FACULTY OF SCIENCE
TANTA UNIVERSITY

1969

# POSTGRADUATE

# PROGRAM AND COURSE SPSECIFICATION

## Volume (1)

## MATHEMATIC - PHYSICS - CHEMISTRY

2014/2015

وحدة ضمان الجودة
كلية العلوم - جامعة طنطا
QUALITY ASSURANCE UNIT
FACULTY OF SCIENCE - TU

# Postgraduate

# Program and Course Specifications

## Volume (1)

**Mathematics – Physics - Chemistry**

**2014-2015**

1969

**TO WHOM IT MAY CONCERN**

This is an approved copy of the Program and course specifications of the Post-graduate Program offered by, Faculty of Science, Tanta University, for the academic year 2014-2015.

Vice Dean of the Faculty
for Education and Student Affairs

Prof. Ebrahem Abdallah Younes

Dean of The Faculty

Prof. Tarek A. Fayed

## شكر وتقدير

الى السيد الأستاذ الدكتور/ عميد الكلية

والسيد الأستاذ الدكتور/ وكيل الكلية لشئون الدراسات العليا والبحوث

والسيد الاستاذ الدكتور رئيس قسم الرياضيات –فيزياء – كيمياء

والسيد الاستاذ الدكتور رئيس وحدة ضمان الجودة

والسادة الزملاء أعضاء هيئة التدريس بوحدة ضمان الجودة

والسادة الزملاء أعضاء هيئة التدريس بالأقسام المذكورة

والذين لولا جهدهم الوفير لما أمكن إتمام هذا العمل

# Postgraduate

# Program and Course Specifications

## Volume (1)

## Mathematics – Physics - Chemistry


**Teamwork**

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Director of the Quality Assurance Unit
Faculty of Science – Tanta University

**Mathematics Teamwork**

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Mathematics Department
Faculty of Science – Tanta University

Dr. Khalid Al Morabea
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Faculty of Science – Tanta University

**Chemistry Teamwork**

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Chemistry Department
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# Postgraduate

# Program and Course Specifications

## Mathematics

**2014-2015**

# Contents

# Master of Science degree in Applied Mathematics

## The Academic Reference Standards for Master Degree of applied mathematics

### 1. Academic standards

The Academic Reference Standards of this program is based upon the General Academic Standards of postgraduate programs published by the National Authority of Quality Assurance and Accreditation of Education (ARS) in (2009).

Specific Academic Reference Standards for M. Sc. in Statistics were approved by the Council of Faculty of Science, Tanta University in 2012-2013 which are listed in the following:

### *1.1 The Attributes of M.Sc. Program in Mathematics.*

The graduate of master's program in mathematics should be able to:
1- Proficiency in applications of basics and methodologies of scientific research
2- Apply the analytical methods in the area of mathematics.
3 – Use mathematical knowledge combined with related knowledge in professional practice.
4- Show awareness of ongoing problems and visions in modern area of Statistics.
5- Identify mathematical problems and find their solutions.
6- Mastery of Statistics skills, and can use appropriate technological means to serve the professional practice.
7- Communicate effectively and the ability to lead teams.
8- Decision-making in different contexts.
9- Use available resources to achieve the highest benefit and its preservation.
10- Show awareness of his role in community development and preservation of the environment.
11- Behave in a manner reflecting the commitment to integrity and credibility of the profession and abide by the rules.
12- Develop his academic capabilities and continuous learning in Statistics.

**1. Knowledge and Understanding:**
By the end of the master's program graduate of applied mathematics the students should be able to:

1. Identify advanced theories, fundamentals, specialized knowledge and professional practice in mathematics.
2. Review all scientific principle and fundamentals in mathematics.
3. Demonstrate scientific developments in the area of mathematics.
4. Explain the specialized subject in the interested field.
5. Classify the interested subject into research points.

**2. Intellectual Skills:**

1. Analyze and evaluate the information in mathematics to solve problems.
2. Solve mathematical problems in case of non-availability of some data.
3. Link between different sciences to solve professional problems.

4. Conduct a research study and / or write a methodology of scientific study onto a research problem.
5. Plan to improve performance in the area of mathematics.

