء البحوث فيه. وأن تكون مصدرا رئيسيا لتزويد الطلاب بالمعلومات في مجال التغذية. من حيث المعايير القياسية والمناهج الدراسية التي تعتمدها علميا للمجتمع المحلي والخارجي.

الهدف من الدبلومة هو تخريج طلاب الدراسات العليا ملمين بالمعرفة السليمة لمجال كيمياء الغذاء و التغذية، حيث أن دبلومة كيمياء الغذاء و التغذية تغطى كثير من الجوانب والمهارات اللازمة لإجراء البحوث الفردية والتعاونية في هذا المجال. وقد تم تصميم هذه الدبلومة للطلاب الذين يرغبون في العمل في مهنة أخصائى تغذية، في مجالات الكيمياء الطبية والصيدلانية والصناعية والأكاديمية أو في أي ميدان لمجال التغذية حيث أن الحاجة لهذا المجال ضرورية فى ظل انتشار عادات غذائية سيئة وما تفرضه بعض الاوبئة العالمية من تباعد اجتماعى والجلوس فى المنزل لفترات طويلة . و يكمن أهميه هذا المجال فى العمل على الكشف عن الغذاء السليم من خلال مراقبه الجودة لكثير من الشركات و المنتجات الغذائية.

الرؤية:

تأهيل خريجى الدراسات العليا بالمهارات اللازمة للعمل ككيميائي تغذية وهي من الوظائف الرئيسية في مجال علوم التغذية لتغطية جميع القياسات و التحاليل الغذائية.

الرسالة:

هذا الدبلوم يمد طلاب الدراسات العليا بالنظريات الحديثة والمهارات التقنية في مجال كيمياء الغذاء و التغذية ومتابعة التطورات والبحث في هذا المجال. كما أنه يزود الخريجين بالمهارات المهنية الأساسية والفنية والأكاديمية الكافية لتأهيلهم للعمل في مختلف مجالات التغذية.

الوضع الإستراتيجى للبرنامج

1- البرنامج خاص بمصروفات مقدم من شعبة الكيمياء الحيوية بقسم الكيمياء – كلية العلوم – جامعة طنطا وهو برنامج يخدم منطقة وسط الدلتا فى فحص الغذاء والتوعية بأهمية الغذاء الصحى ومكوناته.

2- تمتلك الكلية وقسم الكيمياء البنية التحتية والأساسية والتقنيات الحديثة للأنشطة الطلابية والتعليمية المختلفة والتعليم المتقدم والتى تؤدى إلى جودة تعليمية متميزة. توافر البنية التحتية للمعامل الطلابية والبحثية والموارد البشرية المؤهلة والإلكترونية والتى تساعد على الإرتقاء بالمهارات العلمية والعملية لطلاب الدراسات العليا.

3- يوجد تكامل متميز بين تخصصات العلوم بالكلية و كليات الجامعة و خاصة العملية.

4- توجد مدارس بحثية متميزة فى شعبة الكيمياء الحيوية قادرة على المنافسة فى مجال البحث العلمى وتقديم خدمات مجتمعية عالية المستوى وتقديم خريج متميز على معرفة سليمة بمجال التغذية.

الغايات والأهداف الإستراتيجية لبرنامج كيمياء الغذاء و التغذية:

تتصف الخطة الإستراتيجية للبرنامج المقدم من قسم الكيمياء – كلية العلوم – جامعة طنطا بحزمة من الغايات النهائية والتى تغطى مجالات ومحاور جودة البرامج الأكاديمية التطبيقية ، سعيا نحو الإعتماد الأكاديمى للبرنامج والتى تتحقق من خلال محورين أساسيين هما:

١- محور إدارة البرنامج والذى يتضمن الاتفاق مع رسالة ورؤية الكلية والجامعة وتوافر قيادات أكاديمية وإدارية ذات كفاءة متميزة. موارد بشرية ومادية داعمة لتحقيق رسالة البرنامج.

٢- دور الفاعلية التعليمية للبرنامج والذى يتضمن معايير أكاديمية للبرنامج وتقييم للمخرجات به وللطلاب وأعضاء هيئة التدريس ونظم إدارة جودة البرنامج والتقييم.

وعلى ذلك فالغايات النهائية لخطة البرنامج الإستراتيجية هى:

١- تعزيز وتطوير إدارة البرنامج.

٢- تعزيز وتطوير إستراتيجيات التعليم والتعلم.

٣- تعزيز وتطوير برامج الخدمات المجتمعية وتنمية البيئة.

٤- تنمية الموارد الذاتية للبرنامج لدعم العملية التعليمية والتدريب.

٥- الحصول على الإعتماد الأكاديمى المحلى للبرنامج.

٦- استغلال امكانات قسم الكيمياء بكلية العلوم – جامعة طنطا المعملية والعلمية للوفاء بمتطلبات هذا البرنامج وبخاصة امكانيات أعضاء هيئة التدريس به وكذلك الاستعانة بالخبرات الأخرى فى مجال البرنامج من داخل وخارج الجامعة إذا لزم الأمر. عدد 11 عضو هيئة التدريس و 8 من الهيئة المعاونة من شعبة الكيمياء الحيوية بالأضافه الى أعضاء هيئه التدريس من شعبة الكيمياء الفيزيائية و العضوية. وايضا بعض اعضاء هيئة التدريس من شعبة الميكرو بيولوجى.

٧- الاستفادة من المعامل المركزية بجامعة طنطا لتوافر العديد من الأجهزة المتطورة فى المجالات المختلفة.

أهداف البرنامج

١- يهدف هذا البرنامج الى إعداد متخصص قادر على العمل كأخصائي تغذية يفي بالاحتياجات التقنية للمؤسسات كالمستشفيات ودور الرعاية الصحية للفئات العمرية المختلفة وكذلك المؤسسات التى تقدم الرعاية التغذوية وفي المصانع الخاصة بتصنيع الأغذية ومنتجاتها والتحقق من جودة المنتج،

٢- إعداد إخصائى ملم بجميع المكونات الغذائية وتصنيعها وكيفية التعامل مع المواد الخام، وطرق تحليل المواد الكيميائية والميكروبيولوجية والتفاعلات الكيميائية والخصائص الكيميائية الحيوية للأغذية.

٣- توفير فرص التدريب على مستوي من الكفاءة المطلوبة والتنافسية لتطوير المهارات في مجال كيمياء الغذاء و التغذية من حيث وسائل وكفاءة وتقنيات الانتاج بالتفصيل.

٤- الربط بين النظرية والتطبيق والممارسة العملية التى تغطى جميع المنتجات الغذائية.

٥- العمل ضمن فرق العمل مع اكتساب المقدرة على اتخاذ القرارات المناسبة مع متابعة التقييم المستمر مع اظهار وعياً بدوره في تنمية المجتمع.
٦- الحفاظ علي البيئة من خلال الالتزام بالنزاهة والمصداقية وقواعد المهنة مع تنمية القدرات المهنية للخريج بصورة ذاتية ومستمرة ليكون قادرا على نقل علمه وخبراته للآخرين.
٧- تعزيز سياسات وآليات ربط الخريج بسوق العمل لضمان فرص التوظيف والمنافسة .
٨- إعداد كوادر بحثية متخصصة تسهم في الإرتقاء بالمعرفة في مجال كيمياء الغذاء و التغذية.

المخرجات التعليمية المستهدفة من البرنامج

أ- المعرفة والفهم

فى نهاية البرنامج يكون الطالب قادرا على :

١- تحديد العادات الغذائية السائدة في المجتمع.
٢- معرفة تركيب وايض المواد الغذائية المختلفة .
٣- شرح علاقة التغذية بالصحة والمرض.

ب- القدرات الذهنية

فى نهاية البرنامج يكون الطالب قادرا على :

١- تحديد استراتيجيات الاتصال والتثقيف الغذائى.
٢- تفسير وتقييم التطورات المستقبلية في علوم التغذية والصحة.
٣- فهم الطريقة التي يتم بها ايض العناصر الغذائية ، و مبادئ الكيمياء الحيوية ، لفهم الأساس العلمي لما يمكن أن نسميه نظامًا غذائيًا حكيمًا أو صحيًا.

ج- مهارات مهنية وعملية

فى نهاية البرنامج يكون الطالب قادرا على:

١- الالمام بمختلف الطرق والأدوات المستخدمة فى مجال تحليل الغذاء.
٢- كيفية طهى وحفظ الاغذية المختلفة .
٣- تقييم المخاطر الخاصة بالتغذية غير الصحية.

د- مهارات عامة

بانتهاء دراسة هذا البرنامج يكون الطالب قادراً على:

١. القدرة المثلى لعمل وتفسير التحاليل المتعلقة بالغذائية.
٢. التفكير العلمى لحل المشكلات.
٣. استخدام تكنولوجيا المعلومات مع التحاليل و الأجهزة الحديثة .
٤. العمل منفرداً، وكجزء من فريق، والتعلم الذاتي بعقل متفتح وتحري الدقة.

مواد اللائحة

مادة (1) الدرجة العلمية:

تمنح جامعة طنطا بناء على توصية مجلس كلية العلوم دبلوم كيمياء الغذاء و التغذية للدراسات العليا بنظام الساعات المعتمدة.

مادة (2) نظام الدراسة:

نظام الدراسة بالدبلومة هو نظام الساعات المعتمدة (Credit hours system) فى اطار الفصل الدراسى ، بما لا يقل عن 24 ساعة معتمدة موزعة على فصلين دراسيين بواقع 12 ساعة معتمدة لكل فصل دراسى.

مادة (3) الشروط العامة للقبول و التسجيل:

تقبل دبلوم كيمياء الغذاء و التغذية الطالب الحاصل على درجة البكالوريوس في العلوم من جامعة طنطا ، أو من أحدى الجامعات المعترف بها من قبل المجلس الأعلى للجامعات على أن يكون حاصلا على درجة بكالوريوس فى الكيمياء الحيوية الخاصة أو المزدوج أو الكيمياء الخاصة أو الميكروبيولوجى أو الحيوان او الحشرات او النبات الخاص او التخصصات المزدوجة من التخصصات المذكورة سابقا. كما تقبل الدبلوم الحاصلين على درجة البكالوريوس من خريجى كليات الطب البيطرى و الصيدلة و يجوز قبول طلاب من خريجى كلية الزراعة من بعض الشعب بعد موافقة لجنة متخصصة تشكلها اللجنة التنفيذية. في حالة تقدم طلاب غير المذكورين صراحة في اللائحة. يجوز للجنة التنفيذية دراسة حالة كل طالب بناء على راي منسق البرنامج والمقررات التي درسها الطالب للنظرفي قبوله من عدمه و تقرر اللجنة التنفيذية مقررات تكميلية للطلاب من غير شعب بكالوريوس العلوم تخصص الكيمياء الحيوية (الخاصة والمزدوج) يدرسها الطالب ويؤدى فيها الامتحان بنجاح ولا تحسب درجاتها ضمن المعدل التراكمى للطالب. ويجب على الطالب أجتياز المقررات التكميلية التي يقترحها منسق الدبلومه وتقرها اللجنة التنفيذية للدبلومة. تقدم طلبات الإلتحاق بالدبلومة لإدارة الدراسات العليا بالكلية فى شهر يوليو من كل عام دراسى ويبدأ فصل دراسى أول وثانى. وتعلن نتيجة القبول قبل 15 سبتمبر للفصل الأول. ، ويكون قبول الطلاب بعد إستيفاء جميع المستندات وسداد الرسوم خلال أسبوعين من اعلان نتيجة القبول.

مادة(4) مدة الدراسة والمواظبة:

- مدة الدراسة لنيل الدبلوم التغذية عام دراسى جامعى (فصلان دراسيان) و يلغى قيد طالب الدبلوم إذا لم يحصل على الدبلوم في مدة ستة فصول دراسية من تاريخ قيده. و لا تحتسب الدراسات التكميلية من ضمن المدة المقررة .
- مدة الفصل الدراسى سبعة عشر أسبوعا موزعة على النحو التالى:
  - فترة التسجيل مدتها أسبوع و لاتحتسب من مدة الدراسة.
  - فترة الدراسة مدتها أربعة عشر أسبوعا.
  - فترة الأمتحانات فى نهاية الفصل الدراسى و مدتها أسبوعان.

و يجوزللجنة التنفيذية أن توافق على فتح فصل دراسى صيفى مكثف مدته ثمانية أسابيع موزعة على النحو التالى:

- فترة التسجيل 4 أيام.

- فترة الدراسة ستة أسابيع.
- فترة الأمتحان عشرة أيام .
- يحرم الطالب من التقدم لامتحان أى مقرر دراسى لم يحقق نسبة حضور فيه قدرها 75% إذا تم إنذار الطالب ثلاث إنذارات ويكون ذلك بناءً على تقرير من أستاذ المقرر مع موافقة اللجنة التنفيذية واللجنة التنفيذية العليا للبرنامج، وفى هذه الحالة يعتبر الطالب راسبا فى هذا المقرر وتحسب عليه فرصة من فرص دخول الإمتحان مع إخطار الطالب بذلك عن طريق الكلية.

مادة (5) <u>الانسحاب من المقرر:</u>

- فى حالة انسحاب الطالب من بعض أو كل المقررات المسجلة فى خلال أسبوعين من بدء الدراسة يتم رد رسوم الدراسة التي تحددها اللجنة التنفيذية وتعتمدها اللجنة العليا للبرنامج.
- يجوز للطالب الأنسحاب من أى مقرر بعد موافقة منسق البرنامج و ذلك حتى نهاية الأسبوع الرابع من اى من الفصلين و نهاية الأسبوع الثالث من الفصل الصيفى بشرط ألا يكون قد تجاوز نسبة الغياب المقررة قبل الأنسحاب و لا تدخل تلك المقررات فى حساب معدل الطالب. و إذا تم الإنسحاب بعد الفترة المحددة يعتبر الطالب راسبا فى المقرر .

مادة (6) <u>متطلبات التخرج:</u>

متطلبات التخرج لنيل دبلوم كيمياء الغذاء و التغذية هى اجتياز اربعة و عشرون ساعة معتمدة بنجاح على ان لا يقل المعدل التراكمى عن (2).

مادة (7) <u>التسجيل المقررات:</u>

- يسجل الطالب حد اقصى 12 ساعة معتمدة للفصل الدراسى الواحد من مقررات الدبلوم ومايفرض عليه من مقررات تكميلية.
- يسمح بالتسجيل 4 ساعات اضافية لدواعي التخرج على ان لايقل المعدل عن 2,33
- الطالب الذي لم يتمكن من الحصول على معدل تراكمي 2 فأكثر في التقدير العام (CGPA) يمكن له تحسين مقررات على ان يلغي الرصد التاريخي لهذه المقررات وتحتسب مقرر مرة واحدة في حالة نجاحه في المقررات المحسنة.

<u>مادة (8)الأرشاد الأكاديمى:</u>

المرشد الأكاديمى ، عضو هيئة تدريس تتم تسميته بترشيح منسق البرنامج و موافقة اللجنة التنفيذية للبرنامج و ذلك لمساعدة الطلاب فى أختيار المقررات الدراسية والتسجيل وحل مشاكلهم الأكاديمية. ويقسم الطلاب الى مجموعات بحد أقصى 25 طالب لكل مرشد أكاديمي.

<u>مادة (9) وثائق الألتحاق بالدبلومة:</u>

- أصل شهادة المؤهل الدراسى.
- بيان تقديرات جميع سنوات الدراسة لمرحلة البكالوريوس.
- المحتوى العلمى للمقررات من غير خريجى بكالوريوس العلوم – جامعة طنطا.

- أصل شهادة الميلاد .
- عدد اربعة صور مقاس 4 x6 حديثة.
- سداد الرسوم الدراسية مقابل الساعة المعتمدة المسجلة.
- أستمارة إلتحاق بالدراسات العليا بعد أستيفائها.

مادة (10) إيقاف و إلغاء القيد:

يلغى قيد طالب الدبلوم إذا لم يحصل على الدبلوم في مدة ستة فصول دراسية من تاريخ قيده و يجوز إعادة قيد الطالب لسنة واحدة أو اكثر بناء على موافقه منسق الدبلومة وموافقة اللجنة التنفيذيه للبرنامج وموافقة اللجنة التنفيذيه العليا طبقا للشروط العامة للقيد.

وكذلك يوقف قيد الطالب فى أى فصل دراسى بناء على طلبه و بعد تقديم عذر تقبله اللجنة التنفيذية و يلغى قيده فى الحالات الأتية:

- إذا تقدم الطالب بطلب بإلغاء قيده.
- إذا حصل الطالب على إنذارين متتاليين من الأنذارت الأكاديمية للفصل الدراسى الواحد.
- إذا رسب للمرة الثالثة فى أجتياز أمتحان أحد المقررات.
- وفى كل الأحوال تعرض حالات الإيقاف و ألغاء القيد على اللجنة التنفيذية.
- اذا وقع عليه جزاء تأديبى وفقا لما ينص عليه قانون تنظيم الجامعات.

مادة (11) قواعد دراسة مقرر:

- الطالب الذى يحصل على أقل من 2 نقاط التقدير(يرسب في المقرر) لا يحسب له هذا المقرر من الساعات للحصول على الدرجة مالم يحسنه .
- أما بالنسبة للمقررات الأختيارية فيجوز إعادة التسجيل فى ذات المقرر و تكون الإعادة أو أستبداله بمقرر إختيارى أخر و بحيث لاتزيد عن ثلاث مرات.
- في حالة رسوب الطالب اكثر من مره في المقرر تحسب له في المعدل التراكمي لمرة واحدة فقط ساعات الرسوب .

مادة (12) الإمتحانات:

1) يحدد مجلس الكلية فى بداية كل عام دراسى مواعيد الإمتحانات الفصلية.
2) يمنح الطالب أربع فرص لإعادة الامتحان فى المقررات التى يرسب فيها عندما تطرح للدراسة.
3) يسمح للطلاب الراسبين بالإلتحاق بفصل دراسى صيفى بعد موافقة مجلس الكلية عليه، كما يجوز لمجلس الكلية بعد موافقة الأقسام العلمية أن يسمح لطلاب بالإلتحاق بالفصل الصيفي بهدف التخرج أو التسجيل تحت ظروف يقبلها مجلس الكلية.
4) يجوز لمجلس الكلية قبول إعتذار الطالب عن عدم دخول الإمتحان لمرتين فقط خلال دراسته اذا تقدم بطلبه قبل بدء الإمتحان أو خلال 24 ساعة من تاريخ عقد الإمتحان مدعماً بعذر يقبله مجلس القسم ويعتمده مجلس الكلية.

مادة (13) الأنذارات الأكاديمية

يوجه للطالب إنذار أكاديمى إذا حصل على معدل تراكمى لنقاط التقديرات أقل من 2 لأى فصل دراسى.

مادة (14) الإنسحاب من الفصل الدراسى

- يجوز للطالب الإنسحاب الكلى من الفصل الدراسى بعد أخذ رأى منسق البرنامج وموافقة اللجنة التنفيذية على ألا يتجاوز ذلك نهاية الأسبوع الثامن من بداية الفصل الدرا سى الأول أو الثانى و نهاية الأسبوع الرابع من بداية الفصل الصيفى.
- تنظر اللجنة التنفيذية فى طلبات الإنسحاب التى تقدم بعد نهاية الفترة المسموح بها.
- الطالب الذى يقبل بالبرنامج و لم يسجل خلال أسبوع التسجيل يعتبر منسحبا من الفصل الدراسى وإذا لم يسجل فى الفصل الذى يليه يلغى قبوله.

مادة (15) التقييم

- يتم تقييم كل مقرر من 100 (مائة) درجة .
- يتم تقييم الطالب فى المقررات النظرية و العملية و التطبيقية بناء على العناصر التالية:

أ- فى حالة المقررات التى تشتمل على دراسة نظرية فقط يخصص (10%) للإمتحانات الشفوية، (20%) للإختبارات الدورية، (10%) عن التكليفات، وإمتحان تحريرى درجته (60%) من الدرجة الكلية للمقرر .

ب- فى حالة المقررات التى تشتمل على دراسة نظرية ودراسة عملية تطبيقية يخصص نسبة 20% من درجة المقرر للإختبارات الدورية والتكليفات، 20% من درجة المقرر للتقييم المستمر بالعملى، 10% للإمتحانات الشفوية، 50% للإمتحان التحريرى النهائى.

مادة (16) الدلالات الرقمية و الرمزية للدرجات و التقديرات للمقرر:

تقدير الطالب	النسبة	الرمز	النقاط
ممتاز	90 and more	A+	4.000
	85 to < 90	A	3.667
جيد جدا	80 to < 85	B+	3.333
	75 to < 80	B	3.000
جيد	70 to < 75	C+	2.667
	65 to < 70	C	2.333
مقبول	60 to < 65	D	2.000
راسب	0 to < 60	F	0.000
يرصد للطالب المنسحب من مقرر W ----- Withdrawal			
يرصد للطالب المنسحب إجبارياً من مقرر FW ---- Forced Withdrawal			
يرصد للطاب الذي لم يكمل متطلبات المقرر IC----- Incomplete			

(1) تحسب النقطات النهائية للمقرر والمعدل الفصلى والتراكمى للمقررات الدراسية كما يلى :

النقاط النهائية للمقرر = قيمة رمز التقدير × عدد الساعات المعتمدة للمقرر

المعدل الفصلى = مجموع النقاط النهائية التى حصل عليها الطالب فى جميع مقررات التي سجلها في الفصل الدراسى

مجموع الساعات المعتمدة لهذه المقررات

المعدل التراكمى العام: هو متوسط ما يحصل عليه الطالب من نقاط خلال الفصلين الدراسيين و يقرب إلى رقمين عشريين فقط و يحسب كما يلى:

المعدل التراكمى = مجموع (حاصل ضرب نقاط كل مقرر تم دراسته x عدد ساعاته المعتمدة)

حاصل جمع الساعات المعتمدة لهذه المقررات التى تم دراستها

- تمنح التقديرات التى يحصل عليها الطالب عند تخرجه كما يلى:

تقدير الطالب	الرمز	النقاط	النسبة
ممتاز	A+	4.000	90 and more
	A	3.667	85 to < 90
جيد جدا	B+	3.333	80 to < 85
	B	3.000	75 to < 80
جيد	C+	2.667	70 to < 75
	C	2.333	65 to < 70
مقبول	D	2.000	60 to < 65
راسب	F	0.000	➢ 60 %

مادة (17) اللجنة التنفيذية:

تشكل اللجنة التنفيذية برئاسة ا.د/ عميد الكلية ولجنة تنفيذية عليا برئاسة ا.د/ رئيس الجامعة ويتم اعتماد التشكيل من مجلس الجامعة وتتولى اللجنة التنفيذية إدارة البرنامج.

مادة (18):

- تطبق الأحكام التنظيمية للوائح الدراسات العليا بجامعة طنطا وقانون تنظيم الجامعات ولائحتة التنفيذية واي تعديلات تطرا عليه فيما لم يرد فيه نص في هذة اللائحة.

مقررات البرنامج للفصلين الدراسين وتوصيفها

Semester 1		Course title	Hours		
Code	Preq	Obligatory	Lec.	Prac.	Cred.
Bio541	---	Nutrition and metabolism	2	0	2
Mic547	---	Food safety and food microbiology	2	0	2
Bio545		Practical food analysis 1	0	4	2
Bio551		Food additive	2	0	2
	---	**Elective**: select Four credits hours from the following modules			
Bio543		Micronutrients: the vitamins and minerals	2	0	2
Bio549		Metabolic disorders	2	0	2
Chm531		Analytical methods	1	2	2
					12

Semester 2		Course title	Hours		
Code	Preq	Obligatory	Lec.	Prac.	Cred.
Bio542		Nutritional genomics	2	0	2
Bio544		Food quality control	2	0	2
Bio546		Practical food analysis2	0	4	2
Bio556		Instrumental food analysis	1	2	2
		Elective: select Four credits hours from the following modules			
Bio548		Food Toxicology	2	0	2
Bio552		Milk and dairy Production	2	0	2
Bio554		Natural Dietary Supplements	2	0	2
Chm532		Food package	2	0	2
					12

Table of distribution of Marks for Food and nutritional chemistry diploma.

Total exam hours	Total	Oral Marks	Assignments Marks	Periodical exams Marks	Lab, Marks	Written exam marks	Total credit Hours	Laboratory	Lectures	Diploma Students	
Semester1											
2	100	10	10	20	0	60	2	0	2	Nutrition and metabolism	1
2	100	10	10	20	0	60	2	0	2	Food safety and food microbiology	2
2	100	10	10	20	60	0	2	4	-	Practical food analysis 1	3
2	100	10	10	20	0	60	2	0	2	Food additive	4
Elective course(4 hours credit only) for the first semester											
2	100	10	10	20	0	60	2	0	2	Micronutrients: the vitamins and minerals	5
2	100	10	10	20	0	60	2	0	2	Metabolic disorders	6
2	100	10	10	10	20	50	2	2	1	Analytical methods	7
Semester 2											
2	100	10	10	20	0	60	2	0	2	Nutritional genomics	9
2	100	10	10	20	0	60	2	0	2	Food quality control	10
2	100	10	10	20	60	0	2	4	-	Practical food analysis2	11
2	100	10	10	10	20	50	2	2	1	Instrumental food analysis	12
Elective course(2 hours credit only) for the second semester											
2	100	10	10	20	0	60	2	0	2	Food Toxicology	14
2	100	10	10	20	0	60	2	0	2	Milk and dairy Production	15
2	100	10	10	20	0	60	2	0	2	Natural dietary Supplements	16
2	100	10	10	20	0	60	2	0	2	Food package	17
--	1200		--		--	--		--	--	Total Marks for diploma	

Courses Description:
I- First-term nutrition courses

Obligatory courses

1-Nutrition and metabolism (Bio 541)

This course will provide information about food and its importance to our health focusing on the metabolism of different food components and their regulation. It also will give basic information about obesity and malnutrition.

2- Food safety and food microbiology (Mic 547)

The protection of foods and beverages from microbiological spoilage is essential to assure an adequate food supply for the world's population. This course includes an explanation of food spoilage and food safety as they are prominent features in the education of food microbiologists.

3- Practical food analysis (1) (Bio545)

This course will involve full information about laboratory methods for the analysis of food products as part of a quality management program throughout the development process (including raw ingredients), through production, and after a product is on the market. The nature of the sample and the specific reason for the analysis commonly dictate the choice of analytical methods.

4- Food additive (Bio 551)

It covers the introduction to the types of food additives currently used in the food industry and the function(s) of these chemical compounds. The safety of food additives will be addressed as related to their toxicological information. The overarching question of the need for food additives and their safety will be presented. In addition, a selection of naturally occurring toxicants in foods will be examined and discussed.

Elective courses

1- Micronutrients: the vitamins and minerals (Bio 543)

In this course, the instructor will describe and explain how micronutrient requirements are determined with chemistry, metabolic functions, and deficiency signs associated with each of the vitamins and important minerals.

2- Metabolic disorders (Bio 549)

The course focuses on the causes of metabolic disorders and the kinds of these disorders which can be a result of genetics, a deficiency in a certain hormone or enzyme, consuming too much of certain foods, or several other factors. This course provides students with sufficient knowledge on the most common of these disorders. The course includes topics on Diabetes Mellitus, metabolic syndrome, obesity, inborn errors of metabolism, iodine deficiency disorder, and celiac disease.

3- Analytical methods (Chm531)

This course gives an overview of important analytical methods and their range of application within the detection of inorganic and organic compounds. Important analytical quantitative techniques from classical methods, electrochemical methods, spectrochemical/spectrophotometric methods, and separation techniques.

Second-term nutrition courses

Obligatory courses

1- Nutritional genomics (Bio 542)

This course will be focused on the influence of nutrients on the transcriptional activity of genes and the heterogeneous response of gene variants to nutrients. Also, is devoted to the impact of food components on the machinery of gene expression. And summarizes the nuclear receptor which response specifically to dietary components with transcriptional activation or repression. Also, this course demonstrates the molecular mechanisms, micro- or macronutrients involved, and the potential or established relevance to human health.

2- Food quality control (Bio 544)

It covers the fundamentals of quality control and its industrial application through physical, chemical, microbiological, statistical, and sensory methods will be studied. Statistical process control (SPC) will be mainly covered.

3- Practical food analysis (2) (Bio 546)

The course will be focused on the practical application of instrumental measurements for individual food and beverage categories. The categories covered are meat, poultry, and fish; baked goods; dry crisp products; dairy products; fruit and vegetables; and juices. Also, food flavor analysis and solid food texture analysis, and microtoxin analysis.

4- Instrumental food analysis (Bio 556)

The course focused on the application of qualitative and quantitative techniques used in the physical, chemical, sensory, and instrumental examination of food products. The lectures will cover the basic principles of analytical procedures and techniques commonly used to determine the chemical composition, physical properties, and sensory characteristics of foods. The laboratory sessions aim to give students experience in performing food analysis experiments, analyzing data, and reporting their findings.

Elective courses

1- Food toxicology (Bio 548)

The course aims to study the adverse effects of chemicals on living organisms, and it will be reporting the amount that determines the toxicity, also, study the safety, absorption, translocation, storage, and excretion. In addition, it will study the metabolism. Also, this course will deal with natural toxins in different foodstuffs.

2- Milk and dairy Production (Bio 552)

This course will be covering the secretion and milking procedures, and study the comparative composition of blood and milk nutrients. Also, this course will be covering all the constituents of milk which include protein, lipid, carbohydrates, minerals, vitamins, Enzymes, Hormones, Growth Factors, and Organic Acids.

3- Natural dietary supplements (Bio 554)

It will be a focus on dietary supplements such as antioxidants which play significant roles in scavenging free radicals and toxins from the human body. Also, this course covers various dietary supplements for example bee pollen, chitosan, coenzyme Q, fish oils, flavonoids, garlic, ginseng, glucosamine, green tea extract, Isoflavones, Lecithin, melatonin.

4- Food package (Chm532)

It provides knowledge and skills in the handling and packaging of foods and develops values about the safety and environmental impact of packaging. The students will be able to describe the role and function of packaging materials used for a range of consumer food needs and wants. Also, design solutions to packaging problems, relate the properties of food packages to conversion technologies, processing, and packaging technologies and user requirements including safety, convenience, and environmental issues, measure and evaluate the chemical, physical and mechanical properties of packages and packaging, describe the technology involved in the production, shaping, and printing of various packaging materials and packages, and package foods in rigid and flexible containers.





(خامسا)

برنامج

دبلوم البيولوجيا الصناعية والبيئية

ساعات معتمده

جمهورية مصر العربية

وزارة التعليم العالي

الوزيـــــر

قـــرار وزاري
رقم (٤٩٤) بتاريخ ١ / ٩ / ٢٠٢١
بشأن تعديل اللائحة الداخلية لكلية العلوم
جامعة طنطا (مرحلة الدراسات العليا)
بنظام الساعات المعتمدة

وزير التعليم العالي والبحث العلمي ورئيس المجلس الأعلى للجامعات

** بعد الاطلاع على القانون رقم (٤٩) لسنة ١٩٧٢ في شأن تنظيم الجامعات والقوانين المعدلة له.
** وعلى قرار رئيس الجمهورية رقم (٨٠٩) لسنة ١٩٧٥ بإصدار اللائحة التنفيذية لقانون تنظيم الجامعات والقرارات المعدلة له.
** وعلى القرار الوزاري رقم (٦٥٤) بتاريخ ١٩٦٩/١٢/٢٢ بشأن إصدار اللائحة الداخلية لكلية العلوم جامعة طنطا والقرارات المعدلة له .
** وعلى موافقة مجلس جامعة طنطا بجلستيه بتاريخ ٢٠٢٠/١١/٣٠ ، ٢٠٢١/٤/٢٥ .
** وعلى موافقة لجنة قطاع العلوم الأساسية بجلساتها بتاريخ ١/٣٠ ، ٢/٢٧ ، ٢٠٢١/٧/٢٩ .
** وعلى موافقة المجلس الأعلى للجامعات بجلسته بتاريخ ٢٠٢١/٨/٢١ .

قـــرر
(المادة الأولى)

إضافة بند جديد (ت) الى نص المادة (٢١) الواردة باللائحة الداخلية لكلية العلوم جامعة طنطا الصادرة بالقرار الوزارى رقم (٦٥٤) بتاريخ ١٩٦٩/١٢/٢٢ على النحو التالى :-

مادة (٢١) : تمنح جامعة طنطا بناء على اقتراح كلية العلوم دبلومات الدراسات العليا الاتية :-

أ- .....

ت- دبلوم الجيولوجيا الصناعية والبيئية .

(المادة الثانية)

يلحق باللائحة الداخلية المشار إليها بعاليه اللائحة الدراسية الخاصة ببرنامج دبلوم (الجيولوجيا الصناعية والبيئية) .

(المادة الثالثة)

على جميع الجهات المختصة تنفيذ هذا القرار .

وزير التعليم العالي والبحث العلمي
ورئيس المجلس الأعلى للجامعات

(أ.د/ خالد عبد الغفـــار)

اللائحة الداخلية لبرنامج دبلوم الجيولوجيا الصناعية والبيئية
بنظام الساعات المعتمدة
Diploma in Industrial and Environmental Geology -DIEG
(Credit Hours System)
كلية العلوم - جامعة طنطا

برنامج دبلوم الجيولوجيا الصناعية والبيئية بنظام الساعات المعتمدة

Diploma in Industrial and Environmental Geology

اللائحة الداخلية للبرنامج

رسالة البرنامج:

يهدف برنامج دبلوم الجيولوجيا الصناعية والبيئية الي إكساب خريجيه المعرفة والمهارات اللازمة للعمل في الصناعات والتطبيقات المتقدمة التي تعتمد على المواد الخام الجيولوجية بالإضافة إلى تلك المطلوبة لتقليل مخاطر العوامل الجيولوجية التي تؤثر على البيئة بالاضافة الي تنمية المهارات البحثية لخريجى البرنامج، بما يلبي خطط التنمية المستدامة في مصر.

Mission:

To give its graduates the knowledge and skills necessary to work in advanced industries and applications that depend on geological raw materials in addition to those required to reduce the hazards of geological factors that affect the environment, and develop the research skill of the graduates, meeting the sustainable development plans of Egypt.

اهـــداف البرنامج:

- تحقيق التميز نحو نقل التعليم العالي في مجالات التطبيقات الصناعية والمتقدمة للمواد الخام الجيولوجية وحماية البيئة الجيولوجية المصرية مع التأكيد الواجب على جودة الطلاب في مستويات الدراسات العليا.
- تلبية احتياجات سوق العمل من خريجي البرنامج وفقا لخطط الدولة في مجالات معالجة المواد الخام وتصنيعها ودراسات المخاطر البيئية والطبيعية.
- ضمان الاستخدام الأمثل للموارد مع التكنولوجيا الحديثة لخلق مكان للتعليم العالي في مجالات التطبيقات الصناعية والبيئية للجيولوجيا.
- توفير بيئة محفزة قادرة على استقطاب أفضل الطلاب وأعضاء هيئة التدريس.

- إقامة شراكات فعالة مع المؤسسات الأكاديمية والمنظمات الصناعية / البيئية في مجالات الاستخدامات الصناعية وتطبيقات المواد الجيولوجية ، وكذلك دراسة الأخطار البيئية والطبيعية.
- العمل على إنشاء كيانات بالتعاون مع المؤسسات الصناعية والبيئية لتقديم الاستشارات في المجالات ذات الصلة

اللائحة الداخلية

مادة(1):

الشهادة العلمية:

تمنح جامعة طنطا بناء على طلب مجلس كلية العلوم شهادة دبلوم الجيولوجيا الصناعية والبيئية بنظام الساعات المعتمدة.

مادة (2):

مدة ولغة الدراسة:

أ- مدة الدراسة بالبرنامج عام دراسي واحد تشتمل على فصلين دراسيين، الفصل الأول (الخريف) والفصل الثاني (الربيع)، مدة كل منهما 16 اسبوعا تشمل الاعمال الامتحانية بواقع 12 ساعة معتمدة لكل فصل دراسي. ويجوز فتح فصل دراسي صيفي مدته 8 اسابيع شاملة الامتحانات.

ب- يسمح للطالب الذي تمت فترة دراسته اكثر من عام جامعى ان يتخرج اذا حقق متطلبات التخرج في اي من الفصلين الدراسيين لعام التخرج او الفصل الصيفي.

ت- لغة الدراسة بالبرنامج هي اللغة الانجليزية

مادة (3):

القيد والتسجيل بالبرنامج :

يفتح التسجيل بالبرنامج في حال الطلاب الذين سيتم فرض فصل دراسي تحضيري (Preparatory Semester) لهم (مادة 5 بند ب ، ت) في خلال شهر مارس ويجوز اذا اقتضت الحاجه فتح التسجيل للفصل الدراسي التحضيري في وقت آخر خلال العام وتحدد مواعيد الامتحانات بناء على اقتراح اللجنة التنفيذية وموافقة اللجنة العليا واعتماد مجلس الجامعة من كل عام

يفتح التسجيل بالبرنامج في غير هذه الحالة (مادة 5 بند أ) مره واحدة في العام خلال شهر اغسطس او سبتمبر من كل عام وتحدد مواعيد الامتحانات بناء على اقتراح اللجنة التنفيذية وموافقة اللجنة العليا واعتماد مجلس الجامعة

مادة (4):

نظام الدراسة :

أ- الدراسة بالبرنامج بنظام الساعات المعتمدة Credit Hours System.

ب- الساعات المعتمده هي وحدة قياس دراسية وتعادل ساعة دراسية نظرية ، او ساعتين لكل درس عملي اسبوعيا لمدة اربعة عشر (14) اسبوعا، وتدرس على مدى فصل دراسي واحد.

ت- الدراسة بنظام الحضور العادى للمحاضرات والتدريبات والدروس العملية ويجوز أن تكون الدراسة بنظام التعليم الهجين تبعا لما يقرره مجلس الكلية ويعتمده مجلس الجامعة.

ث- يجب على الطلاب متابعة الدروس النظرية والعملية والتدريبات وزيارات مؤسسات سوق العمل التي يتم اقرارها من قبل النظام الدراسي للبرنامج، وللجنة العليا بناء على اقتراح اللجنة التنفيذية ان يحرم الطالب من التقدم لامتحان أى مقرر دراسى اذا لم يحقق نسبة الحضور فيه قدرها % 75 إذا تم إنذار الطالب ثلاث إنذارات ويكون ذلك بناءً على تقرير من أستاذ المقرر وفي هذه الحالة يعتبر الطالب راسبا في المقررات التي حرم من التقدم للإمتحان فيها.

مادة (5):

قواعد القبول:

أولا :يُشترط في من يتقدم للالتحاق بالبرنامج أن يستوفي الشروط التى يحددها المجلس الأعلى للجامعات علي النحو التالي:

أ- الحصول علي بكالوريوس العلوم في احد التخصصات الآتية:

الجيولوجيا – الجيوفيزياء – الجيولوجيا/الجيوفيزياء – الجيولوجيا/ الكيمياء – جيولوجيا البترول والتعدين

ب- جميع الخريجين من كليات العلوم والكليات المناظرة الحاصلين على بكالوريوس الكيمياء – الفيزياء – الكيمياء/الفيزياء – الفيزياء/الكيمياء، على ان يجتاز خريجي هذه البكالوريوسات قبل تقدمهم للإلتحاق ببرنامج دبلوم الجيولوجيا الصناعية والبيئية مقررات خلال فصل دراسي تحضيري (Preparatory Semester) سابق للفصل الدراسي الأول من البرنامج . و لن تحتسب معدلات تقييم هذه المقررات عند احتساب المعدل التراكمي لخريجي البرنامج.

ت- جميع الخريجين من كليات العلوم وكليات علوم الارض والكليات المناظرة الذين درسوا مقررات لعلوم الجيولوجيا اثناء دراستهم الجامعية على ان يقوم منسق البرنامج بتحديد المقررات المطلوب دراستها والنجاح فيها قبل الإلتحاق بالبرنامج من مقررات الفصل الدراسي التحضيري واعتمادها من اللجنة التنفيذية للبرنامج. و لن تحتسب معدلات تقييم هذه المقررات عند احتساب المعدل التراكمي لخريجي البرنامج.

ث- على منسق البرنامج بعد موافقة اللجنة التنفيذية للبرنامج تحديد المقررات المطلوب دراستها والنجاح فيها قبل الإلتحاق بالبرنامج من بين مقررات الفصل التحضيري وذلك لجميع الخريجين من كليات العلوم والكليات المناظرة الذين درسوا مقررات لعلوم الجيولوجيا اثناء دراستهم الجامعية خارج تخصصات الجيولوجيا – الجيوفيزياء – الجيولوجيا/الجيوفيزياء – الجيولوجيا/ الكيمياء –جيولوجيا البترول والتعدين.

ثانيا: يكون قبول الطلاب بالبرنامج سنويا وفقا للعدد الذي تقرره اللجنة العليا للبرنامج في ضوء اقتراح اللجنة التنفيذية.

مادة (6):

متطلبات الحصول على الدبلوم:

1) يتطلب الحصول على دبلوم الجيولوجيا الصناعية والبيئية استيفاء عدد 24 ساعة معتمدة خلال عام جامعي موزعة الي 18 ساعة معتمده اجبارية مقسمه على فصلين دراسين + 6 ساعات معتمد اختيارية مقسمه على الفصلين الدراسيين، كما هو مبين بجداول توزيع المقررات.
2) ترقم المقررات المختلفة بالبرنامج والمبينة بجداول المقررات الدراسية بحروف يتبعها ثلاثة ارقام، ومدلولاتها من اليسار الي اليمين على النحو التالي:

فيما يتعلق بمقررات الفصل الدراسي الأول والفصل الدراسي الثاني

أ) الحروف تدل على اسم البرنامج (DIEG) الذي يتبعه هذا المقرر

ب) يمثل الرقم الاول من اليسار المستوى الدراسي (5) الذي يقدم فيه هذا المقرر، ويمثل الرقم الثاني والثالث من اليسار تسلسل المقرر في المستوى الدراسي حيث الارقام الفرديه للفصل الدراسي الاول بينما الارقام الزوجيه للفصل الدراسي الثاني.

فيما يتعلق بمقررات الفصل الدراسي التحضيري

أ) الحروف تدل على اسم البرنامج (DIEG) الذي يتبعه هذا المقرر

ب) يمثل الرقم الاول والثاني من اليسار المستوى الدراسي التحضيري (5P) الذي يقدم فيه هذا المقرر، ويمثل الرقم الثالث والرابع والخامس من اليسار تسلسل المقرر في المستوى الدراسي التحضيري.

مادة (7):

التسجيل والحذف والاضافة:

1) يشترط لتسجيل الطلاب الحاصلين على درجات بكالوريوس غير بكالوريوس الجيولوجيا – الجيوفيزياء – الجيولوجيا/الجيوفيزياء – الجيولوجيا/الكيمياء – جيولوجيا البترول والتعدين كما مذكور في الماده (5)- قسم ب، ت النجاح في مقررات الفصل الدراسي التحضيري.
2) تقوم ادارة الدراسات العليا بالكلية بعد مراجعة المرشد الاكاديمي بتسجيل مقررات البرنامج الكترونيا في الاسبوع الاول بكل فصل دراسي لكل طالب.
3) لايسمح للطالب بالتسجيل المتاخر الا بموافقة اللجنة التنفيذية للبرنامج، على الا تزيد مدة التاخير عن اسبوعين من نهاية فترة التسجيل.
4) يجوز للطالب بعد استكمال إجراءات التسجيل ان يحذف او يضيف مقررا او اكثر مع مراعاة الحد الادنى والحد الاقصى للعبء الدراسي، وذلك حتى نهاية الاسبوع الثاني من بدء الدراسة.

مادة (8):

الرسوب في المقررات:

أولا: يعتبر الطالب راسبا في المقرر في الحالات الأتيه:

1) اذا تغيب الطالب بدون عذر مقبول عن الامتحان النظري النهائي أو حرمانه من اداء الامتحان النظري النهائي في المقرر لتجاوز نسبة الغياب.
2) اذا حصل الطالب على اقل من 60% من النهاية العظمى لمجموع درجات المقرر

ثانيا: اذا رسب الطالب في اي مقرر اساسي في اي فصل دراسي فعليه اعادة دراسة ذات المقرر والامتحان فيه. اما اذا رسب في مقرر اختياري فيمكنه اعادة دراسته او دراسة مقرر اختياري آخر بديل لاستكمال متطلبات التخرج.

ثالثا: عند اعادة الطالب لمقرر رسب فيه، سواء مقرر اجباري او اختياري، يرصد في سجله الدراسي جميع تقديرات المقررات الحاصل عليها في جميع محاولاته وتدخل جميعا في حساب متوسط نقاط التقدير التراكمي للدرجات.

مادة(9)

التعثر الاكاديمى:

ينذر الطالب اكاديميا اذا حصل على معدل تراكمي اقل من 2 للفصل الدراسي ويسجل الحد الادنى من عدد الساعات المعتمده (8 ساعات).

مادة (10)

الانقطاع عن الدراسة:

يعتبر الطالب منقطعا عن الدراسة اذا لم يسجل مقررات في اي فصل دراسي، او انسحب من الفصل بعد نهاية المواعيد المقررة بدون عذر مقبول (يعتبر منسحب برسوب WF).

مادة (11)

الفصل من الدراسة:

يفصل الطالب من البرنامج اذا تجاوز الحد الاقصى لمده الدراسة بالبرنامج وهي 3 اعوام دراسية متتالية من غير الفصل الدراسي التحضيري الذي يخصص للدراسة وعقد الامتحانات في المقررات المطلوبه للإلتحاق بالبرنامج (مادة 5).

مادة (12):

التقييم:

1) النهايه العظمى لدرجات كل مقرر هي 100 درجة لكل ساعة معتمده من ساعات المقرر.

2) يتم توزيع النهاية العظمى للتقييم على طرق التقييم بنسب مختلفة كما يلي:

فى حالة المقررات التى تشتمل على دراسة نظرية ودراسة عملية تطبيقية

اختبارات دورية وتكليفات	التقييم المستمر بالعملي	امتحانات شفويه	امتحان تحريري نهائي
%20	%20	%10	%50

فى حالة المقررات التى تشتمل على دراسة نظرية فقط

امتحانات شفوية	اختبارات دوريه	التكليفات	امتحان تحريري نهائي
%10	%20	%10	%60

3) الحد الادنى للنجاح في اى مقرر هو 60% من النهايه العظمى لدرجة المقرر.
4) مدة الامتحان النهائي النظري في المقرر ساعتان.
5) يعتبر الطالب الغائب بدون عذر في الامتحان النهائي النظري للفصل راسبا في المقرر
6) اذا تقدم الطالب بعذر مقبول خلال المده المحدده وفقا للقواعد المقرره للأعذار باللأئحة التنفيذية لقانون تنظيم الجامعات تكون نتيجة الطالب في هذا المقرر (غير مكتمل) ويستكمل الطالب متطلبات المقرر في الفترة التي يعقد بها الامتحان النهائي للمقررات غير المكتملة وهي امتحانات الفصل الدراسي التالي مباشرة.
7) يعقد الامتحان في مقررات الفصل الدراسي التحضيري في نهاية الفصل الدراسي السابق للفصل الدراسي الاول بالبرنامج و لن تحتسب معدلات تقييم هذه المقررات عند احتساب المعدل التراكمي لخريجي البرنامج.

مادة (13):

الدلالات الرقمية والرمزية للدرجات والتقديرات:

تقُدر الدرجات والتقديرات والنقاط التي يحصل عليها الطالب في كل مقرر دراسي وكذلك فى التقدير العام للطالب على النحو التالي:

التقدير Grade	النسبة المئوية	المعدل التقدير	النقاط
ممتاز	90 and more	A+	4.000
	85% to <90%	A	3.667
جيد جدا	80% - <85%	B+	3.333
	75% - <80%	B	3.000
جيد	70% - <75%	C+	2.667
	65% - <70%	C	2.333
مقبول	60% - <65%	D	2.000
راسب	<60%	F	<2

3) المعدل التراكمي GPA هو متوسط ما يحصل عليه الطالب من نقاط خلال الفصول الدراسية ويقرب الي رقمين عشريين فقط ويحسب كما يلي:

المعدل التراكمي (GPA) = مجموع (حاصل ضرب نقاط كل مقرر تمت دراسته × عدد ساعته المعتمده) / حاصل جمع الساعات المعتمده التي درسها الطالب نجاحا ورسوبا

4) الحد الادنى للمعدل التراكمي للتخرج هو (2) مقبول.

5) تمنح التقديرات التي يحصل عليها الطالب عند تخرجه كما هو مبين بالجدول الذي يوضح العلاقة بين التقدير العام للتخرج والمعدل التراكمي GPA

حالات الطالب غير الناجح

عدد النقاط	الرمز	الحالة
-	W	منسحب Withdrawn
-	WE	منسحب بعذر مقبول Withdrawn Excuse
0	WF	منسحب برسوب Withdrawn Fail

-	I	غير مكتمل Incomplete

ويبين في شهادة تخرج الطالب النقاط المكتسبه الي جانب التقدير العام للتخرج

مادة 14:

الخطة الدراسية للبرنامج:

مقررات الفصل التحضيري

Preparatory Semester	Course title	Hours		
Code	Obligatory	Lec.	Prac.	Cred.
DGIE 5P01	Physical Geology	1	2	2
DGIE 5P02	Crystallography	1	2	2
DGIE 5P03	Mineralogy and Structural Mineralogy	1	2	2
DGIE 5P04	Introduction to Petrology	1	2	2
DGIE 5P05	Introduction to Hydrogeology	1	-	1
DGIE 5P06	Introduction to Environemntal Geology	1	-	1
DGIE 5P07	GIS Applications to Geology	1	2	2
				12

مقررات الفصل الدراسي الأول

Semester 1	Course title	Credit Hours		
Code	Obligatory	Lec.	Prac.	Cred.
DIEG 501	Analytical Mineralogical and Geochemcial Methods	1	2	2
DIEG 503	Industrial Minerals and Rocks in Egypt	1	2	2
DIEG 505	Ceramics and Refractories from Geologic Materials	1	2	2

DIEG 507	Ore Dressing	1		1
DIEG 509	Safety in Industry and Geologic Locations	1		1
DIEG 511	Total Quality Mangement and Marketing in Geologic Instituions	1		1
Optional: Select Three only from the following courses				
DIEG 513	Environemntal Geophysics	1		1
DIEG 515	Geoenvironmental Hazards	1		1
DIEG 517	Water Resources Industry	1		1
DIEG 519	Environmental Geochemistry	1		1
DIEG 521	Medical Geology	1		1
DIEG 523	Synthetic Materials	1		1
DIEG 525	Structural and Tectonic Framework of Egypt	1		1
				12

مقررات الفصل الدراسي الثاني

Semester 2	Course title	Credit Hours		
Code	Obligatory	Lec.	Prac.	Cred.
DIEG 502	Economic Assessment of Industrial Geological Materials	1	2	2
DIEG 504	Cement From Geologic Materials	1	2	2
DIEG 506	Glasses and Pigments from Geologic Materials	1	-	1
DIEG 508	Environmental laws and Geological Protectorates	1	-	1
DIEG 510	Geo-environmental Impact Assessment	1	2	2
DIEG 512	Applications of Geologic Materials in Nanotechnology	1	-	1
Optional: Select Three only from the following courses				
DIEG 514	Hydro-environmental Assessment	1	–	1

DIEG 516	**Foundry Sands, Fillers and Absorbents from Geologic Materials**	**1**		**1**
DIEG 518	**Lapidary Techniques and Processing of stones**	**1**		**1**
DIEG 520	**Geostatistical Methods**	**1**		**1**
DIEG 522	**Waste mangement- related Geological investigations**	**1**		**1**
DIEG 524	**Environmental Mineralogy**	**1**		**1**
DIEG 526	**Geotechnical Engineering**	**1**		**1**
				12

Breif Description of Courses (Preparatory Semester)

Physical Geology (DIEG 5P01)

Earth materials and the processes that develop and modify the composition, structure, and topography of the earth. Included is an overview of minerals, rocks, volcanoes, earthquakes, plate tectonics, geologic time, water resources, glaciation, structural geology, and energy and mineral resources.

Crystallography (DIEG 5P02)

Crystal structure of the elements, Crystal structure: lattices, unit cell, symmetry, the seven crystal systems, crystal forms, Crystal defects: point defects, dislocations and stacking faults

Mineralogy and Structural Mineralogy (DIEG 5P03)

Physical and chemical properties of minerals, chemical classification of minerals, introduction to the optical mineralogy, chemistry of minerals, internal atomic structures of minerals, structural divisions of minerals

Introduction to Petrology (DIEG 5P04)

Igneous and metamorphic processes explained using crystallization theory, phase diagrams, thermodynamics and geochemistry; laboratory study of rocks, their chemical and mineralogical classification, and their geologic origins, sedimentary rocks composition and classification, introduction to microscopic characteristics of rocks.

Introduction to Hydrogeology (DIEG 5P05)

Fundamentals of groundwater hydrology. The hydrologic cycle, Darcy's Law, aquifer parameters, steady and transient flow equations, well hydraulics, elementary and transient flow equations, well hydraulics, elementary multi-phase flow, groundwater recharge, watershed hydrology, geological controls on groundwater flow, well constructions, and groundwater chemistry and pollution.

Introduction to Environemntal Geology (DIEG 5P06)

important environmental problems, including global change, water resources, coastal problems, air pollution and ozone depletion, and land use and degradation.

GIS Applications to Geology (DIEG 5P07)

Basic principles and techniques of Geographic Information Systems (GIS) with applications to Earth systems, including geomorphology, geology, and hydrology.

(First Semester)

Analytical Mineralogical and Geochemcial Methods (DIEG 501)

Microscopic (optical, scanning electron microscope, transmission electron microscope, Electron Probe Micro Analysis (EPMA), thermal analysis (Thermogravimetry (TG), Differential Thermal Analysis (DTA), X-ray Diffraction, X-ray Fluorescence Spectrometry, Atomic Absorption Spectroscopy.

Industrial Minerals and Rocks in Egypt (DIEG 503)

Deposits of Industrial Minerals in Egypt (Asbestos, Zircon, Barite, Beryl, feldspar, fluorite, graphite, magnesite, mica, quartz crystals, sulfur, talc), Deposits of industrial rocks in Egypt (Bauxite and Al-Laterite, Bentonite Clay, kaolin, Clays and Claystones, Decorative Stones, Diatomite, Dolomite, Glass Sands and Foundry Sands, Black sands, Gypsum and Anhydrite, Limestone, Mineral Pigments, Phosphates, Quartz Raw Materials, Salt.

Ceramics and Refractories from Geologic Materials (DIEG 505)

Ceramics Ceramic Tiles, Tile Raw Materials (kaolin, illite, smectaite, Halloysite, Chlorites, Talc, Pyrophyllite, Feldspathics, Wollastonite, Carbonates, Silica Sand, Ceramic tile/whiteware processing (Grinding & Classifying, Milling & Blending, Body preparation, Pressing, Drying, Glazing, Firing, Sorting and packaging

Refractory materials (oxides, carbides, nitrides, and borides of aluminum, silicon, alkaline earth metals, and transition metals.). The raw materials for refractories bauxite, magnesite, clay, Refractory properties (specific gravity, Bulk densities, apparent porosity, permeability, mechanical properties, thermal properties, corrosion resistance, alkali resistance, classification of refractories. Manufacturing of refractories (shaped refractories, unshaped refractories, insulation refractory).

Ore Dressing (DIEG 507)

Ore Handling, Comminution (crushing, grinding mill, Screening and Classification), Concentration (Leaching, Ore Sorting, Gravity Concentration, Magnetic Separation, Electrostatic Separation, Dense Medium Separation, Flotation, Dewatering, Tailing Management), Metallurgical Accounting, Smelting and Refining, biological concentration.

Safety in Industry and Geologic Locations (DIEG 509)

Mining and quarrying safety, safety in oil and gas exploration and production locations, OSHA, OSHA regulations

Total Quality Management and Marketing in Geologic Institutions (DIEG 511)

Implementation of TQM, using TQM to industry, linking TQM, extrinsic attributes and company results, Marketing mix variables, market share growth, Business performance and excellence.

Environmental Geophysics (DIEG 513)

Physical properties of the shallow sub-surface technical problems arising during construction works (karst collapse, evaporite sinkholes, landslides, mine subsidence and fault zones), surficial or cross hole passive or active seismic methods, electrical resistivity imaging techniques, time domain or spectral induced polarization methods, self-potential, electromagnetic (including terrain conductivity, ground penetration, transient

electromagnetic measurements), gravity-microgravity and magnetic (including magnetic susceptibility).

Geo-environmental Hazards (DIEG 515)

Earthquakes, volcanic activity, landslides, tsunamis, intensive erosion and hydro-meteorological events, Climate Change, Disaster Management and Risk Reduction, GIS Solutions for Hazard Management

Water Resources Industry (DIEG 517)

Distribution of Water resources in Egypt, selecting the proper site for drinking water pumping station either from groundwater or surface water, water Well construction and development, physical, chemical and biological water treatment processes, disinfection techniques, water quality control and monitoring from source to tap and survey of groundwater in Egypt for selecting sites need purification for drinking purposes quality of water in Egypt, water cycle, treatment of water in Egypt, desalination of water, sewage treatment, water sludge treatment. brackish groundwater in Egypt to find out the best sites for desalination.

Environmental Geochemistry (DIEG 519)

Abundance, distribution and behavior of trace elements in the surface environment. The course concerns several environmental matrices such as soil, stream sediment, surface water and groundwater, particulate matter, vegetable and animal organisms, as well as foods.

Medical Geology (DIEG 521)

Natural geological factors and their effects on human and animal health, sources of chemical in nature, diseases related to natural factors (iodine deficiency, Cardiovascular Disease, radiation, health problems related to F, As, NO_3^-.

Synthetic Materials (DIEG 523)

Zeolite minerals from clays, Mesoporous and microporous materials from different minerals, thermal activation, chemical activation, mechanical activation.

Structural and Tectonic Framework of Egypt (DIEG 525)

Bathymetry of the Gulf of Suez, Northern Red Sea, and Gulf of Aqaba, Tectonostratigraphy of the Gulf of Suez and Northern Red Sea, Pre-rift Sequences, Syn-rift Sequences, Post-rift Sequence of the Suez Rift, Structural Geometry of the Gulf of Suez and Northwestern Red Sea, Pre-rift

Structures, Rift Geometry, Impact of Tectonics on Sedimentation in the Gulf of Suez and Northwestern Red Sea

(Second Semester)

Economic Assessment of Industrial Geological Materials (DIEG 502)

Geological field study and mapping, mineral reserves, physical properties, geotechnical properties, mineral components, chemical compositions, cases of clays, white sand, phosphates, limestone and dolomite, talc

Cement from Geologic Materials (DIEG 504)

Basic process and operation, raw materials, Chemical and Mineralogical Composition of Clinker, Clinker Phases in Industrial Clinker, Burnability, Chemical Parameters of Clinker, Effect of Raw Material Properties on Clinkering, The Clinkering Process, Minor Constituents, Analysis of Clinker and Cement, Effects of Milling, Hydration of Portland Cement, Specification of Portland Cement.

Glasses and Pigments from Geologic Materials (DIEG 506)

Soda-Lime Glass, Aluminosilicate Glass, Borosilicate Glass, Lithia Glass, Phosphate Glass, Opal Glass, Lead Glass,

Environmental Laws and Geological Protectorates (DIEG 508)

Law 4/1994 for the Protection of the Environment Amended by Law 9/2009, Executive Regulation amended in 2005, 2011 amendment of regulation, 2015 amendment of regulation, PM decree 544 for 2016, PM decree 618 for 2017, PM decree 1963 for 2017, Multilateral Environmental Agreements. Natural Protectorates description in Egypt, Protectorates declared in the framework of Law 102 of year 1983, natural protectorates map (current and future), regulations of protectorates. Protectorates-related laws and decrees.

Geo-Environmental Impact Assessment (DIEG 510)

Geo-environmental problems, Anthropogenic activities, Evaluation methods, Evaluation process (Evaluation unit division, Evaluation factor system, Weight determination, Model construction.

Applications of Geologic Materials in Nanotechnology (DIEG 512)

Nanoparticles formation, Natural geological materials, nanoparticles from clays, applications of Nano-geological materials in the oil and gas industry, nanotechnology in geotechnical field, natural zeolites in purification of water.

Hydro-environmental Assessment (DIEG 514)

Occurrence, distribution, and quality of water used in industry, agriculture and drinking, water pollution monitoring, assessment and remediation, water resources vulnerability assessment for pollution, Effect of industrial, agricultural and urbanization mega projects on water resources, Effect of mining activities and hydropower plants on water resources.

Foundry Sands, Fillers and Absorbents from Geologic Materials (DIEG 516)

Sand processing (washing, classification, attrition, scrubbing, removal of contaminants, draying) sand casting, refractory sands, Mineral fillers, properties of fillers, uses of mineral fillers (paint, paper, rubber, plastics, insecticides) sand filtration system, mineral sorbents.

Lapidary Techniques and Processing of Stones (DIEG 518)

Sawing, grinding, sanding, lapping, polishing, drilling, tumbling. Lapidary forms (cabochons, faceted stones, beads and spheres, inlays, Intarsias and Mosaics, Cameos and Intaglios, Sculpture), preparation of thin sections, polished sections and thin polished thin sections.

Geostatistical Methods (DIEG 520)

Types of geological spatiotemporal datasets, probability distribution in ore grades, geochemistry, hydrogeology, environmental control, landscape ecology.

Waste mangement- related Geological investigations (DIEG 522)

Geological investigations (bedrock, drift lithology and structures), hydrological/hydrogeological, topographical, surface runoff patterns, radiation, Geologic disposals of radioactive materials.

Environmental Mineralogy (DIEG 524)

Minerals and global ecosystems, mineral-aqueous solution interface, Sorption of contaminants and pollutants on mineral surfaces, natural vs. anthropogenic inputs of elements and contaminants into the biosphere, role of nanominerals and mineral nanoparticles in environment, behavior of mercury, arsenic, and uranium at Earth's surface.

Geotechnical Engineering (DIEG 526)

Origin of soil and its Classification, Weight volume relationship Soil Compaction, seepage and permeability, Effective stress concept and applications, Bouusinesq's theory and vertical stress distribution, Shear Strength, Shear strength, Compressibility of soils, Consolidation and time rate of settlement, Earth pressure theory, Earth pressure theory, Stability of slopes

مادة (15):

الأحكام المطبقة فيما لم يرد فيه نص في هذه اللائحه:

تطبق أحكام قانون تنظيم الجامعات ولائحته التنفيذية وأي تعديلات تطرأ عليه فيما لم يرد فيه نص في هذه اللائحه.

برنامج

الدبلوم المهني في الفيزياء الاشعاعيه

((ساعات معتمده))

جمهورية مصر العربية
وزارة التعليم العالي
الوزير

قـــرار وزاري
رقم (١٠٨٣) بتاريخ ١٣ / ٦ / ٢٠٢٣
بشأن تعديل اللائحة الداخلية لكلية العلوم
جامعة طنطا (مرحلة الدراسات العليا)
بنظام الساعات المعتمدة

وزير التعليم العالي والبحث العلمي ورئيس المجلس الأعلى للجامعات

** بعد الاطلاع على القانون رقم (٤٩) لسنة ١٩٧٢ في شأن تنظيم الجامعات والقوانين المعدلة له.
** وعلى قرار رئيس الجمهورية رقم (٨٠٩) لسنة ١٩٧٥ بإصدار اللائحة التنفيذية لقانون تنظيم الجامعات والقرارات المعدلة له.
** وعلى القرار الوزاري رقم (٤٠٩٦) بتاريخ ٢٠٢٢/١٠/٢ بشأن إصدار اللائحة الداخلية لكلية العلوم جامعة طنطا(مرحلة الدراسات العليا) بنظام الساعات المعتمدة والقرارات المعدلة له .
** وعلى موافقة مجلس جامعة طنطا بجلسته بتاريخ ٢٠٢٢/١٠/٣١ ، ٢٠٢٣/٤/١١ .
** وعلى موافقة لجنة قطاع العلوم الأساسية بجلساتها بتاريخ ٢٠٢٢/١١/١٤ ، ٢٠٢٣/١/٣ ، ٢٠٢٣/٥/١٠ .
** وعلى موافقة المجلس الأعلى للجامعات بجلسته بتاريخ ٢٠٢٣/٥/٢٠ .

قـــرر
(المادة الأولى)

يستبدل بنص البند (ب) الوارد بالمادة رقم (٢) من اللائحة الداخلية لكلية العلوم جامعة طنطا (مرحلة الدراسات العليا) بنظام الساعات المعتمدة الصادرة بالقرار الوزاري رقم (٤٠٩٦) بتاريخ ٢٠٢٢/١٠/٢ النص التالي :-

مادة (٢) : الدرجات العلمية

أ- .....

ب- يمنح مجلس جامعة طنطا بناء على اقتراح مجلس كلية العلوم الشهادات والدرجات العلمية في البرامج المتميزة الآتية :-

١- الدبلوم المهني في الميكروبيولوجي
٢- دبلوم كيمياء الغذاء والتغذية
٣- دبلوم الكيمياء الحيوية التحليلية
٤- دبلوم الجيولوجيا الصناعية والبيئية
٥- الدبلوم المهني في الفيزياء الإشعاعية
٦- الماجستير المهني في المساحة والتعدين

* توجد لائحة مستقلة لكل برنامج ، كل منها يتسق مع الأسس التي استندت إليها هذه اللائحة .

(المادة الثانية)

يلحق باللائحة الداخلية المشار إليها بعاليه اللائحة الدراسية المرفقة والخاصة ببرنامج الدبلوم المهني في (الفيزياء الإشعاعية) بنظام الساعات المعتمدة .

(المادة الثالثة)

على جميع الجهات المختصة تنفيذ هذا القرار.

وزير التعليم العالي والبحث العلمي
ورئيس المجلس الأعلى للجامعات

(أ.د/ محمد أيمن عاشور)

التعريف بالبرنامج:

برنامج الدبلوم المهني في الفيزياء الإشعاعية هو برنامج يُلبي طموحات خريجي كليات العلوم في تخصصات (الفيزياء - فيزياء حيوية – كيمياء حيوية – كليات الطب – الصيدلة – التمريض والعلاج الطبيعي) والراغبين في العمل مع الأجهزة المستخدمة للأشعة في المستشفيات والعيادات الطبية المستخدمة لأجهزة الإشعاع سواء في العلاج أو التشخيص، ويُشبع تطلعاتهم إلي تطبيق ما يدرسونه، ويدربهم على الأمان الإشعاعي. ويهدف إلي الحصول علي خريج مُلم بالمفاهيم النظرية لعلوم الفيزياء الإشعاعية، وتطبيقاتها التكنولوجية في الصناعة، والاستفادة منها في خدمة البيئة والمجتمع الذي يعيش فيه.

فهذا البرنامج يهدف إلي إعداد خريج مُزود بالمهارات والقدرات التي تُؤهله للمنافسة في سوق العمل علي الفرص المتاحة بالمعامل والعيادات المستخدمة للأجهزة الإشعاعية وبمصانع المنتجات الغذائية والكيميائية والصناعية المعتمدة في إنتاجها أو التعامل معها علي استخدام الأشعة في العديد من المجالات المختلفة والرقابة علي البيئة في مجال الاستخدام المفرط للأشعة والمواد المشعة.

كما تؤهله للعمل في معامل التحاليل، المستشفيات، بنوك الدم، مصلحة الطب الشرعي، هيئة المصل واللقاح، شركات الأدوية، فروع جهاز شئون البيئة، محطات معالجة المياه، الجامعات الحكومية والخاصة، ومراكز البحوث المنتشرة بأنحاء الجمهورية.

والأهم من ذلك هو أن البرنامج يهدف إلي إعداد خريج مُدرب ومُجهز لتطبيق ما يدرسه في تأسيس مشروع خاص به من أجل صيانة المعدات الإشعاعية والتدريب علي الوقاية من الأخطار الناتجة عن الاستخدام المتزايد للأشعة في العديد من المجالات واستخدام الأجهزة في قياس المستوي الإشعاعي لأجهزة التعامل مع الإشعاع، ويتدرب عليها بكفاءة من خلال الدراسة النظرية والعملية والتدريب الميداني الذي يتلقاه على مدار الدراسة.

صمم هذا البرنامج الدراسي بحيث يتم التعلم عن طريق المحاضرات والدروس العملية التطبيقية والتدريب في المستشفيات ومعامل التحاليل الإشعاعية للمصانع ومراكز البحوث والمعامل الحكومية والخاصة في مجال الفيزياء الإشعاعية التطبيقية.

رسالة البرنامج:

يسعى برنامج " الدبلوم المهني في الفيزياء الإشعاعية " أن يمد المجتمع بالكوادر المهنية المتميزة المزودة بالمهارات العملية والتقنية في مجال استخدام الفيزياء الإشعاعية وتكون قادرة على المنافسة محلياً وعالمياً وتساهم في تنمية وخدمة المجتمع.

الأهداف الاستراتيجية للبرنامج:

1) إثراء المعرفة المهنية في مجال الفيزياء الإشعاعية وتطبيقاتها ومتابعة التطورات المعاصرة.
2) تأهيل الخريجين بتزويدهم بالنظريات والتطبيقات الحديثة وإكسابهم الخبرات والمهارات التقنية في مجال الفيزياء الإشعاعية وتطبيقاتها وفقا لاحتياجات سوق العمل محلياً وإقليميا.
3) رفع كفاءة الخريجين في مجال الفيزياء الإشعاعية وتطبيقاتها وذلك بإتاحة فرص الربط بين الدراسة النظرية والتدريب
4) استخدام المنهج العلمي السليم لإجراء الاختبارات والقياسات وحل المشكلات التقنية الخاصة بالفيزياء الإشعاعية.

مادة (1): الدرجة العلمية

تمنح جامعة طنطا درجة الدبلوم المهني في الفيزياء الإشعاعية بنظام الساعات المعتمدة بناء على اقتراح مجلس كلية العلوم.

مادة (2): نظام الدراسة

1) نظام الدراسة هو نظام الساعات المعتمدة Credit Hours System في إطار الفصل الدراسي بواقع 24 ساعة معتمدة موزعة على فصلين دراسيين بواقع 12 ساعة معتمدة لكل فصل دراسي.

2) الساعة المعتمدة هي وحدة قياس دراسية وتُعادل ساعة محاضرة دراسية نظرية واحدة في الأسبوع، أو ساعتين لكل درس عملي أو تمارين تطبيقية في الأسبوع طوال الفصل الدراسي.
3) لغة الدراسة في البرنامج هي اللغة الإنجليزية.

مادة (3) مدة الدراسة:

1) مدة الدراسة سنة واحدة جامعية مقسمة على فصلين دراسيين ويُسمح للطالب الذي تمتد فترة دراسته أكثر من سنة جامعية أن يتخرج إذا حقق متطلبات التخرج في أي من الفصلين الدراسيين لعام التخرج أو الفصل الدراسي الصيفي.
2) مدة الفصل الدراسي سبعة عشر أسبوعاً موزعة على النحو التالي:

- فترة التسجيل مدتها أسبوع ولا تحتسب من مدة الدراسة.
- فترة الدراسة مدتها أربعة عشر أسبوعاً.
- فترة الامتحانات في نهاية الفصل الدراسي ومدتها أسبوعان.

ويجوز للجنه التنفيذية بطلب من منسق البرنامج أن توافق على فتح فصل دراسي صيفي مكثف مدته 8 أسابيع على النحو التالي:

- فترة التسجيل 4 أيام.
- فترة الدراسة ستة أسابيع.
- فترة الامتحان عشرة أيام.

مادة (4) الشروط العامة للقيد والقبول بالبرنامج:

1) الحصول على درجة البكالوريوس في العلوم في أحد التخصصات الآتية: الفيزياء – الفيزياء الحيوية – علوم المواد - الكيمياء الحيوية من احدى الجامعات داخل جمهورية مصر العربية.
2) خريجي كليات القطاع الطبي وجميع الخريجين من الكليات العملية الأخرى الذين درسوا مقررات الفيزياء الإشعاعية أثناء دراستهم الجامعية.
3) يتم قبول الطلاب بالبرنامج سنوياً وتحدد اللجنة العليا للبرنامج أعداد المقبولين في ضوء اقتراح اللجنة التنفيذية.

مادة (5) متطلبات الحصول على الدبلومة:

1) يتطلب الحصول على الدبلوم المهني في الفيزياء الإشعاعية استيفاء عدد 24 ساعة معتمدة خلال عام جامعي موزعة إلى:
   أ) 16 ساعة معتمدة إجبارية مقسمة على فصلين دراسيين.
   ب) 8 ساعات معتمدة اختيارية مقسمة على الفصلين الدراسيين، كما هو مبين بجداول توزيع المقررات.
2) اجتياز الطالب فترة تدريبية مدتها ثلاثة أسابيع في الأماكن التي لها علاقة بالدراسة أو العمل بعد التخرج.

مادة (6): الإرشاد الأكاديمي:

المرشد الأكاديمي هو عضو هيئة تدريس بقسم الفيزياء يتم ترشيحه من منسق البرنامج وتوافق عليه اللجنة التنفيذية لتقديم النصح والإرشاد للطالب وتوجيهه دراسياً ومساعدته على اختيار المقررات الدراسية.

مادة (7) التسجيل والحذف والإضافة:

1) تقوم وحدة الإرشاد الأكاديمي بالكلية بعد مراجعة المرشد الأكاديمي بتسجيل المقررات لكل طالب إلكترونياً في الأسبوع الأول لكل فصل دراسي.
2) يُشترط لتسجيل المقرر أن يكون الطالب قد اجتاز بنجاح المتطلب السابق لهذا المقرر (إن وُجد).
3) لا يُسمح للطالب بالتسجيل المتأخر إلا بموافقة اللجنة التنفيذية، علي ألا تزيد مدة التأخير عن أسبوعين من نهاية فترة التسجيل.
4) يجوز للطالب بعد استكمال إجراءات التسجيل وبعد موافقة المرشد الأكاديمي أن يحذف أو يضيف مقرراً أو أكثر مع مراعاة الحد الأدنى والحد الأقصى للعبء الدراسي، وذلك حتى نهاية الأسبوع الرابع من بدء الدراسة للفصل الدراسي الأول و الثاني وحتى نهاية الأسبوع الثاني في الفصل الدراسي الصيفي.

مادة (8) الانسحاب:

1) يجوز للطالب الانسحاب من أى مقرر بعد موافقة المرشد الأكاديمي وذلك حتى نهاية الأسبوع السادس من الفصلين الأول والثاني ونهاية الأسبوع الثالث من الفصل الصيفي بشرط ألا يكون قد تجاوز نسبة الغياب المقررة قبل الانسحاب ولا تدخل تلك المقررات في حساب المعدل الفصلي/التراكمي للطالب. وإذا تم الانسحاب بعد انتهاء الفترة المحددة يعتبر الطالب راسبا في المقرر.
2) يجوز للطالب الانسحاب الكلى من الفصل الدراسي بعد موافقة المرشد الأكاديمي وموافقة اللجنة التنفيذية على ألا يتجاوز ذلك نهاية الأسبوع الثامن من بداية الفصل الدراسي الأول أو الثاني ونهاية الأسبوع الرابع من بداية الفصل الصيفي.
3) تنظر اللجنة التنفيذية في طلبات الانسحاب التي تقدم بها الطلاب بعد نهاية الفترة المسموح بها وللجنة أتخاذ القرار المناسب.
4) الطالب الذى يقبل بالبرنامج ولم يسجل خلال فترة التسجيل يعتبر منقطعا عن الدراسة وإذا لم يسجل في الفصل الذى يليه يفصل من البرنامج إلا اذا تقدم بعذر تقبله اللجنة التنفيذية وتوافق عليه اللجنة العليا للبرنامج.
5) يجب على الطالب متابعة المحاضرات والاشتراك في التمرينات العملية أو حلقات البحث. وللجنه العليا للبرنامج بناء على اقتراح اللجنة التنفيذية أن تحرم الطالب من التقدم إلى الامتحان كله أو بعضه إذا تجاوزت نسبة الغياب 25 % وفى هذه الحالة يعتبر الطالب راسباً في المقررات التي حرم من التقدم للامتحان فيها.

مادة (9) إيقاف وإلغاء القيد والفصل من الدراسة:

1) يجوز للطالب أن يتقدم بطلب لوقف قيده بالبرنامج لمدة لا تزيد عن فصلين دراسيين، منفصلين أو متصلين، خلال مدة دراسته بالبرنامج على ان تقدم طلبات وقف القيد في موعد أقصاه نهاية الأسبوع الثاني من الفصل الدراسي ويكون وقف القيد نافذا بعد اخذ راي المرشد الأكاديمي وموافقة اللجنة التنفيذية واللجنة العليا للبرنامج على العذر الذى قدمه الطالب.
2) تقوم اللجنة العليا بإلغاء قيد الطالب بناء على موافقة اللجنة التنفيذية في الحالات الأتية:

أ) إذا تقدم الطالب بطلب لإلغاء قيده.

ب) إلغاء قيد الطالب بناء على تقرير المرشد الأكاديمي وبموافقة اللجنة التنفيذية.

ت) اذا انقطع الطالب عن الدراسة فصلين دراسيين متتاليين بدون عذر مقبول طبقا للقواعد المعمول بها بالجامعة.

ث) في حالة عدم التزامه بسداد الرسوم والمصروفات الدراسية عن كل فصل دراسي.

ج) في حالة اذا صدر في حقه جزاءً تأديبياً.

3) يفصل الطالب من البرنامج اذا لم يجتز عدد الساعات اللازمة للتخرج (24 ساعة معتمدة) خلال اربع فصول دراسية متصلة أو منفصلة.

وفي كل الأحوال تعرض حالات إيقاف وإلغاء القيد على اللجنة التنفيذية واللجنة العليا للموافقة عليها.

مادة (10) إعادة القيد:

إذا تم إلغاء قيد الطالب لأحد الأسباب المذكورة في المادة (9) باللائحة يجوز لمجلس الكلية بناءً على اقتراح اللجنة التنفيذية واللجنة العليا للبرنامج إعادة قيده، ويراعى أن تطبق عليه القواعد التي تطبق على الطالب المستجد. وعلى الطالب أن يتقدم بطلب إعادة القيد في المواعيد المحددة والشروط العامة للقيد طبقاً للمادة (4).

مادة (11) النظام الكودى للمقررات

1) تدرس مقررات الدبلوم المهني في الفيزياء الإشعاعية والموضحة بالجداول المرفقة في هذه اللائحة.

2) تُكود المقررات بوضع الرمز الكودي للتخصص العام (القسم العلمي) والبرنامج الذى يتبعه المقرر (PRPH) يليه الرقم الدال على المقرر.

3) تأخذ مقررات الدبلوم (كود 500).

4) يوضع الرقم الدال على مستوى المقرر (5) في خانة المئات ثم رقم المقرر في خانتي الآحاد والعشرات، بحيث ترمز الأرقام الفردية لمقررات الفصل الدراسي الأول، والأرقام الزوجية ترمز لمقررات الفصل الدراسي الثاني.

مادة (12) التقييم:

1) النهاية العظمى لدرجات كل مقرر دراسي هي 100 درجة ويتم توزيعها وفقاً للعناصر التالية.

نوع المقرر	أعمال فصلية	شفوي	تطبيقي	عملي	نظري
مقررات بها محتوى نظري وعملي	%10	%5	%5	%20	%60
مقررات نظريه فقط	%20	%10	-	%10	%60

2) مدة الامتحان النهائي التحريري للمقرر ساعتان. ويمكن استخدام نظام الامتحانات الإلكترونية.

3) يعتبر الطالب الغائب بدون عذر في الامتحان النهائي النظري للفصل راسباً في المقرر.

4) إذا تقدم الطالب بعذر مقبول خلال المدة المحددة وفقاً للقواعد المقررة للأعذار باللائحة التنفيذية لقانون تنظيم الجامعات تكون نتيجة الطالب في هذا المقرر (غير مكتمل)، ويستكمل الطالب متطلبات المقرر في الفترة التي يُعقد بها الامتحان النهائي للمقررات غير المكتملة وهي امتحانات الفصل الدراسي التالي مباشرة، واذا تغيب الطالب عن الامتحان النهائي يُعتبر الطالب راسباً في هذا المقرر ويُرصد له تقدير (F).

مادة (13) الدلالات الرقمية والرمزية للدرجات والتقديرات:

1) تُقدر الدرجات والنقاط التي يحصل عليها الطالب نجاحاً ورسوباً في كل مقرر دراسي علي النحو التالي:

التقدير	الرمز	النقاط	النسبة
ممتاز	A^+	4.00	90 -100
	A	3.67	85 - < 90
جيد جدا	B^+	3.33	80 - < 85
	B	3.00	75 - < 80
جيد	C^+	2.67	70 - < 75
	C	2.33	65 - < 70
مقبول	D	2.00	60 - < 65
راسب	F	0.00	0 - < 60
يرصد للطالب المنسحب من مقرر تقدير: منسحب Withdrawn (W)			
يرصد للطالب المنسحب من مقرربعذر مقبول تقدير: منسحب بعذر Withdrawn Excuse (WE)			
يرصد للطالب المنقطع عن الدراسة أو الذى لم يسجل تقدير: منسحب برسوب Withdrawn Fail (WF)			
يرصد للطاب الذي لم يكمل متطلبات المقرر تقدير: غير مكتمل Incomplete (I)			

مادة (14): المعدل الفصلى والتراكمى

1) المعدل الفصلي:

هو متوسط ما يحصل عليه الطالب من نقاط في الفصل الدراسي الواحد ويقرب إلى رقمين عشريين ويحسب كما يلى:

$$\text{المعدل الفصلي} = \frac{\text{مجموع (حاصل ضرب نقاط كل مقرر x عدد ساعاته المعتمدة)}}{\text{مجموع الساعات المعتمدة لهذه المقررات في الفصل}}$$

2) المعدل التراكمي GPA

هو متوسط ما يحصل عليه الطالب من نقاط خلال الفصلين الدراسيين ويقرب إلى رقمين عشرين ويحسب كما يلى:

$$\text{المعدل التراكمي العام} = \frac{\text{مجموع (حاصل ضرب نقاط كل مقرر تم دراسته x عدد ساعاته المعتمدة)}}{\text{مجموع الساعات المعتمدة للمقررات التي تم دراستها}}$$

- الحد الأدنى للنجاح في المقرر هو (60 %) = (2) مقبول
- الحد الأدنى للمعدل التراكمي هو (60 %) = (2) مقبول

مادة (15) الرسوب فى المقررات:

أولاً: يعتبر الطالب راسباً في المقرر في الحالات الأتية:

1) إذا تغيب الطالب بدون عذر مقبول عن الامتحان النظري النهائي أو حرمانه من أداء الامتحان النظري النهائي في المقرر.
2) إذا حصل الطالب علي أقل من 60% (عدد نقاط 2) من النهاية العظمي لمجموع درجات المقرر.

ثانياً: إذا رسب الطالب في أي مقرر إجباري في أي فصل دراسي فعليه إعادة دراسة ذات المقرر والامتحان فيه. أما إذا رسب في مقرر اختياري فيمكنه إعادة دراسة نفس المقرر أو دراسة مقرر اختياري أخر بديل لإكمال متطلبات التخرج وذلك بعد موافقة المرشد الأكاديمي.

ثالثاً: عند إعادة الطالب لمقرر رسب فيه، سواء مقرر إجباري أو اختياري، يرصد في سجله الدراسي جميع تقديرات المقررات الحاصل عليها في جميع محاولاته وتدخل جميعا في حساب متوسط نقاط التقدير التراكمي للدرجات علي ان يضاعف عدد الساعات المعتمدة للمقرر لمرة واحدة.

مادة (16) التعثر الأكاديمي:

1) يوجه للطالب إنذاراً أكاديمياً إذا حصل على معدل فصلى أقل من 2 لأى فصل دراسي ولا يسجل في الفصل الدراسي الثاني إلا في الحد الأدنى لعدد الساعات (8 ساعات معتمدة في الفصل الدراسي).

2) يمكن للطالب الذى اجتاز عدد الساعات المتطلبة، ولكن بمعدل تراكمي اقل من 2 أن يسجل في مقرر أو اكثر لتحسين معدله التراكمي.

مادة (17) الانقطاع عن الدراسة:

يعتبر الطالب منقطعاً عن الدراسة إذا لم يسجل مقررات في أي فصل دراسي، أو انسحب من الفصل بعد نهاية المواعيد المقررة بدون عذر مقبول. (يعتبر منسحب برسوبWF)

مادة (18) الإشراف على البرنامج

يقوم بالأشراف على البرنامج لجنة عليا على مستوى الجامعة ولجنة تنفيذية على مستوى الكلية وتصدر لائحة إدارية ومالية للبرنامج يعتمدها مجلس الجامعة تحدد اختصاصات لجان الإشراف و جميع الأمور الإدارية و المالية الخاصة بالبرنامج.

الأهداف وتوزيع المقررات بالبرنامج

Tanta University, Faculty of Science

Diploma program specifications of Professional Radiation Physics.

Program Department	Physics Department
Academic year	2021/2022
Date of specification approval	9/2022

A- Basic Information:

Program title:	Professional Diploma in Radiation Physics.
Program type	Single.
Coordinator:	Head of Physics Department.
QAA Benchmarking Standards	Academic Reference Standards (ARS)
Date of Delivery	Every year in June
Review Date	Internal Periodic Review, every Summer

B- Professional Information

1. Program aims to:

1. Deliver students with a broad understanding of the fundamental principles of Professional Radiation Physics emphasizing its impact on human, ecology, daily used and plants.
2. Study the diverse aspects of the field of radiation physic, including biochemistry, ecology, radiated instruments in all types of medial tools for investigation and pharmaceutical materials. Applied applications of radiation in different fields.
3. Prepare the students to diploma program in the field of Professional Radiation Physics or to the professional controller in field of radiation.
4. Equip students with IT and statistical parameters to present and edit their data.

2. Intended learning outcomes of course (ILOs)

a- Knowledge and understanding

By the end of the diploma program the graduate must be able to :

a1. Gain knowledge of different topics of radiation physics.

a2. Define in depth new trends in the different branches of Professional Radiation Physics

a3. Mention concepts as well as the tools and indicators of evaluating sustainability.

a4. Explain the field works in (data collection, sampling and working with portable apparatuses).

a5. Trace the relevant and recent laboratory methodology; the safe and proper operation of large scale techniques and instruments.

a6. Describe the methods of data management and analysis.

b- Intellectual skills

By the end of the Diploma program, the graduate must be able to:

b1. Link between knowledge and concepts in the modern trends to solve problems.

b2. Analyze what is relevant to scientific problems in the field of Professional radiation physics.

b3. Evaluate scientific evidence, both quantitative and qualitative, in order to arrive at evidence-based conclusions.

b4. Conclude not only the theoretical underpinnings of the discipline but also how that theory influences practice.

b5. Evaluate the applications, progress and outcomes of suggested solutions.

b6. Evaluate critically published information.

b7. Analyze criteria and specifications appropriate to specific problems at different levels and propose options for their solution.

c- Professional and practical skills

By the end of the diploma program, the graduate must be able to:

c1. Dissect research results objectively.

c2. Run instruments with accuracy in experimental data of radiation instruments.

c3. Collect data from a variety of sources concerning scientific reports.

c4. Implement annual management plans based on scientific observation.

c5. Write professional report.

c6. Assess existing method and tools of the radiation research

d- General and transferable skills

By the end of the diploma program the graduate must be able to:
d1. Express ideas through structure, writing essays and oral modes using it.
d2. Manage self-development skills including time management and organization.
d3. Use in safe and effective manner the scientific systems and tools.
d4. Possess good project management and business skills.
d5. Identify personal learning needs.
d6. Be aware about the basic and ethics of scientific research.

Professional Diploma in Radiation Physics

Semester 1 (12 Credit Hours)

Code	Course title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 8 Credits				
PRPH501	Atomic and Nuclear Physics	2	-	2
PRPH503	Radiation Physics for Medical Facilities	2	-	2
PRPH505	Physics of Radiotherapy and Medical Imaging	1	2	2
PRPH507	Kinetics of Radioactive Decay	2	-	2
Optional: Select 4 credits				
PRPH509	Radiation Biology	1	2	2
PRPH511	Radiation Sources	1	2	2
PRPH513	Attenuation of Radiation	1	2	2
PRPH515	Interaction of Radiation with Matter	1	2	2
PRPH517	Radiation Regulations and Protection	1	2	2
PRPH519	Measuring Radiation	1	2	2
PRPH521	Practical Field Training	1	3	2
Total Credits		**`12**		

Semester 2 (12 Credit Hours)

Code	Course title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 8 Credits				
PRPH502	Statistics of Radiation Counting	2	-	2
PRPH504	Radiation Dosimeters, Waste, and Safety	1	2	2
PRPH506	Radiation and Environment	1	2	2
PRPH508	Radiation Sterilization and Applications	2	-	2
	Optional: Select 4 credits			
PRPH510	Nuclear and Radiological Regulation Act قانون تنظيم الأنشطة النووية والإشعاعية	1	2	2
PRPH512	Pollution of Radiation	1	2	2
PRPH514	Radiation Detectors and Their Kinds	1	2	2
PRPH516	National and International Standardization of Radiation Dosimetry	1	2	2
PRPH518	Transportation of Radioactive Materials	1	2	2
PRPH520	Digital Computer Applications	1	2	2
Total Credits		**12**		

Course Description of the Diploma Program of Professional Radiation Physics

PRPH501: Atomic and Nuclear physics

Atomic nature of matter, Information on radionuclides, the natural abundance of isotopes, mass defect, binding energy, energy levels of atoms and nuclei, radioactive decay, rates of variation of radioactivity over time, half-life time, radioactive equilibrium, interaction of radiation with matter.

PRPH502: Statistics of Radiation Counting

Statistics and measurements, sources of errors in radiation measurements, characterization of radiation data, estimation of precision and accuracy of a measurement, propagation of error, application of statistical analysis, random errors in radiation measurements.

PRPH503: Radiation Physics for Medical Facilities

Basic radiation physics concepts and units of measurement, regulatory requirements in the areas of medical imaging and radiation oncology, medical imaging, safety and image quality, radiation physics surveys (RPS), radiation oncology, X-rays, fluoroscopy, mammography, CT, and MRI. Radiation shielding (design, survey, and oncology), Accreditation Quality System Audit (ACR).

PRPH504: Radiation Dosimeters, Waste, and Safety

Radiation dosimeters, properties of dosimeters, accuracy and precision, linearity, dose rate dependence, Energy dependence, Directional dependence, Spatial resolution and physical size, convenience of use, ionization chamber dosimetry systems, film dosimetry, luminescence dosimetry, semiconductor dosimetry, chemical dosimetry, neutron dosimetry, other dosimetry systems, radiation protection practice/evaluation.

PRPH505: Physics of Radiotherapy and Medical Imaging

Basic physics, classical radiation therapy, radiation units, dose distribution and scatter analysis, a system of dosimetric calculation, treatment planning, isodose distributions, patient data, corrections, and set-up, field shaping, skin dose, and field separation, electron beam therapy, brachytherapy, radiation protection, quality assurance, total body irradiation, modern radiation therapy, three-dimensional conformal radiation therapy, intensity-modulated radiation therapy, stereotactic radiosurgery, high dose rate brachytherapy, screen-film radiography, computed and digital radiography, fluoroscopy imaging, mammography, computed tomography scanner, gamma imaging, ultrasound imaging, magnetic resonance imaging.

PRPH506: Radiation and Environment

Pollution of radiation, radiation levels and human activities, mining, handling and processing of radioactive materials, handling and storage of radioactive waste, nuclear power plants, radiation in medicine and research, microwaves, cell phones, radio transmitters, wireless devices, computers.

PRPH507: Kinetics of Radioactive Decay

Basic principles of radiation physics, radioactivity, physics of ionizing radiation, radiation dosimetry, imaging equipments, radiation therapy, and radiation detectors, clinical equipments, interaction of neutrons and photons with matter, ionizing radiation, charged particle equilibrium, radiography equipments.

PRPH508: Radiation Sterilization and Applications

Radiation sterilization, types, mechanisms, applications, drawbacks of radiation sterilization techniques in instrumentation, product degradation, radioactive material. advantages and disadvantages of radiation sterilization, Market (RSM). Application to medical devices products, the effect of ionizing radiation on some molecules of biological importance (e.g., water, proteins, carbohydrates, ..), the effect of ionizing radiation on bacteria, viruses, fungi, and animal parasites, Gamma sterilization, X-ray

sterilization, electron beam sterilization, validation of radiation sterilization process, dosimetry, dose setting, material compatibility, hygienic requirements, sterility criteria, quality and sterility control, safety rules.

PRPH509: Radiation Biology

Effects of electromagnetic radiation on human health, electric and magnetic fields generated by power lines, radio/microwave frequencies emitted by radio antennas and wireless networks, direct effects of low power radio-frequency electromagnetic fields on human health, effects on cell metabolism and tumor growth. Electromagnetic radiation for treatment of bone and nerve stimulation, cancer therapy, tumor treating fields, electrotherapy.

PRPH510: Nuclear and Radiological Regulation Act

قانون تنظيم الأنشطة النووية والإشعاعية

يعمل بأحكام هذا القانون في شأن تنظيم الأنشطة النووية والإشعاعية وعلي الجهات والمنشأت القائمة والتي تمارس أيا من هذه الأنشطة وتتعارض نظمها مع أحكام هذا القانون ان تعدل نظمها وتوفق أوضاعها طبقا لهذا القانون ولائحته التنفيذية وذلك خلال مدة لا تتجاوز سنة من تاريخ العمل بهذه اللائحة وفق القواعد والإجراءات التي تحددها – جهات الاختصاص والتي تشرف عليها وتراقبها – المحطات النووية تشغيلها وإدارتها – هيئة الطاقة الذرية والهيئات الرقابية تباشر الرقابة علي المنشئات وتوقف الخروقات المتعلقة بأمن وثائق ونظم المعلومات والحاسبات الخاصة بها . منع واكتشاف والتصدي للسرقة والفقد وأعمال التخريب والدخول غير المصرح به والنقل غير القانوني والأفعال المتعلقة بمواد نووية أو بمواد إشعاعية

PRPH511: Radiation Sources

Types of radiation, non-ionizing radiation, ionizing radiation, sources of ionizing radiation, natural background radiation, cosmic radiation, terrestrial radiation, exposure through inhalation, exposure through ingestion, artificial sources of radiation, atomic weapons testing, medical sources, industrial sources, nuclear fuel cycle.

PRPH512: Pollution of Radiation

Human activities and pollution. Radioactive materials. Handling and processing of radioactive materials. Storage of radioactive waste. Nuclear power plants. Use of radiation in medicine. Microwaves, Cell phones, Radio transmitters, Wireless devices. Computers. materials, handling and storage of radioactive waste, as well as the use of radioactive reactions to

generate energy (nuclear power plants), along with the use of radiation in medicine (e.g., X-rays) and research.