**3. Professional Skills:**

By the end of the study master's program graduate must be able to:

1. Plan, design, conduct and report on the investigated data, using appropriate techniques and considering scientific guidance.
2. Apply techniques and tools considering scientific ethics.
3. Solve problems using a range of formats and approaches.
4. Identify and criticize the different methods used for preparing, processing, interpreting and presenting data.
5. Write and evaluation of mathematical reports

**4. *General and Transferable skills***

By the end of the study master's program graduate must be able to:

1. Recognize the basics and ethics of scientific research
2. Effective communication in its different forms.
3. Use of information technology to serve the development of mathematics.
4. Use different sources for information and knowledge in mathematics.
5. Work in a team, and leading teams in various professional contexts.
6. Self- and continuous learning in mathematics.

The M.Sc. Program Structure includes:

- Pre-master courses specified by the Mathematics Department
- Thesis in different branches of Mathematics.

**Thesis**

- The thesis of M.Sc. program is a formal written document representing sustained research into an important intellectual issue. The thesis must be an independent effort which contributes to the accumulated understanding of the field in which it is written. The required research preparation and advanced research methods courses will help the student to focus his or her research effort, and provide general guidelines for research approach and report preparation. Thesis will be reviewed and approved by the candidate's supervising professor and external academic review committee.
- The thesis should contain at least the following:
- Title page (title, name of student, university, faculty,? name of program, date, supervisors
- Table of contents
- Introduction, containing a definition of the thesis? statement, working method, the theoretical framework, and the aim.
- Literature review.
- Materials and methods.
- Results
- Discussion and conclusions
- References.
- Language of the thesis

- The thesis must be written in English language accompanied by a summary in Arabic.

**Formation of Examiners Committees**

- A committee is selected by Mathematics Department Council. The M.Sc. Degree is awarded to the applicant by University, upon the recommendation of the department and the Faculty Council.

**3- Program Admission Requirements:**

- An applicant for admission to the M.Sc. program in Statistics should hold an B.Sc. degree in Statistics with a minimum grade of (Good = 70%)

**4- The candidate should pass successfully :**

- **Courses of pre-master academic year**
- Written Thesis
- Oral Presentation
- Defense at least one published paper.

1969

Tanta University
Faculty of Science
Department of Mathematics

**M.Sc. Program (Applied Mathematics)**

| | |
|---|---|
| **Program Title** | **Applied Mathematics** |
| **Department** | **Mathematics** |

## A. Program Specification

| | |
|---|---|
| Program Title | **Applied Mathematics (M.Sc.)** |
| Award | **M.Sc. in Applied Mathematics** |
| Parent Department | **Mathematics Department** |
| Teaching Institution | **Faculty of Science – TU** |
| Awarding Institution | **Tanta University** |
| Coordinator | **Prof. Kadry Zakaria** |
| External Evaluator(s) | **Prof. Samia S. El Azab**<br>**Faculty of Science – Ein Shams University** |
| QAA Benchmarking Standards | **Academic Reference Standards (ARS)** |
| Date of intake | **Every year in September** |
| Review Date | |
| Date of Approval | **September 2014** |

**1. Aims**

This Program provides graduate students with the skills and techniques needed for advanced research in applied mathematics with the help of computer science. You will understand how these can be applied to the formulation and solution of engineering problems, technological, physical, and other practical areas. We also encourage graduate to research more about these subjects and how to use in life.

The M.Sc. graduates of applied mathematics must have the ability to:

- Gain new knowledge and continually enhance information to improve the understanding and handling issues in one of the different branches of applied mathematics.
- Analysis the Mathematical structure problems and solutions techniques in many researching fields as: Quantum Mechanics, elasticity, Fluid and Aerodynamics.
- Use and apply mathematical knowledge combined with related topics in building a mathematical model.
- Identify mathematical problems and find their solutions.
- Show awareness of ongoing problems and visions in the modern area of mathematics.
- Hold professional values that maintain individuality, positive thinking and self learning.
- Use modern technology effectively and develop his mathematical professional skills.
- Be a competent, creative, and critical.

| **2. Intended Learning outcomes (ILOs) of M.Sc. program in applied Mathematics.** |
|---|
| At the end of the Program, a successful student must be able to: |
| **A. Knowledge and understanding:** |

A1. Recognize the advanced theories of quantum mechanics, Fluid Aerodynamics, elasticity, electrodynamics, statistical mechanics and analytical dynamics.

A2. Understand advanced knowledge, theories, proofs and new solutions techniques from the scientific papers.

A3. Describe and express the details of interested research points.

A4. Identify the recent problems and modern vision in the field of study.

A5. Know the applications of different systems of differential equations and applied the fundamental theories of numerical analysis and their applications in the field of applied mathematics.

**B. Intellectual skills:**

B1. Develop mathematical knowledge to solve problems of the surrounding environment.

B2. Apply logical thinking principle for solving advanced problems.

B3. Analyze and estimate mathematical knowledge and use it for solving interested problems.

B4. Solve problems using appropriate techniques and recent approaches.

B5. Construct mathematical modeling for real-world problems.

**C. Professional Skills:**

C1. Evaluate and present research results objectively.

C2. Use accuracy principal for analyzing and presenting the research results.

C3. Apply rules and techniques of mathematics to model and solve real world problem

C4. Write and present professional reports.

C5. Use mathematical software to solve applied mathematical problems.

**D. General Skills:**

D1. Work effectively as part of a team.

D2. Apply technology to enhance mathematical thinking and understanding.

D3. Convey the meaning of mathematics concepts to others

D4. Be appropriate the ethics of scientific research

D5. Demonstrate ability to lead a group.

**3. Academic Reference Standards (ARS):**

In order to fulfill National Academic Reference Standards, our students should acquire:

**1. Knowledge and Understanding:**

By the end of the master's program graduate of applied mathematics the students should be able to:

1. Identify advanced theories, fundamentals, specialized knowledge and professional practice in mathematics.
2. Review all scientific principle and fundamentals in mathematics.
3. Demonstrate scientific developments in the area of mathematics.
4. Explain the specialized subject in the interested field.
5. Classify the interested subject into research points.

**2. Intellectual Skills:**

1. Analyze and evaluate the information in mathematics to solve problems.
2. Solve mathematical problems in case of non-availability of some data.
3. Link between different sciences to solve professional problems.
4. Conduct a research study and / or write a methodology of scientific study onto a research problem.
5. Plan to improve performance in the area of mathematics.

**3. Professional Skills:**

By the end of the study master's program graduate must be able to:

1. Plan, design, conduct and report on the investigated data, using appropriate techniques and considering scientific guidance.
2. Apply techniques and tools considering scientific skills.
3. Solve problems using a range of formats and approaches.
4. Identify and criticize the different methods used for preparing, processing, interpreting and presenting data.
5. Write and evaluation of mathematical reports.

**4. *General and Transition skills***

By the end of the study master's program graduate must be able to:

7. Access the basics and ethics of scientific research
8. Effective communication in its different forms.
9. Use different sources of information and knowledge in mathematics.
10. Work in a team, and leading teams in various professional contexts.
11. Self- and continuous learning in mathematics.

**3. b. Comparison of provision to external references:**

**4. Curriculum Structure and contents:**

4.a Programme duration **At most 5 years**

4.b Programme structure:

| | | | | | | |
|---|---|---|---|---|---|---|
| Number of contact hours | per week | | | | | |
| | Lectures per week | 12 | | | Total | 12 |
| 4.c **Thesis** | | | | | | |

**5. Program courses**

| Code | | Course Title | Hours/Week | | | Program ILOs Covered |
|---|---|---|---|---|---|---|
| | | | Lec. | Prac. | Exer. | |
| 1123 | | Fluids and Aerodynamics | 2 | | | KU, I, P, T |
| 1122 | | Quantum Mechanics (1) | 2 | | | KU, I, P, T |
| 1123 | | Quantum Mechanics (2) | 2 | | | KU, I, P, T |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | Theory of Elasticity | 2 | | | KU, I, P, T |
| 1317 | | Introduction to computer science | 2 | | | KU, I, P, T |

**6. Program admission requirements**

Candidates must satisfy the general admission requirements of the University, Faculty and department and also hold a B. Sc. in physics with at least accumulative grade "Good".
To be qualified to register as a candidate of a master degree in Physics, student must pass in all course units and achieve at least an overall of 70%.