PRPH513: Attenuation of Radiation

The interaction of radiation with matter, interaction of charged particles with materials, Interactions of gamma rays with matter, radiation shielding, stopping power of radiation, radiation attenuation coefficients for beta particles and gamma rays.

PRPH514: Radiation Detectors and Their Kinds

Radiation basics, radiation measurement, types of radiation detectors, gas-filled radiation detectors, scintillation radiation detectors, solid-state radiation detectors, neutron detectors, personal radiation detectors (prds), handheld survey meters, radiation isotope identification devices (riids).

PRPH515: Interaction of Radiation with Matter

Interaction of radiation with matter, mechanisms of absorption, penetration, scattering, interactions of photons/ electrons with matter, photon attenuation coefficients. Interactions of alpha, beta particles and gamma rays with matter.

PRPH516: National and international standardization of radiation Dosimetry

Conditions and regulation in radiation treatments in different places and countries, basic aspects of electron and photon dosimetry, high-energy radiation dosimetry, calibration of dose meters in terms of absorbed dose in water for ^{60}co gamma radiation, correction factors in gamma-ray dosimetry, calculation of the fluence of secondary photons, compton and fluorescence generated by attenuation in thin walls, standardization and calibration of radioactive sources, standardized radioactive decay data sets for use in radiation dosimetry, absorbed dose determinations, a technique to compensate for geometry-induced errors in a photon irradiator calibration, absorbed-dose determination with ionization chambers in electron and photon beams having energies between 1 and 50 mev, ionization-chamber-dependent factors for calibration of megavoltage.

PRPH517: Radiation Regulation and Protection

Environmental safety conditions, fundamentals of radiation physics, effects of radiation on living systems, concepts of regulatory guidance that govern the radiation dose, radiation detection and monitoring techniques, external and internal radiation hazards, shielding and protective equipment's, radiation management plans, worker dose monitoring, a control and waste management issues, radiation releases to the environment, derived release limits, environmental protection.

PRPH518: Transportation of Radioactive Materials

The issues associated with the transportation of radioactive materials, regulatory requirements of both the NRC and the department of transportation (DOT). regulations for the safe transport of radioactive material,

PRPH519: Measuring Radiation

General properties, simplified detector model, modes of detector operation, pulse height spectra, counting curves and plateaus, energy resolution, detection efficiency, deadtime, scintillation detector, units and definitions, fast electron sources detector, heavily charged particle source detectors, electromagnetic radiation and interaction of heavy charged particles, interaction of fast electrons, and neutrons with matter, radiation exposure and dose.

PRPH520: Digital Computer Applications

Application in radiation dosimetry, assist in radiography, some of cr, ct, x-ray imaging, ultrasound imaging.

PRPH521: Practical Field Training

Construction of experiments, nuclear radioactive decay, radiation propagation, spectroscopic analyses, radiation intensity measurements.





سابعا

اللائحة الداخلية للدراسات العليا

((ساعات معتمدة))

جمهورية مصر العربية
وزارة التعليم العالي
الوزير

قرار وزاري
رقم (٤٠٩٣) بتاريخ ١٠/ ٢٠٢٢/
بشأن إصدار اللائحة الداخلية لكلية العلوم
جامعة طنطا (مرحلة الدراسات العليا)
بنظام الساعات المعتمدة

وزير التعليم العالي والبحث العلمي ورئيس المجلس الأعلى للجامعات

** بعد الاطلاع على القانون رقم (٤٩) لسنة ١٩٧٢ في شأن تنظيم الجامعات والقوانين المعدلة له.
** وعلى قرار رئيس الجمهورية رقم (٨٠٩) لسنة ١٩٧٥ بإصدار اللائحة التنفيذية لقانون تنظيم الجامعات والقرارات المعدلة له.
** وعلى القرار الوزاري رقم (٦٥٤) بتاريخ ١٩٦٩/١٢/٢٢ بشأن إصدار اللائحة الداخلية لكلية العلوم جامعة طنطا مرحلتي (البكالوريوس – الدراسات العليا) والقرارات المعدلة له .
** وعلى موافقة مجلس جامعة طنطا بجلستيه بتاريخ ٢٠٢٢/٤/٢٧، ٢٠٢٢/٨/٢٨ والممتدة إلى ٢٠٢٢/٨/٣١ .
** وعلى موافقة لجنة قطاع العلوم الأساسية بجلساتها بتاريخ ٥/٢٦ ، ٦/٢٩ ، ٢٠٢٢/٩/٧ .
** وعلى موافقة المجلس الأعلى للجامعات بجلسته بتاريخ ٢٠٢٢/٩/٢٤ .

قـرر

(المادة الأولى)

يعمل باللائحة الداخلية المرفقة والخاصة بكلية العلوم جامعة طنطا (مرحلة الدراسات العليا) بنظام الساعات المعتمدة ويلغى كل نص يخالف أحكامها .

(المادة الثانية)

على جميع الجهات المختصة تنفيذ هذا القرار.

وزير التعليم العالي والبحث العلمي
ورئيس المجلس الأعلى للجامعات

(أ.د/ محمد أيمن عاشور)

الفهرس

الباب الأول.....1

مـــواد اللائـــحة.....1

الباب الثاني.....20

مناهج البرامج الدراسية وتوصيف المقررات.....20

أولاً: قسم الرياضيات.....22

أ. برامج الماجستير في علوم الرياضيات:.....23

توصيف مقررات الماجستير.....27

ب. برامج الدكتوراه في علوم الرياضيات:.....36

توصيف مقررات الدكتوراه.....40

ثانياً: قسم الفيزياء.....48

أ. برامج الدبلوم في علوم الفيزياء:.....49

توصيف مقررات الدبلوم.....50

ب. برامج الماجستير في علوم الفيزياء:.....53

توصيف مقررات الماجستير.....58

ت. برامج الدكتوراه في علوم الفيزياء:.....66

توصيف مقررات الدكتوراه.....71

ثالثاً: قسم الكيمياء.....79

أ. برامج الماجستير في علوم الكيمياء:.....80

توصيف مقررات الماجستير.....85

ب. برامج الدكتوراه في علوم الكيمياء:.....94

توصيف مقررات الدكتوراه.....99

رابعاً: قسم الجيولوجيا.....106

أ. برامج الماجستير في علوم الجيولوجيا:.....107

توصيف مقررات الماجستير.....116

ب. برامج الدكتوراه في علوم الجيولوجيا:.....143

توصيف مقررات الدكتوراه.....152

خامساً: قسم النبات.....170

أ. برامج الدبلوم في النبات:.....171

توصيف مقررات الدبلوم.....173

ب. برامج الماجستير في علوم النبات:.....178
توصيف مقررات الماجستير.....184
ت. برامج الدكتوراه في علوم النبات:.....202
توصيف مقررات الدكتوراه.....208
سادساً: قسم علم الحيوان.....220
أ. برامج الدبلوم في علم الحيوان:.....221
توصيف مقررات الدبلوم.....222
ب. برامج الماجستير في علم الحيوان:.....225
توصيف مقررات الماجستير.....232
ت ـ. برامج الدكتوراه في علم الحيوان:.....255
توصيف مقررات الدكتوراه.....262

الباب الأول

مـــــواد اللائـــــحة

الباب الأو ل: مواد اللائحة

أو لاً: أحكام عامة

مادة (1) الأقسام العلمية:

تتكون كلية العلوم جامعة طنطا من الأقسام العلمية الموضحة بالجدول (1)

جدول (1): الأقسام العلمية والرمز الكودى لكل قسم

م	القسم العلمي		الرمز
1	الرياضيات	Mathematics	MA
2	الفيزيـــاء	Physics	PH
3	الكيميـــاء	Chemistry	CH
4	الجيولوجيا	Geology	GE
5	النبـــــات	Botany	BO
6	علم الحيوان	Zoology	ZO
7	الكيمياء الحيوية	Biochemistry	BCH

مادة (2) الدرجات العلمية

أ. يمنح مجلس جامعة طنطا بناءً على اقتراح مجلس كلية العلوم الشهادات والدرجات العلمية الآتية في التخصصات المبينة بالجدول رقم (2):

1- دبلوم الدراسات العليا

2- درجة الماجستير في العلوم (.M. Sc)

3- درجة دكتور الفلسفة في العلوم (.Ph. D)

4- درجة دكتور في العلوم (.D. Sc)

جدول (2): الشهادات والدرجات العلمية التي تمنحها جامعة طنطا بناء على طلب الكلية

جدول (2- أ): الدبلومات التي تمنحها جامعة طنطا بناء على طلب الكلية

م	القسم العلمي	البرامج الدراسية
1	**الفيزيـــاء (PH)**	• الفيزياء التطبيقية الحديثة • Modern Applied Physics
2	**النبـــــات (BO)**	• الميكروبيولوجي • Microbiology Diploma • صون التنوع الحيوي وتقييم الأثر البيئي • Biodiversity Conservation and Environmental Impact Assessment Diploma
3	**علم الحيوان (ZO)**	• التحاليل البيولوجية المعملية • Laboratory Biological Analyses

جدول (2- ب): درجات الماجستير في العلوم التي تمنحها جامعة طنطا بناءً على طلب الكلية

م	القسم العلمي	البرامج الدراسية	
1	الرياضيات (MA)	• الرياضيات البحتة	• Pure Mathematics
		• الرياضيات التطبيقية	• Applied Mathematics
		• الإحصاء	• Statistics
		• علوم الحاسب	• Computer Science
2	الفيزيـــاء (PH)	• فيزياء البلازما والليزر	• Laser and Plasma Physics
		• الفيزياء النووية والإشعاعية والطاقة العالية	• High Energy, Radiation and Nuclear Physics
		• الفيزياء الحيوية	• Biophysics
		• فيزياء علوم المواد والإلكترونيات	• Electronics and Materials Science Physics
		• فيزياء الجوامد والطاقة الشمسية	• Solar Energy and Solid-State Physics
3	الكيميـــاء (CH)	• الكيمياء الفيزيائية	• Physical Chemistry
		• الكيمياء غير العضوية	• Inorganic Chemistry
		• الكيمياء العضوية	• Organic Chemistry
		• الكيمياء التحليلية	• Analytical Chemistry
		• الكيمياء الحيوية	• Biochemistry
4	الجيولوجيا (GE)	• الصخور والجيوكيمياء	• Petrology and Geochemistry
		• الجيولوجيا الاقتصادية والتعدين	• Economic Geology and Mining
		• الحفريات والطبقات	• Paleontology and Stratigraphy
		• الصخور الرسوبية والترسيب	• Sedimentary Rocks and Sedimentation
		• الجيوفيزياء التطبيقية	• Applied Geophysics
		• جيولوجيا البترول	• Petroleum Geology
		• الجيولوجيا التطبيقية	• Applied Geology
		• الجيولوجيا البيئية	• Environmental Geology
		• الجيولوجيا التركيبية والتكتونية	• Structural Geology and Geotectonics
5	النبـــــات (BO)	• الميكروبيولوجي	• Microbiology
		• الوراثة النباتية	• Plant Genetics
		• فسيولوجيا النبات	• Plant Physiology
		• علم البيئة النباتية والفلورا	• Plant Ecology and Flora
		• علم الطحالب	• Phycology
		• التقنية الحيوية	• Biotechnology
6	علم الحيوان (ZO)	• علم الخلية والأنسجة والوراثة	• Cell Biology, Histology and Genetics
		• الفقاريات	• Vertebrates
		• الفسيولوجي	• Physiology
		• علم البيئة	• Ecology
		• اللافقاريات	• Invertebrates
		• علم المناعة والطفيليات	• Immunology and Parasitology
		• علم الحشرات	• Entomology

جدول (2- ت): درجات دكتور الفلسفة في العلوم التي تمنحها جامعة طنطا بناء على طلب الكلية

م	القسم العلمي	البرامج الدراسية	
1	الرياضيات (MA)	• الرياضيات البحتة	• Pure Mathematics
		• الرياضيات التطبيقية	• Applied Mathematics
		• الإحصاء	• Statistics
		• علوم الحاسب	• Computer Science
2	الفيزيـــاء (PH)	• فيزياء البلازما والليزر	• Laser and Plasma Physics
		• الفيزياء النووية والإشعاعية والطاقة العالية	• High Energy, Radiation and Nuclear Physics
		• الفيزياء الحيوية	• Biophysics
		• فيزياء علوم المواد والإلكترونيات	• Electronics and Materials Science Physics
		• فيزياء الجوامد والطاقة الشمسية	• Solar Energy and Solid-State Physics
3	الكيميـــاء (CH)	• الكيمياء الفيزيائية	• Physical Chemistry
		• الكيمياء غير العضوية	• Inorganic Chemistry
		• الكيمياء العضوية	• Organic Chemistry
		• الكيمياء التحليلية	• Analytical Chemistry
		• الكيمياء الحيوية	• Biochemistry
4	الجيولوجيا (GE)	• الصخور والجيوكيمياء	• Petrology and Geochemistry
		• الجيولوجيا الاقتصادية والتعدين	• Economic Geology and Mining
		• الحفريات والطبقات	• Paleontology and Stratigraphy
		• الصخور الرسوبية والترسيب	• Sedimentary Rocks and Sedimentation
		• الجيوفيزياء التطبيقية	• Applied Geophysics
		• جيولوجيا البترول	• Petroleum Geology
		• الجيولوجيا التطبيقية	• Applied Geology
		• الجيولوجيا البيئية	• Environmental Geology
		• الجيولوجيا التركيبية والتكتونية	• Structural Geology and Geotectonics
5	النبـــــات (BO)	• الميكروبيولوجي	• Microbiology
		• الوراثة النباتية	• Plant Genetics
		• فسيولوجيا النبات	• Plant Physiology
		• علم البيئة النباتية والفلورا	• Plant Ecology and Flora
		• علم الطحالب	• Phycology
		• التقنية الحيوية	• Biotechnology
6	علم الحيوان (ZO)	• علم الخلية والأنسجة والوراثة	• Cell Biology, Histology and Genetics
		• الفقاريات	• Vertebrates
		• الفسيولوجي	• Physiology
		• علم البيئة	• Ecology
		• اللافقاريات	• Invertebrates
		• علم المناعة والطفيليات	• Immunology and Parasitology
		• علم الحشرات	• Entomology

ب. يمنح مجلس جامعة طنطا بناءً على اقتراح مجلس كلية العلوم الشهادات والدرجات العلمية في البرامج المتميزة الآتية

1- الدبلوم المهني في الميكرو بيولوجي

2- دبلوم كيمياء الغذاء والتغذية

3- دبلوم الكيمياء الحيوية التحليلية

4- دبلوم الجيولوجيا الصناعية والبيئية

5-الماجستير المهني في المساحة والتعدين

توجد لائحة مستقلة لكل برنامج، كل منها يتسق مع الأسس التي استندت إليها هذه اللائحة.

مادة (3) قيد الدراسات العليا ومواعيد القيد:

تقدم طلبات الالتحاق للدبلومات والماجستير والدكتوراه لإدارة الدراسات العليا سنويا في المواعيد التي تحددها كلية العلوم ومجلس الدراسات العليا والبحوث بالجامعة.

مادة (4) شروط عامة للقيد للدراسات العليا:

أ. موافقة جهة عمل الطالب على قيده لدراسة الدرجة المتقدم لها في حالة عمله.

ب. ان يكون المتقدم حاصلا على بكالوريوس العلوم من جامعة طنطا أو من احدى الجامعات المعترف بها من المجلس الأعلى للجامعات وان يستوفى شروط القبول بالبرنامج الذى يريد الالتحاق به كما هو موضح بالمواد (16)، (21)، (27) من هذه اللائحة.

ت. استكمال جميع المستندات المطلوبة من إدارة الدراسات العليا والبحوث طبقا للقواعد المعمول بها في الجامعة.

ث. الحصول على موافقة مجلس القسم المختص، ومجلس الكلية وموافقة مجلس الدراسات العليا والبحوث بالجامعة.

ج. سداد رسوم القيد المقررة في الموعد المحدد والمعلن من الكلية ويتم سداد هذه الرسوم سنويا لكل برنامج أو عند إعادة القيد في المدة التي انقطع عنها.

ح. يجوز لمجلس القسم تحديد عدد الطلاب المقبولين حسب الإمكانيات المتاحة بالقسم وتطبيق قواعد المفاضلة المعتمدة من مجلس الكلية.

مادة (5) إيقاف القيد:

يجوز لمجلس الكلية بناءً على اقتراح مجلس القسم المختص، ولجنة الدراسات العليا والبحوث بالكلية أن يوقف قيد الطالب المقيد بالدراسات العليا (دبلوم – ماجستير – دكتور الفلسفة) لمدد لا تزيد في مجموعها عن أربع

فصول دراسية ولا تحتسب مدد الإجازات الوجوبية ضمن فترات القيد، وبشرط ألا يكون إيقاف القيد عن سنوات سابقة وأن يكون إيقاف القيد في المدة الأساسية وليس في فترات مد القيد وذلك في الحالات الأتية:

أ. التجنيد.

ب. - الاستدعاء.

ت. - المرض الطويل.

ث. - الاعتقال أو السجن.

ج. - مرافقة الزوج أو الزوجة إذا كان عضو هيئة تدريس أو من الهيئة المعاونة.

مع إلزام الطالب بسداد الرسوم المقررة.

مادة (6) المواظبة:

1) يحرم الطالب من التقدم لامتحان أي مقرر دراسي إذا لم يحقق نسبة حضور فيه قدرها 75% ويسجل له تقدير محروم، بشرط إنذار الطالب ثلاث إنذارات في فترة زمنية لا تقل عن شهر ويكون ذلك بناءً على تقرير من أستاذ المقرر مع التزام الطالب بسداد الرسوم المقررة، وفي هذه الحالة يعتبر الطالب راسبا ويرصد له تقدير F في هذا المقرر وتحسب عليه فرصة من فرص دخول الامتحان مع إخطار الطالب بذلك عن طريق إدارة الدراسات العليا والبحوث بالكلية.

2) الطالب الذي يتعذر عليه حضور الامتحان النهائي لمقرر أو إتمام بعض متطلباته لأسباب قهرية يقبلها مجلس الكلية وفقا للقرارات المنظمة من مجلس الجامعة، ويكون الطالب قد حضر وأدى 75% من متطلبات المقرر على الأقل، يحصل على تقدير (غير مكتمل I)، ويجب عليه أداء الامتحان في الأسبوع الأول من الفصل الدراسي التالي، وإلا حصل على تقدير راسب ويرصد له تقدير (F).

3) المقررات التي يحصل الطالب فيها على تقدير (W أو FW) لا تحسب له ساعات دراسية ولا تدخل هذه التقديرات في حساب المتوسط التراكمي للدرجات.

4) يُنذر الطالب الذي يحصل في مقرر على تقدير أقل من C، ولا يحسب له هذا المقرر ضمن الساعات المطلوبة للحصول على الدرجة، ولكن يدخل في حساب متوسط نقاط التقدير الفصلي (GPA) وعلى الطالب إعادة دراسة هذا المقرر مرة أخرى.

مادة (7) النظام الكودي للمقررات الدراسية:

1. تُكود المقررات بوضع الرمز الكودي للتخصص العام (القسم العلمى) يليه الرقم الدال على المقرر
2. تقسم مقررات الدراسات العليا إلى:

أ- مقررات (كود 500) تدرس أساسا لطلبة الدبلوم.

ب- مقررات (كود 600) تدرس أساسا لطلبة الماجستير.

ج- مقررات (كود 700) تدرس أساسا لطلبة دكتور الفلسفة في العلوم.

3. يوضع الرقم الدال على مستوى المقرر في خانة المئات ثم رقم المقرر في خانتي الآحاد والعشرات، بحيث ترمز الأرقام الفردية لمقررات الفصل الدراسي الأول، والأرقام الزوجية ترمز لمقررات الفصل الدراسي الثاني.

مادة (8) المقررات الدراسية:

1) تدرس مقررات الدراسات العليا المدرجة بكل برنامج من برامج اللائحة والموضحة بالجداول المرفقة في الباب الثانى (مناهج البرامج الدراسية) خلال عام أكاديمي واحد على فصلين دراسيين.

2) يجوز للأقسام العلمية اقتراح مقررات تكميلية يقرها مجلس القسم ويوافق عليها مجلس الجامعة وبحد اقصى مقررين في التخصص المطلوب القيد فيه للدراسة التمهيدية لدرجة الماجستير وذلك من كود 300 أو 400 المخصصة لمرحلة البكالوريوس.

3) يجوز للأقسام العلمية اقتراح مقررات تكميلية (بحد أقصى مقررين) من كود 600 وذلك عند تسجيل الطالب لرسالة الماجستير في تخصص مختلف للدراسة التمهيدية للماجستير.

4) يجوز للأقسام العلمية اقتراح مقررات تكميلية (بحد أقصى مقررين) من كود 600 أو 700 وذلك عند تسجيل الطالب لرسالة الدكتوراه في تخصص مختلف لدراسة الماجستير.

مادة (9) نظام الدراسة (نظام الساعات المعتمدة):

1) نظام الدراسة في برامج الدراسات العليا هو نظام الساعات المعتمدة.

2) الساعة المعتمدة هى وحدة قياس أكاديمى لتحديد وزن كل مقرر فى الفصل الدراسى الواحد. وتمثل الساعة المعتمدة الأساس الذى يتم عليه حساب المعدل الفصلى والتراكمى للطالب.

3) بالنسبة للمحاضرات النظرية: تحتسب ساعة معتمدة واحدة لكل محاضرة مدتها ساعة واحدة أسبوعيا على مدار الفصل الدراسي الواحد.

4) بالنسبة للدروس العملية والتدريبات التطبيقية: تحتسب ساعة معتمدة واحدة لكل فترة عملية أو تدريبية مدتها من 2-3 ساعات أسبوعياً على مدار الفصل الدراسي الواحد.

مادة (10) قواعد الحذف والإضافة والانسحاب

1. يجوز للطالب بعد موافقة المرشد الأكاديمي أو المشرف الرئيسى في حالتي الماجيستير والدكتوراه أن يحذف / يضيف أي مقرر قبل نهاية الأسبوع الثالث من بداية الفصل الدراسى الأول والثانى أو نهاية الأسبوع الأول من القصل الدراسى الصيفى، وذلك دون أية مصاريف دراسية إضافية.

2. يسمح للطالب أن ينسحب من مقرر دراسي قبل نهاية الأسبوع الثامن من بداية الفصل الدراسى الأول والثانى أو نهاية الاسبوع الثالث من القصل الدراسى الصيفى، ولا تحسب للطالب ساعات هذا المقرر في المتوسط التراكمي، ويظهر في شهادته تقدير (منسحب W) وفي هذه الحالة لا تحسب للطالب ساعات هذا المقرر في متوسط نقاط التقدير (GPA).

مادة (11) الدلالات الرقمية والرمزية للدرجات والتقديرات:

1) يحدد التقدير في المقررات الدراسية وكذلك التقدير العام للطالب بأحد التقديرات الآتية والموضحة بالجدول التالى:

المعدل/التقدير	**التقدير**/Grade	**النقاط**	**الدرجة** / Mark
ممتاز	A+	4.000	90 - 100
	A	3.667	85 - < 90
جيد جداً	B+	3.333	80 - < 85
	B	3.000	75 - < 80
جيد	C+	2.667	70 - < 75
	C	2.333	65 - < 70
مقبول	D+	2.000	60 - < 65
راسب	F	0.000	0 - < 60
يرصد للطالب المنسحب من مقرر Withdrawal ----- W			
يرصد للطالب المنسحب إجبارياً من مقرر Forced Withdrawal ---- FW			
يرصد للطاب الذي لم يكمل متطلبات المقرر Incomplete -----I			
يرصد للطالب الذى تتجاوز نسبة غيابه 75 % Denied----DN			
يرصد للطالب المسجل لساعات الرسالة العلمية ولم تكتمل بعد In Progress ----IP			
يرصد للطالب عند مناقشة الرسالة العلمية بنجاح Approved ----A			
يرصد للطالب عند رسوبه في مناقشة الرسالة العلمية Not Approved ----NA			

2) يمنح طالب الدبلوم شهادة بتقديرات المقررات، باللغة العربية أو اللغة الإنجليزية (بناءً على طلبه) يذكر فيها اسم المقررات والتقديرات والنسب المئوية وكذلك عدد الساعات المعتمدة التي اجتازها.

3) يمنح طالب الماجستير أو الدكتوراه إفادة بتقديرات المقررات، باللغة العربية أو اللغة الإنجليزية في برنامج الدراسة الذى اجتازه (بناءً على طلبه) يذكر فيها اسم المقرر والتقدير والنسبة المئوية وكذلك عدد الساعات المعتمدة التي اجتازها. كما يمنح شهادة بناءً على طلبه تفيد بحصوله على الدرجة العلمية في البرنامج الذى اجتازه.

4) تحسب النقاط النهائية للمقرر والمعدل الفصلي والتراكمي للمقررات الدراسية كما يلى:

- النقاط النهائية للمقرر = نقاط المقرر × عدد الساعات المعتمدة للمقرر

- المعدل الفصلي = مجموع النقاط النهائية التي حصل عليها الطالب في جميع مقررات الفصل الواحد / مجموع الساعات المعتمدة لهذه المقررات في الفصل الواحد

- المعدل التراكمي= مجموع النقاط التي حصل عليها الطالب في جميع المقررات التي درسها في جميع الفصول / مجموع الساعات المعتمدة لهذه المقررات في جميع الفصول

5) يتم تقييم الطالب في المقررات النظرية والعملية بناءً على العناصر التالية:

نوع المقرر	اختبارات دورية/ تقييم مستمر	تطبيقى	شفوي	اختبار عملي	اختبار نظري	الإجمالي
مقررات نظرية	%20	%10	%10	-	%60	% 100
مقررات بها محتوى نظري وعملي	%10	%10	%10	%20	%50	% 100
مقررات عملية	%20	%10	%10	%60	-	% 100

- بالنسبة لمقرر المشروع أو دراسة الحالة أو البحث المرجعي يخصص 60% من الدرجة لجودة المشروع أو البحث، 20% للمناقشة الشفوية في حلقة النقاش، 20% للمتابعة الدورية.

مادة (12) الامتحانات

1) يحدد مجلس الكلية في بداية كل عام دراسي مواعيد الامتحانات الفصلية طبقا للقواعد المنظمة بالجامعة.
2) يخصص لكل مقرر 100 درجة.
4) مدة الامتحان التحريري ساعتان لكل مقرر.
3) يجوز لمجلس الكلية قبول اعتذار الطالب عن عدم دخول الامتحان اذا تقدم بطلبه قبل بدء الامتحان أو خلال 72 ساعة من تاريخ عقد الامتحان في حالة إذا كان العذر مقبول.

مادة (13) إعادة القيد:

إذا تم إلغاء قيد الطالب لأحد الأسباب المذكورة في المواد (20، 26، 32) التالية باللائحة يجوز لمجلس الكلية بناءً على اقتراح مجلس القسم المختص وموافقة مجلس الدراسات العليا والبحوث إعادة قيده، ويراعى أن تطبق عليه القواعد التي تطبق على الطالب المستجد. ويجوز أن يعفي من بعض مقررات التمهيدي إذا لم يمض على نجاحه فيها أكثر من ثلاث سنوات بناءً على موافقة مجلس القسم المختص. وعلى الطالب أن يتقدم بطلب إعادة القيد في المواعيد المحددة لذلك طبقاً للمادة (3) والشروط العامة للقيد طبقاً للمادة (4) والشروط الخاصة بالقيد لكل درجة والمبينة بهذه اللائحة.

مادة (14) التسجيل والإرشاد الأكاديمي:

أولا: التسجيل الاكاديمي

أ. يتابع وكيل الكلية لشئون الدراسات العليا والبحوث مع منسق عام البرنامج تنفيذ قواعد التسجيل وإجراءاته وإعداد قوائم الطلاب للمجموعات الدراسية، وإعداد الجداول الدراسية، وتوزيع الطلاب على المرشدين الاكاديميين، ويتم الانتهاء من تسجيل الطلاب في الأسبوع الأول من الفصل الدراسى الأول والثانى.

ب. يجوز لمجلس الكلية بعد موافقة مجلس القسم المختص التسجيل للطالب في برنامج الدبلوم أو الماجستير أو دكتور الفلسفة في العلوم عن بعد بنظام جزء من الوقت (part time) في التخصصات التي يطرحها مجلس القسم ويوافق عليها مجلس الكلية، وفي هذه الحالة لا يشترط على الطالب الانتظام في الحضور إلى الكلية كل الوقت.

ثانيا: الإرشاد الاكاديمي

يحدد مجلس القسم والكلية مرشداً أكاديمياً لكل طالب (يكون المشرف الرئيسى في حالة الماجستير والدكتوراه). يقوم المرشد الأكاديمي بتقديم النصح والإرشاد للطالب وتوجيهه دراسياً ومساعدته على اختيار المقررات الدراسية المتعلقة بموضوع خطته البحثية.

مادة (15) القواعد المنظمة للإشراف العلمى على رسائل الماجستير والدكتوراه:

أولا: الإشراف

1) يعين مجلس الكلية بناءً على اقتراح مجلس القسم المختص وتوصية لجنة الدراسات العليا والبحوث مشرفا رئيسيا على الطالب من بين الأساتذة أو الأساتذة المساعدين بالكلية ويجوز اشتراك أحد المدرسين في الإشراف ويجوز بموافقة مجلس الكلية أن يشارك في الإشراف من هم في مستواهم في التخصص من خارج الكلية وفي جميع الحالات لا يزيد عدد المشرفين عن ثلاثة في الماجستير وأربعة في الدكتوراه، مع مراعاة التخصص الدقيق لكل منهم طبقا لنص المادة (98) من اللائحة التنفيذية لقانون تنظيم الجامعات. ويحدد عدد الرسائل لإشراف عضو هيئة التدريس طبقا لدرجته العلمية والقواعد المنظمة بالجامعة.

2) يمكن إضافة مشرف أجنبي إلى لجنة الإشراف وذلك بعد موافقة الجامعة وجامعة المشرف الأجنبي.

3) في حالة سفر أحد المشرفين أو إعارته، إلى الخارج تطبق القواعد المنصوص عليها بقانون تنظيم الجامعات ومجلس الجامعة.

4) يقدم المشرف الرئيسى كل ستة أشهر تقريراً إلى مجلس القسم المختص عن مدى تقدم الطالب في دراسته وللمشرف الرئيسي أن يوصى باستمرار القيد أو إلغائه.

ثانيا: لجنة الحكم والمناقشة

1) يجوز للطالب المقيد لدرجة الماجستير أو الدكتوراه عمل محاضرة (سيمينار) في موضوع الرسالة المتقدم بها قبل التسجيل وكذلك قبل تشكيل لجنة الحكم والمناقشة وذلك بقرار من مجلس القسم- لجنة الدراسات العليا – مجلس الكلية.

2) يتم تقديم الرسالة بعد الانتهاء من إعدادها طبقا لنص المواد 103 – 107 من اللائحة التنفيذية لقانون تنظيم الجامعات.

3) يتقدم المشرف الرئيسى بمقترح إلى مجلس القسم المختص بتشكيل لجنة الحكم على الرسالة تمهيداً للعرض على مجلس الكلية مدعما بالمستندات التالية: -

أ- تقرير عن صلاحية الرسالة للتحكيم موضحاً به عنوان الرسالة باللغتين العربية والإنجليزية وموقعا عليه من المشرفين أو أغلبيتهم.

ب- ما يفيد مرور عامين على الاقل من تاريخ موافقة الجامعة على القيد والتسجيل لدرجة الماجستير، ومرور ثلاثة أعوام من تاريخ موافقة الجامعة على القيد والتسجيل لدرجة الدكتوراه.

ج- يقدم الطالب قبل التقدم بالرسالة لمجلس القسم المختص ما يفيد قبول بحث واحد على الأقل للنشر من النتائج العلمية التي تم التوصل إليها في رسالتي الماجستير والدكتوراه) في مجلة علمية محكمة، مع مراعاة أحكام المادتين (25) و(31).

4) يشكل مجلس الكلية بناءً على اقتراح المشرف الرئيسى و موافقة مجلس القسم المختص و لجنة الدراسات العليا والبحوث لجنة للحكم على الرسالة من ثلاثة أعضاء أحدهم المشرف الرئيسى على الرسالة والعضوان الآخران من خارج الكلية/ الجامعة من بين الأساتذة والأساتذة المساعدين بالجامعات أو المراكز أو معاهد البحوث العلمية المتخصصة من داخل أو خارج الجمهورية ويكون رئيس اللجنة أقدم الأساتذة، وفي حالة تعدد تخصصات المشرفين على الرسالة يجوز أن يزيد عدد أعضاء اللجنة عن ثلاثة مع مراعاة أحكام المادة (104) من اللائحة التنفيذية لقانون تنظيم الجامعات.

5) يقوم كل عضو من أعضاء لجنة الحكم بإعداد تقرير فردى عن الرسالة في خلال شهر من استلام الرسالة وتُعرض هذه التقارير جميعا في المناقشة العلانية، ويعد تقرير جماعي يعتمده رئيس مجلس القسم المختص ثم مجلس الكلية تمهيداً لعرضه على مجلس الجامعة، وللمحكم أن يوصى في تقريره بإحدى التوصيات التالية:

أ- قبول الرسالة كما هي.

ب- قبول الرسالة بعد إجراء بعض التصويبات غير الجوهرية.

ت- تأجيل المنح لإجراء التصويبات وبحد أقصى ثلاثة شهور.

ث- رفض الرسالة.

6) ضوابط اختيار المحكمين:

أ- أن تكون الدرجة العلمية للمحكم الخارجي هي درجة أستاذ أو أستاذ مساعد.

ب- ألا يزيد عدد الرسائل التي يقوم بتحكيمها المحكم الواحد عن ثلاثة رسائل مقدمة من ذات الكلية في العام الجامعي الواحد.

ت- أن يكون تخصص المحكم مناسباً للتخصص العام للرسالة.

7) لمجلس الكلية عند الضرورة تعديل تشكيل لجنة الحكم على الرسالة إذا رأى ما يستوجب ذلك.

ثانيــا: دبلوم الدراسات العليا

مادة (16) شروط القيد:

يشترط لقيد الطالب بأي من دبلومات الدراسات العليا بالإضافة إلى الشروط الواردة في المادة (4) الشروط الآتية:

1. أن يكون حاصلا على درجة بكالوريوس العلوم من إحدى كليات العلوم بالجامعات المصرية أو ما يعادلها من أي معهد علمي آخر معترف به من المجلس الأعلى للجامعات وذلك في التخصصات التي يحددها مجلس القسم المختص.
2. يجوز قبول الطلاب المتقدمين للدبلوم من غير الحاصلين على بكالوريوس العلوم، ولكن في التخصص المناسب مع تحميلهم بمقررات تكميلية طبقا لمتطلبات القسم المختص ولا تحسب هذه الساعات ضمن الساعات المذكورة في المادة (17).
3. سداد الرسوم الدراسية.

مادة (17) مدة الدراسة:

مدة الدراسة لنيل أي من دبلومات الدراسات العليا عام أكاديمي يتفرغ خلالها الطالب لدراسته النظرية والعملية والتدريبات. وعدد الساعات المعتمدة المخصصة لأى من دبلومات الدراسات العليا لا يقل عن 24 ساعة معتمدة (16 ساعة معتمدة مقررات إجبارية + 8 ساعات معتمدة مقررات اختيارية)، على فصلين دراسيين.

مادة (18) المقررات الدراسية:

1) تحدد هذه اللائحة المقررات الدراسية (كود 500) المخصصة لكل درجة دبلوم.
2) تدرس المقررات على مدار العام الأكاديمي ويتقدم الطالب للامتحان في نهاية كل فصل دراسي في المقررات التي درسها.
3) يجوز لمجلس القسم المختص أن يكلف الطالب بدراسة بعض المقررات التكميلية من مرحلة البكالوريوس ولا تحتسب ضمن الساعات المعتمدة للدبلوم.

مادة (19) معادلة المقررات:

يجوز لمجلس الكلية بناءً على اقتراح مجلس القسم وتوصية لجنة الدراسات العليا والبحوث احتساب مقررات على مستوى الدراسات العليا سبق للطالب دراستها بالكلية أو في أي معهد علمي معترف به من المجلس الأعلى للجامعات خلال الثلاث سنوات السابقة لقيده بالدبلوم.

مادة (20) إلغاء القيد:

يلغى قيد طالب الدبلوم في الحالات التالية:

أ) اذا انقطع عن الدراسة فصلين دراسيين متتاليين بدون عذر مقبول طبقا للقواعد المعمول بها بالجامعة.

ب) في حالة انسحاب الطالب من الدراسة بناءً على رغبته.

ج) في حالة عدم التزامه بسداد الرسوم والمصروفات الدراسية عن كل عام.

د) في حالة اذا صدر في حقه جزاء تأديبي.

ثالثا: درجة الماجستير في العلوم (M. Sc.)

مادة (21) شروط القيد والتسجيل:

يشترط لقيد الطالب لدرجة الماجستير بالإضافة إلى الشروط الواردة في المادة (4) الشروط الآتية:

1) أن يكون حاصلا على درجة البكالوريوس في العلوم بتقدير عام جيد (C) على الأقل من إحدى كليات العلوم بالجامعات المصرية أو أي درجة معادلة لها من أي معهد آخر أو جامعة أخرى معترف بها من المجلس الأعلى للجامعات. وفى حالة التخصصات المزدوجة يجب ان يكون الطالب حاصلا على تقدير جيد (C) على الأقل في مادة التخصص بالإضافة الى تقدير عام جيد.(C)
2) يجوز لمجلس الكلية بناءً على موافقة مجلس القسم المختص قبول قيد الطالب لدرجة الماجستير إذا كان حاصلاً على بكالوريوس العلوم بتقدير عام أقل من جيد (C)بالإضافة إلى إحدى دبلومات الدراسات العليا بتقدير عام جيد جدا (B)على الأقل في التخصص المناسب من إحدى كليات العلوم الأساسية المعترف بها من المجلس الأعلى للجامعات.
3) يجوز لمجلس الكلية بناءً على توصية مجلس القسم المختص قبول الطلاب غير المصريين الحاصلين على درجة البكالوريوس في العلوم من أي كلية أو معهد علمي معترف به من المجلس الأعلى للجامعات بشرط حصوله على تقدير عام لا يقل عن مقبول (D).
4) أن يتفرغ الطالب للدراسة يومين على الأقل أسبوعيا وذلك لمدة عامين على الأقل بعد موافقة جهة العمل.

5) يجوز قبول الطلاب الحاصلين على تقدير عام جيد جداً (B) على الأقل في بكالوريوس العلوم والتربية وبكالوريوس الهندسة في القيد لدرجة الماجستير في العلوم وذلك بعد اجتيازهم بنجاح المقررات التكميلية لمدة عامين والتي تحددها الأقسام العلمية وبموافقة مجلس الكلية أو الحصول على دبلوم في مجال التخصص بتقدير عام جيد جداً (B)على الأقل.

6) يجوز قبول الطلاب المتقدمين للتسجيل في درجة الماجستير من غير الحاصلين على بكالوريوس العلوم لكن في التخصص المناسب (تخصصات مناظرة لتخصص البرنامج المطلوب التسجيل فيه)، مع تحميلهم بمقررات تكميلية طبقا لمتطلبات القسم المختص ولا تحسب هذه الساعات ضمن الساعات المذكورة في المادة (23).

7) أن يتقدم بطلب إلى إدارة الدراسات العليا والبحوث لقيده لدرجة الماجستير ويعرض الطلب على مجلس القسم المختص لتحديد مجال وخطة البحث والمقررات النظرية (طبقا للمادة 23) ثم يعرض الأمر- بعد استيفاء جميع المستندات- على لجنة الدراسات العليا والبحوث ثم مجلس الكلية.

8) سداد الرسوم الدراسية المقررة.

مادة (22) مدة الدراسة:

1) الحد الأدنى لمنح درجة الماجستير هو عامين ميلاديين من تاريخ موافقة مجلس الجامعة على القيد أو عام ميلادى من تاريخ التسجيل.

2) الحد الأقصى لمنح درجة الماجستير هو خمسة أعوام ميلادية من تاريخ التسجيل مع مراعاة حالات وقف القيد ويجوز مد القيد بحد أقصى عامين بناءً على طلب المشرف الرئيسي وموافقة مجلس القسم المختص ولجنة الدراسات العليا والبحوث ومجلس الكلية.

3) يشترط لتسجيل رسالة الماجستير عدم مرور أكثر من ثلاث سنوات على اجتياز الطالب امتحانات السنة التمهيدية للماجستير.

مادة (23) متطلبات الحصول على درجة الماجستير:

1) إجمالي عدد الساعات المعتمدة لنيل درجة الماجستير 48 ساعة معتمدة، بواقع 24 ساعة مقررات دراسية (16 ساعة معتمدة مقررات إجبارية + 8 ساعات معتمدة مقررات اختيارية)، و24 ساعة للرسالة العلمية.

2) يحدد مجلس القسم المختص المقررات الدراسية للطالب طبقاً لبرنامجه الدراسي من بين قائمة المقررات الدراسية طبقا للجداول المرفقة في الباب الثانى من هذه اللائحة، بحيث لا يقل عدد الساعات الإجمالية التي ينبغي على طالب الماجستير أن يدرسها عن 24 ساعة معتمدة من الكود 600، تُدرس على فصلين دراسيين.

3) ويجوز للقسم المختص تحديد مقررين على الأكثر من مرحلة البكالوريوس (كود 300، أو 400)، أو 500، تبعاً لما يتطلبه موضوع الرسالة، ولا تحتسب ضمن الساعات المعتمدة لدرجة الماجستير المذكورة في الفقرة السابقة.

4) يقوم الطالب بإجراء بحث في موضوع الرسالة يحدده له المشرف الرئيسي ويعتمد من مجلس القسم المختص ولجنة الدراسات العليا والبحوث ومجلس الكلية ويقدم الطالب الرسالة.

مادة (24) معادلة المقررات:

يجوز لمجلس الكلية بناءً على اقتراح مجلس القسم المختص وتوصية لجنة الدراسات العليا والبحوث بالكلية احتساب مقررات على مستوى الدراسات العليا في نفس التخصص سبق للطالب دراستها بمرحلة الدراسات العليا بالكلية أو في معهد علمي معترف به من المجلس الأعلى للجامعات والنجاح فيها خلال الثلاث سنوات السابقة للقيد بالماجستير.

مادة (25) شروط منح الدرجة:

توصى لجنة الدراسات العليا والبحوث ومجلس الكلية منح درجة الماجستير في العلوم في حالة استيفاء الطالب للشروط الآتية:

1) اجتياز الطالب بنجاح جميع المقررات الدراسية.

2) اجتياز الطالب امتحان اللغة الإنجليزية لمستوى التويفل الدولي أو المحلى طبقا لقرارات مجلس الجامعة الصادرة وتعديلاتها بهذا الشأن.

3) يتقدم الطالب برسالة متضمنة نتائج أبحاثه تقبلها لجنة الحكم.

4) يقدم الطالب ما يفيد قبول بحث واحد للنشر على الأقل من النتائج العلمية التي توصل إليها من بحوث الرسالة في مجلة علمية محكمة تصدرها هيئة علمية بصفة منتظمة ومفهرسة وذلك قبل التقدم بالرسالة لمجلس القسم المختص.

5) يقدم الطالب ما يفيد اجتيازه بنجاح الدورات التي يحددها مجلس الدراسات العليا والبحوث ومجلس الجامعة فيما يخص التحول الرقمى.

مادة (26) إلغاء القيد:

يقوم مجلس الكلية بإلغاء قيد الطالب لدرجة الماجستير في الحالات الآتية:

1) عدم اجتياز الطالب المقررات التمهيدية للماجستير مع مراعاة المادة (12)، ويجوز أن يمنح الطالب الراسب في مقرر أو مقررين فقط فرصتين وذلك بعد تسديد الرسوم الدراسية المقررة طبقا للقواعد المنظمة وبعد موافقة مجلس الكلية ومجلس الدراسات العليا بالجامعة.

2)انقطاع الطالب عن الدراسة أو عدم جديته في البحث وذلك بموافقة مجلس القسم المختص ولجنة الدراسات العليا والبحوث بناءً على تقرير من المشرف الرئيسى وبعد إنذاره.

3)عدم منح الدرجة خلال المدد المنصوص عليها في المادة (22) باللائحة مع مراعاة حالات وقف القيد.

4)في حالة اذا صدر في حق الطالب جزاء تأديبي.

رابعا: درجة دكتور الفلسفة في العلوم (.Ph. D)

مادة (27) شروط القيد والتسجيل:

يشترط لقيد الطالب لدرجة الدكتوراه بالإضافة إلى الشروط الواردة في المادة (4) الشروط الآتية:

1) أن يكون الطالب حاصلا على درجة الماجستير في العلوم في مجال التخصص من إحدى كليات العلوم بالجامعات المصرية أو أي درجة معادلة لها من معهد علمي أخر معترف به من المجلس الأعلى للجامعات.
2) يجوز قيد الطالب في تخصص مخالف لتخصص الماجستير بنفس القسم العلمي وذلك بفرض ما يلزم من المقررات التكميلية تحددها الأقسام العلمية وبموافقة مجلس الكلية، طبقا لمتطلبات القسم المختص وبعد اقتراح المشرف الرئيسى، ولا تحسب هذه الساعات ضمن الساعات المذكورة في المادة (29).
3) أن يتقدم بطلب إلى مجلس القسم المختص برغبته في التسجيل في تخصص معين وتحديد مجال وخطة البحث والمقررات النظرية التي يحددها المشرف الرئيسى ثم يعرض الأمر- بعد استيفاء جميع المستندات- على لجنة الدراسات العليا والبحوث ثم مجلس الكلية.
4) سداد الرسوم الدراسية المقررة.

مادة (28) مدة الدراسة:

1) الحد الأدنى للحصول على درجة الدكتوراه هو ثلاثة أعوام ميلادية من تاريخ موافقة مجلس الجامعة على القيد والتسجيل.
2) الحد الأقصى للحصول على درجة الدكتوراه هو خمسة أعوام ميلادية من تاريخ التسجيل مع مراعاة حالات وقف القيد. ويجوز مد القيد طبقا لقرارات مجلس الجامعة بهذا الشأن.

مادة (29) متطلبات الدراسة:

1) إجمالي عدد الساعات المعتمدة لنيل درجة دكتور الفلسفة في العلوم 60 ساعة معتمدة، بواقع 8 ساعات مقررات دراسية (4 ساعات معتمدة مقررات إجبارية + 4 ساعات معتمدة مقررات اختيارية)، و52 ساعة للرسالة العلمية.

2) يحدد مجلس القسم المختص، بعد اقتراح المشرف الرئيسى، المقررات الدراسية للطالب طبقاً لبرنامجه الدراسي من بين قائمة المقررات الدراسية طبقا للجداول المرفقة. وتعتمد هذه المقررات من وكيل الكلية للدراسات العليا والبحوث ومجلس الكلية.

3) لا يقل عدد الساعات الإجمالية التي ينبغي على طالب الدكتوراه أن يدرسها عن 8 ساعات معتمدة من الكود 700، تدرس على فصلين دراسيين، في إطار التخصص الدقيق، وبما يخدم النقطة البحثية للطالب.

4) ويجوز أن يختار المشرف الرئيسى مقرراً واحداً على الأكثر من الكود 600، تبعاً لما يتطلبه موضوع الرسالة، ولا يحتسب ضمن الساعات المعتمدة لدرجة الدكتوراه المذكورة في الفقرة السابقة.

5) يقوم الطالب بإجراء بحث في موضوع يحدده له المشرف الرئيسى يعرض على مجلس القسم المختص ولجنة الدراسات العليا والبحوث ومجلس الكلية، ويقدم الطالب رسالة علمية بنتائج البحث بحيث تمثل إضافة جديدة في فروع التخصص وذلك مع مراعاة المدد الزمنية المنصوص عليها في المادة (28) من هذه اللائحة.

مادة (30) معادلة المقررات:

يجوز لمجلس الكلية بناءً على اقتراح مجلس القسم المختص وتوصية لجنة الدراسات العليا والبحوث بالكلية احتساب مقررات من الكود 700 في نفس التخصص سبق للطالب دراستها بالدراسات العليا أو أي معهد علمي معترف به من المجلس الأعلى للجامعات، والنجاح فيها خلال الثلاث سنوات السابقة للقيد بالدكتوراه.

مادة (31) شروط منح الدرجة:

يوصى مجلس الكلية بناءً على توصية مجلس القسم المختص ولجنة الدراسات العليا والبحوث بالكلية بمنح درجة دكتور الفلسفة في حالة استيفاء الطالب للشروط الآتية:

1) اجتياز الطالب بنجاح جميع المقررات الدراسية.

2) اجتياز الطالب امتحان اللغة الإنجليزية لمستوى التويفل الدولي أو المحلى طبقا لقرارات مجلس الجامعة الصادرة وتعديلاتها بهذا الشأن.

3) يتقدم الطالب برسالة متضمنة نتائج أبحاثه تقبلها لجنة الحكم.

4) يقدم الطالب ما يفيد قبول بحث واحد على الأقل للنشر من النتائج العلمية التي توصل إليها من بحوث الرسالة في مجلة علمية دولية محكمة تصدرها هيئة علمية بصفة منتظمة ومفهرسة، طبقا لقرارات مجلس الجامعة بهذا الشأن.

5) يقدم الطالب ما يفيد اجتيازه بنجاح الدورات التي يحددها مجلس الدراسات العليا والبحوث ومجلس الجامعة فيما يخص التحول الرقمى.

مادة (32) إلغاء القيد:

يقوم مجلس الكلية بإلغاء قيد الطالب لدرجة الدكتوراه في الحالات الآتية:

1) عدم اجتياز الطالب المقررات التمهيدية للدكتوراه مع مراعاة المادة (12)، ويجوز أن يمنح الطالب الراسب في مقرر أو مقررين فرصتين وذلك بعد تسديد الرسوم الدراسية المقررة طبقا للقواعد المنظمة وبعد موافقة مجلس الكلية ومجلس الدراسات العليا والبحوث.
2) انقطاع الطالب عن الدراسة أو عدم جديته في البحث وذلك بموافقة مجلس القسم المختص ولجنة الدراسات العليا والبحوث بناءً على تقرير من المشرف الرئيسى وبعد إنذاره.
3) رفض لجنة الحكم الرسالة وتوصيتها بعدم منح الدرجة.
4) عدم منح الدرجة خلال المدد المنصوص عليها في المادة (28) باللائحة مع مراعاة حالات وقف القيد.
5) في حالة اذا صدر في حق الطالب جزاء تأديبي.

خامساً: قواعد درجة دكتوراه العلوم

مادة (33) شروط التقدم ونيل درجة الدكتوراه في العلوم (.D.Sc)

1) أن يكون المتقدم حاصلا على درجة دكتور الفلسفة في العلوم قبل خمس سنوات على الأقل من تاريخ التقدم للحصول على الدرجة.

2) أن يقدم بحوثا مبتكرة منشورة لم يسبق له التقدم بها للحصول على أي درجة علمية أو وظيفية، ويراعى الآتي:

أ) أن يتضمن الإنتاج العلمي المقدم بحوثا باللغة الإنجليزية.

ب) أن يكون للمتقدم معامل هيرش لا يقل عن 15 وعدد استشهادات لا يقل عن 1000 في سكوبس، ومعامل جوجل سكولار لا يقل عن 20 وعدد استشهادات لا يقل عن 1500 في جوجل سكولار.

ج) يقدم بيانا مكتوبا بالرسائل العلمية التي أشرف عليها باللغة الإنجليزية ودوره في الإشراف.

3) على المتقدم أن يبين الاتجاهات العامة لبحوثه وما قدمه للعلم من فائدة ملموسة في البحوث المختارة للحصول على الدرجة، في الصورة التي تعزز موقفه لدى المحكمين، وما أشرف عليه من الرسائل.

4) للمتقدم علاوة على ذلك أن يقدم بيانا بالأنشطة العلمية والتطبيقية المبتكرة وغير المنشورة التي تدل على إضافات جديدة للعلم.

5) يتقدم طالب الحصول على درجة الدكتوراه في العلوم (.D.Sc) إلى عميد الكلية بإنتاجه العلمي ويقوم عميد الكلية بالعرض على مجلس الكلية، ويقوم المجلس بتحويل الإنتاج العلمي للمتقدم الى لجنة مختصة بهذه الدرجة لمخاطبة أساتذة في نفس التخصص من الحاصلين على درجة الدكتوراه في العلوم (.D.Sc) أو إحدى الجمعيات العلمية المتخصصة من خارج الوطن أو داخله للحصول على موافقة ثلاثة محكمين على أن يكون من بينهم أحد المحكمين الحاصلين على درجة D.SC من إحدى الجامعات المصرية ان وجد.

6) يقدم أعضاء لجنة الحكم تقارير فردية عن مدى أصالة أبحاث المتقدم في مجال تخصصه ومدى صلاحية الإنتاج العلمي للمتقدم للتوصية بمنح الدرجة، ويتم المنح بإجماع أراء أعضاء لجنة التحكيم.

7) يذكر في الشهادة الخاصة بدرجة الدكتوراه في العلوم (.D.Sc) بيان ما تخصص فيه المتقدم.

مادة (34)

يجوز لمجلس الكلية بعد اخذ رأى مجلس القسم المختص أن يوافق على فتح برامج جديدة لدبلوم الدراسات العليا والماجستير الأكاديمي والماجستير المهنى وبرامج دكتوراه جديدة و ذلك وفقاً لقانون تنظيم الجامعات وبنفس قواعد هذه اللائحة.

الباب الثانـي

مناهج البرامج الدراسية وتوصيف المقررات
(Programs' Curricula & Course Description)

الباب الثاني: مناهج البرامج الدراسية
(Programs' Curricula)

أولاً: قسم الرياضيات

أ. برامج الماجستير في علوم الرياضيات:

1. برنامج الماجستير في العلوم في الرياضيات البحتة: (Pure Mathematics)

First Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 8 Credits				
MA601	Lattice Theory I نظرية الشبكيات 1	2	-	2
MA603	Advanced Partial Differential Equations معادلات تفاضلية جزئية متقدمة	2	-	2
MA605	Advanced Mathematical Programming برمجة رياضية متقدمة	2	-	2
MA607	General Topology توبولوجي عام	2	-	2
Optional: Select 4 Credits				
MA609	Probability Theory (1) نظرية الاحتمالات (1)	2	-	2
MA611	Advanced Modeling & Simulation النمذجة والمحاكاة المتقدمة	1	2	2
MA613	Combinatorial and Graph Theory نظرية التوافقيات والمخططات	2	-	2
MA615	Special Function & Applications الدوال الخاصة وتطبيقاتها	2	-	2
Total Credits		**12**		

Second Semester

Code	Preq.	Course Title	Hours/Week		
			Lec.	Prac.	Cred.
Obligatory: 8 Credits					
MA602	-	Advanced Functional Analysis تحليل دالي متقدم	2	-	2
MA604	-	Advanced Numerical Analysis تحليل عددي متقدم	2	-	2
MA606	-	Advanced Differential Geometry هندسة تفاضلية متقدمة	2	-	2
MA608	-	Concept Data Analysis تحليل البيانات	2	-	2
Optional: Select 4 Credits					
MA610	-	Algebraic Number Theory نظرية الأعداد الجبرية	2	-	2
MA612	-	Distribution Theory (1) نظرية التوزيعات (1)	1	2	2
MA614	-	Advanced Complex Analysis تحليل مركب متقدم	2	-	2
MA616	-	Intelligent Systems النظم الذكية	1	2	2
Total Credits			**12**		

2. برنامج الماجستير في العلوم في الرياضيات التطبيقية: (Applied Mathematics)

First Semester

Code	Course Title		Hours/Week		
			Lec.	Prac.	Cred.
Obligatory: 8 Credits					
MA617	Advanced Fluid Mechanics	ميكانيكا الموائع المتقدمة	2	-	2
MA619	Advanced Quantum Mechanics	ميكانيكا الكم المتقدمة	2	-	2
MA621	Theoretical Mechanics	ميكانيكا نظرية	2	-	2
MA603	Advanced Partial Differential Equations	معادلات تفاضلية جزئية متقدمة	2	-	2
Optional: Select 4 Credits					
MA623	Advanced Relatively Theory	النظرية النسبية المتقدمة	2	-	2
MA625	Advanced Electrodynamics	الديناميكا الكهربية المتقدمة	2	-	2
MA627	Particles Transport Theory	نظرية انتقال الجسيمات	2	-	2
MA611	Advanced Modeling & Simulation	النمذجة والمحاكاة المتقدمة	2	-	2
Total Credits			**12**		

Second Semester

Code	Preq.	Course Title		Hours/Week		
				Lec.	Prac.	Cred.
Obligatory: 8 Credits						
MA618	-	Advanced Elasticity Theory	نظرية المرونة المتقدمة	2	-	2
MA620	-	Reactors Dynamic Systems	أنظمة ديناميكا المفاعلات	2	-	2
MA622	-	Celestial Mechanics	الميكانيكا السمأو ية	2	-	2
MA604	-	Advanced Numerical Analysis	تحليل عددي متقدم	2	-	2
Optional: Select 4 Credits						
MA624	-	Waves Theory	نظرية الموجات	2	-	2
MA626	-	Statistical Mechanics	ميكانيكا إحصائية	2	-	2
MA628	-	Dynamical Systems	الأنظمة الديناميكية	2	-	2
MA612	-	Distribution Theory (1)	نظرية التوزيعات (1)	2	-	2
Total Credits				**12**		

3. برنامج الماجستير في العلوم في الإحصاء: (Statistics)

First Semester

Code	Course Title		Hours/Week		
			Lec.	Prac.	Cred.
Obligatory: 8 Credits					
MA609	Probability Theory (1)	نظرية الاحتمالات (1)	2	-	2
MA629	Estimation Theory	نظرية التقدير	2	-	2
MA631	Reliability Theory	نظرية الموثوقية	2	-	2
MA612	Distribution Theory (1)	نظرية التوزيعات (1)	2	-	2
Optional: Select 4 Credits					
MA633	Advanced Queuing Theory	نظرية الطوابير المتقدمة	2	-	2
MA635	Biostatistics	الإحصاء حيوي	1	-	2
MA611	Advanced Modeling & Simulation	النمذجة والمحاكاة المتقدمة	2	-	2
MA637	Design of Experiments	تصميم تجارب	2	-	2
Total Credits			**12**		

Second Semester

Code	Preq.	Course Title		Hours/Week		
				Lec.	Prac.	Cred.
Obligatory: 8 Credits						
MA630	-	Probability Theory (2)	نظرية الاحتمالات (2)	2	-	2
MA632	-	Stochastic Processes	العمليات التصادفية	2	-	2
MA634	-	Advanced hypothesis testing	إختبارات الفروض المتقدمة	2	-	2
MA636	-	Distribution Theory (2)	نظرية التوزيعات (2)	2	-	2
Optional: Select 4 Credits						
MA638	-	Probabilistic Inventory Theory	نظرية المخزون الاحتمالي	2	-	2
MA640	-	Selected Topics in Statistics	موضوعات مختارة في الإحصاء	1	2	2
MA642	-	Advanced Regression Analysis	تحليل الانحدار المتقدم	2	-	2
MA644	-	Advanced Time Series Analysis	تحليل السلاسل الزمنية المتقدمه	2	-	2
Total Credits				**12**		

4. برنامج الماجستير في علوم الحاسب :(Computer Science)

First Semester

Code	Course Title		Hours/Week		
			Lec.	Prac.	Cred.
Obligatory: 8 Credits					
MA639	Advanced Artificial Intelligent	الذكاء الاصطناعي المتقدم	2	-	2
MA611	Advanced Modeling & Simulation	النمذجة والمحاكاة المتقدمة	2	-	2
MA641	Advanced Database Systems	نظم قواعد البيانات المتقدمة	2	-	2
MA643	Information Retrieval	استرجاع المعلومات	2	-	2
Optional: Select 4 Credits					
MA645	Cryptography	التشفير	2	-	2
MA647	Web Application Development	تطوير تطبيقات الوب	1	2	2
MA605	Advanced Mathematical Programming	برمجة رياضية متقدمة	2	-	2
MA649	Quantum Computing	الحوسبة الكمية	2	-	2
Total Credits			**12**		

Second Semester

Code	Preq.	Course Title		Hours/Week		
				Lec.	Prac.	Cred.
Obligatory: 8 Credits						
MA646	-	Natural Language Processing	معالجة اللغات الطبيعية	2	-	2
MA648	-	Advanced Machine Learning	تعلم الآلة المتقدم	2	-	2
MA650	-	Data Warehouse and Data Mining	مستودع البيانات والتنقيب عنها	2	-	2
MA652	-	Mobile Computing	الحوسبة المتنقلة	2	-	2
Optional: Select 4 Credits						
MA638	-	Probabilistic Inventory Theory	نظرية التخزين	2	-	2
MA654	-	Bioinformatics	المعلوماتية الحيوية	1	2	2
MA616	-	Intelligent systems	الأنظمة الذكية	2	-	2
MA608	-	Concept Data Analysis	تحليل البيانات	1	2	2
Total Credits				**12**		

توصيف مقررات الماجستير

MA601: Lattice theory I

Basic definitions and some algebraic concepts – Special elements and pseudo complements. Distributive and Modular lattices - Complete lattices – Boolean Algebra - Characterization and Representation Theorems of Distribution lattices and Boolean algebras – Congruence Relations and Lattice of Congruences – Introduction to Concept lattices and Formal Concept Analysis.

MA602: Advanced Functional Analysis

Introduction and Notations- Linear Topological Spaces-Linear Metric Spaces- Banach Spaces-Hilbert Spaces-Banach Algebras-Measures of Noncompactness- Fredholm Theory- Sequence Spaces-Fixed Point Theory.

MA603: Advanced Partial Differential Equations

Introduction. Terminology; boundary and initial value problems; well- and ill-posed problems.Linear PDE. Review and classification; the Laplace, wave and diffusion equations; the Klein-Gordon equation; more on characteristics; standard methods: separation of variables, integral transforms, Green's functions; potential scattering; special topics in conformal mapping; dispersion and diffusion; dimensional analysis and self-similarity; regular and singular perturbation theory; asymptotics for complete solutions; geometrical optics and WKB eikonal equation; high-frequency expansions; caustics.More on nonlinear PDE. Equations that convert into linear PDE; some exactly solvable cases; Burgers' equation; dimensional analysis and similarity; traveling waves; nonlinear diffusion and dispersion; the KdV, nonlinear Schrödinger and Sine-Gordon equations; reaction-diffusion equations; Fisher's equation; singular perturbations: boundary layers, homogenization, weakly nonlinear geometrical optics, etc.; Solitons; Backlund transformations; Painlevé conjecture.Variational Methods. First and second variation; Euler-Lagrange equation; constraints.Free-boundary value problems. Formulation; perturbation theory; more on water waves; method of extended gradient; materials surface evolution; some open problems.

MA604: Advanced Numerical Analysis

Descriptive treatment of elliptic, parabolic, and hyperbolic equations – Finite difference formulae - Finite difference approximations to partial derivatives. Transformation to non-dimensional form – An explicit finite difference approximation to the heat conduction equation- The weighted average approximation. Explicit formula for central differenced and forward differenced boundary conditions – Finite difference approximations to parabolic equations in cylindrical and spherical polar coordinates. The characteristics technique for hyperbolic equations- Alternative approach to the characteristics-propagation of discontinuities. Torsion problem – Derivative boundary conditions in the heat conduction problem. Finite differences in polar coordinates for elliptic equations- The direct methods for solving the finite difference equations of Poisson’s equation. The iterative method for the existence of an unique solution to linear integral equations- Solution of Fredholm’s integral equation with small values of its parameter and with an arbitrary continuous kernel. Volterra integral equation of first and second kinds - Volterra integral equation of the second kind with multiple integrals – Applications.

MA605: Advanced Mathematical Programming

Constrained NLP optimization, Methods NLP of constrained optimization, unconstrained NLP optimization, Methods of NLP unconstrained optimization, convex optimization, Methods of convex optimization, nonconvex optimization, Methods of nonconvex optimization, Applications in optimization.

MA606: Advanced Differential Geometry

Manifold and Riemannian manifold. Classical differential geometry affine differential geometry. Projective differential geometry. Local differential geometry. conformal D.G._ convex and general convexity kinematics.

MA607: General Topology

Topological spaces, continuous maps, and convergence. Constructions of topological spaces: products, subspaces, and quotient spaces. Connectedness and path connectedness. Separation axioms: Hausdorff, regular, and normal topological spaces. Urysohn's lemma and Urysohn's metrization theorem. Compactness and Tychonoff's theorem. Compactification of topological spaces. Uniform spaces and uniform convergence. Ascoli's theorem. Dimensions of topological spaces and embedding theorems.

MA608: Concept Data Analysis

Basic notions of Orders and Complete lattices – Closure Operator and Galois Connection – Context and its Concepts – Concept Hierarchies and Lattice of Concepts – The Fundamental Theorem of Concept Lattices – Algorithms for drawing concept lattices – Nested line diagrams. Properties of concept lattices Implications and dependencies of attributes. Knowledge exploration and attribute reduction – Treating Incomplete knowledge.

MA609: Probability Theory (1)

Review of some important basics to probability theory, including definitions and rules with Bayes' Formula. Moment generating function, Cumulant generating function, Functions of multiple random variables (two or more) for (discrete & continuous) random variables. Bayesian Procedures, involving prior and posterior distributions.

MA610: Algebraic Number Theory

Integral Domain's, Factorization, Extension. Norms, Traces, Traces and Discriminants. Dedekind Domains, Unique Factorization of Ideals. Factorization of Prime Ideals in Extensions, Norms of Ideals and Factorization theorem. The Ideal Class Group, Lattices, the Canonical Embedding. The Dirichlet Unit Theorem, Units in Quadratic Fields. Cyclotomic Extensions, Integral Basis of a Cyclomatic Field. Factorization of Prime Ideals in Gabis Extensions Frobenius Automorphism. Local Fields, Artin-Whaples Theorem, Hensel's Lemma.

MA611: Advanced Modeling & Simulation

Introduction to Simulation - Simulation Examples in a Spreadsheet- General Principles (Concepts in Discrete-Event Simulation and List Processing)- Statistical Models in Simulation, including: Review of Terminology and Concepts; Useful Statistical Models, e.g. Queueing systems; Discrete Distributions; Continuous Distributions; Poisson Process. SPSS, Matlab, Mathematica, etc….

MA612: Distribution Theory (1)

Study on some known statistical distributions, such as negative binomial distribution, Riemann zeta distribution, Hypergeometric distribution, Lognormal distribution, Beta distribution, Inverse Gaussian distribution, Logistic distribution, Cauchy distribution, mixed Distributions. Functions of random variables and their distribution, distribution function method, Transformation method for univariate case, Transformation method for bivariate case, Convolution method for sums of random variables, Moment method for sums of random variables. Applications to some special (discrete and continuous) bivariate distributions.

MA613: Combinatorial and Graph Theory

Combinatorics: Fundamental Principals of Counting – Languages and Finite State Machines – The Principle of Inclusion and Exclusion – Generating Functions – Recurrence Relations.Graph Theory: Formal description of graphs – Connectedness and equivalence relations – Matrix representations – Graph Isomorphism – Euler and Hamilton Paths – Short Path Problems – Transport Networks – Matching Problems – Planer Graphs – Graph Coloring – Introduction to trees and some applications – Tree Traversal – Trees and Sorting – Spanning trees – Minimum spanning trees.

MA614: Advanced Complex Analysis

Relevant fundamental concepts – Holomorphic functions (Cauchy- Weistress type) – Meromorphic functions – Some particular Holomorphic functions – Mebus transformation - Conformal mapping and some interesting transformation – Applications.

MA615: Special Function & Applications

One or two subjects are treated in depth from: Orthogonal polynomials - special functions and boundary-value problems - numerical methods and special functions - wavelets and their computational applications - classical and basic special functions. The course may contains: spectral solutions of differential equations Ordinary differential equations: one-step methods, multistep methods, difference methods for boundary value problems in ODE's - difference methods for parabolic, hyperbolic and elliptic PDE's - Spectral methods for ordinary differential equations: weighted residual methods.

MA616: Intelligent Systems

Intelligent systems enabled a range of problems to be tackled more effectively. This course emphasises on the methods and tools that can be used to develop systems (intelligent systems) that demonstrate intelligent behavior including dealing with uncertainty, learning from experience and following problem solving strategies found in nature. It goes in depth on selected topics and methods include computational intelligence algorithms in search, optimization and classification, which to a large extent consist of bio-inspired mechanisms. Also, it cover the applications of these methods include robotics, health and medicine. The course introduce the sufficient background for the concepts such as: cognitive robots, cognitive phenomenology, imitation learning, and humanoid robots.

MA617: Advanced Fluid mechanics:

Fundamental Laws of Continuum Mechanics-Advanced Steady for Unidirectional Flow-Unsteady Unidirectional Flows-Unidirectional Flows of a Bingham Material-Boundary Layer Theory-Steady Compressible Flow-Advanced studies for potential Flows-Transport of heat and mass.

MA618: Advanced Elasticity Theory

Stress and equilibrium- deformation: Displacements and strains- Static problems of asymmetric elasticity- Complex variable methods–Theorems and problems of dynamic elasticity- Elastic waves in unbounded medium- Anisotropic elasticity.

MA619: Advanced Quantum Mechanics

Dirac Formulation of Quantum Mechanics - Angular Momentum and Spin - Operator Algebra - Quantization of the Electromagnetic Field - Interaction of Radiation with Matter - Quantum Theory of Damping (Density Operator Methods - Langevin Approach).

Book: William H. Louisell, Quantum Statistical Properties of Radiation, John Wiley & Sons Inc. 1973.

MA620: Reactors Dynamic Systems

Neutron Transport Theory, Neutron Slowing Down, Resonance Absorption, Neutron Thermalization, Perturbation and Variational Methods, Homogenization, Nodal and Synthesis Methods, Space–Time Neutron Kinetics.

MA621: Theoretical Mechanics

General motion of a rigid body-Euler's angles-Euler-Poisson equations-Motion of a rigid body in a fluid-Bifurcations of Liouville tori-Topological types of the rigid body motion-Vibrational motion of the rigid body-Oscillatory solutions-Nonlinear oscillatory systems-Periodic solutions.

MA622: Celestial Mechanics

Basic concepts of celestial mechanics: Coordinate systems, Basic concepts of spherical trigonometry, Time systems, Keplerian orbit, The motion of two bodies problem, Kepler's laws, Elliptic and hyperbolic orbits, Kepler's equation, Flight path angle. Orbital elements: Some different groups of orbital elements, Classical elements, Orbital elements transformation. Some practical aspects of satellite orbits: Classification of orbits, Types of orbits, Applications.

MA623: Advanced Relatively Theory

Einstein-Maxwell field theory- Telle parallel equivalent of general relativity (CTEGR)-F(R) field theories- the gravitional waves- Spherical symmetry solutions of the theory of general relativity- Axiall-Symmetry solutions of general relativity-Rotating black holes-Geometric field theories.

MA624: Waves theory

Wave fundamentals-The wave equation-Wave components-The mechanical wave equation.

MA625: Advanced Electrodynamics

Vector Calculus and Field Theories- Maxwell's Equations and the Lorentz Force- Scalar and Vector Potentials- Solving Maxwell's Equations: Electro- and Magnetostatics- Solving Maxwell's Equations: Electromagnetic Waves- Energy and Momentum of Electromagnetic Fields- Radiation Sources and Antennas- Electrodynamics in Macroscopic Media- Surfaces, Wave Guides and Cavities- Relativistic formulation of electrodynamics.

MA626: Statistical Mechanics

Fundamentals of Statistical Physics - Statistical Mechanics of Non-Interacting Particles - Interacting Gases and the Liquid-Gas Phase Transition - Dynamics of Liquids and Gases - Lattices and Spins - Microscopic Models for Interacting Gases - Landau Field Theory.

MA627: Particles Transport Theory

Transport equations - Exact solutions for simple modeled theories of particle transport - Collision phenomena in particle transport - Derivation of continuum descriptions from transport equations - Basic problems in transport theory - Approximate methods in transport theory.

MA628: Dynamical Systems:

Selected topics in Dynamical systems.

MA629: Estimation Theory

Mathematical estimation problem, Minimum variance unbiased estimation, Cramer-Rao lower bound for the general Gaussian case, Measures of quality of estimators, Sufficient statistics, Minimal sufficiency and ancillary statistics, Best linear unbiased estimators, Maximum likelihood estimation, Least squares estimators, Method of moments, Interval estimation. Bayesian point estimation, Bayesian interval estimation.

MA630: Probability Theory (2)

Conditional expectations, Exchangeability, Martingales. Generating random variates by inverse of cumulative distribution function. Inequalities. Consistency and limiting distributions: Convergence in probability & distribution, Central limit theorem, and Extensions to multivariate distributions.

MA631: Reliability Theory

This course covers the main statistical methods used in reliability and life data analysis. The main distributions used in reliability data analysis are overviewed. The ageing properties of different distributions are explored. A course in reliability helps in probabilistic modeling of the reliability of systems with multiple components and statistical modeling of reliability of individual components based on lifetime data.

MA632: Stochastic Processes

Review for some concepts of stochastic processes, involving their properties. Some common stochastic processes, Discrete-Time Markov Chains: Chapman–Kolmogorov equations, n-step transition matrix, Classification of States, stationary distribution of the chain, positive recurrent, the limit distribution of the Markov chain, simple random walk, Multidimensional Random Walk, branching processes, continuous-time Markov chain: Stationary Distributions and Limit Distributions, Birth–Death Processes.

MA633: Advanced Queueing Theory

This course provides quick review of some important previous studies, basic definitions and concepts, birth-death processes, simple Markovian queues, bulk arrival and service queues, Erlangian queues and networks queues. The queueing models can be studied in cases: truncated, non–truncated, single server, several servers, steady–state, transient behavior, busy period and self–service. The next concepts can be

added also to queueing models: customer behavior, state–dependent, additional servers, catastrophes and feedback. Investigating the quality control procedure to confirm the queueing models.

MA634: Advanced hypothesis testing

Review of simple & composite hypotheses testing, and critical regions. Maximum likelihood tests, multi-parameter case testing, most powerful tests, uniformly most powerful tests. Tests of hypothesis concerning parameters in normal. Rank tests, Randomized tests, Unbiased tests, Likelihood ratio tests and their asymptotic properties. Linear hypotheses and least squares, Tests of homogeneity. Tests of independence of bivariate normal variables. Testing by minimax and classification Procedures. Bayesian testing procedures. Sequential Probability Ratio Test.

MA635: Biostatistics

Introduction to biostatistics – Design of medical studies – Hazard rates and odds ratio – Sensitivity analysis – Receiver Operating Characteristic (ROC curve) – Survival analysis – Life tables – Estimate the survival curve using Kaplan-Meier. More survival procedures may be discussed.

MA636: Distribution Theory (2)

Basics to Distribution Models: Model Analysis, Parameter Estimation, Model Selection and Validation (Graphical Methods -Goodness of fit Tests). Taxonomy for Distribution Models: Type I Models: Transformation for the random variable. Type II Models: Modification/Generalization for Distribution Models. Type III Models: Models Involving Two or More Distributions (Composite and Compound Distributions). Type IV Models : Distribution Models with Varying Parameters. Type V Models: Bivariate and Multivariate Distribution Models. Further distributions on censored schemes

MS637: Design of Experiments

Simple comparative experiments; Experiments with a single factor; Randomized blocks; Latin squares; Factorial designs; The 2k factorial design; Two-level fractional factorial designs. More procedures for experimental design may be discussed.

MA638: Probabilistic Inventory Theory

Types of inventories- Inventory Costs - Probability distributions of inventory management- Geometric programming approach- Lagrange multiplier technique- Probabilistic inventory model with zero lead time -Constrained probabilistic inventory models with varying units cost- Lead time demand follows some continuous distributions- Constrained probabilistic <Q,r> inventory model with mixture Shortage - Periodic review inventory models.

MA639: Advanced Artificial Intelligent

Review the AI history from 1943 to the current. Intelligent agents: Discussion on what Artificial Intelligence is about and different types of AI agents. Solving problems by Searching: Problem-Solving Agents, Example Problems, Searching for Solutions, Uninformed Search Strategies (DFS and BFS) – A Review. Informed Search and Exploration: Informed (Heuristic, A* algorithm) Search Strategies, Local Search Algorithms and Optimization Problems, Genetic algorithms – A Review. Adversarial Search: Games, Optimal Decisions in Games, Optimal Strategies, Minimax algorithm, Optimal decisions in multiplayer games, Alpha-Beta Pruning, Cutting off search, State-of-the-Art Game Programs. Knowledge and Reasoning: Propositional logic; Inference in Propositional logic, Knowledge and Reasoning: First-order logic as a basis for building intelligent agents capable of acting and reacting in a

complex environment; Inference in First order logic. Knowledge Representation: Ontological Engineering, Mental Events and Mental Objects, Frames, Conceptual Graphs, Semantic Networks, Knowledge-based Systems, and Truth Maintenance Systems. Uncertain Knowledge and Reasoning: Uncertainty, Graphical Models, Probabilistic Reasoning and Bayesian Network.

MA640: Selected Topics in Statistics

The course provides topics of statistics that are not considered in the Master Subjects.

MA641: Advanced Database Systems

System implementation techniques, data storage, representing data elements, database system architecture, query processing and optimization, a typical relational query optimizer, transaction processing concepts, concurrency control techniques, database recovery techniques, database security and authorization, Schema Refinement and Normal forms, Physical Database Design, Crash recovery, Parallel and distributed databases, deductive databases, and database technology for decision support systems.

MA642: Advanced Regression Analysis

Multiple linear regression (MLR), Least squares estimates of the MLR parameters, Detection of Outliers in MLR, Detection of influential observations in MLR, Non-Full-Rank linear regression models, Generalized least squares, Statistical inference, Logistic regression for binary data, Ridge regression , Nonlinear regression. More regression procedures.

MA643: Information Retrieval

Goals and history of IR. The impact of the web on IR. Basic IR Models Boolean and vector-space retrieval models; ranked retrieval; text-similarity metrics; TF-IDF (term frequency/inverse document frequency) weighting; cosine similarity. Basic Tokenizing, Indexing, and Implementation of Vector-Space Retrieval, Simple tokenizing, stop-word removal, and stemming; inverted indices; efficient processing with sparse vectors; Java implementation. Experimental Evaluation of IR, Performance metrics: recall, precision, and F-measure; Evaluations on benchmark text collections. Query Operations and Languages, Relevance feedback; Query expansion; Query languages.Text Representation, Word statistics; Zipf's law; Porter stemmer; morphology; index term selection; using thesauri. Metadata and markup languages (SGML, HTML, XML). Web Search, Search engines; spidering; metacrawlers; directed spidering; link analysis (e.g. hubs and authorities, Google PageRank); shopping agents. Text Categorization, Categorization algorithms: Rocchio, nearest neighbor, and naive Bayes. Applications to information filtering and organization. Language-Model Based Retrieval, Using naive Bayes text classification for ad hoc retrieval. Improved smoothing for document retrieval. Text Clustering, Clustering algorithms: agglomerative clustering; k-means; expectation maximization (EM). Applications to web search and information organization. Recommender Systems: Collaborative filtering and content-based recommendation of documents and products. Ethical Issues in IR, Privacy, Fairness, Fake news and disinformation, Filter bubble , Viewpoint diversity, Fostering extremism, Internet addiction. Information Extraction and Integration, Extracting data from text; semantic web; collecting and integrating specialized information on the web.Question Answering , Semantic parsing. Question Answering from structured data and text. Deep Learning for IR :Word embeddings. Neural language models.

MA644: Advanced Time Series Analysis

Review of principles and definitions of time series, involving stationarity, Yule-Walker estimation, autoregressive moving average (ARMA) models. Hence working on spectral density function (SDF) and its properties, SDF of ARMA models, estimating SDF by Periodogram. Integer-valued time series models: Thinning operator and its properties, Integer-valued autoregressive of order (1), INAR(1). Integer-valued moving average of order 1, INMA(1). Autocorrelation of the earlier models. Yule-Walker estimation and conditional Least squares estimation of the model parameters.

MA645: Cryptography

The basic complexity theory, some elementary cryptographic schemes like Caesar's cipher, general substitution ciphers, polyalphabetic ciphers and how they can be broken efficiently, Shannon's cryptographic principles of confusion and diffusion, the Feistel-based block ciphers, the block ciphers DES, CAST-128 and AES, public key cryptography, the RSA, ElGamal scheme, the foundations of Elliptic Curve Cryptography, the cryptanalysis of RSA and ECC.

MA646: Natural Language Processing

NLP tasks in syntax, semantics, and pragmatics. Applications such as information extraction, question answering, and machine translation. The problem of ambiguity. The role of machine learning. Brief history of the field. N-gram Language Models: The role of language models. Simple N-gram models. Estimating parameters and smoothing. Evaluating language models. Part Of Speech Tagging and Sequence Labeling, Lexical syntax. Hidden Markov Models (Forward and Viterbi algorithms and EM training). Basic Neural Networks, Any basic introduction to perceptron and backpropagation. LSTM Recurrent Neural Networks, "Understanding LSTM Networks" blog post, optionally the original paper Long Short Term Memory. Syntactic parsing, Grammar formalisms and treebanks. Efficient parsing for context-free grammars (CFGs). Statistical parsing and probabilistic CFGs (PCFGs). Lexicalized PCFGs. Neural shift-reduce dependency parsing. Semantic Analysis, Lexical semantics and word-sense disambiguation. Compositional semantics. Semantic Role Labeling and Semantic Parsing. Information Extraction (IE), Named entity recognition and relation extraction. IE using sequence labeling. Machine Translation (MT), Basic issues in MT. Statistical translation, word alignment, phrase-based translation, and synchronous grammars.

MA647: Web Application Development

This course gives the background, terminology and fundamental concepts that are important to build modern full stack web applications. It makes student familiar with all each layer of the software technologies involved in a web application, including data modeling and database technologies, the web server environment and middleware components, network protocols, the user interface and basic visual design, and user interaction concepts. Also, the course introduces the major components of web application architectures and the fundamental design patterns and philosophies that are used to organize them. In addition, it includes the topics: Web Applications Frameworks, Managing Data, Middleware, and The User Interface.

MA648: Advanced Machine Learning

This course is an advanced-on machine learning, focusing on recent advances in deep learning with neural networks, such as recurrent and Bayesian neural networks. The course concentrates on natural language processing (NLP) and computer vision applications. Also, it introduces the mathematical definitions of the relevant machine learning models and derive their associated optimization algorithms. In addition it covers a range of applications of neural networks in natural language processing, including analyzing latent dimensions in text, translating between languages, answering questions, and in medicine.

MA649: Quantum Computing

Complex numbers and its geometrical representations, Complex vector spaces, inner products and Hilbert spaces, Hermitian and unitary matrices, Tensor products of vector spaces Deterministic Systems, Probabilistic descriptions and Quantum systems, Basics of Quantum theory, Schrodinger's time dependent equation, Wave nature of Particles, state vector, operators, postulates of quantum mechanics, Dirac formalism, Stern-Gerlach experiment, electron spin, superposition of states, entanglement Bits and Qubits, Classical gates versus quantum gates, Deutsch's Algorithm, DeutschJozsa Algorithm, Simon's periodicity algorithm, Grover's search algorithm, Shor's Factoring algorithm Quantum programming languages, Probabilistic and Quantum computations, introduction to quantum cryptography and quantum information theory.

MA650: Data Warehouse and Data Mining

Data Warehousing concepts, Comparing operational database to data warehouse, Data Warehousing system and components, Data transformation process functions, Online analytical processing (OLAP) and OLAP tools, Data Warehousing applications, Data Mining concepts and techniques, Classification, Association Analysis, Cluster Analysis, Anomaly Detection, Web Mining, Data Mining applications.

MA652: Mobile Computing

Introduction to Mobile Computing Systems. Mobile terminology and enabling technologies. Mobile protocols and architectures. Mobile terminals and smart technologies. Mobile commerce, billing and payments. Mobile learning. Mobile health and wearable computing. Location-based services. Mobile Web vs native applications. Mobile systems design. Developing mobile applications. Mobile software constraints and usability challenges. Future trends in mobile computing.

MA654: Bioinformatics

Introduction to Bioinformatics and Sequence Analysis. In addition to lecture material, skills needed for future problem set assignments will be covered. Internet Resources focusing on text-based searches of literature, molecular, and medical databases. Searching DNA databases with DNA queries: BLASTN. Searching protein databases with protein queries: BLASTP. Cross-molecular searches: BLASTX and TBLASTN. Bioinformatics Tools for the Laboratory. Protein Analysis. Analysis problems involving short sequences. MicroRNAs and Pathway Analysis.

ب. برامج الدكتوراه في علوم الرياضيات:

1. برنامج الدكتوراه في العلوم في الرياضيات البحتة: (Pure Mathematics)

First Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
MA701	Selected topics in pure mathematics (1) مواضيع مختارة في الرياضيات البحتة (1)	2	-	2
Optional: 2 Credits				
MA703	Lattice theory (2) نظرية الشبكة (2)	2	-	2
MA705	Vector Optimization الأمثلية الموجه	2	-	2
MA707	Manifold and Riemannian manifold عديدات الطيات وعديدات الطيات الريمانية	2	-	2
MA709	Topology and its Applications (1) التوبولوجى وتطبيقاته (1)	2	-	2
MA711	Measure theory نظرية القياس	2	-	2
MA713	Advanced Complex Analysis تحليل مركب متقدم	2	-	2

Second Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
MA702	Selected topics in pure mathematics (2) مواضيع مختارة في الرياضيات البحتة (2)	2	-	2
Optional: 2 Credits				
MA704	Ockham algebras جبريات أو كهام	2	-	2
MA706	Numerical Optimization الأمثلية العددية	2	-	2
MA708	Local differential geometry الهندسة التفاضلية المحلية	2	-	2
MA710	Topology and its Applications (2) التوبولوجى وتطبيقاته (2)	2	-	2
MA712	Advanced Functional Analysis تحليل دالي متقدم	2	-	2
MA714	The approximate numerical and analytical solutions for integral equations الحلول التقريبية العددية والتقريبية التحليلية للمعادلات التكاملية	2	-	2

2. برنامج الدكتوراه في العلوم في الرياضيات التطبيقية: (Applied Mathematics)

First Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
MA725	Selected topics 1 in applied mathematics موضوعات مختارة في الرياضيات التطبيقية (1)	2	-	2
Optional: 2 Credits				
MA715	Chaos theory and its applications in fluid mechanics نظرية الفوضى وتطبيقاتها في ميكانيكا الموائع	2	-	2
MA717	Asymptotic solutions of the rigid body motion الحلول التقاربية لحركة للجسم المتماسك	2	-	2
MA719	Advanced Kinetic models الأنظمة الحركية المتقدمة	2	-	2
MA721	Theory of relativistic quantum mechanics نظرية ميكانيكا الكم النسبوية	2	-	2
MA723	Space Dynamics ديناميكا الفضاء	2	-	2
MA727	Selected topics in applied mathematics (2) موضوعات مختارة في الرياضيات التطبيقية (2)	2	-	2

Second Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
MA726	Selected topics in applied mathematics (3) موضوعات مختارة في الرياضيات التطبيقية (3)	2	-	2
Optional: 2 Credits				
MA716	Advanced topics in electromagnetic fields موضوعات متقدمة في المجالات الكهرومغناطيسية	2	-	2
MA718	Vibrational motion of dynamical models الحركة الاهتزازية للأنظمة الديناميكية	2	-	2
MA720	Selected topics of nuclear reactor dynamics مختارات من ديناميكا المفاعلات النووية	2	-	2
MA722	Advanced space dynamics ديناميكا الفضاء المتقدمة	2	-	2
MA724	Advanced elasticity المرونة المتقدمة	2	-	2
MA728	Selected topics 4 in applied mathematics (3) موضوعات مختارة في الرياضيات التطبيقية (4)	2	-	2

3. برنامج الدكتوراه في العلوم في الإحصاء: (Statistics)

First Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
MA741	Selected topics in statistics (1) موضوعات مختارة في الإحصاء (1)	2	-	2
Optional: 2 Credits				
MA729	Advanced probability theory (1) نظرية الاحتمالات المتقدمة (1)	2	-	2
MA731	Advanced distributions theory (1) نظرية التوزيعات المتقدمة (1)	2	-	2
MA733	Advanced Reliability theory نظرية الموثوقية المتقدمة	2	-	2
MA735	Search theory نظرية البحث	2	-	2
MA737	Advanced probabilistic inventory theory نظرية المخزون الاحتمالي المتقدمة	2	-	2
MA739	Statistical optimality methods طرق الامثلية الإحصائية	2	-	2

Second Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
MA742	Selected topics in statistics (2) موضوعات مختارة في الإحصاء (2)	2	-	2
Optional: 2 Credits				
MA730	Advanced probability theory (2) نظرية الاحتمالات المتقدمة (2)	2	-	2
MA732	Advanced distributions theory (2) نظرية التوزيعات المتقدمة (2)	2	-	2
MA734	Advanced queuing theory نظرية الطوابير المتقدمة	2	-	2
MA736	Advanced Markov chains سلاسل ماركوف المتقدمة	2	-	2
MA738	Advanced Time series analysis تحليل السلاسل الزمنية المتقدمة	2	-	2
MA740	Advanced biostatistics الإحصاء الحيوي المتقدم	2	-	2

4. برنامج الدكتوراه في في علوم الحاسب :(Computer Science)

First Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
MA749	Selected topic in computer science (1) موضوعات مختارة في علوم الحاسب (1)	2	-	2
Optional: 2 Credits				
MA743	Artificial Intelligence and Robotics الذكاء الاصطناعي والروبوتات	2	-	2
MA745	Network security أمن الشبكات	2	-	2
MA747	Information storage and retrieval تخزين المعلومات واسترجاعها	2	-	2
MA751	Machine learning and neural networks التعلم الآلي والشبكات العصبية	2	-	2
MA753	Queuing models: simulation and comparison نماذج الطوابير: المحاكاة والمقارنة	2	-	2
MA755	Computer vision الرؤية بالحاسب	2	-	2

Second Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
MA750	Selected topic in computer science (2) موضوعات مختارة في علوم الحاسب (2)	2	-	2
Optional: 2 Credits				
MA744	Computer architecture and deep learning systems هندسة الحاسوب وأنظمة التعلم العميق	2	-	2
MA746	Advanced Modeling & Simulation النمذجة والمحاكاة المتقدمة	2	-	2
MA748	Databases and systems information retrieval قواعد البيانات ونظم استرجاع المعلومات	2	-	2
MA752	Mobile systems أنظمة الهاتف المحمول	2	-	2
MA754	Selected topics of Advanced database systems موضوعات مختارة في أنظمة قواعد البيانات المتقدمة	2	-	2
MA756	Distributed systems and networks الأنظمة الموزعة والشبكات	2	-	2

توصيف مقررات الدكتوراه

MA701: Selected topics in pure mathematics (1)

MA702: Selected topics in pure mathematics (2)

MA703: Lattice Theory II

Basic Definitions – Polynomials, Identities and Inequalities. Free Lattices. Distributive Lattices with Pseudo complementation, Stone Algebras. Representation Theorems. Congruences and Ideals, Prime and Maximal Ideals, Complete Lattices, Complete Sublattices. Subalgebra Lattice of an algebra. Infinitely distributive and Complete distributive Lattices. Direct and Subdirect Decomposition. Semi modular Lattices. Unions, join, edge sum – Products – Tensor Products and the Product in EGra Box Product – Complete product Lexiocographic Products and Corona – Algebraic Properties – Diamond Produtcs – Left inverces for tensor Functors – Power Products.

MA704: Ockham Algebra

Ordered sets, Lattices, and Universal Algebra. Examples of Ockham Algebras; the Berman Classes. Congruence Relations. Subdirectly irreducible Algebras. Duality Theory. The Lattice of Subvarities. Fixed Points. Fixed Point separating congruences. Congruences on K1,1 - algebras. MS-spaces; fences, crowns. The dual space of a finite simple ockham algebra. Relative Ockham Double MS-algebras. Subdirectly irreducible double MS-algebras. Congruences on double MS-algebras. Singles and doubles.

MA705: Vector Optimization

The course among others includes topics on multiobjective linear programming, differentiable vector optimality conditions, sensitivity analysis, different a priori and a posteriory methods etc.

MA706: Numerical Optimization

Modeling: linear programming models, convex optimization models. Basic optimization theory: optimality conditions, sensitivity, duality. Algorithms for constrained convex optimization: active-set methods for linear and quadratic programming, proximal methods and ADMM, stochastic gradient, interior-point methods. Line-search methods for unconstrained nonlinear programming, sequential quadratic programming.

MA707: Manifold and Riemannian manifold

Manifold and Riemannian manifold, Classical differential geometry, affine differential geometry, Projective differential geometry, Local differential geometry conformal D.G. convex and general convexity kinematics.

MA708: Local differential geometry

Holonomy and the Gauss-Bonnet theorem, introduction to hyperbolic geometry, surface theory with differential forms, calculus of variations and surfaces of constant mean curvature, abstract surfaces (2D Riemannian manifolds).

MA709: Topology and its Applications (1)

Topics are chosen that serve the researcher in a branch of topology, whether it is general topology, algebraic topology, or geometric topology. These topics are modern in specialization and serve the applications that serve the community in this period.

MA710: Topology and its Applications (2)

Advanced Topics are chosen that serve the researcher in a branch of topology, whether it is general topology, algebraic topology, or geometric topology. These topics are modern in specialization and serve the applications that serve the community in this period.

MA711: Measure theory

Advanced topics to measure theory. The study of lengths, surface areas, and volumes in general spaces, as related to integration theory.

MA712: Advanced Functional Analysis

Advanced topics to locally convex spaces (including the Hahn-Banach separation theorem, weak and weak*-topologies, Alaoglu´s theorem, Krein-Milman´s theorem). more on operators on Hilbert spaces (including polar decomposition, the spectral theorem for normal compact operators, index theory for Fredholm operators, trace class operators, Hilbert-Schmidt operators). the Gelfand theory for commutative Banach algebras and commutative C*-algebras with application to the spectral theory for normal operators; an introduction to the theory of unbounded operators on Hilbert spaces.

MA713: Advanced Complex Analysis

Main concepts of meromorphic functions – Starlikness and Convexity – Subordination and superordination principles - Paticular families of meromorphic functions and distortion theorems - Application.

MA714: The approximate numerical and analytical solutions for integral equations

1. Abel's problem - Iterated and Resolvent kernels- the eign-values and the eign functions. 2. Initial value problems and its conversion to Volterra's integral equation–Boundary value problems and its conversion to Fredholm's integral equation. 3. Fredholm's integral equation with separable kernels - Solution of homogeneous Fredholm's integral equation of the second kind. 4. Integral equations with symmetric kernels - Hilbert-Schmidt theorem. 5. Solution of integral equations of the second kind by successive approximations Neumann series - Resolvent kernel and Volterra's integral equation. 6. Classical Fredholm theory- Integral transform methods - Singular integral equation - Convolution type kernels - Solution of singular integral equations by Fourier transform. 7. Integral of the theory of the wing of an airplane - Integral equations with a kernel having logarithmic singularity.