**7.** Evaluation of program intended learning outcomes

| Evaluator | Tool | Sample |
|---|---|---|
| 1. Senior students | applied | |
| 2. Alumni | Applied | |
| 3. Stakeholders (Employers) | | |
| 4. External Evaluator(s) (External Examiner(s)) | Applied | |

We certify that all of the information required to deliver this programme is contained in the above specification and will be implemented. All course specifications for this program are in place.

### 8.1. Matrix of ARS ILOs and Mathematics Program ILOs

| ARS ILOs | Programme intended learning outcomes ILOs | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | | Intellectual | Practical | | | | | | | | | Transferable | | | | |
| | A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | C1 | C2 | C3 | C4 | C5 | D1 | D2 | D3 | D4 | D5 |
| **Knowledge and Understanding** | | | | | | | | | | | | | | | | | | | | |
| **1**. Identify advanced theories, fundamentals, specialized knowledge and professional practice in mathematics | √ | √ | | | √ | | | | | | | | | | | | | | | |
| **2.** Review all scientific principle and fundamentals in mathematics | | | | | √ | | | | | | | | | | | | | | | |
| **3.** Demonstrate scientific developments in the area of mathematics | | √ | | √ | | | | | | | | | | | | | | | | |
| **4.** Explain the specialized subject in the interested field | | | | √ | | | | | | | | | | | | | | | | |
| **5.** Classify the interested subject into research points | | | √ | | √ | | | | | | | | | | | | | | | |
| **Intellectual Skills** | | | | | | | | | | | | | | | | | | | | |
| **1.** Analyze and evaluate the information in mathematics to solve problems | | | | | | | | √ | | | | | | | | | | | | |
| **2.** Solve mathematical problems in case of non-availability of some data | | | | | | √ | √ | | | | | | | | | | | | | |
| **3.** Link between different sciences to solve professional problems | | | | | | √ | | | √ | | | | | | | | | | | |
| **4.** Conduct a research study and / or write a methodology of scientific study onto a research problem | | | | | | | | | | √ | | | | | | | | | | |
| **5.** Plan to improve performance in the area of mathematics | | | | | | √ | | | | | | | | | | | | | | |
| **Professional Skills** | | | | | | | | | | | | | | | | | | | | |
| **1.** Plan, design, conduct and report on the investigated data, using appropriate techniques and considering scientific guidance | | | | | | | | | | | √ | √ | | | √ | | | | | |
| **2.** Apply techniques and tools considering scientific ethics | | | | | | | | | | | | | √ | √ | | | | | | |
| **3.** Solve problems using a range of formats and approaches | | | | | | | | | | | | | √ | | | | | | | |
| **4.** Identify and criticize the different methods used for preparing, processing, interpreting | | | | | | | | | | | | √ | | | √ | | | | | |

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| and presenting data | | | | | | | | | | | | | | | | | | | | |
| **5.** Write and evaluation of mathematical reports | | | | | | | | | | | √ | | | √ | | | | | | |
| **General Skills** | | | | | | | | | | | | | | | | | | | | |
| **1**. Access the basics and ethics of scientific research | | | | | | | | | | | | | | | | | | | √ | |
| **2**. Effective communication in its different forms. | | | | | | | | | | | | | | | | √ | | | | |
| **3.** Use different sources of information and knowledge in mathematics. | | | | | | | | | | | | | | | | | √ | √ | | |
| **4.** Work in a team, and leading teams in various professional contexts. | | | | | | | | | | | | | | | | √ | | | | √ |
| **5.** Self- and continuous learning in mathematics. | | | | | | | | | | | | | | | | | | √ | | |

## Course Programme – ILOs. Matrix

| Course code / Title | Course outcomes ILOs | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | | Intellectual | | | | | Practical | | | | | Transferable | | | | |
| | A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | C1 | C2 | C3 | C4 | C5 | D1 | D2 | D3 | D4 | D5 |
| Fluids and Aerodynamics | √ | | √ | √ | √ | √ | | √ | √ | √ | √ | √ | √ | √ | √ | √ | | | | √ |
| Quantum Mechanics (1) | √ | √ | | | | | √ | √ | | | √ | | | | | | √ | √ | | |
| Quantum Mechanics (2) | √ | √ | | | | | √ | √ | √ | | √ | √ | | √ | √ | √ | √ | √ | √ | √ |
| Theory of Elasticity | √ | | √ | | √ | √ | | √ | | √ | | | √ | √ | √ | √ | | | | |
| Computer Science | | | | √ | | | | | √ | | | | | | √ | | | √ | | |
| Thesis | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | | √ | √ | √ | |

We certify that all of the information required to deliver this Program is contained in the above specification and will be implemented. All course specifications for this Program are in place.

| Name | Signature | Date |
|---|---|---|
| *Head of Department:*<br>Prof. Kadrey Zakaria<br>أ.د. قدري زكريا | | 9/2014 |
| *Head of Quality Assurance Unit:*<br>Prof. Hoda kamal El-Sayed<br>أ.د. هدى كمال السيد | | 9/2014 |
| *Dean of the Faculty:*<br>Prof. Tarek Fayed<br>أ.د. طارق فايد | | 9/2014 |

| Course Title | Quantum Mechanics (1) | |
|---|---|---|
| Course Code | 1122 | |
| Academic Year | 2014/2015 | |
| Coordinator | Prof.Dr. Mohammed O. Shaker | |
| Other Staff | | |
| Level | Graduate-M. Sc. | |
| Semester | Semesters One and Two | |
| Pre-Requisite | B.Sc. Mathematics | |
| Course Delivery | Lecture | 28 x 2h Lectures |
| Parent Department | Mathematics Department | |
| Date of Approval | September, 2014 | |

**1. Aims**

This course aims to:

- study the old quantum theory and its shortcomings
- study the foundation of quantum mechanics.
- learning the uncertainty principle and the uncertainty relations
- study Perturbation theory and Scattering theory
- solving numerical examples in quantum theory

**2. Intended Learning outcomes**

***A. Knowledge and understanding:***

Upon successful completion of this course the students should be able to:

A1- provide high quality education in quantum mechanics within an environment committed to excellence in both teaching and research.

A2- provide high quality education in quantum mechanics within an environment committed to excellence in both teaching and research.

A3- provide students with a broad and balanced foundation of knowledge and practical skills in problems of quantum mechanics structures and proofs.

A4- offer students a flexible educational framework that enables them to specialize or maintain a broad course of study.

***B. Intellectual skills:***

They will also acquire the ability to:

B1- provide students with a broad and balanced foundation of knowledge and practical skills in problems of quantum mechanics structures and proofs.gh

B2- attracts well-qualified students and to provide intellectual challenge in a structure containing an appropriate amount of flexibility, so that students can develop their specialist interests.

B3- work in cooperative multi-disciplinary teams

***C. Professional and practical skills:***

C1- teach and provide the opportunities to learn a core of quantum mechanics fundamental to the education of applications of quantum mechanics, together with a wide range of higher level options in mathematics and allowing some broadening of study through a range of Management and Humanities options

C2- develop in students the ability to apply their mathematical knowledge and skills in problem-solving, project work, computation and presentation to enable them to take prominent roles in a wide spectrum of employment and research

***D. General and transferable skills:***

D1- produce graduates capable of pursuing a professional career or of proceeding to further study or research.

D2- provides the necessary skills and training for further study or research in applied Mathematics.

**3. Contents**

| | |
|---|---|
| Lecture 1 | On the old quantum theory and its shortcomings 1 |
| Lecture 2 | On the old quantum theory and its shortcomings 2 |
| Lecture 3 | On the old quantum theory and its shortcomings 3 |
| Lecture 4 | On the waves mechanics |
| Lecture 5 | Foundation of quantum mechanics 1 |
| Lecture 6 | Foundation of quantum mechanics 2 |
| Lecture 7 | Foundation of quantum mechanics 3 |
| Lecture 8 | On the uncertainty principle and the uncertainty relations 1 |
| Lecture 9 | On the uncertainty principle and the uncertainty relations 2 |
| Lecture 10 | On the motion of a particle in force field 1 |
| Lecture 11 | On the motion of a particle in force field 2 |
| Lecture 12 | On the motion of a particle in force field 3 |
| Lecture 13 | The angular momentum 1 |
| Lecture 14 | The angular momentum 2 |
| Lecture 15 | The angular momentum 3 |
| Lecture 16 | Two particles problem |
| Lecture 17 | Perturbation theory 1 |
| Lecture 18 | Perturbation theory 2 |
| Lectures 19,20 | Perturbation theory 3 |
| Lectures 21,22 | Scattering theory 1 |
| Lectures 23,24 | Scattering theory 2 |
| Lectures 25,26 | On the relativistic quantum mechanics 1 |
| Lectures 27,28 | On the relativistic quantum mechanics 2 |
| Weeks 29,30 | **Assessment** |

## 4. Teaching and Learning Methods

- Lectures
- Computer modeling
- Discussions
- Term paper and reports
- Web searching

## 5. Student Assessment

| Assessment Method | Skills assessed* | Assessment Length | Schedule | Proportion |
|---|---|---|---|---|
| Written Examination | KU, I,P,T | 3 Hour Examination | | 100% |

*KU: Knowledge and Understanding, I: Intellectual, P: Professional, T: Transferabl

## 6. List of references

*Essential Books:*

- Klaus Ziock "Basic Quantum Mechanics", John Wiley & Sons Inc,(19690.

*Recommended Books:*

-

*Periodicals, Itzhak Bars "Quantum Mechanics" (2006) periodicals,*

*Web sites:*

- www.eulc.edu.eg

**Assessment Methods**

| Assesment Methods | Course outcomes ILOs | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | Intellectual Skills | | | Professional and Practical Skills | | General and Transferable Skills | |
| | A1 | A2 | A3 | A4 | B1 | B2 | B3 | C1 | C2 | D1 | D1 |
| Written Examination | √ | | √ | √ | | √ | √ | √ | | √ | |

| | Course Coordinator | Head of Department |
|---|---|---|
| Name | Prof. Mohammed O .Shaker | Prof. Kadry Zakaria |
| Name (Arabic) | أ. د. محمد عمر شاكر | ا.د.قدری زکریا |
| Signature | …………………………… | ………………………………… |
| Date | 9/2014 | 9/2014 |

| | | |
|---|---|---|
| Course Title | Quantum Mechanics (2) | |
| Course Code | 1124 | |
| Academic Year | 2014/2015 | |
| Coordinator | Prof. Ahmed E. Aboanber | |
| Other Staff | Dr. Abdallah A. Nahla | |
| Level | Graduate-M. Sc. | |
| Semester | Semesters One and Two | |
| Pre-Requisite | B.Sc. Mathematics | |
| Course Delivery | Lecture | 28 x 2h Lectures |
| Parent Department | Mathematics Department | |
| Date of Approval | September, 2014 | |

**1. Aims**

**This course aims to:** study Dirac formulation of quantum mechanics - orbital angular momentum and electron spin (Pauli spin operators)- spin operator in Heisenberg picture - electron in electric and magnetic field - quantization of the electromagnetic field - quantization of an LC circuit with a source - quantization of a lossless transmission Line - equivalence of classical radiation field in cavity to infinite set of oscillators.

**2. Intended Learning outcomes**

***A. Knowledge and understanding:***

Upon successful completion of this course the students should be able to:

A1- identify Dirac formulation to study modern quantum mechanics.

A2- study harmonic oscillator and total angular momentum.

A3- understand quantization of the electromagnetic field.

A4- study equivalence of classical radiation field in cavity to infinite set of oscillators.

***B. Intellectual skills:***

They will also acquire the ability to:

B1- solve the problems of quantum physics by approximation methods.

B2- use linear vector space and operators to understand natural phenomena.

B3- Applied quantization for physics phenomena.

***C. Professional and practical skills:***

C1- teaches and provides the opportunities to learn a core of quantum mechanics

C2- develop in students the ability to apply their mathematical knowledge and skills in problem-solving, project work, computation and presentation to enable them to take prominent roles in a wide spectrum of employment and research.

D. General and transferable skills:

D1. write reports and give oral representation.

D2. work in cooperative multi-disciplinary teams.