MA715: Chaos theory and its applications in fluid mechanics

Selected topics in Chaos theory and its applications in fluid mechanics

MA716: Advanced topics in electromagnetic fields

Selected topics of Effects of external and generated electromagnetic fields

MA717: Asymptotic solutions of the rigid body motion

Periodic solutions-Periodic solutions in the case of a time-dependent torque vector fixed along the largest principal axis-Periodic solutions in the case of a time-dependent torque vector fixed along the middle principal axis-Iterative solutions.

MA718: Vibrational motion of dynamical models

Oscillatory Solutions-Theorems on Linear Oscillatory Systems-Nonlinear Oscillatory Systems-Periodic Solutions-Gradient Systems-Poincaré Theorem-Limit Cycles-Poincaré–Bendixson Theorem-Liénard System-van der Pol Oscillator-Applications.

MA719: Advanced Kinetic models

Selected topics of Advanced Kinetics model.

MA720: Selected topics of nuclear reactor dynamics

Selected topics of nuclear reactors dynamics

MA721: Theory of Relativistic Quantum Mechanics

Relativistic Quantum Field Theory, is a one-term self-contained subject in quantum field theory. Concepts and basic techniques are developed through applications in elementary particle physics, and condensed matter physics. Topics include: Classical field theory, symmetries, and Noether's theorem. Quantization of scalar fields, spin ½ fields, and Gauge bosons. Feynman graphs, analytic properties of amplitudes and unitarity of the S-matrix. Calculations in quantum electrodynamics (QED). Introduction to renormalization.

MA722: Advanced Space Dynamics

Relativistic equations of motion – Relativistic Two body problem, three body problem, Lagrange planetary equations (LPE) - LPE in Gauss form, applications using conservative and nonconservative forces - advanced topics in space dynamics.

MA723: Space Dynamics

The two-body problem (integrals of motion and orbit equation), orbital elements, coordinate transformation, orbital perturbation theory of satellite motion, orbital maneuvers, relative motion and rendezvous, interplanetary trajectories and launch windows, and applications on motion satellites.

MA724: Advanced elasticity

Review the fundamentals of linear elastic materials behavior- the generalized Hooke’s Law for Linear elastic materials – Linear viscoelasticity material – Time-dependent behavior of polymers – Rate-independent Plasticity - Complex Formulation of the Plane Elasticity Problem- Complex Potentials- Axially and spherically symmetric solutions to Quasi-static linear elastic problems - Solutions to dynamic problems for isotropic linear elastic solid - Reciprocal theorem and applications - Energy

MA725: Selected topics in applied mathematics (1)

MA726: Selected topics in applied mathematics (3)

MA727: Selected topics in applied mathematics (2)

MA728: Selected topics in applied mathematics (4)

MA729: Advanced Probability Theory (1)

Fundamentals of probabilistic measure theory - Probability space - Measurable functions and random variables - Zero-one laws - Borel-Cantelli lemmas - Characteristic functions - Uniform integrability - Basic limit theorems - Collection of problems in probability theory.

MA730: Advanced Probability Theory (2)

Laws of large numbers - Kolmogorov's three-series theorem - Central limit theorems for independent and non-identically distributed random variables - Large deviations - Laws of the iterated logarithm - Important results that have recently appeared in the literature.

MA731: Advanced Distributions Theory (1)

Some transformations for generating univariate distributions, e. g. power transform, log transform and exponent to random variable followed a certain basic distribution. Distributions by raising cumulative distribution function with a power. Weighted distributions. Some recent compound distributions, e.g. Pareto Poisson-Lindley. Further transformations may be discussed. Discuss some distributional properties of the obtained distributions by checking some papers from the recent literature of the distribution theory.

MA732: Advanced Distributions Theory (2)

General families of distributions, including, but not limited to, Marshall-Olkin family, Beta-generated family, T-X family and family of extended half-distributions. Some recent discrete distributions by, e.g., discretization and infinite series approaches. Discuss some distributional properties of the obtained distributions by checking some papers from the recent literature of distribution theory. Further families of distributions can be discussed.

MA733: Advanced Reliability theory

Estimation of parameters and reliability with complete and censored samples with distribution of the estimators, Product reliability, reliability data, and data sources, Bayesian reliability estimation, modelisation of complex systems: structure function, coherent system, fault tree, reliability diagram, computation of reliability and availability, measures of the importance of the individual components, both for repairable and non-repairable systems (theory of Markov processes is used).

MA734: Advanced Queuing Theory

This course deals with the relationship between queuing theory and many branches of mathematics and statistics, such as: Queueing–inventory systems, Queueing models and methods of order statistics, Queueing models and economic analysis, Stochastic processes in queueing models, Queueing theory and stochastic traffic models, Statistical inferences in queueing models, A linear algebraic approach to queueing models, Special functions in queueing theory.

MA735: Search Theory

Basic Definitions, Some kinds of search problems, Search for a randomly located target: Search paths, Optimal search paths for continuous random variables, Optimal search paths for discrete random variables, Search and stop with discrete effort, Search and stop with continuous effort, Search in the presence of false targets, Whereabouts search, Coordinated search problem: Search plans, Optimal search plan for continuous distributions.

MA736: Advanced Markov Chains

The Markov property, Chapman-Kolmogorov's relation, classification of Markov processes, Transition probability matrix of a Markov chain, forward and backward equations, stationary and asymptotic distribution, convergence of Markov chains, finite homogeneous Markov chains and continue on continuous time discrete state processes, non-homogenous Markov processes, Inference for Markov models, applications of Markov processes.

MA737: Advanced Probabilistic inventory theory

Probability Inventory Management- Probabilistic Inventory Model with Zero Lead Time - Geometric Programming Approach- Backlogged Probabilistic Inventory Model for Crisp and Fuzzy Environment - Probabilistic Multi Item Inventory Model with Varying Mixture Shortage Cost under Restrictions - Lagrange Multiplier Technique- -Constrained Probabilistic Inventory Models with Varying units Cost-Lead Time Demand Follows some Continuous Distributions- Constrained Probabilistic <Q,r> Inventory Model with Varying Mixture Shortage - Periodic Review Inventory Models with Varying Mixture Shortage.

MA738: Advanced Time series analysis

Cumulants of stationary stochastic processes. Thinning operation and more properties of the obtained operator. Integer-valued autoregressive time series or order, INAR(1). Likelihood function of the Poisson INAR(1). Spectral density function. Poisson INAR(1) model, conditional mean and conditional variance. Integer-valued moving average, INMA(1), time series. Estimation of model parameters by Yule-Walker estimation, conditional Least squares estimation, conditional maximum likelihood.

MA739: Statistical Optimality Methods

Optimum Design Theory. Continuous and Exact Designs. The General Equivalence Theorem. Function Optimization and Continuous Design. Criteria of Optimality. A-, D-, and E-optimality. DA-, DS-, c-optimality.

MA740: Advanced Biostatistics

Practically significant difference, equivalence and non-inferiority. Relative Risk & Odds Ratio and their confidence intervals. Randomization methods, stratification, blinding. Missing data, Intention to Treat versus Per Protocol, Full analysis sets. Study types (Case Reports and Case Series, Cross-Sectional Studies, Cohort Studies, Case-Control Studies, Randomized Trials, Confounding). Analysis of covariance.

MA741: Selected Topics in Statistics (1)

The course provides topics of statistics that are not considered in the PhD Subjects.

MA742: Selected Topics in Statistics (2)

The course provides topics of statistics that are not considered in the PhD Subjects.

MA743: Artificial Intelligence and Robotics

An Introduction to Artificial Intelligence (Deduce how to gain strategic advantage through the use of different kinds of intelligence), Artificial Intelligence in Business and Society (Assess the impact of AI on the future of work and society), Robotics in Business, Evaluate the appropriateness of a business

application for robotics, The Future of Artificial Intelligence, Develop a road map for an organization to gain strategic advantage through the use of artificial intelligence.

MA744: Computer architecture and deep learning systems

Deep Learning and Tensorflow Basics, Density, Parallelism, and Values, Linear-algebra Processor and Neuflow, Memory Hierarchies: Diannao, Memory Hierarchies: Eyeriss 1 and 2, Compression: Quantization and Pruning, Compression of Recurrent DNN, More Complexity: Attention and Transformers, Industry Inference Products (TPU, Cambricon), Industry Training: Graphcore, other PR, Architecture: Predictive Activation, Temporal Similarity, Smart Training: Lottery Tickets and Hash-based, FPGA-based acceleration: BrainWave and FPGA Limitations, Architecture: Spatial Similarity: PRA and Diffy, Industry - GPU's (Volta) and Architecture: Neural Cache, Beyond Digital: Flash and Memristor based inference, DNN Accelerators and Conventional Computer Architecture.

MA745: Network security.

This course provides background to network security, Threats to communication networks, Principles of encryption, Implementing encryption in networks, Integrity, Freshness, Authentication, Access control.

MA746: Advanced Modeling & Simulation

Simulation Software, Selection of Simulation Software, Simulation in GPSS, Simulation in SSF, Simulation Environments, Experimentation and Statistical-Analysis Tools, Statistical Models in Simulation, Review of Terminology and Concepts, Useful Statistical Models, Discrete Distributions, Continuous Distributions, Random-Number Generation, Random-Variate Generation

MA747: Information storage and retrieval

Introduction to IR: What is IR, Notion of Relevance, IR problems, Conceptual Models, Conceptual Models of IR Systems: Boolean Systems: Lexis/Nexis, The Vector Space Model: SMART, Probabilistic Models: Inquery Evaluation: Assumptions, Measures of IR performance, Test Collections, TREC,Evaluation Methodology, Term and Language properties: Zipf's Law, Statistical distributions, Search Strategies: Query Languages, Query Reformulation: query expansion, term reweighting,Relevance Feedback,Information Visualization, Data and File Structures: Inverted files,Signature Files, PAT trees, Automatic Indexing: Lexical Analysis: stoplists, stemming,Segmentation strategies for long text, Thesaurus Construction, manually derived (WordNet), automatic (Latent Semantic Indexing), NLP techniques in IR: POS tagging, parsing, Phrase recognition, Word Sense Disambiguation, Named Entity Tagging, Web Search Engines: PageRank, Distributed Search Engines.

MA748: Databases and systems information retrieval

Goals and history of information retrieval (IR), the impact of the web on IR, Related areas to IR, Basic IR Models, Basic Searching and Indexing, Query Operations and Languages, Hypermedia, Web Search and Link Analysis, Information Extraction and Integration.

MA749: Selected topic in computer science (1)

This course is intended to expose students to advanced topics of Computer science, which are not covered in other courses of the program. The topics covered will be approved by the Computer Science department board and will depend on the specialty of the available faculty and graduate students' interest.

MA750: Selected topic in computer science (2)

This course is intended to expose students to advanced topics of Computer science, which are not covered in other courses of the program. The topics covered will be approved by the Computer Science department board and will depend on the specialty of the available faculty and graduate students' interest.

MA751: Machine learning and neural networks

This course provides a broad introduction to machine learning and neural networks. Topics include: supervised learning (generative/discriminative learning, parametric/ non-parametric learning, neural networks, support vector machines); unsupervised learning (clustering, dimensionality reduction, kernel methods); learning theory (bias/variance tradeoffs, practical advice); reinforcement learning and adaptive control. The course will also discuss recent applications of machine learning, such as to robotic control, data mining, autonomous navigation, bioinformatics, speech recognition, and text and web data processing.

MA752: Mobile systems.

Platforms: configurations, runtime environments and limitations. Mobile App build process, Development environments; tools and implementation characteristics, Development Paradigms; model, view, controller (MVC), data sources, outlets, and callbacks, User-interface; multi-view, multi-touch interfaces and associated tool-kits; animation and multi-media, Facilities for communicating with other on-platform applications, Facilities for communicating with off-platform services; through the Web and other direct interconnection frameworks such as sockets or RPC, Mobile device language runtime environments; benchmarking their performance, and understanding their configuration.

MA753: Queuing models: simulation and comparison

Characteristics of Queueing Systems, The Calling Population, System Capacity, The Arrival Process, Queue Behavior and Queue Discipline , Service Times and the Service Mechanism, Queueing Notation, Long-Run Measures of Performance of Queueing Systems, Time-Average Number in System L, Average Time Spent in System Per Customer w, The Conservation Equation: $L = \lambda w$, Server Utilization , Costs in Queueing Problems, Steady-State Behavior of Infinite-Population Markovian Models, Single-Server Queues with Poisson Arrivals and Unlimited Capacity: M/G/l , Multiserver Queue: $M/M/c/\infty/\infty$, Multiserver Queues with Poisson Arrivals and Limited Capacity: $M/M/c/N/\infty$, Steady-State Behavior of Finite-Population Models {M/M/c/K/K), Networks of Queues, Rough-cut Modeling: An Illustration.

MA754: Selected topics of Advanced database systems.

Normalization Techniques, Data Mining and Data warehouse, Transaction Processing, Concurrency Control Distributed Databases, Database Security, and Temporal database.

MA755: Computer vision

This course provides Introduction to computer vision, Image formation and acquisition, Image processing, Feature detection and matching, Segmentation, Feature-based alignment, Structure from motion, Dense motion estimation, Image stitching, Image-based rendering, Recognition, Computer Vision application

MA756: Distributed systems and networks

Definitions, Motivations & Goals, Sorts of Distributed Systems: Distributed Computing Systems, Distributed Information Systems, Distributed Pervasive Systems. Trends in Distributed Systems: Resuming & Foreseeing, Characterization of distributed systems (Introduction, examples of distributed systems, resource sharing and web, challenges). System Models: Introduction, Architectural models: S/w layers, system architecture and variants, Interface and Objects, Design requirements for distributed architectures, Fundamental Models: Interaction Model, Failure Model and Security Model.

ثانياً: قسم الفيزياء

أ. برامج الدبلوم في علوم الفيزياء:

ا. دبلوم الفيزياء التطبيقية الحديثة (Modern Applied Physics Diploma)

First Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 8 Credits				
PH501	Solar Energy Physics and its Applications فيزياء الطاقة الشمسية وتطبيقاتها	1	2	2
PH503	X- Rays and its Applications الأشعة السينية وتطبيقاتها	2	–	2
PH505	Applications of Biophysics تطبيقات الفيزياء الحيوية	2	–	2
PH517	Plasma Physics فيزياء البلازما	1	2	2
Optional: Select 4 Credits				
PH509	Quantum Physics فيزياء الكم	2	–	2
PH511	Fundamentals of Electronics أساسيات الإلكترونيات	2	–	2
PH513	Environmental Physics فيزياء بيئية	2	–	2
PH515	Solid state Physics فيزياء الحالة الصلبة	2	-	2
Total Credits		**12**		

Second Semester

Code	Preq.	Course Title	Hours/Week		
			Lec.	Prac.	Cred.
Obligatory: 8 Credits					
PH502	-	Radiation physics فيزياء إشعاعية	2	–	2
PH504	-	Laser Physics and its applications فيزياء الليزر وتطبيقاتها	1	2	2
PH506	-	Introduction to Nuclear Medicine مقدمة في الطب النووي	1	2	2
PH508	-	Introduction to Polymer Physics مقدمة في فيزياء البوليمرات	2	–	2
Optional: Select 4 Credits					
PH510	-	Digital Electronics الإلكترونيات الرقمية	2	–	2
PH512	-	Analytical Techniques التقنيات التحليلية	2	–	2
PH514	-	Renewable Energy Concepts مفاهيم الطاقة المتجددة	2	–	2
PH516	-	Introduction to Plasma Technology مقدمة في تقنية البلازما	2	–	2
Total Credits			**12**		

PH501: Solar energy physics and its applications

This course offers advanced knowledge within the field of photovoltaic system technology. We'll learn about solar energy and how photovoltaic energy conversion is used to produce electric power. From this fundamental starting point, we'll cover the design and fabrication of different solar cell and module technologies, the various photovoltaic system components, how to design a photovoltaic plant and carry out energy yield simulations, essentials in energy economics, and reliability assessment, as well as the role of photovoltaic energy in sustainable energy systems.

PH502: Radiation Physics

Sources of radiation, cosmic rays, radioactive decay, radioactive sources, accelerators, synchrotron radiation, neutron sources, irradiation by neutrons, interactions of charged particles, types of charged particle interaction, interactions of photons, attenuation coefficients, interactions of neutrons, detectors, dosimetry and radiation effects, radiotherapy, imaging, x-ray techniques, diagnostic radiology, nuclearmedicine, magnetic resonance imaging, radiation protection.

PH503: X- Rays and its applications

X-ray spectroscopy: Interactions of X-rays with matter • Properties of conventional X-ray and synchrotron radiation (SR) sources • Quantitative methods in (SR)XRF analysis. NMR, NQR, EPR/ESR, ENDOR, scanning tunneling, acoustic resonance, FTIR, auger electron emission, X-ray photoelectron emission, luminescence, and optical polarization. Emphasis is placed on fundamentals and current methods and procedures, together with the latest applications and developments in the field.

PH504: Laser Physics and its applications

Properties of Lasers, The Einstein Coefficients, Light Amplification, The Threshold Condition, Line Broadening Mechanisms, Laser Rate Equations, The Two-Level System, The three-Level System, The four-Level System, cavity modes, Optical Resonators, Some Laser Systems, Ruby Lasers, Neodymium-Based Lasers, The CO2 Laser, Dye Lasers, Some Important Applications of Lasers, Laser-Induced Fusion, Light Wave Communications, Lasers in Industry, Applications in Material Processing, Laser Tracking, LIDAR, Lasers in Medicine

PH505: Applications of biophysics

Biological structures – Structure and function of proteins and nucleic acids – Biological energy conversion – Photosynthesis – Biological transport processes – membrance -bound energy transduction – Biophysics of nerves – biophysics of contractility – Biophysics of sensory system.

PH506: Introduction to nuclear medicine

Basic principles of nuclear medicine, nuclear medicine and molecular imaging, scope of nuclear medicine, diagnostic nuclear medicine, therapeutic nuclear medicine, nuclear medicine in the digestive system, nuclear medicine in the genitourinary system, dynamic renal scintigraphy, radiopharmaceuticals, cortical renal scintigraphy.

PH507: Plasma Physics

This module has two components. The first provides a basis for understanding the physics of plasmas in general and includes a discussion of laboratory plasmas and in particular the application of plasma physics to fusion. The second applies this knowledge to describe space and astrophysical plasmas. This module will convey how our understanding of plasma physics extends to a description of a huge diversity of systems over hugely varying scales of space, time, density, and temperature. Accelerators and colliders.

PH508: Introduction to polymer physics

Basic Definitions, polymer, monomer, Molecular Weight and Molar Mass, end groups, Degree of Polymerization, copolymers, Polymerization Processes, Classification of Polymers, Polymer Chains, Structures and Dimensions, Conformational Changes, Polymer Conformations in Crystals, Constitutional and Configurational Isomerism, Thermal Transitions in Polymers, Thermal Transitions in Polymers, Chain Movements in Amorphous State, Thermodynamics of Rubber Elasticity, Polymers in Solution, Thermodynamics of Liquid Mixtures, Polymer Molecular Weights, Molecular Weight Determination, End-Group Analysis, Light-Scattering Method.

PH509: Quantum Mechanics

The hydrogen atom- Solved problems - Perturbation Theory and solved problems

Exact soluble problems and solved problems - Hydrogen Like Atoms and Solved problems - Helium atom - the variation method - Solved problems - this course cover quantum physics with applications drawn from modern physics. Topics covered in this course include the general formalism of quantum mechanics, harmonic oscillator, and quantum mechanics in three-dimensions, angular momentum, spin, and addition of angular momentum.

PH510: Digital electronics

Number systems, analogue versus digital, decimal number system, binary number system, octal number system, hexadecimal number system, binary codes, basic rules of binary addition and subtraction, addition of larger-bit binary numbers, subtraction of larger-bit binary numbers, binary multiplication, binary division, positive and negative logic, truth table, logic gates, or gate, AND gate, NOT gate, exclusive-OR gate, NAND gate, NOR gate, universal gates, AND-OR-invert gates, some common applications of logic gates, logic families, transistor transistor logic (ttl), multiplexers and demultiplexers, flip-flops and related devices, multivibrator, integrated circuit (ic) multivibrators, r-s flip-flop, j-k flip-flop, microprocessors, basic microprocessor instructions.

PH511: Fundamentals of electronics

Diode-resistor circuits analyses for principal gates AND & OR - Transistor-resistor circuits analyses for NOT gates - Transistor-diode-resistor circuits analyses for NAND gates - Shift register Types and functions - Shift register Applications - Memory concepts and memory types - Read and Write memory operations - Basic structure of memory - Simplifying logic circuits using Karnugh Maps - Code Conversions - Interfacing the analog and digital signals - Digital – to- Analog (D/A) circuit analyses - Analog – to- Digital (A /D) circuit analyses – Applications in the field of Digital Electronics.

PH512: Analytical Techniques

Inductively coupled plasma mass spectrometry (ICP-MS), Inductively coupled plasma optical emission spectroscopy (ICP-OES), laser-induced breakdown spectroscopy (LIBS), Ultraviolet and Visible Absorption Spectroscopy, Infrared Spectroscopy, X-Ray Fluorescence Spectroscopy, Nuclear Magnetic Resonance Spectroscopy, Raman Spectroscopy, Electron Microscopy, Scanning Electron Microscopy, X-Ray Diffraction (XRD), Instrumental neutron activation analysis.

PH513: Environmental physics

Climate and Climate Change: the Vertical Structure of the Atmosphere, the Radiation Balance and the Greenhouse Effect, Simple Changes in the Radiation Balance, Radiation Transfer, Radioactive Forcing and Global Warming, The Greenhouse Gases.

Heat Engines: Heat Transfer and Storage, Phase Change, The Solar Collector, The Heat Diffusion Equation, Heat Storage, Principles of Thermodynamics, Loss of Exergy in Combustion, Idealized Cycles, Co-Generation of Heat and Electricity, Storage of Electric Energy, Transmission of Electric Power, Pollution from Heat Engines, Nitrogen Oxides NOx,/SO2/ CO/CO2, Aerosols, Volatile Organic Compounds VOC, Thermal Pollution.

Nuclear Power: Nuclear Fission, Stationary Reactor, Time Dependence of a Reactor, Reactor Safety, Nuclear Explosives, Nuclear Fusion, Radiation and Health, Radiation from Nuclear Accidents, Health Aspects of Fusion.

PH514: Renewable Energy concepts

Renewable energy sources, a tailwind for sustainable technology, hydroelectric power plants, solar thermal power plants, photovoltaic energy conversion, new materials for photovoltaics, geothermal power generation, biofuels, biofuels from algae, electric power from hot air, sun, moon and earth as power source, electric automobiles, climate engineering.

PH515: Solid state physics

Dielectrics in static fields: permittivity- polarization- Dielectrics in alternating fields: resonance – relative permittivity- dielectric relaxation- losses- – Piezoelectricity: piezoelectric materials – Ferroelectricity: ferroelectric materials- Thermal properties of dielectrics – electrical breakdown of dielectrics.

PH516: Introduction to plasma technology

Space Plasmas, Kinetic Plasmas, Elastic and Inelastic Collision Processes in Weakly Ionized Gases, the Drift Velocity, the interaction of electromagnetic field with plasmas, The Behaviour of Plasmas at DC and Low Frequencies in the Near Field, Behaviour of Charged Particles in Magnetic Fields (Magnetized Plasmas), Initiation of an Electrical Discharge or Plasma, Coupling processes, Direct Coupling, Indirect Coupling, Induction Coupling, Capacitive Coupling, applications of nonequlibrium cold low-pressure discharges and plasmas, Nonequilibrium Atmospheric Pressure Discharges and Plasmas, Plasmas in Charge and Thermal Equilibrium; Arc Processes, Diagonestic methods, Neutral Particle Density Measurement, Probes and Sensors, The Langmuir Probe, Magnetic Probes.

ب. برامج الماجستير في علوم الفيزياء:

1. برنامج الماجستير في العلوم في فيزياء البلازما والليزر: (Laser and Plasma Physics)

First Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 8 Credits				
PH601	Advanced Quantum Mechanics ميكانيكا كم متقدمة	2	-	2
PH603	فيزياء حاسوبيه متقدمة ومحاكاة Advanced Computational Physics and Simulation	2	-	2
PH605	Molecular and Laser Spectroscopy أطياف جزيئية وليزرية	2	-	2
PH607	Experimental Plasma and Applications بلازما تجريبيه وتطبيقاتها	2	-	2
Optional: Select 4 Credits				
PH609	Selected Topics in Lasers (1) موضوعات مختاره من الليزر (1)	2	-	2
PH611	Advanced Mathematical Physics فيزياء رياضية متقدمة	2	-	2
PH613	Laser Therapy العلاج بالليزر	2	-	2
PH615	Selected Topics in Plasma (1) موضوعات مختارة في البلازما (1)	2	-	2
Total Credits		**12**		

Second Semester

Code	Preq.	Course Title	Hours/Week		
			Lec.	Prac.	Cred.
Obligatory: 8 Credits					
PH602	-	Applied Optics بصريات تطبيقية	2	-	2
PH604	-	Laser Matter Interactions تفاعلات الليزر مع المادة	2	-	2
PH606	-	Laser Systems And Applications أنظمة الليزر وتطبيقاتها	2	-	2
PH608	-	Advanced Plasma Physics فيزياء البلازما المتقدمة	2	-	2
Optional: Select 4 Credits					
PH610	-	Optoelectronics الكترونيات ضوئية	2	-	2
PH612	-	Selected Topics in Plasma (2) موضوعات مختارة في البلازما (2)	2	-	2
PH614	-	Vacuum Technology تكنولوجيا التفريغ	2	-	2
PH616	-	Selected Topics in Optics موضوعات مختاره من البصريات	2	-	2
Total Credits			**12**		

2. برنامج الماجستير في العلوم في الفيزياء النووية والإشعاعية والطاقة العالية:

(High Energy, Radiation and Nuclear Physics)

First Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 8 Credits				
PH601	Advanced Quantum Mechanics ميكانيكا كم متقدمة	2	-	2
PH603	Advanced computational physics and simulation فيزياء حاسوبيه متقدمة ومحاكاة	2	-	2
PH617	Nature and behavior of celestial objects طبيعة الأجرام السمأو ية وسلوكها	2	-	2
PH619	Radiation Interaction with matter تفاعل الإشعاع مع المادة	2	-	2
Optional: Select 4 Credits				
PH611	Advanced Mathematical Physics فيزياء رياضية متقدمة	2	-	2
PH621	Selected topics in Nuclear Physics موضوعات مختاره في الفيزياء النووية	2	-	2
PH623	Nuclear Reactors مفاعلات نووية	2	-	2
PH625	Nuclear Technology التكنولوجيا النووية	2	-	2
PH627	Selected Topics in Radiation Physics موضوعات مختاره في الفيزياء الإشعاعية	2	-	2
Total Credits		**12**		

Second Semester

Code	Preq.	Course Title	Hours/Week		
			Lec.	Prac.	Cred.
Obligatory: 8 Credits					
PH618	-	Advanced semiconductors أشباه موصلات متقدمة	2	-	2
PH620	-	Experimental Nuclear Techniques التقنيات النووية التجريبية	2	-	2
PH622	-	Elementary Particles جسيمات أوليه	2	-	2
PH624	-	Nuclear Detectors and Devices أجهزة وكاشفات نووية	2	-	2
Optional: Select 4 Credits					
PH626	-	Selected topics in High Energy Physics موضوعات مختاره من فيزياء الطاقة العالية	2	-	2
PH628	-	Neutron Scattering تشتت نووي	2	-	2
PH630	-	Nuclear Spectroscopy علم أطياف نووية	2	-	2
PH632	-	Reactors and Neutrons مفاعلات ونيترونات	2	-	2
Total Credits			**12**		

3. برنامج الماجستير في العلوم في الفيزياء الحيوية: (Biophysics)

First Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 8 Credits				
PH601	Advanced Quantum Mechanics ميكانيكا كم متقدمة	2	-	2
PH603	فيزياء حاسوبيه متقدمة ومحاكاة Advanced computational physics and simulation	2	-	2
PH629	Mathematical Biophysics فيزياء حيوية رياضية	2	-	2
PH631	Physics of Radiation Therapy فيزياء العلاج الإشعاعي	2	-	2
Optional: Select 4 Credits				
PH633	Selected topics in Biophysics (1) موضوعات في الفيزياء الحيوية (1)	2	-	2
PH635	Statistical Biophysics فيزياء حيوية إحصائية	2	-	2
PH637	Biophysics methods & measurements قياسات وطرق الفيزياء الحيوية	2	-	2
PH639	Radiation Immunity مناعة إشعاعية	2	-	2
Total Credits		**12**		

Second Semester

Code	Preq.	Course Title	Hours/Week		
			Lec.	Prac.	Cred.
Obligatory: 8 Credits					
PH634	-	Bioelectronics الكترونيات حيوية	2	-	2
PH636	-	Nuclear medicine طب نووي	2	-	2
PH638	-	Control and Communication Biophysics الفيزياء الحيوية للتحكم والاتصال	2	-	2
PH640	-	Molecular Biophysics فيزياء حيوية وجزيئيه	2	-	2
Optional: Select 4 Credits					
PH642	-	Selected topics in Biophysics (2) موضوعات في الفيزياء الحيوية (2)	2	-	2
PH644	-	Radiation Protection and Health Physics الحماية من الإشعاع والفيزياء الصحية	2	-	2
PH646	-	Biophysics of cells and tissues الفيزياء الحيوية للخلايا والأنسجة	2	-	2
PH648	-	Substitutional Biomaterials مواد حيوية بديلة	2	-	2
Total Credits			**12**		

4. برنامج الماجستير في العلوم في فيزياء علوم المواد والإلكترونيات:

(Electronics and Materials Science Physics)

First Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 8 Credits				
PH601	Advanced Quantum Mechanics ميكانيكا كم متقدمة	2	-	2
PH603	فيزياء حاسوبيه متقدمة ومحاكاة Advanced computational physics and simulation	2	-	2
PH641	خواص العوازل ونظريه الاسترخاء Properties of Insulators and Relaxation Theory	2	-	2
PH619	Radiation Interaction with matter تفاعل الإشعاع مع المادة	2	-	2
Optional: Select 4 Credits				
PH611	Advanced Mathematical Physics فيزياء رياضية متقدمة	2	-	2
PH645	Selected topics in Materials Science موضوعات مختارة من علوم المواد	2	-	2
PH647	Advanced Solid-State Physics فيزياء الجوامد المتقدمة	2	-	2
PH649	Selected topics in digital electronics موضوعات مختاره في الإلكترونيات الرقمية	2	-	2
Total Credits		**12**		

Second Semester

Code	Preq.	Course Title	Hours/Week		
			Lec.	Prac.	Cred.
Obligatory: 8 Credits					
PH618	-	Advanced semiconductors أشباه موصلات متقدمة	2	-	2
PH610	-	Optoelectronics الكترونيات ضوئية	2	-	2
PH650	-	Physics of Polymers فيزياء البوليمرات	2	-	2
PH660	-	Modern Electronics الكترونيات حديثة	2	-	2
Optional: Select 4 Credits					
PH604	-	Laser Matter Interactions تفاعلات الليزرمع المادة	2	-	2
PH614	-	Vacuum Technology تكنولوجيا التفريغ	2	-	2
PH652	-	Surface Physics and Thin films فيزياء الأسطح والأغشية الرقيقة	2	-	2
PH654	-	Micromagnetism مغناطيسيه دقيقة	2	-	2
Total Credits			**12**		

5. برنامج الماجستير في العلوم في فيزياء الجوامد والطاقة الشمسية:

(Solar Energy and Solid-State Physics)

First Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 8 Credits				
PH601	Advanced Quantum Mechanics ميكانيكا كم متقدمة	2	-	2
PH603	Advanced computational physics and simulation فيزياء حاسوبيه متقدمة ومحاكاة	2	-	2
PH641	Properties of Insulators and Relaxation Theory خواص العوازل ونظريه الاسترخاء	2	-	2
PH651	Advanced solar energy and applications طاقة شمسية متقدمة وتطبيقاتها	2	-	2
Optional: Select 4 Credits				
PH611	Advanced Mathematical Physics فيزياء رياضية متقدمة	2	-	2
PH653	Selected topics in Solid state Physics موضوعات مختاره في فيزياء الجوامد	2	-	2
PH647	Advanced Solid-State Physics فيزياء الجوامد المتقدمة	2	-	2
PH655	Selected topics in Renewable Energy موضوعات مختاره من الطاقة المتجددة	2	-	2
Total Credits		**12**		

Second Semester

Code	Preq.	Course Title	Hours/Week		
			Lec.	Prac.	Cred.
Obligatory: 8 Credits					
PH618	-	Advanced semiconductors أشباه موصلات متقدمة	2	-	2
PH650	-	Physics of Polymers فيزياء البوليمرات	2	-	2
PH656	-	Renewable Energy Resources مصادر طاقة متجددة	2	-	2
PH652	-	Surface Physics and Thin films فيزياء الأسطح والأغشية الرقيقة	2	-	2
Optional: Select 4 Credits					
PH604	-	Laser Matter Interactions تفاعلات الليزر مع المادة	2	-	2
PH610	-	Optoelectronics الكترونيات ضوئية	2	-	2
PH614	-	Vacuum Technology تكنولوجيا التفريغ	2	-	2
PH654	-	Micromagnetism مغناطيسيه دقيقه	2	-	2
PH658	-	Superconductivity التوصيلية الفائقة	2	-	2
Total Credits			**12**		

PH601: Advanced Quantum Mechanics

The hydrogen atom- Solved problems - Perturbation Theory and Solved problems
Exact soluble problems and Solved problems - Hydrogen Like Atoms and Solved problems - Helium atom - the variation method - Solved problems - this course cover quantum physics with applications drawn from modern physics. Topics covered in this course include the general formalism of quantum mechanics, harmonic oscillator, quantum mechanics in three-dimensions, angular momentum, spin, and addition of angular momentum.

PH602: Applied Optics

A review of basic concepts of interference and diffraction, Fourier Optics, Holography, Optical Coherence, Brief Introduction to Lasers, Laser Beam Propagation and Gaussian Optics, Introduction to Nonlinear Optics, Introduction to Ultrafast Optics, Basics of light-matter interactions

PH603: Advanced Computational Physics and Simulation

Interfacing and programming – Multi layer neural networks – Multi layer model – Numerical method of integration – Modeling of biophysical problems with programming. This physics-based programme is for students interested in computing, modelling and simulation. You will study programming – algorithms-problem-solving methodologies.

PH604: Laser Matter Interactions

Absorption of Laser Light, Optical Properties, Modified Optical Properties, Phase Transitions and Shape Effects, Heating by Laser Light, Temperature Distributions, Heat-Treatment Processes, Melting and Solidification, Evaporation and Plasma Formation, Pulsed Laser Deposition, Nanosecond Laser Ablation and Processing of Solids in Vacuum in a High-Pressure Atmosphere, Femtosecond Laser Ablation of Solids in Vacuum and Low-Pressure Gas Atmosphere, Nanoparticle Generation by Laser Ablation, Ultrafast Laser-Induced Phenomena inside Transparent Materials, Laser Materials Processing.

PH605: Molecular and Laser spectroscopy

Lasers as spectroscopic light sources, Spectral line broadening, Spectroscopic techniques, Steady state spectroscopy,Spectrophotometers, Raman spectroscopy, Absorption spectroscopy, Fluorescencs spectroscopy, Nonlinear spectroscopy. Time-resolved spectroscopy, Liftime measurements, Photoelectron spectroscopy, Laser-induced breakdown spectroscopy, Laser ablation inductively coupled optical emission spectroscopy. New developments in laser spectroscopy.

PH606: Laser Systems and Applications

Ideal laser – Gas Laser-He-Ne-Ar Laser – Metal vapor and molecular gas Laser-CO_2 and Excimer Laser- Semiconductor lasers, Nd:YAG laser, Ruby laser, Metal vapor laser - Properties of Gas laser-He-Ne laser amplifier and Set Up and applications-Argon Laser amplifier , setup ,applications and Features-Metal vapor laser-Co_2 Laser features and applications-Molecular energy levels and vibrational states- Solid state Lasers – Neadymium laser-Eribium laser-crystal laser-Tunable and vibronic laser-Dye Laser.

PH607: Experimental Plasma and applications

Basic concepts of plasmas • Single-particle motion in electric and magnetic fields • Plasmas as fluids, magnetohydrodynamics • Waves in plasmas (electrostatic, electromagnetic and acoustic waves) • Collisions, diffusion and resistivity • Equilibrium and stability, plasma instabilities • Plasma kinetic theory • Nonlinear effects (plasma sheaths, shock waves, solitons) • Special plasmas (ultracold plasmas, dusty plasmas, atmospheric-pressure plasmas) • Plasma engineering applications (semiconductor etching, surface treatment, • spacecraft propulsion, fusion energy)

PH608: Advanced Plasma physics

This module has two components. The first provides a basis for understanding the physics of plasmas in general and includes a discussion of laboratory plasmas and in particular the application of plasma physics to fusion. The second applies this knowledge to describe space and astrophysical plasmas. This module will convey how our understanding of plasma physics extends to a description of a huge diversity of systems over hugely varying scales of space, time, density, and temperature.

PH609: Selected Topics in Lasers (1)

PH610: Optoelectronics

This course provides an introduction to optical data transmission. It covers the materials used in optoelectronics, the operation of LEDs and lasers, optical fibres, optical detectors and concepts for modern optical fiber communication systems. The aim of this course is to develop in students a comprehensive understanding of optical data transmission, from the underlying semiconductor materials and active devices, through transmission media, to multiplexing techniques and overall systems design.

PH611: Advanced Mathematical Physics

General Theory of Partial Differential Equations of First Order. Differential Equations of Higher Order. Potential Theory and Elliptic Differential Equations. Hyperbolic Differential Equations in Two Independent Variables. Hyperbolic Differential Equations in More than Two Independent Variables.

PH612: Selected Topics in Plasma (2)

PH613: Laser Therapy

Principles of Laser Application in Medicine, Action Mechanisms of Laser Radiation in Biological Tissues, Properties of Biological Tissues, Interactions of Laser Radiation with Biological Tissue, Photochemical Effects, Thermal Effects, Thermal and Non-Thermal Effects on Tissues, Technical Basics of Medical Laser Systems, Dose- Effect-Controlled Nd: YAG Laser System for the Cutting of Tissues, Beam-Handling Systems, Laser Medicine Technology and Dosimetry, Therapeutic Guidelines, Basics of Laser-Induced Thermotherapy (LlTT), Laser Applications in Ophthalmology, Dental Laser Applications, Endoscopic Laser Treatment, Laser Treatments in Plastic Surgery and Dermatology, Laser Treatment in Urology, Laser Application in Orthopaedic Medicine, Laser Applications in Diagnostics,

Laser Safety in Medicine. Introduction to laser therapy, Low-level laser light therapy, Tissue optics, Optical properties of tissues, Methods used for the measurement of optical parameters of tissues, Light–tissue interaction, Light dosimetry, Photobiomodulation, Water as a photoacceptor and energy transducer in Photobiomodulation, Molecular basis for photobiomodulation, Clinical applications of low-level laser therapy.

PH614: Vacuum Technology

Designing of Evacuation Systems: Selection of Pumping Speed- Pumping-down Characteristics -State Evacuation - Roughing System - Backstreaming of RP Oil Vapor - Backstreaming of DP Oil Vapor - Overload in High-Vacuum Evacuation Systems - DP In-Series System - Ultrahigh Vacuum Electron Microscopes - Know-how Technology in Designing UHV Evacuation Systems

Vacuum Pumps : Mechanical Pumps - Diffusion Pumps - Turbomolecular Pumps - Dry Vacuum Pumps - Cryopumps - Vapor Pressures for Gases -Sputter Ion Pumps - Noble Pumps for Inert Gases - Getter Pumps -Titanium-Sublimation Pumps - Non-Evaporable Getter (NEG) Pumps - Methods for Measuring Pumping Speeds - Simulation of Pressures in High-Vacuum Systems. - Basic Concept of Vacuum Circuits - Designing of Vacuum Circuits - Simulation of Pressures - Resistor-Network Simulation Method - Outgassing : Process of Outgassing - Diffusion -Recombination-limited Outgassing - Vacuum Gauges. - New Gauges for Measuring Extreme High Vacuum.

PH615: Selected Topics in Plasma (1)

PH616: Selected topics in Optics

The selected topics in the field of Optics will be chosen by the main supervisor of the thesis.

PH617: Nature and behavior of celestial objects

Astrophysics is the science that endeavours to understand the universe and its contents through observations and the applications of physical laws. The phenomena we seek to explain include the distribution of matter on the largest scales, and the nature and behaviour of celestial objects; these objects include galaxies and quasars, stars and planets, comets, pulsars and black holes.

PH618: Advanced Semiconductors

Introduction to semiconductor physics - Materials used as semiconductors - Structure and crystal structure of semiconductors - Energy bands and photoelectric properties of semiconductor - Phonons and thermal properties - The interaction between photons and phonons - The interaction between photons and electron - Effect of structural defects on light absorption - Defects in semiconductors Conductors - Transmission of current carriers - Generation and union processes of current carriers - Photoelectric conduction - Study of the electrical and optical properties of some electronic devices.. Semiconductor Basics 2. PN Junction Theory 3. PN Junction Diode 4. The Signal Diode 5. Power Diodes and Rectifiers 6. Full Wave Rectifier 7. The Zener Diode 8. The Light Emitting Diode 9. Bypass Diodes in Solar Panels10. Diode Clipping Circuits 11. The Schottky Diode

Ph619: Radiation interaction with matter

the basic concepts of radiation-matter interactions. Different modes of interactions of charged particles (electron, positron, alpha, proton, ions) with matter; Stopping power of heavy charged particles, electron

and positron; Cerenkov. Coulomb Elastic interactions, interactions of neutral radiations (photons and neutrons) with matter. the different modes of interactions of photon with matter (Photoelectric effect, Compton effect, Pair creation). Radio-protection and the standard radioprotection units.

PH620: Experimental Nuclear Techniques

Introduction, Pulse signals in nuclear electronics : Pulse Signal Terminology - Analog and Digital Signals - Fast and Slow Signals - The Frequency Domain. Bandwidth - The NIM standard : Modules - Power Bins - NIM Logic Signals –TTL and ECL Logic Signals -Analog Signals - Signal Transmission : Coaxial Cables - The General Wave Equation for a Coaxial Line - The Ideal Lossless Cable - Reflections - Cable Termination. Impedance Matching - Losses in Coaxial Cables. Pulse Distortion - Mössbauer XPS - Neutron activation analysis - Ion beam spectroscopic techniques

PH621: Selected topics in Nuclear Physics

PH622 : Elementary particles

In this course the following topics are covered:

This course is devoted to demonstrate main stages in the development of the physics of the atomic nucleus and particles as well as the scale of the phenomena of the micro world. In connection with this purpose, the following topics are to be studied: Properties of atomic nuclei; Radioactivity; Nucleon - nucleon interaction and properties of nuclear forces; Models of atomic nuclei; Nuclear reactions; Particles and interactions.

PH623: Nuclear Reactors

Nuclear Reactor Theory and Reactor Analysis - Discovery of the Neutron and Nuclear - Fission and Invention of the Nuclear Reactor - Nuclear Structure and Nuclear – Energy - Elementary Particles and Fundamental Forces - Constitution of Atom and Nucleus - Sizes of Atoms and Nuclei and Their Energy - Mass of a Nucleus - Nuclear Reactions - Decay of a Nucleus - Distribution of Nuclides and Nuclear Fission/Nuclear Fusion

PH624: Nuclear Detectors and Devices

General characteristics of detectors – Sensitivity - Detector response - Energy resolution - The response function - Response time - Detector efficiency - Dead time - Measuring dead time - Ionization detectors - Gaseous ionization detectors - Transport of electrons and ions in gas chamber - Proportional counter - Geiger Muller counter - Scintillation detectors - General characteristics - Organic scintillators mechanism - Types of organic scintillators - Inorganic crystals - Gaseous scintillators - Glass scintillators - Photomultiplier tubes - Operating parameters – Noise - Environmental factors - Semiconductor detectors - Basic semiconductor properties - Doped semiconductors - Depletion layer - Silicon diode detectors - Neutron detectors - Neutron classification - Detection through nuclear reaction for slow neutrons - Detectors based on the Boron reaction - Fast neutron detection

PH625: Nuclear Technology

Introduction to PWR Systems. Core Characteristics. Reactor Core and Vessel Construction. Reactor Coolant System - Piping and Components. Reactor Coolant System Instrumentation Pressurizer.

Pressure Control. Chemical and Volume Control System. Pressurizer Level Control. Main and Auxiliary Steam. Condensate and Feedwater Systems.

PH626: Selected topics in High Energy Physics

The selected topics in the field of High Energy Physics will be chosen by the main supervisor of the thesis.

PH627: Selected topics in Radiation Physics

The selected topics in the field of Radiation will be chosen by the main supervisor of the thesis.

PH628: Neutron Scattering

Fundamentals of Neutron Scattering by Condensed Matter, Neutron Diffraction, Excitations, Critical Scattering, Neutron Scattering in Liquids, Diffuse Scattering, Small Angle Scattering and Polymers, Small-Angle Neutron Scattering in Materials Science.

PH629: Mathematical Biophysics

Curve and equation fitting – Roots finding – Fourier analysis – Laplace transform – Some special theories – Poissan series and biological applications – Monte carlo simulation

PH630:Nuclear spectroscopy

Nuclear spectroscopy involves the measurement of particles and radiation emitted from atomic nuclei excited by nuclear reactions or following the decay of radioactive atoms. Applications for nuclear spectroscopy exist in a number of areas, including (1) studies of nuclear structure, nuclear reactions, and radioactive decay; (2) studies of the chemical and physical properties of heavy elements; (3) studies of macroscopic phenomena, such as astrophysics or geochronology where nuclear processes are involved; (4) measurement of radioactive isotopes used in nuclear medicine; and (5) measuring the amounts of elements present in samples using techniques, such as activation analysis. Appreciation of nuclear spectroscopy and its applications benefits from an understanding of the elementary principles of nuclear physics such as nuclear structure, nuclear reactions, and radioactive decay. The course continues with descriptions of irradiation sources, radiation detection, and measurement. It concludes by describing several nuclear analytical techniques and some of the more important applications.

PH631: Physics of Radiation Therapy

Quality of X-ray Beams - Measurement of Absorbed Dose Dose - Distribution and Scatter Analysis - System of Dosimetric Calculations - Isodose istributions- Treatment Planning: Field Shaping, Skin Dose, and Field Separation - Proton Beam Therapy - Electron Beam - Low-Dose-Rate Brachytherapy Modern Radiation Therapy.

PH632: Reactors and Neutrons

Neutron Nuclear Reactions - Neutron Reactions and Characteristics - Scattering of Neutrons - Nuclear Fission - Chain Reaction - Neutron Flux and Cross-section - Nuclear Reactors and their Structures - Thermal Reactor - Breeder Reactors.

PH633: Selected topics in Biophysics (1)

The selected topics in the field of **Biophysics** will be chosen by the main supervisor of the thesis.

PH634: Bioelectronics

Construction and circuits of: Preamplifier, amplifier, digital circuits, cathode ray oscilloscope and biological stimulators, advanced measuring instruments.

PH635: Statistical Biophysics

Distribution functions – Debye theorem – Degenerate gases – System of interacting particles (Gibbs method) – Theory of fluctuations – Phase transitions.

PH636: Nuclear medicine

Physical and technical principles of the nuclear medical equipment, production and absorption mechanisms of the radiopharmaceuticals, calculation dose, and inject radiopharmaceuticals, nuclear medical examinations. gamma camera, PET - CT.

PH637: Biophysics methods & measurements

Spectroscopy: Absorbance spectrometer, Fluorescence spectrometer, CD spectroscopy, Calorimetry, Analytical ultracentrifugation, Microscopies (optical and electronic), Single Molecule Techniques.

PH638: Control and Communication Biophysics

Neural Physics and structure, Electrical Properties of Living Cells, Neural Network and Methods of Information Transition in Living Bodies, Artificial Intelligence, Central Nervous System Modeling

PH639: Radiation Immunity

Functions of immune system – cell and tissue of immune response – Antigen – Antibody – Defense – Allergy and auto immunity – Transplantation – Cancer and immunity.

PH640: Molecular Biophysics

Macromolecules Spectra, Biomolecular Structure, Modeling of Biomolecules, Dynamics of biomolecules, Non-equilibrium thermodynamics and biochemical reaction – molecular biological machines.

PH641: Properties of Insulators and Relaxation Theory

Dielectric materials, electric susceptibility, storage, and dissipation of electric and magnetic energy in materials, dielectric polarization, dielectric dispersion, dielectric relaxation, Debye relaxation, theory of thermal dielectric relaxation and direct determination of trap parameters, some practical dielectrics. Dielectrics in static fields: permittivity- polarization, Dielectrics in alternating fields: resonance – relative permittivity- dielectric relaxation- losses- – Piezoelectricity: piezoelectric materials – Ferroelectricity: ferroelectric materials- Thermal properties of dielectrics – electrical breakdown of dielectrics.

PH642: Selected topics in Biophysics (2)

PH644: Radiation Protection and Health Physics

Safety criteria and regulations – Methods of radiation protection – Shielding – Evaluation of protective measures – Internal radiation protection – Contamination limits.

PH645: Selected topics in Material Science

The selected topics in the field of **Material Science** will be chosen by the main supervisor of the thesis.

PH646: Biophysics of cells and tissues

Biological structures – Structure and function of proteins and nucleic acids – Biological energy conversion – Photosynthesis – Biological transport processes – membrance -bound energy transduction – Biophysics of nerves – biophysics of contractility – Biophysics of sensory system.

PH647: Advanced Solid-State Physics

Introduction, Electronic band structure, Semiconductors, Phonons, Magnetic effects and Fermi surfaces, Linear response theory and optical properties, Crystal Physics, Structural phase transitions, Landau theory of phase transitions, Quasiparticles, Electron-electron interactions, Metal - Insulator transitions.

PH648: Substitutional Biomaterials

Surface chemistry of materials – Metals as implant materials – Polymers and plastics – Ceramics – Tissue reactions – bioimplants and overall systems design.

PH649: Selected topics in Digital Electronic

The selected topics in the field of **Digital Electronics** will be chosen by the main supervisor of the thesis.

PH650: Physics of Polymers

Definition of polymers, types of polymers, physical properties of polymers, Polymer solution, polymer crystallization, conjugated polymers, mechanical and dielectric response, optics of polymers.

PH651: Advanced solar energy and applications

This course offers advanced knowledge within the field of photovoltaic system technology. We'll learn about solar energy and how photovoltaic energy conversion is used to produce electric power. From this fundamental starting point, we'll cover the design and fabrication of different solar cell and module technologies, the various photovoltaic system components, how to design a photovoltaic plant and carry out energy yield simulations, essentials in energy economics, and reliability assessment, as well as the role of photovoltaic energy in sustainable energy systems.

PH652: Surface Physics and Thin films

Surface Physics and Thin Films, Ultra High, Vacuum and clean surfaces, Surface Crystallography, • Surface Thermodynamics, The electronic structure of surfaces, Surface Chemical Analysis : XPS, Adsorption • Thin Films: Thin film growth, Evaporation, • Sputter deposition

PH653: Selected topics in Solid State Physics

The selected topics in the field of **Solid State Physics** will be chosen by the main supervisor of the thesis.

PH654: Micromagnetism

Static micromagnetics, Exchange energy, Anisotropy energy, Zeeman energy, Energy of the demagnetizing field, Magnetoelastic Energy, Dynamic micromagnetics, Effective field, Landau-Lifshitz-Gilbert equation, Applications.

PH655: Selected topics in Renewable Energy

PH656: Renewable energy Resources

Aims: An understanding of the principles of renewable energy technologies is key to assimilate the technological basis of the systems and applications. The module provides the fundamentals of the renewable energy technologies and their impact on global and national energy system. The purpose of this module is to introduce the basis for assessment of the performances of solar, wind, wave and tidal, geothermal as well as hydro-electricity technologies. By the end of the module, you will have a better understanding of the various renewable technologies and will have the opportunity to visit a PV solar plant to see the real dimension of an operational plant. Energy resources and their utilization- Solar radiations - Solar devices - Solar thermal energy - Solar photovoltaic systems - Energy consuming and converting equipment - nanotechnology and solar power - Wind energy - Hydroelectric power - Tide, wave and ocean energy - Geothermal power generation - Biofuels: A review- Biogas - Biomass gasification – Photosynthesis – Ethanol – Biodiesel - Biohydrogen - Algae fuel for future.

PH658: Superconductivity

Superconductivity- Topics include electrodynamics of superconductors, London's model, flux quantization, Josephson Junctions, superconducting quantum devices, equivalent circuits, high-speed superconducting electronics, and quantized circuits for quantum computing. Ccharacterization of superconducting materials, strands and cables at liquid helium temperature, including the definition of dedicated experiments on existing or new test installations, the design of test stations operated at liquid helium temperatures and conceive experiments for the measurement of structural, electrical, magnetic and mechanical properties of superconductors. Low temperature superconducting materials - High temperature superconductivity.

PH660: Modern Electronics

Diode-resistor circuits analyses for principal gates AND & OR - Transistor-resistor circuits analyses for NOT gates - Transistor-diode-resistor circuits analyses for NAND gates - Shift register Types and functions - Shift register Applications - Memory concepts and memory types - Read and Write memory operations - Basic structure of memory - Simplifying logic circuits using Karnugh Maps - Code Conversions - Interfacing the analog and digital signals - Digital – to- Analog (D/A) circuit analyses - Analog – to- Digital (A /D) circuit analyses – Applications.

ت. برامج الدكتوراه في علوم الفيزياء:

1. برنامج الدكتوراه في العلوم في فيزياء البلازما والليزر (Laser and Plasma Physics):

First Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
PH701	Advanced Special Course in Plasma (1) مقرر خاص بلازما متقدم (1)	2	-	2
Optional: 2 Credits				
PH703	Advanced Special Course in Laser (1) مقرر خاص ليزر متقدم (1)	2	-	2
PH705	Nonlinear optics البصريات الغير خطيه	2	-	2
PH707	Quantum optics بصريات كمية	2	-	2
PH709	Applications of Plasma in Solar Cell Fabrication تطبيقات البلازما في صناعه الخلايا الشمسية	2	-	2
PH711	Low Temperature Plasmas Technology تقنيات البلازما منخفضه الحرارة	2	-	2
PH713	Plasma Simulation محاكاه البلازما	2	-	2

Second Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
PH704	Advanced Special Course in Laser (2) مقرر خاص ليزر متقدم (2)	2	-	2
Optional: 2 Credits				
PH702	Advanced Special Course in Plasma (2) مقرر خاص بلازما متقدم (2)	2	-	2
PH706	Plasma Technology for Biomedical Applications تقنيات البلازما لتطبيقات الطب الحيوي	2	-	2
PH708	Environmental Applications of Plasmas تطبيقات بيئية للبلازما	2	-	2
PH710	Fiber Optics ألياف ضوئية	2	-	2
PH712	Lasers in Materials Science الليزر في علوم المواد	2	-	2
PH714	Dust Plasma Physics فيزياء البلازما الغبارية	2	-	2

2. برنامج الدكتوراه في العلوم في الفيزياء النووية والإشعاعية والطاقة العالية:

(High Energy, Radiation and Nuclear Physics)

First Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
PH715	Advanced Special Course in Nuclear Physics (1) مقرر خاص فيزياء نووية متقدم (1)	2	-	2
Optional: 2 Credits				
PH717	Advanced Special Course in Radiation Physics (2) مقرر خاص فيزياء إشعاعيه متقدم (2)	2	-	2
PH719	Particles Accelerators معجلات الجسيمات	2	-	2
PH721	Heavy ion physics فيزياء الأيونات الثقيلة	2	-	2
PH723	Advances in Mathematical Physics الفيزياء الرياضية المتقدمة	2	-	2
PH725	Advanced Nuclear Reactors المفاعلات النووية المتقدمة	2	-	2
PH727	Advanced Nuclear Technology التقنيات النووية المتقدمة	2	-	2

Second Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
PH716	Advanced Special Course in Radiation Physics (2) مقرر خاص فيزياء إشعاعية متقدم (2)	2	-	2
Optional: 2 Credits				
PH718	Advanced Special Course in High energy Physics (2) مقرر خاص فيزياء طاقه عالية متقدمة (2)	2	-	2
PH720	Selected topics in Advanced High Energy Physics موضوعات مختاره في فيزياء الطاقة العالية المتقدمة	2	-	2
PH722	Advanced Digital electronics الكرتونيات رقميه متقدمة	2	-	2
PH724	Selected topics in Advanced Nuclear Spectroscopy دراسة أطياف نووية متقدمة	2	-	2
PH726	Advanced Reactors and Neutrons مفاعلات نووية متقدمة و نيترونات	2	-	2

3. برنامج الدكتوراه في العلوم في الفيزياء الحيوية: (Biophysics)

First Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
PH729	Advanced Special Course in Biophysics I مقرر خاص الفيزياء الحيوية متقدمة 1	2	-	2
Optional: 2 Credits				
PH731	Single-molecule biophysics الفيزياء الحيوية أحادية الجزيء	2	-	2
PH733	Advanced Radiation Therapy العلاج الإشعاعي المتقدم	2	-	2
PH735	Advanced Health Physics فيزياء صحية متقدمة	2	-	2

Second Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
PH730	Physics of Medical Imaging فيزياء التصوير الطبي	2	-	2
Optional: 2 Credits				
PH728	Advanced Special Course in Biophysics II مقرر خاص الفيزياء الحيوية متقدمة 2	2	-	2
PH732	Neuroscience علم الأعصاب	2	-	2
PH734	Advanced Biomaterials and regenerative medicine المواد الحيوية المتقدمة والطب التجديدي	2	-	2

4. برنامج الدكتوراه في العلوم في فيزياء علوم المواد والالكترونيات:

(Electronics and Materials Science Physics)

First Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
PH737	Advanced Special Course in Electronics I مقرر خاص الكرتونيات متقدمة 1	2	-	2
Optional: 2 Credits				
PH739	Advanced Special Course in Materials Science I مقرر خاص علوم مواد متقدم 1	2	-	2
PH741	Advanced Semiconductor Physics فيزياء أشباه الموصلات المتقدمة	2	-	2
PH743	Nano-scale magnetic materials المواد المغناطيسية النانو متريه	2	-	2
PH745	Computer Structure تركيب الحاسب	2	-	2
PH747	Troubleshooting Digital Circuits and Test Equipment حل مشاكل الدوائر الرقمية وأجهزة القياس	2	-	2

Second Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
PH738	Advanced Special Course in Materials Science II مقرر خاص علوم مواد متقدم 2	2	-	2
Optional: 2 Credits				
PH736	Advanced Special Course in Electronics II مقرر خاص إلكترونيات متقدم 2	2	-	2
PH740	Electrochemical Energy Storage Systems أنظمة تخزين الطاقة الكهروكيميائية	2	-	2
PH742	Selected Topics in nano-materials موضوعات مختاره في المواد النانو متريه	2	-	2
PH744	Advances in microcontrollers and microprocessors المعالجات والحاكمات الدقيقة المتقدمة	2	-	2
PH722	Advanced Digital electronics الكترونيات رقميه متقدمة	2	-	2

5. برنامج الدكتوراه في العلوم في فيزياء الجوامد والطاقة الشمسية:

(Solar Energy and Solid-State Physics)

First Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
PH749	Advanced Special Course in Solid State I مقرر خاص فيزياء الجوامد متقدم 1	2	-	2
Optional: 2 Credits				
PH751	Advanced Special Course in Solar energy I مقرر خاص الطاقة الشمسية متقدم 1	2	-	2
PH741	Advanced Semiconductor Physics فيزياء أشباه الموصلات المتقدمة	2	-	2
PH743	Nano-scale magnetic materials المواد المغناطيسية النانومترية	2	-	2
PH753	Thermal applications of solar energy تطبيقات حرارية للطاقة الشمسية	2	-	2
PH755	Simulation in solar cells محاكاه الخلايا الشمسية	2	-	2
PH757	Electrical applications of solar energy تطبيقات كهربيه للطاقة الشمسية	2	-	2

Second Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
PH748	Advanced Special Course in Solar energy II مقرر خاص الطاقة الشمسية متقدمة 2	2	-	2
Optional: 2 Credits				
PH746	Advanced Special Course in Solid State II مقرر خاص فيزياء الجوامد المتقدمة 2	2	-	2
PH742	Selected Topics in nano-materials موضوعات مختارة في المواد النانو مترية	2	-	2
PH750	Materials for solar cell fabrication المواد لصناعة الخلايا الشمسية	2	-	2
PH752	Art of state of manufacturing and applications of ferrites تصنيع وتطبيقات الفريتات	2	-	2
PH754	Simulation in thermal systems المحاكاة في الأنظمة الحرارية	2	-	2

توصيف مقررات الدكتوراه

PH701: Advanced Special Course in Plasma (1)
Selected advanced topics in the field of Plasma chosen by the main supervisor of the thesis.

PH702: Advanced Special Course in Plasma (2)
Selected advanced topics in the field of Plasma chosen by the main supervisor of the thesis.

PH703: Advanced Special Course in Laser (1)
Selected advanced topics in the field of **Laser** chosen by the main supervisor of the thesis.

PH704: Advanced Special Course in Laser (2)
Selected advanced topics in the field of Laser chosen by the main supervisor of the thesis.

PH705: Nonlinear optics
A review of laser physics and an introduction to non-linear optical phenomena with applications. Laser physics content: optical amplification, gain saturation, laser threshold and efficiency, spatial and spectral mode control, CW and pulsed lasers, including Q-switching, cavity dumping and mode locking. Nonlinear optics content: chi-2 processes, three-wave mixing and phase matching chi-3 processes, third-harmonic generation, optical Keff effect; Inelastic scattering, stimulated Raman scattering.

PH706: Plasma technology for biomedical applications
At the end of the course the students will be able to characterize the state of the art of the industrial processes assisted by thermal (hot) plasmas for the production and treatment of high added value materials; the same on the side of most advanced Technologies using atmospheric pressure non-equilibrium (cold) plasmas for application ranging from use in the energy industry to use in biomedical and plasma medicine applications. The students will be able to relate to patent literature with particular emphasis on the most recent industrial developments of thermal and non-equilibrium plasma sources. The design of those systems will be described together with experimental analysis of the plasma assisted processes used in industrial applications.

PH707: Quantum optics
The course provides a basis for the quantum description of optics, lasers, and coherent optical processes. The covered topics include: quantum nature of light, notion of a photon, photon detection processes, coherent and squeezed states of the radiation field, lasers, and nonlinear optics. We further describe experimental techniques in quantum optics such as single-frequency lasers and single-photon sources, photon counters, optical cooling,

PH708: Environmental Applications of Plasmas
Introduction to plasma sources in atmospheric pressure condition: dielectric barrier discharge, pulsed corona, arc, elongated arc, and microwave plasma. Application fields for mechanical engineers. Energy:

fuel reforming and combustion. Environment: after-treatment of hazardous gases. Manufacturing: surface treatment of materials. Plasma devices for biomedical application.

PH709: Applications of plasma in solar cell fabrication

Revision of Plasma Physics Fundamentals- Plasma Deposition Tools: Sputter deposition- Plasma Enhanced Vapor Deposition- Cleaning procedure with NF_3- Cost control by quality and process management- PECVD of Amorphous and Microcrystalline Silicon Thin Films: Elementary Processes in Silane/Hydrogen Plasmas- Fundamentals of Plasma-Surface Interactions- Film Growth Control- Plasma Diagnostics and Monotoring of SiH_4 / H_2- Future Concepts.

PH710: Fiber Optics

The course is aimed at equipping the students with the basic understanding of optical fibers and optical fiber communication. The course provides knowledge of optical fiber waveguide at fundamental level, essentials of an optical fiber communication system and understanding of various components of an optical fiber telecommunication system.

PH711: Low temperature plasmas technology

Fundamentals of plasma physics, • plasma sources, • thermal and low pressure plasmas, • atomic processes, • electron kinetics, • diagnostics and plasma spectroscopy, • modeling, • plasma-surface interactions.

PH712: Lasers in Materials Science

Fundamentals of Laser Physics, Fundamentals of Laser-Materials Interactions, Laser Systems Used in Materials Processing, Laser Ablation, Material Response to Laser Energy Deposition (Thermal and Non-Thermal), Response of Metals, Response of Dielectrics and Semiconductors, Impact/Avalanche and Multiphoton Ionization, Non-Thermal Melting, Formation of Laser-Induced Periodic Surface Structures, Coulomb Explosion, Photochemical Ablation, Laser Melting, Photomechanical Spallation, Phase Explosion and Cluster Ejection, Ultrafast Laser Excitation of Wide-Bandgap Dielectrics, Attosecond Pulses for Atomic and Molecular Physics, Laser Interactions for the Synthesis of Nanomaterials, Carbon Nanostructure Synthesis in Laser Vaporization, Industrial Applications of Laser-Material Interactions for Coating Formation, Laser Synthesis of Nanoparticles for Therapeutic Drug Monitoring, Lasers in Thin Film Deposition.

PH713: Plasma Simulation

Numerical integration and differentiation, errors in numerical calculations, analytical models and their limitation, numerical fluid simulation, numerical kinetic simulation, Particle-in-cell, commercial and open softwares, applications on nonlinear plasma phenomena.

PH714: Dust plasma physics

The student should be learn more about; characteristics of plasma and dust plasma, dusty plasma in laboratory and in space, production of dusty plasma, dust charging processes, dynamic of dust plasma, forces on dust grains, dust acoustic waves, dust ion acoustic waves, kinetic theory.

PH715: Advanced Special Course in Nuclear Physics I

Selected advanced topics in the field of **Nuclear Physics** chosen by the main supervisor of the thesis.

PH716: Advanced Special Course in Radiation Physics (2)

PH717: Advanced Special Course in Radiation Physics I
Selected advanced topics in the field of Radiation Physics chosen by the main supervisor of the thesis.

PH718: Advanced Special Course in High energy Physics (2)
Selected advanced topics in the field of High energy Physics chosen by the main supervisor of the thesis.

PH719: Particle accelerators
motivations - collision with another beam- collision with a fixed target.- Center of mass energy - Acceleration methods – Cyclotron – Synchrotron - Particle physics experiments - Cross section – Luminosity - Particle detectors- Kinematics and data analysis methods - Momentum conservation in particle jets .

PH720: Selected topics in Advanced High Energy Physics
Selected advanced topics in the field of High Energy Physics chosen by the main supervisor of the thesis.

PH721: Heavy ion Physics
Features of reactions with heavy ions, Classification of reactions with heavy ions, Coulomb excitation of nuclear levels by heavy ions, Interaction of nuclei, potential, Conservation laws and kinematics, Elastic scattering; Optical model; Trajectory analysis; Rainbow; Scattering of heavy ions, Direct reactions; Low-nucleon transmission reactions, Deep inelastic scattering; Fragmentation and massive transfer processes, Reactions of fusion of atomic nuclei, Fission of nuclei by heavy ions, Synthesis of new elements, Relativistic collisions of heavy ions; Features of reactions at high energies. Phase diagram.

PH722: Advanced Digital electronics
Modern and emerging integrated circuit technology - Static and dynamic logic families - Noise sources, analysis and avoidance - Process variations and design for manufacturing (DFM) - Low power and ultra low power design - Leakage characteristics and low leakage design - Adaptive design over PVT variations - Packaging and on-chip power supply design - Interconnect and signaling - Clock design - Synchronization issues - Embedded SRAM and DRAM - Design for reliability.

PH723: Advances in mathematical physics
The purpose of the course PH739 is to present standard and widely used mathematical methods in Physics, including functions of a complex variable, linear algebra, differential equations, and special functions associated with eigenvalue problems of ordinary and partial differential operators.

PH724: Selected topics in Advanced Nuclear Spectroscopy
Selected advanced topics in the field of Nuclear Spectroscopy chosen by the main supervisor of the thesis.

PH725: Advances in nuclear reactors

Components of Nuclear Reactors - Time-dependent Change of a Reactor and its Control - Dynamic Characteristics of a Reactor - Effect of Xenon - Burn-up - Fuel Management - Nuclear Equilibrium State - Fuel Cycle - Transport Equation and Diffusion Equation - Neutron Density and Flux - Neutron Transport Equation - Slowing-down of Neutrons - Continuous Energy Model - Multigroup Energy Model - Neutron Diffusion - Multigroup Transport Model - Multigroup Diffusion Model - Iterative Calculations for Neutron Sources - Group Diffusion Model.

PH726: Selected topics in Advanced Reactors and Neutrons

Selected advanced topics in the field of Nuclear Spectroscopy chosen by the main supervisor of the thesis.

PH727: Advanced Nuclear Technology

Steam Generator Water Level Control. Steam Dump Control. Excore Nuclear Instruments. Rod Control System. Containment Systems. Auxiliary Feedwater System. Electrical System. Cooling Water Systems. Emergency Core Cooling System. Reactor Protection System. Plant Heat up.

PH728: Advanced Special Course in Biophysics II

Selected advanced topics in the field of High Energy Physics chosen by the main supervisor of the thesis.

PH729: Advanced Special Course in Biophysics I

Selected advanced topics in the field of **Biophysics** chosen by the main supervisor of the thesis.

PH730: Physics of Medical Imaging

methods of medical imaging: X-ray, nuclear medicine, magnetic resonance and ultrasound. the physics principles and clinical applications. mathematical principle of image formation and processing.

PH731: Single-molecule biophysics

Single-Molecule Fluorescent Particle Tracking, Analysis of Biomembranes, Imaging in Live Cells, Fluorescence Imaging, Single-Molecule FRET, Rotary Molecular Motors, Fluorescence Correlation Spectroscopy in Living Cells, Precise Measurements of Diffusion in Solution, Interactions Using Nanopores, Atomic Force Microscopy of Protein–Protein Interactions.

PH732: Neuroscience

Anatomy, physiology, of the central and peripheral nervous system. neuronal function, sensory processing, movement, sleep and caloric and body fluid homeostasis, Neurons and conductance-based models, Associators and synaptic plasticity, Cortical organization and neural networks

PH733: Advanced Radiation Therapy

Deep inspiration breath hold, Stereotactic body radiation therapy, Total body irradiation, Proton beam therapy, Intraoperative radiotherapy (IORT), Brachytherapy, Leksell Gamma Knife radiosurgery

PH734: Advanced Biomaterials and regenerative medicine

The Fate of Stem Cell by Biomaterials, Controlling of Signal Pathway of Stem Cell by Biomaterials, Functional Biomaterials for Regenerative Medicine, Inorganic Biomaterials for Regenerative Medicine, Smart Natural Biomaterials for Regenerative Medicine

PH735: Advanced Health Physics

Solutions to problems pertaining to radiation safety in the environment, industry, medical facilities, and nuclear reactors. Topics include shielding, accelerators, radon, non-ionizing radiation, and radiation dose-effect.

PH736: Advanced Special Course in Electronics II

Selected advanced topics in the field of High Energy Physics chosen by the main supervisor of the thesis.

PH737: Advanced Special Course in Electronics I

Selected advanced topics in the field of High Energy Physics chosen by the main supervisor of the thesis.

PH738: Advanced Special Course in Materials Science II

Selected advanced topics in the field of High Energy Physics chosen by the main supervisor of the thesis.

PH739: Advanced Special Course in Materials Science I

Selected advanced topics in the field of High Energy Physics chosen by the main supervisor of the thesis.

PH740: Electrochemical Energy Storage Systems

Basic concepts, Primary and Secondary cells, Materials for batteries, supercapacitors and fuel cells, Electrochemical energy storage systems, Design, fabrication, operation and Evaluation; Safety and tolerance, Scientific and technical factors influencing electrochemical energy storage and conversion, Anode and cathode materials, Electrolyte aspects. Laboratory practical including for example analysis of charge- and discharge curves, polarization, and impedance spectroscopy.

PH741: Advanced Semiconductor Physics

Defects in semiconductors Conductors - Transmission of current carriers - Generation and union processes of current carriers - Photoelectric conduction - Study of the electrical and optical properties of some electronic devices.

PH742: Selected Topics in nano-materials

Selected advanced topics in the field of nano-materials chosen by the main supervisor of the thesis.

PH743: Nano-scale magnetic materials

Structure, Chemistry, and Geometry - Anisotropy and Hysteresis - Quantum-Mechanical Effects - Magnetic Nanowires for Domain Wall Logic and Ultrahigh Density Data Storage – Development of nanostructure soft magnetic materials - Magnetic Performance – Power Applications - Electromagnetic Interference Applications - Sensor Applications.

PH744: Advances in Microprocessors and microcontrollers

Evolution of Microprocessors - Inside a Microprocessor -Basic Microprocessor Instructions - Addressing Modes - Microprocessor Selection- Programming Microprocessors - RISC Versus CISC Processors - Eight-Bit Microprocessors - 16-Bit Microprocessors - 32-Bit Microprocessors - Pentium Series of Microprocessors- Microprocessors for Embedded Applications - Peripheral Devices - Microcontrollers - Inside the Microcontroller - Microcontroller Architecture -Power-Saving Mode - Application-Relevant Information - Interfacing Peripheral Devices with a Microcontroller - Interfacing LEDs - Interfacing Electromechanical Relays- Interfacing Keyboards, Seven-Segment Displays, Interfacing LCD Displays, Interfacing A/D Converters and Interfacing D/A Converters

PH745: Computer structure

Anatomy of a Computer- Central Processing Unit- Memory - Input/output Ports- A Computer System - Types of Computer System - Classification of Computers on the Basis of Applications , the Technology Used and Size and Capacity- Computer Memory : Primary - Random Access Memory - RAM Applications - Read Only Memory - Types of ROM -Applications of ROMs - Expanding Memory Capacity- Word Size Expansion - Memory Location Expansion - Input and Output Ports -Serial Ports - Parallel Ports - Internal Buses - Input/output Devices - Secondary Storage or Auxiliary Storage - Magnetic Storage Devices - Magneto-Optical Storage Devices-USB Flash Drive.

PH746: Advanced Special Course in Solid State II

Selected advanced topics in the field of High Energy Physics chosen by the main supervisor of the thesis.

PH747: Troubleshooting Digital Circuits and Test Equipment

General Troubleshooting Guidelines- Faults Internal to Digital Integrated Circuits - Faults External to Digital Integrated Circuits- Troubleshooting Sequential Logic Circuits - Troubleshooting Arithmetic Circuits- Troubleshooting Memory Devices - Troubleshooting RAM Devices -Troubleshooting ROM Devices - Test and Measuring Equipment - Digital Multimeter - Advantages of Using a Digital Multimeter- Inside the Digital Meter - Significance of the Half-Digit - Oscilloscope - Importance of Specifications and Front-Panel Controls - Types of Oscilloscope - Analogue Oscilloscopes - CRT Storage Type Analogue Oscilloscopes - Digital Oscilloscopes - Analogue Versus Digital Oscilloscopes - Oscilloscope Specifications - Analogue Oscilloscopes - Analogue Storage Oscilloscope - Digital Storage Oscilloscope-Oscilloscope Probes - Probe Compensation - Counters -Frequency Synthesizers and Synthesized Function/Signal Generators -Logic Probe - Logic Analyser - Computer–Instrument Interface Standards - Virtual Instrumentation

PH748: Advanced Special Course in Solar energy II

Selected advanced topics in the field of High Energy Physics chosen by the main supervisor of the thesis.

PH749: Advanced Special Course in Solid State I

Selected advanced topics in the field of High Energy Physics chosen by the main supervisor of the thesis.

PH750: Materials for solar cell fabrication

An Overview of the Materials Used for Solar Cells, Monocrystalline Silicon Solar Cells, Semiconductor Solar Cells, Thin Film Solar Cells, Amorphous Silicon, Copper-Indium Gallium Diselenide (CIGS), Cadmium Telluride (CdTe), Dye-Sensitized Solar Cells, Perovskite Solar Cells, Organic Solar Cells, Graphene Solar Cells, The Economics of Silicon & the Challenge of Research

PH751: Advanced Special Course in Solar energy I

Selected advanced topics in the field of High Energy Physics chosen by the main supervisor of the thesis.

PH752: Art of State of Fabricating and Applications of Ferrite

Applications and functions of ferrites - Ferrites for permanent magnetic applications - Ferrites inductors and transformers for low power applications. - Ferrites transformers and inductors at high power - Ferrites for microwaves applications.

PH753: Thermal applications of solar Energy

Calculations and measurements of solar radiation- solar heating - solar cooling systems - solar ponds - Solar charge – solar discharge- thermal storage – phase change materials – use of Nano fluid in solar thermal conversion devices.

PH754: Simulation in Thermal Systems

Energy balance equation of solar – thermal conversion systems- analytical and numerical solutions of first and second total and partial differential equations. Computer programs for EBE by Mat. Lab. And /or Pascale language- curve fitting to verify the mathematical modes for thermal devices.

PH755: Simulation of solar cells

The course gives a comprehensive introduction to numerical simulation of various semiconductor devices, with a particular focus on solar cells and photodetectors. This course will start with the fundamental equations and physics behind the many semiconductor devices that surround us, and teach you numerical methods and software tools to solve them.

PH757: Electrical applications of solar energy

This course covers the areas of research including but not limited to Fundamental and commercial solar cell technologies such as crystalline and amorphous Silicon - Chalcopyrites and Dye Sensitized solar

cells etc - Advanced nano-structured and hybrid solar cells - Photovoltaic systems. Supporting technologies, such as, electrical storage, inverter technologies, hybrid systems, grid tied and off grid technologies etc.

ثالثاً: قسم الكيمياء

أ. برامج الماجستير في علوم الكيمياء:

1. برنامج الماجستير في العلوم في الكيمياء الفيزيائية: (Physical Chemistry)

First Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 8 Credits				
CH601	Advanced physical chemistry كيمياء فيزيائية متقدمة	2	-	2
CH603	Advanced inorganic chemistry كيمياء غير عضوية متقدمة	2	-	2
CH605	Advanced organic chemistry كيمياء عضوية متقدمة	2	-	2
CH607	Advanced analytical techniques كيمياء تحليلية متقدمة	2	-	2
Optional: Select 4 Credits				
CH609	Solid state chemistry and group theory كيمياء الحالة الصلبة ونظرية المجموعات	2	-	2
CH611	Coordination polymers بوليمرات تناسقية	2	-	2
CH613	Advanced heterocyclic chemistry كيمياء حلقية غير متجانسة متقدمة	2	-	2
CH615	Green chemistry كيمياء خضراء	2	-	2
Total Credits		**12**		

Second Semester

Code	Preq.	Course Title	Hours/Week		
			Lec.	Prac.	Cred.
Obligatory: 8 Credits					
CH602	-	Chemistry of nanomaterials كيمياء المواد النانوية	2	-	2
CH604	-	Advanced photochemistry and lasers كيمياء ضوئية متقدمة وليزر	2	-	2
CH606	-	Advanced chemical kinetics and fast reactions كيمياء حركية متقدمة وتفاعلات سريعة	2	-	2
CH608	-	Advanced surface chemistry and corrosion كيمياء سطوح متقدمة والتآكل	2	-	2
Optional: Select 4 Credits					
CH610	-	Selected topics in physical chemistry موضوعات مختارة في الكيمياء الفيزيائية	2	-	2
CH612	-	Environmental chemistry كيمياء بيئية	2	-	2
CH614	-	Analytical sensors مجسات تحليلية	2	-	2
CH616	-	Thermoanalytical techniques تقنيات تحليل حراري	2	-	2
Total Credits			**12**		

2. برنامج الماجستير في العلوم في الكيمياء غير العضوية :(Inorganic Chemistry)

First Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 8 Credits				
CH601	Advanced physical chemistry كيمياء فيزيائية متقدمة	2	-	2
CH603	Advanced inorganic chemistry كيمياء غير عضوية متقدمة	2	-	2
CH605	Advanced organic chemistry كيمياء عضوية متقدمة	2	-	2
CH607	Advanced analytical techniques كيمياء تحليلية متقدمة	2	-	2
Optional: Select 4 Credits				
CH609	Solid state chemistry and group theory كيمياء الحالة الصلبة ونظرية المجموعات	2	-	2
CH611	Coordination polymers بوليمرات تناسقية	2	-	2
CH613	Advanced heterocyclic chemistry كيمياء حلقية غير متجانسة متقدمة	2	-	2
CH615	Green chemistry كيمياء خضراء	2	-	2
Total Credits		**12**		

Second Semester

Code	Preq.	Course Title	Hours/Week		
			Lec.	Prac.	Cred.
Obligatory: 8 Credits					
CH602	-	Chemistry of nanomaterials كيمياء المواد النانوية	2	-	2
CH618	-	Organometallic chemistry كيمياء عضوية فلزية	2	-	2
CH620	-	Inorganic reaction mechanisms ميكانيكية التفاعلات غير العضوية	2	-	2
CH622	-	Metal complexes and bioinorganic chemistry متراكبات فلزية وكيمياء غير عضوية حيوية	2	-	2
Optional: Select 4 Credits					
CH624	-	Metal-organic frameworks أطر معدنية عضوية	2	-	2
CH626	-	Advanced inorganic catalysis حفز غير عضوي متقدم	2	-	2
CH628	-	Nuclear chemistry and renewable energy كيمياء نووية وطاقة متجددة	2	-	2
CH630	-	Selected topics in inorganic chemistry موضوعات مختارة في الكيمياء غير العضوية	2	-	2
Total Credits			**12**		

3. برنامج الماجستير في العلوم في الكيمياء العضوية (Organic Chemistry):

First Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 8 Credits				
CH601	Advanced physical chemistry كيمياء فيزيائية متقدمة	2	-	2
CH603	Advanced inorganic chemistry كيمياء غير عضوية متقدمة	2	-	2
CH605	Advanced organic chemistry كيمياء عضوية متقدمة	2	-	2
CH607	Advanced analytical techniques كيمياء تحليلية متقدمة	2	-	2
Optional: Select 4 Credits				
CH609	Solid state chemistry and group theory كيمياء الحالة الصلبة ونظرية المجموعات	2	-	2
CH611	Coordination polymers بوليمرات تناسقية	2	-	2
CH613	Advanced heterocyclic chemistry كيمياء حلقية غير متجانسة متقدمة	2	-	2
CH615	Green chemistry كيمياء خضراء	2	-	2
Total Credits		**12**		

Second Semester

Code	Preq.	Course Title	Hours/Week		
			Lec.	Prac.	Cred.
Obligatory: 8 Credits					
CH602	-	Chemistry of nanomaterials كيمياء المواد النانوية	2	-	2
CH632	-	Advanced natural products and organic reaction mechanism نواتج طبيعية متقدمة وميكانيكية تفاعلات عضوية	2	-	2
CH634	-	Stereoselective synthesis and organometallic chemistry تحضير انتقائي فراغي وكيمياء عضوية فلزية	2	-	2
CH636	-	Advanced polymer chemistry كيمياء بوليمرات متقدمة	2	-	2
Optional: Select 4 Credits					
CH638	-	Chemistry of textile and dyes كيمياء الصبغات والنسيج	2	-	2
CH640	-	Separation techniques of organic materials and bio-organic chemistry تقنيات فصل المواد العضوية وكيمياء عضوية حيوية	2	-	2
CH642	-	Industrial organic and environmental chemistry كيمياء بيئية وعضوية صناعية	2	-	2
CH644	-	Physical organic and organic photo chemistry كيمياء عضوية ضوئية وعضوية طبيعية	2	-	2
Total Credits			**12**		

4. برنامج الماجستير في العلوم في الكيمياء التحليلية :(Analytical Chemistry)

First Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 8 Credits				
CH601	Advanced physical chemistry كيمياء فيزيائية متقدمة	2	-	2
CH603	Advanced inorganic chemistry كيمياء غير عضوية متقدمة	2	-	2
CH605	Advanced organic chemistry كيمياء عضوية متقدمة	2	-	2
CH607	Advanced analytical techniques كيمياء تحليلية متقدمة	2	-	2
Optional: Select 4 Credits				
CH609	Solid state chemistry and group theory كيمياء الحالة الصلبة ونظرية المجموعات	2	-	2
CH611	Coordination polymers بوليمرات تناسقية	2	-	2
CH613	Advanced heterocyclic chemistry كيمياء حلقية غير متجانسة متقدمة	2	-	2
CH615	Green chemistry كيمياء خضراء	2	-	2
Total Credits		**12**		

Second Semester

Code	Preq.	Course Title	Hours/Week		
			Lec.	Prac.	Cred.
Obligatory: 8 Credits					
CH602	-	Chemistry of nanomaterials كيمياء المواد النانوية	2	-	2
CH612	-	Environmental chemistry كيمياء بيئية	2	-	2
CH614	-	Analytical sensors مجسات تحليلية	2	-	2
CH616	-	Thermoanalytical techniques تقنيات التحليل الحراري	2	-	2
Optional: Select 4 Credits					
CH646	-	Water analysis and treatment معالجة وتحليل المياه	2	-	2
CH648	-	Statistical analytical chemistry كيمياء تحليلية إحصائية	2	-	2
CH650	-	Bioanalytical chemistry كيمياء تحليلية حيوية	2	-	2
CH652	-	Advanced chemical kinetics and catalysis كيمياء حركية متقدمة وحفز	2	-	2
Total Credits			**12**		

5. برنامج الماجستير في العلوم في الكيمياء الحيوية: (Biochemistry)

First Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 8 Credits				
CH617	Metabolism التمثيل الغذائي	2	-	2
CH619	Molecular biology البيولوجيا الجزيئية	2	-	2
CH621	Hormones هرمونات	2	-	2
CH623	Immunology علم المناعة	2	-	2
Optional: Select 4 Credits				
CH625	Bioradiation إشعاع حيوي	2	-	2
CH627	Biochemical toxicology علم السموم البيوكيميائية	2	-	2
CH629	Nutritional biochemistry كيمياء حيوية غذائية	2	-	2
CH631	Cancer biology بيولوجيا السرطان	2	-	2
Total Credits		**12**		

Second Semester

Code	Preq.	Course Title	Hours/Week		
			Lec.	Prac.	Cred.
Obligatory: 8 Credits					
CH654	-	Enzymology علم الإنزيمات	2	-	2
CH656	-	Biotechnology تقنية حيوية	2	-	2
CH658	-	Regulation metabolism تنظيم التمثيل الغذائي	2	-	2
CH660	-	Biostatistics الإحصاء الحيوي	2	-	2
Optional: Select 4 Credits					
CH662	-	Toxicology علم السموم	2	-	2
CH664	-	Metabolic syndrome متلازمة الأيض	2	-	2
CH666	-	Biosignaling الإشارات الحيوية	2	-	2
CH668	-	Genetic engineering الهندسة الوراثية	2	-	2
CH602	-	Chemistry of nanomaterials كيمياء المواد النانوية	2	-	2
Total Credits			**12**		

توصيف مقررات الماجستير

CH601: Advanced physical chemistry

The goal of this course is to introduce the fundamental concepts of quantum and electrochemical aspects. The quantum includes molecular mechanics, molecular dynamics, and different methods in quantum mechanics for the description of molecular systems. It will explain the methods of structure theory such as DFT, HF, and semiempirical methods that are widely used in chemical synthesis, characterization, and materials research. The lectures are designed to provide an accessible understanding of molecular orbitals, basis sets, computational thermochemistry, molecular spectroscopy, and applications of symmetry. The electrochemical aspects include the principles of the electrode-solution interface, kinetics of mass and electron transfer, and the electrochemical techniques. These techniques are chronoamperometry, chronocoulometry, chronopotentiometry, linear sweep voltammetry, cyclic voltammetry, convolutive voltammetry, electrochemical processes coupled to chemical steps, adsorption at electrode surface, electrodeposition, and nanostructured materials.

CH602: Chemistry of nanomaterials

Introduction to nanomaterials, synthesis, classification, types, surfaces and interfaces, quantum effects, size effects, surface plasmon resonance, surface plasmon absorption bands of Ag, Au, Cu, properties, tools and instrumentation, fabricating nanostructures, and applications of nanomaterials.

CH603: Advanced inorganic chemistry

Upon completion of this course, the postgraduate students will be familiar with the advanced methods of synthesis of coordination and organometallic compounds. Emphasis will be placed on advanced aspects of nano-chemistry and its application in inorganic chemistry, carbon nanotubes and inorganic fibers. Topics to be discussed will include metal-metal single and multiple bonds, transition metal hybrids and electron deficient compounds as well as polyoxometalates and their applications in heterogeneous and homogeneous catalysis.

CH604: Advanced photochemistry and lasers

Grotthuss-Draper and Stark-Einstein photochemistry laws, site selective photochemistry, modified selection rules by El Sayed, flash photolysis, transients, environmental photochemistry, industrial photochemistry, photo isomerization, photoenolization, H abstraction, bond cleavage, cycloaddition and orbital correlation, free radical photochemistry, and photoresists. The laser part includes the electronic states and term symbols, lifetimes of electronically excited states and time-resolved spectroscopy, laser action, Q-switching and mode-locking, amplified spontaneous emission (ASE) and gain measurement, types of lasers, excimer, dye, energy transfer, chemical, proton transfer, carbon dioxide and solid- state lasers, polarized fluorescence, specific applications of lasers as a photochemical tool, modification of inert surfaces, photocatalysis, impurity removal, multi-photon absorption, isotope separation, the tunneling phenomenon, the abnormal kinetic isotope effect.

CH605: Advanced organic chemistry

Advanced organic chemistry course studies the advanced modern spectroscopic techniques used in the determination of molecular structure with the interpretation of spectra including ultraviolet, infrared, (^{1}H NMR & ^{13}C NMR) and mass spectroscopy. Study of its applications to identify the chemical structure.

CH606: Advanced chemical kinetics and fast reactions

Kinetics of complex reactions in the gas phase. Kinetics of photochemical reactions. autocatalysis, autocatalytic explosions. Kinetics of reactions in solution. Factors affecting the reaction rate in solution. Elementary reactions. Ionic reactions. Theories of reaction rates (collision theory, transition state theory). The steady-state approximations. Fast reaction kinetics. Fast reaction techniques. The modern theories for identification of the reaction rate pathway. Methods of identification of reaction mechanism using the kinetic studies.

CH607: Advanced analytical techniques

This course comprises a broad range of aims that cover the most important analytical separation techniques of several analytes and interferents. Theory and advanced instrumentation is also discussed with emphasis on applicable aspects of separation and analytical science. This course focus also on application of theoretical principles of electrochemistry to the interpretation of the various types of analytical electrochemical methods - Utility of the advanced selected electroanalytical methodology and techniques (such as chronopotentiometry, voltammetry, amperometry, chronoamperometry, coulometry, chronocoulometry and electrochemical impedance spectroscopy) in chemical, environmental, and pharmaceutical or clinical sciences.

CH608: Advanced surface chemistry and corrosion

Introduction, solid surfaces, structure of surfaces, surface characterization, microporous and mesoporous surfaces, adsorption isotherms, adsorption kinetics, desorption process, steps of heterogeneous surface catalysis, kinetic and diffusion controlled heterogeneous catalysis, synergetic effect, catalysis by core shell nanoparticles, micellar catalysis. Energetics of solid surfaces- surfactants, detergents – lubricants, photographic materials – plastic – elastomers – water treatment and dyes. The corrosion part includes the importance of corrosion study, electrochemical nature of corrosion, types of corrosion, soil corrosion, concrete corrosion, atmospheric corrosion, electrochemical mechanism of corrosion, thermodynamics of corrosion, corrosion kinetics, corrosion control, protective coating, corrosion inhibitors, cathode protection, anode protection, passivation of metallic substances.

CH609: Solid state chemistry and group theory

The solid–state chemistry part deals with the crystallography, the lattice energy and Madelung constants, crystal engineering in chemical synthesis, calculation of nanomaterials concentrations, surface energy of planes, dangling bonds, epitaxial growth, polymorphism and phase transformations in solids, metal-organic frameworks (MOFs), porous coordination polymers (PCPs), nanoclusters, defects in solids, the exciton concept, the band theory chemical and physical approaches, x-ray emission in metals, electron microscopy, scanning tunneling microscope (STM), and the Auger effect.

The group theory includes the history of group theory, symmetry elements, the symmetry elements and symmetry operations, point groups, rules for classification of molecules into point groups, symmetry in the crystal lattices (space groups), groups in mathematical terms, multiplication of symmetry operation, symmetry species and character tables, mixed symmetry operations, transformation matrices, spectral notations in water molecule, reducible and irreducible representations, vibrational analysis of the ammonia molecule, symmetry notations of electronic transitions, symmetry and intensity of electronic transitions, hybridization, and symmetry.

CH610: Selected topics in physical chemistry

Advanced thermodynamics, catalysis and photocatalysis, combustion chemistry, nanocomposites and their applications, ionic solutions, molecular liquids, and polarities in physical chemistry.

CH611: Coordination polymers

This course will focus on the history, synthesis and propagation (intermolecular forces and bonding, coordination, metal centers including transition metals, lanthanides, as well as alkali metals and alkaline earth metals) of coordination polymer. Ligands including chemical composition, structural orientation and ligand length. Other factors involves counterion, crystallization environment and guest molecules, applications. research trends comprising molecular storage, luminescence, electrical conductivity, magnetism and sensor capability.

CH612: Environmental chemistry

This course explores topics related to chemical effects in the natural environment. Environmental topics include the sources, reactions, transport, effects, and fates of chemical species in the soil, water, and air. These two areas are woven together in daily work and larger projects. This course is divided into four major parts that reflects the most pressing issues in environmental chemistry Atmospheric chemistry. Water chemistry. Pollution and toxic organic compounds. Energy and climate change.

CH613: Advanced heterocyclic chemistry

Advanced heterocyclic chemistry course studies the basic terms of heterocyclic compounds containing 5-, 6 7 & -membered rimgs with one or more heter-atoms N, O & S and condensed systems containig such rings.

CH614: Analytical sensors

This course describes the fundamental and applications of a wide variety of chemical sensors. It discusses first the design and the development of new sensors concepts to improvement their function in different analytical fields. Specific types of sensors and their applications will also be discussed like optical, electrochemical, biochemical sensors, etc. Flexible sensors for simultaneous detection of some biologically relevant molecules in body fluids and wearable chemical sensors for physiological information via measuring changing concentrations of biomarkers in biological fluids such as interstitial fluid (ISF), sweat, tears and saliva will also be studied.

CH615: Green chemistry

This course will also discuss the origins and the fundamentals of Green Analytical Chemistry (GAC), based on using clean, environmentally-friendly or GAC methods. GAC involves the development of analytical methodologies with an environmental concern, encourages the use of direct analysis to avoid any sample treatment that involves energy and reagent consumption and generation of wastes. This course pays also special attention to the strategies and the tools available to make sample-pretreatment and analytical methods greener. Special emphasis on environmentally friendly sample preparation techniques, miniaturisation of analytical devices and shortening the time elapsing between performing analysis, solventless extraction techniques, the application of alternative solvents and assisted extractions techniques for the extraction of solid, liquid, and gaseous samples are considered to be the main approaches complying with green analytical chemistry principles. Green synthesis of nanoparticles by biomass filtrate obtained from various biological systems such as bacteria, yeast, virus,

actinomycetes, algae, fungi and plant extract for catalysis, sensing and biosensing, drug delivery, molecular diagnostics, solar cell, optoelectronics, and imaging applications will be disccused.

CH616: Thermoanalytical techniques

This course aim to study thermoanalytical techniques including (thermogravimetry, differential thermal analysis, differential scanning calorimetry, thermomechanical analysis) to provide students by theoretical knowledge, their performance, evaluation and processing of results, analysis of obtained thermograms, kinetics of thermal reactions from thermoanalytical data, applications of thermoanalytical methods in different fields (quality control, purity of substances, pharmaceuticals, polymers, food industry, dyes, combustion, etc.).

CH617: Metabolism

This course deal with the concept of metabolism, characteristics of metabolic pathways and strategies used to study these pathways. This is followed by a detailed overview of various pathways involved in carbohydrate, protein and lipid metabolism with their significance and regulation. The student should be able to integrate the received knowledge so that she/he within this field can explain the background of relevant diseases

CH618: Organometallic chemistry

This course intends to introduce the students to understand some advanced aspects related to organometallic compounds, their scope, conventions, reviews and journals, modern synthetic methods such as electrochemical and miscellaneous methods, structure and bonding in organometallic compounds, thermochemistry of organometallic compounds, organometallic compounds as sources of carbanions, reactions of organic groups bonded to metals, as well as special emphasis on the catalytic applications of organometallic compounds in different pathways.

CH619: Molecular biology

This course will impart knowledge about all the aspects of emergent areas of molecular biology and its latest status. This is mainly research oriented course and increase the visibility of studying biochemistry as a research oriented subject. Course content:. DNA, RNA Structures. Nature of genetic information and storage of genetic information. Transcription and translation. Regulation of gene expression. DNA mutation.

CH620: Inorganic reaction mechanisms

Inorganic reaction mechanism course deals with the advanced mechanistic aspects of transition metal chemistry including substitution reactions, electron transfer reactions, rearrangement reactions, ligand reactions and photochemical reactions of complexes. It will give a deep interest on the types of inorganic reactions, complexes formation constants and kinetics of reactions, Trans effect, outer-Inner shell mechanism and conditions of mechanism reactions as well as catalyzed substitution reactions and addition of protons to metals.

CH621: Hormones

The course covers definition of Hormones. Classification of hormones. Hypothalamus hormones. Pituitary (anterior and posterior) Hormones. Thyroid Hormones, Parathyroid Hormones. Adrenal (cortex and medulla) Hormones. Steroid Hormones and pineal hormones. Pancreatic hormones. and mechanism of their actions.

CH622: Metal complexes and bioinorganic chemistry

This course includes a broad insight into the reactivity, structure, biological functions and methods for the characterization of bioinorganic systems. At the end of the course the student will be able to understand how metal ions interact with the biological systems and how such interactions affect the properties of metal centers, apply principles of coordination chemistry to explain how nature is able to modulate the properties of metal centers for a specific function, appley the information gained by the study of bioinorganic systems for the design of synthetic catalysts, diagnostic probes and therapeutic agents.

CH623: Immunology

The course on immunology is intended to make the student aware of the types of immunity, and biochemical mechanisms involved in immune responses and immune-mediated diseases. The aim of this course is study of the molecular and cellular interactions and principles of the immune system. Topics include immune system development, humoral & cell-mediated immunity, disease and treatments involving immunization, immunodeficiency, and autoimmunity.

CH624: Metal-organic frameworks

This course will give details on the structures of Metal–Organic Frameworks (MOFs), their synthesis (general synthesis, high-throughput synthesis, pseudomorphic replication), composite materials, catalysis (design, achiral catalysis and asymmetric catalysis and biomimetic design and photocatalysis) and applications in electrocatalysis, biological imaging and sensing, nuclear wasteform materials, drug delivery systems, semiconductors, bio-mimetic mineralization, carbon capture, desalination/ion separation, gas separation, water vapor capture and dehumidification as well as ferroelectrics and multiferroics.

CH625: Bioradiation

The course covers basic knowledge on biological effects of radiation and risks on cellular level to humans, factors that affect the dose-effect relationship and a deeper knowledge on radiation protection for ionizing and non-ionizing radiation, both in legislation and practical radiation protection technology. The course covers radiation effects at cellular level including the formation of free radicals, chromosome breakage and repair mechanisms as well as target theory and the dose-response curves. It also includes radiation effects on individual organs and humans, somatic, genetic as well as immediate and late radiation damages and factors affecting the relationship between dose and biological effects.

CH626: Advanced inorganic catalysis

This course compresses on the development of inorganic customized, nanostructured catalytic materials for different applications such as energy conversion and chemical storage. This will includes the scope of this field and its conceptual analogy, heterogeneous catalysis, mechanism, and kinetics.

CH627: Biochemical Toxicology

The course aims to the study of the basis concepts in toxicology, history and branches, dose - response curves, statistically defined expression in toxicology, classification of toxicants and their mode of action, mutagens, and carcinogen, phytotoxins, zootoxin and environmental toxicants.

CH628: Nuclear chemistry and renewable energy

The focus of this course is on advanced and fundamental nuclear chemistry concepts, such as the importance of nuclear chemistry, nuclear reactions, radioactivity detection, types of radioactive decay, radioactive series, nuclear transmutations, nuclear dating, and artificially induced radioactivity, nuclear fission, nuclear fusion, plasma, and hydrogen bombs, as well as important applications of radioisotopes. Special interest will be directed to renewable energy resources as alternative sources for finite sources and future energy demand of world regarding the available renewable energy resources as well as fundamentals of solar energy, photovoltaic and fuel cells.

CH629: Nutritional biochemistry

Nutritional Biochemistry aims at understanding the food groups, formulation of balanced diets, vitamin types, human nutrition, and the disorders that arise due to nutritional imbalances and its impact on overall health, and gives an introduction to nutrigenomics. This course will provide information about food and its importance to our health, and an overview of nutrition, food choice and diet planning diets, diet and health, functional foods, antioxidants, food drugs interactions, genetically modified food.

CH630: Selected topics in inorganic chemistry

The contents of selected topics in inorganic chemistry course will be chosen from selected topics of current interest in theoretical and experimental fields of inorganic chemistry. Specific topics will be changed from Semester to Semester and possible topics include crystallographic and spectroscopic methods of structure determination such as X-ray diffraction, nuclear magnetic resonance (NMR), electron spin resonance (ESR), and mass spectral analysis as important and powerful techniques for inorganic chemists.

CH631: Cancer Biology

Definition and classification; evolution of cancer cells; cellular oncogenes; oncogene, viral-oncogene, tumorigenicity, tumor suppressor genes; p53, Rb and PTEN, micro RNAs and regulation of cancer growth; tumor suppressor microRNAs and oncomiRs. Cancer metastasis, migration & invasion, metastasis steps, epithelial to mesenchymal transition, angiogenesis; hypoxia and crosstalk between autophagy and apoptosis in mammalian cells.

CH632: Advanced natural products and organic reaction mechanismn

Part A: Study the chemistry and isolation of natural products (alkaloids, terpens, steroids and vitamins) . In addition, the industrial applications. Part B: Organic reaction mechanism: Study the mechanistic aspects of organic reactions including the rate and kinetic concepts, use of isotopes with emphasize on the nucleophilic substitution reactions of aliphatic compounds. Elimination and addition reactions (including stereoselectivity and orientation). Reactivity of aromatic towards electrophilic and nucleophilic reactions.

CH634: Stereoselective synthesis and organometallic chemistry

Part A: Stereoselective synthesis: Study the synthesis of optically pure compounds use several techniques: Synthesis of racemic mixture followed by its separation using several types of columns, and Asymmetric synthesis with several asymmetric reagents and detection of the enantiometric excess. Part B: Organometallic chemistry: Study the synthesis and reactions of organo-lithium compounds, organo-magnesium, organo-boron, organo-silicon, organo - tin and organo – cadmium compounds.

CH636: Advanced polymer chemistry

Study the chemistry of polyolefins, polyvinyl chloride, polyvinyl acetate, poly urethanes, epoxies, silicons and styrene, copolymer used as textile finishes, fibric coating, composite adhesive and foams.

CH638: Chemistry of textile and dyes

Study the fiber structure, properties, identification, classification (cellulose, cotton flax, hemp jute- man-made, rayon acetate and triacetate protein, wool and silk mineral fibers) man-made fibers, processing of textile (purification and preliminary signing designing scouring, bleaching and mercerizing dying), and kinds of forces by which dye molecules are bound to the fiber. The course of dyes offers correlation of color and chemical constitution, synthetic routes for popular dyes of important types, electronic mechanism for reactive dyes, chemistry of dye interaction with light, washing and other in use influences and economic consideration.

CH640: Separation techniques of organic materials and bio-organic chemistry

Part A: Study several methods for separation of organic compounds as: Fractional distillation liquids, Steam distillation separation of steam distillable compounds, Crystallization technique using several solvents with different polarity. Using chromatographic techniques: Thin layer chromatography (TLC), Column chromatography (flash column), Liquid chromatography (MPLC), Gas chromatography, High performance liquid chromatography (HPLC). Part B: The chemistry of living cells including carbohydrates, proteins, nucleic acids, vitamins, enzymes, coenzymes and enzymatic catalysis. Study the metabolism of all these compounds.

CH642: Industrial organic and environmental chemistry

Part A: The course surveys areas as chemical, biochemical and pharmaceutical industries. Production of common organic chemicals, petrochemical industry and production of various polymers. Chemical production related to agriculture and forestry is studied. Part B: The chemical nature of environmental processes is examined with amajor focus on atmospheric and aquatic chemistry, urban pollution, climate change and acid rain. In addition, the use and environmental facts of heavy metals metals, chlorinated organic chemicals and pesticides.

CH644: Physical organic and organic photo chemistry

Part A: Physical Organic Chemistry: Study the chemical structure and reactivity correlation Hammett equation including the physical significance of 6-& p values and its application. Limitation and deviation of Hammett plots, neighboring group participation and displacement reactions. Part B: Organic photochemistry: Study the electronic transitions and selection rules, photo physical and photochemical pathways, following electronic excitation, fluorescence, kinetic rate constants of excited state processes, photochemical reaction and photosensitization. This course will provide the basic theory and concepts behind laser chemistry.

CH646: Water analysis and treatment

This course related to water analysis and treatment to improve the quality of water to make it appropriate for a specific end-use. The end use may be drinking, industrial water supply, irrigation, river flow maintenance, water recreation or many other uses, including being safely returned to the environment. The different standard and advanced methods for analysis and treatment of drinking water and domestic

and industrial wastewater treatment will be studied. The terms quality assurance and quality control of water are also discussed.

CH648: Statistical analytical chemistry

This course gives a clear account of the underlying principles of statistical methods, validation and the application to any form of chemical analysis. Also, stability testing as a requirement for the regulatory approval during product marketing, and is a vital component of the overall quality control program can be simply discussed.

CH650: Bioanalytical chemistry

This course aims to throw some light on the critical role of bioanalytical measurement procedures on several biological and bimolecular samples analysis. Several techniques can cover such analysis based on their separation and determination such as photometric, electrometric, chromatographic, electrophoreses as well as isotope, immunochemical and osmometry.

CH652: Advanced chemical kinetics and catalysis

This course will deal with the kinetics of complex reactions in the gas phase, develop the kinetics of photochemical reactions, explosions: autocatalysis and autocatalytic explosions, write the kinetics of reactions in solution: factors affecting the rates of reactions in solution. Also, it will cover the different theories of reaction rates (collision theory, transition state theory). Furthermore, it will discuss the nature of homogeneous and heterogeneous reactions, elementary reactions, ionic reactions. State the steady-state approximations.

CH654: Enzymology

The course aims to the study of the definition of enzymes, importance, classification the mechanisms of enzyme action; enzyme kinetics and regulation: activation energy, Km value, types of inhibition, RNA enzymes, enzyme Specificity, allosteric enzymes, regulation of enzymes. Isoenzymes, and Immobilization of enzymes.

CH656: Biotechnology

This course provides an understanding of how biochemical processes find application and improved our life. The course introduces the concept and application of plant tissue culture, transgenic technology, fermentation technology, genome analysis, gene therapy, environmental biotechnology, nanotechnology and its applications in medicine. It examines the mechanisms through which biotechnology is commercialized, such as university-industry links, spin-off firms and corporate alliances. The role of regulatory and ethical debates in the development of biotechnology is also explored.

CH658: Regulation metabolism

The purpose of this course is to provide through description of the mechanism of metabolic regulation. This course will also cover key areas in metabolism and will highlight relationships to clinically relevant topics and the integration and regulation of carbohydrate, lipid, amino acid and nucleic acid metabolism.

CH660: Biostatstics

This course deal with population, sample, sampling techniques, random sample, mean, median, mode, range, variance, coefficient of variation, frequency, standard deviation, standard error .Representation of statistical data line graph, histogram, bar diagram, pie chart, scatter diagram. Collection of data: Relevance of sample size. Sources, methods-questionairs, records, archives, scaling-Likert and Gutman.

Validation and standardization of the methods, modification andexperimental design Probability: Rules of probability, binomial distribution, normal distribution, area under the curve, Z value, choosing sample size, hypothesis testing, Student's t test. One way ANOVA, correlation and

CH662: Toxicology

The goal of course is studying the body's response to drugs, foods, and toxic substances. Fundamentals of pharmacology and mechanisms of action are examined for acute and chronic exposure derived from environmental, dietary, occupational, and pharmaceutical sources.

CH664: Metabolic syndrome

The course covers the Metabolic syndrome, which is a cluster of conditions that occur together, increasing your risk of CAD, stroke, and type 2 diabetes. These conditions include increased blood pressure, high blood sugar, excess body fat around the waist, and abnormal cholesterol or triglyceride levels. The main diagnostic components are reduced HDL-cholesterol, raised triglycerides, blood pressure, and fasting plasma glucose; all of which are related to weight gain, specifically intra-abdominal/ectopic fat accumulation and large waist circumference.

CH666: Biosignaling

The course covers the various internal or external signals, via stepwise coordination, regulate essential functions in cells such as division, growth, metabolism, and even death. Signal transduction is evolutionarily developed to maintain cellular homeostasis. The objective of this course is to provide an in-depth knowledge of the physiological functions and aberrations of disease-related signaling pathways. Therefore, each lecture will discuss the fundamentals of the specific signaling pathway and its implications in respective diseases. Additional topics that have been covered in conventional courses will be also optimally discussed to demonstrate their disease linkage, including the neuroendocrine system, hormones and neurotransmitters.

CH668: Genetic engineering

The course aims to the study of introduction, tools of cloning: Cloning vectors restriction enzymes DNA ligase and kinases hosting bacterial cells Basic steps of gene cloning: Vector and insert preparation-ligation-transformation-screening. Understanding of cell proliferation and differentiation, analysis, metamorphosis, and communication between cells will also be developed. Production of hormones as insulin by gene manipulation. Treatment by gene therapy.

ب. برامج الدكتوراه في علوم الكيمياء:

1. برنامج الدكتوراه في العلوم في الكيمياء الفيزيائية: (Physical Chemistry)

First Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
CH701	Selected topics in physical chemistry موضوعات مختارة في الكيمياء الفيزيائية	2	-	2
Optional: 2 Credits				
CH703	Selected topics in inorganic chemistry موضوعات مختارة في الكيمياء غير العضوية	2	-	2
CH705	Selected topics in organic chemistry موضوعات مختارة في الكيمياء العضوية	2	-	2
CH707	Selected topics in analytical chemistry موضوعات مختارة في الكيمياء التحليلية	2	-	2

Second Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
CH702	Computer applications in chemistry تطبيقات الحاسب في الكيمياء	2	-	2
Optional: 2 Credits				
CH704	Advanced electrochemistry كيمياء كهربية متقدمة	2	-	2
CH706	Applied physical chemistry كيمياء فيزيائية تطبيقية	2	-	2
CH708	Modern aspects of catalysis الجوانب الحديثة للحفز الكيميائي	2	-	2
CH710	Advanced physical polymer chemistry كيمياء البوليمرات الفيزيائية المتقدمة	2	-	2
CH712	Advanced supramolecular chemistry كيمياء الجزيئات الفوقية المتقدمة	2	-	2
CH714	Advanced techniques for structural and surface analysis تقنيات متقدمة للتحليل السطحي والتركيبي	2	-	2
CH716	Nanomaterials and nanotechnology المواد النانوية وتكنولوجيا النانو	2	-	2
CH718	Seminars حلقات بحث	2	-	2

2. برنامج الدكتوراه في العلوم في الكيمياء غير العضوية :(Inorganic Chemistry)

First Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
CH703	Selected topics in inorganic chemistry موضوعات مختارة في الكيمياء غير العضوية	2	-	2
Optional: 2 Credits				
CH701	Selected topics in physical chemistry موضوعات مختارة في الكيمياء الفيزيائية	2	-	2
CH705	Selected topics in organic chemistry موضوعات مختارة في الكيمياء العضوية	2	-	2
CH707	Selected topics in analytical chemistry موضوعات مختارة في الكيمياء التحليلية	2	-	2

Second Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
CH720	Advanced organometallic chemistry كيمياء عضوية فلزية متقدمة	2	-	2
Optional: 2 Credits				
CH722	Inorganic materials and nanotechnology المواد غير العضوية وتكنولوجيا النانو	2	-	2
CH724	Structural inorganic chemistry كيمياء غير عضوية تركيبية	2	-	2
CH726	Advanced techniques in inorganic chemistry تقنيات متقدمة في الكيمياء غير العضوية	2	-	2
CH728	Advanced bioinorganic chemistry كيمياء غير عضوية حيوية متقدمة	2	-	2
CH730	Computational inorganic chemistry كيمياء غير عضوية حاسوبية	2	-	2
CH732	Industrial inorganic chemistry كيمياء غير عضوية صناعية	2	-	2
CH734	Research methods and seminars طرق وحلقات بحث	2	-	2

3. برنامج الدكتوراه في العلوم في الكيمياء العضوية: (Organic Chemistry)

First Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
CH705	Selected topics in organic chemistry موضوعات مختارة في الكيمياء العضوية	2	-	2
Optional: 2 Credits				
CH701	Selected topics in physical chemistry موضوعات مختارة في الكيمياء الفيزيائية	2	-	2
CH703	Selected topics in inorganic chemistry موضوعات مختارة في الكيمياء غير العضوية	2	-	2
CH707	Selected topics in analytical chemistry موضوعات مختارة في الكيمياء التحليلية	2	-	2

Second Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
CH702	Computer applications in chemistry تطبيقات الحاسب في الكيمياء	2	-	2
Optional: 2 Credits				
CH736	Advanced applications of polymers and industrial chemistry تطبيقات متقدمة للبوليمرات وكيمياء صناعية	2	-	2
CH738	Advanced natural products and Stereoselective synthesis نواتج طبيعية متقدمة وتحضير فراغي انتقائي	2	-	2
CH740	Advanced applications of dyes and textiles تطبيقات متقدمة للصبغات والأنسجة	2	-	2
CH742	Modern organic synthesis التحضير العضوي الحديث	2	-	2
CH744	Advanced physical organic chemistry كيمياء عضوية طبيعية متقدمة	2	-	2
CH746	Advanced biochemical compounds مركبات كيميائية حيوية متقدمة	2	-	2
CH748	Advanced petrochemicals and chemistry of petroleum بتروكيمأو يات متقدمة وكيمياء البترول	2	-	2
CH750	Advanced heterocyclic chemistry كيمياء حلقية غير متجانسة متقدمة	2	-	2
CH752	Advanced applications of organic spectroscopy تطبيقات متقدمة للأطياف العضوية	2	-	2

4. برنامج الدكتوراه في العلوم في الكيمياء التحليلية: (Analytical Chemistry)

First Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
CH707	Selected topics in analytical chemistry موضوعات مختارة في الكيمياء التحليلية	2	-	2
Optional: 2 Credits				
CH701	Selected topics in physical chemistry موضوعات مختارة في الكيمياء الفيزيائية	2	-	2
CH703	Selected topics in inorganic chemistry موضوعات مختارة في الكيمياء غير العضوية	2	-	2
CH705	Selected topics in organic chemistry موضوعات مختارة في الكيمياء العضوية	2	-	2

Second Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
CH702	Computer applications in chemistry تطبيقات الحاسب في الكيمياء	2	-	2
Optional: 2 Credits				
CH702	Computer applications in chemistry تطبيقات الحاسب في الكيمياء	2	-	2
CH754	Quality management in analytical chemistry إدارة الجودة في الكيمياء التحليلية	2	-	2
CH756	Pharmaceutical and toxicological analysis التحليل الدوائي والسموم	2	-	2
CH758	Advanced techniques for structural investigation تقنيات متقدمة للتوصيف التركيبي	2	-	2
CH760	Applied electrochemical techniques تقنيات كهروكيميائية تطبيقية	2	-	2
CH762	Advanced biochemical analysis تحليل كيميائي حيوي متقدم	2	-	2

5. برنامج الدكتوراه في العلوم في الكيمياء الحيوية: (Biochemistry)

First Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
CH709	Metabolomics التمثيل الغذائي	2	-	2
Optional: 2 Credits				
CH711	Advanced molecular biology بيولوجيا جزيئية متقدمة	2	-	2
CH713	Advanced clinical biochemistry كيمياء حيوية سريرية متقدمة	2	-	2
CH715	Advanced analytical biochemistry كيمياء حيوية تحليلية متقدمة	2	-	2

Second Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
CH766	Bioinformatics المعلوماتية الحيوية	2	-	2
Optional: 2 Credits				
CH764	Proteomics بروتينات	2	-	2
CH768	Biochemistry of signal transduction and regulation الكيمياء الحيوية لنقل الإشارات وتنظيمها	2	-	2
CH770	Biopolymer and biotechnology بوليمرات حيوية وتكنولوجيا حيوية	2	-	2

توصيف مقررات الدكتوراه

CH701: Selected topics in physical chemistry

Surface science and nanotechnology, surfactants and their applications, environmental catalysis, photodegradation of polymers, photocatalysis, supercapicitors, generation of hydrogen by water splitting, recent development in porous materials, quantum dots.

CH702: Computer applications in chemistry

The course includes the capabilities and limitations of modern quantum chemistry, calculation of molecular properties, study of chemical processes by different programs in quantum chemistry, how do the principal quantum-chemistry methods work, choosing the appropriate methodology to present the findings of a study in a research paper, appreciation of the role played by electronic structure theory in many branches of science, finding the good correlation between the experimental results and theoretical data.

CH703: Selected topics in inorganic chemistry

The contents of selected topics in inorganic chemistry course will be chosen from advanced subjects of current interest in theoretical and experimental fields of inorganic chemistry. These topics will be changed from one Semester to the other Semester upon development in inorganic chemistry field of research.

CH704: Advanced electrochemistry

This course provides the applications of electrochemistry in the fields of fuel cells, batteries, super capacitors, superconductors, electrolytic process, electrocatalysis, electropolymerization deposition, environmental electrochemistry, inorganic electrochemistry, organic electrochemistry.

CH705: Selected topics in organic chemistry

Study of modern review articles in organic chemistry.

CH706: Applied physical chemistry

Introduction to catalysis. Catalysis as a multidisciplinary science. Homogeneous and heterogeneous catalysis. Catalyst characterization: infrared spectroscopy, x-ray diffraction, x-ray photoelectron spectroscopy, extended x-ray absorption, SEM and TEM electron microscopy, ion spectroscopy. Industrial catalysis. Kinetics of catalytic reactions. Temperature-programmed reduction. Surface science techniques: low energy electron diffraction, scanning probe microscopy, scanning tunneling microscopy, atomic force microscope. Solid catalysts. Oil refining and petro-chemistry. Environmental catalysis. Catalysis and green chemistry.

CH707: Selected topics in analytical chemistry

The contents of "selected topics in analytical chemistry" course will be chosen according to the area of active researches in the analytical chemistry over the world and the advanced current subjects related to theoretical and experimental fields of which help to solve the problems we face or the development in various analytical fields. Accordingly, these topics will be changed from one Semester to the other Semester considering the development in this important branch of chemistry field.

CH708: Modern aspects of catalysis

Recent and hot topics on catalytic materials such as nanocatalysts, smart catalysts, environmental catalysts, energy production catalysts, green catalysts, polymeric catalysts, industrial catalysts, enzyme and quantum dot catalysts.

CH709: Metabelomics

Metabolomics is an emerging field that aims to measure the complement of metabolites (the metabolome) in living organisms. The metabolome represents the downstream effect of an organism's genome and its interaction with the environment. Metabolomics has a wide application area across the medical and biological sciences. The course provides an introduction to metabolomics, describes the tools and techniques we use to study the metabolome and explains why we want to study it. By the end of the course you will understand how metabolomics can revolutionise our understanding of metabolism.

CH710: Advanced physical polymer chemistry

Polymeric composites and nanocomposites (introduction, types, preparation, properties, and applications. Polymer blends and hybrids (introduction, types, preparation, properties, and applications). Advancements in productions and applications of conductive polymers. Polymeric Liquid Crystal (introduction, types, preparation, properties, and applications). Mechanical properties (compression, impacts, and hardness) of polymers.

CH711: Advanced molecular biology

The goal of this course is the study of biological systems at the molecular level. Molecular biology deals with nucleic acids and proteins and how these molecules interact within the cell to promote proper growth, division, and development. The goal of this course is the study of biological systems at the molecular level. Molecular biology deals with nucleic acids and proteins and how these molecules interact within the cell to promote proper growth, division, and development.

CH712: Advanced supramolecular chemistry

This course deals with the concept of advanced supramolecular nanoarchitechtonics. The concept and design of materials nanoarchitechtonics cover the introductory features underlying the field, presents an overview of the theoretical aspects and emerging applications that are changing the capability to understand and design of advanced functional materials. The concept of nanoarchitechtonics was introduced to describe the correct manipulation of nanoscale materials in the creation of nano-devices and applications. Nanoarchitectonics has begun to spread into many fields including the synthesis of nanostructured materials, supramolecular assembly, nanoscale structural fabrications, materials hybridizations, materials and structures for energy and environmental sciences, device and physical application, and bio- and medical applications.

CH713: Advanced clinical biochemistry

The clinical biochemistry course emphasizes on the concepts of quality assurance in chemical pathology/clinical biochemistry and gives an insight into the understanding of organ functions in health and disease.

CH714: Advanced techniques for structural and surface analysis

X-ray Photoelectron Spectroscopy (XPS) and imaging**,** Electron Spectroscopy (AES), Secondary ion mass spectroscopy (SIMS) and imaging, Dynamic Secondary Ion Mass Spectrometry (DSIMS), Time-of-Flight Secondary Ion Mass Spectrometry (ToF-SIMS), X-ray Photoelectron Spectroscopy (XPS), White Light Interferometry (WLI), Scanning Electron Microscopy / Energy Dispersive Analysis (SEM/EDX), Three Dimensional Scanning Electron Microscopy (3DSEM), X-Ray Diffraction (XRD), Fourier Transform Infrared Analysis (FTIR), Atomic Force Microscopy (AFM), Transmission Electron Microscopy (TEM), Raman Spectroscopy.

CH715: Advanced analytical biochemistry

This course will familiarize the students with the state of the art techniques followed in analytical biochemistry. This course is this course will provide them theoretical knowledge to understand the rationale behind each analytical methodology.

CH716: Nanomaterials and nanotechnology

An overview of nanoparticles and nanotechnologies, classification of nanomaterials, types of nanoparticles, chemical composition concepts, synthesis, characterization, application in different fields.

CH718: Seminars

The student will deliver seminars at the beginning, middle, and end of his study before he can submit the PhD thesis.

CH720: Advanced organometallic chemistry

By finishing advanced organometallic chemistry course postgraduate students will be familiar with the coordination chemistry of organometallic compounds including general survey, effects on structure, and effects on reactivity, carbene chemistry and organometallic compounds, stoichiometric applications of organometallic (main group elements and transition metal) compounds to organic chemistry. It will give a broad insight on the homogeneous catalysis and catalytic applications of organometallic compounds. Relevant and modern methods for characterization of organometallic compounds will be studied.

CH722: Inorganic materials and nanotechnology

By ending this course PhD students will be familiar the most important topics related to applications of inorganic materials in nanotechnology such as electrical conductivity in ionic solids, transparent conducting oxides and their applications in devices, superconductivity especially iron-based superconductors, ceramic materials and colour pigments, chemical vapour deposition (CVD) especially metal deposition, ceramic coatings, perovskites and cuprate superconductors.

CH724: Structural inorganic chemistry

This course focuses structural inorganic chemistry topics such as the packing-of-spheres model applied to the structures of inorganic elements, polymorphism in metals, metallic radii, melting points and standard enthalpies of atomization of metals, alloys and intermetallic compounds, bonding in metals and semiconductors, intrinsic semiconductors and extrinsic semiconductors, ionic radii and ionic lattices, crystal structures of semiconductors and Lattice energy: ‘calculated’ versus ‘experimental’ values.

CH726: Advanced techniques in inorganic chemistry

Advanced techniques in inorganic chemistry deals with modern techniques in inorganic chemistry such as Mössbauer spectroscopy and its applications in inorganic chemistry, X-ray diffraction analysis as most powerful technique for inorganic chemists and X-ray single crystal, transmittance electron microscopy, scanning electron microscopy and Raman spectral analysis, nuclear quadropole resonance (N.Q.R) spectral analysis and mass spectral analysis as well as their applications in inorganic chemistry.

CH728: Advanced bioinorganic chemistry

Advanced Bioinorganic Chemistry course will give a survey of the pertinent topics of modern biological inorganic chemistry. It gives a survey of metalloproteins and metalloenzymes, their structures and functions, including recent advances in biomimetic modeling, small molecule activation in biological systems, and related physical methods. By the end of this course, students will have deeper understanding of designing experiments relevant to any bioinorganic systems (metalloenzymes or model complexes).

CH730: Computational inorganic chemistry

By the end of this course the students will be familiar with the applications of molecular mechanics on transition metal centers: from coordination compounds to metalloproteins and calculation of magnetic circular dichroism spectra with time-dependent dentistry function theory. Special emphases will be directed to computational studies on properties, formation and complexation of divalent metals with porphyrins.

CH732: Industrial inorganic chemistry

Industrial inorganic chemistry deals with the importance of inorganic chemical industry and their economic impact. It will cover the classification of the chemical inorganic industry, raw materials, inorganic chemical processes, ore dressing, magnetic separation and floatation, pyro-processing and refining. It explains the hydrometallurgy, electrometallurgy and thermite extraction of metals. Also, it provides deep understanding of ultra-purification of metals, electro-refining, ceramic composite and quartz industry, some acids, bases and fertilizer industries.

CH734: Research methods and seminars

By the end of the course, students will be able to conduct a theoretical or experimental search in the field of inorganic chemistry under the supervision of a department staff member, deliver a detailed report on his seminar topic, and give a seminar with a discussion of his findings.

CH736: Advanced applications of polymers and industrial chemistry

Study of modern review articles in applications of polymers and its relation with industry.

CH738: Advanced natural products and stereoselective synthesis

Study of modern review articles which describe the synthesis of optically pure natural products.

CH740: Advanced applications of dyes and textiles

Study of modern review articles which describe the new types of dyes and its chemistry in addition to its applications.

CH742: Modern organic synthesis
Study of modern review articles which describe the synthesis of organic compounds and its applications

CH744: Advanced physical organic chemistry
Study of modern review articles which describe the physical organic chemistry.

CH746: Advanced biochemical compounds
Study the metabolism of carbohydrates, proteins, nucleic acids and lipids with attention to interrelationships in metabolic rates of these important constituents of living cells.

CH748: Advanced petrochemicals and chemistry of petroleum
Study the chemistry of petroleum fuels, manufacturing processes, oils refinery and separation processes. Study the production of motor and jet fuels, cracking, reforming, isomerization, refining and treating processing, petrochemical industries.

CH750: Advanced heterocyclic chemistry
Study of modern review articles which describe the application of heterocyclic nucleous in organic synthesis.

CH752: Advanced applications of organic spectroscopy
Study of modern review articles which describe the application of organic spectroscopy for detection of the molecular structure of organic compounds.

CH754: Quality management in analytical chemistry
What do we mean by 'Quality', purpose of analysis, general principles of quality assurance and quality control, quality management system, good Laboratory practice, sampling, selecting the method, factors to consider when selecting a method, performance criteria for methods used. Method validation, making measurements, data treatment, benchmarking your laboratory, proficiency testing schemes, documentation and its management, managing quality and international Organization for Standardization (ISO) Standard will be discussed.

CH756: Pharmaceutical and toxicological analysis
The course summarizes the difference between pharmacology and toxicology, the most common instrumentation techniques used in forensic toxicology and their relative advantages and disadvantages, and discusses the analytical methods such as immunoassays and chromatography-based methods employed in toxicological analysis and analysis of recreational drugs in urine, saliva, hair and blood and bioanalysis for the pharmaceutical and veterinary industry and biomarkers of occupational exposure to chemicals, etc....

CH758: Advanced techniques for structural investigation
This course must include the following aspects: X-ray single crystal and powder diffraction electron microscopy, energy dispersive X-ray analysis (EDX), X-ray photoelectron spectroscopy (XPS), electron paramagnetic resonance (EPR), scanning electronic microscopy (SEM), transmission electronic microscopy (TEM), Fourier transform Infrared (FTIR) spectroscopy, Raman spectroscopy, vibrating sample magnetometer (VSM) and gas sorption analysis.

CH760: Applied electrochemical techniques

The course includes the following subjects: Electrodeposition and its applications, electrocatalysis in modern technology including basic methods of catalysts preparation and modification, elementary steps in electrocatalysis, theoretical modeling in electrocatalyst design, the reaction mechanism during this processes, role of nanoparticles in electrocatalysis, electrocatalysis of organic components in liquid phase, electrocatalysis of methanol and propanol, role of electrocatalysis in industrial and medical applications, fuel cells and supercapacitors technology, and convolutive voltammetry.

CH762: Advanced biochemical analysis

This course gives a deep illustration about qualitative and quantitative of biomolecules as drugs and their metabolites. Moreover, it shows the succession of bioanalytical techniques to construct a new diagnostic tool such as biosensors, biomarker detectors that server many fields as biotechnology, biochemical-engineering, drug design and food industry.

CH764: Proteomics

It covers the introduction to proteomics: Basics of protein structure and function, An overview of systems biology, Evolution from protein chemistry to proteomics; Abundance-based proteomics: Sample preparation and fractionation steps, Gel-based proteomics - two-dimensional gel electrophoresis (2-DE), two-dimensional fluorescence difference in-gel electrophoresis (DIGE), Staining techniques.

CH766: Bioinformatics

This course will be focused on introduction to Bioinformatics, Biology and Bioinformatics, Genomics and Proteomics, Computers in Biology and Medicine, computer algorithms, Biological Macromolecules, Topics covered include: central dogma and introduction to macromolecular sequences; Genome Analysis, sequencing methods and physical mapping of genomes; genome data and databases, Databases and Search Tools, algorithms for gene finding; statistical methods; pattern recognition; local sequence homology and scoring (BLAST tools), phylogenetic analysis and molecular evolution; tree building methods; RNA structure methods, protein structure and analysis; protein sequence and docking.

CH768: Biochemistry of signal transduction and regulation

The course covers the definition of Hormones. Classification of hormones. Hypothalamus hormones. Pituitary (anterior and posterior) Hormones. Thyroid Hormones, Parathyroid Hormones. Adrenal (cortex and medulla) Hormones. Steroid Hormones and pineal hormones. Pancreatic hormones.

The roles of membrane in signaling pathways, including the activities of a Kinase. Examines the nature and conservation of families of multivalent protein binding modules, which combine to create many discrete signaling pathways. Adds a new discussion of signaling in plants and bacteria, with comparison to mammalian signaling pathways.

CH770: Biopolymer and biotechnology

The structure, function, properties and use of biopolymers. Molecular architecture for some biological structures such as collagen, tissue, silk, wool, spider’s thread, shell. Nature as a model for polymeric materials. Cycle- and environment adapted materials. Survey and introduction to biomedical materials and “drug delivery” formulations. Biocomposites and biominerals. Biological attacks on polymeric materials and degradation mechanisms in polymeric materials. Degradation products in different

environments. Environmental issues when using polymers. Recovery/reuse of plastics. Polymer characterization in environmental analysis.

رابعاً: قسم الجيولوجيا

أ. برامج الماجستير في علوم الجيولوجيا:

1. برنامج الماجستير في العلوم في علم الصخور والجيوكيمياء: (Petrology and Geochemistry)

First Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 8 Credits				
GE601	Advances in Igneous Petrology صخور نارية متقدمة	2	-	2
GE603	Advances in Geochemistry جيوكيمياء متقدمة	2	-	2
GE605	Mineralogical and Geochemical Analytical Techniques طرق تحليلية معدنية وجيوكيميائية	2	-	2
GE607	Geotectonism and Petrogenesis تكتونية وأصل الصخور	2	-	2
Optional: Select 4 Credits				
GE609	Petrography and Microstructures وصف الصخور والتراكيب الميكروسكوبية	2	-	2
GE611	Organic Geochemisty جيوكيمياء عضوية	2	-	2
GE613	Field Geology (1) جيولوجيا الحقل (1)	2	-	2
GE615	Special Selected Topics in Petrology and Geochemistry (1) موضوعات خاصة مختارة في علم الصخور والجيوكيمياء (1)	2	-	2
GE617	Statistics الإحصاء	1	2	2
Total Credits		**12**		

Second Semester

Code	Preq.	Course Title	Hours/Week		
			Lec.	Prac.	Cred.
Obligatory: 8 Credits					
GE602	-	Advanced Metamorphic Petrology صخور متحولة متقدمة	2	-	2
GE604	-	Advances in Precambrian Geological Research بحوث جيولوجية متقدمة لعصر البريكامبرى	2	-	2
GE606	-	Isotope Geology جيولوجيا النظائر	2	-	2
GE608	-	Mineral Chemistry كيمياء المعادن	2	-	2
Optional: Select 4 Credits					
GE610	-	Structural Geology جيولوجيا تركيبية	2	-	2
GE612	-	Environmental Geochemistry جيوكيمياء بيئية	2	-	2
GE614	-	Plate Tectonics and Magmatism الالواح التكتونية والنشاط البركانى	2	-	2
GE616	-	Special Selected Topics in Petrology and Geochemistry (2) موضوعات خاصة مختارة في علم الصخور والجيوكيمياء (2)	2	-	2
GE618	-	Scientific writing and presentations الكتابة والعروض العلمية	1	2	2
Total Credits			**12**		

2. برنامج الماجستير في العلوم في الجيولوجيا الاقتصادية والتعدين:(Economic Geology and Mining)

First Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 8 Credits				
GE619	رواسب الخامات والخامات المعدنية Mineral Deposits and Ore Mineralogy	2	-	2
GE621	Rock Blasting and Mine Drilling تفجير الصخور وحفر المنجم	2	-	2
GE623	مناجم سطحية وتحت سطحية متقدمة Advances in Surface and Subsurface Mining	2	-	2
GE625	Geochemical Exploration الاستكشاف الجيوكيميائي	2	-	2
Optional: Select 4 Credits				
GE627	Mineral Resources in Egypt الثروات المعدنية في مصر	2	-	2
GE629	رواسب المحاليل الساخنة وتحلل جدار الحائط Hydrothermal Deposits and Wall Rock Alteration	2	-	2
GE631	Ores in Igneous Rocks الخامات في الصخور النارية	2	-	2
GE633	موضوعات خاصة مختارة في الجيولوجيا الاقتصادية والتعدين (1) Special Selected Topics in Economic Geology and Mining (1)	2	-	2
GE617	Statistics إحصاء	1	2	2
Total Credits		**12**		

Second Semester

Code	Preq.	Course Title	Hours/Week		
			Lec.	Prac.	Cred.
Obligatory: 8 Credits					
GE620	-	Geochemistry of Ore Deposits جيوكيمياء رواسب الخام	2	-	2
GE622	-	Advances in Ore Dressing فصل المعادن متقدم	2	-	2
GE624	-	Radioactive Minerals المعادن المشعة	2	-	2
GE626	-	Industrial Applications of Minerals and Rocks التطبيقات الصناعية للمعادن والصخور	2	-	2
Optional: Select 4 Credits					
GE628	-	Geothermobarometry of Ores قياس الحرارة والضغط للخامات	2	-	2
GE630	-	Ores in Sedimentary and Metamorphic Rocks الخامات في الصخور الرسوبية والمتحولة	2	-	2
GE632	-	Mineral Deposits in Relation to Plate Tectonics الرواسب المعدنية وعلاقاتها باللألواح التكتونية	2	-	2
GE634	-	Special Selected Topics in Economic Geology and Mining (2) موضوعات خاصة مختارة في الجيولوجيا الاقتصادية والتعدين (2)	2	-	2
GE618	-	Scientific writing and presentations الكتابة والعروض العلمية	1	2	2
Total Credits			**12**		

3. برنامج الماجستير في العلوم في الحفريات والطبقات: (Paleontology and Stratigraphy)

First Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 8 Credits				
GE635	Calcareous Microfossils الأحافير الدقيقة الجيرية	2	-	2
GE637	Advanced Macropaleontology الأحافير الكبيرة المتقدم	2	-	2
GE639	Siliceous Microfossils الأحافير السيليسية الدقيقة	2	-	2
GE641	Advanced Stratigraphy and Correlation علم الطبقات والمضاهاة المتقدم	2	-	2
Optional: Select 4 Credits				
GE643	Quaternary Geology of Egypt جيولوجيا الحقب الرابع لمصر	2	-	2
GE645	Stratigraphical Field Techniques تقنيات الطرق الحقليه للطبقات	2	-	2
GE647	Stage Boundaries and Global Stratotypes حدود الفترة الزمنية والأنماط الطبقية العالمية	2	-	2
GE649	Special Selected Topics in Paleontology and Stratigraphy (1) موضوعات خاصة مختارة في علم الأحافير وعلم الطبقات (1)	2	-	2
GE617	Statistics إحصاء	1	2	2
Total Credits		**12**		

Second Semester

Code	Preq.	Course Title	Hours/Week		
			Lec.	Prac.	Cred.
Obligatory: 8 Credits					
GE636	-	Organic-Walled Microfossils الأحافير العضوية ذات الجدران الدقيقة	2	-	2
GE638	-	Vertebrate Paleontology علم الحفريات الفقارية	2	-	2
GE640	-	Sequence Stratigraphy التتابع الطباقي	2	-	2
GE642	-	Type-Sections Stratigraphy of Egypt طباقية القطاعات النوعية لمصر	2	-	2
Optional: Select 4 Credits					
GE644	-	Paleontology and Oil Exploration علم الحفريات واستكشاف البترول	2	-	2
GE646	-	Field Geology (2) جيولوجيا الحقل (2)	2	-	2
GE648	-	Applied Sedimentoloy علم الرسوبيات التطبيقية	2	-	2
GE650	-	Special Selected Topics in Paleontology and Stratigraphy (2) موضوعات خاصة مختارة في علم الأحافير وعلم الطبقات (2)	2	-	2
GE618	-	Scientific writing and presentations الكتابة والعروض العلمية	1	2	2
Total Credits			**12**		

4. برنامج الماجستير في العلوم في الصخور الرسوبية والترسيب:

(Sedimentary Rocks and Sedimentation)

First Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 8 Credits				
GE651	Clastic Rocks الصخور الفتاتية	2	-	2
GE653	Geochemistry of Sedimentary Rocks جيوكيمياء الصخور الرسوبية	2	-	2
GE655	Diagenisis of Sediments عمليات ما بعد الترسيب	2	-	2
GE657	Facies Analysis (1) تحليل السحنات (1)	2	-	2
Optional: Select 4 Credits				
GE659	Siliceous Sediments الرواسب السليسية	2	-	2
GE661	Field Geology (3) جيولوجيا حقلية (3)	2	-	2
GE663	Sedimentary Structures التراكيب الرسوبية	2	-	2
GE665	Special Selected Topics in Sedimentary Rocks and Sedimentation (1) موضوعات مختارة خاصة في الصخور الرسوبية والترسيب (1)	2	-	2
GE617	Statistics or Biostatistics الإحصاء	1	2	2
Total Credits		**12**		

Second Semester

Code	Preq.	Course Title	Hours/Week		
			Lec.	Prac.	Cred.
Obligatory: 8 Credits					
GE652	-	Non-Clastic Rocks الصخور الغير فتاتيه	2	-	2
GE654	-	Sedimentary Basin Analysis تحليل الأحواض الرسوبية	2	-	2
GE656	-	Marine Geology الجيولوجيا البحرية	2	-	2
GE658	-	Advanced Sedimentary Techniques التقنيات الرسوبية المتقدمة	2	-	2
Optional: Select 4 Credits					
GE660	-	Depositional Environmental Systems أنظمة وبيئات الترسيب	2	-	2
GE662	-	Tectonics and Sedimentation التكتونية والترسيب	2	-	2
GE648	-	Applied Sedimentology علم الرسوبيات التطبيقية	2	-	2
GE664	-	pecial Selected Topics in Sedimentary Rocks and Sedimentation (2) موضوعات مختارة خاصة في الصخور الرسوبية والترسيب (2)	2	-	2
GE618	-	Scientific writing and presentations الكتابة والعروض العلمية	1	2	2
Total Credits			**12**		

5. برنامج الماجستير في العلوم في الجيوفيزياء التطبيقية: (Applied Geophysics)

First Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 8 Credits				
GE667	Gravity and Magnetic Prospection الجاذبية والتنقيب المغناطيسي	2	-	2
GE669	Electric Prospecting التنقيب الكهربائي	2	-	2
GE671	Well Logging تسجيلات الآبار	2	-	2
GE673	Seismic Acquisition and Data Interpretation التوليد الزلزالى وتفسير البيانات	2	-	2
Optional: Select 4 Credits				
GE675	Petroleum geology جيولوجيا البترول	2	-	2
GE677	Facies Analysis and Sequence Stratigraphy تحليل السحنات والتتابع الطباقى	2	-	2
GE679	Structural Geology and Field Geology الجيولوجيا التركيبية وجيولوجيا الحقل	2	-	2
GE681	Special Selected Topics in Applied Geophysics (1) موضوعات خاصة مختارة في الجيوفيزياء التطبيقية (1)	2	-	2
GE617	Statistics إحصاء	1	2	2
Total Credits		**12**		

Second Semester

Code	Preq.	Course Title	Hours/Week		
			Lec.	Prac.	Cred.
Obligatory: 8 Credits					
GE666	-	Geothermal Energy and Radiometric Prospecting الطاقة الحرارية الجوفية والتنقيب الإشعاعي	2	-	2
GE668	-	Petrophysics طبيعة أرضية	2	-	2
GE670	-	Paleomagnetic Applications تطبيقات المغناطيسية القديمة	2	-	2
GE672	-	Seismological Applications تطبيقات الزلازل	2	-	2
Optional: Select 4 Credits					
GE674	-	Basin modeling نمذجة الأحواض	2	-	2
GE676	-	Remote Sensing Applications in Geophysics تطبيقات الاستشعارعن بعد في الجيوفيزياء	2	-	2
GE678	-	Seismic Stratigraphy طباقية سيزمية	2	-	2
GE680	-	Special Selected Topics in Applied Geophysics (2) موضوعات خاصة مختارة في الجيوفيزياء التطبيقية (2)	2	-	2
GE618	-	Scientific writing and presentations الكتابة والعروض العلمية	1	2	2
Total Credits			**12**		

6. برنامج الماجستير في العلوم في جيولوجيا البترول: (Petroleum Geology)

First Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 8 Credits				
GE671	Well Logging تسجيلات آبار	2	-	2
GE675	Petroleum Geology جيولوجيا البترول	2	-	2
GE683	Advanced Structural Geology الجيولوجيا التركيبية المتقدمة	2	-	2
GE685	Reservoir Characterization خصائص الخزانات	2	-	2
Optional: Select 4 Credits				
GE687	Paleomagnetic Measurements القياسات المغناطيسية القديمة	2	-	2
GE689	Ground Penetrating Radar الرادار مخترق الأرض	2	-	2
GE691	Geostatistics in Geophysics الإحصاء الجيولوجي في الجيوفيزياء	2	-	2
GE693	Special Selected Topics in Petroleum Geology (1) موضوعات خاصة مختارة في جيولوجيا البترول (1)	2	-	2
GE617	Statistics إحصاء	1	2	2
Total Credits		**12**		

Second Semester

Code	Preq.	Course Title	Hours/Week		
			Lec.	Prac.	Cred.
Obligatory: 8 Credits					
GE682	-	Seismic Interpretation and Modeling التفسير الزلزالي والنمذجة	2	-	2
GE684	-	Potential Exploration الاستكشافات المتوقعة	2	-	2
GE686	-	Well Drilling Methods طرق حفر الآبار	2	-	2
GE688	-	Source Rock Evaluation تقييم صخور المصدر	2	-	2
Optional: Select 4 Credits					
GE690	-	Facies Analysis (2) تحليل السحنات (2)	2	-	2
GE674	-	Basin Modeling نمذجة الأحواض	2	-	2
GE692	-	Petroleum Seismology سيزمية البترول	2	-	2
GE694	-	Special Selected Topics in Petroleum Geology (2) موضوعات خاصة مختارة في جيولوجيا البترول (2)	2	-	2
GE618	-	Scientific writing and presentations الكتابة والعروض العلمية	1	2	2
Total Credits			**12**		

7. برنامج الماجستير في العلوم في الجيولوجيا التطبيقية: (Applied Geology)

First Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 8 Credits				
GE683	Advanced Structural Geology الجيولوجيا التركيبية المتقدمة	2	-	2
GE695	Advanced Engineering Geology الجيولوجيا الهندسية المتقدمة	2	-	2
GE697	Advanced Hydrogeology جيولوجيا المياه المتقدمة	2	-	2
GE699	Advanced Remote Sensing and GIS الاستشعار عن بعد المتقدم ونظم المعلومات الجغرافية	2	-	2
Optional: Select 4 Credits				
GE6101	Hydrology of the Nile Basin هيدرولوجيا حوض النيل	2	-	2
GE6103	Hydrogeological Modeling and Analysis النمذجة الهيدروجيولوجية وتحليلها	2	-	2
GE6105	Soil Mechanics ميكانيكا التربة	2	-	2
GE6107	Special Selected Topics in Applied Geology (1) موضوعات خاصة مختارة في الجيولوجيا التطبيقية (1)	2	-	2
GE617	Statistics إحصاء	1	2	2
Total Credits		**12**		

Second Semester

Code	Preq.	Course Title	Hours/Week		
			Lec.	Prac.	Cred.
Obligatory: 8 Credits					
GE696	-	Advanced Rock Mechanics ميكانيكا الصخور المتقدمة	2	-	2
GE698	-	Geotechnical Engineering الهندسة الجيوتقنية	2	-	2
GE6100	-	Geotectonics الجيولوجيا التكتونية	2	-	2
GE6102	-	Programming for Remote Sensing and GIS برمجة الاستشعار عن بعد ونظم المعلومات الجغرافية	2	-	2
Optional: Select 4 Credits					
GE6104	-	Digital Image Processing and Analysis معالجة الصور الرقمية وتحليلها	2	-	2
GE6106	-	Surveying and Geologic Mapping المسح والتخريط الجيولوجى	2	-	2
GE6108	-	Renewable Energy for Cities الطاقة المتجددة في المدن	2	-	2
GE6110	-	Special Selected Topics in Applied Geology (2) موضوعات خاصة مختارة في الجيولوجيا التطبيقية (2)	2	-	2
GE618	-	Scientific writing and presentation الكتابة والعروض العلمية	1	2	2
Total Credits			**12**		

8. برنامج الماجستير في العلوم في الجيولوجيا البيئية: (Environmental Geology)

First Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 8 Credits				
GE6109	Environmental Geology الجيولوجيا البيئية	2	-	2
GE6111	Natural Resources الموارد الطبيعية	2	-	2
GE6113	Water Resources Management إدارة الموارد المائية	2	-	2
GE6115	Water Pollution and Management تلوث المياه وإدارتها	2	-	2
Optional: Select 4 Credits				
GE698	Geotechnical Engineering الهندسة الجيوتقنية	2	-	2
GE6117	Pollution Control and Waste Management التحكم في التلوثات وإدارة المخلفات	2	-	2
GE6119	Remote Sensing and Water Resources Management الاستشعار عن بعد وإدارة الموارد المائية	2	-	2
GE6121	Special Selected Topics in Environmental Geology (1) موضوعات خاصة مختارة في الجيولوجيا البيئية (1)	2	-	2
GE617	Statistics إحصاء	1	2	2
Total Credits		**12**		

Second Semester

Code	Preq.	Course Title	Hours/Week		
			Lec.	Prac.	Cred.
Obligatory: 8 Credits					
GE6112	-	Sustainable Energy الطاقة المتجددة	2	-	2
GE6114	-	Environmental Impact Assessment تقييم الأثر البيئى	2	-	2
GE6116	-	Geothermal Energy and Reservoirs in Egypt الطاقة الحرارية الجوفية والخزانات في مصر	2	-	2
GE6118	-	Geohazards مخاطر جيولوجية	2	-	2
Optional: Select 4 Credits					
GE 6120	-	Field Geology and Surveying الجيولوجيا الحقلية والمساحة	2	-	2
GE6122	-	Environmental Geostatistics الإحصاء الجيولوجى البيئي	2	-	2
GE6124	-	Geomorphology الجيومورفولوجيا	2	-	2
GE6126	-	Special Selected Topics in Environmental Geology (2) موضوعات خاصة مختارة في الجيولوجيا البيئية (2)	2	-	2
GE618	-	Scientific writing and presentations الكتابة والعروض العلمية	1	2	2
Total Credits			**12**		

9. برنامج الماجستير في العلوم في الجيولوجيا التركيبية والتكتونية: (Structural Geology and Geotectonics)

First Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 8 Credits				
GE695	Advanced Engineering Geology الجيولوجيا الهندسية المتقدمة	2	-	2
GE6123	Structural Geology and Basin Formation الجيولوجيا التركيبية ونشأه الاحواض الرسوبية	2	-	2
GE6125	The Geology of the Egyptian Nubian Shield جيولوجيا الدرع النوبي المصري	2	-	2
GE6127	Remote Sensing and GIS in Structural Geology الاستشعار عن بعد ونظم المعلومات الجغرافية في الجيولوجيا التركيبية	2	-	2
Optional: Select 4 Credits				
GE6131	Fundamental of Rock Mechanics أساسيات ميكانيكا الصخور	2	-	2
GE6133	Neotectonics and Tectonic Geomorphology التكتونية الحديثة والجيومورفولوجيا التكتونية	2	-	2
GE6135	Structural Geology for Exploration and Mining الجيولوجيا التركيبية للاستكشاف والتعدين	2	-	2
GE6137	Advanced Stratigraphy علم الطبقات المتقدمة	2	-	2
GE6118	Geohazards المخاطر الجيولوجية	2	-	2
GE6139	Deformation Microstructures in Rocks التراكيب المجهرية نتيجة التشوه في الصخور	2	-	2
Total Credits		**12**		

Second Semester

Code	Preq.	Course Title	Hours/Week		
			Lec.	Prac.	Cred.
Obligatory: 8 Credits					
GE6128		Tectonic Evolution of Egypt التطور التكتونى لمصر	2	-	2
GE6130		Geodynamics and Basin Evolution الجيوديناميكا وتطور الاحواض الرسوبية	2	-	2
GE6132		Precambrian Rocks of Egypt and Associated Mineralization صخور ما قبل الكمبرى في مصر والتعدين المرتبط بها	2	-	2
GE6129		Advanced Geological Field Skills مهارات الجيولوجيا الحقلية المتقدمة	2	-	2
Optional: Select 4 Credits					
GE6134		Geological Structures of Egypt التراكيب الجيولوجية في مصر	2	-	2
GE6136		Structural Geology and Petroleum Systems الجيولوجيا التركيبية والأنظمة البترولية	2	-	2
GE6138		Geochemistry and Geochronology الجيوكيمياء وعلم الأرض	2	-	2
GE618		Scientific writing and presentations الكتابة والعروض العلمية	2	-	2
Total Credits			**12**		

توصيف مقررات الماجستير

GE601: Advances in Igneous Petrology

Experiments with Molten Silicates: Unary, Binary and Ternary Systems (simple, complex systems), Pressure Effects, Crystallization of Magma, The Formation of Magma: Rift Zones, Mid-ocean Ridge and Continental Margins.

GE602: **Advanced Metamorphic Petrology**

In-depth analysis of metamorphic phase equilibria in pelites, amphibolites, carbonates, and ultramafic rocks. Schreinemakers' analysis, petrogenetic grids, P-T-X relations, reaction space, geothermometry, geobarometry, and analysis of zoned prophyroblasts. Heat flow, metamorphic, and tectonic evolution.

GE603: **Advances in Geochemistry**

Mantle geochemistry, mantle processes and distribution of elements, geodynamics and cycling of elements, composition of the atmosphere, chemical interaction with living organisms, the use of geochemistry in environmental issues, the biogeochemistry.

GE604: **Advances in Precambrian Geological Research**

chemical, biological, biochemical and cosmochemical evolution during Precambrian, nature and evolution of the lithosphere, geochronology of Precambrian periods, the effect of Precambrian evolution on Phanerozoic earth-system processes.

GE605: Mineralogical and Geochemical Analytical Techniques

Microscopic (optical, scanning electron microscope, transmission electron microscope, Electron Probe Micro Analysis (EPMA), thermal analysis (Thermogravimetry (TG), Differential Thermal Analysis (DTA), X-ray Diffraction, X-ray Fluorescence Spectrometry, Atomic Absorption Spectroscopy.

GE606: Isotope geology

Nucleosynthesis, extinct radionuclides and early processes in the solar system, applications of radiogenic isotope systematics to study geological processes and date rockforming events (igneous, metamorphic, sedimentary), the main features of low-temperature geochronology, applications of stable isotope systematics in geological processes and events.

GE607: Geotectonism and Petrogenesis

Magma source regions and their ascent trough the Earth's lithosphere. Relation of present-day magmatism to global tectonic processes, geodynamics and partial melting in the Earth's mantle, igneous rocks in mid-ocean ridges, island arcs, active continental margins, back-arc basins, oceanic islands, metamorphism at the convergent plates, metamorphism in subduction zones, metamorphism at spreading plates.

GE608: Mineral Chemistry

Chemical compositions of mineral groups (pyroxenes, amphiboles, mica, plagioclase, spinels, garnet, spinel, chlorite, sulfides,,,,,), Trace elements classification in minerals, application of trace elements in minerals to geological processes (melting, metasomatism, alteration,), isotopes in minerals applied to geological processes.

GE609: Petrography and Microstructures

Deformation and metamorphism of the Earth's lithosphere, Analysis, interpretation and application of structural data in the field and in thin sections on metamorphism, controls on metamorphism, fluid-rock interaction and mineral reactions, metamorphic and deformation fabrics, deformation mechanisms, lithosphere rheology.

GE610: Structural Geology

Relation between fracturing, flow and mineralization, remobilization of mineralization and formation of epigenetic mineralization, genetic link between mineralization and orogenic domains, cases of pre-existing structural control vein style deposits, uranium mineralizations, application of structural geology in mineral exploration.

GE611: Organic Geochemisty

origin and distribution of organic matter in the environment, and its fate in natural and engineered environments, carbon biogeochemistry, origin and characteristics of natural organic matter, organic matter in the rock record, molecular biomarkers, evolution of organic compounds in petroleum and contaminated sites, and analytical tools, applications of organic chemistry in the study of earth history, economic geology, and natural and contaminated environments.

GE612: Environmental Geochemistry

Abundance, distribution and behavior of trace elements in the surface environment. The course concerns several environmental matrices such as soil, stream sediment, surface water and groundwater, particulate matter, vegetable and animal organisms, as well as foods.

GE613: Field Geology (1)

Environmental and applied mapping problems, geological mapping and careful observation in the field. Relevant analyses (landslide geometry, folds and faults, earthquake hazard, and subsidence hazard), logistics and the key elements of the mapping problem and follow-up analysis.

GE614: Plate Tectonics and Magmatism

Ore deposits at mid-ocean ridges Ore deposits related to ophiolites, ore deposits related to subduction zones, ore deposits related to continental rift, mantle pluming and ore genesis

GE615: Special Selected Topics in Petrology and Geochemistry (1)

GE616: Special Selected Topics in Petrology and Geochemistry (2)

GE617: Statistics

Descriptive Statistics, Probability, Random Variables and Probability Distribution, Mathematical Expectation, Fundamental Sampling Distributions and Data Descriptions

GE618: Scientific writing and presentations

Analysis and interpretation of scientific data are essential skills for modern scientists and are important for handling of biotechnological information. The purpose of this module is to develop these skills through a directed program of reading, discussion and question answering, based on a series of thesis or

scientific research paper and to prepare other materials for presentation. This module will introduce the students to the elements of scientific writing starting with how to present the data, prepare tables and graphs using Microsoft Word, PowerPoint and Excel etc.

GE619: Mineral Deposits and Ore Mineralogy

Minology- Metallic and non-metallic minerals- Ore-forming process- Classifications of ore deposits and geologic environments- Recognize the economic aspects of ore minerals and their evaluation. Components of the ore microscope and its accessories comparing with other different types of optical microscopes- Preparation of ore samples for ore microscopy- Optical properties of opaque minerals- Ore textures-Paragenetic sequence.

GE620: Geochemistry of Ore Deposits

Geochemistry and origin of the ore-forming fluids in hydrothermal-magmatic systems, geochemistry of hydrothermal ore deposits, geochemistry of sedimentary ore deposits, stable isotope geochemistry in ore genesis.

GE621: Rock Blasting and Mine Drilling

The main aims of this course are: Evaluate and optimize blast performance and productivity improvement, Develop the documentation of safe blasting procedures, Avoid dangerous procedures, design flaws and common blasting mistakes, Reduce drilling and blasting cost by using realistic estimates and techniques, Manage flyrock and other hazards associated with blasting operation, Limit vibration levels in accordance with existing rules and regulations, Control costs by managing risk.

GE622: Advances in Ore dressing

Ore Handling, Comminution (crushing, grinding mill, Screening and Classification, Concentration (Leaching, Ore Sorting, Gravity Concentration, Magnetic Separation, Electrostatic Separation, Dense Medium Separation, Flotation, Dewatering, Tailing Management), Metallurgical Accounting, Smelting and Refining, biological concentration.

GE623: Advances in Surface and Subsurface Mining

This course will focus on Analysis of elements of surface mine operation. Design of surface mining systems with emphasis on minimization of adverse environmental impact and maximization of efficient use of mineral resources. Surface excavation. The uses, handling and maintenance of surface equipment and plants. Ore reserve estimates, grade control (blending and dilution), short and long range planning, unit operations, equipment selection, cost estimation, slope stability and Placer mining operation. Aggregates quarrying and dimension stones production. Ore handling equipment. Case studies of typical surface mines: coal, metallic and non-metallic mines.

GE624: Radioactive Minerals

Recognize of radioactive elements (ex; U, Th, K40) and their natural decay- Principal source minerals for radioactive elements and their geologic setting- Radioactive minerals as useful tool for dating and their importance in rock genesis- Analytical techniques in measurement of radiation dose- Radioactive and radiometric survey- Method for extraction of radioactive elements and preparation of the yellow cake- Uses of radioactive minerals.

GE625: Geochemical Exploration

Obviously, the goal of exploration is to find an economic mineral deposit. The use of chemical properties of naturally occurring substances (including rocks, glacial debris, soils, stream sediments, waters, vegetation, and air) as aids in a search for economic deposits of metallic minerals or hydrocarbons. This course provides a detail information and knowledge on distribution of ore deposits in space and time. Ore types and crustal evolution. Geochemical environments (primary and secondary environments).; Mobility and dispersion of elements at the earth surface (sediments, soils and waters).; Design of exploration programs based on the concept of ore-types (i.e., Geochemical exploration Survey Design). Exploration Methods (geology, geophysics, geochemical, drilling, bulk sampling).; Different natural geological material used in geochemical exploration programs (including rocks, glacial debris, soils, stream sediments, waters, vegetation, and air).; Sampling (soil, chip, grab), drilling methods, analysis methods, and Assaying.; Typical Geochemical Exploration Program and Stages of exploration (reconnaissance, regional and detail) and objectives. Prospecting criteria and selection of areas for exploration during reconnaissance and initial follow-up. Integration of data sets for evaluation of mineral potential. Practical examples in geochemical prospecting.

GE626: Industrial applications of minerals and rocks

Types of Coatings Formulating Raw Materials Additives. Papermaking Pulping. Recycling Microparticle Retention. Rubber Compounding Materials. Adhesive and Sealant Testing Chemical Raw Materials-Polymers. Fillers Comparison of Mineral Fillers. Minerals in Plastics Pharmaceuticals Minerals. Ceramics and Glass. Tile/Whiteware Processing Refractories.

GE627: Mineral Resources in Egypt

This course provide a detail information and knowledge on different types of mineral resources in Egypt including both of Metallic ore deposits and Non-metallic Mineral Deposits), as well as covering their origin and geological characteristics, the principles of the search for ores and minerals, and the investigation of newly found deposits. Types of mineral resources in Egypt (Metallic ore deposits and Non-metallic Mineral Deposits), Formation of various economic mineral resources in Egypt, The relationship between the distribution of different types of mineral resources and plate tectonics, and the environmental problems associated with the extraction and utilization of Egyptian mineral resources.

GE628: Geothermobarometry of ores

Exchange equilibria involving major or trace elements and net-transfer reactions, geothermobarometry using multi-mineral equilibria based on internally consistent thermodynamic datasets, analysis of mineral zoning and P-T phase diagrams (petrogenetic grids and pseudosections). stable isotope fractionation to geothermometric problems, fluid inclusions and P-T

GE629: Hydrothermal Deposits and Wall Rock Alteration

Chemical changes due to alteration, Phyllosilicates formation during alteration, fracturing and alteration of rocks, wall rocks alteration zones, quantification of alteration using mass balance calculation, alteration to exploration.

GE630: Ores in Sedimentary and Metamorphic Rocks

Classification of ore minerals and their physical and chemical properties. Stability of ore minerals and their types of equilibrium in binary and ternary systems for some oxides, sulfides, and sulfate salts. Solid solutions and segregation. Ore minerals in aqueous medium; old and recent mineralizing fluids, Ores in Sedimentary and Metamorphic Rocks

GE631: Ores in Igneous Rocks

Classification of ore minerals and their physical and chemical properties. Stability of ore minerals and their types of equilibrium in binary and ternary systems for some oxides, sulfides, and sulfate salts. Solid solutions and segregation. Ore minerals in aqueous medium; old and recent mineralizing fluids, Ores in Igneous Rocks

GE632: Mineral Deposits in Relation to Plate Tectonics

In this course metal deposits, in particular those of non-ferrous and precious metals, are classified and analyzed in terms of their plate tectonic settings. This approach allows a meaningful treatment of metal deposits of different types and provides significant insights into both their genesis and formative environments. Particular attention is paid to the geological settings and generative models of gold deposits of all kinds. Learn about plate tectonics and mineral resources, and explore different plate environments, including divergent boundaries, subduction zones, and transform boundaries, Classifications of ore deposits and geologic environments.

GE633: Special Selected Topics in Economic Geology and Mining (1)

GE634: Special Selected Topics in Economic Geology and Mining (2)

GE635: Calcareous Microfossils

Introduction to marine Micropaleontology and types of microfossil groups-Methods of study of the different of marine microfossil groups. Test morphology, classification and stratigraphical distribution of some microfossil groups: Foraminifera, Calcareous Nannofossils, Ostracods, Diatoms, palynomorph (Silicoflagellates, Dinoflagellates, spores and pollens). Application of marine microfossils in different studies such as biostratigraphy, reconstruction of paleoenvironments, paleoclimatology, paleogeography, in petroleum exploration, in different economic industry, medicines and as excellent indicators in evolution of life on the earth.

GE636: Organic-Walled Microfossils

The diversification of organic-walled vesicular microfossils of unknown affinity, filamentous, and multicellular microorganisms,

GE637: Advanced Macropaleontology

Introduction, Origin and history of live on Earth, Geologic Time Scale, Fossils and fossilization, Taphonomy, Significance of fossils, Age determination, Ecology and mode of life. Taxonomy, classification, Morphology, Paleobiology and geologic history of different fossil groups: Mollusca, Bryozoa, Porifera, Arthropoda (Class: Trilobite), Brachiopoda, Cnidaria, Echinodermata, Hemichordata (Class: Graptolithina, Trace fossils, Geological importance, Paleoecology and paleoenvironment, Field trip: Fossil collection examination, description and preparation for investigation.

GE638: Vertebrate Paleontology

Introduction, definitions, Subphylum: Vertebrata; Superclass: Pisces and Superclass: Tetrapoda (Amphibia, Reptila, Aves and Mammalia). Dinosaur paleobiology and the origin of birds. Major mammalian lineages and Primate origins. Importance of Fayoum province in Egypt as a famous locality for vertebrate fossils. Wadi El-Hitan as a world heritage protectorate in Egypt. laboratory exercises include examples of each class.

GE639: Siliceous Microfossils

The course covers the most important siliceous microfossils that have shell consists mainly of opaline (amorphous) silica such as Diatoms, Sponge spicules, Radiolarians, and Silicoflagellate. The main Siliceous Microfossil Groups will be discussed in terms of: Morphology, description and taxonomy of siliceous microfossils, Distribution in different ecosystems, Evolutionary trends throughout geological time, Geological and stratigraphical significance, Applications in different branches sciences included the stratigraphy, paleoenvironmental and paleoclimate construction.

GE640: Sequence Stratigraphy

Introduction and general definitions used in sequence stratigraphic. Sequence stratigraphic seismic tool: principles of seismic stratigraphic interpretation-resolution of seismic data-seismic processing and display for seismic interpretation- seismic reflection termination patterns-seismic facies and attribute patterns. Principles of sequence stratigraphy concept of scale sequence stratigraphy vs. lithostratigraphy and allostratigraphy - Dynamics of Basin wide Sedimentation Patterns and Sea level Changes– accommodation and shoreline shifts- orders and causes of stratigraphic cycles- surfaces and their criteria-hierachies in sequence stratigraphy (sequence, system tracts, para-sequences) outlines of siliciclastic and carbonate sequence stratigraphy. Recognize the depositional environment. Depositional environment and gross lithofacies interpretation.

GE641: Advanced Stratigraphy and Correlation

Introduction, strata and stratification, Basic stratigraphic principles and laws, Stratigraphic contacts, conformable and unconformable boundaries, Geologic time units, Relative and absolute ages, Branches of stratigraphy, Stratigraphic procedures, stratigraphic maps and diagrams, Stratigraphic relationships and sequence of events, Stratigraphic subdivisions (litho-, bio-, chrono-) and event stratigraphy.Construction of different types of stratigraphic maps and diagrams, Field trip.

GE642: Type-Sections Stratigraphy of Egypt

Introduction, Main Phanerozoic basins in Egypt, Early Paleozoic stratigraphy, Late Paleozoic stratigraphy, Permo-Triassic transition, Triassic stratigraphy, Jurassic stratigraphy, K/T boundary, Cretaceous stratigraphy in Sinai and Gulf of Suez region, Cretaceous stratigraphy in the Eastren and Western deserts, Paleocene-Eocene stratigraphy and boundary, Oligocene-Miocene stratigraphy, Pliocene-Pleistocene, Stratigraphy of some selected sections, field trip.

GE643: Quaternary Geology of Egypt

An introduction to the major topics of Quaternary Science in Egypt with an emphasis on 1) the regional glacial geology and the geologic processes pertaining to glacial environments, 2) the methods to study the past 2.6 million years in Egypt, 4) applications in mineral exploration (drift prospecting) and water resources assessments in Egypt (e.g. hydrostratigraphy). Field trips and laboratory sessions will involve various observations, measurements, and sedimentologic analyses of glacial sediments.

GE644: Paleontology and Oil Exploration

Give a brief introduction on how paleontologists use fossils and biostratigraphy to help correlate borehole information. The primary focus of this course is to provide practical and pragmatic techniques for the non-specialist to help integrate paleontological information with other borehole data, as well as recognize when to seek specialists' advice. While this course is geared for the geoscientist, engineers (reservoir/drilling/completions) will also find utility.

GE645: Stratigraphical Field Techniques

Field equipment and safety, Quantification of geological observations, The hand lens and binoculars, The compass-clinometer, Global positioning systems and altimeters, Measuring distance and thickness, Classification and colour charts, Hammer, chisels and other hardware, The hardcopy field notebook, Writing equipment, maps and relevant literature, Comfort, field safety and field safety equipment, Defining the fieldwork objectives, Scale of observation, where to start and basic measurements, Hand specimens, Field sketches and maps, Recording data, ideas and interpretation, Collecting fossil data, Fossil distribution and where to find them, Sampling strategies, Sampling of bedding surfaces and palaeoecology, How many samples are required, Recording features of sedimentary rocks and constructing graphic logs, Description, recognition and recording of sedimentary deposits and sedimentary structures, Graphic logs.

GE646: Field Geology (2)

Describes the structure of the Earth on and beneath its surface, and the processes that have shaped that structure. It also provides tools to determine the relative and absolute ages of rocks found in a given location, and also to describe the histories of those rocks.By combining these tools, geologists are able to chronicle the geological history of the Earth as a whole, and also to demonstrate the age of the Earth. Geology provides the primary evidence for plate tectonics, the evolutionary history of life, and the Earth's past climates.

GE647: Stage Boundaries and Global Stratotypes

Definition of the boundaries between stages on the geologic time scale, Description of transitions between different faunal stages, Requirements for Stratotypes and Type Sections, Kinds of Stratotype, The Cambrian explosion, Ordovician–Silurian Extinction Events, Late Devonian Extinction, End-Permian Mass Extinction (the great dying), Triassic–Jurassic Extinction Event, The Cretaceous/Tertiary (K/T) boundary stratotype section, The Global Standard Stratotype-section (GSSP) for the Paleocene/Eocene (P/E) boundary, Eocene-Oligocene; Miocene-Pliocene; Pliocene-Pleistocene and Pleistocene-Holocene stratotypes.

GE648: **Applied Sedimentology**

This course is a survey of modern sedimentary geology that will give you experience interpreting sedimentary rocks in terms of the processes that created them. Completing the course should give you a greater understanding of what sediment and sedimentary rocks can tell you about Earth surface processes and how those processes have changed through time. The skills and knowledge you learn in this class have applications in core facets of environmental and geological work. The course aims develop practical geological skills applicable to the hydrocarbons industry, embracing the subdisciplines of clastic and carbonate sedimentology, stratigraphy, and diagenesis; it will show how sedimentological

and stratigraphic knowledge is crucial in both exploration and development activities, and is fundamental in making predictive models. It will impart a practical knowledge of depositional environments which form hydrocarbon reservoirs, linking these together using the techniques of sequence stratigraphy as applied to siliciclastic and carbonate settings. The origin and effects of reservoir fluids and subsequent diagenesis will also be covered.

GE649: Special Selected Topics in Paleontology and Stratigraphy (1)

GE650: Special Selected Topics in Paleontology and Stratigraphy (2)

GE651: Clastic Rocks

Mineralogy of sandstones, heavy minerals, diagenetic and burial depth history, and the geochemistry of major, minor and trace elements, all provenance, tectonic setting, paleoclimate and depositional environments, determination of the recent and ancient depositional environments of the clastic sedimentary rocks.

GE652: Non-Clastic Rocks

Non-Clastic Sedimentary Rocks has two types; Chemical Sedimentary Rocks and Organic Sedimentary Rocks: Chemical sedimentary rocks are formed when the water components evaporate, leaving dissolved minerals behind. Sedimentary rocks of these kinds are very common in arid lands such as the deposits of salts and gypsum. Examples include rock salt, dolomites, flint, iron ore, chert, and some limestone. Organic Sedimentary Rocks: Organic sedimentary rocks are formed from the accumulation of any animal or plant debris such as shells and bones. These plant and animal debris have calcium minerals in them that pile on the sea floor over time to form organic sedimentary rocks. Examples include rocks such as coal, some limestone, and some dolomites. More Information About Sedimentary Rocks.

GE653: **Geochemistry of Sedimentary Rocks**

A beginning summary of the chemical and mineralogical effects of weathering, sedimentary sorting and diagenesis is particularly useful for its extensive bibliography. Following that reviews the use of whole rock and mineral component isotope analyses for geochronology and chemical tracers. Discusses the mobility of REE, Th and U during diagenesis and then illustrates the use of isotopes to evaluate provenance and sedimentary processes and how sedimentary geochemistry can be used to constrain models for tectonic environments, paleoclimates and crustal evolution.

GE654: Sedimentary Basin Analysis

The foundation of sedimentary basins (Basins in their plate tectonic environment, the physical state of the lithosphere). The mechanics of sedimentary basins (Basins due to lithospheric stretching, Basins due to flexure, Basins in subduction zones, Basins associated with strike-slip deformation). The sedimentary basin ill. The sediment routing system (in stratigraphy, Subsidence and thermal history). Application to petroleum play assessment.

GE655: Diagenisis of Sediments

The aim of this course is to obtain insight in the importance of diagenetic processes "Physical and chemical changes in sediments from the depositional environment to deep burial". Also, this course will focus on the factors that control destruction or preservation of porosity.

GE656: Marine Geology

This course will cover a broad range of topics in marine geology and geophysics, including: ocean floor morphology, plate tectonics, earthquakes and tsunamis, marine sedimentation, records of climate change, ocean circulation, and gas hydrates. We will also spend some time on recent geologic events.

GE657: Facies Analysis (1)

The aim of this course is to analysis sedimentary facies and facies architecture at different scales, sedimentary models, as well as factors controlling continental and marine basin sedimentation. This general view on the interpretation of sediments and sedimentary rocks will be useful in the analysis of sedimentary basins, geological history, exploration of natural risks related to sedimentary processes.

GE658: Advanced Sedimentary Techniques

This course covers various techniques used in the study of sedimentary rocks. Also quantitative techniques for the analysis of sediments.

GE659: Siliceous Sediments

Siliceous rock is one of the groups of sedimentary rocks which consists mainly of silicon dioxide (SiO2), which is either in the form of quartz or amorphous silica and cristobalite. They are included by these rocks which have formed as precipitates of chemical composition and are excluded from those of detrital or fragmental origin. Common topics include: Siliceous Limestone, Siliceous Shale, Low Silica Rocks, Chert and flint, Diatomaceous earth, Tripoli, Porcellanitic, Novaculite, Radiolarian earth, Chemical rock, Nodular chert.

GE660: Depositional Environmental Systems

The course focus on sedimentology as a fundamental part of understanding past and present earth surface processes. We use the modern physical environment as examples of depositional and erosional style, rates and resulting morphologies and deposits, and the excellent outcrops of sedimentary rocks as examples of ancient sedimentary strata. All teaching is directly related to field experience with the aim of providing hands on experience with sedimentological description and analysis. The course activities switch between background lectures, reading and discussions as preparation for field work, field studies and classroom exercises, seminars and independent analysis and discussion of results. All examples will be related to state of the art literature and new scientific discussions in the field.

GE661: Field Geology (3)

Field equipment and safety, Quantification of geological observations, The hand lens and binoculars, The compass-clinometer, Global positioning systems and altimeters, Measuring distance and thickness, Classification and colour charts, Hammer, chisels and other hardware, The hardcopy field notebook, Writing equipment, maps and relevant literature, Comfort, field safety and field safety equipment, Defining the fieldwork objectives, Scale of observation, where to start and basic measurements, Hand specimens, Field sketches and maps, Recording data, ideas and interpretation, Collecting fossil data, Fossil distribution and where to find them, Sampling strategies, Sampling of bedding surfaces and palaeoecology, How many samples are required, Recording features of sedimentary rocks and constructing graphic logs, Description, recognition and recording of sedimentary deposits and sedimentary structures, Graphic logs.

GE662: Tectonics and Sedimentation

The course describes Pan African Orogeny. Proterozoic plate tectonism in the Afro-Arabian Shield. Wilson's cycle and magma activity. Basement rock units. Major structural elements affecting the Pan-African Orogenic belts: Sutures, thrust, and shear zones. Magmato-tectonic evolution of the Afro-Arabian Shield in the Eastern Desert of Egypt. Precambrian structures and its role in the configuration of the Paleozoic sedimentary basins. Paleozoic tectonism and related structures. Mesozoic tectonsim and related structures. Reactivation of early formed structures and neotectonics. Practical examination of some structural and tectonic maps of selected areas in Egypt.

GE663: Sedimentary Structures

Sedimentary structures are visible textures or arrangements of sediments within a rock. Geologists use these structures to interpret the processes that made the rock and the environment in which it formed. They use uniformitarianism to usually compare sedimentary structures formed in modern environments to lithified counterparts in ancient rocks. The sedimentology component of this course will provide a broad background to the description of sedimentary rocks and recognition of sedimentary structures.

GE664: Special Selected Topics in Sedimentary Rocks and Sedimentation (1)

GE665: Special Selected Topics in Sedimentary Rocks and Sedimentation (2)

GE666 : Geothermal Energy and Radiometric Prospecting

Geothermal Energy: Definition and classification of geothermal systems, heat flow, geothermal anomalies and their plate tectonic framework. Thermal properties of rocks. Age and region of anomalous heat flow. Heat production and transfer in the Earth and temperature within the Earth. Prospecting for geothermal resources and measuring techniques. Geothermal resource assessment. Environmental aspects of geothermal energy development. Examples of geothermal surveys. Geothermal activities in Egypt and some case studies. Radiometric: Introduction to radiometric and applications of radiometric. Fundamentals of natural radioactivity, radioactivity in nature, types of radiations, cosmic rays, decay series, half-life period, equilibrium, scattering of Gamma Rays, energy spectra, units. Radiation effects on rocks and minerals, interaction of gamma rays with matter. Classification of radioactive minerals K , U and Th radioactive minerals. Instrumentation and calibration, types of detectors, Giger Muller, Scintllometers and spectrometers and radon detector. Field surveys and data corrections, ground and airborne surveys, dead time correction, background corrections and statistical noise correction. Interpretation of radiometric, qualitative and quantitative etc… Applications and some case studies of radiometric measurements. The course also rely on the use of the remote sensing spectroradiometry techniques for the detection purposes in a GIS environment.

GE667: Gravity and Magnetic Prospection

Gravity method: Historical view, Main principles of gravitational attraction force and Newton; stheory, Main types of gravimeters, Main types of gravity data corrections, Land; aero and marine gravity surveys, Using the computer for gravity data processing, Separation of gravity anomalies into regional and residual components, Depth determination of subsurface structures, Modeling technique for depth determination, Interpretation of gravity results; Magnetic methods: The main bases of magnetic methods, The nature of Geomagnetic Field and various magnetometers, The main types of Geomagnetic

variations and their correction, Land, aeromagnetic and marine magnetic surveys, Using the computer for magnetic data processing, Separation of magnetic anomalies by different methods, Calculate the depth and dimensions of the subsurfacenbodies, 2D. and 3- D magnetic modeling, Interpretation and construction of basement relief subsurface tectonic maps.

GE668: Petrophysics

Physical properties of rocks; density, electrical properties, radioactivity of the rocks, thermal properties, magnetic properties, acoustic properties (elastic properties, competence scale and bearing capacities), mechanical properties [compressive stress and N value (standard penetration test)]. Collection of rock samples, particle properties (textures). Pore properties (porosity & permeability). Effect of diagenesis on petrophysical properties of rocks. Relation between porosity, permeability and textures. Capillary pressure and wettability. Reservoir fluid properties. Petrophysics applications: Evaluation of reservoirs by determination lithology, net pay, porosity, water saturation and permeability and fluid contacts identification. Data base, 2D and 3D seismic imaging, mud-logging, cores, wirline logging, MDT, Tests and PSV.

GE669: Electric Prospecting

The course is an advanced course of electrical geophysical prospecting method. The students would be introduced into how the principle of electrical resistivity can be utilized for subsurface investigations with a view to applying it to near surface features delineations. Furthermore, the students would also be introduced to the application of the method to groundwater studies, engineering site investigations, environmental studies and mineral explorations. The techniques to be covered include the Spontaneous potential, the induced polarization and the electrical resistivity techniques. This course explains the resistivities of rocks and minerals, factors controlling the bulk resistivity of rocks, electrical properties of rocks and an overview of practical methods of electrical surveying including Resistivity, Spontaneous Potential and Induced Polarization. The goal this course is to introduce students to electrical prospecting methods and their applications in investigating subsurface Conditions; And provide students with opportunities to develop basic acquisition, processing and interpretation skills using the electrical methods.

GE670: Paleomagnetic Applications

Introduction, physical basis of rock and mineral magnetism, Types of magnetization and magnetic materials, Common magnetic minerals and their identification, Natural Remanent magnetization (NRM) types and acquisition mechanisms, Sampling, measurements and Data acquisition, Laboratory and field Stability tests, Data presentation, Reversals and excursion of magnetization Statistical analysis and computation of paleopoles and paleopositions. Magnetic susceptibility and its anisotropy (AMS), Geomagnetic applications, Geological and archeological applications.

GE671: Well Logging

The course includes self potential origin and measurement, factors affecting the shape of peaks, anomalies, conventional electric logs, laterally focused types, small spacing pad type sonds, induction logging; measurement, advantages and disadvantages, natural gamma ray tools, density and lithology logging, acoustic velocity logs and miscellaneous logs.

GE672: Seismological Applications

Introduction, Basics and types of Seismic waves, Earthquake seismology, Causes of Earthquakes and tsunamis, Seismology and plate tectonics, Magnitude and energy of earthquakes, Seismological hazards, Earthquake prediction, Earthquake belts (circles of fire) and their geographic distribution, Historical earthquakes and Paleoseismology.

GE673: Seismic Acquisition and Data Interpretation

Seismic data acquisition aims mainly to obtain an image of the sedimentary basins in interior of the earth, using artificial waves. The artificial seismic signals can be on land (on surface, or, buried) or in water. The signals travel through the interior of the earth, and their (digital) recording for later analysis. Energy sources; Seismic equipment; Common field Procedures; Site selection and planning considerations; Geophone spread geometries and placements; Split spread. Data Interpretation: understanding the different data (seismic and well log data); the seismic methods-2D, 3D and 4D seismic acquisition and processing. Recognize and differentiate between the 2D, 3D and 4D seismic lines. Processing sequence; Types of velocities; Acoustic impedance and reflection coefficient. Analyzing seismograms with relevant software; Computation of acoustic impedance and reflection coefficient.

GE674: Basin modeling

This course examines the tectonic, stratigraphic and sedimentary controls of sedimentary basins. The main aim of this course is to understand sedimentary basins, how it forms and what are its types. The tectonic processes generating sedimentary basins, their structural development, the geometry of each basin type and the development of depositional systems within basins are described. The evolution of sedimentary basins, and the reasons for their existence in particular places at specific times, can provide fundamental insights into a wide range of Earth processes.

GE675: Petroleum geology

The course comprises petroleum generation; organic and inorganic, kerogen types, evolution of organic matter in response to burial, maturity degree measurements; pyrolysis, electron spin resonance, vitrinite reflectance and pollen coloration, reservoir properties, primary, secondary and tertiary migration, petroleum trapping; traps caused by tectonics, depositional elements, water flow process or combination of one or more causes, barren traps, oil shale and tar sand.

GE676: Remote Sensing Applications in Geophysics

Remote sensing is defined as the acquisition of data using a remotely located sensing device, that relies on the measurements of electromagnetic energy (EM) in the range of 0.4 μm to 1 m, and extraction of information from the data (Gupta, 2003; McCloy, 2006). Remote sensing can be multilevel (i.e., sensing the surface of material from a distance of few centimeters to millions of kilometers). Taking a spectrum of a leaf by using a spectroradiometer to taking an image by Hubble telescope from a star at a distance of few light years fall in the realm of remote sensing. However, here, we mean the imaging of the Earth's surface.

GE677: Facies Analysis and Sequence Stratigraphy

The three-dimensional distribution of bodies of rock and sediments with different sedimentological properties and associated hydraulic properties is controlled to varying degrees by the depositional

history of the strata of interest. Primary (depositional) variations in sediment textures and fabrics are modified by diagenetic processes, such as compaction, dissolution, and cement precipitation. A facies is a body of sedimentary rock with specified characteristics, which may include lithology (lithofacies), fossils (biofacies), and hydraulic properties (hydrofacies). Sedimentary facies analysis is based on the concept that facies transitions occur more commonly than would be expected if sedimentation processes were random. A facies model (or type model) is an idealized sequence of facies defined as a general summary of a specific sedimentary environment. Sequence stratigraphy is based on the concept that the sedimentary rock record can be divided into unconformity-bounded sequences, which reflect the sedimentological response to sea level changes, subsidence, and sediment supply. The value of facies analysis and sequence stratigraphy is that they can provide some predictability to the facies distribution between data points (i.e., wells). Where there is an underlying sedimentological control on the distribution of the hydraulic properties in aquifer systems, facies analysis can be used to better incorporate the underlying sedimentological fabric into groundwater models.

GE678: Seismic Stratigraphy

Principles of seismic stratigraphic interpretation-resolution of seismic data-seismic processing and display for seismic interpretation- seismic reflection termination patterns-seismic facies and attribute patterns. Principles of sequence stratigraphy concept of scale sequence stratigraphy vs. lithostratigraphy and allostratigraphy - Dynamics of Basin wide Sedimentation Patterns and Sea level Changes– accommodation and shoreline shifts- orders and causes of stratigraphic cycles- surfaces and their criteria-hierachies in sequence stratigraphy (sequence, system tracts, para-sequences) outlines of siliciclastic and carbonate sequence stratigraphy. Recognize the depositional environment. Depositional environment and gross lithofacies interpretation.

GE679: Structural Geology and Field Geology

Structural geology is the study of the three-dimensional distribution of rock units with respect to their deformational histories. The primary goal of structural geology is to use measurements of present-day rock geometries to uncover information about the history of deformation (strain) in the rocks, and ultimately, to understand the stress field that resulted in the observed strain and geometries. This understanding of the dynamics of the stress field can be linked to important events in the geologic past; a common goal is to understand the structural evolution of a particular area with respect to regionally widespread patterns of rock deformation (e.g., mountain building, rifting) due to plate tectonics. Field Geology describes the structure of the Earth on and beneath its surface, and the processes that have shaped that structure. It also provides tools to determine the relative and absolute ages of rocks found in a given location, and also to describe the histories of those rocks.By combining these tools, geologists are able to chronicle the geological history of the Earth as a whole, and also to demonstrate the age of the Earth. Geology provides the primary evidence for plate tectonics, the evolutionary history of life, and the Earth's past climates.

GE680: Special Selected Topics in Applied Geophysics (2)

GE681: Special Selected Topics in Applied Geophysics (1)

GE682: Seismic Interpretation and Modeling

Review of the physical basis of the seismic methods-2D, 3D and 4D seismic acquisition and processing-the principles of seismic data interpretation. Recognize and differentiate between the 2D, 3D and 4D seismic lines. time structure map –depth converted map-stacking and deconvolution – migration – reprocessing- post stack processing –coherency processing- particular characteristics and pitfalls for 2D and 3Dseismic methods techniques for viewing seismic data- recognize the depositional environment of the area -project preparation- building the database- velocity data acquisition –editing and integration of sonic and density logs –VSP- synthetic seismograms - structural interpretation –stratigraphic interpretation –AVO- seismic attributes. Seismic modeling essentially is a simulation of a recorded seismic wavefield, seismic amplitudes, or seismic travel times. The input to seismic modeling is a representation of the earth's reflectivity and a velocity-depth model.

GE683: Advanced Structural Geology

Structural Geology and Tectonics examines the deformation of earth´s lithosphere. The course aims to provide advanced theoretical aspects of rock deformation. Besides quantitative aspects of stress and strain analyses, the broad spectrum of deformation complexities in contractional, extensional and strike-slip regimes at various scales are highlighted. The course provides an in depth understanding of the rheological properties of the lithosphere, including brittle and plastic deformation processes at the microscale. At the macroscale, the interaction between climate and tectonic is discussed. Lectures are accompanied by a series of practicals with the objective to apply and strengthen the gained knowledge in various exercises.

GE684: Potential Exploration

We introduce exploration potential, a quantity that measures how much a reinforcement learning agent has explored its environment class. In contrast to information gain, exploration potential takes the problem's reward structure into account. This leads to an exploration criterion that is both necessary and sufficient for asymptotic optimality (learning to act optimally across the entire environment class). Our experiments in multi-armed bandits use exploration potential to illustrate how different algorithms make the tradeoff between exploration and exploitation.

GE685: Reservoir Characterization

A model of a reservoir that incorporates all the characteristics of the reservoir that are pertinent to its ability to store hydrocarbons and also to produce them. Reservoir characterization models are used to simulate the behavior of the fluids within the reservoir under different sets of circumstances and to find the optimal production techniques that will maximize the production.

GE686: Well Drilling Methods

This course introduces the subject of drilling, completion and well workover operations, looking to build a solid foundation level knowledge of the practices, people and equipment used in these key operations. As no prior knowledge is assumed for this course, each concept is introduced in simple terms and then built upon to allow a comprehensive overview each of the three disciplines to be developed. The course is firmly rooted in ensuring that well integrity is maintained whilst working in each of these independent disciplines and the processes and technology that is discussed.

GE687: Paleomagnetic Measurements

Introduction, physical basis of rock and mineral magnetism, Types of magnetization and magnetic materials, Common magnetic minerals and their identification, Natural Remanent magnetization (NRM) types and acquisition mechanisms, Sampling, measurements and Data acquisition, Laboratory and field Stability tests, Data presentation, Reversals and excursion of magnetization Statistical analysis and computation of paleopoles and paleopositions. Magnetic susceptibility and its anisotropy (AMS), Geomagnetic applications, Geological and archeological applications.

GE688: Source Rock Evaluation

The main target of this course is the identification of the palynofacies types, interpreting the depositional paleoenvironments, estimating the thermal maturation using the spore coloration, source rock evaluation by integrating the results from palynofacies and geochemical analyses.

GE689: Ground Penetrating Radar

Ground-penetrating radar (GPR) is a geophysical method that uses radar pulses to image the subsurface. It is a non-intrusive method of surveying the sub-surface to investigate underground utilities such as concrete, asphalt, metals, pipes, cables or masonry.[1] This nondestructive method uses electromagnetic radiation in the microwave band (UHF/VHF frequencies) of the radio spectrum, and detects the reflected signals from subsurface structures. GPR can have applications in a variety of media, including rock, soil, ice, fresh water, pavements and structures. In the right conditions, practitioners can use GPR to detect subsurface objects, changes in material properties, and voids and cracks.