### 3. Contents

| | |
|---|---|
| Week 1 | Bra-Ket Space |
| Week 2 | Linear operators and Hermitian operators |
| Week 3 | The Eigenvalue and eigenvector Problem |
| Week 4 | Observables, Completeness, Expansion in Eigenkets; Dirac Function |
| Week 5 | Matrix Representation of Kets, Bras, and Operators |
| Week 6 | Transformation Functions; Change of Representation; Diagonalization |
| Week 7 | Quantization; Example of Continuous Spectrum |
| Week 8 | The Heisenberg Uncertainty Principle |
| Week 9 | The Schrodinger Picture and Heisenberg Picture of Quantum Mechanics |
| Week 10 | The Interaction Picture. Time-Dependent Perturbation Theory, Dyson Time Ordering Operator |
| Week 11 | Perturbation Theory for a Heisenberg Operator |
| Week 12 | The Free Particle; Change in Time of Minimum Uncertainty Wave Packet |
| Week 13 | The Density Operator, Perturbation Theory |
| Week 14 | The Reduced Density Operator |
| Week 15 | The Harmonic Oscillator in the Heisenberg Picture |
| Week 16 | The Energy-Eigenvalue Problem for the Oscillator |
| Week 17 | Physical Interpretation of $N$, $a$, and $a+$, Bosons and Fermions |
| Week 18 | Transformation Function from $N$ to $q$ Representation for Oscillator |
| Week 19 | The Coherent States |
| Week 2 | Eigenvalues and Eigenvectors of Angular Momentum |
| Week 21 | Particle in a Central Force Field |
| Week 22 | Spin Operators in the Heisenberg Picture |
| Week 23 | Hamiltonian for Electron in Electromagnetic Field |
| Week 24 | Quantization of an $LC$ Circuit with a Source |
| Week 25 | Quantization of a Lossless Transmission Line |
| Week 26 | Equivalence of Classical Radiation Field in Cavity to Infinite Set of Oscillators |
| Week 27 | Quantization of the Radiation Field in Vacuum |
| Week 28 | Commutation Relations for Fields in Vacuum at Equal Times |
| Weeks 29-30 | Assessment |

### 6. List of references

Essential Books:

- WILLIAM H. LOUISELL " Quantum Statistical Properties of Radiation ", Wiley Classics Library Edition Published (1990).

Recommended Books:

- Michel van Veenendaal "Notes on Quantum Mechanics", Northern Illinois University (2012).
- Leslie E. Ballentine "Quantum Mechanics: A Modern Development", World Scientific Publishing (1998).

Periodicals, Web sites:

### 7. Facilities required for teaching and learning

- Projectors, Data show and Internet
- Computer Presentations and Writing Boards.
- Software package

**Course contents – Course ILOs Matrix**

| Course Contents | Course outcomes ILOs | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | Intellectual | | | Practical | | Transferable | |
| | A1 | A2 | A3 | A4 | B1 | B2 | B3 | C1 | C2 | D1 | D2 |
| Bra-Ket Space | √ | | | | | √ | | √ | | √ | |
| Linear operators and Hermitian operators | √ | | | | | √ | | | √ | √ | |
| The Eigenvalue and eigenvector Problem | √ | | | | | √ | | √ | | √ | |
| Observables, Completeness, Expansion in Eigenkets; Dirac Function | √ | | | | | √ | | | √ | √ | |
| Matrix Representation of Kets, Bras, and Operators | √ | | | | | √ | | √ | | √ | |
| Transformation Functions; Change of Representation; Diagonalization | √ | | | | | √ | | √ | | √ | |
| Quantization; Example of Continuous Spectrum | √ | | | | | √ | | | √ | √ | |
| The Heisenberg Uncertainty Principle | √ | | | | | | | | √ | √ | |
| The Schrodinger Picture and Heisenberg Picture of Quantum Mechanics | √ | | | | √ | | √ | √ | | √ | |
| The Interaction Picture. Time-Dependent Perturbation Theory, Dyson Time Ordering Operator | √ | | | | √ | | | √ | | √ | |
| Perturbation Theory for **a** Heisenberg Operator | √ | | | | √ | | | √ | | √ | |
| The Free Particle; Change in Time of Minimum Uncertainty Wave Packet | √ | | | | | | | | √ | √ | |
| The Density Operator, Perturbation Theory | √ | | | | √ | | | | √ | | √ |
| The Reduced Density Operator | √ | | | | | | | √ | | | √ |
| The Harmonic Oscillator in the Heisenberg Picture | | √ | | √ | √ | | | | √ | | √ |
| The Energy-Eigenvalue Problem for the Oscillator | | √ | | √ | √ | | | √ | √ | | √ |
| Physical Interpretation of $N$, $a$, and $a^+$, Bosons and Fermions | | √ | | √ | | | | | √ | | √ |
| Transformation Function from $N$ to $q$ Representation for Oscillator | | √ | | √ | | √ | | √ | | | √ |
| The Coherent States | | √ | | | | √ | | √ | | √ | √ |
| Eigenvalues and Eigenvectors of Angular Momentum | | √ | | | | | | √ | | √ | √ |
| Particle in a Central Force Field | | √ | | | | √ | | √ | | √ | √ |
| Spin Operators in the Heisenberg Picture | | √ | | | | | √ | √ | | √ | √ |
| Hamiltonian for Electron in Electromagnetic Field | | √ | | | | √ | √ | | √ | √ | √ |
| Quantization of an $LC$ Circuit with a Source | | | √ | | | √ | √ | | √ | √ | √ |
| Quantization of a Lossless Transmission Line | | | √ | | | √ | √ | √ | | √ | √ |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Equivalence of Classical Radiation Field in Cavity to Infinite Set of Oscillators | | | √ | √ | | √ | √ | | √ | √ | √ |
| Quantization of the Radiation Field in Vacuum | | | √ | √ | | √ | √ | √ | | √ | √ |
| Commutation Relations for Fields in Vacuum at Equal Times | | | √ | √ | | √ | √ | | √ | √ | √ |