GE690: Facies Analysis (2)

The three-dimensional distribution of bodies of rock and sediments with different sedimentological properties and associated hydraulic properties is controlled to varying degrees by the depositional history of the strata of interest. Primary (depositional) variations in sediment textures and fabrics are modified by diagenetic processes, such as compaction, dissolution, and cement precipitation. A facies is a body of sedimentary rock with specified characteristics, which may include lithology (lithofacies), fossils (biofacies), and hydraulic properties (hydrofacies). Sedimentary facies analysis is based on the concept that facies transitions occur more commonly than would be expected if sedimentation processes were random. A facies model (or type model) is an idealized sequence of facies defined as a general summary of a specific sedimentary environment. Sequence stratigraphy is based on the concept that the sedimentary rock record can be divided into unconformity-bounded sequences, which reflect the sedimentological response to sea level changes, subsidence, and sediment supply. The value of facies analysis and sequence stratigraphy is that they can provide some predictability to the facies distribution between data points (i.e., wells). Where there is an underlying sedimentological control on the distribution of the hydraulic properties in aquifer systems, facies analysis can be used to better incorporate the underlying sedimentological fabric into groundwater models.

GE691: Geostatistics in Geophysics

The use of geostatistics can also be applied to regional or licence scales on seismic amplitudes/velocities, wells logs and horizons data. Created in 1951 by Danie Krige for mining applications this branch of mathematics is particularly suitable for geological environments when wisely

manipulated. Hence the gathering of geostatisticians, geophysicists and geologists to form Estimages' team, which has been building geostatistical solutions for geophysics since 2007.

GE692: Petroleum Seismology

Upon completion of this course, students will gain an essential knowledge in: The purposes and principles of common seismic data processing, imaging and analysis methods employed in the petroleum industry. The main technical issues in exploring onshore and offshore petroleum reservoirs using seismology, such as in assessing the suitability of using common seismic methods for petroleum targets. Using various seismic techniques to enhance signals and suppress noise in reflection seismic data to help detecting hydrocarbon reservoirs. Applying borehole geophysics and well logging techniques to tie with seismic and geological data to help achieving the exploration objectives. Common issues and techniques of applied seismology for characterizing petroleum reservoirs. Current issues in exploring unconventional petroleum reservoirs using seismology.

GE993: Special Selected Topics in Petroleum Geology (1)

GE994: Special Selected Topics in Petroleum Geology (2)

GE695: Advanced Engineering Geology

Engineering geology is a multidisciplinary field that combines geology and engineering. Geologic data and principles are used with engineering principals and techniques in order to study and work with rock and soil surficial materials and ground water. This is essential for the proper location, planning, design, construction, operation and maintenance of engineered structures. Engineering geology complements environmental geology and hydrogeology. Describe the origin and development of soils and main types and characteristics of Swedish bedrock Describe the basic concepts in the properties of soils and also the development of coarse-grained and fine-grained soils Determine the stress state in the soil profile and to describe the relationship between the strain and stress of soil in the case of the normal stresses and shear stresses perform calculations of settling for a given overload and explain the concept of consolidation and perform simple consolidation calculations. Calculate the failure state in granular and cohesive soils based on Mohr-Coulomb failure theory, be able to describe the concepts active and passive failure states, and analyze the stability of simpler slopes Perform rock mechanics calculations Describe different preliminary investigation methods and rock classification methods.

GE696: Advanced Rock Mechanics

The course introduces the theory of rock mechanics and its applications in mine construction and operation. Students are presented with the fundamental concepts of stress and strain in isotropic and anisotropic rocks and conduct stress analyses using data collected in the laboratory and the field. Rock mass structures and classification schemes are introduced, and students learn how these govern rock slope stability and underground rock excavation methods in each stress environment. Rock control and support systems utilized in underground and surface excavations and their related safety requirements are discussed.

GE697: Advanced Hydrogeology

The course covers theory relevant for advanced studies and research within the field of hydrogeology and groundwater resources. The goal of the course is to strengthen the knowledge base of students

beyond introductory level by investigating the scientific research frontier regarding three central themes of research in hydrogeology: Soil water and groundwater, subsurface transport of waterborne substances (tracers, nutrients, contaminants), and groundwater resource variability and change.

GE698: Geotechnical Engineering

The course applies and extends the fundamental understanding of soil mechanics to the design of geotechnical engineering systems. The following topics are examined: site investigations and in situ testing; lateral earth pressures and retaining wall design; foundation design; loading induced stresses and displacements; bearing capacity of shallow foundations; design of shallow foundations; analysis and design of pile foundations; pavement design; and the stability of slopes

GE699: Advanced Remote Sensing and GIS

Definition and Overview of Remote Sensing and Remote Sensing Systems, Electromagnetic Radiation, Terms and Definitions, Laws of Radiation, EM Spectrum, Sources of EMR , Interaction between EM Radiation and matter, Reflection, Absorption and Transmission , Interactions between EM Radiation and Atmosphere, Atmospheric windows, Spectral Signatures for common LULC features, e.g., Water, Soil, Vegetation and Snow Instruments for ground truth data collection (e.g., instatherm, spectroradiometers, etc.) Principles of visual Interpretation of aerial photos and satellite imagery Recognition Elements and Interpretation keys for Visual Interpretation, Interpretation of Multispectral Imagery and High resolution data, Remote Sensing Systems - Active and Passive Systems, Imaging and Non Imaging Systems, Concept of Resolutions in RS - Spatial, Spectral, Radiometric and Temporal Orbits and Platforms for Earth Observation Radiometric, geometric and atmospheric errors; Image Quality Data Reception, Types of Data Products (e.g., Spectral Indices, Orthoproducts, Pan Sharpened Products, etc.). Active remote sensing and structural elements extraction, Automatic extraction of structural elements and mapping using GIS, structural data modelling and analysis.

GE6100: Geotectonics

The course provides an overview of the Earth´s tectonic evolution in the context of plate tectonics. The first part of the course consists of lectures giving a systematic description of geological processes and the Wilson cycle, which include the formation of continental rifts and margins, oceanic spreading, transform faults, subduction and island arcs, as well as continental collision and formation of mountain belts. The tectonic processes typical of the various stages of the Wilson cycle, and their significance for basin formation, deformation, metamorphism and generation of magma, will be in focus in this part of the course. The second part of the course concentrates on large-scale plate motions, palaeogeography and the link between plate tectonics and the Earth´s interior. The course includes one-week obligatory field teaching where many of the phenomena discussed in the lectures are presented.

GE6101: Hydrology of the Nile Basin

This course will provide an overview about the Nile system-the White Nile, the Blue Nile and the main Nile, together with the lakes they connect, Victoria, Albert and Tana for example. Major basins in the great Nile basin will be discussed. It will also discuss the history of the Nile River, the water balance, sources of the Nile, water projects on the main Nile and its tributaries, and the agreements or treaties between Egypt and the Nile basin countries.This course describe the role of global tectonics in the tectonic and geologic history of Egypt. The major global tectonic events that affected the geology of Egypt are described chronologically, emphasizing the regional geological implications of each event.

The major geological features of Egypt in terms of the interaction of global tectonics. Egypt and a new phase of the Wilson cycle of opening and closing of oceans. The course describes also common historical flooding of the Nile River and introduces the basic of flash flooding in the eastern desert, Sinai, and the Nile Valle and their forecasting, warning systems, and mitigation plans.

GE6102: Programming for Remote Sensing and GIS

This course aims at providing advance knowledge in spatial data understanding, analysis and programming skill in GIS environment. Students will also be exposed to advance geoprocessing and modeling techniques, exploratory geostatistical analysis and spatial data analysis to impart advance knowledge of programming, customization and automation in GIS. Perform object-oriented programming tasks in GIS using Python, Analyze GIS-model interactions and design procedures for modeling with GIS, Develop their own tools for geospatial analysis, Python Programming, Python Scripting, Python Language Control Structure, Programming Syntax, Vector and Raster Data Algorithm, Algorithms for Remote sensing.

GE6103: Hydrogeological Modeling and Analysis

General: This is an introductory course in groundwater modelling. The course will provide the student with the relevant theory and practical experience to develop and test conceptual models, recognize data requirements, and identify the limitations of numerical models. Assignments and a term project will be completed using state-of-the-art groundwater modelling software. An emphasis will be placed on modelling flow in the saturated zone, but unsaturated zone hydrology, solute transport, and density dependent flow are also covered.

Course Topics: 1. Modeling Fundamentals, 2. Conceptual Hydrogeological Model Development, 3. Designing the Numerical Model, 4. Model Calibration, Forecasting and Uncertainty Analysis, Model Documentation, 5. Advanced Topics – Particle Tracking, Solute Transport, Flow in the Unsaturated Zone, Fracture Flow, Heat Transport, Multi-Phase Flow, Density Dependent Flow.

GE6104: Digital Image Processing and Analysis

The objective of this course is to introduce the students to the fundamental techniques and algorithms used for acquiring, processing and extracting useful information from digital images. Particular emphasis will be placed on covering methods used for image sampling and quantization, image transforms, image enhancement and restoration, image encoding, image analysis and pattern recognition. In addition, the students will learn how to apply the methods to solve real-world problems in several areas including medical, remote sensing and surveillance and develop the insight necessary to use the tools of digital image processing (DIP) to solve any new problem. Remote Sensing Image File Format and Handling, Image Processing Algorithm and Implementation, RS data and DEM for 3D Visualization and Mapping.

GE6105: Soil Mechanics

Describe the use of unconsolidated soils in building and construction technology, and describe basic concepts in soil science, Describe and classify the bedrock and its structure in terms of its technical characteristics for construction on and in bedrock. Describe the prevalence and use of rock and aggregate material, including processes, Describe soil behaviour during compression and shear, Soil behaviour: Stress conditions in soil. Compression and shear of soil. Movement in soil, Soil mechanics:

Consolidation subsidence, bearing capacity, pressure, slope stability. Field and laboratory methods in soil mechanics. Soil stabilisation methods, Describe the main features of geotechnical design.

GE6106: Surveying and Geologic Mapping

Survey: Introduction, traverse types, methods and techniques of surveying, Laboratory and field training applying traverses and preparation of topographic maps. Observing and collecting data and samples, using geological compass, clinometer, hand level, GPS and Total Station, plotting features on a base map, mapping features on aerial photographs, making a map from aerial photographs, measuring stratigraphic sections. Laboratory and field training include preparing and interpretation of maps and cross-sections. Field study of rocks and structures. Periodic field trips are needed to make student training in situ in the field, to activate the teamwork and student groups, to learn how to describe, to measure and to interpret in the field. Field Mapping: Introduction, methods and techniques of surveying. Field equipments (Compass, Alidade, Total Station, GPS), the nature and construction of topographic and geologic maps, Preparation of topographic maps. Detailed mapping and sampling, Mapping and field geology of Igneous, Sedimentary and Metamorphic Rocks. Cross-sections. Preparing and writing a geologic report. Map projections, layout, and designs. GPS: How GPS works, Pseudo-ranges, Orbits and Signals, Modern GPS receivers. Coordinate (latitude and longitude/ Universal Transverse Mercator-UTM) registration, and Map production with collected X, Y, and Z in-situ point data. Laboratory and field training applying geologic traverses and preparation of topographic maps. Sampling and interpreting maps, applied field problems, Stereonets and faults, Crosssections.

GE6107: Special Selected Topics in Applied Geology (1)

GE6108: Renewable Energy for Cities

This course examines the production and consumption of energy from a systems perspective. Sustainability is examined by studying global and regional environmental impacts, economics, energy efficiency, consumption patterns and energy policy. First, the physics of energy and energy accounting methods are introduced. Next, the current energy system that encompasses resource extraction, conversion processes and end-uses are covered. Responses to current challenges such as declining fossil fuels and climate change are explored with an emphasis on emerging renewable energy technologies (e.g., biomass, wind, and photovoltaics), building technologies, alternative vehicle technologies, and end-use efficiency and conservation. Introduction and Energy Fundamentals, Energy and Carbon Accounting, Energy Supply, Energy Demand, Renewable Energy Technologies and Policy.

GE6109: Environmental Geology

Philosophy and Fundamental Concepts, Ecology and Geology, Introduction to Natural Hazards, Water Resources, Water Pollution, Water Quality, Mineral Resources and the Environment, Energy Resources, Soils and Environment, Waste as a Resource, Waste Management, Global Climate Change, Geology, Society, and the Future, Field visits are needed to some hazardous and polluted areas. Renewable resources (soil, forests, water, wildlife), and nonrenewable resources (oil, metals and minerals). Renewable Energy sources (Solar, Wind, Biomass of Algae and Waste, Wave Energy, geothermal energy, Hydropower). Concepts dealing with natural (e.g., ecology) and social (e.g., economics, politics, and planning) processes. Ecological Restoration, Natural Resource Conservation- Community Values-Economics and Policy.

GE6110: Special Selected Topics in Applied Geology (2)

GE6111: Natural Resources

Natural resources include oil, coal, natural gas, metals, stone, and sand. Air, sunlight, soil, and water are other natural resources. Describe the composition of, and interactions between, the atmosphere, hydrosphere, biosphere and lithosphere. Global cycles from geological/hydrological and system ecological perspectives. Ecosystem services, ecological processes and biological diversity. Usage of natural resources. Usage of resources, effects on the environment and our health, ecological resilience. Global climate changes. Environmental law. Learn the causes and effects of earthquakes, tsunamis, volcanoes, floods, landslides, subsidence, hurricanes, coastal erosion, tornadoes, wildfires, climate change, and impacts of extraterrestrial events. Develop an understanding of the methods scientists use to predict and assess the risk of natural hazards. Describe the influence of mitigation, preparation, response.

GE6112: Sustainable Energy

The course is an introduction to further studies in energy and environment, and therefore it will give an overview and a broad understanding of the subject area. It will provide an overview of: -The environment as a framework for energy.Energy resources and energy use. Methods of production as well as environmental impacts for electrical power, thermal energy and cooling. Heat and cold, production methods and environmental impacts. Energy conversions in industry and buildings. Energy flexibility and transport of district heating. Electrical energy, electricity as energy carrier and the infrastructure associated with this. Energy balance and environmental accounts. With the fight against global warming and the need to reduce our CO2 emission, we have to find new ways of producing energy in a sustainable way. Geothermal energy is a renewable resource that can help to reduce our impact on the planet. The exploitation of geothermal energy is closely linked to the geological context. Mostly, the direct use of hot water or steam for the production of electricity or heat is limited by the access to hot fluids at accessible depth, what is mostly related to the tectonic and geological context. Its exploitation is also directly linked to the property of the rocks such as the permeability and the geochemistry of the fluid. More recently, the use of low temperature systems (10-30°C) has started to increase. Those systems are using rocks and groundwater combined to heat pumps to produce heating and cooling for buildings. In this course, we will discuss the different geothermal systems and the contexts in which they can be exploited, highlighting the role of the geologist and hydrogeologist in the production of sustainable energy

GE6113: Water Resources Management

Introduction; Science of water (Physical and chemical properties of water, Global water, Freshwater use, Water pollution, Urban water supply and purification of potable water, Drains, wastewater); Water sustainability and development (Sustainable development and application to rural water supply in developing countries, Water and sanitation); Methods and techniques for water management (Integrated Water Resource Management (WRM), Methods for testing the water quality); Water and economics (Value of water, Global financing of water supply, The role of water in cost recovery, Targeting water valuation); Management for sustainability (Rural water supply in sub–Saharan Africa,

Operation and maintenance) and Case studies. The above-mentioned techniques rely on the use of GIS and remote sensing approaches.

GE6114: Environmental Impact Assessment

Regulation and regulatory framework of the environmental and hazardous - Waste law; Definitions; policy guidance vs. regulations; role of the states, municipalities and the EEAA, compliance issues; case studies. Environmental management system (EMS) understanding ISO 14000 scope and definitions; EMS requirements and environmental policy; cost benefit analysis; environmental planning; implementation and operation; checking and corrective action; environmental auditing and the environmental management system in Egypt. Objective and needs of the environmental impact assessment (EIA); activities involved in EIA, characteristics of impacts); EIA methods, checklists, overlay mapping, networks, matrices; estimates of resources demand for EIA studies; Recommended methodologies for rapid EIA; case studies; guidelines for EIA in developing countries; environmental impact statement; land evaluation and suitability analysis. Current ecological and environmental problems that may include the threats to natural resources, energy problem, food problem, desertification, grazing problem in dessert regions, pollution and global climate change. Sustainable development, soil quality, waste management, and water shortage problem in the Middle East, management of water resources in arid lands, human impact and ecosystem restoration.

GE6115: Water Pollution and Management

An understanding of the physical, chemical and biological processes involved during contamination of water is essential if society is going to effectively monitor and control the effects of pollution using modern technology and engineering practices. A huge range of pollutants may be released into the aquatic environment during every day domestic, leisure, industrial and commercial activities and many of these contaminants are potentially harmful to human health and the environment. In this course, we will focus on the origins, pathways and consequences of anthropogenic pollutants in the environment as well as discussing the various approaches to pollution control and remediation. This course will deal also with groundwater contamination by discussing different factors control groundwater contamination using DRASTIC model. Also mechanism of pollutant flow and dispersion through the porous media will be discussed.

GE6116: Geothermal Energy and Reservoirs in Egypt

Provides an introduction to geothermal energy. Learn the principles and techniques of geothermal energy utilization and identify the major issues associated with the further development of geothermal energy. Understanding of thermal, hydraulic, and mechanical processes occurring in a geothermal reservoir, which are also important for non-geothermal applications such as CO2 geosequestration, underground storage of nuclear waste, and other mining and petroleum applications. Introduction of the course Overview of Geothermal Energy. Heat Transfer in rock - Introduction (conduction, convection and radiation, Reservoir Geomechanics (fundamentals of geomechanics & borehole stability), Geothermal Power Generation, Environmental Impact of Geothermal Energy Utilization, Geothermal Reservoir Management, Conceptual models of geothermal energy resources, Geothermal Energy and Reservoirs in Egypt

GE6117: Pollution Control and Waste Management

The main objective of this subject is to provide the opportunity to understand the practice of pollution control and waste management in modern society. This subject focuses on tackling the problems of solid and hazardous waste minimization, generation, treatment and disposal. Topics include solid waste characterization, generation and composition analysis, development of optimum collection routing networks, transfer stations, design, operation and maintenance of sanitary landfills, and related social and environmental issues; hazardous waste generation, regulatory process, process information, toxicology, design of treatment and stabilization methodologies, methods of disposal and related environmental issues, community perspective and education; soil contamination, chemical, biological and thermal remediation methodologies, site characterization, planning, monitoring, containment and case studies. The subject also develops an understanding of air and noise pollution control technologies, as well as better process design to mitigate the pollution problems both in the community and industries. Other topics include: practice of control of the generation of specific air pollutants from the projects such as wastewater treatment works and waste management disposal sites. Some aspects of noise pollution and its control are also covered.

GE6118: Geohazards

Understanding of the fundamental processes governing the most important s and of the impacts that such s can have on society, and insight in approaches to conduct hazard and risk assessment and to establish mitigation and prevention measures. Main focus will be on processes causing landslides, floods, tsunamis, earthquakes and volcanic eruptions, as well as their possible consequences, in addition to methods for quantifying their hazard and risk. In addition, we will discuss potential interlinkages between different types of geohazards, disaster prevention and management and quantification and communication of uncertainties. Introduces natural hazard risk assessment and management theory and practices, with a strong focus on risk communication. The course assumes no background, but progresses to advanced topics throughout the course. The course begins with equipping students with a strong foundation in risk concepts and the risk management process. It then progresses to using risk tools and applications in real world case-studies as part of course assessment. The course includes a number of guest lecturers from industry and local government.

GE6119: Remote Sensing and Water Resources Management

Learn about water resources management by getting an overview of relevant satellites and sensors, Earth system models, and data and tools for water resources management. Topics: Water Resources and Climate Adaptation, Freshwater Ecosystems, Water Resource Management Institutions, Earth Observation of Water, Groundwater Management.

GE 6120: Field Geology and Surveying

Survey: Introduction, traverse types, methods and techniques of surveying, Laboratory and field training applying traverses and preparation of topographic maps. Observing and collecting data and samples, using geological compass, clinometer, hand level, GPS and Total Station, plotting features on a base map, mapping features on aerial photographs, making a map from aerial photographs, measuring stratigraphic sections. Laboratory and field training include preparing and interpretation of maps and cross-sections. Field study of rocks and structures. Periodic field trips are needed to make student training in situ in the field, to activate the teamwork and student groups, to learn how to describe, to

measure and to interpret in the field. Field Mapping: Introduction, methods and techniques of surveying. Field equipments (Compass, Alidade, Total Station, GPS), the nature and construction of topographic and geologic maps, Preparation of topographic maps. Detailed mapping and sampling, Mapping and field geology of Igneous, Sedimentary and Metamorphic Rocks. Cross-sections. Preparing and writing a geologic report. Map projections, layout, and designs. GPS: How GPS works, Pseudo-ranges, Orbits and Signals, Modern GPS receivers. Coordinate (latitude and longitude/ Universal Transverse Mercator-UTM) registration, and Map production with collected X, Y, and Z in-situ point data. Laboratory and field training applying geologic traverses and preparation of topographic maps. Sampling and interpreting maps, applied field problems, Stereonets and faults, Crosssections

GE6121: Special Selected Topics in Environmental Geology (1)

GE6122: Environmental Geostatistics

Learn Geostatistics and Geographic Information Systems (GIS) concepts and techniques with special skills on spatial information management, analysis, interpretation, map generation and display using advanced geostatistics and GIS software packages. Specific contents include geostatistical assessment of spatial data, map generation and computerization using vector and raster data models; coordinate systems conversion and geometric transformation; spatial data editing, management and exploration; terrain mapping and analysis with applications in generating viewsheds and watersheds; spatial interpolation; geo-coding and GIS modeling, etc. Intro to geostatistics, descriptive statistics, graphical analysis, the Normal distribution, the standard normal distribution, hypothesis testing, correlation and regression, cross correlation, Kriging and interpolation methods. Vector and Raster data analysis, terrain mapping and analysis, GIS model and modeling.

GE6123: Structural Geology and Basin Formation

Description, classification, and interpretation of geological structures such as faults, folds, foliations, lineations, shear zones, kinematic indicators, and the relationships between such structures and tectonic phenomena such as compressional mountain building and extensional basin formation. Visualisation and calculation of folded and faulted rock units, especially how these appear on geological maps and cross sections. This course includes study of: Structures developed during mainly brittle deformation in the upper crust and the geometry/architecture of structures that develops during fracture and fault growth. Analyses of various tectonic provinces (extension, strike-slip, contraction, diapirism) and their sedimentary basins. Deformation mechanisms operating in faults and how they impact fluid flow. Importance of kinematic indicators and fault dynamics. Relationships between faults and earthquakes.

GE6124: Geomorphology

The course reviews topics within geomorphology and earth surface processes such as key concepts of geomorphology, landform development at different spatial and time scales, endogenic and exogenic processes, their controlling mechanisms, and their interaction to form the landscape, geomorpholgical research methods, denudation and long-term landscape evolution. It considers different geomorphic contexts such as fluvial, coastal, aeolian and periglacial and the interaction between these and climate. The course involves field and laboratory methods relevant to geomorphology. Outlines of geomorphology - an overview, Rock weathering, Karst and speleology, Landform Analysis based on Aerial/Satellite data Interpretation, the fluvial geomorphic system (Drainage basin Morphometry), Slope

Analysis, Late Quaternary climatic geomorphology, coastal geomorphology, Remote Sensing for Geomorphological Mapping and Terrain Evaluation, Morphostructure/ Morphotectonics/ Neotectonics, integrated digital Terrain Evaluation using GIS, Human effects on geomorphic processes.

GE6125: The Geology of the Egyptian Nubian Shield

This course provides an overview of the Neoproterozoic Pan-African Belt of Egypt, which represents the northwestern continuation of the Arabian-Nubian Shield and the East African Orogen. This course include: The Egyptian Nubian Shield Within the Frame of the Arabian–Nubian Shield , Rock Succession in Egyptian Nubian Shield , The Infracrustal Rocks in the Egyptian Nubian Shield: An Overview and Synthesis , Petrogenetic Evolution of the Neoproterozoic Igneous Rocks of Egypt , Ediacaran Post-collisional Volcanosedimentary Successions in Egypt , The Ophiolite-Dominated Suprastructure, Eastern Desert, Egypt , Neoproterozoic Ophiolitic and Arc Metavolcanics of the Egyptian Nubian Shield , The Egyptian Granitoids: an up-to-date Synopsis , The Ediacaran Post-collisional DokhanVolcanics , Ediacaran Sedimentary Rocks "so-called Hammamat" of the Egyptian Shield , History of Mineral Exploration and Exploitation of the Egyptian Nubian Shield , The Pan-African Nonmetallic Mineral Deposits of Egypt: Genetic and Exploration Constraints

GE6126: Special Selected Topics in Environmental Geology (2)

GE6127: Remote Sensing and GIS in Structural Geology

Definition and Overview of Remote Sensing and Remote Sensing Systems, Electromagnetic Radiation, Terms and Definitions, Laws of Radiation, EM Spectrum, Sources of EMR , Interaction between EM Radiation and matter, Reflection, Absorption and Transmission , Interactions between EM Radiation and Atmosphere, Atmospheric windows, Spectral Signatures for common LULC features, e.g., Water, Soil, Vegetation and Snow Instruments for ground truth data collection (e.g., instatherm, spectroradiometers, etc.) Principles of visual Interpretation of aerial photos and satellite imagery Recognition Elements and Interpretation keys for Visual Interpretation, Interpretation of Multispectral Imagery and High resolution data, Remote Sensing Systems - Active and Passive Systems, Imaging and Non Imaging Systems, Concept of Resolutions in RS - Spatial, Spectral, Radiometric and Temporal Orbits and Platforms for Earth Observation Radiometric, geometric and atmospheric errors; Image Quality Data Reception, Types of Data Products (e.g., Spectral Indices, Orthoproducts, Pan Sharpened Products, etc.). Active remote sensing and structural elements extraction, Automatic extraction of structural elements and mapping using GIS, structural data modelling and analysis.

GE6128: Tectonic Evolution of Egypt

The course provides an overview of the Earth´s tectonic evolution in the context of plate tectonics. The first part of the course consists of lectures giving a systematic description of geological processes and the Wilson cycle, which include the formation of continental rifts and margins, oceanic spreading, transform faults, subduction and island arcs, as well as continental collision and formation of mountain belts. The tectonic processes typical of the various stages of the Wilson cycle, and their significance for basin formation, deformation, metamorphism and generation of magma, will be in focus in this part of the course. The second part of the course concentrates on large-scale plate motions, palaeogeography

and the link between plate tectonics and the Earth´s interior. The course includes one-week obligatory field teaching where many of the phenomena discussed in the lectures are presented.

GE6129: Advanced Geological Field Skills

Advanced Field Geology covers all aspects of geology in the field. It covers typical skills involved in geologic field studies, such as rock descriptions, structural observations and measurements, note taking, and geologic mapping. Advanced field course that allows students to attain a high level of geological field skills through a series of integrative field problems. At the end of this subject, students should have skills in field geology that will enable them to identify unfamiliar minerals and rocks. This is a vocational M. Sc. course that will give you with the knowledge, skills, competence and confidence to work in a wide range of practical geoscience careers.

GE6130: Geodynamics and Basin Evolution

The course introduces quantitative geodynamics. The overall goal of this course is to provide the students with a good understanding of geodynamics and surface processes. A first sub-goal of this course is to provide the students with an intermediate level of understanding of geodynamic processes of the solid earth plus programming skills in computational methods. A second sub-goal of this course is for the students to learn how to do a literature study on a topic in geodynamics and/or surface processes. A brief overview of plate tectonic processes is given. The equation for thermal energy balance for the lithosphere is developed, and it is shown how the equation may be applied on various geological models and processes. Vertical movements expressed as uplift or exhumation and the concept of isostasy and flexural strength are then examined. The mechanics of the crust and lithosphere deformation is covered including a discussion of plate driving forces, the rheology of the lithosphere, elastic, brittle and viscous deformation processes. The response of rocks to applied forces is discussed and modelled. Dynamic processes including lithosphere extension, basin formation, and continental collision are discussed.

GE6131: Fundamental of Rock Mechanics

The course introduces the theory of rock mechanics and its applications in mine construction and operation. Students are presented with the fundamental concepts of stress and strain in isotropic and anisotropic rocks and conduct stress analyses using data collected in the laboratory and the field. Rock mass structures and classification schemes are introduced, and students learn how these govern rock slope stability and underground rock excavation methods in each stress environment. Rock control and support systems utilized in underground and surface excavations and their related safety requirements are discussed.

GE6132: Precambrian Rocks of Egypt and Associated Mineralization

Historical review, classification of the basement complex in Egypt, stratigraphic and tectonic units, metallogenesis, application of plate tectonic theory, history of magmatic activities, tectonic evolution, detailed description of the rock units of the basement complex: e.g. metamorphic rocks, sedimentation and sedimentary rocks, volcanicity and volcanic rocks, ophiolitic rocks, gabbroic rocks, and granitoid rocks. Explore the classification and evolution of the Precambrian rocks of Egypt with emphasis to their associated mineralization. Surface exposure of the Egyptian Precambrian basement complex covers ca. 100 000 km². Outcrops of the basement rocks extend over extensive areas in southern Sinai, the Eastern Desert south of latitude 29°N and the Western Desert south of latitude 24°N between the Nile valley at Aswan in the east to GabalUweinat, near the Egyptian-Libyan-Sudanese border, in the west. Apart from the rejuvenated Paleoproterozoic to Archean rocks of GabalUweinat-GabalKamil inlier (charnockitic, TTG and gabbro-diorite gneisses), belonging to the Saharan

Metacraton, the Precambrian basement complex of Egypt, in Sinai and the Eastern Desert, belongs to the juvenile Neoproterozoic (550–900 Ma) crust of the Arabian-Nubian Shield (ANS).

GE6133: Neotectonics and Tectonic Geomorphology

The course reviews topics within geomorphology and earth surface processes such as key concepts of geomorphology, landform development at different spatial and time scales, endogenic and exogenic processes, their controlling mechanisms, and their interaction to form the landscape, geomorpholgical research methods, denudation and long-term landscape evolution. It considers different geomorphic contexts such as fluvial, coastal, aeolian and periglacial and the interaction between these and climate. The course involves field and laboratory methods relevant to geomorphology. Outlines of geomorphology - an overview, Rock weathering, Karst and speleology, Landform Analysis based on Aerial/Satellite data Interpretation, The fluvial geomorphic system (Drainage basin Morphometry), Slope Analysis, Late Quaternary climatic geomorphology, coastal geomorphology, Remote Sensing for Geomorphological Mapping and Terrain Evaluation, Morphostructure/ Morphotectonics/ Neotectonics, Integrated digital Terrain Evaluation using GIS, Human effects on geomorphic processes

GE6134: Geological Structures of Egypt

The course describes Pan African Orogeny. Proterozoic plate tectonism in the Afro-Arabian Shield.Wilson's cycle and magma activity.Basement rock units. Major structural elements affecting the Pan-African Orogenic belts: Sutures, thrust, and shear zones. Magmato-tectonic evolution of the Afro-Arabian Shield in the Eastern Desert of Egypt.Precambrian structures and its role in the configuration of the Paleozoic sedimentary basins.Paleozoic tectonism and related structures.Mesozoic tectonsim and related structures.Reactivation of early formed structures and neotectonics.Training on some structural maps of selected areas in Egypt.

GE6135: Structural Geology for Exploration and Mining

This course introduces structural geology in the context of exploration and mining, and how to record, analyse and present data from drill core. On completion of the course delegates should be able to: clearly describe why structural analysis is so important in mineral exploration, identify, describe and understand the formation of the major types of structures found in deformed rocks, describe basic drilling procedures and the potential limitations of working with drill core, know about the different tools used to measure structures in drill core, identify and measure structural features in drill core, confidently record, present and analyse the data, relate structures to likely controls on ore bodies.

GE6136: Structural geology and Petroleum Systems

This course examines aspects of structural interpretation in different tectonic regimes, from outcrop to regional scale, using field examples, petroleum industry case studies, seismic exercises and scaled analogue modelling examples. Key aspects of extensional, inversion and thrust tectonic regimes are described, analysed and reviewed in the classroom and at outcrop. Appraise different tectonic regimes, Recognize and interpret characteristic seismic expressions of different tectonic regimes, Assess the fundamental geometries of extensional fault systems - planar and listric - in both 2D and in 3D, using analogues and field examples, Characterise structural styles of inversion and seismic expressions and assess hydrocarbon trap styles in inverted terranes, Evaluate the fundamental dynamics and characteristic structural styles of strike-slip terranes and their 4D evolution, Assess the 4D evolution of thrust systems, thrust wedge dynamics and thrust fault-related folds, Critically assess and Evaluate seismic interpretations and map interpretations of different tectonic regimes, Judge the effects of structural development on hydrocarbon reservoirs.

GE6137: Advanced Stratigraphy

This course is to familiarize the student with the principles and techniques of historical geology. The student should be able to understand the underlying principles in the study of stratigraphic record, viz. chrono – and litho – stratigraphy and the concept of lithofacies and biofacies. The lab work involves study of stratigraphic maps, preparation and interpretation of structure contour maps, isopach maps, facies maps and principles of stratigraphic data processing. This includes sequence-stratigraphic principles and applications, quantifying stratigraphy in a mass-balance framework, qualitative and quantitative paleoenvironmental reconstructions, and an understanding of autogenic dynamics in sedimentary systems. At the end of this course students should be able to: Analyze stratigraphy using a simple mass-balance framework, Interpret basin/depositional histories using sequence stratigraphy, Evaluate important autogenic (self-formed) scales in sedimentary basins, Interpret qualitative and quantitative stratigraphic paleoenvironmental signals. Moreover, introduces highlights about the stratigraphy of Egypt

GE6138: Geochemistry and Geochronology

An overview of geochemical theory and problem-solving techniques used by Earth Scientists to elucidate Earth system processes. Topics of discussion will include the origin of elements, stable and radiogenic isotopes, geochronology, thermodynamics, trace element partitioning in mineral fluid systems, weathering and aqueous geochemistry. Geochemistry & Geochronology is a quantitative course that introduces third-year science students to the basic principles and practical applications of geochemistry. The course provides important background for students interested in pursuing advanced degrees in Earth and Environmental Sciences and the knowledge for professional geoscientists to use and interpret geochemical information. The course introduces conceptual knowledge of processes controlling the bulk composition of the Earth and other objects in the solar system; processes controlling the differentiation of the Earth into crust, mantle and atmosphere; plate tectonic controls on high temperature geochemistry and environmental controls on low temperature geochemistry. Analytical techniques used for major and trace element, and isotope analysis, and methods for presenting and interpreting different types of chemical data will be introduced in lectures and through practical exercises. Explore the rocks geochemistry and tectonic environments.

GE6139: Deformation Microstructures in Rocks

The course begins with a review of the main deformation mechanisms and continues with discussions of recovery and recrystallization processes, the role of metamorphic reactions in deformation, deformation partitioning, foliation development, and the effects of fluids and mass transfer. Porphyroblast-matrix relationships are then discussed, especially with regard to the relative timing of deformation and metamorphic reactions. The course concludes with a discussion of the microstructures of partly melted rocks and the microstructural results of deformation in Earth’s mantle.

Important concepts that will be discussed include the controls on metamorphism, fluid-rock interaction and mineral reactions, metamorphic and deformation fabrics, deformation mechanisms, lithosphere rheology.

The course’s aims are:

To provide a basis for the identification and classification of deformed and metamorphosed rocks developed at "deeper" levels of the Earth.

To introduce the field and petrographic tools for investigating and interpreting structural and metamorphic processes quantitatively.

To provide insight and understanding of deformation and metamorphic processes.

ب. برامج الدكتوراه في علوم الجيولوجيا:

1. برنامج الدكتوراه في العلوم في علم الصخور والجيوكيمياء: (Petrology and Geochemistry)

First Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
GE707	Geochemistry of Precambrian Rocks in Egypt جيوكيمياء صخور ما قبل الكمبري في مصر	2	-	2
Optional: 2 Credits				
GE701	Tectonism and Magmatism التكتونية والصهير	2	-	2
GE703	Tectonism and Metamorphism التكتونية والتحول	2	-	2
GE705	Advances in Isotope Geochemistry موضوعات متقدمة في كيمياء جيولوجيا النظائر	2	-	2
GE709	Mineral Chemistry كيمياء المعادن	2	-	2
GE711	Special Selected Topics in Petrology and Geochemistry (3) موضوعات خاصة مختارة في علم الصخور والجيوكيمياء (3)	2	-	2

Second Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
GE710	Exploration Geochemistry تنقيب واستكشاف جيوكيميائى	2	-	2
Optional: 2 Credits				
GE702	Geochemical Interpretation of Igneous Rocks التفسير الجيوكيميائي للصخور النارية	2	-	2
GE704	Volcanology علم البراكين	2	-	2
GE706	Geochemical Interpretation of Metamorphic Rocks التفسير الجيوكيميائي للصخور المتحولة	2	-	2
GE708	Isotopic Interpretation of Igneous and Metamorphic Rocks تفسير النظائر للصخور النارية والمتحولة	2	-	2
GE712	Special Selected Topics in Petrology and Geochemistry (4) موضوعات خاصة مختارة في علم الصخور والجيوكيمياء (4)	2	-	2

2. برنامج الدكتوراه في العلوم في الجيولوجيا الاقتصادية والتعدين:

(Economic Geology and Mining)

First Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
GE723	Special Selected Topics in Economic Geology and Mining (3) موضوعات خاصة مختارة في الجيولوجيا الاقتصادية والتعدين (3)	2	-	2
Optional: 2 Credits				
GE713	Hydrothermal Mineral Deposits رواسب المحاليل الساخنة	2	-	2
GE715	Residual and Supergene Mineral Deposits رواسب االمتبقيات ونواتج التجوية	2	-	2
GE717	Granite-related Mineral Deposits الرواسب المعدنية المتعلقة بالجرانيت	2	-	2
GE719	Ore Reserve Estimation تقدير احتياطي الخام	2	-	2
GE721	Environmental Impact of Mining and waste management التأثير البيئى للتعدين وأداره المخلفات	2	-	2

Second Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
GE718	Special Selected Topics in Economic Geology and Mining (4) موضوعات خاصة مختارة في الجيولوجيا الاقتصادية والتعدين (4)	2	-	2
Optional: 2 Credits				
GE714	Gold deposits رواسب الذهب	2	-	2
GE716	Mineral Deposits Associated with Ophiolites رواسب المعادن المصاحبة مع الأفيولايت	2	-	2
GE720	Quarries and Economic Minerals المحاجر والمعادن الاقتصادية	2	-	2
GE722	Mining Codes دستور التعدين	2	-	2
GE724	Mining Industry in Egypt صناعة التعدين في مصر	2	-	2

3. برنامج الدكتوراه في العلوم في الحفريات والطبقات: (Paleontology and Stratigraphy)

First Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
GE735	Special Selected Topics in Paleontology and Stratigraphy (3) موضوعات خاصة مختارة في علم الأحافير وعلم الطبقات (3)	2	-	2
Optional: 2 Credits				
GE725	Applied Palynology علم الحفريات التطبيقي	2	-	2
GE727	Sequence Stratigraphy التسلسل الطباقى	2	-	2
GE729	Mass Extinctions and Global Stratotypes الانقراضات الجماعية والأنماط الطبقية العالمية	2	-	2
GE731	Mesozoic-Cenozoic Deformation History of Egypt تأريخ التشوه اثناء حقب الحياة الوسطى والحديثة في مصر	2	-	2
GE733	Microfossil Applications تطبيقات الأحافير الدقيقة	2	-	2

Second Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
GE730	Special Selected Topics in Paleontology and Stratigraphy (4) موضوعات خاصة مختارة في علم الأحافير وعلم الطبقات (4)	2	-	2
Optional: 2 Credits				
GE726	Paleoecology علم البيئة القديمة	2	-	2
GE728	Index Fossil Groups مجموعات الحفريات المرشدة	2	-	2
GE732	Vertebrate Paleontology علم الحفريات الفقارية	2	-	2
GE734	Subsurface Stratigraphy الطبقات تحت السطحية	2	-	2
GE736	Stable Isotope and Chemostrtigraphy النظائر المشعة والطباقية الكيميائية	2	-	2

4. برنامج الدكتوراه في العلوم في الصخور الرسوبية والترسيب:

(Sedimentary Rocks and Sedimentation)

First Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
GE747	Special Selected Topics in Sedimentary Rocks and Sedimentation (3) موضوعات مختارة خاصة في الصخور الرسوبية والترسيب (3)	2	-	2
Optional: 2 Credits				
GE737	Advanced Research Topics in Sedimentary Rocks and Sedimentation موضوعات بحثية متقدمه في الصخور الرسوبية والترسيب	2	-	2
GE739	Sedimentary Geology in the Field الجيولوجيا الرسوبية في الحقل	2	-	2
GE741	Siliciclastic Sediments رواسب السيليكا الفتاتية	2	-	2
GE743	Chemical and Biochemical Sedimentary Rocks الصخور الرسوبية الكيميائية والبيوكيميائية	2	-	2
GE745	Sedimentological Reservoir Characteristics خصائص الخزان الرسوبي	2	-	2

Second Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
GE742	Special Selected Topics in Sedimentary Rocks and Sedimentation (4) موضوعات مختارة خاصة في الصخور الرسوبية والترسيب (4)	2	-	2
Optional: 2 Credits				
GE738	Depositional Models of Sea Transgressions/Regressions - Walther's Law نماذج ترسيبية لتقدم / انحسار البحر - قانون والتر	2	-	2
GE740	Sedimentary Rocks: The Key to Past Environments الصخور الرسوبية: مفتاح البيئات القديمة	2	-	2
GE744	Sedimentology and Petroleum Occurrence علم الترسبات وتواجد البترول	2	-	2
GE746	Analytical Techniques in Sedimentology التقنيات التحليلية في علم الرواسب	2	-	2
GE748	Microfacies studies of Carbonate Rocks دراسات السحن الدقيقة لصخور الكربونات	2	-	2

5. برنامج الدكتوراه في العلوم في الجيوفيزياء التطبيقية: (Applied Geophysics)

First Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
GE759	Special Selected Topics in Applied Geophysics (3) موضوعات خاصة مختارة في الجيوفيزياء التطبيقية (3)	2	-	2
Optional: 2 Credits				
GE749	Potential Exploration الاستكشاف المحتمل	2	-	2
GE751	Petrophysics Applications تطبيقات فيزياء الصخور	2	-	2
GE753	Advanced Structural Geology الجيولوجيا التركيبية المتقدمة	2	-	2
GE755	Oil Provinces in Egypt and the Middle East المناطق النفطية في مصر والشرق الأوسط	2	-	2
GE757	Formation Evaluation تقييم المتكون	2	-	2

Second Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
GE760	Special Selected Topics in Applied Geophysics (4) موضوعات خاصة مختارة في الجيوفيزياء التطبيقية (4)	2	-	2
Optional: 2 Credits				
GE750	Electromagnetic Exploration الاستكشاف الكهرومغناطيسي	2	-	2
GE752	Seismic Sequence Stratigraphy التسلسل الزلزالي للطبقات	2	-	2
GE754	Seismic Modeling النمذجة الزلزالية	2	-	2
GE756	Computer Programming in Geophysics برمجة الحاسب في الجيوفيزياء	2	-	2
GE758	Gas Fields in the Nile Delta حقول الغاز بدلتا النيل	2	-	2

6. برنامج الدكتوراه في العلوم في جيولوجيا البترول: (Petroleum Geology)

First Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
GE771	Special Selected Topics in Petroleum Geology (3) موضوعات خاصة مختارة في جيولوجيا البترول (3)	2	-	2
Optional: 2 Credits				
GE761	Oil Provinces in the Middle East مناطق النفط في الشرق الأو سط	2	-	2
GE763	Sandstone Reservoirs خزانات الحجر الرملي	2	-	2
GE765	Information Technology in Petroleum Industry تكنولوجيا المعلومات في صناعة البترول	2	-	2
GE767	Plate Tectonics Bearing on Hydrocarbon Distribution تأثير الالواح التكتونية على توزيع الهيدروكربونات	2	-	2
GE769	Carbonate Reservoirs خزانات الكربونات	2	-	2

Second Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
GE764	Special Selected Topics in Petroleum Geology (4) موضوعات خاصة مختارة في جيولوجيا البترول (4)	2	-	2
Optional: 2 Credits				
GE762	Oil Drilling and Production حفر النفط وإنتاجه	2	-	2
GE752	Seismic Sequence Stratigraphy التتابع الطباقى الزلزالى	2	-	2
GE766	Basin Analysis تحليل حوضى	2	-	2
GE754	Seismic Modeling النمذجة الزلزالية	2	-	2
GE768	Fluids in Subsurface Environment السوائل في البيئة الجوفية	2	-	2

7. برنامج الدكتوراه في العلوم في الجيولوجيا التطبيقية: (Applied Geology)

First Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
GE781	Special Selected Topics in Applied Geology (3) موضوعات خاصة مختارة في الجيولوجيا التطبيقية (3)	2	-	2
Optional: 2 Credits				
GE775	Applied Groundwater Modeling نمذجة المياه الجوفية التطبيقية	2	-	2
GE777	Applications of Geoinformatics تطبيقات نظم المعلومات الجيولوجية	2	-	2
GE779	Advanced Environmental Remote Sensing الاستشعار عن بعد البيئي المتقدم	2	-	2
GE731	Mesozoic-Cenozoic Deformation History of Egypt تأريخ التشوه اثناء حقب الحياة الوسطى والحديثة في مصر	2	-	2

Second Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
GE784	Special Selected Topics in Applied Geology (4) موضوعات خاصة مختارة في الجيولوجيا التطبيقية (4)	2	-	2
Optional: 2 Credits				
GE776	Hydrogeology of Egypt and Arid Areas جيولوجيا المياه في مصر والمناطق الجافة	2	-	2
GE778	Geodynamics الجيوديناميكا	2	-	2
GE780	Water Resources Planning and Management تخطيط وإدارة موارد المياه	2	-	2
GE782	Airborne Gamma-Ray spectrometry مطياف أشعة جاما المحمولة جواً	2	-	2

8. برنامج الدكتوراه في العلوم في الجيولوجيا البيئية: (Environmental Geology)

First Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
GE793	Special Selected Topics in Environmental Geology (3) موضوعات خاصة مختارة في الجيولوجيا البيئية (3)	2	-	2
Optional: 2 Credits				
GE783	Water Pollution تلوث المياه	2	-	2
GE785	Environmental Impact Assessment تقييم الأثر البيئي	2	-	2
GE787	Near Shore Processes and Environment العمليات القريبة من الشاطئ والبيئة	2	-	2
GE789	Marine Pollution التلوث البحري	2	-	2
GE791	Waste Disposal Management إدارة النفايات غير المستعملة	2	-	2

Second Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
GE796	Special Selected Topics in Environmental Geology (4) موضوعات خاصة مختارة في الجيولوجيا البيئية (4)	2	-	2
Optional: 2 Credits				
GE786	Air Pollution تلوث الهواء	2	-	2
GE788	Mineral Resources and Environment الموارد المعدنية والبيئة	2	-	2
GE790	Management of Protected Areas إدارة المناطق المحمية	2	-	2
GE792	Energy Resources and Environment مصادر الطاقة والبيئة	2	-	2
GE794	Land Use and Decision Making استخدام الأراضي وصناعة القرار	2	-	2

9. برنامج الدكتوراه في العلوم في الجيولوجيا التركيبية والتكتونية: (Structural Geology and Geotectonics)

First Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
GE795	3D Modelling of Structural Geology النمذجه ثلاثية الأبعاد للجيولوجيا التركيبية	2	-	2
Optional: 2 Credits				
GE797	Kinematic Analysis of Structural Geology التحليل الحركي للجيولوجيا التركيبية	2	-	2
GE735	Mesozoic-Cenozoic Deformation History of Egypt تشوه حقب الحياه المتوسطة-الحديثة في مصر	2	-	2
GE799	Structural Geology and Mineralization الجيولوجيا التركيبية والتمعدنات	2	-	2

Second Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
GE798	Advanced Structural Geology الجيولوجيا التركيبية المتقدمة	2	-	2
Optional: 2 Credits				
GE7100	Egypt in the framework of global tectonics مصر في إطار التكتونية الكونية	2	-	2
GE7102	Remote Sensing Detection & Analysis of Geological Structures التحقق عن طريق الاستشعار عن بعد وتحليل التراكيب الجيولوجية	2	-	2
GE7104	Deformation Belts in the Egyptian Nubian Shield أحزمة التشوه في الدرع النوبي المصري	2	-	2

GE701: Tectonism and Magmatism

present-day magmatism to global tectonic processes, geodynamics and partial melting in the Earth's mantle, igneous rocks in mid-ocean ridges, island arcs, active continental margins, back-arc basins, oceanic islands, tectonic provinces and magmatism in Egypt and Arabian Nubian Shield.

GE702: Geochemical Interpretation of Igneous Rocks

large collections of whole-rock data and, access to the wealth of statistical functions built into R. Data management tools include import and export of data files, geochemical graphs (e.g. binary and ternary graphs, Harker plots, spider plots, and several dozens of classification and geotectonic discrimination diagrams). Geochemical interpretation of mantle processes (melting, mantle-crust interaction, metasomatism, metamorphism), Geochemical interpretation of crustal processes (fractional crystallization, magma contamination, ,,,,). Volcanology. Plate tectonics and volcanoes; the processes that takes place at active volcanoes (eruptive mechanisms, effusive and explosive volcanism); methods and instrumentation used to study them; petrology of volcanics in Egypt and the Arabian Nubian Shield, the hazards of different types of eruptions.

GE703: Tectonism and Metamorphism

Metamorphic belts in Egypt and Arabian Nubian Shield. Metamorphism at the convergent plates, metamorphism in subduction zones, metamorphism at spreading plates. tectonic provinces and metamorphism in Egypt and Arabian Nubian Shield.

GE704: Volcanology

Plate tectonics and volcanoes; the processes that takes place at active volcanoes (eruptive mechanisms, effusive and explosive volcanism); methods and instrumentation used to study them; petrology of volcanics in Egypt and the Arabian Nubian Shield, the hazards of different types of eruptions.

GE705: Advances in Isotope Geochemistry

Applications of radiogenic and stable isotope high- and low-temperature geochemistry in Earth Sciences (igneous, metamorphic, alteration, sedimentary processes). Age-dating techniques and thermometers involving isotopes. Appliations of Re-Os, Lu-Hf, Zr, Fe, S, H, O, N isotopes.

GE706: Geochemical Interpretation of Metamorphic Rocks Behavior of chemical elements (volatile, semi volatile, alkaline and alkali-earth elements, rare earth elements, high filed strength elements, transition metals, noble elements) during metamorphism. Deduce the primary source and nature of the protolith of metamorphic rocks. Deciphering source of metamorphic fluids.

GE707: Geochemistry of Precambrian Rocks in Egypt Geochemical characteristics of Nubian Shield rocks in Egypt: ophiolites, island arc assemblage, granites, Dokhan volcanics, ultrabasic-basic intrusions, post-Hammamat intrusions.

GE708: Isotopic Interpretation of Igneous and Metamorphic Rocks

Radiogenic (Rb-Sr, Sm-Nd, Re-Os, U-Pb, Lu-Hf) and stable isotope (O, Zr, K, Zn, Cu) fractionation during melting, crystallization and magma contamination. Radiogenic dating of igneous and metamorphic rocks. Use of stable isotope composition of metamorphic rocks (O, H, C, N, Li, B, Mg, S)

to detect the composition of the pre-metamorphic protolith; the effects of volatilization; exchange with infiltrating fluids (with variable composition and fluid/rock ratio); and the T of exchange.

GE709: Mineral Chemistry

Chemical compositions of mineral groups (pyroxenes, amphiboles, mica, plagioclase, spinels, garnet, spinel, chlorite, sulfides,,,,,), Trace elements classification in minerals, application of trace elements in minerals to geological processes (melting, metasomatism, alteration,), isotopes in minerals applied to geological processes.

GE710: Exploration Geochemistry

This is an advanced course divided into two parts. Part I deals with the basic principles and concepts of exploration geochemistry, which is absolutely critical to the successful application of geochemistry within mineral exploration. Part II handles the procedures of (i) geochemical surveys, (ii) geochemical analyses, (iii) geochemical data evaluation and interpretation.The major topics of this course are: •Principles and Concepts of Exploration Geochemistry • Quality Control in Exploration Geochemistry • Geochemical Survey Methods (Field, Laboratory and Data Analysis) • Procedure for carrying out geochemical exploration of different regions

GE711: Special Selected Topics in Petrology and Geochemistry (3)

GE712: Special Selected Topics in Petrology and Geochemistry (4)

GE713: **Hydrothermal Mineral Deposits**

They include six main categories: porphyry, skarn, volcanogenic massive sulfide (VMS), sedimentary exhalative (SEDEX), and epithermal and Mississippi Valley-type (MVT) deposits. Each hydrothermal mineral deposit has different distinct geological formation, structures, ages, sizes, grades, geological formation, characteristics and, most importantly, value.

GE714: Gold deposits

The distribution, geology, occurrences, important characteristics (geochemistry, geophysics, structure, alteration, mineralogy), genesis, and exploration critational incomeeria of the most important gold deposit types

GE715: Residual and Supergene Mineral Deposits

Conditions of lateralization and supergene enrichment, zones (gossan cap, leached zone, oxidized zone, water table, enriched zone, primary zone), Mineral alteration, element mobility with lateralization and supergene mineralization.

GE716: Mineral Deposits Associated with Ophiolites

They include chromite deposits, Cu-Ni-Co sulphide deposits, asbestose and vermiculite deposits, corundum, talc and magnesite deposits..

GE717: Granite-related Mineral Deposits

They include vein molybdenum, vein tin, vein tungsten, vein Nb-Ta, beryllium, fluorite and uranium mineralization.

Granite-pegmatite, skarn and greisen-veins, porphyry, orogenic gold, intrusionrelated, epithermal and porphyry-related gold and base metal, iron oxide–copper– gold (IOCG).

GE718: Special Selected Topics in Economic Geology and Mining (4)

GE719: Ore Reserve Estimation

Course is also provided of the methods available for the production of an overall estimate of grade, tonnage and metal/mineral content of a deposit. These 'classical methods' have stood the test of time but are now being gradually superseded by geostatistical (kriging) techniques which are described in the course. Ore-reserve Estimation: Considerable attention is thus given to the production and modelling of the semi-variogram, the basic tool of the geostatistician. This aspect is frequently underplayed which is a pity, for the whole process is totally dependent on the interpretation of the semivariogram. The various stages of a geostatistical ore-reserve estimation procedure are explained, leading to the production of block (local) reserves and overall (global) reserves. The construction of a grade-tonnage curve.

GE720: Quarries and Economic Minerals

Introduction to earth resources, Mineral deposits and their geologic settings, Types of mineral deposits and their economics, Distribution of ore deposits in the world, Ore deposit formation and geological environments, Egyptian ore deposits, distribution and genetic issues, Ore dressing and upgrading, Tools applied to exploration of ore minerals, Mines and quarries in Egypt and national income

GE721: Environmental Impact of Mining and waste management

Loss of biodiversity, soil erosion, air pollution, water pollution and damage to land.

GE722: Mining Codes

The course is a briefly highlights on the various Mine Codes; namely: USBM/USGS Classification of identified mineral resources and reserves; International Financial Reporting Standards (IFRSs); APEO Classification; Committee for Mineral Reserves International Reporting Standards (CRIRSCO); Australasian IMMI AMIC Classification; and Coal resources and reserves. The course is detail highlights on Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves (The JORC Code) as well as Classification of Reserves and Resources according to mine codes.

GE723: Special Selected Topics in Economic Geology and Mining (3)

GE724: Mining Industry in Egypt

Various metals were mined in Egypt. Egypt has deposits of iron ore, phosphates, manganese, copper, lead, zinc, gold, chromite, magnesite, talc, asbestos and gypsum. Ornamental and building stones (limestones, sandstones, breccias, alabaster, basalt, andesite, granite, serpentinite rocks and marble.

GE725: Applied Palynology

Surface and sub-surface sampling methods, sample processing techniques; morphology, classification of palynomorphs; Palynofacies and paleoenvironmental interpretation; analytical biostratigraphy and correlation, biostratigraphy and palaeoecology, Palaeozoic records of terrestrial palynomorphs; role of palynomorphs in mineral and hydrocarbon exploration.

GE726: Paleoecology

Introduction, Paleoecological data derived from sedimentology, mineralogy, geochemistry and paleontology. Study of some selected ancient organisms and their environments. Environmental parameters. Populations in paleoecology, Paleobiogeography and climate. The ice age, global warming and sea level rise, aspects of Paleozoic, Cenozoic global climate, Paleoclimatic data from fauna and flora.

GE727: Sequence Stratigraphy

Introduction, Definition of sequence stratigraphy, Basic concepts, Accommodation, Stratal stacking patterns, Sequence stratigraphic units, Definition, Types of sequences, Sequence stratigraphic units, Systemtracts, Definition, Shoreline-related systems tracts, Shoreline-independent systems tracts, Sequence stratigraphic units, Parasequences, Definition, Scale and stacking patterns, Sequence stratigraphic surfaces, Definition Subaerial unconformity, Correlative conformities, Maximum flooding surface, Maximum, regressive surface, Transgressive ravinement surfaces, Regressive surface of marine erosion.

GE728: Index Fossil Groups

Paleozoic Index fossil groups (Trilobites, Rugosa, Graptolites), Mesozoic Ammonite biozones, Cretaceous Planktonic foraminiferal biozones, Cretaceous nannofossil biozones, Paleocene – Eocene – Miocene Planktonic foraminiferal biozones, Paleocene – Eocene – Miocene nannofossil biozones, Correlation of the Egyptian biozones with global and standard biozones.

GE729: Mass Extinctions and Global Stratotypes

Introduction, Five big mass extinction, Cambrian explosion, Ordovician–Silurian extinction event, Late Devonian extinction Permian–Triassic (P–Tr) Extinction event, Triassic–Jurassic extinction event, The end of Cretaceous mass extinction (The K/T Boundary), Concept of stage, Stage Boundaries, k/T and Paleocene-Eocene boundaries.

GE730: Special Selected Topics in Paleontology and Stratigraphy (4)

GE731: Mesozoic-Cenozoic Deformation History of Egypt

This course provides details about Mesozoic-Cenozoic Deformation History of Egypt and includes: Tethyan rifting that started in Middle-Late Triassic almost to the end of Early Cretaceous due to the divergent movement between the Afro-Arabian Plate and Eurasian Plate. Extensional deformation that led to opening of NW-SE to WNW-ESE oriented rift basins during the Cretaceous-Early Tertiary time. This phase of deformation is probably related to the opening of the South Atlantic and the divergence between the Afro-Arabian and South American Plates. Compressional transpressive deformation that resulted from the convergence between the Afro-Arabian and Eurasian Plates leading to inversion of the Tethyan extensional basins, started at Santonian time and continued to the Miocene. The last phase is related to divergence between the African and Arabian Plates in Late Oligocene-Miocene time forming the Gulf of Suez-Ancestral Red Sea rift.

GE732: Vertebrate Paleontology

Introduction, definitions, Subphylum: Vertebrata; Superclass: Pisces and Superclass: Tetrapoda (Amphibia, Reptila, Aves and Mammalia). Dinosaur paleobiology and the origin of birds. Major mammalian lineages and Primate origins. Importance of Fayoum province in Egypt as a famous locality

for vertebrate fossils. Wadi El-Hitan as a world heritage protectorate in Egypt. laboratory exercises include examples of each class.

GE733: Microfossil Applications

Introduction to marine Micropaleontology and types of microfossil groups-Methods of study of the different of marine microfossil groups. Test morphology, classification and stratigraphical distribution of some microfossil groups: Foraminifera, Calcareous Nannofossils, Ostracods, Diatoms, palynomorph (Silicoflagellates, Dinoflagellates, spores and pollens). Application of marine microfossils in different studies such as biostratigraphy, reconstruction of paleoenvironments, paleoclimatology, paleogeography, in petroleum exploration, in different economic industry, medicines and as excellent indicators in evolution of life on the earth. Age dating of the stratigraphical sequences using identified microfossil assemblages. Correlate the identified microfossil groups with other groups in several areas in Egypt and outside Egypt. Construct the paleoenvironments and paleobathemetry of the different rock units in a given area. Identify different marine environments and determining the ocean water temperatures in the past.

GE734: Subsurface Stratigraphy

Seismic Reflection Data, Acquisition of seismic reflection data, Interpretation of seismic reflection data, Stratigraphic relationships on seismic profiles, Structural features on seismic reflection profiles, Borehole Stratigraphy, Borehole cuttings, Core logging, Petrophysical logging tools.

GE735: Special Selected Topics in Paleontology and Stratigraphy (3)

GE736: Stable Isotope and Chemostrtigraphy

Geochemical parameters used in chemostratigraphy, the major source of organic matter entombed in the sediments. Reconstruct the history of geological records of ancient marine and continental environments, Dating and correlation techniques, Radiometric dating, Potassium-argon and argon-argon dating, Uranium-lead dating, Rubidium-strontium, Carbon, Oxygen and Strontium Isotopic Composition of Carbonates.

GE737: Advanced Research Topics in Sedimentary Rocks and Sedimentation

Apply standard sedimentary and stratigraphic techniques in field and lab settings, Apply standard sedimentary and stratigraphic techniques to rock cores, Identify sedimentary rock features/characteristics, Analyze sedimentary rock features/characteristics to determine depositional environments and settings, Evaluate sedimentologic data to determine unanswered questions or future directions of sedimentological research.

GE738: Depositional Models of Sea Transgressions/Regressions - Walther's Law

The rate of change of accommodation (at the shoreline) and the rate of sediment supply are the primary factors controlling regression and transgression in the geological record, or retreat and advance of a coastal depositional system. Lithostratigraphy vs. Sequence Stratigraphy, What’s wrong with lithostratigraphy? Lithostratigraphy vs. Sequence Stratigraphy, Fundamentals of Sequence Stratigraphy/Correlation, Fundamentals of Sequence Stratigraphy, Walther’s Law, Accommodation vs. Supply, The sea level curve and systems tracts.

GE739: Sedimentary Geology in the Field

Field methods in stratigraphy and sedimentology; interpretation of depositional systems and paleoenvironments; methods of observations, data recording and analysis, and presentation of geological information (maps, cross sections).

GE740: Sedimentary Rocks: The Key to Past Environments

Sedimentary rocks tell us about past environments at Earth's surface. Because of this, they are the primary story-tellers of past climate, life, and major events at Earth's surface. Each type of environment has particular processes that occur in it that cause a particular type of sediment to be deposited there.

GE741: Siliciclastic Sediments

To introduce the ways in which siliciclastic rocks are described and classified, Correctly describe siliciclastic rocks in hand specimen, Comment on the textural and compositional maturity of siliciclastic rocks, Classify siliciclastic rocks according to grainsize, texture and composition of detrital components, Determine between cement/matrix/pores/grains in thin section, Make simple petrographic descriptions of sandstones in thin section.

GE742: Special Selected Topics in Sedimentary Rocks and Sedimentation (4)

GE743: Chemical and Biochemical Sedimentary Rocks

(1) Clastic sedimentary rock consists of cemented-together clasts, solid fragments and grains broken off of preexisting rocks (the word comes from the Greek klastos, meaning broken); (2) biochemical sedimentary rock consists of shells; (3) organic sedimentary rock consists of carbon-rich relicts of plants or other organisms; and (4) chemical sedimentary rock is made up of minerals that precipitated directly from water solutions.

GE744: Sedimentology and Petroleum Occurrence

A consideration of the actual state of relations between sedimentology and the petroleum industry shows that between the rapid development of sedimentology on the one hand, and the application of the results to concepts of the petroleum industry on the other hand, a striking discrepancy exists. Important results of sedimentological investigations which should influence current ideas concerning source beds, primary distribution of organic matter in sediments, occurrence and distribution of hydrocarbons, primary migration and reservoir traps.

GE745: Sedimentological Reservoir Characteristics

This course will review the controls on carbonate reservoir heterogeneity from the pore architecture scale to the geometrical attributes at reservoir-scale and how these parameters can be incorporated and integrated into the development of viable petrophysically-based reservoir models for carbonates.

GE746: Analytical Techniques in Sedimentology

Collection and analysis of field data grain size determination and interpretation. Microscopical techniques: Slices, slides, stains and peels Microscopic techniques. Principles of sedimentary petrography Cathodoluminescence microscopy, X-ray powder diffraction of sediments, use of the scanning electron microscope in sedimentology, chemical analysis of sedimentary rocks.

GE747: Special Selected Topics in Sedimentary Rocks and Sedimentation (3)

GE748: Microfacies studies of Carbonate Rocks

This course synthesizes the methods used in microfacies analysis and details the potential of microfacies in evaluating depositional environments and diagenetic history, and, in particular, the application of microfacies data in the study of carbonate hydrocarbon reservoirs and the provenance of archaeological materials.

GE749: Potential Exploration

We introduce exploration potential, a quantity that measures how much a reinforcement learning agent has explored its environment class. In contrast to information gain, exploration potential takes the problem's reward structure into account. This leads to an exploration criterion that is both necessary and sufficient for asymptotic optimality (learning to act optimally across the entire environment class). Our experiments in multi-armed bandits use exploration potential to illustrate how different algorithms make the tradeoff between exploration and exploitation.

GE750: Electromagnetic Exploration

This course investigates diffusive and wave-based geophysical techniques, covering topics in time-domain and frequency-domain electromagnetics. Electromagnetic information can provide constraints on subsurface resistivity. The main objective of this course is to present the different types of electromagnetic surveys (ground and airborne) which are very low frequency, ground penetrating radar, horizontal loop, time domain, frequency domain and telluric and magnetotelluric techniques. The goal of this course is to introduce students to the CSEM (controlled source electromagnetic) and the MT methods prospecting methods and their applications in investigating subsurface condition; and provide students with opportunities to develop basic acquisition, processing and interpretation skills using the electromagnetic methods. The course describes the basic concepts and basic physics of the CSEM and MT methods and case studies from hydrocarbon exploration. After the course the students should be able to use EM data for identification of hydrocarbons.

GE751: Petrophysics Applications

Evaluation of reservoirs by determination lithology, net pay, porosity, water saturation and permeability and fluid contacts identification. Data base, 2D and 3D seismic imaging, mud-logging, cores, wirline logging, MDT, Tests and PSV.

GE752: Seismic Sequence Stratigraphy (1)

Introduction and general definitions used in sequence stratigraphic. Sequence stratigraphic seismic tool: principles of seismic stratigraphic interpretation-resolution of seismic data-seismic processing and display for seismic interpretation- seismic reflection termination patterns-seismic facies and attribute patterns. Principles of sequence stratigraphy concept of scale sequence stratigraphy vs. lithostratigraphy and allostratigraphy - Dynamics of Basin wide Sedimentation Patterns and Sea level Changes– accommodation and shoreline shifts- orders and causes of stratigraphic cycles- surfaces and their criteria-hierachies in sequence stratigraphy (sequence, system tracts, para-sequences) outlines of siliciclastic and carbonate sequence stratigraphy. Recognize the depositional environment. Depositional environment and gross lithofacies interpretation.

GE753: Advanced Structural Geology

The course includes a quantitative approach of stress and strain in various tectonic setting, advanced aspects of rock deformation and rheology in the light of brittle, ductile and plastic deformation processes, an appraisal of the spectrum of complex deformation geometries, approaches of balancing and restoring deformation, as well as aspects of climate-tectonic interaction. Structural Geology and Tectonics examines the deformation of earth´s lithosphere. The course aims to provide advanced theoretical aspects of rock deformation. Besides quantitative aspects of stress and strain analyses, the broad spectrum of deformation complexities in contractional, extensional and strike-slip regimes at various scales are highlighted. The course provides an in depth understanding of the rheological properties of the lithosphere, including brittle and plastic deformation processes at the microscale. At the macroscale, the interaction between climate and tectonic is discussed. Lectures are accompanied by a series of practicals with the objective to apply and strengthen the gained knowledge in various exercises.

GE754: Seismic Modeling

Seismic modeling is a set of processes to simulate the response of the earth to the excitation of seismic sources placed at the earth's surface or inside the earth. The simulation can be performed either on a scaled physical model using actual elastic waves or on a computer with approximate (numerical) solutions to the elastic wave equation. Two types of modeling: Structural modeling is the first step in building 3D models and subdivided into three processes (Fault modeling, Pillar gridding and Make horizons). Property modeling contain (Facies modeling and Petrophysical modeling). Structural modeling: Data import, Well correlation, Synthetic seismogram, Interpret grid horizons, Structure interpretation, Fault modeling, Pillar gridding, Make horizons, Depth convert 3D grid, Velocity model, Seismic maps. Facies Modeling: FZI modeling, classification of facies and their accurate representation in a 3D cellular geologic model. Petrophysical modeling is a complete set of continuous reservoir parameters (i.e. porosity, permeability and water saturation).Then Volume and Original-Oil-in-Place Calculations.

GE755 : Oil Provinces in Egypt and the Middle East

Oil and Gas is one of the most dynamic industries in Egypt, and hydrocarbon production is by far the largest single industrial activity in the country representing around 13.6% of the total GDP in 2018. Egypt has significant energy resources, both in traditional fossil fuels and in renewable energy. Egypt's proven hydrocarbon reserves stood at 3.3 billion barrels of oil and 77.2 trillion cubic feet (tcf) of natural gas at the end of 2018. The Government of Egypt encourages international oil companies (IOC) to participate in the oil and gas sector, and currently more than fifty IOCs are operating in Egypt. Egypt plays a vital role in international energy markets through the operations of the two Suez Canal transit points and the Suez-Mediterranean (SUMED) pipeline. Expanded in 2015, the Suez Canal is an important transit route for oil and liquefied natural gas (LNG) shipments travelling southbound from North Africa and along the Mediterranean Sea to Asia. Fees collected from the operation of these two transit points are significant sources of revenue for the Egyptian government. Egypt plans to invest around $38 billion developing its petrochemicals sector over the next four years. The petrochemical sector represents about 12% of industrial production and generates revenues totaling USD 7 billion, equivalent to nearly 3% of GDP. Egypt has the largest refinery capacity in Africa at a nominal 840,000 barrels per day, although it operates well below this capacity, with 508,000 barrels per day processed in

2017. Currently, the government is updating existing refineries, and a new private-sector refinery is also set to begin production.

GE756: Computer Programming in Geophysics

General Introduction, Importance of software in geophysical data retrieval and presentation, Digitizing geophysical data for software manipulation and processing, Software for Potential data analysis (e.g., Geosoft) and 3D modeling (e.g., Surfer). Software for well-log data analysis and interpretation (e.g., Interactive Petrophysics, IP). Software for Seismic data analysis and interpretation (landmark, Petrel), Integrating software for geological modelling.

GE757: Formation Evaluation

The course deals with measurement environment, borehole diameter, filtration invasion, formation temperature, mud cake resistivity, conventional interpretation technique, concepts of cut off, porosity, determination of formation water resistivity, reconnaissance interpretation technique; Fo , Ro logs and Rx / Rt, graphical interpretation techniques, Hingle plot, Pickett plot, lithology-porosity crossplots, porosity overlays, MN and MID plots, evaluation of shaly formation and evaluation of gas bearing formation.

GE758: Gas Fields in the Nile

The offshore Nile Delta basin is considered as one of the most promising province in Egypt which has an excellent potential gas and condensate reserves for future exploration. This course aims to characterize the origin of natural gas and to determine whether it is biogenic, thermogenic or mixed processes which are considered the dominant generation pathways.

GE759: Special Selected Topics in Applied Geophysics (3)

GE760: Special Selected Topics in Applied Geophysics (4)

GE761: Oil Provinces in the Middle East

Geography of the Middle East: What is the location of the Middle East? How does the region appear to NOT have valuable resources? What is crude oil? Where is it found? In what waterway can most of the regions oil reserves be found?; The Processing of Oil:What is process that formed oil reserves? Where is oil stored? What is impermeable rock? Why is it significant to the processing of oil for humans? Why does the region of the Middle East have so much oil? What is the process to bring oil out of the ground? What are the top 10 oil producing countries in the Middle East? How could the distribution of the world's oil resources cause conflict in our world?; The Human Impact:In general, how has the wealth in the region from oil benefitted the people in the Middle East? How is the wealth in the region divided among the people? What countries experience the highest per capita GDP based on their oil wealth?; The Export Business: Why do exporting countries want control in the oil industry? What is OPEC? Who are the member countries? What is the mission of OPEC? Why do importing countries want some control in the exporting of oil? What is the U.S. doing to protect their energy future? What plan should be put into place to protect the world's energy future?

GE762: Oil Drilling and Production

The course discusses drilling techniques; cable tool, rotary and turbodrilling, mud drilling fluid,fluid circulation, drilling problems, directional drilling, workover activities, petroleum production; reservoir mechanism; water drive, gas drive and dissolved gas drive, artificial lift; fluid injection and pumping, well completion, well production units, casing , tubing, perforation, production facilities, free water level identification, reserve calculation for oil and gases, formation damage, and well stimulation.

GE763: Sandstone Reservoirs

Tis course focuses on the analysis of carbonate and sandstone depositional textures and the subsequent diagenetic modifications as the main controls on the pore system evolution, heterogeneity and complexity. The intricate inter-relationship of the depositional and burial history can be unraveled to allow the prediction of reservoir facies.

GE764: Special Selected Topics in Petroleum Geology (4)

GE765: Information Technology in Petroleum Industry

nformation Technology (IT) is widely acknowledged to be crucial for efficient operation and management of all industrial systems. It is one of the most promising industrial sectors of the Indian economy and India's IT capability is well recognized globally. The demand for IT services has increased substantially over the years. Oil and gas companies are under pressure to achieve higher returns on their capital assets in a safe and sustainable manner. They need to drive higher asset reliability, productivity and performance while managing growing demands as well as competition for oil reserve access. This paper explores the Information Technology Applications in Petroleum Sector. In particular, it discusses Information Technology and it applications within Petroleum Industry major sectors such as upstream, midstream and downstream.

GE766: Basin Analysis

The aim of this course is to introduce basin analysis and the techniques used to reconstruct depositional, post-depositional, and burial history. The lectures will include: basin formation and tectonic setting, subsidence mechanisms, sedimentary responses to tectonic activity, and modern examples of basin types. An introduction to various techniques used in basin analysis will include provenance analysis and seismic reflection and sequence stratigraphy, Objectives of this course is designed to familiarize students with the major mechanisms involved in formation, subsidence, and filling of sedimentary basins, Examine the dynamics of basin evolution in tectonically active settings, including convergent, divergent, and strike-slip plate margins and interiors, To develop a solid understanding of the major structural, tectonic, and geophysical processes that produce sedimentary basins, and develop some skills in basin analysis that allow us to interpret those processes from the stratigraphic record and to emphasize a multi-disciplinary approach that integrates concepts in structure, tectonics, geodynamics, sediment transport, and process stratigraphy to help us understand the behavior of sedimentary basins in active settings

GE767: Plate Tectonics Bearing on Hydrocarbon Distribution

This course examines aspects of structural interpretation in different tectonic regimes, from outcrop to regional scale, using field examples, petroleum industry case studies, seismic exercises and scaled analogue modeling examples. Key aspects of extensional, inversion and thrust tectonic regimes are described, analysed and reviewed in the classroom and at outcrop. Appraise different tectonic regimes,

Recognize and interpret characteristic seismic expressions of different tectonic regimes, Assess the fundamental geometries of extensional fault systems - planar and listric - in both 2D and in 3D, using analogues and field examples, Characterise structural styles of inversion and seismic expressions and assess hydrocarbon trap styles in inverted terranes, Evaluate the fundamental dynamics and characteristic structural styles of strike-slip terranes and their 4D evolution, Assess the 4D evolution of thrust systems, thrust wedge dynamics and thrust fault-related folds, Critically assess and Evaluate seismic interpretations and map interpretations of different tectonic regimes, Judge the effects of structural development on hydrocarbon reservoirs.

GE768: Fluids in Subsurface Environment

The course concerns the study of fluids; gas, oil and water, chemical constituents of petroleum, natural gases; hydrocarbon and non hydrocarbon gases, types of crude oils, physical properties of oils, mode of subsurface water occurrence and chemistry, subsurface temperature and pressure, and subsurface fluid mechanics.

GE769: Carbonate Reservoirs

This course focuses on the analysis of carbonate and sandstone depositional textures and the subsequent diagenetic modifications as the main controls on the pore system evolution, heterogeneity and complexity. The intricate inter-relationship of the depositional and burial history can be unraveled to allow the prediction of reservoir facies.

GE771: Special Selected Topics in Petroleum Geology (3)

GE775: Applied Groundwater Modeling

This course is designed to provide participants with principles and procedures of groundwater modeling and the use of computer models for groundwater resources management and protection. The topics will be provided are: describe process and procedures of applied groundwater modelling; construct numerical groundwater models using popular modelling tools with hands-on exercises; use groundwater models to simulate groundwater flow, contaminant transport, and saltwater intrusion with hypothetical examples; and apply groundwater models for groundwater resources management and protection in real-world case studies.

GE776: Hydrogeology of Egypt and Arid Areas

Hydrological processes and water balance in arid areas. Ground water, surface water and their spatio-temporal variations. Agriculture, water requirements and water harvesting in the arid areas. Flash floods in arid areas catchments. The problem of salinization and ground water pollution. About Egypt, the topics will be provided are: available water resources evaluation, rainfall, climate conditions, main drainage basins, aquifers (Geology, hydrogeology, geographic locations, water quality and chemistry, factors affecting groundwater chemistry, pollution, flow system and recharge sources), environmental problems related to water use, effect of clime change in surface and groundwater. The aquifer in Egypt including, Nubian Sandstone Aquifer, Fractured Aquifers, Moghra Aquifer, Nile Vlley and Nile Delta aquifers and coastal aquifers will be studied. A special part about hydrogeology of Sinai will be provided.

GE777: Applications of Geoinformatics (GIS)

Concepts of spatial data, databases, data models, data sources, data acquisition and image analysis are explored in lectures and reinforced by computer-based assignments. Applications of GIS and remote sensing to environmental issues are considered. GIS experts map out features of the earth's surface and offer guidance for natural resource management. The availability of open data portals means that there is a vast amount of valuable information available to geologists everywhere. Geoinformatics integrate a lot of data to extract new information.

GE778: Geodynamics

The course introduces quantitative geodynamics. The overall goal of this course is to provide the students with a good understanding of geodynamics and surface processes. A first sub-goal of this course is to provide the students with an intermediate level of understanding of geodynamic processes of the solid earth plus programming skills in computational methods. A second sub-goal of this course is for the students to learn how to do a literature study on a topic in geodynamics and/or surface processes. A brief overview of plate tectonic processes is given. The equation for thermal energy balance for the lithosphere is developed, and it is shown how the equation may be applied on various geological models and processes. Vertical movements expressed as uplift or exhumation and the concept of isostasy and flexural strength are then examined. The mechanics of the crust and lithosphere deformation is covered including a discussion of plate driving forces, the rheology of the lithosphere, elastic, brittle and viscous deformation processes. The response of rocks to applied forces is discussed and modelled. Dynamic processes including lithosphere extension, basin formation, and continental collision are discussed.

GE779: Advanced Environmental Remote Sensing

Environmental Remote Sensing is designed to introduce students to remote sensing science and technology. It emphasizes mastering fundamental remote sensing concepts and utilizing remotely sensed data for environmental information extraction and problem solving. Students will develop a basic understanding and working knowledge of the principles and applications of remote sensing including satellite multispectral data sets, matter-energy interactions, radiation transfer theory, image interpretation, computer-assisted analysis, and remote sensing applications. It will also provide a survey of the concepts and techniques of remote sensing and image analysis for mapping and monitoring natural resources, environment and land use and a wide spectrum of geoscientific applications ranging from meso- to global scale. It will also cover how remote sensing is used as a tool of geo-exploration.

GE780: Water Resources Planning and Management

Introduction; Science of water (Physical and chemical properties of water, Global water, Freshwater use, Water pollution, Urban water supply and purification of potable water, Drains and wastewater); Water sustainability and development (Sustainable development and application to rural water supply in developing countries and Water and sanitation); Methods and techniques for water management (Integrated Water Resource Management (WRM) and Methods for testing the water quality); Water and economics (Value of water, Global financing of water supply, The role of water in cost recovery and Targeting water valuation); Management for sustainability (Rural water supply in sub–Saharan Africa, Operation and maintenance) and Case study. The use of remote sensing data in a GIS environment is an integral and important part for the planning and management.

GE781: Special Selected Topics in Applied Geology (3)

GE782: Airborne Gamma-Ray spectrometry

The radiometric, or gamma-ray spectrometric method is a geophysical process used to estimate concentrations of the radioelements potassium, uranium and thorium by measuring the gamma-rays which the radioactive isotopes of these elements emit during radioactive decay. Airborne gamma-ray spectrometric surveys estimate the concentrations of the radioelements at the Earth's surface by measuring the gamma radiation above the ground from low-flying aircraft or helicopters. All rocks and soils contain radioactive isotopes, and almost all the gamma-rays detected near the Earth's surface are the result of the natural radioactive decay of potassium, uranium and thorium. The gamma-rays are packets of electromagnetic radiation characterised by their high frequency and energy. They are quite penetrating, and can travel about 35 centimetres through rock and several hundredmetres through the air. Each gamma ray has a characteristic energy, and measurement of this energy allows the specific potassium, uranium and thorium radiation to be diagnosed. The gamma-ray spectrometric method has many applications but is used primarily as a geological mapping tool. Changes in lithology, or soil type, are often accompanied by changes in the concentrations of the radioelements. The method is capable of directly detecting mineral deposits. Potassium alteration, which is often associated with hydrothermal ore deposits, can be detected using the gamma-ray spectrometric method. It is also used for uranium and thorium exploration, heat flow studies and environmental mapping.

GE783: Water Pollution

An understanding of the physical, chemical and biological processes involved during contamination of water is essential if society is going to effectively monitor and control the effects of pollution using modern technology and engineering practices. A huge range of pollutants may be released into the aquatic environment during every day domestic, leisure, industrial and commercial activities and many of these contaminants are potentially harmful to human health and the environment. In this course, we will focus on the origins, pathways and consequences of anthropogenic pollutants in the environment as well as discussing the various approaches to pollution control and remediation. This course will deal also with groundwater contamination by discussing different factors control groundwater contamination using DRASTIC model. Also mechanism of pollutant flow and dispersion through the porous media will be discussed.

GE784: Special Selected Topics in Applied Geology (4)

GE785: Environmental Impact Assessment

Regulation and regulatory framework of the environmental and hazardous - Waste law; Definitions; policy guidance vs. regulations; role of the states, municipalities and the EEAA, compliance issues; case studies. Environmental management system (EMS) understanding ISO 14000 scope and definitions; EMS requirements and environmental policy; cost benefit analysis; environmental planning; implementation and operation; checking and corrective action; environmental auditing and the environmental management system in Egypt. Objective and needs of the environmental impact assessment (EIA); activities involved in EIA, characteristics of impacts); EIA methods, checklists, overlay mapping, networks, matrices; estimates of resources demand for EIA studies; Recommended methodologies for rapid EIA; case studies; guidelines for EIA in developing countries; environmental

impact statement; land evaluation and suitability analysis. Current ecological and environmental problems that may include the threats to natural resources, energy problem, food problem, desertification, grazing problem in dessert regions, pollution and global climate change. Sustainable development, soil quality, waste management, and water shortage problem in the Middle East, management of water resources in arid lands, human impact and ecosystem restoration.

GE786: Air Pollution

The Burning of Fossil Fuels. Sulfur dioxide emitted from the combustion of fossil fuels like coal, petroleum for energy in power plants, and other factory combustibles is one the major cause of air pollution. Air pollution results from a complex mixture of thousands of pollutants. This mixture may include solid and liquid particles suspended in the air (particulate matter (PM)), and various gases such as ozone (O3), nitrogen oxides (NO2 or NOx), volatile organic compounds (VOCs), and carbon monoxide (CO). Types of air pollution: particulate matter, nitrogen dioxide, ozone, sulphur dioxide.

GE787: Near Shore Processes and Environment

The major topics will include coastal environments and processes, coastal management, and field based investigations. It aims to provide students with an understanding of the coast and the hazards and risks within coastal environments as well as how these issues impact on coastal management. Distinguish fundamental understanding of oceanic processes and interaction between oceans, atmosphere, and coastlines. Assess the extent of global coastal changes (natural and human-caused) and their effects on coastlines. Discuss how coastal areas should be best managed to balance human interest with protecting valuable habitats for wildlife and fisheries.

GE788: Mineral Resources and Environment

Geologic, economic, societal, and environmental issues related to the production and consumption of mineral resources. The geologic and economic nature of commercial concentrations of metals and industrial minerals will be the focus of the course. Probable topics include natural controls on mineral resource localization, modern resource-forming systems, economic evaluation, resource extraction, environmental issues, mineral exploration, etc. Lab exercises typically involve studies of selected mineral deposit types, including representative sample suites and economic evaluation.

GE789: Marine Pollution

Land-based sources account for the 82% of the total marine pollution. Pollution from vessels can take the forms of oil, chemicals, lost cargo and equipment, sewage, garbage, fumes and invasive exotic species. Dumping is the deliberate disposal of wastes at sea. Offshore activity generates minor pollution primarily through the use of oily drilling muds and by production blow outs. This course introduces you to the international legal framework on marine pollution, which covers global and regional legally binding and non-legally binding agreements addressing different sources of pollution. At the end of this course, you will be able to: 1. Define and distinguish different sources of marine pollution 2. Identify global and regional agreements and initiatives addressing marine pollution.

GE790: Management of Protected Areas

Protected areas are a mainstay of global conservation policy, with more than 14% of the terrestrial realm and 4% of the marine realm under some type of protection. In this module students will be introduced to the key concepts needed to understand protected area management and policy at the national and

international level. The following indicative topics will form the basis of lectures, seminars and field trip around which the module will be taught: the history of protected areas and relevant international policies and commitments; current definitions of protected area based on management categories and governance types; management planning and measuring protected area management effectiveness; economic issues relating to protected areas; designing protected area networks to form representative ecological networks.

GE791: Waste Disposal Management

This course deals with major problems of pollution of the atmosphere, water, the land surface and the food chain. It covers processes responsible for the occurrence and release of pollutants in the environment, dispersion mechanisms, the hazards associated with different types of pollutant, problems of accumulation of toxic substances, and procedures for the reduction of emissions and remediation of contaminated environments. Waste Definition, Generation, Effects, Management Options (General and legal definitions- Sources & waste generation – physiochemical properties of municipal solid waste and hazardous waste)- Waste Compositions, quantities, and classifications- Effects of in-proper management -Relevant environmental regulations for waste disposal, Site Investigations. Landfills construction/design, base liner system and the leachate collection system, operation, aftercare, closure and re-cultivation, and the interaction of contaminants and the environment. Soil contaminant retention capacity - Geotechnical aspects. Water balance control of landfills. In situ stabilization (aeration, methane-oxidation, water balance control) of landfills. Facilities of landfills, the monitoring system.

GE792: Energy Resources and Environment

The course is an introduction to further studies in energy and environment, and therefore it will give an overview and a broad understanding of the subject area. It will provide an overview of: -The environment as a framework for energy.Energy resources and energy use. Methods of production as well as environmental impacts for electrical power, thermal energy and cooling. Heat and cold, production methods and environmental impacts. Energy conversions in industry and buildings. Energy flexibility and transport of district heating. Electrical energy, electricity as energy carrier and the infrastructure associated with this. Energy balance and environmental accounts. With the fight against global warming and the need to reduce our CO2 emission, we have to find new ways of producing energy in a sustainable way. Geothermal energy is a renewable resource that can help to reduce our impact on the planet. The exploitation of geothermal energy is closely linked to the geological context. Mostly, the direct use of hot water or steam for the production of electricity or heat is limited by the access to hot fluids at accessible depth, what is mostly related to the tectonic and geological context. Its exploitation is also directly linked to the property of the rocks such as the permeability and the geochemistry of the fluid. More recently, the use of low temperature systems (10-30°C) has started to increase. Those systems are using rocks and groundwater combined to heat pumps to produce heating and cooling for buildings. In this course, we will discuss the different geothermal systems and the contexts in which they can be exploited, highlighting the role of the geologist and hydrogeologist in the production of sustainable energy

GE793: Special Selected Topics in Environmental Geology (3)

GE794: Land Use and Decision Making

From local (municipality-level) to global scales, planners wish to understand likely trajectories, patterns, and impacts of land-use change in urban areas. Planners use such information to evaluate the likely social and environmental impacts of current growth trends, to conduct scenario analysis to understand hypothetical future growth trajectories, and to design policy interventions to steer urban areas towards desired change trajectories. A variety of fine-scale spatial modeling methods have been developed to support these goals. This course provides an introduction to such models and their application to planning and policy analysis. This is a one term course with credit weight 0.5. Course meetings include 2 hours of lecture and 1 hour of GIS/spatial modeling lab per week. Course Objectives: Having completed the course, students should be able to critically review and interpret an urban simulation model, whether presented in a report or scholarly article. They should have an understanding of the input data requirements, the ways in which the model output can support planning and policy analysis, the spatial, temporal, and human scale over which the model operates, the disciplinary scope of the model, and the strengths, weaknesses, and limitations of the modeling technique used. Students should also be able to discuss and analyze applications of urban simulation models to particular planning case studies.

GE795: 3D Modelling of Structural Geology

Description, classification, and interpretation of geological structures such as faults, folds, foliations, lineations, shear zones, kinematic indicators, and the relationships between such structures and tectonic phenomena such as compressional mountain building and extensional basin formation. Visualisation and calculation of folded and faulted rock units, especially how these appear on geological maps and cross sections. This course includes study of: Structures developed during mainly brittle deformation in the upper crust and the geometry/architecture of structures that develops during fracture and fault growth. Analyses of various tectonic provinces (extension, strike-slip, contraction, diapirism) and their sedimentary basins. Deformation mechanisms operating in faults and how they impact fluid flow. Importance of kinematic indicators and fault dynamics. Relationships between faults and earthquakes.

GE796: Special Selected Topics in Environmental Geology (4)

GE797:Kinematic Analysis of Structural Geology

The purpose of the structural model is to illustrate the location, orientation and character of major geologic structures, as well as identify the spatial distribution of features that make up the rock mass fabric (i.e minor faults, folds, foliation). The identification of patterns or spatial trends in rock mass fabric allows the selection of structural domains. The goal of paleostress analysis is to derive the direction of slip on a fault, using basic fault data collected in the field, There are many methods of paleostress inversion, which outline different approaches to the problem, however they are all based on similar assumptions: Slip on a fault plane occurs in the direction of the resolved shear stress, Individual faults do not interact – movement on one fault is independent of another, The blocks bounded by the fault planes do not rotate, The stress field activating the faults is time-dependent and homogeneous. Analysis, interpretation and application of structural data will be undertaken along with analysis of metamorphism in the field and in thin sections. Practical classes will focus on petrological and fabric description of deformed and metamorphosed rocks at both hand specimens and thin sections scale. Important concepts that will be discussed include the controls on metamorphism, fluid-rock interaction and mineral reactions, metamorphic and deformation fabrics, deformation mechanisms, lithosphere rheology.

GE798:Advanced Structural Geology

The course includes a quantitative approach of stress and strain in various tectonic setting, advanced aspects of rock deformation and rheology in the light of brittle, ductile and plastic deformation processes, an appraisal of the spectrum of complex deformation geometries, approaches of balancing and restoring deformation, as well as aspects of climate-tectonic interaction. Structural Geology and Tectonics examines the deformation of earth´s lithosphere. The course aims to provide advanced theoretical aspects of rock deformation. Besides quantitative aspects of stress and strain analyses, the broad spectrum of deformation complexities in contractional, extensional and strike-slip regimes at various scales are highlighted. The course provides an in depth understanding of the rheological properties of the lithosphere, including brittle and plastic deformation processes at the microscale. At the macroscale, the interaction between climate and tectonic is discussed. Lectures are accompanied by a series of practical with the objective to apply and strengthen the gained knowledge in various exercises.

GE799: Structural Geology and Mineralization

Distribution and characteristics (especially mineralogy, morphology, and structure) of major mineral deposit types with background on structural techniques. Emphasis on application to mineral exploration and development. Laboratory exercises stress recognition of major mineral deposit types, zoning, and grade patterns; and use of structural techniques in mineral deposit exploration and development. Identifying common ore and alteration minerals and rock types; Recognizing major ore deposit types from hand specimen, map, and outcrop characteristics, Recognizing simple geological structures from map data, Solving simple structural problems (e.g., fault offset, unit strike & dip, unit thickness) from map data; and Understanding the importance and limitations of models in mineral deposit exploration and development. Study structural controls of ore deposits.

GE7100: Egypt in the framework of global tectonics

This course describes the role of global tectonics in the tectonic and geologic history of Egypt. The major global tectonic events that affected the geology of Egypt are described chronologically, emphasizing the regional geological implications of each event. The major geological features of Egypt in terms of the interaction of global tectonics. Egypt and a new phase of the Wilson cycle of opening and closing of oceans.

GE7102: Remote Sensing Detection & Analysis of Structures

Definition and Overview of Remote Sensing and Remote Sensing Systems, Electromagnetic Radiation, Terms and Definitions, Laws of Radiation, EM Spectrum, Sources of EMR , Interaction between EM Radiation and matter, Reflection, Absorption and Transmission , Interactions between EM Radiation and Atmosphere, Atmospheric windows, Spectral Signatures for common LULC features, e.g., Water, Soil, Vegetation and Snow Instruments for ground truth data collection (e.g., instatherm, spectroradiometers, etc.) Principles of visual Interpretation of aerial photos and satellite imagery Recognition Elements and Interpretation keys for Visual Interpretation, Interpretation of Multispectral Imagery and High resolution data, Remote Sensing Systems - Active and Passive Systems, Imaging and Non Imaging Systems, Concept of Resolutions in RS - Spatial, Spectral, Radiometric and Temporal Orbits and Platforms for Earth Observation Radiometric, geometric and atmospheric errors; Image Quality Data Reception, Types of Data Products (e.g., Spectral Indices, Orthoproducts, Pan Sharpened Products, etc.). Active remote sensing and structural elements extraction, Automatic extraction of structural elements and mapping using GIS, structural data modelling and analysis.

GE7104: Deformation Belts in the Egyptian Nubian Shield

This course reviews some of the major shear zones existed inside the Egyptian Nubian Shield (ENS). It addresses also the Allaqi-Heiani Suture which is regarded as the western segment of the enormous arc-arc Allaqi–Heiani-

Oneib- Sol Hamid-Yanbu Suture Zone. The shear zones are dealt with through two main groups; syn-accretion- and post-accretion shear zones. The first group is manifested by the NNE-oriented Hamisana Shear Zone, whereas the second group is typified by the Najdrelated NW-trending Shear Zones, such as Hodein-Karite, Nugrus- and Atallah-Shear Zones, as well as by the relatively younger ENE- (to E-) trending shear zones and shear belts, such as Mubarak-Barramiya Shear Belt and Abu Dabbab Shear Zone.

خامساً: قسم النبات

أ. برامج الدبلوم في النبات:

1- برنامج دبلوم الدراسات العليا في الميكروبيولوجي: (Microbiology Diploma)

First Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 8 Credits				
BO501	Medical Microbiology ميكروبيولوجيا طبية	1	2	2
BO503	Advanced Mycology علم الفطريات المتطور	1	2	2
BO505	Applied Bacteriology علم البكتريا التطبيقى	1	2	2
BO507	Methods and Instruments in Microbiology طرق وأجهزة دراسة الكائنات الدقيقة	1	2	2
Optional: Select 4 Credits				
BO509	Microbial toxins السموم الميكروبية	1	2	2
BO511	Laboratory Safety الأمان المعملى	1	2	2
BO513	Biochemistry الكيمياء الحيوية	2	-	2
Total Credits		**12**		

Second Semester

Code	Preq.	Course Title	Hours/Week		
			Lec.	Prac.	Cred.
Obligatory: 8 Credits					
BO502	-	Applied Mycology علم الفطريات التطبيقى	1	2	2
BO504	-	Immunology and Virology علم المناعة والفيروسات	2	-	2
BO506	-	Microbial Physiology فسيولوجيا الكائنات الدقيقة	1	2	2
BO508	-	Algae and their Applications الطحالب وتطبيقاتها	1	2	2
Optional: Select 4 Credits					
BO510	-	Microbial Fermentation التخمر بواسطة الكائنات الدقيقة	1	2	2
BO512	-	Phytopathology علم أمراض النبات	1	2	2
BO514	-	Biostatistics and Bioinformatics الإحصاء الحيوى والمعلوماتية الحيوية	2	-	2
Total Credits			**12**		

2- درجة دبلوم الدراسات العليا في صون التنوع الحيوى وتقييم الأثر البيئي:

Biodiversity Conservation and Environmental Impact Assessment Diploma

First Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 8 Credits				
BO515	Desert Ecosystems النظم البيئية الصحرأو ية	1	2	2
BO517	Ecosystem Services خدمات النظم البيئية	1	2	2
BO519	Biostatistics إحصاء حيوى	1	2	2
BO521	Remote Sensing and Its Ecological Applications الاستشعار عن بعد وتطبيقاته البيئية	1	2	2
Optional: Select 4 Credits				
BO523	Plant Resources and Their Conservation الموارد النباتية وصونها	1	2	2
BO525	Animal Resources and Their Conservation الموارد الحيوانية وصونها	1	2	2
BO527	Geology, Geomorphology and Hydrology جيولوجيا وجيومرفولوجيا	2	-	2
BO529	Conservation of Plant Genetic Resources الحفاظ على الموارد الوراثية النباتية	1	1	2
Total Credits		**12**		

Second Semester

Code	Preq.	Course Title	Hours/Week		
			Lec.	Prac.	Cred.
Obligatory: 8 Credits					
BO516	-	Wetland Ecosystems بيئة الأراضى الرطبة	1	2	2
BO518	-	Environmental Impact Assessment تقييم الأثر البيئى	1	2	2
BO520	-	Multivariate Analysis تحليل متعدد المتغيرات	1	2	2
BO522	-	Environmental Pollution التلوث البيئى	1	2	2
Optional: Select 4 Credits					
BO524	-	Microbial Resources الاصول الميكروبية	1	2	2
BO526	-	Geological Resources and their Conservation وصونها الأصول الجيولوجية	1	2	2
BO528	-	Conservation of Animal Genetic Resources صون الأصول الوراثية الحيوانية	1	2	2
BO530	-	Geographical Information System (GIS) and its Ecological Applications نظام المعلومات الجغرافية وتطبيقاتها البيئية	1	2	2
Total Credits			**12**		

توصيف مقررات الدبلوم

BO501: Medical Microbiology

The aim of the course is to provide general knowledge about the pathogenesis of medically important microorganisms including bacteria, fungi, viruses, rickettsia and protozoa. The symptoms of diseases caused by microbial pathogens and their diagnosis will be addressed. In addition, the immune-biology of the major microbial diseases, with emphasis on their ways and means of their prevention will be studied. Collection of clinical samples, types of media, isolation of gram positive and gram negative pathogens. Studying types of superficial fungi and dimorphic fungi.

BO502: Applied mycology

This course gives an opportunity to learn how secondary metabolism for nutrients is achieved in fungi. It provides the students of microbiology with an understanding of the basic principles of the core of different beneficial fungal metabolic products.

BO503: Advanced Mycology

This course will introduce information about the fungal population's diversity and speciation, isolation of fungi from the environment and identify them using morphological and molecular approaches, consider evolutionary relationships among different groups of fungi, their ecology and significance to humans. It explore fungal lifestyles, their reproduction, and the ways that fungi use to communicate with each other and with their symbiotic partners.

BO504: Immunology and Virology

This course gives opportunity to provide students with understanding of the basic principles of immunology and virology in the experimental design of immune response during viral infections. Also, studying viral mechanisms of infection and how to diagnose it with giving examples for different families of viruses.

BO505: Applied bacteriology

This course gives students the aspects of biocontrol of pests and pathogens and the role of microorganisms in treatments of wastes and hydrocarbons in general. In addition, the economic importance of the application of bacteria in food and diary industries, tumor treatment, plant breeding and nitrogen fixation. It provides students with basic knowledge about bacterial toxins and vaccines.

BO506: Microbial Physiology

This course explore the fundamental principles of fungal physiology especially spore germination, dormancy, stimulatory substances, heat shock, fungicides, and chitosan applications. This course gives an opportunity to explore the fundamental principles of physiology of bacteria with reference to nutrition, growth and metabolism.

BO507: Methods and Instruments in Microbiology

This course gives an opportunity to provide students with basic knowledge of different chromatographic techniques, basis of electron microscope and its applications, and useful instruments used in the field of microbiology.

BO508: Algae and their applications

This course explore the fundamental principles of algal classification depending on the photosynthetic pigments, food storage, chemical structures of cell wall, and evolution of thallus, evolution of sex organs and flagella, fine structure of algal plastids, biochemical taxonomy of algae based on pigments, lipids and carbohydrates; and provide the students an understanding of the basic principles of algal physiology, and core of what are algae and how they live, reproduce and cultivation. Algae as a promising biological tool for the production of metallic nanoparticles with diverse potential applications in various applied fields especially in biomedical areas, clinical diagnostics, biotechnology, water treatment, agriculture and other areas such as electronics, cosmetics, paint, packaging and coating.

BO509: Microbial toxins

This course will give a spot on the severity of microbial toxins produced in contaminated food, textile, and paper industry; and their characterization, detection methods, and expected hazards.

BO510: Microbial fermentation

This course develops the modern experimental approaches in microbial fermentation, selection and preservation of microorganisms and production of useful materials.

BO511: Laboratory safety

This course deals with parameters of safe handling of microorganisms during there cultivation, preservation, and extraction, or antimicrobial testing. That will control the spread of microbial elements, and save the microbiologist social hygiene.

BO512: Phytopathology

This course explores the principles of plant pathology in terms of disease cycle, how pathogen attacks plant, Chemical weapons and mechanical forces exerted by pathogens on host tissues, microbial toxins in plant diseases, plant defense against pathogens and methods for controlling plant diseases.

BO513: Biochemistry

This course covers the classification, nomenclature of enzymes, vitamins and the biochemical pathways involving coenzymes. It develops understanding of the processes of digestion and metabolism of carbohydrates. It gives a description of digestion of proteins and metabolism of amino acids. It acquires knowledge of the digestion of lipids, metabolism of lipids and metabolism of nucleotides.

BO514: Biostatistics and Bioinformatics

This course aims to strengthen the ongoing University research in the area of life sciences. It aims to develop an expert manpower to help bioinformatics industry, academia and thereby society, create an advanced research facility to carry out research in frontier areas of bioinformatics and computational biology; teach computer applications, including resources that exist on the internet; instruct some of the basic algorithms and programming concepts that underlie these problems. In addition, this course will introduce the students to data analytic and applied statistical methods commonly used in industrial and scientific applications. The module will focus on computer-aided data analysis using comparisons between batches, analysis of variance, regression and correlation. The module will also deal with estimation and hypothesis testing, multivariate analysis, and nonparametric techniques. Various concepts

including, approximations and errors (accuracy and precision; errors; blunders, formulation error, and data uncertainty) will be presented as well.

BO515: Desert Ecosystems

Geography of arid lands; Climatic and biological classifications; Flora and Fauna; Biological resources of arid lands; Land uses in arid lands; Impact of man and desertification; Combating desertification; Case studies in the deserts of Egypt and the Middle East; Desert geomorphology and landscape; Non-biological resources of arid lands; Minerals, energy and water; Culture and demography of desert population. This course will include one week field training in a desert reserve.

BO516: Wetland Ecosystems

Wetland overview, Wetland criteria, Methods in wetland research, some case studies in the Mediterranean wetlands, Egyptian wetlands (distribution, structure, services and management plans). This course will include one week field training in a wetland reserve.

BO517: Ecosystem Services

This course will include the study of the following topics: defining ecosystems services, provisioning services, regulating services, cultural services, biodiversity and ecosystem services, developing mechanisms for managing ecosystem services, payment for the ecosystem services.

BO518: Environmental Impact Assessment

Definition: Objectives and needs of environmental impact assessment (E1A); Activities involved in EIA (major components and subcomponents, characteristics of Impacts); EIA methods, Checklists, Overlay mapping, networks, matrices; Estimates of resources demand for EIA Studies; Recommended methodologies for rapid EIA; Case studies; Guidelines for EIA in developing countries; Environmental impact statement; Auditing; Land evaluation and suitability analysis.

BO519: Biostatistics

Statistical definitions, sampling of attributes, distributions (Normal, Binomial, Poisson), and tests of significance, analysis of variance, experimental designs, association between variables, curve fitting and the method of least square, multiple and partial correlation and regressions, and analysis of time series.

BO520: Multivariate Analysis (1-2-2)

Introduction, Similarity coefficients (Jacquard and Sorenson coefficients, Euclidean distance), Classification methods (agglomerative clustering and Twinspan), Ordination methods (PCA, DCA and CANOCO), Direct gradient analysis, Training on some software dealing with multivariate analysis (e.g. CAP).

BO521: Remote Sensing and its Ecological Applications

The concepts and fundamentals of remote sensing; aerial photo-interpretation; Multispectral scanning and spectral pattern recognition; Image processing and applications of remote sensing; Geographic information systems (GIS); Data input, verification and storage; Methods of data analysis and spatial modeling; Implementation and application of GIS.

BO522: Environmental Pollution

Introduction to the atmosphere, the endangered global atmosphere, food chains and webs, Nature and mitigation of air pollution, Nature and mitigation of soil and water pollution, Noise pollution, food pollution, Current status of the environmental pollution in Egypt with emphasis on waste pollution.

BO523: Plant Resources and Their Conservation

The diversity of nature and need for classification; Principles of taxonomy; The Theory of classification; Classification systems; Orders and families of flowering plants (detailed examples of families of economic importance); Flora of Egypt; Agricultural ecosystems and food production; Forests and woodlands; Natural rangelands; Plant genetic resources; Traditional uses of plant resources; Conservation of plant resources.

BO524: Microbial Resources

This course aims to develop students' skills in the management of microbial resources including storage and identification of microorganisms and management information, as well as to strengthen the linkages among culture collections.

BO525: Animal Resources and Their Conservation

Division of the animal kingdom into different phyla and the general characters of each phylum; Phylogeny (the evolutionary histories of the various phyla); Distribution of the different phyla; Animal diversity and food chains (eg. Phylum Arthropoda-class insect); Animal natural resources; Conservation of animal resources.

BO526: Geological Resources and their Conservation

An overview, Ground water resources, Rock and mineral resources, Petroleum geology, Fossil fuels, Mining and querying, Medical geology, Geological resources in Egypt.

BO527: Geology, Geomorphology and Hydrology

Principles of physical geology, Desert environment from the sedimentological point of view, Principles of field geology and field surveying; Types of aerial photographs and maps; Photo-interpretation of aerial photographs, and applications using stereoscope. The *course* will introduce students to the study of landscapes and the variability and impacts of *hydrological* and *geomorphological* processes; Methods and tools for measuring components such as precipitation, evaporation and transpiration.

BO528: Conservation of Animal Genetic Resources

Endangered and extinct species (genetics and extinction), Genetic diversity, Evolutionary genetics of natural populations, Genetic consequences of small population size, Taxonomy in conservation biology, Genetic management of endangered species, Captive breeding and reintroduction.

BO529: Conservation of Plant Genetic Resources

Endangered and extinct species (genetics and extinction), Genetic diversity, Evolutionary genetics of natural populations, Genetic consequences of small population size, Taxonomy in conservation biology, Genetic management of endangered species, Captive breeding and reintroduction.

BO530: Geographical Information System (GIS) and its Ecological Applications

This course deals with different aspects related to the use of remote sensing and GIS in spatial ecology by using the Free and Open Source Software GRASS GIS. By the end of this course, students will have

the capacity to deal with ecological patterns and processes by using GIS and remote sensing algorithms. The increasing availability of open ecological and geographical data through networks such as the Global Biodiversity Information Facility (GBIF, http://www.gbif.org); or the Data Observation Network for Earth (DataONE). In using a shared open-source code for testing these ecological theories, researchers can be sure that their results are reliable and also that the code they have used is robust. Students will be able to process spatial and ecological data by free and open source algorithms. The course is mainly practical, but based on robust theory.

ب. برامج الماجستير في علوم النبات:

1. برنامج الماجستير في العلوم في علم الطحالب :(Phycology)

First Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 8 Credits				
BO601	Methods in Algal Research I طرق عملية في دراسة الطحالب (1)	-	4	2
BO603	Biodiversity and Ecology of Algae التنوع الحيوي وبيئة الطحالب	2	-	2
BO605	Phycoremediation Aspects المعالجة الحيوية بالطحالب	2	-	2
BO607	Biochemistry of Algae I كيمياء حيوية للطحالب (1)	2	-	2
Optional: Select 4 Credits				
BO609	Applications of Algae and Nanotechnology تطبيقات الطحالب و كيمياء النانو	2	-	2
BO611	Algal Biofertilizers and Biopesticides المخصبات الحيوية ومبيدات الآفات الحيوية من الطحالب	2	-	2
BO613	Oxidative Damage and Antioxidative Systems in Algae الضرر التأكسدي ومضات الأكسدة في الطحالب	2	-	2
BO615	Biostatistics (2) الإحصاء الحيوية	2	-	2
Total Credits		**12**		

Second Semester

Code	Preq.	Course Title	Hours/Week		
			Lec.	Prac.	Cred.
Obligatory: 8 Credits					
BO602	-	Methods in Algal Research II طرق عملية في دراسة الطحالب	-	4	2
BO604	-	Algal Biofuels and Bioenergy إنتاج الوقود الحيوي من الطحالب	1	2	2
BO606	-	Algal Biotechnology الطحالب والتقنية حيوية	2	-	2
BO608	-	Biochemistry of Algae II كيمياء حيوى الطحالب (2)	2	-	2
Optional: Select 4 Credits					
BO610	-	Physiology of Alga فيسيولوجيا الطحالب	1	2	2
BO612	-	Algal Symbiosis and Allelopathy التكافل مع الطحالب والتأثير المتبادل	2	-	2
BO614	-	Photobioreactors: design and applications المفاعلات الحيوية الضوئية: التصميم والتطبيقات	2	-	2
BO616	-	Scientific Writing and Presentation الكتابة والعروض العلمية	1	2	2
Total Credits			**12**		

2. برنامج الماجستير في العلوم في الوراثة النباتية: (Genetics)

First Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 8 Credits				
BO617	Methods in Genetics I الطرق المستخدمة في الوراثة 1	-	4	2
BO619	Advanced Plant Molecular Biology بيولوجيا جزيئية نباتية متقدمة	2	-	2
BO621	Advanced Genes Technology تقنية الجينات المتقدمة	2	-	2
BO623	Molecular Breeding for Stress Tolerance تربية النبات الجزيئية لتحمل الإجهاد	2	-	2
Optional: Select 4 Credits				
BO625	Plant Molecular Systematics تصنيف النبات الجزيئي	1	2	2
BO627	RNAi: Biology and Applications بيولوجيا وتطبيقات تداخل الأحماض النووية الريبوزية	2	-	2
BO629	Genetic Variation and Evolution التباينات الوراثة والتطور	2	-	2
BO631	Molecular Genetics of Microorganisms الوراثة الجزيئية للكائنات الدقيقة	2	-	2
BO633	Plant Cell, Tissue, and Organ Culture زراعة الخلايا والأنسجة النباتية	1	2	2
BO635	Biostatistics (3) الإحصاء الحيوي	2	-	2
Total Credits		**12**		

Second Semester

Code	Preq.	Course Title	Hours/Week		
			Lec.	Prac.	Cred.
Obligatory: 8 Credits					
BO618	-	Methods in Genetics II الطرق المستخدمة في الوراثة 2	-	4	2
BO620	-	Bioinformatics and Computational Genomics معلوماتية حيوية والجينومية الحاسوبية	1	2	2
BO622	-	Plant Biotechnology and Crop Improvement التقنية الحيوية النباتية وتحسين المحاصيل	2	-	2
BO624	-	Advanced Plant Cytogenetics وراثة خلوية متقدمة	1	2	2
Optional: Select 4 Credits					
BO626	-	Population and Quantitative Genetics الوراثة الكمية و وراثة العشائر	2	-	2
BO628	-	Genetic Resources and Crop Evolution الأصول الوراثية وتطور المحاصيل	2	-	2
BO630	-	Mutagenesis and Mutational Breeding التطفير وتربية النبات الطفرية	1	2	2
BO632	-	Molecular Plant-Microbe Interactions التفاعلات الميكروبية النباتية الجزيئية	2	-	2
BO634	-	Genetics of Organelles وراثة العضيات	2	-	2
BO616	-	Scientific Writing and Presentations الكتابة العلمية والعروض	1	2	2
Total Credits			**12**		

3. برنامج الماجستير في العلوم في فسيولوجيا النبات: (Plant Physiology)

First Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 8 Credits				
BO637	Methodology in Plant Physiology I طرق عملية في فسيولوجيا النبات 1	-	4	2
BO639	Advanced Water Relations and Mineral Nutrition علاقات مائية وتغذية معدنية متطورة	2	-	2
BO641	Advanced Photosynthesis and Energy Bioconversion بناءً ضوئي متقدم وتحولات الطاقة	2	-	2
BO643	Advanced Plant Growth and Stress Hormones هرمونات النمو والإجهاد	2	-	2
Optional: Select 4 Credits				
BO645	Plan Secondary Metabolites الأيض الثانوي في النباتات	2	-	2
BO647	Plant Biochemistry كيمياء حيوية نباتية	2	-	2
BO649	Cultivation Techniques in Microbiology طرق زراعة الكائنات الدقيقة	1	2	2
BO651	Soil Science and Soil Microorganisms علم التربة والكائنات الدقيقة بالتربة	2	-	2
BO653	Biostatistics (4) الإحصاء الحيوية	2	-	2
Total Credits		**12**		

Second Semester

Code	Preq.	Course Title	Hours/Week		
			Lec.	Prac.	Cred.
Obligatory: 8 Credits					
BO636	-	Methodology in Plant Physiology II طرق عملية في فسيولوجيا النبات 2	-	4	2
BO638	-	ROS and Antioxidants in Plants شقوق الأكسجين الحرة ومضادات الأكسدة	2	-	2
BO640	-	Plant Responses to Abiotic stresses استجابة النبات للإجهادات غير الحيوية	2	-	2
BO642	-	Advanced Plant Tissue Culture زراعة الأنسجة النباتية	1	2	2
Optional: Select 4 Credits					
BO644	-	Phytoremediation المعالجة الحيوية باستخدام النباتات	2	-	2
BO646	-	Mechanisms in Plant Defense أليات النبات للدفاع ضد الأفات	2	-	2
BO648	-	Allelopathy and Allelochemicals التأثير الكيميائي المتبادل بين النباتات	2	-	2
BO650	-	Plant Cell Walls and Membranes الجدر والأغشية الخلوية النباتية	2	-	2
BO616	-	Scientific Writing and Presentation الكتابة والعروض العلمية	1	2	2
Total Credits			**12**		

4. برنامج الماجستير في العلوم في البيئة النباتية والفلورا: (Plant Ecology and Flora)

First Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 8 Credits				
BO655	Methods in Plant Ecology I طرق عملية في البيئة النباتية 1	-	4	2
BO657	Population and Community Ecology بيئة الجماعات والمجتمعات النباتية	2	-	2
BO659	Soil Quality جودة التربة	1	2	2
BO661	Identification of Plants and Seeds تعريف النباتات والبذور	1	2	2
Optional: Select 4 Credits				
BO663	Egyptian Agro-biodiversity التنوع الزراعي	1	2	2
BO665	Plant Water Relations العلاقات المائية النباتية	1	2	2
BO667	Palynology علم الحفريات	1	2	2
BO669	Wetland and Desert Ecology بيئة الأراضي الرطبة والصحاري	2	-	2
BO671	Biostatistics (5) الإحصاء الحيوية	2	-	2
Total Credits		**12**		

Second Semester

Code	Preq.	Course Title	Hours/Week		
			Lec.	Prac.	Cred.
Obligatory: 8 Credits					
BO652	-	Methods in Plant Ecology II طرق عملية في البيئة النباتية 2	-	4	2
BO654	-	Geomorphology and GIS applications الجيومورفولوجي وتطبيقات الـ GIS	1	2	2
BO656	-	Environmental Impact Assessment تقييم الأثر البيئي	1	2	2
BO658	-	Climate and climate changes المناخ والتغيرات المناخية	2	-	2
Optional: Select 4 Credits					
BO660	-	Important plant areas of Egypt المناطق النباتية الهامة في مصر	2	-	2
BO662	-	Multivariate Analysis تحليل التباين المتعدد	2	-	2
BO664	-	Egyptian Protectorates and Historical Plants المحميات المصرية والنباتات التاريخية	2	-	2
BO666	-	Physiological Bases of Plant Growth الأسس الفسيولوجية لنمو النباتات	2	-	2
BO616	-	Scientific Writing and Presentation الكتابة والعروض العلمية	1	2	2
Total Credits			**12**		

First Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 8 Credits				
BO673	Methods in Biotechnology I طرق مستخدمة في التقنية الحيوية 1	-	4	2
BO675	Advanced Molecular Biology بيولوجيا جزيئية متطورة	1	2	2
BO677	Advanced Enzymology علم الإنزيمات المتطور	2	-	2
BO679	Advanced Biochemistry I كيمياء حيوية متقدمة 1	2	-	2
Optional: Select 4 Credits				
BO681	Advanced Bacteriology and Virology علم البكتيريا والفيروسات المتطور	2	-	2
BO683	Advanced Mycology and Phytopathology فطريات وأمراض نبات متطورة	2	-	2
BO685	Stress Physiology and Bioremediation فسيولوجيا الإجهاد والمعالجة الحيوية	2	-	2
BO687	Food and Water Biotechnology تطبيقات التقنية الحيوية في صناعة الغذاء ومعالجة المياه	1	2	2
BO689	Biostatistics الإحصاء الحيوية	2	-	2
Total Credits		**12**		

Second Semester

Code	Preq.	Course Title	Hours/Week		
			Lec.	Prac.	Cred.
Obligatory: 8 Credits					
BO668	-	Methods in Biotechnology II طرق مستخدمة في التقنية الحيوية 2	2	-	2
BO670	-	Advanced Topics in Hormones الهرمونات	2	-	2
BO672	-	Advanced Nanobiotechnology علم النانو والتقنية الحيوية	2	-	2
BO674	-	Advanced Biochemistry II كيمياء حيوية متقدمة	2	-	2
Optional: Select 4 Credits					
BO676	-	Advanced Phycology and Uses of Algae علم الطحالب المتطور وتطبيقاتها	2	-	2
BO678	-	Advanced Cell and Tissue Culture زراعة أنسجة نباتية متقدمة	2	2	2
BO680	-	Advanced Immunology علم المناعة المتقدم	2	-	2
BO616	-	Scientific Writing and Presentation الكتابة والعروض العلمية	1	2	2
Total Credits			**12**		

6. برنامج الماجستير في العلوم في الميكروبيولوجي :(Microbiology)

First Semester

Code	Course Title		Hours/Week		
			Lec.	Prac.	Cred.
Obligatory: 8 Credits					
BO691	Methods in Microbiology I	طرق عملية في الميكروبيولوجي 1	-	4	2
BO693	Advanced Bacteriology	علم البكتريا المتقد	2	-	2
BO695	Advanced Mycology	علم الفطريات المتقدم	2	-	2
BO697	Biochemistry	كيمياء حيوية	2	-	2
Optional: Select 4 Credits					
BO699	Fungal Metabolites	النواتج الأيضية الفطرية	2	-	2
BO6101	Microbial Nanotechnology	علم التكنولوجيا النانووية الميكروبية	2	-	2
BO6103	Food Microbiology	ميكروبيولوجيا الأغذية	2	-	2
BO6105	Biostatistics (1)	الإحصاء الحيوية	2	-	2
Total Credits			**12**		

Second Semester

Code	Preq.	Course Title		Hours/Week		
				Lec.	Prac.	Cred.
Obligatory: 8 Credits						
BO682	-	Methods in Microbiology II	طرق عملية في الميكروبيولوجي 2	-	4	2
BO684	-	Fungal Phytopathology	علم أمراض النبات الفطرية	2	-	2
BO686	-	Virology and Immunology	علم الفيروسات والمناعة	2	-	2
BO688	-	Microbial Physiology	فسيولوجي الكائنات الدقيقة	2	-	2
Optional: Select 4 Credits						
BO690	-	Bacterial Phytopathology	علم أمراض النبات البكتيرية	2	-	2
BO692	-	Medical Microbiology	الميكروبيولوجيا الطبية	2	-	2
BO694	-	Microbial Bio-fuels	الوقود الحيوى الميكروبى	2	-	2
BO616	-	Scientific Writing and Presentation	الكتابة والعروض العلمية	1	2	2
Total Credits				**12**		

BO601: Methods in algal research I

This course aimed to: overview the classification of algae, their different types and habitats, how to collect microalga and seaweeds and cultivation and preservation methods. To identify different types of culture media and their suitability for growing each group of algae and determine the effect of different environmental conditions on algal growth and metabolism (biochemical products). In addition, to describe different methods to measure algal growth and methods of extracting and estimating their phytochemical and biochemical contents.

BO602: Methods in Algal Research II

This course aimed to: Study in details the effect of environmental conditions on extracting and estimating each biological content in algae separately, studying the biological extracts and analyzing them chemically to find out the active substances in them; methods the applications of these materials in various fields, whether medical, pharmacy, commercial, industrial, etc.

BO603: Biodiversity and Ecology of Algae

This course gives an opportunity to explore the different methods used in systematic of algae with reference to occurrence and distribution in fresh water habitats and bases of algal classification. It also aims at developing written, communication skills, and the ability to obtain information, integrate it, and cogently present an argument pertinent to a specified theme in botany.

BO604: Algal Biofuels and Bioenergy

This course gives an opportunity to explore the algal biofuels (as categorized into bio-ethanol, biogas, bio-hydrogen, biodiesel and bio-oil) as a clean, nature friendly, cost effective solution to other fuels. It provides students with the fundamental knowledge about the conditions affecting fat, oil production from algae. Also to compare its advantages over land-based biomass crops conversion process, kind of energy and economic return from the product.

BO605: Phycoremediation Aspects

This course aims to explore the ability of biological using of different algal species as an eco-friendly and low cost treatment for bioremediation of harmful chemicals and diferent pollutants from wastewater. Cultivation of different algal strains on wastewater (as an algal growth medium) to minimize the large volume of water needed for algal growth. The course also aims to study the characters of the strains used for wastewater treatment, and to know factors affecting the process and the various end-uses to which the algae biomass from sewage and wastewater can be put to (for example: production of biofuel and other useful bio products). Like plants algae need large quantities of nitrates and phosphate to support their fast cell cycles also some certain heavy metals are important for photosynthesis and different metabolic activities, so that we will study mechanism of algae to uptake large amounts of heavy metals from soil . Furthermore, the biodegradations of pesticides by algae will be discussed.

BO606: Algal Biotechnology

This course aims to know, and to be able to demonstrate knowledge on the biotechnological potential of micro and macroalgae, to solve some economic problems, with an emphasis on human nutrition, aquaculture, feed, phycocolloid industry and as environmental tools. To understand the importance of

correct identification of the organisms used in biotechnology; use and cultivation of macroalgae; algal immobilization and its applications. Furthermore, to assess exemplification of cultivation for production of biomass, harvesting and drying methods and processing biomass for various applications and utilities of algae.

BO607: Biochemistry of Algae I

This course aims to develop an understanding of the machinery (i.e. the enzymes and the genes that encode them) required to synthesize biochemical compounds such as pigments (chlorophyll, carotenoids and phycobiliproteins), carbohydrates, proteins, amino acids, lipids, waxes, glycerol, vitamins, and toxins. Furthermore, to understand how this machinery is regulated by environmental conditions, and gain insights as to how the biosynthetic enzymes evolved and (or) have been spread through different algal species.

BO608: Biochemistry of algae II

This course is the proceedings of Semester one course of Biochemistry of algae I concerns with the biochemistry of algae and cyanobacteria. It covers topics such as the flexibility and variety of algal metabolism, metabolic control, extracellular products and some aspects of biotechnology. Topics in this course include reviews of studies with marine macroalgae, as well as the microalgae and the prokaryotic cyanobacteria (blue-green algae). Individual topics extend from osmoregulation, uptake and utilization of nitrogenous compounds, lipid metabolism, tetrapyrrole biosynthesis, photosynthesis, respiratory electron transfer, nitrogen fixation, enzyme regulation, cyanobacterial storage bodies, nutrient interaction in the fresh, marine and soil environments, and production of secondary bioactive compounds.

BO609: Applications of Algae and Nanotechnology

This course gives an opportunity to explore algae-mediated biosynthesis of metallic nanoparticles providing further knowledge of this applied science, i.e. phyconanotechnology. Algae as a promising biological tool for the production of metallic nanoparticles with diverse potential applications in various applied fields especially in biomedical areas, clinical diagnostics, biotechnology, water treatment, agriculture and other areas such as electronics, cosmetics, paint, packaging and coating.

BO610: Physiology of algae

This course gives an opportunity to explore the fundamental principles of physiology of algae with reference to its growth, nutrition, photosynthesis, growth regulators and various metabolic pathways. Also students will gain the fundamentals of the algal cultivation systems; strain selection; algal growth rate; optimization of nutrients and scaling up for large-scale cultivation of algae.

BO611: Algal Biofertilizers and Biopesticides

This course gives detailed information about algalization technology. Use of cyanobacteria (Blue-green algae), micro and macroalgae as agricultural biofertilizers, and benefits of algalization on crops, soil characteristics and aggregation will be considered. Method of preparation, application and its advantages over inorganic fertilizers. Role of hormones in algal biofertilizers as plant growth regulators (PGR). Genetically modified algae with potential in sustainable agriculture. Also, this course will give students general knowledge of biological control of different plant pests as viral, microbial, nematode, weeds and vertebrate pests.

BO612: Algal Symbiosis and Allelopathy

This course is divided into two parts. The aim of the first part is to know the meaning of the term symbiosis and to identify its various types and benefits to environment. The second part of the course aims to explore the role of harmful algae. It provides students with the fundamental knowledge about algae producing toxins, pathways of toxin production, extraction and analysis of toxins. Besides, to identify different ways for using and /or removing these toxins.

BO613: Oxidative Damage and Antioxidative Systems in Algae

This course aims to identify and describe the oxidative damage and its causes, explain the types of ROS and how ROS cause oxidative stress in algae, roles of ROS in different pathways of algae, methods of balance between production and suppression of ROS, and role of antioxidant enzyme and non-enzyme system to cope on oxidative damage in algae.

BO614: Photobioreactors: design and applications

The course is aimed at postgraduate students and postdoctoral researchers to acquire a thorough understanding of microalgal metabolism, photobioreactor design and bioprocess technology. Also, the course provides the essential skills for designing optimal microalgae-based production processes (for both research and commercial purposes). Through lectures, and a photobioreactor digital cases, the participants will learn how to describe microalgal metabolism quantitatively; how to apply basic design kinetic principles and set up mass/energy balances for photobioreactors; how to choose the appropriate photobioreactor type; how to cultivate microalgae in fully parameter-controlled photobioreactors; and how to integrate all acquired knowledge into optimal production strategies for microalgae biomass or secondary metabolites.

BO615: Biostatistics (2)

This course represents an introduction to the field and provides a survey of data and data types in biology. Specific topics include tools for describing central tendency and variability in data; methods for performing inference on population means and proportions via sample data; statistical hypothesis testing and its application to group comparisons; issues of power and sample size in study designs; and random sampling. Also to know basic statistics, including probability, descriptive statistics, and inference for means and proportions, and regression methods. The analytic methods and applications will be linked to topic applications in science, health care, medicine, public health, and program evaluation. While there are some formulae and computational elements to the course, the emphasis is on interpretation and concepts of the results.

BO616: Scientific writing and presentation

Analysis and interpretation of scientific data are essential skills for modern scientists and are important for handling of biotechnological information. The purpose of this module is to develop these skills through a directed program of reading, discussion and question answering, based on a series of thesis or scientific research paper and to prepare other materials for presentation. This module will introduce the students to the elements of scientific writing starting with how to present the data, prepare tables and graphs using Microsoft Word, PowerPoint and Excel etc. Also, searching into scientific literature and writing different sections of a research paper (abstract, introduction, materials and methods, results, discussion and conclusion). In addition to learning how to write references within text and how to make

list of references using reference-software programs. Skills necessary for knowing how to represent the scientific data in a poster or oral sessions will be described in detail; and finally, how to accept constructive criticism and using reviewers' comments to improve quality of written articles and presentations.

BO617: Methods in Genetics I

This course covers all techniques used in genetics including nucleic acid hybridization; sequencing of nucleic acids; Southern, Northern and Western blotting techniques; polymerase chain reaction, Methods for measuring nucleic acid and protein interaction. Applications of gel filtration, ion exchange & affinity chromatography; electrophoresis (starch, agarose, PAGE) and radio labeling techniques.

BO618: Methods in Genetics II

This course covers all techniques used in genetics including nucleic acid hybridization; sequencing of nucleic acids; Southern, Northern and Western blotting techniques; polymerase chain reaction, Methods for measuring nucleic acid and protein interaction. Applications of gel filtration, ion exchange & affinity chromatography; electrophoresis (starch, agarose, PAGE) and radio labeling techniques.

BO619: Advanced Plant Molecular Biology (2-0-2)

In this module, the following topics are to be discussed: information flow in the cell, structure and organization of nuclear genes, replication and repair of nuclear genes in addition to the expression of nuclear genes. The chloroplast and mitochondrial genomes will be covered. Moreover, molecular basis of genetic changes and molecular biology research methods will be addressed in details.

BO620: Bioinformatics and Computational Genomics

This course will focus on the application of machine learning and computer algorithms to the problems in the field of molecular biology. In particular, this course will cover some fundamental computational molecular biology problems including sequence alignment, homology search, RNA/protein structure analysis and prediction, gene expression, biological network analysis and next-generation sequencing.

BO621: Advanced Genes Technology

The course covers the principles of recombinant DNA technology, enzymes used for genetic engineering and cloning and transfer of genes. In addition, characterization of cloned and transferred genes, methods of gene sequencing and engineering plants to receive desired traits are discussed. Moreover, applications of genetic engineering and future prospects in gene manipulation are to be addressed in details.

BO622: Plant Biotechnology and Crop Improvement

This course covers the methods, applications, and implementation of plant biotechnology in agriculture and crop improvement. The topics covered include technical as well as regulatory and policy aspects of plant biotechnology and transgenic plants.

BO623: Molecular Breeding for Stress Tolerance

This course covers breeding systems, reproductive systems, breeding for abiotic stress resistance and tolerance to such factors deals with concepts such as adaptability and stability of crop plants, genotype by environment interaction and selection in multi-environment trials. In addition, inheritance of resistance genes and durable effectiveness of resistance genes are to be discussed. Moreover, selection

methods, molecular breeding, breeding selected crops and common statistical methods in plant breeding are to be addressed.

BO624: Advanced Plant Cytogenetics

This course covers cell division and cell cycle analysis, chemical and architectural structure of chromosomes, chromosomal changes, karyotype analysis and chromosome micro-dissection. In addition, karyotype evolution, methods of chromosomal studies and molecular cytogenetics are to be discussed. Moreover, applications of cytogenetics in plant breeding and evolution are to be addressed in details.

BO625: Plant Molecular Systematics

The course deals with central concepts of general and molecular systematics, technologies for collection of molecular data and basic methods for phylogenetic analysis. In addition, delimitation and identification of taxa; species concepts, criteria and methods to delimit species in practice, identification of species with DNA sequences. Molecular data; types of molecular data for phylogenetic analysis and identification, extraction, amplification and sequencing of DNA.

BO626: Population and Quantitative Genetics

This course covers the following topics: quantitative characters, genetic structure of populations, genetic equilibrium, changes in gene frequency, population diversification. In addition, genetic variation and speciation, reproduction isolation, stable polymorphisms and estimation of genetic variations are to be discussed.

BO627: RNAi: Biology and Applications

The course deals with discovery of RNA interference (RNAi), molecular basis of RNAi /siRNA /miRNA mediated gene silencing, RNAi in defense and expression and functions of microRNAs. In addition, use of RNAi in the prevention of diseases in animal models and crop improvement, RNAi therapy, future prospects of RNAi in biology, medicine and agriculture.

BO628: Genetic Resources and Crop Evolution

This course covers types of genetic resources and conservation modes, genetic resources maintained in Situ and genetic resources maintained ex Situ. In addition, strategies for using PGR in breeding, origin of agriculture, crop domestication and origin of selected crops are to be discussed.

BO629: Genetic Variation and Evolution

This course covers types of genetic resources and conservation modes, genetic resources maintained in Situ and genetic resources maintained ex Situ. In addition, strategies for using PGR in Breeding, origin of agriculture, crop domestication and origin of selected crops are to be discussed.

BO630: Mutagenesis and Mutational Breeding

This course covers nature and classification of mutations; radiation types and sources; effect of mutations on DNA; chemical mutagens; factors influencing the mutant spectrum. In addition, use of mutagens in creating oligogenic and polygenic variations. Moreover, mutation breeding for various traits (disease resistance, insect resistance, quality improvement, etc) in different crops.

BO631: Molecular Genetics of Microorganisms

This course deals with basic concepts of microbial genetics; bacterial genomes and basic functions. In addition, microbial replication, transcription and translation; microbial gene organization and Operon will be covered. Moreover, plasmid; transduction; transposition; transformation; conjugation; DNA mutation and DNA repair; viral genetics.

BO632: Molecular Plant-Microbe Interactions

The course focuses on the molecular basis of the interactions of plants with attackers (viruses, micro-organisms, nematodes, insects, parasitic plants) and beneficial organisms (symbiotic bacteria and fungi). In addition, it covers mechanisms and strategies by which symbiotic organisms interact with plants and how fundamental molecular knowledge on these biological processes can be exploited to improve control measures, by novel non-toxic chemicals or genetic modification.

BO633: Plant Cell, Tissue, and Organ Culture

The course focuses mainly on methods used in plant cell and tissue culture. This covers tissue culture nutrient media, laboratory organization for tissue cultures, culture of haploid cells, isolation and fusion of protoplast, propagation of plants from tissue cultures and propagation of plants from fused protoplast. In addition, cytology of cultured cells and genetic variability through in vitro tissue and cell culture will be covered. Moreover, it discusses the use of tissue cultures in gene transfer, use of tissue cultures approaches for the production of plants adapted to environmental stress, and other desired traits.

BO634: Genetics of organelles

This course deals with structural organization and function of intracellular organelles specifically mitochondria and chloroplasts. In addition, genetics; genome organization and functions of such organelles.

BO635: Biostatistics (3)

The aim of the course is to give students knowledge of basic statistical concepts and tools that can be used to understand results published in scientific literature and to perform their own statistical analyses.

BO636: Methodology in plant physiology II

This course includes the study of the main techniques and experimental procedures involved in research in the area of Plant Physiology including quantification of various plant hormones, reactive oxygen species and antioxidants, stress markers including lipid peroxidation levels and membrane leakage, heavy metals digestion and quantification, mineral analysis, study of protein patterns (protein extraction and gel electrophoresis), extraction of nucleic acids, running PCR, ……

BO637: Methodology in Plant Physiology I

This course includes the study of the main techniques and experimental procedures involved in research in the area of Plant Physiology including establishing scientific experimental designs and protocols, plant sampling, buffer solution preparation, operating and using various spectrophotometers, extraction and quantification of carbohydrates, proteins, amino acids, osmolytes, enzymes extraction and assays,

BO638: ROS and Antioxidants in Plants

This course will provide students with advanced knowledge on reactive oxygen species (ROS) including their chemistry, production in plants and scavenging. Antioxidants (enzymatic and non-enzymatic) will be discussed in details. Signaling role of various ROS during biotic and abiotic environmental stress will

be emphasized. The involvement of ROS and antioxidants in improving crop stress tolerance will be highlighted.

BO639: Advanced Water Relations and Mineral Nutrition

This course aims at studying deep….. First part: This module will deal with the role of water in plants including the properties of water and aqueous solutions. The course should also address cell-water relations and the absorption of water and factors affecting this process. A major part of the module should deal with the translocation of water to stem and leaves and the transpiration and factors affecting this important process. Stomatal mechanisms and measurements of stomatal apertures and their contribution to plant-water balance and water stress will be major topics of this course. Second part: This part will provide a comprehensive understanding of processes involved in mineral-nutrients uptake and transport in the plant, and roles of mineral nutrients in plant physiology and metabolism. The role of the various micro and macroelements in physiology and metabolism will be presented and discussed, and so will the physiological implications of deficient and toxic levels. Central methodologies used for plant mineral nutrition research will be described as well.

BO640: Plant Responses to Abiotic stresses

The course will be a review of plant responses to different types of abiotic environmental stress, in particular physiological and molecular analysis. Molecular biology tools have allowed tremendous progress in our understanding of plant responses. Responses of plants to drought, salt, extreme temperatures and toxic concentrations of trace metals will be presented. The course will also include advances in the improvement of plant resistance to stress by genetic engineering. General research strategies will be discussed through analysis of case studies.

BO641: Advanced Photosynthesis and Energy Bioconversion

This course aims to provide students with comprehensive and up to date knowledge about the process of photosynthesis with its deep detailed biochemical pathways. Students will acquire knowledge about the ways in which photosynthesis is adapted to different physiological situations including C4, CAM and photorespiration mechanisms. The module will also examine the ways in which biochemical pathways are controlled and integrated in plant cells and tissues. Students should gain modern knowledge of the control of energy flux through metabolic pathways, and the ways in which metabolism is adapted to different physiological states. The module will also consider the amazing diversity and sophistication in the ability of cells to synthesize complex molecules from simple precursors, and the ways in which knowledge of this can lead to the ability to manipulate metabolism in biotechnology. Throughout the module, the ways in which individual pathways illustrate the general principles of metabolism will be highlighted. Examples will be taken from a wide range of micro-organism, plant and animal systems.

BO642: Advanced Plant Tissue Culture

This course provides postgraduate-level advanced knowledge of plant tissue culture theory and practice. This course has a vocational focus and introduces the student to the theory and practice of plant tissue culture and their role from modifying plants in plant biotechnology to the propagation of endangered plants and from modifying cell lines in biotechnology to the propagation of all lines for use in medical, microbiological and biochemical research. It prepares the students in particular for a career with plants, both in plant biotechnology and in environmental biotechnology. Students study media, sterilization,

explants, micro propagation, callus culture, organogenesis, embryogenesis, somatic variation, doubled haploids, interspecific hybrids, protoplast fusion and environmental conditions required.

BO643: Advanced Plant Growth and Stress Hormones

This module provides the students with advanced and up to date knowledge of the key areas of plant growth and development with emphasis on the role of plant growth regulators on cell division and differentiation. Detailed topics include the chemistry, biosynthesis, translocation, action and role of various plant growth hormones such as auxins, gibberellins and cytokinins in plant growth. Additional lectures will be devoted to photoperiodism and vernalization and the molecular biology aspects of seed embryogenesis, dormancy and germination. This module will also provide students with knowledge of the key stress hormones including abscisic acid, ethylene, salicylic acid and jasmonic acid, with an emphasis on their roles in mediating.

BO644: Phytoremediation

The aim of this module is to address the mechanisms by which hyper-accumulator plants phytoremediate polluted waters and soils. Different examples of hyper-accumulator plants will be presented. The interactions between metals and plants, including discussions of metal toxicity, biosorption, biosensing and metal leaching/mining will be presented.

BO645: Plan Secondary Metabolites

This module deals with secondary metabolites of plants. The structure and function of major groups of these natural products will be covered giving some examples from different plant groups such as phenolics, alkaloids, terpenes and other plant secondary metabolites as well as sterols, cholesterol and vitamins particularly vitamin D_3 & D_4, Bile, vitamin B complex, vitamin B1 (thiamine), vitamin B2, vitamin H, biotin, vitamin E group, vitamin K group, vitamin K1 and vitamin A. The role of the secondary metabolites in plant tolerance to environment will be discussed.

BO646: Mechanisms in Plant Defense

This course will focus on interactions between plants and their pathogenic microorganisms, including the physiological and molecular responses of plants, molecular mechanism of spread of pathogens in their hosts.

BO647: Plant Biochemistry

This course aims to provide students with comprehensive knowledge on biochemistry of compounds in plants. An emphasis will be provided to the metabolism of sugars, amino acids, organic acids and fatty acids. The biochemical pathways involved in these processes will be discussed.

BO648: Allelopathy and Allelochemicals

This course will provide students with advanced knowledge on the ecological, agronomic, and physiological aspects of allelopathy and allelochemicals. The course will discuss the chemicals responsible for the allelopathic phenomena and, closely connected with them, and the modes of action of these compounds in the plant. Description of management practices related to allelopathy and allelochemicals in agriculture will be presented as well.

BO649: Cultivation Techniques in Microbiology

This module deals with aspects related to the preparation of microbial culture media (natural, semi-synthetic and synthetic). Microbial growth and the internal and external factors affecting growth in vitro will be discussed. The course will further address the organic and inorganic microbial nutrition, the utilization and metabolism of carbon and nitrogen sources. Additional topics are the antimicrobial agents and their mode of action.

BO650: Plant Cell Walls and Membranes

Part one (Plant Cell Walls): Plant cell walls are complex, dynamic cellular structures essential for plant growth, development, physiology and adaptation. This course provides an in depth and diverse view of the microanatomy of plant cell walls. Importantly, this course makes an emphasis on the details of the biosynthesis and the molecular physiology of cell walls. The course highlights the importance of plant cell walls both in the life of the plant and in their use for bio-products and biofuels.

BO651: Soil Science and Soil Microorganisms

This course deals with soil ecology. One part of this course will deal with the soil environment (soil physical and chemical features, soil water status, soil pH, soil temperature, soil light). The course will also cover the ecology of soil nutrient cycles and soil pollution. The second part of the course will deal with the soil biota with special emphasis on the interactions between the soil biota and soil features. Part two (Cell Membranes): *This part* offers a solid foundation for understanding the structure and function of biological membranes. The course explores the composition and dynamics of cell membranes. The molecular and biological diversity of lipids and proteins in cell membrane components will be discussed. The course will show how the interactions between lipids and proteins within the cell membrane explain the chemical, mechanical, and self-renewing properties of cell membranes. The signaling roles that the cell membrane plays in the communication between cells and the surrounding environment will be presented.

BO652: Methods in Plant Ecology II

Several practical courses covering how to assess climate changes, Studying important plant areas and Egyptian protectorates, different methods for studying plant physiology, training in writing a scientific paper and presentation. Training on classifying results by using statistical software (CAP, CANOCO and PCoA), and similarity coefficient.

BO653: Biostatistics (4)

Statistical definitions, sampling of attributes, distributions (Normal, Binomial, Poisson), and tests of significance, analysis of variance, experimental designs, the association between variables, curve fitting and the method of least square, multiple and partial correlation and regressions, and analysis of time series and their computer application programs.

BO654: Geomorphology and GIS applications

Principles of physical geology, desert environment from the sedimentological point of view, the principles of field geology and field surveying, different types of aerial photographs and maps, photo-interpretation of aerial photographs, and applications using stereoscope. The concepts and fundamentals of remote sensing; aerial photo-interpretation; Multispectral scanning and spectral pattern recognition; Image processing and applications of remote sensing; Geographic information systems (GIS); Data

input, verification and storage; Methods of data analysis and spatial modeling; Implementation and application of GIS.

BO655: Methods in Plant Ecology I

It covers several practical courses in ecology, including selecting methods to determine (density, frequency and cover) for studying plant community or/and population, plans to explore wetlands and deserts. Training on thinking about designing your statistical results and applying your design using statistical software (SPSS).

BO656: Environmental Impact Assessment

Definition; Objectives and needs of environmental impact assessment (E1A); Activities involved in EIA (major components and subcomponents, characteristics of Impacts); EIA methods, Checklists, overlay mapping, networks, matrices; Estimates of resources demand for EIA Studies; Recommended methodologies for rapid EIA; Case studies; Guidelines for EIA in developing countries; Environmental impact statement; Auditing; Land evaluation and suitability analysis.

BO657: Population and Community Ecology

Introduction, Life tables, Simple models, Regulation of plant populations and communities, Demography of some plant populations and communities, Colonial plants, Evolutionary ecology, Interactions in mixtures of species, co-existence and the niche.

BO658: Climate and climate changes

Introduction, Elements of the climate, Measurement of climate change, natural causes of climate change, Human activities, Evidence of climate change, Consequence of climate change, Predicting climate change, Climate change in Egypt. Effect of climate change on vegetation and agriculture.

BO659: Soil Quality

This course includes importance, definition and composition of soil, Soil development, Types of soil classification, Soil texture and structure, Soil temperature, Soil porosity, Soil air, Soil water and its behavior, Soil living organisms, Erosion and conservation, Management of soil physical properties, Soil cartography and its importance, Soil inorganic compounds, Organic matter (composition and transformation), Electronic properties of soil, Properties of soil colloids, Cation exchange in soil, Soil solution, Soil acidity and alkalinity, hydrological study as well as the atmospheric chemistry, classification of pollutants of soil, air and water- role of soil in recycling Biogeochemical elements (nitrogen, phosphorus, sulfur and trace elements, organic chemicals, gases of greenhouses, acidic rain). Study the various methods for the treatment of contaminated soil.

BO660: Important plant areas of Egypt

The course includes identifying important plant areas in Egypt, criteria of important plant areas, Habitat diversity, Floristic categories, Plant diversity, National RedList, Network of the protected areas, known gaps in the country IPA analysis, Notes on IPAs and plant Conservation issues, Top priorities.

BO661: Identification of Plants and seeds

This course will present the knowledge required for plant identification based on vegetative and seed characteristics. The following topics will be covered: Plant Identification using different plant keys, Identifying Seeds, Plant Names, Plant and Seed Descriptions, and Analysis of seed samples for impurities.

BO662: Multivariate Analysis

This course includes Similarity coefficients (Jacquard and Sorenson coefficients, Euclidean distance), Classification methods (agglomerative clustering and Twinspan), Ordination methods (PCoA, DCA and CANOCO), Direct gradient analysis, Training on some software dealing with multivariate analysis (e.g. CAP).

BO663: Egyptian Agro-biodiversity

Meaning of agro-biodiversity, Role of agro-biodiversity in agriculture, Agricultural plant, phytogeography of cultivated plants, Propagation of agricultural plants, Pollination as an essential ecosystem service, Bees and pollinators, Economic contribution of the biota, weeds conserved and/or associated with agriculture, Threats to agro-biodiversity.

BO664: Egyptian Protectorates and Historical Plants

First section includes Introduction; Geography and geology of Egypt; Biodiversity in Egypt; Nature Reserves for conservation of natural resources; National, regional and international laws and conventions related to Nature Reserves, classification of Nature Reserves; Egyptian Protectorates: Desert, Wetland, Marine and Geological Protectorates, New suggested protectorates. Second section covers the origin and evolutionary history of plants through geologic times as revealed by the fossil records. It includes Introduction to the concepts of geologic time, Stratigraphy and sedimentation, Preservation and fossilization of plants, Plant diversity through Earth's history, Precambrian life, Plant evolution through phanerozoic eras and periods, Invasion of land by plants, and Ecological changes and impacts of plants on the earth. Synthesis of biological and geological perspectives provides insights into the paleoecological relationships of the ancient communities in which these organisms lived. An introduction to the use of plant fossils in biostratigraphy and their roles in coal, oil and gas formation will be considered. Examples of the study will include the vascular plants, calcareous algae, diatoms and palynology, Pharaonic and Romance Plants.

BO665: Plant water relations

This course deal with the identification and effects of Drought, Stress and adaptation to water-stress, Water transport, Low and high soil-water potentials, osmoregulation and water stress in higher plants. Factors affecting osmoregulation, relationship to growth processes, plants' metabolic responses to water deficits, cell-level metabolic responses, effects of water deficits on metabolism and adaptive significance of metabolic responses to water deficits.

BO666: Physiological Bases of Plant Growth

Growth of the whole plant and its cells, Variation in the relative growth rate (RGR) under free access of nutrients, Allocation to the storage, Environmental influences on growth rate (Effects of shade, light, Temperature, Water potential and Salinity, limiting nutrient supply, Soil compaction, Soil flooding, Wind), Adaptations associated with inherent variation in GR.

BO667: Palynology

Aspects and prospects of palynology, Pollen grain development, Chemical properties of pollen and spore, Pollen morphological characters and their terminology, (polarity - symmetry - size - shape - apertures - exine stratification and ornamentation - pollen preparations), Description of pollen grains in selected taxonomic groups.

BO668: Methods in Biotechnology II

This course includes the study of advanced techniques involved in research in the area of biotechnology including quantification of various plant hormones, reactive oxygen species and antioxidants, stress markers including lipid peroxidation levels and membrane leakage. Designing and operating bioreactors. The study of protein patterns (protein extraction and gel electrophoresis), real time RT-PCR, and gene cloning. In addition, theoretical bases of high throughput technologies including microarrays and RNA sequencing will be highlighted.

BO669: Wetland and Desert Ecology

Wetland overview, Wetland criteria, Methods in wetland research, some case studies in the Mediterranean wetlands, Egyptian wetlands (distribution, structure, services and management plans). Geography of arid lands; Climatic and biological classifications; Flora and Fauna; Biological resources of arid lands; Land uses in arid lands; Impact of man and desertification; Combating desertification; Case studies in the deserts of Egypt and the Middle East; Desert geomorphology and landscape; Non-biological resources of arid lands; Minerals, energy and water; Culture and demography of desert population.

BO670: Advanced Topics on Hormones

This module provides students with advanced knowledge of the key areas of plant growth and development with emphasis on the role of plant growth regulators on cell division and differentiation. Detailed topics will include the chemistry, biosynthesis, translocation, action and role of various plant hormones including auxins, gibberellins, cytokinins, ethylene, salicylic acid, abscisic acid, and brassinosteroids. Also, this course will consider the chemistry, biosynthesis, translocation, action and role of different hormones in human and animals, including hypothalamus hormones, pituitary (anterior and posterior) hormones, thyroid hormones, parathyroid hormones, adrenal (cortex and medulla) hormones, steroid hormones and pineal hormones and pancreatic hormones.

BO671: Biostatistics (5)

Statistical definitions, sampling of attributes, distributions (Normal, Binomial, Poisson), and tests of significance, analysis of variance, experimental designs, the association between variables, curve fitting and the method of least square, multiple and partial correlation and regressions, and analysis of time series and their computer application programs.

BO672: Advanced Nano Biotechnology

This course considers the application of the newly emerging science of nanotechnology and its principles, concepts and tools. The working principles of some important apparatus such as atomic force microscopy will be described and its cellular and molecular applications will be taught. In addition, the possible biological applications of carbon nano-tubes, quantum dots, and the rapidly developing techniques of DNA chips will be discussed. The module will also consider single molecular manipulation techniques, particularly those concerning DNA and proteins. This course will be continuously updated to include new discoveries and applications of nano-techniques in biological sciences.

BO673: Methods in Biotechnology I

This course includes the study of the main techniques and experimental procedures involved in research in the area of biotechnology including establishing scientific experimental designs and protocols,

sampling, buffer solution preparation, operating and using various spectrophotometers, enzyme extraction and assays, gel electrophoresis and polymerase chain reaction (PCR),

BO674: Advanced Biochemistry II

This course aims to provide students with comprehensive knowledge on the characteristics of metabolic pathways, with emphasis on deep details of various pathways involved in protein and lipid metabolism. An emphasis will be given to their regulation and significance in cell biology.

BO675: Advanced Molecular Biology

This course will provide students with advanced knowledge on the mechanisms underlying cell proliferation, differentiation and its regulatory circuits, key transcriptional networks that control cell growth, proliferation, DNA repair, the molecular mechanisms responsible for preserving genome integrity and their role in counteracting tumorigenesis, the epigenetic layers that define a specific epigenome and their possible alteration in diseases, the methodologies and cutting-edge technologies to study single molecules and their interactions**.**

BO676: Advanced Phycology and Uses of Algae

This course gives an opportunity to explore the fundamental principles of systematic of algae with reference to occurrence and distribution, cytology of algal cell, different types of life cycles and bases of algal classification. Also, this course gives an opportunity to explore the fundamental uses and economic importance of algae with reference to its application in food, industry, agriculture, pharmacy and medicine.

BO677: Advanced Enzymology

This module will focus on the types, nomenclature and classification of plant enzymes. The course also covers the structure, kinetics and functions of enzymes. It will also cover topics related to the nature of enzymes, enzyme specificity, mechanisms of enzyme action, and separation and purification of enzymes. The following topics will also be dealt with in this course: factor affecting enzymatic reactions, the type of inhibition, regulatory enzymes, multi-enzyme system, prosthetic groups and cofactors.

BO678: Advanced Cell and Tissue Culture

Based on the student’s thesis topic, the course will focus on plant or animal cultures. The course provides advanced knowledge on animal and plant tissue culture theory and practice. This course has a vocational focus and introduces the student to the theory and practice of animal cell culture and plant tissue culture and their role from modifying plants in plant biotechnology to the propagation of endangered plants and from modifying cell lines in biotechnology to the propagation of all lines for use in medical, microbiological and biochemical research. It prepares the students in particular for a career with plants, both in plant biotechnology and in environmental biotechnology. Students study media, sterilization, explants, micro propagation, callus culture, organogenesis, embryogenesis, somatic variation, doubled haploids, interspecific hybrids, protoplast fusion and environmental conditions required. These are related to uses of tissue culture and compared with traditional techniques.

BO679: Advanced Biochemistry I

This course deal with the concept of metabolism, characteristics of metabolic pathways and strategies used to study these pathways. This is followed by a detailed overview of various pathways involved in carbohydrate metabolism. An emphasis will be given to its regulation and significance in cell biology.

BO680: Advanced Immunology

The aim of this course is to provide advanced knowledge of the key immunological principles and terminology and to perform and interpret basic serological and leucocyte tests. In addition, this course aims to elucidate the molecular, cellular and organelle components of the immune system; the nature and causes of its malfunctions; and the scope for intervention and exploitation.

BO681: Advanced Bacteriology and Virology

This course introduces students to advanced detailed biological properties (structure and replication) of viruses particularly those associated with major diseases of man, and plants and provides awareness of the transmission, epidemiology, pathogenesis and control of certain virus groups. The module also embraces the basic specific and non-specific host defense mechanisms associated with these infections and the principles concerned with the diagnosis of viral infections by laboratory producers. Also, this course deals with the occurrence and distribution of bacterial organisms and their structure, diversity and classification. The importance and role of these organisms in nature will be described.

BO682: Methods in Microbiology II

This course deal with isolation and purification protein and enzymes by gel filtration, polyacrylamide gel electrophoreses. Methods for isolation and purification of DNA and plasmid by agarose gel electrophoreses and PCR techniques. Also, this course gives idea about the different methods to make transformation. Also, it is deal with western and southern blot, total amino acid analysis and method to isolation and stain lipopolysaccharide. It is deal with different methods used in bioremediation and degradation different pests, dyes and harmful polymers. Methods deal with prepare probiotics and antibiotics.

BO683: Advanced Mycology and Phytopathology

This course gives students an opportunity to extend advanced concepts and principles of Mycology. It provides students with an understanding of the basic principles of the core of fungi taxonomic groups. Also, this module provides theoretical and practical knowledge of plant diseases; their causative agents and their control. It will cover diseases caused by fungi and other agents such as viruses, plant parasites, insects and nematodes. The module will also include plant disease resistance and disease control.

BO684: Fungal Phytopathology

This course give students an opportunity to extend fundamental concepts about morphology, reproduction, ecology and spread and identification of the phytopathogenic fungi. Providing the students the knowledge about the mechanisms by which phytopathogenic fungi cause the diseases and how the phytopathogenic fungi attack the host plant. Also focus on how the plants defense themselves against the fungal phytopathogens through structural and biochemical defense developed in a plant against the attacking by the pathogens. Study the methods for preventing or alleviating the damage caused by the pathogen before or after it develops in a plant.

BO685: Stress Physiology and Bioremediation

First part of this course will review advanced knowledge on plant responses to different types of abiotic environmental stress, in particular physiological and molecular analysis. Molecular biology tools have allowed tremendous progress in our understanding of plant responses. Responses of plants to drought, salt, extreme temperatures and toxic concentrations of trace metals will be presented. The course will also include advances in the improvement of plant resistance to stress by genetic engineering. General research strategies will be discussed through analysis of case studies. Second part of this course introduces the concept of bioremediation where plants and microorganisms are used to combat environmental pollution with an introduction to drinking and irrigation water standards. The aim of one part of this module is to address the mechanisms by which hyper-accumulator plants phytoremediate polluted waters and soils. Different examples of hyper-accumulator plants will be presented. The interactions between metals and microorganisms, including discussions of metal toxicity, biosorption, biosensing and metal leaching/mining will be presented. A third part of the course will concentrate on the biotechnology of micro-algae and the bioremediation of polluted groundwater systems. The course will also deal with the role of genetic engineering of plants and microbes in developing new approached for bioremediation.

BO686: Virology and Immunology

This course gives opportunity to provide students with understanding of the basic principles of immunology and virology in the experimental design of immune response during viral infections. Also, studying viral mechanisms of infection and how to diagnose it with giving examples for different families of viruses.

BO687: Food and Water Biotechnology

This module will introduce students to advanced research and development thinking across food biotechnology. Examples of the impact of the intersection of food science, nutrition and biotechnology on food processing, chronic disease, sensory properties and food safety will be provided. The course will describe developments in the field of functional dairy products and describe examples of the application of omics techniques in food analysis including food authenticity, food safety. Also, the topics of this course will be extended to enable students to design assessment strategies to engineer flavour profiles in plants and food materials, plan a safety assessment strategy for food developed through genetic engineering, outline the major technical considerations for detecting GM foods and for species identification in meat products. Also, this course deals with the microorganisms that live in food and effects of microbial growth on food quality. The methods used to control, detect, and enumerate microorganisms in food will be addressed. Special emphasis will be devoted to the identification and management of food microorganisms and ways to protect the consumers from microbes in food. Recent advances in water treatment will be emphasized as well.

BO688: Microbial Physiology

This course explore the fundamental principles of fungal physiology especially spore germination, dormancy, stimulatory substances, heat shock, fungicides, and chitosan applications. This course gives an opportunity to explore the fundamental principles of physiology of bacteria with reference to nutrition, growth and metabolism.

BO689: Biostatistics

Statistical definitions, sampling of attributes, distributions (Normal, Binomial, Poisson), and tests of significance, analysis of variance, experimental designs, the association between variables, curve fitting and the method of least square, multiple and partial correlation and regressions, and analysis of time series and their computer application programs.

BO690: Bacterial Phytopathology

This course gives an opportunity to explore the fundamental principle of pathogenic bacteria with reference to their location and transmission to plants, Also explore the effect of pathogen on crops and how controlling the bacterial diseases.

BO691: Methods in Microbiology I

This course involves the methods of isolation, purification and identification of bacteria by morphology, biochemical tests and 16srRNA. Also, this course involves simple and differential stains for bacterial cells. Methods used to determine bacterial growth and methods used to prepare anaerobic conditions. Study methods used to break bacterial cell wall and how prepare cells to lyophilization. It is also including the methods used to purified secondary and fermented compounds by bacteria. Methods used to prepare and study the effect of antimicrobial agents and applications of nanomaterials. Also, it is deal with Plaque assay and how to make mutant cell. Methods used to prepare bacterial cell to examine under electronic microscope.

BO692: Medical Microbiology

The aim of the course is to provide general knowledge about the pathogenesis of medically important microorganisms including bacteria, fungi, viruses, rickettsia and protozoa. The symptoms of diseases caused by microbial pathogens and their diagnosis will be addressed. In addition, the immune-biology of the major microbial diseases, with emphasis on their ways and means of their prevention will be studied. Collection of clinical samples, types of media, isolation of gram positive and gram negative pathogens. Studying types of superficial fungi and dimorphic fungi

BO693: Advanced Bacteriology

This course will give information about the important of bacteria in our life, the course include the bacterial cell structure and the role of bacteria in ATP production and the beneficial secondary products which used in different fields. The role of bacteria in recycle of nutrients in environment, the relationship between bacteria and other groups with symbiotic patterns. The role of bacteria in produce toxins regarding to their relation with human diseases, virulence factors and antibiotic resistance. It is explore the ways to used bacteria as vaccines.

BO694: Microbial Bio-fuels

Biofuels are produced from living organisms or from metabolic by-products (organic or food waste products). In order to be considered a biofuel the fuel must contain over 80 percent renewable materials. It is originally derived from the photosynthesis process and can therefore often be referred to as a solar energy source. There are many pros and cons to using biofuels as an energy source. This course contains articles that explore the many biofuel technologies.

BO695: Advanced Mycology

This course will introduce information about the fungal population's diversity and speciation, isolation of fungi from the environment and identify them using morphological and molecular approaches, consider evolutionary relationships among different groups of fungi, their ecology and significance to humans. It explore fungal lifestyles, their reproduction, and the ways that fungi use to communicate with each other and with their symbiotic partners.

BO697:Biochemistry

This course covers the classification, nomenclature of enzymes, vitamins and the biochemical pathways involving coenzymes. It develops understanding of the processes of digestion and metabolism of carbohydrates. It gives a description of digestion of proteins and metabolism of amino acids. It acquires knowledge of the digestion of lipids, metabolism of lipids and metabolism of nucleotides.

BO699: Fungal Metabolites

This course provides students with an understanding the secondary metabolites produced by fungi due to their bioactive properties as well as their extreme variability in chemical structure. There is a broad range of biological activities of fungal secondary metabolites that include antibiotics, antiviral, antimycotics and cytotoxics which make them important for medicine, pharmaceutical and food industry applications. In addition, this course focuses on endophytic fungi which are able to biosynthesize medicinally important phytochemicals that originally believed to be produced only by their host plants.

BO6101: Microbial Nanotechnology

This course deal with the use of nanomaterials in biotechnology merges the fields of material science and biology. Nanoparticles provide a particularly useful platform, demonstrating therapeutic applications. The unique properties and utility of nanoparticles including proteins, poly-nucleic acids and with a wide range of metal and semiconductor core such as fluorescence and magnetic behavior. The application properties of nanoparticles materials include the integration of nanoparticles with biomolecules like protein–protein and protein–nucleic acid interactions, and enzyme activity. Nanoparticles used as drug delivery systems nanoparticles as delivery vehicles for biomolecules, nanoparticles in biosensing, nanoparticle–biomolecule interactions and nanoparticles for bioimaging.

BO6103: Food Microbiology

This course is designed to introduce students to various aspects of food microbiology, organisms associated naturally with foods and those responsible for spoilage. Conditions favouring the growth, death and survival of microorganisms in foods will also be studied; their immediate and long range effects on foods will be discussed. Topics to be covered include introduction to food microbiology factors that affect interactions of microorganisms with foods; their classification and growth characteristics. Also included food spoilage and preservation; food-borne diseases - infections and intoxications public health and sanitation.

BO6105: Biostatistics (1)

This course represents an introduction to the field and provides a survey of data and data types in biology. Specific topics include tools for describing central tendency and variability in data; methods for performing inference on population means and proportions via sample data; statistical hypothesis testing and its application to group comparisons; issues of power and sample size in study designs; and random

sampling. Also to know basic statistics, including probability, descriptive statistics, and inference for means and proportions, and regression methods. The analytic methods and applications will be linked to topic applications in science, health care, medicine, public health, and program evaluation. While there are some formulae and computational elements to the course, the emphasis is on interpretation and concepts of the results.

ت. برامج الدكتوراه في علوم النبات:

1. برنامج الدكتوراه في العلوم في علم الطحالب: (Phycology)

First Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
BO701	Special Topics in Phycology (I) موضوعات متخصصة في الطحالب (1)	2	-	2
Optional: 2 Credits				
BO703	Algal Natural Products (medicinal) المنتجات الطبيعية من الطحالب	2	-	2
BO705	Advanced Genetic Engineering of Algae الهندسة الوراثية المتقدمة للطحالب	2	-	2
BO707	Advanced Biotechnology of Algae تقنية حيوية متقدمة في الطحالب	2	-	2
BO709	Algal Blooms and Biohazards أضرار الطحالب	2	-	2
BO711	Biogas Production from Algae إنتاج الوقود الحيوي من الطحالب	2	-	2

Second Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
BO702	Special Topics in Phycology (II) موضوعات متخصصة في الطحالب (2)	2	-	2
Optional: 2 Credits				
BO704	Algal Natural Products منتجات طبيعية من الطحالب	2	-	2
BO706	Algae and Nanotechnology الطحالب وتكنولوجيا النانو	1	2	2
BO708	Algal Biorefinery Approaches التكرير الحيوي للطحالب	2	-	2
BO710	Algal Bioremediation المعالجة الحيوية باستخدام الطحالب	2	-	2
BO712	Applications of Phycolloids تطبيقات الغرويات الطحالبية	2	-	2

2. برنامج الدكتوراه في العلوم في الوراثة النباتية: (Plant Genetics)

First Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
BO713	Current Topics in Genetics I موضوعات حديثة في الوراثة 1	2	-	2
Optional: 2 Credits				
BO715	Genetic Mapping and Gene Functions الخرائط الوراثية ووظائف الجينات	2	-	2
BO717	Plant Molecular Development Mechanisms آليات التطور الجزيئى للنبات	2	-	2
BO719	Gene Expression and Regulation التعبير الجيني وتنظيمه	2	-	2
BO721	Functional Genomics الجينومات و التحليلات النسخية و البروتينية	2	-	2
BO723	Engineering of Genes and Genomes هندسة الجينات والجينومات	2	-	2

Second Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
BO714	Current Topics in Genetics II موضوعات حديثة في الوراثة 2	2	-	2
Optional: 2 Credits				
BO716	Plant Breeding and Crop Biotechnology تربية النبات والتكنولوجيا الحيوية للمحاصيل	2	-	2
BO718	Conservation of Plant Genetics Resources صون الأصول الوراثية النباتية	2	-	2
BO720	Nanotechnology and Its Applications in Plants تقنية النانو وتطبيقاتها في النباتات	2	-	2
BO722	Genomics and Molecular الجينومية و البيولوجيا الجزيئية	2	-	2
BO724	Chromosomes and Genome Organization الكروموسومات و تركيب الجينوم	1	2	2

3. برنامج الدكتوراه في العلوم في فسيولوجيا النبات: (Plant Physiology)

First Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
BO725	Special Topics in Plant Physiology (I) موضوعات متخصصة في فسيولوجي النبات (1)	2	-	2
Optional: 2 Credits				
BO727	Advanced Bioremediation معالجة حيوية نباتية متقدمة للتلوث	2	-	2
BO729	Advanced Topics in Plant Hormones موضوعات متقدمة في الهرمونات النباتية	2	-	2
BO731	Advance Plant-microbe Interactions التفاعلات الفسيولوجية بين الميكروب والعائل	2	-	2
BO733	Molecular Biology and Genetic Engineering بيولوجيا جزيئية وهندسة وراثية	2	-	2
BO735	Advanced Plant Biochemistry كيمياء حيوية نباتية متقدمة	2	-	2

Second Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
BO726	Special Topics in Plant Physiology (II) موضوعات متخصصة في فسيولوجي النبات (2)	2	-	2
Optional: 2 Credits				
BO728	Plant Responses to Multiple Stresses استجابة النبات للإجهادة المتعددة	2	-	2
BO730	Molecular Mechanisms of Plant Stress Tolerance الأليات الجزيئية لمقأو مة النباتات للإجهاد	2	-	2
BO732	Plant Cell Signaling الإشارات الخلوية في النباتات	2	-	2
BO734	Nanomaterials and Plant Protection المواد النانوية وحماية النبات	2	-	2
BO736	Seminar Series in Plant Physiology سلسلة سيمنارات في فسيولوجيا النبات	-	3	2

4. برنامج الدكتوراه في العلوم في البيئة النباتية والفلورا: (Plant Ecology and Flora)

First Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
BO737	Current Topics in Plant Ecology I موضوعات حديثة في البيئة النباتية 1	2	-	2
Optional: 2 Credits				
BO739	Plant Invasion الغزو النباتى	1	2	2
BO741	Ecological Modeling النمذجة البيئية	2	-	2
BO743	Primary Production and Nutrient Budget الإنتاج الأو لى وتوزيع المغذيات	2	-	2
BO745	Biofertilizers المخصبات الحيوية	1	2	2
BO747	Plant Aquatic Ecology البيئية المائية النباتية	2	-	2
BO749	IUCN Assessment Criteria المعايير الدولية لتقييم صون الطبيعية	2	-	2

Second Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
BO738	Current Topics in Plant Ecology II موضوعات حديثة في البيئة النباتية 2	2	-	2
Optional: 2 Credits				
BO740	Seed Ecology بيئة البذور	1	2	2
BO742	Ecosystem Services خدمات النظام البيئي	2	-	2
BO744	Environmental Pollution التلوث البيئي	2	-	2
BO746	Conservation of Plant Genetic Resources صون الموارد الوراثية النباتية	2	-	2
BO748	Weed Biocontrol المكافحة الحيوية للحشائش	2	-	2
BO750	Plant Indicators المؤشرات النباتية	2	-	2

5. برنامج الدكتوراه في العلوم في التقنية الحيوية: (Biotechnology)

First Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
BO751	Current Topics in Biotechnology I موضوعات حديثة في التقنية الحيوية 1	2	-	2
Optional: 2 Credits				
BO753	Enzyme Biotechnology التقنية الحيوية والإنزيمات	2	-	2
BO755	Genomics, Proteomics and Metabolomics (OMICS) الجينوم والبروتيوم و الميتابلوم	2	-	2
BO757	Bioprocess Engineering and Fermentation Technology هندسة العمليات الحيوية وتقنيات التخمر	2	-	2
BO759	Stem Cell Technology and Regenerative Medicines تقنية الخلايا الجزعية والطب التجديدي	2	-	2
BO761	Environmental Biotechnology تقنية حيوية بيئية	2	-	2
BO763	Advanced Microbial Biotechnology تقنية حيوية ميكروبية متطورة	2	-	2

Second Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
BO752	Current Topics in Biotechnology II موضوعات حديثة في التقنية الحيوية 2	2	-	2
Optional: 2 Credits				
BO754	Advanced Bioinformatics معلوماتية حيوية متقدمة	1	2	2
BO756	Advanced Genetic Engineering and Epigenetics الهندسة الوراثية المتقدمة وعلم التخلق	1	2	2
BO758	Advanced Clinical Biochemistry كيمياء حيوية سريرية متطورة	1	2	2
BO760	Systems Biology and Synthetic Biology النظم البيولوجية والبيولوجيا الصناعية	2	-	2
BO762	Cell Signaling and Stress Responses الإشارات الخلوية والاستجابة للإجهاد	2	-	2
BO764	Advanced Algal Biotechnology التقنية الحيوية والطحالب	2	-	2

6. برنامج الدكتوراه في العلوم في الميكروبيولوجي: (Microbiology)

First Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
BO765	Selected Topics in Microbiology (I) موضوعات مختارة في الميكروبيولوجي (1)	2	-	2
Optional: 2 Credits				
BO767	Applied Microbiology ميكروبيولوجيا تطبيقية	2	-	2
BO769	Extreme and Beneficial Bacteria البكتريا شديدة التحمل والنافعة	2	-	2
BO771	Molecular Biology and Genetic Engineering البيولوجيا الجزيئية والهندسة الوراثية	2	-	2
BO773	Microbial Secondary Metabolites الأيض الثانوي الميكروبي	2	-	2
BO775	Microbial Enzyme Biotechnology التقنية الحيوية الإنزيمات الميكروبية	2	-	2

Second Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
BO766	Selected Topics in Microbiology (II) موضوعات مختارة في الميكروبيولوجى (2)	2	-	2
Optional: 2 Credits				
BO768	Microbial Biotechnology الكائنات الدقيقة والتقنية الحيوية	2	-	2
BO770	Microbial Quality Control رقابة الجودة للكائنات الدقيقة	2	-	2
BO772	Molecular Plant-Microbe Interactions الاستجابات الجزيئية بين النبات والميكروب	2	-	2
BO774	Environmental Microbiology الميكروبيولوجيا البيئية	2	-	2
BO776	Technology of Microbial Mass Production تقنيات الإنتاج الكبير للكائنات الدقيقة	1	2	2

BO701: Special Topics in Phycology I

This course gives an opportunity to explore special topics about algae and the "state of the art" about all the recent aspects in the algal research fields including: cultivation of algae on large scales using open ponds and photo-bioreactors, harvesting of algae and biomass production. It also concentrates on the modulating of the environmental factors that influence the algal growth and how to optimize various physical and chemical factors for maximum biomass production.

BO702: Special Topics in Phycology II

This course gives an opportunity to explore special topics about algae and the "state of the art" about all the recent aspects in the algal research fields. This course is an extension of Special Topics in Phycology I, and is intended to be free for the student for online reading, collecting literature and discussion about the point of interest that they will choose to work on during their PhD dissertation.

BO703: Algal Natural Products (Medicinal)

This course gives an opportunity to explore the different natural products produced by algae as well as the biosynthetic pathways of algal products and their metabolic regulation. The course embraces the techniques to generate, purify and structurally characterize such compounds and to assess their medicinal activity. The course will also provide exemplified reviews about the recent applications of algae in the pharmaceutical and medical fields.

BO704: Algal Natural Product (commercial)

This course aims to explore different natural products with commercial application produced from algae including: algae as a food for production of single cell proteins, natural pigments, bioactive substances, pharmaceuticals and cosmetics, Omega-3 and other PUFA oils, feed and aquaculture market for raising healthy animals etc., diatomaceous earth and biofertilizers

BO705: Advanced Genetic Engineering of Algae

Microalgae biotechnology gains more and more commercial importance in quite different fields. This course aims to explore genetic modification methodologies of microalgae for enhanced biotechnological exploitation possibilities in nearly all fields where unaltered microalgae are involved. To know how genetic engineering makes it possible to produce compounds or to add traits that are not normally present in algae. Furthermore, to give students a good background about the recent developments in genetic engineering such as omics technologies, construction of vectors, transformation, and selection. The course also will discuss a series of applications for transgenic microalgae including the production of high-value compounds like antibodies or vaccines, food additives, biofuels, and even optogenetic tools for neuroscience.

BO706: Algae and Nanotechnology

This course considers the principle of the newly emerging science of nanotechnology, concepts and tools. Therefore is focused on the recent progress on the utilization of micro and macroalgae of various classes as important organisms in green nanotechnology for the biosynthesis of nanoparticles. Also, this

course will give students general knowledge of characterization of nanoparticles by standard chemical methods and the possible mechanisms involved.

BO707: Advanced Biotechnology of Algae

This course will cover the following objectives: how synthetic biology, genetic engineering, and metabolic engineering is used in algae biotechnology in different utilities; to examine the current state of algae biotechnology research and tools, to explore some of the common bio-products from algae, and to take a look at some real-world of algae companies that are using algae biotechnology to create products consumers can buy today. Moreover, to know how genetic engineering tools of algae can be used for the production of value-added ingredients

BO708: Algal Biorefinery Approaches (2-0-2)

This course will provide students with an insight to the basics of biomass, various conversion technologies and the different types of products that can be obtained upon successful conversion; types of biomass, their structure and composition; various pre-treatment technologies currently adapted to produce cellulose; the physical, chemical, thermal and microbial conversion techniques and basics of bioreactor design; integrate biorefinery concepts and types of biorefinery for developing value added products such as biofuels, platform chemicals, polymers etc.

BO709: Algal Blooms and Biohazards

This course gives an opportunity to explore the harmful role of toxic algae in the ecosystem. To know the biohazard effect of algal blooms on the water bodies, water-borne diseases, animal lives, and human affairs. It provides students with the fundamental knowledge about identification methods of algal blooms and their toxins types; algaecide-preparations and applications, research solution to overcome such algae and how to control their growth.

BO710: Algal Bioremediation

This course is aims provide students with information about the following principals: removal or degradation of organic pollutants by the algae or "phycoremediation" is a sustainable and environmentally eco-friendly approach for cleaning up polluted areas; algal degradation of organic pollutants is a natural process which ensures a lower environmental impact compared with mechanical, physical, and chemical removal approaches of organic pollutants; the advantages of algae-based bioremediation, the biomass produced in bioremediation could be economically valorized in the form of bioenergy, in addition, the ability of macro- and microalgae to accumulate organic pollutants and the role of different enzymes in the degradation processes will be explored.

BO711: Biogas Production from Algae

This course provides students with the fundamental knowledge about gaseous fuel production from algal biomass, how to examine the biochemical and structural properties of seaweeds and of microalgal biomass that has been produced as part of wastewater treatment; study anaerobic digestion of algal biomass and how to reduce costs associated with drying wet biomass before processing; enhancement of algal biomass digestibility and conversion rate by pretreatment; deep integration with other technological processes (e.g., wastewater treatment, co-digestion with other substrates, carbon dioxide sequestration); development and adaptation of molecular biology tools for the improvement of algae

and anaerobic microorganisms; and finally, how to deal with the challenges to biogas production from macro- and microalgae.

BO712: Applications of Phycolloids

This course gives aims to study the source, classification, properties and extraction of phycocolloids produced by marine macroalgae, including their major three groups of alginates, carrageenan, and agars. The course will provide students with the knowledge about structure and function of phycocolloids as safe food components for humans and animals' consumption, various benefits for human health and their uses in numerous technological applications.

BO713: Current Topics in Genetics I

This course deals with current research in genetics critically reviewed and discussed through a combination of student presentations and written assignments.

BO714: Current Topics in Genetics II

This course deals with current research in genetics critically reviewed and discussed through a combination of student presentations and written assignments.

BO715: Genetic Mapping and Gene Functions (2-0-2)

This course focuses on importance of mapping-genetical and physical maps. Breeding requirements for maps. Molecular markers- Isozymes, RFLP, RAPD, SSR, ISSR, AFLP, SNP and SCAR. Marker assisted breeding for crop improvement. In addition, map based cloning, T-DNA and transposon tagging, TILLING, Differential display, Microarray in functional genomics. ESTs, transcriptional profiling and metabolic profiling. Serial Analysis of gene expression (SAGE).

BO716: Plant Breeding and Crop Biotechnology

This course deals with molecular breeding approaches; crop stress and productivity; Genetic engineering for Crop improvement; Gene silencing for crop improvement as well as Introduction to Intellectual Property and Patents.

BO717: Plant Molecular Development Mechanisms

This course will cover various aspects of plant growth and development at the molecular level and recent advances in understanding molecular mechanisms of gene regulation in plants. The course emphasis will be on current literature to understand how the tools of genetics, molecular biology and genomics are being used to understand plant development.

BO718: Conservation of Plant Genetics Resources

Regular lectures will be given on the following topics: collection and conservation of PGRs, in Situ and ex Situ conservation, characterization of diversity, exchange of PGRs and sustainable use of PGRs. In addition, recent literatures in the field of Conservation of Genetic Resources will be selected and presented by students.

BO719: Gene Expression and Regulation (2-0-2)

This course will cover gene expression; transcription (prokaryotic and eukaryotic); post transcriptional modifications; gene regulation in prokaryotes as well as regulation in higher eukaryotes including transcriptional control and post-transcriptional regulation.

BO720: Nanotechnology and its Applications in Plants

This course deals with nanotechnology and its uses in agriculture including nanofertilizers and nanopesticides etc. to increase the productivity and protection against several insect pest and microbial diseases.

BO721: Functional Genomics

This course focuses on overall structure and organisation of the genome in microorganisms, plants and animals. In addition, differentiates between genomics, transcriptomics, proteomics, metabolomics and metagenomics. Moreover, describes and explains a broad spectrum of large-scale functional genomics methods, as well as current technical developments within the genomics and functional genomics fields.

BO722: Genomics and Molecular Biology

Regular lectures will be given on the following topics: molecular markers, linkage maps, fluorescent in situ hybridization, chromosome structure and topology,whole genome sequence analysis, whole genome comparison, genome system, evolution, expression analysis by micro-array techniques, proteomics and functional genome analysis by random and targeted mutagenesis. In addition, recent literatures in the field of Genomics will be selected and presented by students.

BO723: Engineering of Genes and Genomes

This course covers up-to-date techniques in gene and genome engineering and its applications. Genetic engineering techniques including site-directed DNA recombination (Cre-Lox, Phi31 integrase), genome editing (TALEN, CRISPR/Cas-9, etc.), and next generation sequencing. Key concepts in genomics, epigenetics, gene regulation will be introduced.

BO724: Chromosomes and Genome Organization (1-2-2)

This course deals with chromatin structure; cytogenetic aspects of cell division; chromosomal anomalies. In addition, techniques used in the study of chromosomes and their applications; genome organization in viruses, prokaryotes and eukaryotes; concept of geneand genome mapping using physical maps.

BO725: Special Topics in Plant Physiology (I)

This course deals with recent special topics in plant physiology. In addition to the lectures given by the lecturer, student presentations and written assignments will be included to critically review and discuss the selected topics. The course content will be selected to be closely related to the topic of the student's thesis.

BO726: Special Topics in Plant Physiology (II)

This course deals with recent special topics in plant physiology, that differ from those presented in Special Topics in Plant Physiology (I). In addition to the lectures given by the lecturer, student presentations and written assignments will be included to critically review and discuss the selected topics. The course content will be selected to be closely related to the topic of the student's thesis.

BO727: Advanced Bioremediation

This course introduces the concept of bioremediation where plants and microorganisms are used to combat environmental pollution with an introduction to drinking and irrigation water standards. The aim of one part of this module is to address the mechanisms by which hyper-accumulator plants

phytoremediate polluted waters and soils. Different examples of hyper-accumulator plants will be presented. A second part of the course covers the use of microorganisms in bioremediation. The interactions between metals and microorganisms, including discussions of metal toxicity, biosorption, biosensing and metal leaching/mining will be presented. A third part of the course will concentrate on the biotechnology of micro-algae and the bioremediation of polluted groundwater systems. The course will also deal with the role of genetic engineering of plants and microbes in developing new approached for bioremediation.

BO728: Plant Responses to Multiple Stresses

In their natural habitats, plants are rarely to be subjected to a single stress, especially under exaggerated global warming conditions. This course aims at providing students with up to date knowledge about the molecular mechanisms involved in plant responses to simultaneous combined environmental stresses, whether abiotic or biotic. Antagonistic and synergistic interactions will be discussed. Trails for the production of transgenic plants with improved resistance to combined stresses will be presented.

BO729: Advanced Topics in Plant Hormones

This course will provide advanced knowledge on the signaling roles of various plant hormones in orchestrating different molecular mechanisms involved in plant development and responses to external stimuli. The course will deal will a wide variety of hormones, including auxins, gibberellins (GA), abscisic acid (ABA), cytokinins (CK), salicylic acid (SA), ethylene (ET), jasmonates (JA), and brassinosteroids (BR).

BO730: Molecular Mechanisms of Plant Stress Tolerance

This course provides comprehensive knowledge and understanding of the molecular bases of various biotic and abiotic stresses. At the molecular level, the course will discuss the plant response to different pathogens (bacteria and fungi) and to different abiotic stresses including drought, extreme temperatures, salinity and heavy metal pollution. The course will make emphasis to the involvement of different stress signaling messengers in modulating expression of relevant genes to build adaptive responses to different environmental challenges. The studied signaling messengers will include plant phyto-hormones (ABA, SA, JA and Ethylene), reactive oxygen species, calcium etc. Examples for marker genes used in engineering stress resistant crop plants will be presented.

BO731: Advance Plant-microbe Interactions

The course aims at giving the participants detailed interdisciplinary understanding of the function of plant-microbe interactions in general, with emphasis on bacterial, fungal and viral plant-pathogens as well as mutual symbioses such as mycorrhiza. The application of the biological knowledge in disease control will also be covered, in particular disease resistance and biological control. Plant pathogen defense signaling pathways will be discussed. Trails for the production of transgenic disease resistant plants will be presented. The precise content of the course will reflect the interests and needs of the participating students. Recent relevant publications within plant and microbial physiology, biochemistry, ecology, microbiology, molecular biology and pathology will be evaluated and discussed.

BO732: Plant Cell Signaling (2-0-2)

The growth, development, and environmental responses of even the simplest microorganism are determined by the programmed expression of its genes. Among multicellular organisms, turning genes

on (gene expression) or off alters a cell's complement of enzymes and structural proteins, allowing cells to differentiate and respond properly to the surrounding environment. In this course, students will be exposed to the discussion of various aspects of cell signaling including the control layer of cell signaling and modifications in protein folding and binding mediating cell signaling. Importantly, the course will make an emphasis on the two-component signaling systems, and on signaling events regulating gene expression in eukaryotes and prokaryotes. The course will discuss various aspects of the biotic and abiotic stress signaling in plants with an emphasis on the roles of plant hormones. Students will be, also, exposed to various signal transduction protocols applied in constructing cell signaling networks.

BO733: Molecular Biology and Genetic Engineering

This course gives an opportunity to provide the students with up to date and comprehensive concepts underlying the different molecular biology methods, including polymerase chain reaction (PCR), microarrays and RNA sequencing technologies. Throughout the course, students will be well-informed about how these methods are applied in different approaches of biotechnology. Also, this course will deal with advanced developments in method and approaches of genetic engineering including gene cloning and gene transfer, genetic libraries and production of genetically modified crops.

BO734: Nanomaterials and Plant Protection

This course considers the application of the newly emerging science of nanotechnology and its principles, concepts and tools. The working principles of some important apparatus such as atomic force microscopy will be described and its cellular and molecular applications will be taught. In addition, the possible biological applications of carbon nano-tubes, quantum dots, and the rapidly developing techniques of DNA chips will be discussed. The module will also consider single molecular manipulation techniques, particularly those concerning DNA and proteins. This course will be continuously updated to include new discoveries and applications of nano-techniques in biological sciences.

BO735: Advanced Plant Biochemistry

This course aims to provide students with advanced knowledge on the biochemical and molecular bases of the metabolism of carbohydrates, amino acids, organic acids, fatty acids and sugars. An emphasis will be given to the molecular and signaling pathways involved in these processes.

BO736: Seminar Series in Plant Physiology (0-3-2)

This course provides a forum in which students present the results of their research in a formal seminar. Also, students will prepare presentations on research papers related to their research topic (thesis). All students are expected to attend regularly.

BO737: Current Issues in Plant Ecology I

Several courses covering the world's current environmental issues as climate change, Universe Phenomena, Natural crises, different land uses, and other recent environmental issues.

BO738: Current Topics in Plant Ecology II

Several courses covering the world's current environmental issues as climate change, Universe Phenomena, Natural crises, different land uses, and other recent environmental issues.

BO739: Plant invasion

Introduction, Principles, Invisibility of agriculture and natural ecosystems, Evolution of invasive plants, Invasive plant management approaches, methods and tools, Systems approaches for invasive plant management, Case studies on some invasive plants in Egypt.

BO740: Seed Ecology

Introduction, seed characterization, Geographical adaptation of seeds, Seed dormancy and seed environment, soil seed bank, seed dispersal, Problems of seed storage, interacting effects of seed vigor and environment on seedling establishment, Tetrazolium staining for assessing seed quality, Imbibition process, Rate of germination, establishing of seedlings in a changeable environment, Seed-soil system, Mechanization of seed sowing.

BO741: Ecological modeling

Introduction (What is a model? Why do we need models?, Models as a management tool, Models as a research tool. Modeler's toolkit), Model formulation (Conceptual model, Mathematical formulations, Formulation of chemical reactions, Enzymatic reactions, Basic formulation of ecological interactions, Coupled model equations, Model simplifications, Impact of physical conditions), Concepts of modelling (Modelling elements, Modelling procedure, Verification, Sensitivity analysis, Calibration, Validation and assessment of the model uncertainty, Model classes, Selection of model complexity and structure, Parameter estimation), Types of Models (Modelling population dynamics, Steady-state models, Dynamic biogeochemical models, Ecotoxicological models, Individual-based models, Structurally dynamic models, Spatial modelling).

BO742: Ecosystem Services

Introduction, defining ecosystems services, provisioning services, regulating services, Cultural services, Biodiversity and ecosystem services, developing mechanisms for managing ecosystem services, Payment for the ecosystem services, Summary and conclusions.

BO743: Primary production and nutrient budget

Introduction, Ecosystem concept and modeling, Definitions, concepts and units, Measurement of the above-ground standing crop, Litter production, Decomposition and accumulation of litter, Roots and organic matter, Nutrient inputs and losses, Energy budget, Measurement of caloric contents and values.

BO744: Environmental pollution

Introduction to the atmosphere, the endangered global atmosphere, food chains and webs, Nature and mitigation of air pollution, Nature and mitigation of soil and water pollution, Noise pollution, food pollution, Current status of the environmental pollution in Egypt with emphasis on waste pollution.

BO745: Biofertilizers

This course deals with identification of biofertilizers, types of fertilizers, the applications of Plants and microorganisms (e.g. green algae) in the treatment of soil acting as biofertilizers.

BO746: Conservation of plant genetic resources

Endangered and extinct species (genetics and extinction), Genetic diversity, Evolutionary genetics of natural populations, Genetic consequences of small population size, Taxonomy in conservation biology, Genetic management of endangered species, Captive breeding and reintroduction.

BO747: Plant Aquatic ecology

The course covers the physical, chemical, hydrological and ecological processes and their significance for aquatic ecosystem structure and function. Implications of element dynamics and stoichiometry of productivity initiatives and the importance of trophic interactions and the size structure of the population and community dynamics. This course will present an extended theory on the effects of size-structured interactions on food web dynamics, the impact of cross-ecosystem migrations and habitat coupling on food webs, behavioral dependent effects on food web dynamics and colonization processes and effects on species distributions in aquatic environments.

BO748: Weed Biocontrol

This course covers the identification of weeds, types of weeds, threats of weeds in agriculture, the applications of allelopathic Plants and microorganisms in the treatment of weeds associated with strategic crops.

BO749: IUCN Assessment Criteria

This course covers the introduction and identification of IUCN and its role in biological conservation, IUCN Red list, IUCN Red list Assessments, IUCN categories and criteria, Mapping standards, and Regional and Global IUCN Red list Assessment. Assessment of the threatened plants based on IUCN criteria, some studies will be explained for the assessment of the Egyptian threatened plant.

BO750: Plant Indicators

This course covers introduction to define plant indicators: characteristics, types, and physiological changes, use of plant indicators as an index to site quality, Plants as soil indicators, Factors affecting plant indicators, weeds as indicator plants, Indicator plants as a tool for mineral perspective, Urban-environmental indicators, Plants as indicators of air quality, some case studies.

BO751: Current Topics in Biotechnology I

This course deals with current research in biotechnology critically reviewed and discussed through a combination of lecturing, student presentations and written assignments. The course should emphasize on topics related to the approved topic of the student's PhD thesis.

BO752: Current Topics in Biotechnology II

This course deals with current research in biotechnology critically reviewed and discussed through a combination of lecturing, student presentations and written assignments. The course should emphasize on topics related to the approved topic of the student's PhD thesis.

BO753: Enzyme Biotechnology

This course entails understanding of the principles of industrial large scale production of enzymes (techniques in fermentations). Large-scale extraction and purification – a short review of microbial physiology and genetics. A review of general metabolic pathways, control and application in industrial processes. Secondary metabolism. Continuous culture methods: principles and applications. Industria fermentations (chemostat and its applications in industrial fermentation). Principles and design of immobilized- enzyme reactors. Characteristics of free versus immobilized enzymes. Immobilized coenzymes and cells. Enzyme utilization in industrial processes.

BO754: Advanced Bioinformatics

This course provides an in-depth exploration of bioinformatics analysis of genomic data and the different approaches to mapping and aligning genome sequence data. Students will also learn about programming and scripting along with techniques for the detection and analysis of genomic changes. First part: the algorithms perspective will include Gibbs sampling and EM, HMM structure search, duration modeling and semi-Markov models, pairwise HMMs, interpolated Markov models and back-off methods, tries and suffix trees, sparse dynamic programming, Markov random fields, stochastic context free grammars, Bayesian networks, branch and bound search, conditional random fields. The second part: application perspective will include modeling of motifs and cis-regulatory modules, identification of transcription factor binding sites, gene finding, transcriptome quantification and assembly, RNA sequence and structure modeling, modeling biological sequence evolution, large-scale and whole-genome sequence alignment, modeling the evolution of cellular networks, genotype analysis and association studies, protein structure prediction.

BO755: Genomics, Proteomics and Metabolomics (OMICS)

To understand how technologies in genomics, proteomics and metabolomics applications are used to unravel the biology of life. To understand the basic principles analytical techniques in support of genomics, proteomics, metabolomics and data sciences. To gain insight in the advantages and limitations of omics-based experiments. To appreciate the surplus value of combining data from different omics-applications as a systems approach. To provide the basis for gaining insight in bioinformatics and computational genomics

BO756: Advanced Genetic Engineering and Epigenetics

First part: it will cover 3 major components: 1) techniques used in the generation of recombinant molecules and production of genetically modified organisms, 2) application of recombinant technology to diagnostics and therapeutics and 3) regulation of gene expression. The discussion of potential ethical concerns of genome manipulations will also be included in the course. Second part: Irregular patterns of inheritance that cannot be accounted for by changes in DNA sequence are often caused by epigenetic mechanisms. This part of the course will provide a rigorous foundation in epigenetics and epigenomics. This part will emphasize various epigenetics process, how the epigenetic status of the genome forms and maintains, role of epigenetic processes in gene regulation, its involvement in disease development, therapies and recent advances in assessing epigenetic changes of the genome. The course will include a discussion of the histone code, chromatin associated proteins, the formation and maintenance of heterochromatin, experimental methods, and model organisms.

BO757: Bioprocess Engineering and Fermentation Technology

After completion of this course, student will be able to Designing of bioreactors and control necessary for maximizing production. Select and optimize media for maximum production of microbial metabolites. Designing of protocols for strain improvement and separation of molecules after fermentation process. Assess power requirements in bioreactors, modeling of bioprocesses, traditional and new concepts in bioprocess monitoring, and the biological basis for industrial fermentations and cell cultures.

BO758: Advanced Clinical Biochemistry

Discuss advanced principles of clinical chemistry; principles of specialized analytical techniques used in the clinical biochemistry laboratory; proteins in body fluids; cardiac disorders and biomarkers; hormone actions and control of hormone secretions; quality assurance; functional testing of thyroid and adrenal hormones; lipoproteins and lipoproteinaemias; therapeutic drug monitoring, point of care testing, emergency pathology.

BO759: Stem Cell Technology and Regenerative Medicines

Stem cell and regenerative medicine is at the forefront of future therapies to repair disease and damaged organs. This course aims to provide students with in-depth knowledge and critical understanding of essential concepts in stem cell biology, tissue repair/tissue engineering and regenerative medicine, model organisms, along with aspects of molecular medicine.

BO760: Systems Biology and Synthetic Biology

This course provides an introduction to cellular and population-level systems biology with an emphasis on synthetic biology, modeling of genetic networks, cell-cell interactions, and evolutionary dynamics. The course topics will be extended to study cellular systems including genetic switches and oscillators, network motifs, genetic network evolution, and cellular decision-making. Population-level systems include models of pattern formation, cell-cell communication, and evolutionary systems biology.

BO761: Environmental Biotechnology

This course aims to introduce and elaborate the fundamental concepts and applications of biotechnology in all environmental aspects including its protection, restoration and sustainability.

BO762: Cell Signaling and Stress Responses

The basic molecular mechanism of signal transduction pathways will be discussed related to cell growth and stress systems. There will be an emphasis on specific categories of signaling components such as cell receptors, G-proteins, MAP kinases, ROS, growth and stress hormones. Students will read the literature and give presentations. Topics include the pathways by which cells respond to extracellular signals such as growth factors and the mechanisms by which extracellular signals are translated into alterations in the cell cycle, morphology and differentiation state. For stress pathways, we will discuss how cells respond to survive the stress or induce their own death. In many cases these pathways will be related to diseases.

BO763: Advanced Microbial Biotechnology

This course will provide students with an overview of how microbes (e.g. bacteria, viruses and fungi) are manipulated to solve practical problems through biotechnology. Topics include basics in microbial life, ecology and metabolism, methods used in microbial technology, industrial microbiology, microbes in drug development, interactions between microbes, plants and animals; food microbiology, the gut microbiota, metagenomics and others.

BO764: Advanced Algal Biotechnology

In this course, we will cover how synthetic biology, genetic engineering, and metabolic engineering is used in algae biotechnology, and also examine the current state of algae biotechnology research and tools. Also, this course gives an opportunity to explore the fundamental uses and economic importance of algae with reference to its application in food, industry, agriculture, pharmacy and medicine.

BO765: Selected Topics in Microbiology (I)

Subjects within microbiology are going to be reviewed on the idea of selected scientific articles and / or book chapters. During this way, the student will gain experience in both reading and extracting knowledge from articles that address the most recent research. The curriculum is adapted to the interests and desires, and can normally vary from Semester to Semester. A part of the literature shall be submitted by the students in weekly discussion sessions with the course coordinator.

BO766: Selected Topics in Microbiology (II)

The course focuses on selected topics in microbiology without prior courses. Directed readings addressed current research, and up to date trends and discoveries in selected areas of microbiology in an exceedingly seminar format, emphasizing discussion and demanding thinking. Minor investigative problems are conducted with the advice and guidance of the staff members.

BO767: Applied Microbiology

The objective of this course is to provide a perspective of how bacteria and fungi are used for the benefit of humans and how these technologies have been developed. The course gives an overview on the utilization and application of bacteria and fungi in different products and processes, Illustrates the role of bacteria and fungi in food processing, beverage fermentations, biofuels, environmental biotechnology, sewage treatment, chemical and pharmaceutical industries.

BO768: Microbial Biotechnology

This course gives an opportunity to trains the students of microbiology in the experimental design of a recombinant DNA experiment, appreciate the problems that may arise from the use of this technology, and enable students to analyze and interpret molecular biological experimental data and draw sensible conclusions from the data.

BO769: Extreme and Beneficial Bacteria

This course provides a general outlook on the different extreme habitats of microorganisms that differ from the commonly known microorganisms. The course also describes the different mechanisms of tolerance of the extreme microorganisms to these harsh habitats. It also provides the identification, characterization and different applications of these microorganisms in medical and environmental fields.

BO770: Microbial Quality Control

This course deal with training report on microbiological quality Analysis of Drinking water and Food. The ways used to control the microbial contamination and its deterioration. It gives information about aims and objective and overview of the organization. Thermal processing and its calculation. How microorganisms can used as probiotics. It gives information about public health aspects hygiene and sanitary regulations of eating establishments. The laws and Regulations governing quality and safety.

BO771: Molecular Biology and Genetic Engineering

The course gives an opportunity to understand microbial genes, genomes, and gene expression which is essential for understanding the biology and evolution of microorganisms and their interactions with the environment. Moreover, microbial genetics is essential for understanding molecular biological studies, the manipulation of eukaryotic organisms, and for practical applications (biotechnology) in diverse areas of life sciences. Biology and microbial genetics are now in an exciting era of “genomics” and

"post-genomics." Complete genome sequences (genetic blueprints) are being solved at astonishing rates and these hold enormous potential for expanding our understanding of life. In this course, we will discuss the structure, function, expression, and evolution of microbial genes and methods for their study and manipulation. Topics include microbial genomes and their evolution; gene discovery, identification, and mapping; mutation; DNA repair; gene transfer among organisms; plasmids; transposable elements; genetic recombination; and gene regulation. We will also discuss molecular genetic strategies or concepts including gene cloning, polymerase chain reaction (PCR) and quantitative PCR, hybridization techniques, microarrays, 'proteomics,' 'metabolomics,' uses of gene expression, directed mutagenesis, gene fusions, 'reporters,' probes, and emerging technologies such as 'Next Generation' DNA sequencing strategies.

BO772: Molecular Plant-Microbe Interactions

This course deal with new strategy that explain the mechanism of microbial invasion of plant body; different mechanisms of host plant resistance against the microbial diseases(even fungal ,bacterial and viral).It is also aims to study the detailed mechanisms of different chemical ,physical and biological control methods.

BO773: Microbial Secondary Metabolites

Secondary metabolites for human and animal health. The course will provide information about different types of secondary metabolites such as antibiotics, pigments, growth hormones, antitumor agents, and others. Also, it will provide the students with the understanding of the factors that could affect secondary metabolites production besides their mechanism of action. In addition, the economic importance and the different biotechnology applications of secondary metabolites such as medicine, industry, agriculture, and others.

BO774: Environmental Microbiology

Environmental microbiology (terrestrial, aquatic, aero and extreme), the functional diversity of microorganisms in the environment in relation to human welfare and ecosystem health, microbial interactions with pollutants in the environment and the fate of microbial pathogens in the environment. microbial environments, detection of their activities in the environment, microbial biogeochemistry (microbial metabolic activity lies in the heart of the myriad of interactions between the environment and microorganisms that shape the dynamics of ecosystems), bioremediation and water quality.

BO775: Microbial Enzyme Biotechnology

This course concerns with the different metabolic enzymes produced by different microorganisms and their application in different medical or industrial technologies. Students will gain the practical skills to isolate the enzyme producing microorganisms from different sources. They will also learn and practice the extraction, characterizing and identification of different microbial enzymes.

BO776: Technology of Microbial Mass Production

Advancing mass production to the level of economic feasibility is critical. This course educates students further development of mass production from microorganisms, so new technologies can compete in the open market. It is also important for teaching beneficial microorganisms mass production and technologies for other uses, including for study and application in biotechnology and biomedical research.

سادساً: قسم علم الحيوان

أ. برامج الدبلوم في علم الحيوان:

برنامج دبلوم الدراسات العليا في التحاليل البيولوجية المعملية

Laboratory Biological Analyses Diploma

First Semester

Code	Course Title		Hours/Week		
			Lec.	Prac.	Cred.
Obligatory: 8 Credits					
ZO501	Biological Fluids	السوائل البيولوجية	2	-	2
ZO503	Toxicology & Scientific instruments	علم السموم و الأجهزة العلمية	1	2	2
ZO505	Blood chemistry	كيمياء الدم	1	2	2
ZO507	Histological preparations	التحضيرات النسيجية	1	2	2
Optional: Select 4 Credits					
ZO509	Biological analyses	التحاليل البيولوجية	1	2	2
ZO511	Laboratory molecular biology	البيولوجيا الجزيئية و المعملية	1	2	2
ZO513	Computer and statistical analyses	الحاسب الآلي و التحليلات الإحصائية	2	-	2
Total Credits			**12**		

Second Semester

Code	Preq.	Course Title		Hours/Week		
				Lec.	Prac.	Cred.
Obligatory: 8 Credits						
ZO502	-	Parasitology	علم الطفيليات	1	2	2
ZO504	-	Pathology	علم الأمراض	1	2	2
ZO506	-	Immunology	علم المناعة	1	2	2
ZO508	-	Tissue culture	زراعة الأنسجة	1	2	2
Optional: Select 4 Credits						
ZO510	-	Bioethics and related laws	أخلاقيات علم الأحياء والقوانين ذات الصلة	2	-	2
ZO512	-	Microbiology	علم الميكروبات الدقيقة	1	2	2
ZO514	-	Bacteriology	علم البكتريا	1	2	2
Total Credits				**12**		

توصيف مقررات الدبلوم

ZO501: Biological Fluids

This course will introduce the classification of biological fluid and sweat, Diffusion – osmosis - cell water relationship, Cellular transport, facilitated diffusion, active transport, Suspension – colloid, Specific water characters to adapt life, Source of water supply and water loss. This course will help the students to know the origin, components and vessels of Lymph, Lymph circulation and lymphoid organs, Low affecting passage of water, viscosity, enzymes, urine and semen analysis and use of radioactive isotope in biological fluid estimations.

ZO502: Parasitology

This course presents definitions of parasitological items, types and hosts. General characteristics, habitat, distribution, morphology, anatomy, life cycle, diagnostic methods, infection, pathogenic effects, control, treatment and epidemiology of phyla: Platyhelminthes, Nemathelminthes and parasitic protozoa are covered. Important examples in these phyla will be taught.

ZO503: Toxicology & Scientific instruments

The principal goal of this course is to know the introduction on toxicology and its relationship with other sciences, types of toxicology, Toxicity and types of toxicity, Toxins and types of toxins and the factors which affect the toxicity. This course will teach the students toxicology units, general management of a case of poisoning. The students will gain the skills to learn how to measure toxicants and toxicity and the application of toxicology and how to regulate, protect from toxicology and Published Scientific Experimental work in Toxicology. This course will teach the students the Medical Laboratory Technology, Safety and its Rules. Students will explore the requirements of the Sterilization and disinfection of Laboratory instruments, the Laboratory instruments and equipment such as Balances, Centrifuges, Refrigerators, Ovens, Water baths, Incubators, Microscope, Automated analyzers, Spectro-Colorimeter (photometer). It will provide the students the skills to learn important and applicable techniques such as Agarose gel electrophoresis, SDS PAGE gel electrophoresis, Flow cytometry and DNA analysis.

ZO504: Pathology

This course deals with the investigation of various pathological processes. These mechanisms are prevalent in all tissue-cell pathology. Attention is paid to how cells adapt, the carcinogenesis process, the inflammatory response, how tissue heals, immunology, infectious diseases, and cellular level accumulation with a metabolic disorder.

ZO505: Blood chemistry

This course will attempt to take a broad view on using biochemical tests in clinical medicine. It will help the students to teach how to measure CBC and RBCs indices, liver physiology and its function tests, Kidney physiology and renal function tests. The students will know the lipids and lipoprotein, disorders of carbohydrate metabolism, biochemical markers of cardiac injuries, inflammatory and tumor markers.

ZO506: Immunology

The course on immunology is intended to make the student aware of the types of immunity, and biochemical mechanisms involved in immune responses and immune-mediated diseases. The aim of this course is study of the molecular and cellular interactions and principles of the immune system. Topics include immune system development, humoral & cell-mediated immunity, disease and treatments involving immunization, immunodeficiency, and autoimmunity.

ZO507: Histological preparations

This course provides an introduction to different types of human tissues and how to prepare histological and/or histopathological slides in the laboratory to be examined under the microscope. The course will cover the structure and function of epithelial, nervous, muscular, and connective tissues. The course will provide how to prepare wax and fresh frozen tissue sections to examine the different types of lipids, carbohydrates and protein content of disease and normal human tissues.

ZO508: Tissue culture

The course should provide students with the knowledge needed to work with cells in a laboratory setting and explain how adherent and suspension cells grow in the lab. The student should be able to work in this with a good sterilization technique - account for different preventive measures to avoid contamination of cell cultures and how a contaminated cell culture may be treated - account for different cell-culture media and its components- explain the concept of transformation- be able to apply basic cell-culture techniques, such as calculation and harvesting of cells.

ZO509: Biological analyses

This course will provide the students with how to know the definition, components and media of environmental health and environmental risk assessment. The students will understand the air quality, air pollution, water and health, water pollution, water purification and water quality standards. The students will gain some skills and knowledge of food health, food hygiene and safety, soil environment and health, wastes and effect on health, waste disposal and management, housing and health, standards of the healthy house, environmental health behavior, environmental sanitation. The students will apply by analyzing Urine: Basic renal physiology, macroscopic and microscopic analysis of urine, renal pathology, and disease correlations.

ZO510: Bioethics and related laws

Bioethics are concerned with the ethical questions that arise in the relationships among life sciences, biotechnology, medicine and medical ethics, politics, law, theology and philosophy. This course will explore the responsible conduct of science with a focus on ethical issues in biological research that uses various designs, with a wide variety of special populations, and in different types of settings, involving human participants. The student will gain familiarity with the terminology, resources, and major frameworks of ethical analysis in life science ethics.

ZO511: Laboratory molecular biology

This course focuses on the structure and function of biologically important molecules, giving you a range of theoretical knowledge and practical lab skills. Students will learn about DNA, RNA and proteins and the molecular events that govern cell function while exploring the relevant aspects of biochemistry, genetics and cell biology. Laboratory exercises emphasize current techniques in molecular biology such as molecular cloning, blotting, PCR, and assays of gene expression.

ZO512: Microbiology

This course focuses on how to collect and handle different pathological specimens, identification and classification of microbes with emphasis on Gram-positive and Gram-negative bacteria. Other points related to the role of pathogenic bacteria in causing a disease, microbial pathogenicity and mechanism of virulence are also covered. Practices help students to have skills in handling various clinical specimens, methods for evaluation and monitoring microbial disease, using instruments following quality assurance practices and safety measures and performing antimicrobial sensitivity tests.

ZO513: Computer and statistical analyses

This course is designed to enable students to acquire the skills of data analysis for life sciences. Students will learn the basic statistical concepts, gain the tools to apply common statistical methods, analyze and interpret life sciences data. The module will focus on computer-aided data analysis programs as Excel and SPSS necessary for presenting and analyzing biological data.

ZO514: Bacteriology

This course will deliver students the basic and applied principles of diagnosis of pathogenic bacteria and classification of bacteria using Gram staining, physiology, nutrition and growth of microorganisms, control of microbial growth. Techniques use bacteria as a production unit for metabolites, enzymes, immune acid, alcohol, antibiotics and organic acids are also covered. Other topics such as fermentation and downstream processing and biotransformation are relevant.

ب. برامج الماجستير في علم الحيوان:

1. برنامج الماجستير في العلوم في علم الخلية والأنسجة والوراثة

Cell Biology, Histology and Genetics

First Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 8 Credits				
ZO601	Molecular Cell Biology علم الخلية الجزيئي	2	-	2
ZO603	Advanced Histology علم أنسجة متطور	1	2	2
ZO605	Histochemistry & Immunohistochemistry كيمياء المناعة والأنسجة	1	2	2
ZO607	Principles of Toxicology أساسيات علم السموم	1	2	2
Optional: Select 4 Credits				
ZO609	Immunology علم المناعة	1	2	2
ZO611	Experimental Animal Pathology & Oncogenesis علم الأمراض العملي وتكوين الأو رام	1	2	2
ZO613	IPR, Biosafety & Bioethics حقوق الملكية الفكرية والأمان الحيوي والقيم الحيوية	2	-	2
ZO615	Biostatistics إحصاء حيوي	1	2	2
Total Credits		**12**		

Second Semester

Code	Preq.	Course Title	Hours/Week		
			Lec.	Prac.	Cred.
Obligatory: 8 Credits					
ZO602	-	Genetic Engineering & Biotechnology الهندسة الوراثية والتقنية الحيوية	1	2	2
ZO604	-	Functional Histology علم الأنسجة الوظيفي	1	2	2
ZO606	-	Animal Cell & Tissue Culture Techniques تقنيات زراعة الخلايا والأنسجة الحيوانية	2	-	2
ZO608	-	Histological Basis of Endocrinology الأسس النسيجية لعلم الغدد الصماء	1	2	2
Optional: Select 4 Credits					
ZO610	-	Biochemistry and Metabolism الكيمياء الحيوية والأيض	1	2	2
ZO612	-	Introduction to Bioinformatics مقدمة المعلوماتية الحيوية	1	2	2
ZO614	-	Gene Regulation & Epigenetics تنظيم التعبير الجيني وعلم الوراثة اللاجيني	2	-	2
ZO616	-	Scientific Writing & Presentation الكتابة والعروض العلمية	2	-	2
Total Credits			**12**		

2. برنامج الماجستير في العلوم في الفقاريات: (Vertebrates)

First Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 8 Credits				
ZO617	Advanced Vertebrate Comparative Anatomy 1 تشريح مقارن فقاريات متقدم 1	1	2	2
ZO619	Advanced Vertebrate Embryology 1 أجنة فقاريات متقدم 1	1	2	2
ZO621	Vertebrate biodiversity 1 تنوع حيوى فقاريات 1	1	2	2
ZO623	Vertebrate Evolution تطور فقاريات	2	-	2
Optional: Select 4 Credits				
ZO625	Transgenic animals (Methods Application) حيوانات المعدلة وراثيا (طرق وتطبيقات)	2	-	2
ZO627	Vertebrate Samples Preparation 1 طرق تحضير عينات الفقاريات 1	1	2	2
ZO629	Molecular Biology of Vertebrate 1 بيولوجيا جزيئيه 1	1	2	2
ZO631	Histopathology أمراض انسجه	1	2	2
Total Credits		**12**		

Second Semester

Code	Preq.	Course Title	Hours/Week		
			Lec.	Prac.	Cred.
Obligatory: 8 Credits					
ZO618	-	Advanced Vertebrate Comparative Anatomy 2 تشريح مقارن فقاريات متقدم 2	2	-	2
ZO620	-	Advanced Vertebrate Embryology 2 أجنة فقاريات متقدم 2	2	-	2
ZO622	-	Stem Cell Biology بيولوجيا الخلايا الجذعية	2	-	2
ZO624	-	Vertebrate Biodiversity 2 تنوع حيوى فقاريات 2	1	2	2
Optional: Select 4 Credits					
ZO626	-	Molecular Biology 2 بيولوجيا جزيئيه 2	1	2	2
ZO628	-	Principles of Bioinformatics الأساسيات المعلوماتية الحيوية	1	2	2
ZO630	-	Vertebrates Samples Preparation 2 طرق تحضير عينات الفقاريات 2	1	2	2
ZO616	-	Genetc Regulation of Vertebrate Development التنظيم الجينى لتطور الفقاريات	1	2	2
Total Credits			**12**		

3. برنامج الماجستير في العلوم في علم الفسيولوجي: (Physiology)

First Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 8 Credits				
ZO633	Molecular Enzymology علم الإنزيمات الجزيئى	2	-	2
ZO635	Endocrinology علم الغدد الصم	2	-	2
ZO637	Advanced Toxicology علم السموم المتقدم	2	-	2
ZO639	Cell physiology فسيولوجيا الخلية	2	-	2
Optional: Select 4 Credits				
ZO641	Histopathology أمراض أنسجة	2	-	2
ZO643	Fish Physiology فسيولوجيا أسماك	2	-	2
ZO645	Immunology علم المناعة	2	-	2
ZO615	Biostatistics إحصاء حيوي	1	2	2
Total Credits		**12**		

Second Semester

Code	Preq.	Course Title	Hours/Week		
			Lec.	Prac.	Cred.
Obligatory: 8 Credits					
ZO632	-	Physiology of Reproduction & Pregnancy فسيولوجيا التناسل والحمل	2	-	2
ZO634	-	Hematology and Blood Disorders علم الدم وأمراض الدم	2	-	2
ZO636	-	Lab. Techniques (blood indices - enzymes -hormones) تقنيات معملية (إختبارات الدم – انزيمات – هرمونات)	-	4	2
ZO638	-	Neurophysiology & Neurotransmitters الفسيولوجيا العصبية والنواقل العصبية	2	0	2
Optional: Select 4 Credits					
ZO640	-	Blood chemistry كيمياء الدم	2	-	2
ZO642	-	Immuno-histochemistry كيمياء الأنسجة المناعية	1	2	2
ZO644	-	Cell signaling إشارات خلوية	1	2	2
ZO616	-	Scientific writing and presentation الكتابة والعروض العلمية	1	2	2
Total Credits			**12**		

4. برنامج الماجستير في العلوم في علم البيئة: (Ecology)

First Semester

Code	Course Title		Hours/Week		
			Lec.	Prac.	Cred.
Obligatory: 8 Credits					
ZO647	Environmental Biology	البيولوجية البيئية	2	-	2
ZO649	Ecological Methodology	منهجية البحث البيئي	1	2	2
ZO651	Environmental Pollution	التلوث البيئي	2	-	2
ZO653	Soil Ecology	بيئة التربة	2	-	2
Optional: Select 4 Credits					
ZO655	Freshwater Ecology	بيئة المياه العذبة	2	-	2
ZO657	Environmental Impact Assessment	تقييم الأثر البيئي	2	-	2
ZO659	Solid Waste Management	إدارة المخلفات الصلبة	2	-	2
ZO615	Biostatistics	إحصاء حيوي	1	2	2
Total Credits			**12**		

Second Semester

Code	Preq.	Course Title		Hours/Week		
				Lec.	Prac.	Cred.
Obligatory: 8 Credits						
ZO646	-	Experimental Design & Field Skills	تصميم التجارب والمهارات الحقلية	1	2	2
ZO648	-	Principal of Environmental Biotechnology	أساسيات التقنية الحيوية البيئية	2	-	2
ZO650	-	Ecotoxicology & Environmental Safety	علم السموم والسلامة البيئية	2	-	2
ZO652	-	Environmental Analysis	التحاليل البيئية	1	2	2
Optional: Select 4 Credits						
ZO654	-	Marine Ecology	البيئة البحرية	2	-	2
ZO656	-	Desert Ecology	البيئة الصحرأو ية	2	-	2
ZO658	-	Environmental Monitoring	المراقبة البيئية	2	-	2
ZO616	-	Scientific Writing & Presentations	الكتابة والعروض العلمية	2	-	2
Total Credits				**12**		

5. برنامج الماجستير في العلوم في اللافقاريات (Invertebrates):

First Semester

Code	Course Title		Hours/Week		
			Lec.	Prac.	Cred.
Obligatory: 8 Credits					
ZO661	Invertebrate Natural products	المنتجات الطبيعية في اللافقاريات	2	-	2
ZO663	Invertebrate Phylogeny	علم تطور السلالات في اللافقاريات	2	-	2
ZO665	Comparative Anatomy of Invertebrates	تشريح مقارن في اللافقاريات	2	-	2
ZO667	Marine Biotechnology	التقنية الحيوية للكائنات الحيوانية البحرية	2	-	2
Optional: Select 4 Credits					
ZO669	Zooplankton & Benthos	العوالق الحيوانية وكائنات قاع البحر	2	-	2
ZO671	Advanced Embryology	علم أجنة متطور	2	-	2
ZO673	Invertebrate biomonitoring	المراقبة الحيوية للافقاريات	2	-	2
ZO615	Biostatistics	إحصاء حيوي	1	2	2
Total Credits			**12**		

Second Semester

Code	Preq.	Course Title		Hours/Week		
				Lec.	Prac.	Cred.
Obligatory: 8 Credits						
ZO660	-	Invertebrate structure & function	علم التركيب والوظيفة في اللافقاريات	1	2	2
ZO662	-	Invertebrate Embryology	علم الأجنة في اللافقاريات	2	-	2
ZO664	-	Invertebrate Immunity	علم المناعة في اللافقاريات	1	2	2
ZO666	-	Aquaculture Biotechnology	التقنية الحيوية والمزارع المائية	2	-	2
Optional: Select 4 Credits						
ZO668	-	Freshwater Ecosystem (Limnology)	النظم البيئية في المياه العذبة (علم البحيرات)	1	2	2
ZO670	-	Invertebrate Rearing Techniques	تقنيات التربية في اللافقاريات	-	4	2
ZO672	-	Malacology	علم الرخويات	2	-	2
ZO616	-	Scientific writing & presentations	الكتابة والعروض العلمية	1	2	2
Total Credits				**12**		

6. برنامج الماجستير في العلوم في علم المناعة والطفليات:(Immunology and Parasitology)

First Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 8 Credits				
ZO675	Cellular & Molecular Immunology علم المناعة الخلوية والجزيئية	2	-	2
ZO677	Immunology & Immunotherapeutic Techniques علم المناعة وتقنيات العلاج المناعي	2	-	2
ZO679	Protozoology & Helminthology علم الطفيليات وحيده الخلية والديدان الطفيلية	1	2	2
ZO681	Veterinary & Fisheries Parasitology علم الطفيليات البيطرية والسمكية	2	-	2
Optional: Select 4 Credits				
ZO683	Immunology, Vaccination, Immunization & Biotechnology علم المناعة والتطعيم والتحصين والتكنولوجيا الحيوية	2	-	2
ZO685	Immune disorders, Autoimmune Diseases & Immunodeficiency diseases اضطرابات المناعة وأمراض المناعة الذاتية وأمراض نقص المناعة	2	-	2
ZO687	Applied & Experimental Parasitology علم الطفيليات التطبيقي والتجريبي	1	2	2
ZO689	Vectors borne-diseases الأمراض المنقولة بواسطة النواقل	2	-	2
ZO615	Biostatistics إحصاء حيوي	2	-	2
Total Credits		**12**		

Second Semester

Code	Preq.	Course Title	Hours/Week		
			Lec.	Prac.	Cred.
Obligatory: 8 Credits					
ZO674	-	Immunology & Microbiology علم المناعة والميكروبيولوجى	2	-	2
ZO676	-	Clinical Immunology & Biochemistry علم المناعة السريرية والكيمياء الحيوية	2	-	2
ZO678	-	Epidemiology, Control & Food Safety علم الأو بئة والتحكم وسلامة الغذاء	1	2	2
ZO680	-	Immuno & diagnostic Parasitology علم مناعة وتشخيص الطفيليات	1	2	2
Optional: Select 4 Credits					
ZO682	-	Immunology & Biotechnology علم المناعة والتكنولوجيا الحيوية	2	-	2
ZO684	-	Tumor Immunology & Immunotherapy مناعة الأو رام والعلاج المناعي	2	-	2
ZO686		Modern trends in Parasitology الاتجاهات الحديثة في علم الطفيليات	2	-	2
ZO688	-	Zoonotic Diseases الأمراض الطفيلية حيوانية المنشأ	2	-	2
ZO616	-	Scientific writing & presentations الكتابة والعروض العلمية	1	2	2
Total Credits			**12**		

7. برنامج الماجستير في العلوم في علم الحشرات: (Entomology)

First Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 8 Credits				
ZO691	Advanced Insect Physiology فسيولوجيا الحشرات المتقدم	1	2	2
ZO693	Insect Vectors of Diseases ناقلات الأمراض من الحشرات	2	-	2
ZO695	Advanced Chemical Ecology of Insects بيئة كيميائية متقدمة في الحشرات	2	-	2
ZO697	Applications of Insecticides تطبيقات المبيدات الحشرية	1	2	2
Optional: Select 4 Credits				
ZO699	Forensic Entomology & Criminal Justice علم الحشرات الشرعي والعدالة الجنائية	2	-	2
ZO6101	Advanced Biological Control مكافحة بيولوجية متقدمة	1	2	2
ZO6103	Insect Immunity مناعة حشرات	1	2	2
ZO6105	Insect Diversity & Evolution التنوع والتطور في الحشرات	2	-	2
ZO615	Biostatistics إحصاء حيوي	1	2	2
Total Credits		**12**		

Second Semester

Code	Preq.	Course Title	Hours/Week		
			Lec.	Prac.	Cred.
Obligatory: 8 Credits					
ZO690	-	Plant Protection & Pest Management حماية النباتات وإدارة الأفات	2	-	2
ZO692	-	Insect Vector Control مكافحة الحشرات ناقلات المراض	1	2	2
ZO694	-	Insect Models & Research Techniques نماذج الحشرات في البحوث وتقنياتها	2	-	2
ZO696	-	Insect Population Ecology & Dynamics بيئة وديناميكا عشائر الحشرات	2	-	2
Optional: Select 4 Credits					
ZO698	-	Stored Grain Pest Control مكافحة أفات الحبوب المخزنة	2	-	2
ZO6100		Insect Taxonomy & Systematic تصنيف الحشرات والتقسيم	1	2	2
ZO6102	-	Apiculture & Sericulture تربية النحل ودود القز	2	-	2
ZO6104	-	Advanced Insect Hormones & Pheromones هورمونات وفروموناتالحشرات المتقدمة	2	-	2
ZO616	-	Scientific Writing & Presentations الكتابة والعروض العلمية	1	2	2
Total Credits			**12**		

ZO601: Molecular Cell Biology

This course will help students grasp the fundamental concepts of cell molecular biology, combining cell structure and function with the underlying molecular mechanism (s). Gene regulation, genomics, cell cycle management, protein synthesis, intracellular protein trafficking, and protein degradation and epigenetics in eukaryotic cells will be discussed. Many of these topics would be addressed in the sense of how disease is caused by defects in cellular processes.

ZO602: Genetic Engineering & Biotechnology

This course will broaden students' knowledge of genetic science and provide them with the background necessary to shape their own skills to expand understanding of genome research, gain a better understanding of the advantages and risks, and learn about the new research and technologies in genetic engineering and biotechnology. In addition, a detailed explanation of protocols required for isolation, cloning and expression of genes will be discussed. Formation of gene libraries in different bioassays, recombinant DNA technology, applications of genetic engineering in biotechnology for life and industrial aspects. Methods to produce different genetically modified organisms (GMOs). Characteristics and classes of industrial development and technology licensing and patents in life sciences and ethics will be viewed.

ZO603: Advanced Histology

This course focuses on the structure and function of cells comprising healthy tissues and organs. Students will learn to identify all major cell types and their interactions in the mammalian and human body. Students will identify and define the parenchymal and stromal components in a normal organ, various cell types that make up the organ, as well as their overall structure that determines the organ's morphology, identify organs that make up the integumentary, cardiovascular, respiratory, gastrointestinal, endocrine, male and female reproductive systems, as well as the urinary system and others, recognize and classify organs using tissue specimens at low and high magnifications, list the various staining techniques that are used to distinguish particular cell types within an organ.

ZO604: Functional Histology

Students will learn about the cellular structure of tissues and organs in mammals defined by functional histology. They will learn that tissue and organ structure is often linked to function, and examples of dysfunction caused by tissue damage are identified when they are of particular interest, describing the microscopic anatomy (histology) of the cells, tissues (epithelial, connective, muscle, nervous tissues) and organs of the major body systems (integumentary, endocrine, cardiovascular, immune, respiratory, digestive, urinary and reproductive systems and other) and relating them to their function. Through examining microscopic tissue parts or electron micrographs, students should understand how the cellular structure of each tissue or organ relates to its particular role in the body, and recognize major pathological conditions.

ZO605: Histochemistry & Immunohistochemistry

This course will teach students how to prepare and evaluate histochemical and immunohistochemical (IHC) slides using different techniques. Histochemistry techniques will include processes used in

pathology, development and normal animal tissues and organs. This includes connective tissue, carbohydrates, proteins, nucleic acids, amyloid, lipids, pigments, and minerals, neuroendocrine and central nervous systems, immune cells, enzymes, live infectious agents, traditional staining properties, and the staining process of cytoplasmic organelles and other. Procedures and terms relevant to IHC are also covered; various IHC techniques used, slide preparation procedures in IHC, epitope unmasking and retrieval, problems that occur during IHC procedures, IHC applications in medicine and research, methods for IHC evaluation.

ZO606: Animal Cell & Tissue Culture Techniques

This course is designed to introduce students to the fundamentals of animal cell and tissue culture as well as practical considerations. Tissue Culture's main priority will be working on culture maintenance on a regular basis. The importance of specialized techniques and applications, as well as investigative work, will be stressed. Introduces the method and mechanism of laboratory culturing of animal cells and cell lines. Routine maintenance and record-keeping are covered, as well as media planning, cryopreservation, and troubleshooting popular culture issues. This will maintain animal cell cultures and proven cell lines with high viability, avoiding contamination, proper documentation, perform supportive or episodic activities related to cell culture, such as media planning and evaluation, and rehabilitation, and cell growth and health assessment, recognize and solve problems that occur frequently in cell culture.

ZO607: Principles of Toxicology

This course gives an overview of toxicology's fundamental concepts. The fundamentals of exposure, uptake, and metabolism. Dose-response relationships, toxicokinetics, target toxicity, mechanisms of toxic action, toxicant identification, general concepts of toxicity testing, and antidote mechanisms of action are covered. The mechanisms and effects of chemical, biological, and physical agents on human health including nanomaterial toxicology, besides the emphasis on how environmental agents communicate with humans and animals to cause disease.

ZO608: Histological Basis of Endocrinology

The goal of this course is to explain and describe the cellular organization and histology of the major organs of the endocrine system. The morphology of endocrine glands such as hypophysis, thyroid, parathyroid, adrenal glands, pancreas, pineal gland and its relation to capillaries, cellular contents and function with special emphasis to histological changes during pathology. Also, organs with endocrine cell groups, like the ovary, testes, and the gastrointestinal tract will be emphasized.

ZO609: Immunology

Basic immunology, including cellular and molecular processes, is covered in this course, which reflects the human and mammalian immune system. The immune system's cells and tissues, antigen, immunoglobulins, and antibody diversity, innate and adaptive immunity's molecular mechanisms, the complement system, antigen presentation, cell-mediated effector responses, mucosal immunity and application techniques used for immunoassays.

ZO610: Biochemistry and Metabolism

This course was planned to give a vision on a working knowledge of core concepts in metabolic biochemistry and molecular biology with detailed examination of carbohydrate, lipid, protein, and nucleic acid metabolism, as well as the flow of biological knowledge in species. Animals will be studied for specific metabolic pathways and genetic information flow. The course includes signal transduction pathways, tissue specific metabolism and its control, enzyme specificity and regulation for key metabolic pathways, how the body responds to changes in energy demand, hormone action mechanisms.

ZO611: Experimental Animal Pathology & Oncogenesis

This course will study the pathological and underlying aspects during initiation of different diseases in experimental animals such as diabetes, ulcerative colitis, arthritis, cancer…etc. It will also discuss planning animal experiments for developing effective drugs in toxicology and oncology. It emphasizes the mechanism of chemical carcinogenesis and WHO classes for carcinogenic chemicals, carcinogenic agents and their cellular interactions and mode of induction, species and gender variations and susceptibility, mechanisms of radiation carcinogenesis, inoculation of tumor cells in experimental animals, viral oncogenesis, clonality and kinetics of tumor cell growth; initiation, promotion and progression mechanisms, role of proto-oncogenes, oncogenes, tumor suppressor genes and DNA repair.

ZO612: Introduction to Bioinformatics

This course gives students theoretical background and a working knowledge of the techniques employed in bioinformatics with currently available genomic and proteomic databases. The practical part will enable students to search and retrieve information from genomic and proteomic databases (e.g. GenBank, Swiss-Prot), and to analyze their search results using software available on the internet (e.g. BLAST, ClustalW), know how to compare and analyze biological sequences and how to interpret the results, to construct phylogenetic trees, to locate consensus sequences, gene open reading frames within biological sequences, familiar with the principles and applications of microarrays, have knowledge about elementary predictions of protein structure and function and elementary comparative genomic analyses.

ZO613: IPR, Biosafety & Bioethics

This course introduces principles of Intellectual Property Rights (IPR), Biosafety and Bioethics that provide a broad coverage of three areas of patenting. Students will be aware about the value of IPR in life and fosters a better understanding of the rights associated with IPR such as copyright, patent, trademarks, industrial designs, geographical indications and so on particularly for scientific research and industry. Biosafety and bioethical issues prevalent in modern society will be discussed; biosafety and risk assessment issues; regulatory framework for biosafety and bioethics; national biosafety policies, The Cartagena protocol on biosafety, WTO and other international agreements related to biosafety, Cross border movement of germplasm and GMO; risk management issues - containment.

ZO614: Gene Regulation & Epigenetics

This course introduces the concept of gene regulation in prokaryotes and eukaryotes and epigenetics. How genes function at molecular level; DNA structure and chromatin organization, gene structure, coding and noncoding RNAs, structure of mRNA, tRNA, rRNA, small interfering RNAs and micro RNAs, regulation through RNA processing and decay, alternative splicing. Regulation of gene

expression-Transcriptional control I & II, expression of lac operon activators and repressors & attenuation, antitermination. Epigenetics and how it regulates gene expression and heritable phenotypes without changes in the underlying DNA sequence. Mechanistic overview of epigenetics; DNA methylation, histone modifications, chromatin remodeling, and non-coding RNAs, as well as the key players that regulate these processes. Molecular techniques in epigenetics research. Finally, the epigenetic basis of developmental disorders, aging, environmental exposures, and relevant human diseases such as tumorigenesis, obesity, drug resistance and infections.

ZO615: Biostatics

This course is designed to enable students to acquire the skills of data analysis for life sciences. This course provides an introduction to selected important topics in biostatistical concepts and reasoning. This course provides a survey of data and data types, issues of power and sample size in study designs. Specific topics include tools for describing central tendency and variability in data; methods for performing inference on population means and proportions via sample data; statistical hypothesis testing and its application to group comparisons; regression and correlation. The module will also deal with multivariate analysis, and nonparametric techniques. While there are some formulae and computational elements to the course, the emphasis is on interpretation and concepts. The module will focus on computer-aided data analysis programs as Excel and SPSS necessary for presenting and analyzing biological data.

ZO616: Scientific Writing and Presentation

A course designed to give postgraduate students the skills necessary to write a thesis, and to prepare other professional materials for presentation or publication. Topics covered in this course include: searching the scientific literature; scientific writing style; writing postgraduate level papers, proposals, projects, and thesis components; preparing scientific presentations; presentation of data; using visual aids; and using word processing, spreadsheet, and presentation software.

ZO617: Advanced Vertebrate Comparative Anatomy 1

This course provides the study of similarities and differences in the anatomy of different vertebrate species. It is closely related to evolutionary biology and phylogeny.

ZO618: Advanced Vertebrate Comparative Anatomy 2

This course explores the anatomy and function of vertebrates with an emphasis on vertebrate evolution. Lectures cover topics such as the origin, anatomy, paleontology, and evolution of various vertebrate groups, with a focus on organ systems (such as the nervous, circulatory, and respiratory systems), life history, locomotion, behavior, and conservation. This course prepares students for advanced courses on the biology of fishes, amphibians and reptiles, birds, and mammals.

ZO619: Advanced Vertebrate Embryology 1

This course explores animal embryogenesis of Chick, mouse in a way that aims to foster cross-model work and ideas by presenting methods that can be applied across laboratories. Within these traditional model systems, new developments are presented, such as protocols for the analysis of cellular

membranes and intracellular signals, light-controlled manipulation of function, and the analysis of transcriptomic and proteomic data in the context of the embryo.

ZO620: Advanced Vertebrate Embryology 2

This course focuses on understanding the molecular mechanisms that orchestrate embryonic. This course introduces the most important families of molecules known to direct embryonic development development. Within these traditional model systems, new developments are presented, such as protocols for the analysis of cellular membranes and intracellular signals, light-controlled manipulation of function, and the analysis of transcriptomic and proteomic data in the context of the embryo.

ZO621: Vertebrate biodiversity 1

Vertebrate Biodiversity Course explores the diversity, evolution, adaptations, and ecology of vertebrates. The lectures and labs are coordinated as much as possible so that laboratory work expands upon information provided through lecture and reinforces an understanding of diversity and adaptation.

ZO622: Stem Cell Biology

Stem cell Biology is the study and understand how these unique cells (stem cells) differentiate into cells from all three embryonic germ layers as well as their renewability, or capacity to generate different organs.

ZO623: Vertebrate Evolution

Vertebrate Evolution is a course teaching a comprehensive overview of the origin of vertebrates. Students will explore the diversity of Palaeozoic lineages within a phylogenetic and evolutionary framework. This course examines the evolution of major vertebrate novelties including the origin of fins, jaws, and tetrapod limbs.

ZO624: Vertebrate Biodiversity 2

This course focuses on understanding the variability among living organisms from all sources, including terrestrial, marine, and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species, and of ecosystems.

ZO625: Transgenic animals (Methods Application)

Describes the methods used to insert foreign gene into genome. Such animals are most commonly created by the microinjection of DNA into the pronuclei of a fertilized egg which is subsequently implanted into the oviduct of a pseudopregnant surrogate mother.

ZO626 :Molecular Biology 2

Study of intracellular molecular processes. This course will provid new insights into the nature of genes and proteins and the relationship between them.

ZO627: Vertebrate Samples Preparation 1

Proper collection and preservation of tissues across vertebrate species is fundamental to establishing histology slides, cell cultures. Microscopic anatomy of the organ systems of vertebrates with an emphasis on histology essential to understanding drug effects on functional anatomy.

ZO628: Principles of Bioinformatics

This course will provide the necessary skills needed to perform large-scale analyses, for example assembly and annotation of genomes, analysis of gene expression and phylogenetic trees.

ZO629: Molecular biology of Vertebrate 1

The course will provide detailed analysis of the biochemical mechanisms that control the maintenance, expression, and evolution of prokaryotic and eukaryotic genomes. Topics covered in lecture and readings of primary literature will include: gene regulation, DNA replication, genetic recombination, RNA processing, and translation.

ZO630: Vertebrates Samples Preparation 2

Focusing on the study of microstructures with *Transmission electron*microscope and scanning electron microscope.

ZO631: Histopathology

It is the diagnosis and study of diseases of the tissues, and involves examining tissues and/or cells under a microscope. Histopathologists are responsible for making tissue diagnoses and helping clinicians to manage a patient's care.

ZO632: Physiology of reproduction and pregnancy

This course will establish knowledge of animal physiology and reproduction by examining the tissues, organs and cells that govern the life cycle. The course includes biology of sex and sexual differentiation, functional anatomy of male and female, reproduction and lactation, gametogenesis, neuroendocrine and endocrine hormones of reproduction and lactation, sex cycles, folliculogenesis, ovulation, spermatogenesis, fertilization, embryonic development, implantation, pregnancy, parturition, initiation of lactation and maintenance of the dry period, artificial control of reproduction and lactation.

ZO633: Molecular Enzymology

This course is to improve the understanding of enzymatic processes by studying the structure, physical, chemical and catalytic properties of enzymes, and to acquire knowledge about phylogenetic and ontogenetic development of tissue enzymes, enzyme topology and enzyme morphometric analysis. It is also provide students with understanding physiological classifications, mechanisms of secretion, specificity and extracellular distribution of cellular enzymes. Importance of enzymes in diagnosis and treatment should be studied. It also includes interaction between enzymes and coenzymes and prosthetic groups, as well as mechanisms of enzyme catalysis and regulation of enzyme activity. Catalytic strategies: protease, carbonic anhydrase, restriction enzymes, NMP kinases. Additionally, Kinetics of enzymatic reactions and metabolic relation between tissue and organs are studied.

ZO634: Hematology & Blood disorders

Hematology: The first part of this course introduces students to blood and its components specifically the formed cellular elements including erythrocytes, leukocytes and thrombocytes. It also provides the students with a foundation of the theory and principles of hematology in the clinical laboratory setting. Hematology theory and Lab include a review of general cell morphology with an emphasis on hematopoiesis and bone marrow evaluation. Hemostasis, thrombosis and disease of the coagulation system are discussed. The course introduces both manual and automated testing in the laboratory hematology. Hematological disorders: The second part of this course aims to study of diseases of the blood and bone marrow. It will cover the diagnosis and management of blood cell disorders, and disorders related to structure and function of hematopoiesis. The commonest groups of disorders are the leukemia (cancer of the white blood cells), and lymphomas (cancer of the lymphatic system). Students learn how to manage tests of anemia and thalassemia determination and deal with disorders of blood bleeding and clotting tests. This course includes lectures, practice and field training and cases description.

ZO635: Endocrinology

This course is designed to provide a broad *overview* of vertebrate *endocrinology*. *Course* topics will include the various classes of hormones, sources of hormones, production and synthesis of hormones, chemistry of hormones, receptors and target tissues, mechanisms of action and regulation, and methods used in *endocrine investigation*, the hormone biotechnology and use of synthetic or natural hormonal drugs. After the course, the student should be able to; describe the organization and structure of the endocrine glands and their hormones and their relation to other organ systems, allow students to integrate and better understand the functions of the other systems of the body, and to investigate the pathological conditions and diagnostic procedures associated with endocrine imbalance.

ZO636: Laboratory Techniques

The primary purpose of this laboratory practice is to provide a better understanding of the most important basics, techniques, and test procedures that are applied in routine physiology studies with emphasis on physiology of cell molecules. In the lab, students are trained on blood samples collection and withdrawing, complete blood count (CBC), ESR, blood film preparation and examination, bleeding tests examination and the interpretation of test results towards diagnosis of blood diseases and disorders. The basic principles of hematology instrumentation, the quality assurance and quality control measures used in evaluation are demonstrated. Practical lab studies include principles and methods of enzymatic analysis, collecting and analyzing enzyme kinetic and thermodynamic data. This practical course will provide students with lab skills for measuring enzymes in serum and homogenate through experiences with the suitable methods and bioassays. Elisa technique will be practiced to estimate serum level of pituitary, thyroid, adrenal and gonadal selected hormones. Students will learn how they can give interpretations on the obtained enzyme and hormone measures with reference to their medical importance. Instruction will be provided through lectures, handouts, demonstrations, lab exercises, homework assignments, readings and case studies (if any).

ZO637: Advanced Toxicology

This course presents advanced concepts of toxicology in the occupational environment, the principle types of toxins and their distributions in the body. It comprises analysis of target organs, adverse health

effects, and the systems/organs that are the targets of toxicants. It includes assessments of safety and risk of carcinogenic and non-carcinogenic chemicals. The toxicity study of various chemical and physical agents to organ systems and the developing concepts is concerning. This course will cover the study of the mechanisms of action of toxic chemicals as related to carcinogenic and non-carcinogenic effects and the application of that information to regulatory standards for the workplace and environment.

ZO638: Neurophysiology and Neurotransmitters

This course is intended to concern with physiology of the central nervous system with an emphasis on the cellular and molecular basis of signal transmission in the CNS responsible for fast communication. The study of this course is often using electrophysiological or molecular biological tools. Neurotransmitters part is the study of chemicals, including brain chemistry and other molecules such as psychopharmaceuticals and neuropeptides, which control and influence the physiology of the nervous system. Topics that will be addressed include: principles of electric current flow exploited by the nervous system; the basis of the resting potential of neurons; the structure and function of voltage-gated and neurotransmitter-gated ion channels; generation and propagation of action potentials; the physiology of fast synaptic communication. Factors (stimulant and inhibitants) affecting synaptic transmission within CNS will be investigated.

ZO639: Cell Physiology

In this course the basic concepts of physiology and the use of physiology knowledge in the field of molecular biology and genetics are covered. Specifically, it covered topics include homeostasis, cell membranes, membrane transport processes, transportation of the molecules between the organelles, protein synthesis, vesicular trafficking, endocytosis and exocytosis. This course is designed to explore the molecular mechanisms of cell biology as it pertains to mammalian physiology. Specific emphasis is placed on the molecular mechanisms of gene expression and genome function including the role of chromatin and non-coding RNA, translation, cell cycle and division, protein trafficking, cellular metabolism and cell signaling. Other topics include the specific function cellular organelles, DNA repair, mRNA processing and translation, the nuclear pore complex and shuttling between the cytoplasm and nucleus, cytoskeleton, protein trafficking between organelles and through the secretory pathway, lipid synthesis, electron transport, cell homeostasis and apoptosis, extracellular matrix, stem cell development and hematopoiesis, and cellular clocks.

ZO640: Blood chemistry

This course aiming to distinguish the relationship between specific homeostatic disturbances and measurable alterations in the composition of the blood. It acquires students to measure the amount of certain substances in the body, including electrolytes (such as sodium, potassium, and chloride), fats, proteins, glucose (sugar), and enzymes. Blood chemistry studies are used to help diagnose and monitor many conditions before, during, and after treatment. It describes the mechanisms associated with the control of acid-base balance and blood gases formation, regulation and elimination.

ZO641: Histopathology

This course provides an introduction to histopathology and outlines how the appearance of different tissues changes due to damage, inflammation, infection or degeneration and how microscopy can aid in

the diagnosis of disease. A part of this course describes basic mechanisms of cellular pathology, including cell injury, necrosis, and cellular alterations and cell adaptation (hypertrophy, atrophy, hyperplasia, metaplasia. The main objectives of this course are to: outline key features of a number of pathological processes, relate the histological appearance of affected tissues to the underlying pathology, recognize the histological appearance of a number of pathological tissues, and to understand how sections can be photographed, presented and reported.

ZO642: Immuno-histochemistry

IHC is an important application of monoclonal and polyclonal antibodies to determine the tissue distribution of an antigen of interest in health and disease**.** IHC stains are very useful in identifying & distinguishing different cell types in the diagnosis of cancer as benign or malignant, determine the stage and grade of a tumor, and identify the cell type and origin of a metastasis to find the site of the primary tumor. IHC methods are also being applied to confirm infectious agents in tissues by use of specific antibodies against microbial DNA or RNA, e.g. in cytomegalovirus, hepatitis B virus, hepatitis C virus, etc. IHC can also be used to determine the function of specific gene products in molecular biological processes such as development and apoptosis. *A*poptosis by caspase-3 or TUNEL, and proliferation by using anti- PCNA can be expressed by IHC. In immunity, different classes of lymphocytes can be distinguished according to their surface markers. All T lymphocytes express CD3 and CD5, and the two major subpopulations of helper T cells and cytotoxic T cells express CD4 and CD8. Therefore, a T cell lymphoma can be tracked in different tissues using these markers. Other markers like CD23, bcl-2, CD10, cyclinD1, CD15, CD30, ALK-1, CD138 may be used in various blood cancers or hematologic malignancies.

ZO643: Fish physiology

As the student have a basic understanding of physics and chemistry related to the mechanisms and environment, this course presents an introduction to physiological adaptations in fish in relation to their environment. An important part of the course relates to functional physiological regulatory mechanisms. The course is adapted to a focus of fish physiology. The course focuses on physiological processes in fish including, respiration, circulation, acid-base balance, osmoregulation and ionic regulation, saltification, endocrinology, swimming and buoyancy, sensory physiology, egg and larval physiology, digestion, energetics and growth, reproduction, immunology and adaptations to temperature.

ZO644: Cell signaling

By a variety of signal molecules, all cells receive and respond to signals from their surroundings, thereby integrating and coordinating the function of the many individual cells that make up organisms. Extracellular signaling usually entails the many steps; Introduction, types of signaling, types of receptors and other conserved functions, synthesis and release of the signaling molecule by the signaling cell, transport of the signal to the target cell, binding of the signal by a specific receptor leading to its activation, initiation of signal-transduction pathways, cell Signaling and apoptosis, relationships between signaling pathways.

ZO645: Immunology

This course covers the fundamental concepts of modern immunology emphasizing on the molecular and cellular elements of the immune system, and their basic function; the innate and adaptive immunity;

immune system development; humoral & cell-mediated immunity; the basic concepts underlying the mechanisms of innate and adaptive immunity; antibody and B and T-cell receptor structure and functions, cells and molecular mediators that regulate the immune response; modern techniques used in and influenced by immunology; clinical correlates disease, diagnosis and treatments; infectious diseases, allergy, immunization, autoimmunity, immunodeficiency, immunotherapy, transplantation and tumor immunity.

ZO646: Experimental Design and Field Skills

Experimental design and field skills in ecological and environmental studies is important for carrying out research projects. This course examines the current best practice techniques in experimental ecology. Topics covered, include the design and implementation of experiments, detection of environmental impacts. This course explains how to do field observations and record data using different field tools. Students will have the opportunity to apply these skills in the field and laboratory.

ZO647: Environmental Biology

This course examines the ways organisms, species, and communities influence, and are impacted by, natural and human-altered ecosystems. This course focuses on the relationships between organisms and their habitat. Waste management, wildlife management, resource management and environmental law. This course will provide students with a broad survey of environmental science with emphasis on scientific literacy, current events, global and international issues, and historic context. Conservation, pollution, energy and other contemporary ecological problems are just some of the topics which will be addressed.

ZO648: Principal of Environmental Biotechnology

Environmental biotechnology is the branch of biotechnology that addresses environmental problems, such as the removal of pollution, renewable energy generation or biomass production, by exploiting biological processes.

ZO649: Ecological Methodology

Students learn how to analyze hypothesis-centred ecological field research projects on animals, and their environment, with emphasis on the appropriate choice and application of statistical techniques for the analysis of ecological data. The study aims at providing the necessary statistical skills for the data analysis of MSc thesis projects and will enable the students to be able to understand and critically evaluate the analysis of ecological projects, such as described in scientific publications. This course deals with the choice and application of univariate and multivariate statistical techniques and tests, for the interpretation of ecological field data.

ZO650: Ecotoxicology and Environmental Safety.

Principles of toxicology focusing on fate and effects of chemicals in the environment. Topics include history of environmental toxicology; contaminant classification, source, fate, and effects; toxicokinetics; dose-response; major body system contaminant interactions; reproductive toxicology, mutagenesis, teratogeneses, and carcinogenesis; endocrine disruptors; bioaccumulation; toxicity testing; population to global ecological effects; risk assessment; environmental laws and policies.

ZO651: Environmental Pollution.

The course deals with the definition of pollution and pollutants, principles of environmental pollution and its relationship to the ecosystem, types of air, water, soil and food pollution, physical contaminants (heat, noise and radiation), ways of pollutant control, biological effects of pollutants; global and local pollutions. This course is designed to study types of pollutants including gases, chemicals petroleum, noise, light, global warming and radiation as well as pollutant flow and recycling, principles of environmental pollution such as air, water and soil, in addition to environmental factors and interactions between pollutants and their hazards on different ecosystems, population dynamics in different polluted ecosystems such as, waste dumps regions and sewage or industrial waste regions, desalination stations and safe disposal of pollutants.

ZO652: Environmental Analysis

Environmental Analysis is an interdisciplinary major focusing on the interaction between human and non-human components of the biosphere. The major applies approaches in the social sciences, arts and humanities, and natural sciences to understanding and solving environmental problems. Environmental Analysis offers an integrated, unifying perspective on life, as well as a program for creating positive change. The major prepares students for graduate work and careers in teaching, public policy and administration, law, environmental sciences, international affairs, environmental design, and the non-profit sector. Developing sustainable ways of living is one of the greatest challenges of our time. Resources for field research, community-based research, internships. This course covers the general topics on the analysis of pollutants in environmental matrices including the instrumentations, theory and techniques for their measurements. This course also consists of laboratory experiments.

ZO653: Soil Ecology

Soil ecology is the study of how soil organisms interact with other organisms and their environment, their influence on and response to numerous soil processes and properties form the basis for delivering essential ecosystem services. Some of the key processes we study in soil are nutrient cycling, soil aggregate formation, and biodiversity interactions. This course will introduce basic ecological concepts about soil biodiversity, decomposition, nutrient cycling, and plant-soil interactions

ZO654: Marine Ecology

The course gives a broad introduction in marine ecology. Important issues are eco-clines and marine biogeography; chemical-physical factors and the abiotic environment; biodiversity; phytoplankton, pigments and storage components; toxic microalga; photosynthesis; growth rate and respiration of microalgae; limiting and controlling factors of algal growth; heterotrophic plankton; grouping of plankton; functional plankton groups; feed uptake, metabolism and energetics; decomposition chain; trophic level, -transfers, and -efficiency; population dynamics in planktonic communities; global marine production; aquaculture and fisheries; carbon pump and climate, disturbing impacts on marine ecosystems, principles for conservation of marine ecosystems.

ZO655: Freshwater Ecology

The course covers properties of water and the significance of these properties for the structuring of plants and animals on the individual-, population- and community level. The course covers spatial and

temporal variation in natural ecosystems, including effects of human activity and climate change. Important topics include basic limnology and water quality, an overview over the most important groups of organisms, community structure, and control of communities through top-down (predator control) and bottom-up mechanisms (available food). Effects of land use, climate change and other anthropogenic sources of influence on freshwater ecosystems. Effects of abiotic factors on eco-physiology and life history of freshwater organisms. Effects of abiotic factors on trophic interactions, with emphasis on competition, predation and parasitism Phenotypic responses to trophic interactions.

ZO656: Desert Ecology

Deserts are harsh environments that do not sustain high biodiversity or ecological productivity. However, in large part because of this, deserts are living laboratories for understanding ecological processes. The Desert Field Ecology focuses on Physical and biological characteristics of deserts including behavioral and physiological adaptations of organisms to physical extremes, with emphasis on desert organisms. Deserts have relatively simple food webs and comprehensible levels of species richness, and therefore interactions between species as well as adaptations to environmental conditions are frequently obvious. This course will immerse students in the fascinating study of desert ecology: the interactions between desert organisms and their environments. We will focus on the community ecology of the four recognized North American deserts—the Sonoran, Mohave, and Great Basin Deserts.

ZO657: Environmental Impact Assessment

Environmental Impact Assessment (EIA) can be defined as the systematic identification and evaluation of the potential impacts of proposed projects, plans, programs or legislative actions relative to the physical, chemical, biological, cultural and socio-economic components of the total environment. Environment in EIA context mainly focuses physical, chemical, biological, geological, social, economic, and aesthetic dimensions along with their complex interactions, which affects individuals, communities and ultimately determines their forms, character, relationship, and survival.

ZO658: Environmental Monitoring

Introduction to sampling techniques and analytical methods to measure environmental contamination in air, water, soils, and food. Emphasis on instrument selection and quality control, including documentation, calibration, and sample management. This course introduces sampling techniques and analytical methods for determining contaminant levels. Students will learn and practice many methods to be able to collect samples in their research and in their professions. Emphasis on quality control, including documentation, calibration, and sample management, will ensure that students can fully defend their data and can base good decisions on their measurements.

ZO659: Solid Waste Management

The course would cover-general introduction including definition of solid wastes–municipal waste, biomedical waste, hazardous waste, e-waste; legal issues and requirements for solid waste management; sampling and characterization of solid waste; analysis of hazardous waste constituents including QA/QC issues; health and environmental issues related to solid waste management; steps in solid waste management-waste reduction at source, collection techniques, materials and resource recovery/recycling, transport, optimization of solid waste transport, treatment and disposal techniques

(composting, vermi-composting, incineration, non-incineration thermal techniques, refuse derived fuels, land-filling); economics of the onsite vs. offsite waste management options (individual vs. common treatment/disposal practices, integrated waste management; and waste minimization and concepts of industrial symbiosis and industrial ecology.

ZO660: Invertebrate structure and function

This course aims to studying both external and internal structure of invertebrate animals, with understanding the organization of coelom and locomotion. Also, the course will throw light on anatomy by studying internal organs with main physiological body processes of invertebrates.

ZO661: Invertebrate Natural products

This course aims to study the bioactive materials of invertebrates and their biological activity. The course will show different methods of natural product extractions and will also describe the different constituents and their structure and functions.

ZO662: Comparative invertebrate embryology

Comparative embryology is the branch of embryology that compares embryonic development of different invertebrate phyla, showing how all animals are related. In fact, the course typically covers representatives from many phyla. These include Porifera, Cnidaria, Ctenophora, Mollusca, Annelida, Brachiopoda, Echinodermata, Chaetognath, and Arthropoda. The student will master comparative patterns of invertebrate embryology from fertilization, cleavage, and early development, histogenesis, organogenesis to hatching, metamorphosis or birth. These topics will be approached from both the structural point of view of classical embryology and the more recent molecular mechanistic viewpoint. The course will be focused on comparative mechanisms of development, analysis of morphogenetic processes, evolutionary changes in development, and functional consequences of different modes of development. So, the student will be able to make comparisons of the development of various life forms, noting similarities and differences which can yield insights into the process of evolution.

ZO663: Invertebrate Phylogeny

This course introduces the numerous invertebrate phyla providing a description of the features that characterize each phylum. The covers all the invertebrate phyla looking at their diverse forms, functions, and evolutionary relationships. The book first introduces evolution and modern methods of tracing it, then describes the distinctive body plan of each invertebrate phylum, showing what has evolved, how the animals live, and how they develop. Basic physiological mechanisms and their development are discussed. Development both the ontogeny and phylogeny of the invertebrates is discussed as well as how genes control and direct an animal's development. The final chapter explains uses of molecular evidence and presents an up-to-date view of the evolutionary history, giving a more certain definition of the relationships between invertebrates.

ZO664: Invertebrate Immunity

This course describes the structure and functions of higher invertebrate immune system organs and its cells and molecular components. This course aims to provide essential features of invertebrate immunity on the example of crustacean innate immunity. Recognition of non-self (pathogen/microbial associated

molecular patterns, pattern recognition receptors). Mechanisms of invertebrate immunity: anatomical and physiological barriers, cellular response (types of hemocytes, phagocytosis, nodulation, encapsulation), humoral response (hemolymph coagulation, phenol oxidase system, defense peptides and proteins). This course provides the foundational understanding of the immune response to infection and the role of innate and adaptive immunity. Description and Identification of invertebrate's immune system diseases.

ZO665: Comparative anatomy of Invertebrates

This course covers all major aspects of the anatomy of the Invertebrates, including basic comparative anatomy between the invertebrate phyla. The course will examine the comparative biology of invertebrates in an evolutionary and phylogenetic context, with an emphasis on functional morphology. Topics will include an introduction to invertebrate systematic, a comparative study of systems for locomotion, nervous and sensory perception, feeding, digestion, excretion, growth, circulation, respiration, and reproduction. Given the incredible diversity of invertebrates, the course will focus on a selection of invertebrate phyla.

ZO666: Aquaculture Biotechnology

This course describes the structure and functions of higher invertebrate immune system organs and its cells and molecular components. This course aims to provide essential features of invertebrate immunity on the example of crustacean innate immunity. Recognition of non-self (pathogen/microbial associated molecular patterns, pattern recognition receptors). Mechanisms of invertebrate immunity: anatomical and physiological barriers, cellular response (types of hemocytes, phagocytosis, nodulation, encapsulation), humoral response (hemolymph coagulation, phenol oxidase system, defense peptides and proteins). This course provides the foundational understanding of the immune response to infection and the role of innate and adaptive immunity. Description and Identification of invertebrate's immune system diseases.

ZO667: Marine biotechnology

Marine Biotechnology will join other topics to ensure the acquisition by students of basic skills in degree of Marine Sciences. This course is a basic training for graduates in Marine Sciences on the application of biotechnological tools for the analysis and management of the marine and coastal environments and for the development and practical use of the organisms from such environments. The biodiversity of the marine environment is of enormous importance to humans as a resource for food, pharmaceuticals, and ecosystem services. The School's Centre for Marine Biodiversity and Biotechnology (CMBB) focuses on research using traditional and newly developing molecular methods to study these important marine resources and products.

ZO668: Freshwater ecosystem (Limnology)

The goal of this course is that you will understand the basic physical, chemical, and biological processes occurring in lakes, streams, and wetlands with the basic techniques used in aquatic ecological research after this course. The course develops substantial quantities of data concerning the local watershed. This course assumes a basic knowledge of ecology and chemistry. Students will learn about the physical and chemical aspects of aquatic systems and the life cycles and adaptations of aquatic organisms. After

completion of the course students will be competent to apply ecological concepts to aquatic systems and to understand the impacts of human activities on aquatic ecosystems

ZO669: Zooplankton and Benthos

This course aims to study the macroscopic marine zooplankton animals represented by almost all the major taxa (classification) of the Kingdom Animalia. In addition to study an important role in the aquatic food web. The majority benthic animals of these are epifaunal in nature. It is appropriate to discuss the Benthos in detail based on their diversity, lifestyles, as they exhibit variety of lifestyles and diversity of the organisms. The study will include the relation between benthic marine species and marine zooplankton community. The course describes the biology of plankton and benthos.

ZO670: Invertebrate rearing techniques

This is a course in applied sciences provides an overview of the invertebrate industry. It explores the basic structure of the technology used to rear invertebrates including seed production, nursery, grow-out systems. In this course students will participate in field and collection trips and learn about culture approaches to some of the more economically or ecologically valuable species of invertebrates. Attention is rewarded on the rearing of molluscs (Helix, Mussels, oysters…), Arthropods (shrimps, Artemia), worms, sea cucumber. This is a unique assemblage of topics organized around the goal of producing large amounts of organisms for a variety of useful purposes with supplementary information on invertebrate health and nutritional elements.

ZO671: Principle of embryology

Embryology is the science concerned with the study of prenatal (before birth) development of animals. The present course was planned to cover general considerations and basics of development. These principles include the beginning of gamete formation (gametogenesis), types of eggs and sperms, fertilization process, patterns of cleavage and types of blastulae. Also, the course will throw light on general broad steps in embryogenic as morulation, blastulation, gastrulation and larval stages. It is necessary to student to know the significance of each structure and stage of development. The course will be supported by detailed figures and photos that illustrate important concepts.

ZO672: Malacology

The course aims to study phylum Mollusca with its systematic biology of different classes. The student will have in-depth knowledge of morphology, ecology, taxonomy, evolution, and phylogeny of the Phylum Mollusca, with particular emphasis on new acquisitions resulting from modern molecular analysis. In particular, the student can recognize the main families of molluscs, use the phylum for ecological and environmental analysis.

ZO673: Invertebrate biomonitoring

The course based on studying the invertebrates using as a main part of bio-indicator, bio-monitoring and baseline studies. The type and number of invertebrates found at a particular site help to establish the current or changing conditions of the aquatic environment such as sediment, water chemistry, and levels of nutrients or toxins. It aims to the appropriate uses of invertebrates as a highly effective and

informative bio-indicator of physical, biological, and chemical changes in terrestrial and aquatic environment.

ZO674: Immunology and Microbiology

Immunology and microbiology module focuses on: basic immunology, bacteriology, virology and mycology; understanding immune system, its protective function and its role in the infectious and non-infectious diseases; principles of sterilization and infection control of such diseases; common infection and diseases of medical importance their microbial causes, as well as laboratory diagnosis, treatment, prevention and control of such diseases; industrial microbiology and biotechnology; the function of the immune system and the host-microbe interactions; Laboratories investigate mechanisms of pathogenesis and commensalism of viruses, bacteria, and protozoan parasites, as well as the lymphocyte function in antigen recognition, immune response; antigen recognition by T cells; cell-mediated immunity, hypersensitivity; human leukocyte antigen (HLA) polymorphism, transplantation; autoimmunity, immunodeficiency; the body's immune response and mechanisms of defense at the cellular and humoral (molecular) level; virus classification, structure, replication, pathogenesis, epidemiology and control of infections, transmission and diagnostic methods; bacterial structure, classification, growth, mechanisms of gene transfer; transmission and diagnostic microbiology; pathogenesis mechanisms , sterilization and medical mycology and parasitology.

ZO675: Cellular and Molecular Immunology

This course covers the fundamental concepts of modern immunology emphasizing on the molecular and cellular elements of the immune system, and their basic function; the innate and adaptive immunity; immune system development; humoral & cell-mediated immunity; the basic concepts underlying the mechanisms of innate and adaptive immunity; antibody and B and T-cell receptor structure and functions, cells and molecular mediators that regulate the immune response; modern techniques used in and influenced by immunology; clinical correlates disease, diagnosis and treatments; infectious diseases, allergy, immunization, autoimmunity, immunodeficiency, immunotherapy, transplantation and tumor immunity.

ZO676: Clinical Immunology and Biochemistry

This course is intended to equip the student with the basic concept of immune system, its component and mechanism of immune responses with specific reference to the human immune defense system with emphasis on the biochemical aspects of the immune system; immune responses in the context of infection, malignancy and immunological disorders; dealing with non-self-entities such as bacteria, fungi, viruses, allergens, microbes and tumors; innate and acquired immunity; antigens recognition, antigenic determinants and antigen and antibody reactions; lymphocytes; effector mechanisms; immunological and biochemical techniques derived from the field of immune-biochemistry; techniques and approaches used to study and understand and diagnose infection- and immune-associated disorders of the human immune system; pathogenesis of infection-associated and immunological disorders, including bacterial and viral diseases, autoimmune, allergic and inflammatory diseases and Immune deficiency, hypersensitivities; tumour immunology, transplantation and transfusion immune reactions. skills in the biochemistry laboratory, using analytical instruments for the determination of hemoglobin,

bilirubin, iron, liver function tests, blood gases, pH, electrolytes (including calcium and magnesium), and osmolality; biochemical diagnostic techniques, including preparing reagents and solutions, calibration, computer recording of data, understanding and managing interferences, operation and maintenance of equipment, and application of an effective quality control program; techniques in clinical biochemical assays, using the appropriate analytical instruments and equipment to measure constituents of blood and biological fluids, carbohydrates, lipids, proteins, and enzymes that are correlated with disease processes; principles of sample and reagent preparation, automation, instrument preparation use, and maintenance, calibration, quality control, and recording and interpretation of results.

ZO677: Immunology and Immunotherapeutic techniques

components of the immune system; knowledge and experience of immunology; principles of innate and adaptive immunity; antigen recognition by B and T cells; development, maturation and survival of lymphocytes; adaptive immunity to infection; failures of host defense mechanisms; training in the theoretical and practical aspects of modern immunology, with emphasis on therapeutic interventions for disease management; passive, adoptive and active immunotherapy of human diseases; the contribution of immunological mechanisms to a wide range of disease processes, as a basis for developing new diagnostic and therapeutic strategies; illustration of the relevance of immunology to the maintenance of health and the development and understanding of current and future immunotherapies of the latest immunotherapies for diseases such as cancer and autoimmune diseases. Basic and advanced immunotherapy, genes and immunity, biologic therapies, applied statistics, host-pathogen interactions in infection; tumor and transplantation immunology; the application of immunological reactions for the diagnosis and monitoring of disease; and the use of immunological techniques as analytical tools in the clinical laboratory.

ZO678: Epidemiology, control and food safety

The course discusses the basic epidemiology principles, concepts, and procedures useful in the surveillance and investigation of health-related states or events and provides applications of descriptive and analytic epidemiology. The course studies the environmental factors in the development and spread of diseases, pathogen variability, and principles of disease control, with particular emphasis on common tropical infections such as malaria, schistosomiasis, amoebiasis, onchocerciasis e.t.c. The course will also produce basic principles and practice of food and water safety, recognize some of the characteristics of foodborne parasitic protozoa, nematodes, trematodes, and cestodes, recognize how foodborne parasites are transmitted and identify some effective control measures for foodborne parasites. This course covers food safety issues, regulations, and techniques to maintain a food-safe environment. The course will include a discussion of food safety management practices such as public health policies, risk assessment, sanitation, pathogen and allergen control in foods.

ZO679: Protozoology and helminthology

The course surveys the helminth parasites that infect humans, livestock, companion animals and wildlife, particularly those of national importance and the most dangerous human and animal parasitic protozoa. Morphology and pathology are discussed and host-parasite relations, epidemiology, transmission, clinical manifestations, laboratory diagnosis, treatment, prevention and control are

emphasized. Laboratory exercises are designed to acquaint students with proper collection, preservation, processing and identification of stages of development of selected helminth and protozoa species. The course incorporates a research topic that students need to present as a group project. Throughout the Semester, students will be expected to organize information and understand the relevance of these disease organisms to human health in our society.

ZO680: Immuno and diagnostic Parasitology

The course aims to recognize and characterize the immune inter-relations between parasites (protozoa, helminthes as well as ecto-parasites) and the host as well as their immunogenicity with emphasis on the current knowledge of cellular & humeral defense mechanisms of the immune response to these infections. The course provides intellectual and practical skills to recognize the antigens of medically and veterinary common parasites for immunodiagnostic tests.

ZO681: Veterinary and fisheries parasitology

The course presents information on morphology, life cycle, host pathology, epidemiology of infections, and treatment and control of infections of domesticated animals parasite. Based upon later knowledge students will be able to diagnose the major endo- and ecto-parasitic diseases of domesticated animals based upon clinical signs, history and identification of parasite species. Lectures offer this information in didactic and discussion formats; whereas laboratories offer much of the same material with additional opportunities for hands-on learning and acquiring technical skills required for the diagnosis of metazoan and protozoan parasite infections. The course will give also information on the role of parasites in causing fish disease and fish parasites that humans can acquire from eating fish and use parasite data to understand aspects of the natural populations of fishes.

ZO682: Immunology and Biotechnology

This course aims to provide students with: the basic concept of the immune system, its component and mechanism of immune responses with specific reference to the human immune defense system with an emphasis on the immune-biotehnological aspects of the immune system; various immunologic techniques used in research and biotechnology laboratories such as immunoassays, immunofluorescence, western blot analysis, SDS-PAGE, antibody purification, cytokine assays; phage antibody libraries, therapeutic monoclonal antibodies, and flow cytometry, lymphocyte isolation and reactions, immunocytochemistry, immunoprecipitation, ELISA, cell culture, laboratory diagnosis by agglutination, precipitation, immunofluorescence and enzyme immunoassay; current basic immunological techniques as diagnostic tools for bacterial, viral and parasitic diseases; knowledge on immunobiology in relation to biotechnology. Genetic engineering techniques allow large-scale production of substances generated during the immune response; Applications of various aspects of immunology for diagnostic and therapeutic purposes; Development of theoretical bases of biotechnology immunobiological preparations.

ZO683: Immunology, Vaccination, Immunization and Biotechnology

This course develops key concepts in: the structure and function at the molecular and cellular level of the immune system; the development and application of vaccines/immunization as well as the benefits and constraints of vaccination and immunization as a component of integrated disease control, descriptions of conventional vaccination/immunization and new technological approaches; Immunizing

agents (Vaccines, Immuno-globulins), Vaccine development, How vaccines work, vaccine response in individuals, Epidemiology and immunization, Future of vaccinology; account for polyclonal, monoclonal and humanized antibodies and production of these describe immunization/vaccination; immunological disease and immunotherapy plan; immunological techniques and their applications in biotechnical industry; principles governing vaccination/immunization and the mechanisms of protection against disease; vaccine design, use of animal models to determine immune responses to vaccination/immunization and assessment of efficacy, development of new generation vaccines, and regulation of vaccine production and quality control; the basics of immunology developing therapies like vaccines, monoclonal antibodies, CAR T cells and more; factors influence vaccine design and development; different types of vaccines available and their suitability for different diseases; biotechnologies that are fueling the rapid discovery and development of vaccines and immunotherapeutic agents for a wide variety of diseases.

ZO684: Tumor Immunology and Immunotherapy

This course provides an up-to-date and comprehensive account of cancer immunity and immunotherapy; adaptive and innate immunity to cancer; the mechanisms underpinning our immune response; current approaches to cancer immunotherapy; how tumor and host responses can circumvent effective anti-cancer immunity; development of vaccines; interplay between tumors and the immune system, as well as current therapies that use the immune system in the setting of oncology; basic immunology and tumor biology; the interplay between the immune system and tumors; current immunological therapies; immune system functions; how genesis of cancer and its progression; immune system can mount potent and potentially curative responses against cancer; challenges that immunotherapy strategies have to overcome, and illustrate the advantages/disadvantages of different classes of antigenic targets that are currently a focus of immunotherapy; tissue context in which cancer immunotherapy takes place, and the challenges and opportunities that the tumor microenvironment presents; a range of current immunotherapy approaches will be reviewed, focusing on their scientific basis and clinical mode of action; immunotherapy strategies will include antibody therapies, checkpoint blockade strategies, T cell /chimeric antigen receptor adoptive therapy, and cancer vaccines.

ZO685: Immune disorders, Autoimmune Diseases& Immunodeficiency Diseases

This course provides an overview on: cellular and molecular mechanisms of immune system disorders such as autoimmunity and immunodeficiency; different immunological methods and approaches used in the diagnosis of immune diseases; mechanism of specific adaptive immune responses to “self-antigen” that lead to autoimmunity; factors leading to induction of immune disease; the role of antibodies and T cells in mediating autoimmunity and immunodeficiency; the importance of specific receptor mediated responses; concept of tolerance; approach for treatment for autoimmune disorders; clinical manifestation of immunodeficiency disorders; multi-level origin of immunodeficiency disorders; the role of immune cell development with malfunction of the immune system; basis of immunodeficiency disorders; correlations of laboratory tests with the clinical manifestations/symptoms of the immune disorders.

ZO686: Modern trends in parasitology

The course involves individual studies on the selected up-to-date topic on parasites. The topic will include modern developments in parasitology and provides advanced theoretical and applied knowledge

concerning the subject under study which should be of national and/or global importance with special emphasis on parasites of public health importance. The course provides students with information on advances in parasitology research and modern trends in parasitology. Students will be equipped to apply research skills to present a written report including a critical literature review of relevant scientific publications and show competence in communicating scientific findings. The course enables students to deal with public health issues related to parasites in the community.

ZO687: Applied and experimental parasitology

The course provides students with the knowledge and critical understanding of the molecular biology of parasites, introduces the theory and practice of phylogenetic inference from molecular data and to introduce some of the most commonly used methods and computer programs and acquire the detailed principles of molecular methods for clinical diagnosis of parasites. This course will introduce the laboratory exercises that cover the experimental designs to use parasites as experimental models in research, methods of collecting and processing host and parasite samples, methodologies to identify and control parasites and parasite infections, and evaluation of parasitic infections in hosts. Emphasis will be placed on the applications of the modern procedure to study parasitic infections in laboratory models.

ZO688: Zoonotic diseases

The course provides the student with a piece of complete knowledge on the occurrence of zoonoses transmitted from animals including their etiology, source and modes of infections, clinical picture in animals and man, diagnosis, treatment and control and prevention. The course will also identify and manage unusual or rare infectious zoonosis and the emerging and re-emerging zoonotic diseases.

ZO689: Vectors borne diseases

The overall aim of the course is to provide students with a broad understanding of the key aspects of invertebrate vectors behavior, vectors ecology and vector-parasite interactions relevant to the epidemiology with an emphasis on the practical methods used to control vectors and vector-borne diseases.

ZO690: Plant Protection & Pest Management

This course introduces to the students comprehensive, multidisciplinary training in Integrated Pest Management (IPM) of insect, plant disease, and weed pests of agricultural, commercial, and home commodities. Problems of growers and other agricultural professionals are the focus of this course, as well as urban pest control. The students will acquire a blend of pest control strategies including pesticides, transgenic crops, cultural operations, and biological control.

ZO691: Advanced Insect Physiology

The course starts with the overview of insect internal anatomy and the processes such as growth cycles, reproduction and their hormonal regulation. Next, students will learn about physiology of nutrition, metabolism, circulation and respiration. Throughout the course, student will learn about experimental methods used in insect physiology.

ZO692: Insect Vector Control

This course will enable students to acquire knowledge and critical understanding of life history, and background of vector (insects and other arthropods) control affecting human health. Topics include public health significance, vector-parasite interactions, and Vector control strategies.

ZO693: Insect Vectors of Diseases

The course aims to introduce to the student the information flow in plant, domestic animals and human protection practice. This was by providing students with an understanding of the biology of insect vectors of diseases and the role they play in the spread of different pathogens as virus, bacteria, fungi, and nematodes. Also, this course aims to identify different pathogens and their negative impact on the productivity and quality of plants, animal products and how to combat these insect vectors.

ZO694: Insect Models & Research Techniques

This course provides an overview of non-human species that is extensively studied to understand particular biological phenomena specially those widely used to research human diseases when human experimentation will be unfeasible or unethical.

ZO695: Advanced Chemical Ecology of Insects

The course examines primary literature on interactions between chemistry, ecology, and the environment (e.g., effects of plant secondary compounds and environmental contaminants on ecosystem function). This course should be available to graduates and forms the basis of integrating research with education. The course helps train students in statistical methods and other quantitative approaches used by ecologists to design research programs, to analyze complex data, and to generate hypotheses via simulation and analytical models.

ZO696: Insect Population Ecology & Dynamics

This course teaches the insect population structure and life-history characteristics as well as the fluctuation in population size over short periods of time as a result of changes in natality, mortality, immigration, and emigration. This module identifies factors affecting insect population dynamics and regulatory mechanisms to develop models to predict population change.

ZO697: Applications of Insecticides

This course consists of basic knowledge on pesticides, pesticide preparing, principle on pesticide application, introduction about different type of pesticides and their mode of action, pesticide resistance, effect of pesticides on ecosystem and environment, bio-originated pesticides, and innovation and development of pesticides. Attached experiment including pesticide preparing and quality inspecting, pesticide bioassay (indoor and field), mode of action of pesticides, pesticide residual analysis, and so on. Based on class learning and experiment, the students should hold the basic knowledge and principal method about pesticide application, clarify correlation among chemical control, integrated management, and environmental protection, and gain a foundation for further application of pesticides in practice.

ZO698: Stored Grain Pest Control

This module focuses on the biology and management of insect pests of stored grains, flour, feed, dried fruits and nuts within food processing plants, warehouses, wholesale and retail distribution

systems. This course determine the relevant physical properties of agricultural materials and stored products as well as recognize the requirements for proper post-harvest management of crops and fruits.

ZO699: Forensic Entomology & Criminal Justice

An Introduction to Forensic Entomology, History of Forensic Entomology, Advances in Forensic Entomology; Forensic Importance of Insects; Crime Scene Investigation; Collection at the Crime Scene; Estimating the time since death; The use of insects in death investigations; Expert Witness; Report Writing.

ZO6100: Insect Taxonomy & Systematic

Introduction to history and principles of systematics and importance. Levels and functions of systematics. Identification, purpose, methods character matrix, taxonomic keys. Descriptions- subjects of descriptions, characters, nature of characters, analogy vs homology, parallel vs convergent evolution, intraspecific variation in characters, polythetic and polymorphic taxa, sexual dimorphism.

ZO6101: Advanced Biological Control

The goal of this course is to introduce post graduate students to the principles and practices of advanced biological control. This course also addresses biological control issues concerning insects, plant diseases, natural systems and urban environments, emphasizing on the use of diseases, predators, parasites and parasitoids, etc for pest management. Advanced biological control also addresses the influence of human social, economic, and regulatory systems in pest management. The overarching goals of environmental protection, economic viability, and social welfare are considered throughout the course.

ZO6102: Apiculture & Sericulture

This course is designed to acquaint the student with the broad field of beekeeping. It will include honey bee biology and behaviour, management for honey production, products of the hive, pests and the value of bees as pollinators of agricultural crops. Also this course is designed to acquaint the student with the rearing of silkworms and the production of raw silk.

ZO6103: Insect Immunity

The module aims to enable students to acquire knowledge about components involved in insect immune system, cellular immune system, and antibacterial induction in insects. Endocrine and immune system interaction, prophenoloxidase activity system and its role in cellular communication, inhibition of insect immune system by insect parasites.

ZO6104: Advanced Insect Hormones & Pheromones

This course differentiates between pheromones and hormones, their properties and ecological role. The course gives information on the major functional types of insect pheromones and hormones. The study of how pheromones can keep closely related species reproductively isolated from each other.

ZO6105: Insect Diversity & Evolution

This module aims to enable students to acquire knowledge and understanding of the developmental mechanisms that give rise to spectacular diversity in insect form, the course covers the changes in developmental processes that may have led to appearance of subsequent modification of traits in particular lineages.

ت ـ. برامج الدكتوراه في علم الحيوان:

1. برنامج الدكتوراه في العلوم في علم الخلية والأنسجة والوراثة:

(Cell Biology, Histology and Genetics)

First Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
ZO705	Histopathology علم أمراض الأنسجة	1	2	2
Optional: 2 Credits				
ZO701	Electron Microscopy & Imaging Analysis الميكروسكوب الإلكتروني وتحليل الصور	2	-	2
ZO703	Nanotechnology in Molecular Markers & Drug Discovery تطبيقات علم النانو في الدلائل الجزيئية واكتشاف الأدوية	2	-	2
ZO707	Radiobiology البيولوجيا الإشعاعية	2	-	2
ZO709	Cancer Biology بيولوجيا السرطان	2	-	2
ZO711	Genomics & Proteomics Analysis تحليل الجينوم والبروتيوم	2	-	2

Second Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
ZO712	Chromosomes & Cytogenetics Techniques الكروموسومات وتقنيات الوراثة الخلوية	2	-	2
Optional: 2 Credits				
ZO702	Ultrastructure Pathology علم الأمراض والتراكيب الدقيقة	2	-	2
ZO704	Cytochemistry & Immunocytochemistry كيمياء الخلية والمناعة	2	-	2
ZO706	Biometry & Molecular Analysis of Biomolecules القياسات الحيوية والتحاليل الجزيئية	2	-	2
ZO708	Molecular Pathophysiology علم فسيولوجيا الأمراض الجزيئي	2	-	2
ZO710	Neurobiology بيولوجيا الأعصاب	2	-	2

2. برنامج الدكتوراه في العلوم في الفقاريات: (Vertebrates)

First Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
ZO717	Comparative Gene Mapping in Vertebrates الخريطه الجينية المقارنة للفقاريات	2	-	2
Optional: 2 Credits				
ZO713	Advanced Molecular Embryology أجنه جزيئيه متقدم	2	-	2
ZO715	Molecular Evolution 1 تطور جزيئي 1	2	-	2
ZO719	Genomics and Proteomics جينومكس وبروتيمكس	2	-	2
ZO721	Immunohistochemistry الهستوكيميائيه المناعية	2	-	2
ZO723	Vertebrate Paleontology 1 حفريات الفقاريات 1	2	-	2

Second Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
ZO724	Molecular Evolution 2 التطور الجزيئي للفقاريات	2	-	2
Optional: 2 Credits				
ZO714	Cloning & Stem Cells الاستنساخ و الخلايا الجذعية	2	-	2
ZO716	Vertebrate Paleontology 2 حفريات الفقاريات	2	-	2
ZO718	Advanced Stem Cell Biology بيولوجيا الخلايا الجذعية	2	-	2
ZO720	Advanced Bioinformatics الأساسيات المعلوماتية الحيوية المتقدمة	2	-	2
ZO722	Embryonic Stem Cells (Gene Transfer) الخلايا الجزئية الجنينية (نقل الجينات)	2	-	2

3. برنامج الدكتوراه في العلوم في علم الفسيولوجي: (Physiology)

First Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
ZO725	Comparative Physiology فسيولوجيا مقارنة	2	-	2
Optional: 2 Credits				
ZO727	Molecular Physiology فسيولوجيا جزيئية	1	2	2
ZO729	Eco-Physiology & Behavior فسيولوجيا بيئية وسلوك	2	-	2
ZO731	Analytical Physiology & Diagnosis فسيولوجيا تحليلية و تشخيصية	1	2	2
ZO733	Plasma technology تكنولوجيا البلازما	2	-	2
ZO735	Cancer & Tumor Biology سرطان وبيولوجيا أو رام	2	-	2

Second Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
ZO726	Pathophysiology فسيولوجيا مرضية	2	-	2
Optional: 2 Credits				
ZO728	Nano & Biotechnology تكنولوجيا حيوية ونانوية	2	-	2
ZO730	Fertilization physiology & Fertility Assessment فسيولوجيا الاخصاب وتعيين الخصوبة	1	2	2
ZO732	Nutrition Physiology & Metabolic Disorders فسيولوجيا التغذية واختلالات أيضية	2	-	2
ZO734	Serology & Tumor Markers علم الأمصال ودلالات الأو رام	2	-	2
ZO736	Clinical Biochemistry كيمياء حيوية سريرية	1	2	2

4. برنامج الدكتوراه في العلوم في علم البيئة :(Ecology)

First Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
ZO737	Ecosystem Functions & Bioenergetics وظائف النظام البيئي والطاقة الحيوية	2	-	2
Optional: 2 Credits				
ZO739	Environmental Biotechnology التكنولوجيا الحيوية البيئية	2	-	2
ZO741	Environmental Management الإدارة البيئية	2	-	2
ZO743	Applied Soil Biology بيولوجية التربة التطبيقية	2	-	2
ZO745	Ecological Statistics الإحصاء البيئي	2	-	2
ZO747	Evolutionary Ecology علم البيئة التطورى	2	-	2

Second Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
ZO746	Environmental Risk Assessment تقييم المخاطر البيئية	2	-	2
Optional: 2 Credits				
ZO738	Environment & Pesticides البيئة والمبيدات	2	-	2
ZO740	Behavioral Ecology علم البيئة السلوكية	2	-	2
ZO742	Eco-Physiology الفسيولوجيا البيئية	2	-	2
ZO744	Molecular Ecology علم البيئة الجزيئية	2	-	2
ZO748	Practical Research Methods طرق البحث العملية	2	-	2

5. برنامج الدكتوراه في العلوم في اللافقاريات: (Invertebrates)

First Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
ZO757	Marine Invertebrate Ecosystem النظم البيئية للافقاريات البحرية	2	-	2
Optional: 2 Credits				
ZO749	Invertebrate Endocrinology & Hormones علم الغدد الصماء في اللافقاريات والهرمونات	2	-	2
ZO751	Histology & Molecular Pathology of Invertebrates علم الأنسجة وعلم الأمراض الجزيئي في اللافقاريات	2	-	2
ZO753	Field Techniques for Surveying Invertebrates تقنيات الدراسات الحقلية للافقاريات	2	-	2
ZO755	Pollution & Biocontrol المعالجة الحيوية للتلوث	2	-	2
ZO759	Invasive Species in Ecosystems الأنواع الغازية في النظم البيئية	2	-	2

Second Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
ZO754	Aquaculture Economics & Marketing الاقتصاد والتسويق في مجال اللافقاريات	2	-	2
Optional: 2 Credits				
ZO750	Invertebrate Toxicology علم السموم واللافقاريات	2	-	2
ZO752	Biomedical Invertebrates الطب الحيوي واللافقاريات	2	-	2
ZO756	Coral Reef Biology بيولوجيا الشعاب المرجانية	2	-	2
ZO758	National Park & Conservation الحديقة الدولية وحفظ التنوع	2	-	2
ZO760	Invertebrate Behaviour السلوك في اللافقاريات	2	-	2

6. برنامج الدكتوراه في العلوم في علم المناعة والطفيليات:(Immunology and Parasitology)

First Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
ZO761	Advanced & Applied Immunology علم المناعة المتقدم والتطبيقي	2	-	2
Optional: 2 Credits				
ZO763	Immunology of Infectious & Inflammatory Diseases علم المناعة من العدوى والتهابات	2	-	2
ZO765	Immunology, Virology & Immunotherapy مناعة الأمراض المعدية والالتهابيَّة	2	-	2
ZO767	Advanced Protozoology & Helminthology علم الأو ليات المتقدم وعلم الديدان الطفيلية	2	-	2
ZO769	Microbiology & Quality Control in Laboratories علم الأحياء الدقيقة ومراقبة الجودة في المختبرات	2	-	2
ZO771	Parasites Neurobiology & Anti-helminthics البيولوجيا العصبية للطفيليات ومضادات الطفيليات	2	-	2

Second Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
ZO768	Modern Trends in Parasitology الاتجاهات الحديثة في علم الطفيليات	2	-	2
Optional: 2 Credits				
ZO762	Immunological laboratory Techniques & Tissue Culturing Technology تقنيات المختبرات المناعية وتكنولوجيا زراعة الأنسجة	2	-	2
ZO764	Serology & Tumor Markers علم الأمصال ودلائل الأو رام	2	-	2
ZO766	Immunohematology, Blood banking & transfusion علم الدم المناعي وبنكة الدم ونقله	2	-	2
ZO770	Immunoparasitology & Parasite Pathology علم المناعة لطفيليات وعلم أمراض الطفيليات	2	-	2
ZO772	Infectious Diseases and Applied Parasitology الأمراض المعدية وعلم الطفيليات التطبيقي	2	-	2

7. برنامج الدكتوراه في العلوم في علم الحشرات: (Entomology)

First Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
ZO775	Vector Problems in Egypt مشكلات ناقلات الأمراض في مصر	2	-	2
Optional: 2 Credits				
ZO773	Insect Neurophysiology فسيولوجيا الأعصاب في الحشرات	2	-	2
ZO777	Invasive Pest Control مكافحة الأفات الغازية	2	-	2
ZO779	Molecular Applications in Entomology تطبيقات الجزيئية في الحشرات	2	-	2
ZO781	Advanced Insecticide Toxicology علم سموم المبيدات المتقدم	2	-	2
ZO783	Physiological and Evolutionary Ecology of Insects علم البيئة الفسيولوجية والتطورية في الحشرات	2	-	2

Second Semester

Code	Course Title	Hours/Week		
		Lec.	Prac.	Cred.
Obligatory: 2 Credits				
ZO776	Integrated Pest Management Applications تطبيقات إدارة مكافحة الأفات	2	-	2
Optional: 2 Credits				
ZO774	Honeybee Pathology & Treatment Approaches أمراض نحل العسل وطرق العلاج	2	-	2
ZO778	How to write and publish a scientific paper كيف تكتب وتنشر بحث علمي	2	-	2
ZO780	Experimental Design & Analysis تصميم التجارب و تحليلها	2	-	2
ZO782	Bioinformatics المعلوماتية الحيوية	2	-	2
ZO784	Insect Biotechnology Applications تطبيقات التقنية الحيوية في الحشرات	2	-	2

ZO701: Electron Microscopy & Imaging Analysis

The course includes two main parts; an introduction into using electron microscopic technology (EM), and image analysis techniques. EM includes both Transmission (TEM) and Scanning electron microscopy (SEM). Students can learn about EM strategies as well applications. Students will practice the techniques and use the instruments. To become approved users of the microscopes, students must gain additional experience, make an explain images and perform basic techniques of sample preparation. The second part is an introduction to image processing and image analysis techniques and concepts. Areas examined include: Image representation and storage, image enhancement including contrast manipulation, histogram equalization, edge highlighting. Applications of morphology to image processing including erosion, dilation and hit-or-miss operations for binary and grey scale images; Image feature estimation such as edges, lines, corners, texture and simple shape measures.

ZO702: Ultrastructure Pathology

This course covers advances in the uses of electron microscopic techniques, general and specific techniques applied to cytopathology and diagnostic ultrastructural pathology. It gives insight for correlations of ultrastructural data with light microscopy, histochemistry, immunohistochemistry, biochemistry, cell and tissue culturing, electron probe analysis, and investigative, clinical, and diagnostic EM methods. It includes description of the disease under EM such as Hydropic degeneration, the swelling of the endoplasmic reticulum, mitochondria, lysosomes, or the cell sap. Senile plaques, alcoholic hyalin, and amyloid deposits as well all nanomaterial deposits inside the cell. Visualization in pathologic reactions of microtubules, microfilaments, and cell junctions under EM. Also use of electron microscopy particularly for renal and hepatic biopsies.

ZO703: Nanotechnology in Molecular Markers & Drug Discovery

The course will focus on uses of nanotechnology in biomedical uses of nanotechnologies and drug discovery. In detail, the course will cover clinical biomaterials for detection and biocompatibility issues for molecular biomarkers. Furthermore, the course will cover nanoscale advanced drug delivery systems fundamentals, design, synthesis, and uses. In addition, environmental, physiological, cellular and molecular toxicological limitations of industrially encountered nanoparticles will be covered. Performs important position in distinct sorts of biomedical application such as shipping of drug, gene therapy, biosensors, biomarkers and molecular imaging. Teaches students the concepts of using genomic, and proteomic techniques to find novel drug targets. Also introduces the concepts of drug targeting and dosage forms, in vivo/in vitro drug screening, and the importance of pharmacogenetics to explain variability in drug reactions.

ZO704 :Cytochemistry & Immunocytochemistry

The course's aim is to give students comprehensive and in-depth knowledge for the fundamentals of cytochemistry and immunocytochemistry with complete emphasis on general and specific techniques applied to cytopathology and diagnostic areas. It will be shown how to prepare samples for studies in cytochemistry, immunocytochemistry, and *in situ* hybridization particularly for immunofluorescence and

fluorescence *in situ* hybridization. Basic knowledge of optical and electronic visualization of biologically interesting macromolecules will also be given. Theoretical lectures will be accompanied by seminars/workshops on how to apply these approaches to the study of cellular biology and the use of instrument observation techniques.

ZO705: Histopathology

This course provides an introduction to histopathology and outlines how the appearance of different tissues changes due to damage, mutation, inflammation, infection or degeneration and how microscopy can aid in the diagnosis of disease. A special reference is paid due neoplasia formation and causes of cancer, benign and malignant tumors, tumor classification, induction of tumors in experimental animals, tumor cellular heterogeneity and clonal expansion, besides molecular histopathological aspects of carcinogenesis.

ZO706: Biometry & Molecular Analysis of Biomolecules

The ultimate aim of this course is to provide students with advanced knowledge of the relationship between biomolecule structure and function, as well as the ability to use various structural bioinformatics tools for biometry. The course is to teach students basic structure and function of biological molecules including carbohydrates, amino acids, peptides, proteins, lipids, and nucleic acids and to describe their reactivity and to illustrate the mechanisms of biomolecules transformation in the cell and to use and analyze databases with knowledge on their structure and function. This course will also explain how drugs may target biological macromolecules.

ZO707: Radiobiology

This course reviews the concepts relating to the effects of radiation on different animal tissue systems and cells regarding cell cycle effects, cell signal induction, molecular aspects and effects of radiation on tissues, risks on cellular level factors, the dose-effect relationship and a deeper knowledge on radiation protection for ionizing and non-ionizing radiation, both in legislation and practical radiation protection technology. The course covers the formation of free radicals, chromosome breakage and repair mechanisms as well as target theory and the dose-response curves. It also includes radiation effects on individual organs and humans, somatic, genetic as well as immediate and late radiation damages and factors affecting the relationship between dose and biological effects. The course also covers radiation protection, regulations for ionizing, ultraviolet, laser and electromagnetic fields.

ZO708: Molecular Pathophysiology

This course is designed to study the fundamental changes in body physiology due to pathological manifestations. It provides students with a basic understanding of factors that contribute to the occurrence of various pathological disorders and diseases and how those factors may be evaluated. The course relates indices of disease or injury at cellular and histological levels, biochemical and molecular pathology levels, risk factors, and the basic principles of pathology's underlying physiological factors. This covers the basics of cell biology, inflammation, mechanisms of body defense, specific body systems, DNA repair mechanisms, and common disorders with emphasis placed on pathological processes and manifestations during pathogenesis and treatment.

ZO709: Cancer Biology

This course will cover the underlying molecular and cellular biology involved in carcinogenesis, tumor growth, and metastasis. The implications of the biological findings on cancer prevention, chemoprevention, diagnosis, and treatment will be covered. Lectures primarily focus on the role of growth factors, oncogenes, tumor suppressor genes, cancer cell metabolism, angiogenesis, inflammation, and signal transduction mechanisms in tumor formation and to understand the multistep, genetic alterations which enable the transformation of a normal cell to a cancer.

ZO710: Neurobiology

The neurobiology course provides students with an overview of basic neurobiology, cellular and molecular neurobiology and systems neurobiology. Basically, the course deals with the structure and function of neurons, the role of synapses in neural communication, membrane receptors, neuroanatomy, and how brain and spinal cord control the nervous system. The molecular properties of nerve cells will explain the concepts of nervous system growth, the ionic and molecular basis of excitability, and signal transduction in molecular and developmental neurobiology. Also, systems neurobiology will include fundamentals of integrative neural control, sensory, motor, and limbic processes, axon guidance, and neuron-target interaction.

ZO711: Proteomics & Genomic Analysis

The course aims to appraise the students to the vital concepts of technologies pertinent to Genomics and Proteomics, their applications and demonstrate skills to apply the knowledge in scientific queries. To explain principles of basic methods of genomic and proteomic analysis; to propose appropriate methods for analysis of given sample type with respect to purpose of analysis. The course aims to give knowledge for Omics technologies, key technological developments in modern genomic and proteomic studies; advanced genomics and proteomics technologies and their data storing; bioinformatics techniques for genomic and proteomic databases; different types of genome variation and their relationship to human diseases.

ZO712: Chromosomes & Cytogenetics Techniques

This course will focus on human chromosome structure, methodology, and techniques for the visualization of chromosome aberrations such as karyotyping and fluorescence in situ hybridization. Chromosome abnormalities will be discussed from the clinical and cytogenetic viewpoint. The course will also cover current topics in cytogenetics, including new methodologies and their use in clinical genetics and research at the chromosomal and molecular level.

ZO713: Advanced Molecular Embryology

The course will focuses on the molecular, genetic and cellular mechanisms that govern cell behavior and pattern formation during development.

ZO714: Cloning & Stem Cells

Cloning and stem cells is the study cloning procedure which works by combining a patient's body cell with an unfertilized egg cell from a donor. The stem cells can be induced to differentiate into different

types of cells as needed (heart, nerve, muscle, etc.). These cells are genetically identical to the patient's own cells (that is, they are cloned).

ZO715: Molecular Evolution 1

The course describes the process of change in the sequence composition of cellular molecules such as DNA, RNA, and proteins across generations. Major topics in molecular evolution concern the rates and impacts of single nucleotide changes.

ZO716: Vertebrate Paleontology 2

The subfield of paleontology that seeks to discover, through the study of fossilized remains, the behavior, reproduction and appearance of extinct animals with vertebrate or a notochord. It also tries to connect, by using the evolutionary timeline, the animals of the past and their modern-day relatives.

ZO717: Comparative Gene Mapping in Vertebrates

The course describes the methods used to identify the locus of a gene and the distances between genes. Gene mapping can also describe the distances between different sites within a gene.

ZO718: Advanced Stem Cell Biology

Unspecialized cells of the human body. They are able to differentiate into any cell of an organism and have the ability of self-renewal. Stem cells exist both in embryos and adult cells.

ZO719: Genomics and Proteomics

This Course will focusing on the structure, function, evolution, mapping, and editing of genomes. A genome is an organism's complete set of DNA, including all of its genes. Genes may direct the production of proteins with the assistance of enzymes and messenger molecules. In turn, proteins make up body structures such as organs and tissues as well as control chemical reactions and carry signals between cells.

ZO720: Advanced Bioinformatics

The course in Advanced Bioinformatics gives a better understanding of the bioinformatic methods and algorithms used in different types of analyses.

ZO721: Immunohistochemistry

This course will describe the application of immunostaining. It involves the process of selectively identifying antigens (proteins) in cells of a tissue section by exploiting the principle of antibodies binding specifically to antigens in biological tissues.

ZO722: Embryonic Stem Cells (Gene Transfer)

Gene transfer: The insertion of unrelated genetic information in the form of DNA into cells. The embryonic stem cells can be induced to differentiate into different types of cells as needed (heart, nerve, muscle, etc.). There are different reasons to do gene transfer. Perhaps foremost among these reasons is the treatment of diseases using gene transfer to supply patients with therapeutic genes.

ZO723: Vertebrate Paleontology 1

Vertebrate Paleontology is the study of ancient animals that have a vertebral column including fish, amphibians, reptiles, birds, and mammals. Vertebrate paleontologists are best known for their work with fossils.

ZO724: Molecular Evolution 2

This course will investigate the fundamental principles of evolution by natural selection, population genetics, historical reconstructions, and attempt to apply these principles to ecology, development, and physiology.

ZO725: Comparative Physiology

The aim of this course is designed to allow students to develop an in-depth understanding of the evolution happened in body systems between animal classes and how these vary among various species. It contains numerous figures and tables to aid in their comparison, including many illustrations of physiology of animals prepared so as to allow for direct comparison. Relationships between system strategies and environment are discussed throughout the text, and brought together.

ZO726: Pathophysiology

This course provides students with a basic understanding of factors and causes that contribute to the occurrence of various diseases and how abnormal physiology and histology associated with disease, the pathologic processes (pathogenesis) of disease and how that disease affects the human health. A part of this course describes basic mechanisms of cellular pathology, including cell injury, necrosis, and cellular alterations and cell adaptation (hypertrophy, atrophy, hyperplasia, metaplasia). Students will learn how to recognize the signs and symptoms of diseases that may be found in a health record of clients across the life span with acute or chronic dysfunctional health patterns involving system organ's impairments.

ZO727: Molecular Physiology

The course attempts to the scientific study of dynamic interactive processes and biochemical communications at the subcellular level. It includes instruction in ion channels and transporters, molecular signaling pathways, endocrine control and regulation, genetic information transfer, homeostasis and molecular control systems, electrophysiology and sensory mechanisms, protein synthesis, and applicable research methods and technologies. It is identifying the subset of genes and proteins that function in physiological context or malfunction to trigger disease. Also, it is intended to study the expression of thousands of genes or hundreds of proteins at a time by high-through-put microarray technologies, providing a far more detailed molecular snapshot of life inside normal and abnormal cells.

ZO728: Bio- & Nanotechnology

Bio- and Nanotechnology is a new frontier for Biology with important applications in biomedical approaches. It bridges areas in Physics, Chemistry, and Biology and is a testament to the new areas of interdisciplinary science that will become dominant in the twenty-first century. It introduces concepts in nanomaterials and their use with biocomponents to synthesize and address larger systems. Applications include systems for visualization, biosensing, labeling, drug delivery, and cancer research.

Technological impact of nanoscale systems, synthesis, and characterizations of nanoscale materials are discussed.

ZO729: Eco-physiology & Behavior

This course allows students to gain an overview of the integrated nature of physiology, from molecules to whole organism and it explores how animals adapt to their environments within-life and during evolution. In this course we will look at the full range of behaviors found in the animal kingdom, from simple escape behaviors to complex tool use and their evolution. This course comprises a broad range of topics in a variety of vertebrate (fish, birds, reptiles and mammals) and invertebrate (insects, crustaceans and worms) animals. During the course we will use examples from a broad range of animal groups including, foraging in spiders, social behaviors in ants, learning in dogs and tool use in birds and some mammals.

ZO730: Fertilization & Fertility

The aim of this course is to allow students to develop an in-depth understanding in reproductive endocrinology and infertility; addressing types of infertility, causes and factors affecting fertility and enhancement approaches of pregnancy and how to interpret clinical data in relation to embryology and semenology. In addition, teaching students how to recognize the role of assisted reproductive technologies (ART) procedures including *in vitro* fertilization (IVF), embryo transfer techniques, intrauterine insemination (IUI) intracytoplasmic sperm injection (ICSI), and cryopreservation of sperms, ova and embryos.

ZO731: Analytical physiology and diagnosis

This innovative course is designed to provide post graduate students with a laboratory education and training in health and disease diagnostic processes of patient's life. This course will allow students to undertake the theoretical and practical work with the investigation of body's organs functions. It includes teaching of lab. methods and related modern technologies for the physiology and biochemistry of organ's systems. Blood chemistry tests/studies give important information about how well a person’s kidneys, liver, heart and other organs are working. An abnormal amount of a substance in the blood or body fluids can be a sign of a disease or side effect of a treatment. The course provides the experience for topics presented in the lectures and experience working together in small groups to achieve lab's objectives.

ZO732: Nutrition and metabolic disorders

The nutrition module gives students the knowledge on the dietary sources, intake levels, physiological role, and requirement of major nutrients. Also, it gives the opportunity to apply the nutrition principles for the prevention and treatment of common chronic diseases. The biological determinants of nutrient requirements and the assessment of nutrient status in individuals and populations will be studied. This course provides a discussion of disorders of metabolism, either inherited or acquired, in which nutrition plays a major role in the etiology, pathogenesis, or treatment. The nutritional control of the affected metabolic pathways and the interaction of nutrition with exercise, drugs and gene therapy will be presented. The role of nutrition in the growth and health through the life cycle should be considered.

Students have to study the role of diet misuse in the development of chronic diseases, such as cardiovascular disease, cancer, and diabetes.

ZO733: Plasma technology

This course is dealing with blood plasma components health applications, including, nutrients, wastes, gamma globulins, or immunoglobulins, are an important class of proteins. Appropriate selection and use of plasma, coagulation components and blood derivatives can be life-saving. Inappropriate use of blood components is costly, wastes a scarce resource, and can expose patients to unnecessary hazards. Be able to list two indications for transfusing fresh frozen plasma (FFP). This course concerns with the three major therapeutic constituents of cryoprecipitate, and the name of clinical indication for its use. Common blood derivatives such as factor VIII concentrates, prothrombin complex concentrates, albumin, and intravenous immune globulin are learned. The main coagulation abnormalities that occur after massive transfusion, and outline the appropriate treatment for each are also studied.

ZO734: Serology & Tumor markers

Serological module performs and interprets results of selected serological tests; compare and contrast adaptive and innate immunity, immunogenicity and the immune response in regard to antibodies, antigens, complements, MHC, and disease states, including autoimmunity, immunodeficiency, hypersensitivity, various viral and bacterial infections, and transplantation. Tumor immunology; describes, performs and interprets serologic tests including dilutions, titers, agglutination, precipitation, labeled and unlabeled immunoassays, molecular assays, and flow cytometry; identify and differentiate common pathogenic, opportunistic and contaminating fungal elements, including growth requirement, key biochemical tests, and associated disease states; discuss the life cycle, hosts, infective and diagnostic states, morphology, pathology, and epidemiology of common parasitic agents; discuss specimen types, collection methods, specimen preservation and preparation, staining, and interfering substances when identifying fungal and parasitic organisms. **Tumor markers** module intends to provide the basic information necessary regarding tumor markers; how they are used to detect, diagnose, and provide a prognosis of various cancers; provide an increased understanding of the many emerging biomarkers; the field of cancer biology, selectable tumor markers and targeted cancer therapeutics.

ZO735: Cancer and Tumor Biology

The course provides a broad knowledge on the biological principals underlying tumor and cancer formation. The basic science of tumor at the cellular, molecular and genetic level will be addressed. The course allows students to understand the etiology and fundamental mechanisms that underlie eukaryotic cell multiplication, cell senescence and cell death, including the alterations that are involved in the initiation of uncontrolled growth and carcinogenesis. In addition, cell cycle surveillance mechanisms that ensure genomic integrity and the signaling pathways that regulate tumor development and spread will be covered. Molecular and cellular events involved in tumor formation, progression, and metastasis; symptoms and targets for cancer therapy. The assessment methods of tumor should be experienced theoretically and practically.

ZO736: Clinical Biochemistry

This course is intended to provide students with an overview of normal and abnormal metabolic functions, including a review of nutritional requirements at the macro- and micronutrient levels. The role of normal functions of digestion in terms of processing proteins, carbohydrates and fats for the body requirements are discussed. The impact of disorders on metabolic processes is introduced with disease state of specific organs highlighted. The nature of specific manual laboratory tests and automated technologies are introduced, as is the need for an awareness of safety measures required to be taken in a clinical biochemistry laboratory. The main objectives of this course are:

Describe the role of water, carbohydrates, proteins and lipids in the diet.

Define and describe the role and digestive processes associated with uptake of micro and macronutrients, including vitamins and minerals in the diet.

Describe the role of plasma proteins and the application of protein separation technologies.

Describe the theory, application and interpretation of key technologies used in the Clinical Biochemistry laboratories.

ZO737: Ecosystem Functions and Bioenergetics

We all depend on a vast range of services provided by ecosystems, from food and medicines to a stable climate, clean water and storm protection. This course provides an introduction to the ecosystem ecology underlying these services, in particular looking at how ecosystems are structured and function. This course also addresses ecosystems understanding and associated services through different and complementary approaches, from the integrative ecology (including natural abiotic, biotic factors and human impact), the functional and evolutionary relationship between groups (such as parasitism, mutualism, invasive species, engineer species…), to the assessment of environmental threats on ecosystems integrity. This also covers ecosystems management strategies and how it contributes to ecosystem restoration and conservation. Energy is essential for the biological processes of living, and this course will examine energy processes within Ecosystem.

ZO738: Environment and Pesticides

This course examines the role and use of pesticides by various facets of society and the effect of these pesticides on biological activities in the environment. This course will be in focusing on general characteristics and properties of pesticides and their applications in agriculture and public health, with a particular focus on insecticides and herbicides. Emphasis on the ecological impacts of pesticides on organisms and ecosystems, as well as modern alternatives to chemical pesticides via the use of biotechnology and integrated pest management. This course includes the processes determine a pesticide's persistence and movement to ensure that applications are not only effective, but are also environmentally safe.

ZO739: Environmental Biotechnology

This course discusses the principles and commercial applications of biotechnology to environmental problems. The course is structured to promote self-learning and students' development of Biotech solutions to real-life problems. subject areas include the use of biotechnology to clean up or 'bioremediate' polluted environments. Furthermore, the application of biological systems in preventing pollution by supporting our planet's sustainable development is also explored in subject areas such as

'biofuels' and 'bioplastics'. The controversial issues of agricultural biotechnology are also examined in this course.

ZO740: Behavioural Ecology

The course provides an introduction to behavioural ecology, exploring the relationship between animal behaviour, ecology, population biology and evolution. It is illustrated with examples from diverse animal species and ecological systems. Students will gain experience of the practical, quantitative and statistical skills required for the study of behavioural ecology. Introduction. What is behavioural ecology? How do behavioural ecologists see the world? Behaviour involved in maximising survival and reproductive fitness. Optimality. Levels of selection. Finding a mate. Mating systems and conflicts of interest during reproduction. Sexual selection. Altruistic behaviour, inclusive fitness and kin selection. Co-operative breeding in birds. Eusocial behaviour in insects. Finding food. Optimality and economic decisions. Currencies and constraints in foraging behaviour. Simple models of prey choice, patch exploitation and forager distribution. Staying alive. Living in groups. Communication. Predator-Prey interactions - avoiding detection, attack and capture. Arms races in host-parasite interactions. Life histories and reproductive decision-making. Sexual conflict.

ZO741: Environmental Management

This course surveys the scientific principles of environmental issues and environmental management practices, with attention to the health of both humans and the ecosystem. The way in which human societies interact with natural resources and ways in which they can be sustainably managed. Fundamental and emerging topics related to air and water pollution, water use and management, aquatic ecosystems, energy and climate change, biodiversity, toxic substances in the environment, solid waste management, and regulatory strategies for risk assessment and environmental management are examined.

ZO742: Eco-Physiology

The primary goal of this course is to understand the relation between environment and the functioning of the live organism. The aim is to show how life processes depend on the environment at different levels from immediate environment of a cell to the impact of environment on the whole organism. The goal is to train students for a holistic view and understanding of the connection between life processes in the context of homeostasis and different life conditions in different environments.

ZO743: Applied Soil Biology

Applied soil science is concerned with the properties of the major soils of the world and how they can help determine the potential and constraints of the corresponding land units for ecosystem service delivery, including agricultural and forestry production, regulatory performance and land management requirements. Through interactive assignments students acquire the necessary skills in spatial data processing and scientific reporting for applied soil science challenges. Relate soil properties and ecosystem service delivery at different spatial scales.

ZO744: Molecular Ecology

This course will look critically at how molecular genetic tools are used to investigate ecological processes in natural populations of animal species. It will cover issues from the individual to the population level. Specific topics will include methods for studying genetic variation at the protein and DNA levels, quantitative predictions from ecological and evolutionary theory, and application of molecular genetic markers to research questions related to selection, patterns of migration, population bottlenecks and founder events, and animal mating systems and the potential of molecular techniques in conservation.

ZO745: Ecological Statistics

This course Intended for postgraduate students in biology and related environmental sciences, this course is an introduction to statistical methods for ecological data analysis, using the programming language R. The course will have lectures, discussions, and independent research projects using real data or simulated or publicly available data. This course enable student to will be able to design statistically sound data collection strategies to answer a given research questions.

ZO746: Environmental risk assessment

Environmental risk assessment and management (ERAM) is a tool that is increasingly being used by many organizations to identify their risk exposures as part of corporate-wide risk assessment and management programs. ERAM also supports environmental impact assessment (EIA) and environmental management programs. The ERAM encompasses a widely recognized framework and various methodologies for evaluating and managing risks from environmental contaminants and technological hazards. Topics include; introduction to risk sciences. Human Health Risk Assessment: Basic concepts and current approaches, Risk assessment paradigm. Hazard identification, dose/response assessment, Exposure assessment, modeling and monitoring approaches. Conceptual site models, risk characterization.

ZO747: Evolutionary Ecology

Evolutionary Ecology is the field covering the interaction between ecological and evolutionary processes. Ecology can affect evolution by imposing selective and other forces on lineages, forcing them to change over time. It can also create the conditions for new species to form or go extinct. Evolution can affect ecology if the characteristics that evolve impact on the organisms interactions with other organisms and the environment. By thinking across both disciplines, evolutionary ecologists are able to make powerful predictions about the world to which scientists in only one discipline would be blind. The module will take all these issues and discuss them in depth by reference to topical case studies.

ZO748: Practical Research Methods

This course provides a good guide to the methods and techniques for ecological research. Topics include; systematic methods of collection, analysis and reporting of field and laboratory ecological data, and basic experimental design in ecology. Lectures outline the quantitative nature of ecological research and the value of robust experimental methods. Some knowledge of basic statistics is required. Experimental design will be emphasized, and the elements of statistical tests, particularly linear modelling, will be considered in a variety of ecological contexts. This will then be followed by example

applications. These will focus on three most common habitats where teachers take students for fieldwork; the seashore, ponds and lakes, fields and woodland.

ZO749: Invertebrate endocrinology and Hormones

This course describes the structure and functions of endocrine and neuroendocrine system of higher invertebrate Phyla (Annelida, Arthropoda, Mollusca, and Echinodermata). In addition to study the mechanism of hormone action (neurohormones, peptide and steroid hormones), the origin of invertebrate hormones as well as the chemical nature of hormones. This course includes also identify the potential impacts that might occur in invertebrates from exposure to endocrine disrupting pollutants.

ZO750: Invertebrate toxicology

This course aims to study of the effect of different environmental pollutant such as pesticides, herbicides, and hydrocarbons on both aquatic and terrestrial invertebrates. Besides, the way of recovery of vulnerable invertebrate communities after pollutant exposure. A survey of interaction of environmental pollutants with living systems and toxicological evaluation of selected environmental chemicals will be studied

ZO751: Histology and Molecular Pathology of Invertebrates

In this course students learn microscopic anatomy of cells, tissues, and organs of invertebrate animals. Beside to study the infectious agents of invertebrate disease with emphasis on host- parasite relationships, unique aspects of microbial activities and organization, regulation, and genetics with contribute to pathogenicity, including identification and principles of prevention, treatment, and laboratory diagnosis using molecular techniques to study the pathogen problem in invertebrate organisms caused by bacteria, fungi, protozoa, and viruses.

ZO752: Biomedical Invertebrates

This course focused on Invertebrates that have biomedical importance. Those that either produce medically important substances or produce illness to human directly or indirectly. The course also gives an account on the reason and importance of using invertebrates as models on toxicity experiments and research. Also concepts relevant to ethics and potential for suffering will be covered.

ZO753: Field Techniques for Surveying Invertebrates

The course aims to study invertebrate surveying techniques from planning and preparations through to sampling strategies, surveying methods and reporting. Topics include interception and responsive trapping techniques, identification and taxonomic considerations, habitat description and evaluation, managing specimens, and analysing and interpreting data.

ZO754: Aquaculture Economic & Marketing

The course aims to study the basis of production; Interrelationships of aquaculture systems, the basic economic principles applied to aquaculture production; the input-output relationships, maximum level of input, least-cost combination of inputs, maximum level of output. This course is also concerning about the Cost-Benefit Analysis, different Fish marketing methods. Students will learn the basic concepts in demand and price analysis and economic feasibility of investment analysis

ZO755: Pollution and Biocontrol

The course offers an overview of problems related to the degradation and pollution of terrestrial ecosystems with an emphasis on soil and water and analyse the impact of soil and water pollution on ecosystems and humans. Students will learn concepts related to soil and animal sciences, water management, and environmental conservation strategies. It also provides students to identify and analyse natural and human-made environmental problems, evaluate the relative risks associated with these problems, and examine alternative solutions for resolving or preventing them. This course also will explore the ecological and technical basis of green technologies.

ZO756: Coral Reef Biology

This course aims to study coral reef biology which provides an integrated overview of the structure, function, physiology, ecology, behaviour, and how coral reef organisms reproduce and grow. Also, this course provides information about mutualistic relationship most corals have with zooxanthellae which live in their tissues. This study is enriched with coral reefs that dominate the marine environment and although pollution, climate changes, experimental aspects are also included.

ZO757: Marine Invertebrate ecosystem

This course aims to study the definition, types and factors affecting of marine ecosystem. This course emphasis on the invertebrates inhabiting different types of ecosystem like estuaries, salt marshes, mangrove forests, coral reefs, the open ocean, and the deep-sea ocean. The study will include also Biotic factors include plants, animals, and microbes; important abiotic factors include the amount of sunlight in the ecosystem, the amount of oxygen and nutrients dissolved in the water, proximity to land, depth, and temperature.

ZO758: National Parks and Conservation

This course aims todefine the national parks and study their importanceand enumeratethem in Egypt and all overthe world. It describes the threatens of animal diversity and methods of conservation of wildlife.The study will showthe role of National Park agencies**.**

ZO759: Invasive Species in Ecosystems

This course aims to study the effect of invasive species on the native animals and their diversity and habitat. The study will focus on Invertebrate’s species and how they tolerate the new habitat. The study will show the reasons of invading and the types of their control.

ZO760: Invertebrate behaviour

This course aims to study the behaviour of invertebrate animals and the neurologic and physiologic processes that control it. The course will describe the animal ability to learn and its mechanism.

ZO761: Advanced and Applied Immunology

The concept of this course is: cellular and molecular immunobiology and medical immunology; the role of the immune system in normal and abnormal immune responses and how this system manifests in laboratory tests; regulation of the immune system and how defects in this regulation can lead to diseases; introduction into the very complex science like vaccinology and related disciplines; basic information

and general knowledge about application fields of immunology for prevention and treatment of infectious diseases and cancer; historical and political aspects of vaccination; understand and explain principles of various types of vaccines and immunotherapeutical approaches; apply information on pathogen and its interaction with the host for suggestion of efficient strategy for development of particular vaccine or immunotherapy; immune function and dysfunction, particularly pathology in the immune system at the cellular and molecular level, as well as how immunological processes and techniques are used in the biotechnology and pharmacological fields; immunology in the context of immune mediated diseases and the application of immunological principles in the development of new drugsand vaccines; how the immune system can be manipulated by directed therapeutics, how changes that accompany immunologic disease can be measured in the diagnostic laboratory

ZO762: Immunological laboratory techniques and Tissue Culturing technology

This course focuses on: A brief survey of the components of the immune system and how they interact; experimental design and basic techniques and immunological methods and principles (antigen-antibody reaction, agglutination, precipitation), commonly used in immunology research laboratories; preparation of cell suspensions from lymphoid organs of mice, detection of activated T cells, production of monoclonal antibodies, and the following assays; enzyme-linked immunosorbent assay (ELISA), immunoprecipitation, SDS-PAGE, Luminex, western blot, and flow cytometry; isolation of DNA, Southern blotting, restriction mapping, subcloning, and DNA sequencing; immunofluorescence and immunohistochemistry, as well analyze single cell suspensions via flow cytometry; methods in proper image/data quantification/analysis; B and T cell development, activation and culture, the role of cytokines, their production and purification, signal transduction processes in B-cell activation, the role of MHC complexes, immunoglobulin synthesis and origins of diversity, antigen-antibody interactions, practical aspects of raising and purifying polyclonal and monoclonal antibodies, handling and labeling of antibodies, applications of antibodies; laboratory diagnosis by agglutination, precipitation, immunofluorescence and enzyme immunoassay; tissue and cell culture technology, and microscopy; necessary practical skills for the isolation of animals cells for in vitro studies, maintenance of animal cells in vitro, manipulation of animal cells in vitro, and application of molecular techniques to in vitro situations.

ZO763: Immunology of Infectious and inflammatory Diseases

This course will give students an introduction to basic immune mechanisms and emphasizes the basic principles of immunology, innate and adaptive immune system; understanding of immunology, infectious diseases and how it can fight infection and how an immune response can fail; different mechanisms to defend against the threats of multiple pathogens; how the immune system operates in a variety of disease situations and seeks to reinforce basic immunological principles; different types of clinically relevant infectious agents and the type of immunity they activate; how infectious agents can overcome the natural immune response and cause disease; role of immune system in combating diseases caused by common pathogensas well as adverse reactions of the immune system; application of the basic knowledge of immunology to the field of infectious disease prevention and control by vaccines and other treatment; how the immune system causes Inflammatory diseases such as rheumatoid arthritis, asthma, multiple sclerosis and cardiovascular disease; understanding of the role inflammation plays in disease; types of inflammation and disease; how lifestyle choices influence chronic inflammation.

ZO764: Serology & Tumor markers

Serological module perform and interpret results of selected serological tests; compare and contrast adaptive and innate immunity, immunogenicity and the immune response in regard to antibodies, antigens, complements, MHC, and disease states, including autoimmunity, immunodeficiency, hypersensitivity, various viral and bacterial infections, and transplant and tumor immunology; describe, perform and interpret serologic tests including dilutions, titers, agglutination, precipitation, labeled and unlabeled immunoassays, molecular assays, and flow cytometry; identify and differentiate common pathogenic, opportunistic and contaminating fungal elements, including growth requirement, key biochemical tests, and associated disease states; discuss the life cycle, hosts, infective and diagnostic states, morphology, pathology, and epidemiology of common parasitic agents; discuss specimen types, collection methods, specimen preservation and preparation, staining, and interfering substances when identifying fungal and parasitic organisms. Tumor markers module intends to provide: the basic information necessary regarding tumor markers; how they are used to detect, diagnose, and provide a prognosis of various cancers; provide an increased understanding of the many emerging biomarkers; the field of cancer biology, selectable tumor markers and targeted cancer therapeutics.

ZO765: Immunology & Virology and Immunotherapy

This course focuses on: basic immunology, virology and immunotherapeutic approaches; understanding immune system, its protective function and its role in the infectious and non-infectious diseases common infection and diseases of medical importance their microbial causes, as well as laboratory diagnosis, treatment, prevention and control; the host-microbe interactions; Laboratories investigate mechanisms of pathogenesis and commensalism of viruses the body's immune response and mechanisms of defense at the cellular and humoral (molecular) level; innate and adaptive immunity, including T and B cell development, cell mediated and humoral immunity; receptors and cytokines; inflammatory responses; tolerance and autoimmunity; immunity to intra- and extra-cellular organisms such as bacteria, viruses and macroparasites; virus classification, structure, replication, pathogenesis, epidemiology and control of virus infections, transmission and diagnostic methods; virus-host interactions; epidemiology of virus infections; virus vaccines, antiviral drugs; immunotherapy strategies; advantages/disadvantages of different classes of antigenic targets that are currently a focus of immunotherapy; tissue context in which immunotherapy takes place, a range of current immunotherapy approaches focusing on their scientific basis and clinical mode of action; immunotherapy strategies including antibody therapies, checkpoint blockade strategies, T cell /chimeric antigen receptor adoptive therapy, and cancer vaccines.

ZO766: Immunohematology and Blood banking and transfusion

Immunohematology and blood banking and transfusion course provides knowledge in: basic immunology related to methods utilized in the clinical laboratory (blood collection, blood components, immunology and complement, principles of serological testing, genetics, blood group systems, antiglobulin testing, gel and solid phase testing, identification of unexpected antibodies, pre-transfusion compatibility testing, international Society of Blood Transfusion (ISBT) product labeling, adverse effects of blood transfusions, positive direct antiglobulin test (DAT) and immune hemolysis, quality assurance, transplantation, and molecular testing; donor selection process, product preparation, processing, and use of blood components; define and distinguish the immune processes as they relate to immunohematology and the characteristics of antigens and antibodies of the ABO, Rh, and other blood

group systems and the associated nomenclature; routine blood bank procedures utilized in pre-transfusion testing; theory and laboratory techniques including the ABO, Rh and other blood group systems; donor screening, blood collection, preparation and use; blood grouping, antibody screening, cross-matching; incompatibility problems associated with pregnancy; the risk and benefits of transfusions, strategies to investigate adverse effects of transfusions and tissue-typing.

ZO767: Advanced protozoology and helminthology

The course provides an overview and an update on the recent advances in the biology, epidemiology, host-parasite relationship, pathogenesis, diagnosis and control of parasitic protozoa and helminthes of national and global importance with special emphasis on endemic, emerging and introduced parasites of public health importance. The course enables students to deal with public health issues related to parasitic protozoa and helminthes and plan strategies for successful management, prevention and control. The focus will be placed on zoonotic agents currently having a significant impact on animal and public health. Lectures will be followed by active practical lessons that equip students with professional skills in: advanced diagnostic, molecular, immunological, therapeutic, epidemiological, and control aspects of the subject. Students are asked to design a research project and apply relevant research skills; prepare a written report including a critical literature review of relevant scientific publications and show competence in communicating scientific literature.

ZO768: Modern trends in parasitology

The course examines contemporary issues in parasitology, relating to the student's area of specialization and relevance. Such topics are expected to challenge the students into exploring current and relevant research trends/discoveries in scientific approaches. The course will enable students to explore scientific knowledge in modern parasitology, and add on to their depth of information in their chosen areas of specialty. Additionally, it will expose students to current trends of presentations, and foster a stronger confidence-building attitude that will enable enhanced international academic competitive spirit.

ZO769: Microbiology and quality control in laboratories

The microbiology course encompasses bacteriology, mycology and virology it includes the study of the structure and physiology of microorganisms. Lectures cover gene structure and inherited traits, experimental genetics and genetic engineering. The course provides knowledge and practices on incubation of micro-organisms, transmission and replication of viruses, and other microbe groups that affect animals and humans, including their pathology, physiological response to the host and typical investigation and treatment options. The course provides students with practical and professional skills on laboratory identification of bacteria, fungi and viruses using conventional methods, as well as antimicrobial susceptibility testing and evaluation of clinical specimens for evidence of infection. Students will also gain skills in quality assurance procedures. The course will consist of lectures, readings and case studies of quality assurance for the clinical laboratories. The course introduces students to the philosophy of quality control and trains them to achieve quality levels in the workplace.

ZO770: Immunoparasitology and parasite Pathology

This course is an in-depth study of recent advances in fundamental immunological concepts and mechanisms effective in protecting animals from endo- and ectoparasites of domestic, wild animals, birds, and fishes as well as man. The course covers a variety of topics including immune evasion mechanisms, immunogenicity and cellular; humoral; and molecular mechanisms of immunity-related to the pathogenesis of the disease (immunopathology). The course gives the knowledge and practical skills required for advanced research to apply these concepts to clinical settings. This course considers the use of immunological reactions and principles of the development of parasite antigens for diagnostic purposes, immunotherapies, and the future opportunities in this rapidly growing field of parasitology as it can be used to benefit man as part of biological control of pests or as medication against autoimmune diseases.

ZO771: Parasites neurobiology and anthelminthics

The course will provide the students with an introduction to cellular and behavioral neurobiology of helminthes. Topics will include cellular neurobiology, neurophysiology, neuroanatomy, sensory processing, movement, and neurobiology of helminths behaviors. The course also introduces information on properties of ideal anthelmintics, how to choose and evaluate them, alternatives of drug therapy and the mode of actions of antehemintics on the helminthes body.

ZO772: Infectious diseases and applied Parasitology

The course discusses the biology of some parasites of man and domestic animals in Egypt. These include classification, distribution, incidence, morphology, natural history, pathogenicity, and laboratory diagnosis, therapeutic and prophylactic measures. Immunology of parasitic infections and the role of vectors in the transmission of parasitic diseases, host pathology, evasion of host responses by parasites, Serodiagnosis, vaccination, chemotherapy and drug resistance, Genetic resistance to parasitic will also be discussed. The student develops skills in the detection of parasites in tissue and prevention of transmission of infection. The skills developed find application in public health, animal health, pharmaceutical industry, research institutes.

ZO773: Insect Neurophysiology

This course will enable the students to gain profound knowledge in fundamental and applied aspects of the physiology of the central nervous system of insects and sensory neurouns of different sense organs in insects. The student will demonstrate insight into patterns and processes that occur in the central nervous system. They will understand the functional role and evolution of physiological mechanisms that allow insects to adapt to changes in their environment. In this course, the student will analyse and integrate information regarding molecular, cellular, organismal and environmental mechanisms controlling functional processes in the nervous system of insects. In addition, the student will develop practical skills in fundamental and appplied insect neurophysiology.

ZO774: Honeybee Pathology & Treatment Approaches

This course will enable students to acquired knowledge about honey bee pathology and method of treatment. This course contains separate chapters on viruses, bacteria, fungi, protozoa, mites and insect parasites. How to examine and diagnose the different honeybee pathogen, and apply the treatment methods.

ZO775: Vector Problems in Egypt

This course will enable students to acquire knowledge and critical understanding of vector-borne diseases of public health concern in Egypt, including lymphatic filariasis, schistosomiasis and Rift Valley fever etc… However, many of these diseases are preventable through evidence-based protective measures. Acquire knowledge and background about the Ministry of Health and Population issues new guidelines for control of endemic diseases.

ZO776: Integrated Pest Management Applications

The rationale of this course is to introduce students to the diversity and complexity of integrated management (IPM) of insects. The goal is to develop an understanding of the concepts and principles of IPM and the utilization and integration of pest control tactics (cultural methods, biological control, pesticides, host resistance) for management of insects.

ZO777: Invasive Pest Control

Invasive insects are species that have moved beyond their natural distribution and are damaging to the environment and nature biodiversity. Such insects cause enormous problems around the world, and thus understanding methods of control of invasive insect species are critical for conservation.

ZO778: How to write and publish a scientific paper

This course covers the steps of writing a scientific papers such as original articles, and review with emphasis on different sections such as abstract, introduction, methods, results, discussion as references. Later, the student will study how to communicate with journals and editors to publish their work.

ZO779: Molecular Applications in Entomology

This course aims to provide students with hands-on experience in basic molecular biology strategies: DNA extraction, Polymerase Chain Reaction (PCR), quantitative PCR, primer design and optimization, DNA blocking strategies cloning, Sanger sequencing, Fragment sizing, Next Generation sequencing. Students will learn to apply molecular tools to entomology and entomological problems. Emphasizes how molecular biological tools are used to understand insect genome organization, pest resistance, transgenic insects, insect behavior, origin and spread of invasive species and insect systematic.

ZO780: Experimental Design & Analysis

The course focuses on the principles of experimental design, data collection, organization and manipulation. How to present and interpret entomological results. The theory of different analysis types. Using different software of analysis. Practical applications of experimental accuracy, assumptions. Field experimental planning and implementation, data processing and interpretation.

ZO781: Advanced Insecticide Toxicology

This course will provide an over view of insecticide classification, mode of action, genetic basis of resistance, metabolism, environmental fate, formulation, and pesticide laws and regulations. Insecticide toxicity with emphasis on chemistry, toxicity, carcinogenesis, methods of toxicity testing, probability

analysis, analytical methods of detecting pesticide residues, biological and environmental factors affecting toxicity of insecticides.

ZO782: Bioinformatics

This course introduces the students to the application of computational methods to biological data analysis and discovery. The focus will be on Knowledge on molecular biology primer, biological words, sequence assembly, sequence alignment, database similarity searching, fast sequence alignment using FASTA and BLAST, genome rearrangements, motif finding (tentative), phylogenetic trees and gene expression analysis. In genomics, computational methods will include DNA sequencing and fragment assembly, identification of genes in DNA, gene regulation, expression, large data arrays, and methods to study genetic diversity. In proteomics, computational methods will embrace similarity, homology and analogy, protein folding and protein structure.

ZO783: Physiological and Evolutionary Ecology of Insects

The course describes those physiological mechanisms that are fundamental to the ways in which organisms interact with their environment. The important physiological processes that make insects so successful in so many different environments. Fitness considers the relative ability of individuals or their progeny to survive under various constraints imposed by the abiotic and biotic environment in which they find themselves. In this course, students will study the mechanisms of evolutionary ecology pertaining to insects, emphasizing how insect could keep surviving across generations.

ZO784: Insect Biotechnology Applications

This course focuses on the use of insects or insect-derived cells and molecules in human healthcare. The second part of this course addresses the input of insect biotechnology to modern and sustainable approaches in plant protection. The third chapter focuses on industrial application of insects or insect-derived cells or molecules. Insect-derived cell lines prosper in use as heterologous expression systems for production of peptides or proteins used, for example, as vaccines in human healthcare or as enzymes mediating industrial processes.

جامعة طنطا
كلية العلوم

لائحة الدبلوم المهني في جودة المعامل ومراقبتها

Professional Diploma in Laboratory Quality and Control



(برنامج مميز بمصروفات)

2026

Professional Diploma in Laboratory Quality and Control

الدبلوم المهني في جودة المعامل ومراقبتها

مقدمة:

تساهم الدبلومة المهنية في جودة المعامل ومراقبتها في رفع معايير الجودة التي تطبق في المعامل من خلال خريجي هذه الدبلومة، حيث أن مراقبة الجودة يتيح للمختبرات الكشف عن أية مشكلات في وقت مبكر واتخاذ الإجراءات التصحيحية اللازمة، مما يضمن دقة وموثوقية نتائج تلك المختبرات والتي تؤثر إيجابياً على الخدمات المقدمة للعملاء، مما يساهم في تحسين ثقة المجتمع في تلك المعامل، كما سيكون لتلك الدبلومة أثر كبير في رفع كفاءة العاملين في مجال المختبرات من خلال تدريبهم على أحدث المعايير والتقنيات التي تساعد على زيادة كفاءة العمل وتقليل الأخطاء ودقة النتائج مما يساهم في تحسين الأداء وزيادة الفرص الوظيفية، كما أن وجود تلك الدبلومة المهنية يعزز الثقة بين العملاء والمستخدمين لنتائج التحاليل والاختبارات التي تقدمها المعامل كونها تمت علي أيدي متخصصين في جودة المعامل ومراقبتها وتعرف المعامل بأنها أى مكان يقوم تحليل عينات فى أى منشأة علمية أو صناعية.

يتميز هذا البرنامج بطبيعته المهنية التطبيقية التي تركز على إكساب الدارسين المهارات العملية والتدريب الميداني في بيئات العمل الفعلية، وهو ما يميزه جوهرياً عن الدبلومات الأكاديمية التي تركز على الجوانب النظرية والبحثية. ويستند البرنامج بشكل مباشر إلى المعايير الدولية ذات الصلة بجودة المعامل، وعلى رأسها معايير ISO 15189 ومعايير ISO/IEC 17025، مما يعزز أهلية الخريجين للعمل في معامل معتمدة محلياً ودولياً ويرفع من القيمة المهنية للدبلوم كما تأتي رؤية البرنامج متوافقة مع: -

الاستراتيجية الوطنية للتعليم العالي.

الخطة الأإستراتيجية لجامعة طنطا.

- احتياجات سوق العمل المتزايدة في مجال اعتماد وجودة المعامل.

الأهداف العامة لبرنامج جودة المعامل ومراقبتها تشمل عدة جوانب أساسية لضمان الكفاءة والدقة والموثوقية في العمل داخل المختبرات، من بين هذه الأهداف:

1. ضمان دقة واتساق جميع العمليات والإجراءات التي تُنفذ داخل المختبرات، مما يؤدي إلى الحصول على نتائج دقيقة موثوق منها.
2. ضمان الامتثال للمعايير والقوانين المحلية والدولية المتعلقة بالجودة والسلامة داخل المختبرات.

3. تحسين الأداء داخل المختبرات من خلال تحليل النتائج والممارسات بانتظام لتحديد مجالات التحسين وتطبيق الإجراءات التصحيحية اللازمة.
4. توفير بيئة عمل آمنة داخل المختبرات خالية من المخاطر الصحية.
5. تعزيز الثقة لدى العملاء والمستخدمين في النتائج والخدمات خلال تطبيق نظام الجودة الشامل داخل المختبرات
6. توفير نظم التتبع والمراجعة داخل المختبرات من خلال الاحتفاظ بسجلات دقيقة وشاملة لجميع العمليات والنتائج.

بتحقيق هذه الأهداف، سيساهم برنامج جودة المعامل ومراقبتها في رفع مستوى الأداء والجودة في المختبرات، مما ينعكس إيجابياً على نتائج الأبحاث والاختبارات التي تُجرى به.

1. إعداد كوادر قادرة على تطبيق نظم ضمان الجودة داخل المعامل.
2. ضمان الامتثال للتشريعات المحلية والدولية المتعلقة بالجودة والسلامة داخل المختبرات
3. إكساب المتعلمين القدرة على تطوير نظم إدارة الجودة استنادًا إلى المعايير الدولية
4. تدريب الدارسين على توثيق العمليات والإجراءات الفنية وتوجيه عمليات التدقيق الداخلي

المخرجات التعليمية المستهدفة:

بنهاية هذا البرنامج سيصبح الطالب قادرا علي:

المعرفة والفهم:

1. يشرح المعايير الدولية والمحلية المتعلقة بجودة المختبرات
2. يفهم كيف يتحقق من دقة وصحة النتائج المخبرية باستخدام مجموعة من الأدوات مثل العينات القياسية والاختبارات العمياء.
3. يفَهم كيفية إنشاء وصيانة الوثائق المتعلقة بعمليات الجودة مثل سجلات المعايرة والإجراءات التشغيلية القياسية.
4. يعدد مواصفات بيئة العمل الآمنة داخل المختبرات
5. يعدد المخاطر الصحية داخل المختبرات ويشرح كيفية التعامل معها والوقاية منها
6. يشرح معني الحوكمة المؤسسية وعلاقتها بنظم الإدارة
7. التعرف على معايير ISO ذات الصلة بجودة المعامل
8. معرفة متطلبات الاعتماد والتشريعات المنظمة

المهارات العملية

1. يطبق المعايير والإجراءات المحددة لضمان جودة العمل في المعامل
2. يجري الفحوصات والمعايرة المطلوبة للأجهزة والمعدات المستخدمة في المختبرات طبقا لجداول زمنية محددة
3. يطبق القواعد المعيارية لمكافحة العدوي بالمختبرات ذات الصلة.
4. يسجل ويوثق جميع أنشطة وإجراءات ونتائج المحتبرات بطريقة منظمة ودقيقة
5. يجري عمليات تدقيق وتقييم دورية للتأكد من الالتزام بالمعايير والإجراءات المتبعة.
6. يتعامل مع المخاطر المحتملة ويضع استراتيجيات للتعامل معها ومنع حدوثها.

المهارات الذهنية

1. يحلل البيانات الناتجة عن اختبارات الجودة باستخدام الأساليب الإحصائية لتحديد الاتجاهات وأي انحرافات محتملة.
2. يراجع ويحلل أداء أنظمة المختبرات ويتخذ الإجراءات التصحيحية عند الضرورة
3. يحلل ويقيم البيانات الناتجة عن الفحوصات والتجارب لضمان دقتها وصحتها
4. يحلل المطلوب للحصول على اعتماد المختبر
5. تحليل نظم الجودة داخل المؤسسات.

المهارات المنقولة

1. يتواصل بفاعلية لضمان تنسيق العمل
2. ينمي المهارات الشخصية اللازمة للعمل في مجال جودة المعامل
3. يطور المهارات القيادية والإدارية لإنجاز الأمور
4. القدرة على تطبيق بعض أدوات الجودة.
5. إعداد سجلات الجودة

اللائحة الداخلية للدبلوم المهنى في جودة المعامل ومراقبتها

مادة (1): منح الدبلوم المهنى

"يمنح مجلس جامعة طنطا الدبلوم المهني في جودة المعامل ومراقبتها بناءً على موافقة مجلس الكلية" وذلك وفقاً للمادة 147 من اللائحة التنفيذية لقانون تنظيم الجامعات

ماده (2) : نظام الدراسة.

- نظام الدراسة هو نظام الساعات المعتمدة Credit Hours System في إطار الفصل الدراسي بواقع 24 ساعة معتمده موزعه على فصلين دراسيين بواقع 12 ساعة معتمده لكل فصل دراسي.
- الساعة المعتمدة هي وحدة قياس دراسية تعادل ساعة محاضره دراسية نظريه واحده في الأسبوع او ساعتين لكل درس عملي او تمارين تطبيقيه في الأسبوع طوال الفصل الدراسي.
- لغة الدراسة الأساسية في البرنامج هي اللغة الإنجليزية.

ماده (3) : مدة الدراسة.

عام أكاديمى واحد مقسم الى فصلين دراسين وفصل دراسى صيفى (اختيارى)

- مدة الدراسة للفصل الدراسي يمتد من **15 إلى 17أسبوعًا** أسبوع مقسمه كالتالي:
- الأسبوع الأول تسجيل المقررات.
- الأسابيع الدراسية الفعلية (14 أسبوع) .
- أسبوعين للاختبارات النهائية وبحد أقصى 3 أسابيع.

– الفصل الدراسي الصيفي (اختيارى) مدته 9 أسابيع مقسمه كالتالي:

- الأسبوع الأول تسجيل المقررات.
- الأسابيع الدراسية الفعلية (7 أسابيع).
- أسبوع للاختبارات النهائية وبحد أقصى 10 أيام.
- الحد الأدنى لدراسة المقررات الدراسية فصلين دراسيين، والحد الأقصى 6 فصول دراسية (دون الفصل الصيفي).

ماده (4) : الشروط العامة للقيد والقبول بالبرنامج :

- يقيد للدبلوم المهني في جودة المعامل ومراقبتها خريجي كلية العلوم أو إحدى الكليات أو المعاهد (العملية) ذات **الصلة** والتابعة للجامعات أو المعاهد المصرية الحكومية أو الخاصة المعترف بها من المجلس الأعلى للجامعات .
- كما يقبل خريجي الجامعات أو المعاهد (العملية) ذات الصلة من خريجي الجامعات الأجنبية بعد معادلة الشهادات من المجلس الأعلى للجامعات المصرية.
- يحدد موعد قبول الطلاب وفتح باب التسجيل والقيد في شهر أغسطس على أن تبدأ الدراسة في سبتمبر، وأيضاً شهر ديسمبر على أن تبدأ الدراسة في يناير.
- وتحدد اللجنة العليا للبرنامج اعداد المقبولين بعد استيفاء الوثائق المطلوبة والمعلنة بإدارة الدراسات العليا بالكلية وسداد المصروفات الدراسية في ضوء اقتراح اللجنة التنفيذية وفى حالة تجاوز عدد المتقدمين يتم المفاضلة بينهم بالتخصص والتقدير والمجموع بالدرجات في المؤهل الدراسي الاخير.
- يعتبر دبلوم الدراسات المهنية مرحلة منتهية ولا تتيح للحاصل عليها التقدم للدراسة لأي مرحلة أخري.

ماده (5) متطلبات الحصول على الدبلوم :

يشترط للحصول على درجة الدبلوم المهني في جوده المعامل ومراقبتها ما يلي:

1- استيفاء الطالب عدد 24 ساعة معتمدة موزعه على فصلين دراسيين بواقع 12 ساعة معتمده لكل فصل دراسي كالاتي:

البيان	الساعات المعتمدة
مقررات اجبارية فصل دراسي أول	8
مقررات اختيارية فصل دراسي أول	4
مقررات اجبارية فصل دراسي ثاني	8
مقررات اختيارية فصل دراسي ثاني	4
المجموع	24

2-كما يتطلب أيضاً استيفاء تدريب ميداني مكثف بإحدى الجهات المعنية بمراقبة الجودة، توافق عليها الكلية، لمدة لا تقل عن 6 أسابيع ولا تقل ساعات التدريب الفعلي أسبوعياً عن 4 ساعات.

3-يتم تقييم التدريب الميداني من خلال تقرير مفصل يقدمه الطالب عن فترة التدريب، ويُقيَّم بمعرفة لجنة يشكلها مجلس القسم المختص بالتنسيق مع جهة التدريب، ويُحتسب التدريب الميداني ضمن متطلبات منح الدبلوم.

4-يتم تقييم المشروع التطبيقي كالتالي: 40 درجة على جودة المشروع 40 درجة على الجزء العملي التطبيقي للمشروع 20 درجة مناقشة شفهية من لجنة ثلاثية يشكلها القسم المختص بالمشروع وعلى أن يكون حضور المناقشة الشفوية شرط لاستكمال باقي درجات المشروع.

5-الالتزام بنسبة حضور لا تقل عن 75%.

ماده (6) الارشاد الأكاديمي:

المرشد الأكاديمي هو عضو هيئه تدريس يتم ترشيحه عن طريق منسق البرنامج وموافقه اللجان التنفيذية وذلك لمساعدة الطلاب في اختيار المقررات الدراسية والتسجيل وحل المشاكل الأكاديمية يقسم الطلاب الي مجموعات بحد أقصى 10طلاب لكل مرشد أكاديمي.

مادة (7): التسجيل والدراسة:

يتم التسجيل لدراسة المقررات في الدبلوم المهني في جودة المعامل ومراقبتها في بداية كل فصل دراسي وفقا للضوابط الاتية:

- يتابع المرشد الأكاديمي للطلاب مع السيد الأستاذ الدكتور/ منسق البرنامج تنفيذ قواعد التسجيل وإجراءاته ويعتمد من السيد ا.د/ وكيل الكلية لشئون الدراسات العليا.
- يتم اعداد الجداول الدراسية الخاصة بالبرنامج ويتم الإنتهاء من تسجيل الطلاب في الأسبوع الأول من بداية الفصل الدراسي الأول والثاني.
- يـدرس الطالب في كل فصل دراسي 12 ساعة معتمدة كحد ادني
- يجوز للطالب بعد أخذ رأي المرشد الأكاديمي أن يسجل عدد ساعات اضافيه كمتطلبات تخرج بحد أقصى 4 ساعات معتمده.
- لا يجوز للطالب التسجيل المتأخر الا بموافقه اللجنة التنفيذية على الا تزيد مدة التاخير عن أسبوعين فقط من نهاية فترة التسجيل .
- يجوز للطالب تسجيل مقررات سبق له دراستها لرفع او تحسين معدل التخرج في حال عدم نجاحه بالمعدل التراكمي GPA (أقل من 2).
- يجوز للطالب الراسب في مقرر اختياري اعاده تسجيل نفس المقرر الراسب فيه او تغيره بمقرر اختياري اخر بحد أقصى ثلاث مرات في المواعيد المحدد للتسجيل مع سداد الرسوم المقررة .
- يجوز للجنه العليا بعد موافقة اللجنة التنفيذية ان يدرس الطالب عن بعد بنظام اونلاين (online) وفي هذه الحالة يشترط علي الطالب الانتظام في حضورالمحاضرات عن بعد ويحسب ذلك بنسبة الحضور المسموح بها في المقررات بشرط استيفائه ما جاء بالمادة (5) فقره (2) (التدريب الميداني) علي ان يقدم الطالب طلب بذلك في المواعيد المحددة للقيد وعلى أن يستوفى عدد الساعات العمليه قبل دخول الامتحان.

مادة (8): الانسحاب من المقرر:

- يجوز للطالب الانسحاب الكلي من الفصل الدراسي بعد اخذ رأى المرشد الأكاديمي ومنسق البرنامج وموافقه اللجنة التنفيذية على الا يتجاوز ذلك نهاية الاسبوع السادس من بداية الفصل الدراسي الاول أو الثاني ونهاية الاسبوع الرابع من بداية الفصل الصيفي.
- تنظر اللجنة التنفيذية فى طلبات الإنسحاب التى تقدم بعد نهاية الفترة المسموح بها .
- يعتبر الطالب الذي يقبل بالبرنامج ولم يسجل في سنه القيد خلال فترة التسجيل المحددة في الفصل الدراسي الاول او ينسحب بعد نهاية الموعد المقرر للانسحاب بدون عذر مقبول يعتبر منسحبا برسوب (WF) من الفصل الدراسي وإذا لم يسجل فى الفصل الذي يليه يلغي قيده.

مادة (9) إلغاء القيد:

- يقوم مجلس الكلية بإلغاء قيد الطالب بناء على موافقة اللجنة التنفيذية فى الحالات الأتية :
- تجاوز الطالب المدة القصوى للدراسة بالمرحلة دون نجاح.
- عدم سداد الرسوم الدراسية المقررة في المواعيد المحددة دون تقديم عذر تقبله اللجنة التنفيذية بعد اعلانه بثلاث انذارات وفق القواعد والقرارات المنظمة .
- إذا انقطع عن الدراسة بدون عذر مقبول لمدة عامين متصلين، أو إذا تم إنذار الطالب ثلاثة إنذارات متتالية بسبب الانقطاع عن الدراسة خلال الفصل الدراسي الواحد بعد اعتماد المرشد الأكاديمي ومنسق البرنامج وبعد إعلام الطالب بالإنذارات رسمياً.
- إذا تقدم بطلب الانسحاب من الدراسة.
- إذا وقع عليه جزاء تأديبى وفقا لما ينص عليه قانون تنظيم الجامعات.

مادة (10) إعادة القيد:

اذا تم الغاء قيد الطالب لاحد الاسباب المذكور في المادة (9) باللائحة يجوز لمجلس الكلية بناء علي طلب الطالب وموافقة اللجنة التنفيذية للبرنامج اعاده قيده ويراعي ان تطبق عليه القواعد التي تطبق علي الطالب الجديد ويجوز أن يعفى من بعض المقررات الدراسية إذا لم يمر على نجاحه فيها عامين دراسيين مع احتفاظه بتقديرات هذه المقررات مع الإلتزام بالقواعد والمواعيد المعلنة من الجامعة .

مادة (11) النظام الكودي للمقررات:

- تكود المقررات بوضع الرمز (LQCR) يليه الرقم الدال علي المقرر.
- تأخذ مقررات الدبلوم (كود 500) .
- يوضع الرقم الدال على مستوي المقرر(5) في خانة المئات ثم رقم المقرر في خانة الاحاد والعشرات بحيث ترمز الأرقام الفردية لمقررات الفصل الدراسي الأول والمقررات الزوجية للفصل الدراسي الثاني (تكويد نظام للمقررات الإختيارية ويرمز لها (ELEC) .

مادة (12) ضوابط الامتحانات والتقييم:

1. مدة الامتحان ساعتان ويعقد الامتحان التحريري في نهاية كل فصل دراسي.
2. يعتبر الطالب الغائب بدون عذر في الامتحان النهائي النظري للفصل الدراسي راسبا في المقرر (F)
3. اذا تقدم الطالب بعذر مقبول خلال المدة المحددة لتقديم الاعذار وفقا للقواعد المنظمة باللائحة التنفيذية لقانون تنظيم الجامعات وتكون نتيجه الطالب في هذا المقرر غير مكمل (IC) ويستكمل الطالب

متطلبات المقرر في الفترة التي يعقد بها امتحانات نفس الفصل الدراسي التالي مباشرة وإذا تغيب الطالب للمرة الثانية عن الامتحان النهائي يعتبر الطالب راسبا في المقرر ويرصد له تقدير (F).

4. النهاية العظمى لكل مقرر 100 درجة والنجاح في المقرر من 60 درجه على الأقل.
5. توزع درجات التقييمات المختلفة للمقرر الدراسي طبقاً للجدول التالي، ويجوز للجنة التنفيذية بموافقة اللجنة العليا تعديل بعضها بهدف التطوير وقياس كل نواتج التعلم المستهدفة:

نوع المقرر	اعمال فصليه	شفوي	تطبيقي	عملي	نظري
مقررات بها محتوي نظري وعملي	%10	%5	%5	%20	%60
مقررات بها محتوي نظري فقط	%20	%10	–	–	%70

6. الطلاب الراسبون في مقرر ما يحق لهم اعادة التسجيل في المواعيد المتاحة لتدريس المقرر ويكون أداؤه للامتحان في مواعيد الامتحان المحددة لتلك المواد.
7. إذا تكرر رسوب الطالب في مقرر ما، يكتفى باحتساب الرسوب مرة واحدة فقط في معدله التراكمي، ولكن تسجل عدد المرات التي أدى فيها امتحان هذا المقرر في سجله الأكاديمي وعند تكرار الرسوب تحتسب درجة النجاح من 60% ويحصل على تقدير مقبول .
8. يحسب المعدل التراكمي لدرجات الطالب في مرحلة الدبلوم كالآتي:

$$\text{المعدل الفصلي} = \frac{\text{مجموع (حاصل ضرب نقاط كل مقرر} \times \text{عدد ساعاته المعتمدة)}}{\text{عدد الساعات المعتمدة المسجلة في الفصل نجاحا ورسوبا}}$$

$$\text{المعدل التراكمي} = \frac{\text{مجموع (حاصل ضرب نقاط كل مقرر تم دراسته} \times \text{عدد ساعاته المعتمدة)}}{\text{حاصل جمع الساعات المعتمدة المسجلة في جميع الفصول نجاحا ورسوبا}}$$

- يحق للطالب التقدم بتظلم أكاديمي بشأن نتائج الامتحانات أو التقييم، وذلك خلال أسبوعين من تاريخ إعلان النتائج، ويُقدَّم التظلم كتابةً إلى منسق البرنامج مشفوعاً بالأسباب والمستندات المؤيدة.

- تُشكَّل لجنة للنظر في التظلمات الأكاديمية من ثلاثة أعضاء هيئة تدريس بقرار من وكيل الكلية لشئون الدراسات العليا، وتصدر اللجنة قرارها خلال أسبوعين من تاريخ تقديم التظلم، ويكون قرارها نهائياً بعد اعتماده من مجلس الكلية.

مادة (13): الدلالات الرقمية والرمزية للدرجات والتقديرات :

تقدر الدرجات والنقاط التي يحصل عيلها الطالب نجاحا او رسوبه في كل مقرر دراسي علي النحو التالي:

Grade	التقدير	رمز التقدير	GPA بالنقاط من 4	الدرجة المئوية
Excellent	ممتاز	A^+	4.0	**من 90 الى 100**
Excellent	ممتاز	A	3.67	**من 85 الى اقل من 90**
Very Good	جيد جدا	B^+	3.33	**من 80 الى اقل من 85**
Very Good	جيد جدا	B	3.00	**من 75 الى اقل من 80**
Good	جيد	C^+	2.67	**من 70 الى اقل من 75**
Good	جيد	C	2.33	**من 65 الى اقل من 70**
Pass	مقبول	D	2.0	**من 60 الى اقل من 65**
Fail	راسب	F	0.00	**أقل من 60**
Incomplete	غير مكتمل (غ م)	IC	0.00	---
Denial	محروم	DN	0.00	---
Withdrawn	منسحب	W	0.00	---
Withdrawn - Fail	منسحب برسوب	WF	0.00	---
Postponed	مؤجل	P	0.00	---
Excused Absence	غياب بعذر	ExA	0.00	---
Audit-Pass	ناجح حضور	AuP	------	---
Audit-Fail	راسب حضور	AuF	------	---

ماده (14): الحضور

- يجب ان لا تقل نسبة حضور الطالب في المقرر عن 75% من مجموع محاضرات هذا المقرر ما لم يكن قد تغيب بعذر تقبله اللجنة التنفيذية واللجنة العليا طبقاً لقواعد الجامعة.
- يجوز للجنة التنفيذية بعد موافقة اللجنة العليا حرمان الطالب من دخول امتحان المقرر الذي يقل نسبة حضوره عن 75% وفى هذه الحالة يعتبر الطالب راسبا في ذلك المقرر.
- تتبع نفس الإجراءات والقواعد مع الطلاب الدارسين عن بعد بنظام أونلاين وإنذارهم في حالة الغياب طبقا للقواعد ويحسب لهم نسبة الغياب.

ماده (15) احكام تنظيمية:

1. تحدد اللجنة التنفيذية عدد الطلاب المسموح قبولهم بالبرنامج وفى حالة تجاوز عدد المتقدمين يتم وضع اسس لأولوية القبول .

Professional Diploma in Laboratory Quality and Control

مقررات البرنامج

الترم الأول First Semester

Code	Courses title	Lectures hours/ week	Practical hours/ Week	Total credit hours
LQCR 501	Quality Management Systems for Laboratory Equipment نظم إدارة الجودة فى تجهيزات المعامل	1	-	1
LQCR 503	Laboratory Quality and Fundamentals of Accreditation (ISO/IEC 17025, ISO 9001) جودة المعامل وأساسيات الاعتماد	1	-	1
LQCR 505	Occupational Safety and Laboratory Risk Management السلامة المهنية وادارة المخاطر المعملية	1	2	2
LQCR 507	Infection Control and Waste Management مكافحة العدوى وإدارة النفايات	1	2	2
LQCR 509	Biostatistics and Laboratory Data Quality Analysis الإحصاء الحيوي وتحليل جودة البيانات المعملية	1	2	2
ELEC 511	Laboratory Governance and Management حوكمة وإدارة المختبرات (اختياري)	2	-	2
ELEC 513	Laboratory Supply Chain Quality and Performance جودة سلسلة الإمداد وإدارة الأداء بالمختبرات (اختياري)	2	-	2
ELEC 515	Entrepreneurship and Feasibility Studies ريادة الاعمال ودراسة الجدوى (اختياري)	2	-	2
	Total Credit Hours	12		

- يختار الطالب مقررين فقط من المقررات الاختيارية (ELEC).
- يحسب عدد ساعات المقررين الاختيارية 4 ساعات فقط بالفصل الدراسي.

Professional Diploma in Laboratory Quality and Control

مقررات الاجبارية والاختيارية (يختار الطالب مقرران من المقررات الإختيارية)

Second Semester الترم الثاني

Code	Courses title	Lectures hours/ week	Practical hours/ week	Total credit hours
LQCR 502	Laboratory Data and Laboratory Information Systems بيانات المختبر وأنظمة معلومات المختبرات	1	2	2
LQCR 504	Legislation and Regulations Governing Laboratory Work التشريعات والقوانين المنظمة لأعمال المختبرات	2	-	2
LQCR 506	Laboratory Quality Management and Auditing إدارة الجودة والتدقيق بالمختبرات	2	-	2
LQCR 508	Applied Project المشروع التطبيقي	1	2	2
LQCR 510	Human Resource Management in Laboratories إدارة الموارد البشرية بالمختبرات (اختيارى)	2	-	2
ELEC 512	Principles of Marketing مبادئ التسويق (اختياري)	2	-	2
ELEC 514	Artificial Intelligence Applications in Laboratories تطبيقات الذكاء الاصطناعي في المختبرات (اختيارى)	1	2	2
	Total Credit Hours			12

- يختار الطالب مقررين فقط من المقررات الاختيارية (ELEC).
- يحسب عدد ساعات المقررين الاختيارية 4 ساعات فقط بالفصل الدراسي.

محتويات مقررات الدبلوم المهني في جودة المعامل ومراقبتها

Course Contents of Professional Diploma in Laboratory Quality and Control

الترم الأول

أولا: المقررات الإجبارية

Quality Management Systems for Laboratory Equipment

نظم إدارة الجودة فى تجهيزات المعامل (LQCR 501)

This course focuses on identifying the needs that drive laboratory stability and sustainability through learning the planning, design, construction, operation, and maintenance of laboratory facilities throughout the laboratory lifecycle. The course also covers design features and considerations applicable to various types of facilities, including laboratories with basic requirements and those requiring enhanced controls or maximum containment measures.

يهتم هذا المقرر بتحديد الاحتياجات التي تدفع المختبر إلى الإستقرار والاستدامة من خلال تعلم تخطيط وتصميم وبناء وتشغيل وصيانة مرافق المختبرات وذلك طوال فترة عمر المختبر، كما يهتم هذا المقرر بوصف مميزات التصميم أو اعتبارات التصميم التي تنطبق على عدة أنواع من المرافق، بما في ذلك المختبرات ذات المتطلبات الأساسية والمرافق التي تحتاج إلى تحكم متزايد أو تدابير احتواء قصوى .

Laboratory Quality and Fundamentals of Accreditation (ISO/IEC 17025, ISO 9001)

جودة المعامل وأساسيات الاعتماد (LQCR 503)

This course focuses on international standards and the role of metrology bodies. Additionally, it covers assessment, auditing, certification, and accreditation. The course helps students understand how the quality model organizes all laboratory activities, as quality system essentials represent a set of coordinated activities that form the building blocks of quality management in laboratories.

سيركز هذا المقرر على المعايير الدولية ودور هيئات القياس، علاوة على ذلك سيتم تناول التقييم والتدقيق والشهادات والاعتماد، سيساعد هذا المقرر في فهم كيف ينظم نموذج الجودة جميع الأنشطة المختبرية، حيث تعتبر أساسيات نظام الجودة مجموعة من الأنشطة المنسقة التي تشكل اللبنات الأساسية لإدارة الجودة في المختبرات.

Occupational Safety and Laboratory Risk Management

السلامة المهنية وإدارة المخاطر المعملية (LQCR 505)

This course covers the principles of occupational safety in laboratories and methods for hazard identification, analysis, and management to ensure a safe

working environment. It introduces laboratory safety regulations and standards, safe handling, storage, and disposal of hazardous materials, the proper use of personal protective equipment (PPE), biological, chemical, physical, and electrical hazards, fire prevention, and emergency preparedness. The course aims to enable students to identify laboratory hazards, apply occupational safety procedures, analyze and assess risks, and develop effective risk management and mitigation plans.

Practical Component: Students will participate in hands-on laboratory safety training, including laboratory safety orientation, proper selection and use of personal protective equipment (PPE), safe handling and storage of chemicals and biological materials, hazard identification and laboratory inspection exercises, risk assessment workshops using standard risk matrices, chemical spill containment and cleanup procedures, fire safety and extinguisher demonstrations, emergency evacuation drills, incident reporting and accident investigation exercises, preparation of laboratory safety documentation (risk assessments, SOPs, and safety checklists), and emergency response simulations for chemical exposure, fire, and biological incidents.

يتناول هذا المقرر مبادئ السلامة المهنية داخل المختبرات وأساليب تحديد المخاطر وتحليلها وإدارتها لضمان بيئة عمل آمنة. كما يتناول الأنظمة والمعايير الخاصة بسلامة المختبرات، وطرق التعامل الآمن مع المواد الكيميائية والبيولوجية وتخزينها والتخلص منها، والاستخدام الصحيح لمعدات الوقاية الشخصية، والتعرف على المخاطر الكيميائية والبيولوجية والفيزيائية والكهربائية، وإجراءات الوقاية من الحرائق والاستجابة للطوارئ. ويهدف المقرر إلى تمكين الطلبة من التعرف على مصادر المخاطر المعملية، وتطبيق إجراءات السلامة المهنية، وتحليل وتقييم المخاطر، وإعداد خطط فعالة لإدارة المخاطر والحد منها.

الجانب العملى: يشمل الجانب العملي تدريبًا ميدانيًا على إجراءات السلامة داخل المختبرات، ويتضمن التعريف بقواعد السلامة، والاستخدام الصحيح لمعدات الوقاية الشخصية، والتعامل الآمن مع المواد الكيميائية والبيولوجية وتخزينها، وتمارين التعرف على المخاطر وإجراء جولات تفتيش السلامة، وورش عمل لتقييم المخاطر باستخدام مصفوفات تقييم المخاطر، والتدريب على احتواء ومعالجة الانسكابات الكيميائية، والتدريب على إجراءات السلامة من الحرائق واستخدام طفايات الحريق، وتنفيذ خطط الإخلاء في حالات الطوارئ، وإعداد تقارير الحوادث والتحقيق فيها، وإعداد وثائق السلامة مثل تقييمات المخاطر وإجراءات التشغيل القياسية (SOPs) وقوائم التحقق، بالإضافة إلى محاكاة الاستجابة للطوارئ في حالات التعرض للمواد الكيميائية أو الحرائق أو الحوادث البيولوجية.

Infection Control and Waste Management (LQCR 507)

This course aims to provide students with the essential knowledge and skills needed to effectively apply infection prevention and control principles in various

laboratory environments. It covers potential biological hazards in laboratories, modes of infection transmission, standard and transmission-based precautionary measures, hand hygiene, proper use of personal protective equipment (PPE), disinfection and sterilization methods, biosafety principles, exposure prevention, management of accidental exposures, and hazardous biomedical waste management. The course emphasizes implementing safe laboratory practices to protect personnel, prevent laboratory-acquired infections, and ensure the integrity and reliability of laboratory test results.

Practical Component: Students will participate in hands-on laboratory training covering proper hand hygiene techniques, donning and doffing of personal protective equipment (PPE), aseptic techniques, preparation and maintenance of sterile work areas, operation of autoclaves and validation of sterilization procedures, preparation and use of disinfectants, cleaning and decontamination of laboratory equipment and work surfaces, specimen collection and safe handling procedures, segregation, labeling, packaging, transportation, and disposal of biomedical waste according to regulatory guidelines, management of sharps and spill response, incident reporting, post-exposure management, biosafety cabinet operation, environmental monitoring exercises, laboratory infection control audits, and emergency response simulations for biological exposure and contamination incidents.

مكافحة العدوى وإدارة النفايات (LQCR 507)

يهدف هذا المقرر إلى تزويد الطلاب بالمعرفة والمهارات الأساسية اللازمة لتطبيق مبادئ مكافحة العدوى والوقاية منها بفعالية في بيئات المعامل المختلفة. يغطي المقرر المخاطر البيولوجية المحتملة في المعامل، وطرق انتقال العدوى، والإجراءات الاحترازية القياسية والإضافية، وممارسات نظافة اليدين، والاستخدام الصحيح لمعدات الوقاية الشخصية، وأساليب التطهير والتعقيم، ومبادئ السلامة الحيوية، والوقاية من التعرض للعوامل الممرضة، وإجراءات التعامل مع حالات التعرض العرضي، وإدارة النفايات الطبية الخطرة. ويركز المقرر على تطبيق الممارسات المعملية الآمنة لحماية العاملين، والحد من العدوى المكتسبة داخل المختبرات، وضمان دقة وموثوقية نتائج الفحوصات المعملية.

الجانب العملي: يشمل الجانب العملي تدريبًا ميدانيًا على تطبيق إجراءات مكافحة العدوى داخل المختبرات، ويتضمن التدريب على تقنيات غسل وتعقيم اليدين، والارتداء والخلع الصحيح لمعدات الوقاية الشخصية (PPE)، وتطبيق تقنيات العمل المعقم(Aseptic Technique) ، وإعداد بيئات العمل المعقمة والمحافظة عليها، وتشغيل أجهزة التعقيم بالبخار (Autoclave) والتحقق من كفاءة عمليات التعقيم، وتحضير واستخدام المطهرات المناسبة، وتنظيف وتطهير الأسطح والأجهزة المعملية، والتعامل الآمن مع العينات البيولوجية ونقلها، وفرز وتصنيف وتعبئة ونقل والتخلص من النفايات الطبية الحيوية وفق اللوائح المعتمدة، والتعامل الآمن مع الأدوات الحادة والانسكابات البيولوجية، والإبلاغ عن الحوادث وإدارة حالات التعرض

المهني، والتدريب على استخدام خزانات السلامة الحيوية(Biosafety Cabinets) ، وإجراء مراجعات وتدقيقات لممارسات مكافحة العدوى داخل المختبر، بالإضافة إلى محاكاة الاستجابة للطوارئ في حالات الانسكابات البيولوجية والتعرض للمواد المعدية

Biostatistics and Laboratory Data Analysis (LQCR 509)

This course prepares students to collect, organize, summarize, analyze, and interpret laboratory data using appropriate biostatistical methods and analytical tools. It emphasizes statistical approaches for evidence-based decision-making in laboratory quality management, quality control, method validation, process improvement, and risk management. Topics include descriptive statistics, probability distributions, sampling techniques, confidence intervals, hypothesis testing, correlation and regression analysis, analysis of variance (ANOVA), clustering, decision trees, forecasting, statistical process control, measurement uncertainty, and data visualization. Students will develop the skills needed to analyze laboratory performance, evaluate analytical methods, and communicate statistical findings effectively.

Practical Component: Students will gain hands-on experience using statistical software (e.g., Microsoft Excel, SPSS, R, or Minitab) for laboratory data analysis. Practical activities include data entry, cleaning, and visualization; descriptive statistical analysis; hypothesis testing; regression and correlation analysis; construction and interpretation of Levey–Jennings charts, Shewhart control charts, and Cusum charts; Westgard rules application for internal quality control; method validation studies including accuracy, precision, linearity, sensitivity, specificity, limit of detection (LOD), limit of quantification (LOQ), and robustness; calculation of measurement uncertainty; outlier detection and analysis; laboratory proficiency testing data interpretation; risk-based statistical analysis; preparation of statistical reports and graphical presentations; and case studies using real laboratory datasets to support quality improvement and decision-making.

الإحصاء الحيوي وتحليل البيانات المختبرية (LQCR 509)

يهيئ هذا المقرر الطلاب لجمع البيانات المعملية وتنظيمها ووصفها وتحليلها وتفسيرها باستخدام الأساليب الإحصائية الحيوية المناسبة وأدوات تحليل البيانات. ويركز على توظيف الإحصاء في دعم اتخاذ القرار المبني على الأدلة في إدارة الجودة المختبرية، ومراقبة الجودة، والتحقق من صلاحية الطرق التحليلية، وتحسين العمليات، وإدارة المخاطر. وتشمل موضوعات المقرر الإحصاء الوصفي، والاحتمالات، وأساليب المعاينة، وفترات الثقة، واختبارات الفرضيات، وتحليل الارتباط والانحدار، وتحليل التباين (ANOVA)، والتجميع، وأشجار القرار، والتنبؤ، والضبط الإحصائي للعمليات، وعدم يقين القياس، وتمثيل

البيانات بصريًا. كما يهدف المقرر إلى تنمية قدرة الطلاب على تحليل أداء المختبرات، وتقييم الطرق التحليلية، وعرض النتائج الإحصائية وتفسيرها بصورة علمية.

الجانب العملى: يشمل الجانب العملي تدريبًا على استخدام البرامج الإحصائية مثل Microsoft Excel و SPSSو Rأو Minitabلتحليل البيانات المختبرية. ويتضمن التدريب إدخال البيانات وتنظيفها وتنظيمها وتمثيلها بيانيًا، وإجراء التحليل الإحصائي الوصفي، واختبارات الفرضيات، وتحليل الارتباط والانحدار، وإنشاء وتفسير مخططات Levey–Jenningsومخططات الضبط الإحصائي Shewhartو Cusum، وتطبيق قواعد Westgardلمراقبة الجودة الداخلية، وإجراء دراسات التحقق من صلاحية الطرق التحليلية بما يشمل الدقة(Accuracy) ، والإحكام(Precision) ، والخطية(Linearity) ، والحساسية (Sensitivity)، والنوعية(Specificity) ، وحد الكشف(LOD) ، وحد التقدير الكمي(LOQ) ، والمتانة (Robustness)، وحساب عدم يقين القياس، واكتشاف القيم الشاذة وتحليلها، وتفسير نتائج اختبارات الكفاءة(Proficiency Testing) ، وإجراء التحليلات الإحصائية الداعمة لإدارة المخاطر، وإعداد التقارير الإحصائية والعروض البيانية، بالإضافة إلى تطبيق دراسات حالة باستخدام بيانات مختبرية حقيقية لدعم تحسين الجودة واتخاذ القرارات.

ثانيا: المقررات الاختيارية

Laboratory Governance and Management

Understanding the key factors affecting organizations, including .strategyautonomy, operational management, business model, and expertise ,The course discusses how to strengthen these factors for organization management, and governance. Furthermore, it addresses how to identify institutional strengths and weaknesses, prioritize improvements, and implement improvement plans.

حوكمة وإدارة المختبرات (اختيارى) (ELEC 5011)

فهم العوامل الرئيسية التي تؤثر على المنظمة وهي الاستراتيجية، الاستقلال الذاتي، الإدارة التشغيلية، نموذج العمل والخبرة، سيناقش المقرر كيفية تقوية هذه العوامل للتنظيم والإدارة والحوكمة، علاوة على ذلك، سيتم معالجة كيفية تحديد نقاط القوة والضعف في المؤسسة، وكيفية تحديد أولويات التحسين وكيفية تنفيذ خطط التحسين.

Laboratory Supply Chain Quality and Performance

Learning that supply chain management and performance management in laboratories are positively correlated, with operations management perspective being an integral part of this relationship. Furthermore, recognizing that best practices in supply chain quality management can be found within total quality management principles, as transitioning to supply chain quality management

requires knowledge of all three domains: operations, quality, and supply chain management.

جودة سلسلة الإمداد وإدارة الأداء بالمختبرات (اختياري) (ELEC 513)

تعلم أن إدارة سلسلة التوريد وإدارة الأداء في المختبرات مرتبطان ارتباطا إيجابيا، حيث أن جزء لا يتجزأ من هذه العلاقة هو منظور إدارة العمليات، علاوة على ذلك إدراك أن أفضل الممارسات في إدارة جودة سلسلة التوريد يمكن العثور عليها ضمن مبادئ إدارة الجودة الشاملة، حيث يتطلب الانتقال إلى إدارة جودة سلسلة التوريد معرفة جميع المجالات الثلاثة: العمليات والجودة وإدارة سلسلة التوريد.

Entrepreneurship and Feasibility Studies (ELEC 515)

This course introduces students to the principles of entrepreneurship and the processes involved in developing and evaluating new business ventures. It focuses on entrepreneurial thinking, opportunity identification, innovation, business model development, and project planning. Students will learn the fundamentals of feasibility studies, including market, technical, financial, legal, and operational analyses, to assess the viability of business ideas and investment opportunities. The course also emphasizes business plan development, project financing, risk assessment, and sustainable entrepreneurial practices, enabling students to transform innovative ideas into feasible and successful projects.

ريادة الاعمال ودراسة الجدوى (اختياري) (LQCR 502)

يهدف هذا المقرر إلى تنمية مهارات ريادة الأعمال لدى الطلاب وتعزيز قدرتهم على الابتكار وتحويل الأفكار إلى مشروعات قابلة للتنفيذ. ويتناول المقرر المفاهيم الأساسية لريادة الأعمال، وتحديد الفرص الاستثمارية، وتطوير نماذج الأعمال، والتخطيط للمشروعات، وإدارة المخاطر، ومصادر تمويل المشروعات الناشئة. كما يركز على إعداد دراسات الجدوى بمختلف مكوناتها، بما يشمل دراسة السوق، والدراسة الفنية، والدراسة المالية، والدراسة القانونية، والدراسة التشغيلية، لتقييم جدوى المشروعات واتخاذ القرارات الاستثمارية المناسبة. ويؤهل المقرر الطلاب لإعداد خطط أعمال متكاملة وتقييم فرص نجاح المشروعات وفق أسس علمية واقتصادية.

الترم الثاني

أولا: المقررات الإجبارية

Laboratory Data and Laboratory Information Systems (LQCR 502)

This course provides an overview of integrated laboratory information systems ,and fundamental concepts of their integration, such as interoperability types system options, integration tools, system integration options, and integration preparation. Additionally, it helps clarify misconceptions related to laboratory

.information system functions and what should be implemented in laboratories Practical component: Hands-on training with Laboratory Information Management Systems (LIMS), data entry and retrieval exercises, system integration workflows, and data reporting and management.

Practical component: Hands-on training in Laboratory Information Management Systems (LIMS), data entry and retrieval, system integration workflows, and laboratory data reporting and management.

بيانات المختبر وأنظمة معلومات المختبرات (LQCR 502)

يقدم المقرر نظرة عامة لأنظمة المعلومات المختبرية المتكاملة والمفاهيم الأساسية حول تكاملها مثل أنواع قابلية التشغيل البيني وخيارات الأنظمة وأدوات التكامل وخيارات تكامل الأنظمة والتحضير للتكامل، علاوة على ذلك سيساعد المقرر في إزالة المفاهيم الخاطئة المتعلقة بوظائف نظام معلومات المختبر وما يجب تنفيذه في المختبرات

الجانب العملي :تدريب عملي على استخدام أنظمة إدارة معلومات المختبرات(LIMS) ، وإدخال واسترجاع البيانات، وتطبيق إجراءات تكامل الأنظمة، وإعداد وإدارة التقارير والبيانات المختبرية

Legislation and Regulations Governing Laboratory Work (LQCR 504)

This course presents the legal and legislative aspects governing laboratory work, including understanding regulatory laws, compliance requirements, applying legislation in laboratory practice, and promoting legal practices.

التشريعات والقوانين المنظمة لأعمال المختبرات (LQCR 504)

يقدم المقرر الجوانب القانونية والتشريعية المنظمة للعمل المعملي من حيث التعرف على القوانين المنظمة وفهم متطلبات الامتثال وتطبيق التشريعات في العمل المعملي وتعزيز الممارسات القانونية.

Laboratory Quality Management and Auditing (LQCR 506)

This course introduces the principles and practices of laboratory quality management, focusing on accurate and reliable testing, quality assurance, and verification of laboratory results. The practical component includes method validation and verification, proficiency testing, inter-laboratory comparisons, and quality control sample analysis.

إدارة الجودة والتدقيق بالمختبرات (LQCR 506)

يقدم هذا المقرر مبادئ وممارسات إدارة الجودة في المختبرات، مع التركيز على دقة وموثوقية الاختبارات، وضمان الجودة، والتحقق من صحة نتائج التحاليل. ويشمل الجانب العملي تطبيقات على التحقق من صحة الطرق، واختبارات الكفاءة، والمقارنات بين المختبرات، وتحليل عينات ضبط الجودة.

Applied Project (LQCR 508)

This course includes the implementation of an applied project that addresses one of the laboratory quality issues through planning, implementation, data analysis, and presentation of results.

Practical component: Laboratory training, participation in quality management activities, preparation of technical documentation, internal audit and quality improvement exercises, and completion and presentation of an applied project.

المشروع التطبيقى (LQCR 508)

يتضمن هذا المقرر تنفيذ مشروع تطبيقي يعالج إحدى قضايا جودة المختبرات من خلال التخطيط، والتنفيذ، وتحليل البيانات، وعرض النتائج.

- **الجانب العملي:** التدريب في المختبر، والمشاركة في أنشطة إدارة الجودة، وإعداد الوثائق الفنية، والتدقيق الداخلي وتمارين تحسين الجودة، وإكمال وتقديم مشروع تطبيقي.

ثانيا: المقررات الاختيارية

Human Resource Management in Laboratories (LQCR 510)

This course introduces the principles and practices of human resource management in laboratory settings. It covers workforce planning, recruitment, training and competency assessment, performance evaluation, leadership, team development, and professional ethics. The course also addresses capacity building, continuous professional development, diversity and sustainability, and strategies for enhancing employee performance to support laboratory quality and organizational excellence.

إدارة الموارد البشرية بالمختبرات (اختيارى) (LQCR 510)

يقدم هذا المقرر مبادئ وممارسات إدارة الموارد البشرية في المختبرات، مع التركيز على تخطيط القوى العاملة، والاستقطاب، والتدريب، وتقييم الكفاءة والأداء، والقيادة، وبناء فرق العمل، وأخلاقيات المهنة. كما يتناول بناء القدرات، والتطوير المهني المستمر، والاستدامة والتنوع، واستراتيجيات تعزيز أداء العاملين بما يدعم جودة المختبرات والتميز المؤسسي.

Principles of Marketing (ELEC 512)

This course presents the fundamentals of marketing and their application in institutions through understanding marketing concepts, analyzing the laboratory market, developing marketing strategies, and improving competitiveness among different laboratories.

مبادئ التسويق (ELEC 512)

يقدم هذا المقرر أساسيات التسويق وتطبيقها في المؤسسات من خلال فهم مفاهيم التسويق وتحليل سوق المختبرات ووضع استراتيجيات تسويقية وتحسين القدرة التنافسية بين المختبرات المختلفة.

Artificial Intelligence Applications in Laboratories (ELEC 514)

This course introduces students to the fundamental concepts and applications of Artificial Intelligence (AI) in laboratory quality and control. The course focuses on how AI techniques can improve efficiency, accuracy, and reliability in various laboratory operations, from data management and analysis to diagnostics and predicting potential problems. Students will learn the tools and methodologies needed to apply AI solutions in practical contexts within laboratory environments, with emphasis on quality assurance and standards compliance.

Practical component: Hands-on exercises using AI-based data analysis tools, development of machine learning models for laboratory quality prediction, automated quality monitoring, and interpretation of AI-generated results for laboratory decision-making.

تطبيقات الذكاء الاصطناعي في المختبرات (ELEC 514)

يقدم هذا المقرر للطلاب المفاهيم الأساسية وتطبيقات الذكاء الاصطناعي (AI) في مجال جودة المختبرات ومراقبتها. ويركز على كيفية استخدام تقنيات الذكاء الاصطناعي لتحسين الكفاءة والدقة والموثوقية في العمليات المختبرية المختلفة، بدءًا من إدارة البيانات وتحليلها وصولًا إلى التشخيص والتنبؤ بالمشكلات المحتملة. كما يتعرف الطلاب على الأدوات والمنهجيات اللازمة لتطبيق حلول الذكاء الاصطناعي في بيئات المختبرات، مع التركيز على ضمان الجودة والامتثال للمعايير .

الجانب العملي :تطبيقات عملية باستخدام أدوات تحليل البيانات المعتمدة على الذكاء الاصطناعي، وتطوير نماذج تعلم الآلة للتنبؤ بجودة المختبرات، وتصميم أنظمة آلية لمراقبة الجودة، وتفسير نتائج الذكاء الاصطناعي لدعم اتخاذ القرار في المختبرات.