**Learning and Teaching Methods**

| Learning Method | Course outcomes ILOs | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | Intellectual | | | Practical | | Transferable | |
| | A1 | A2 | A3 | A4 | B1 | B2 | B3 | C1 | C2 | D1 | D2 |
| Lecture | √ | √ | √ | √ | √ | √ | √ | | | √ | |
| Discussion (Brain Storming) | √ | √ | √ | √ | √ | √ | √ | | | | √ |
| Self-Learning (Essay) | | | | | | | | √ | √ | √ | √ |

**Assessment Methods**

| Assessment Method | Course outcomes ILOs | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | Intellectual | | | Practical | | Transferable | |
| | A1 | A2 | A3 | A4 | B1 | B2 | B3 | C1 | C2 | D1 | D2 |
| Written Examination | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |

| | **Course Coordinator** | **Head of Department** |
|---|---|---|
| Name | Prof. Ahmed E. Aboanber | Prof. Kadry Zakaria |
| Name (Arabic) | أ. د. أحمد إبراهيم أبوعنبر | ا.د. قدري زكريا |
| Signature | ……………………… | ………………….. |
| Date | 9/2014 | 9/2014 |

| Course Title | **Fluids and Aerodynamics** | |
|---|---|---|
| Course Code | **1123** | |
| Academic Year | **2014_2015** | |
| Coordinator | **Prof. Kadry Z. El-Sherbeny** | |
| Other Staff | | |
| Level | **Graduate-M. Sc.** | |
| Semester | **Semesters One and Two** | |
| Pre-Requisite | **B.Sc. Mathematics** | |
| Course Delivery | **Lecture** | **28 x 2h Lectures** |
| | | |
| Parent Department | **Mathematics Department** | |
| Date of Approval | **September, 2014** | |

**1. Aims**

This course aims to:

1- investigate the equation of motion of the Newtonian fluids with boundary conditions.

2- study the rotation and vorticity and the vortex sheets theory

3- study the boundary layers theory and some Non-Newtonian fluids.

4- study the shocks in the gas dynamics.

**2. Intended Learning outcomes**

***A. Knowledge and understanding:***

Upon successful completion of this course the students should be able to:

A1- provide high quality education in hydrodynamics within an environment committed to excellence in both teaching and research.
A2- provide students with a broad and balanced foundation of knowledge and practical skills in problems of fluids and aerodynamics structures and proofs.

A3- offer students a flexible educational framework that enables them to specialize or maintain a broad course of study

A4- attract well-qualified students and to provide intellectual challenge in a structure containing an appropriate amount of flexibility, so that students can develop their specialist interests.

***B. Intellectual skills:***

They will also acquire the ability to:

B1. learn a core of mathematics fundamental to the education of problems of fluids, together with a wide range of higher level options in applied mathematics and allowing some broadening of study through a range of Management and Humanities options.

B2. apply their mathematical knowledge and skills in problem-solving, project work, computation and presentation to enable them to take prominent roles in a wide spectrum of employment and research.

B3. Produce graduates capable of pursuing a professional career or of proceeding to further study or research.

***C. Professional and practical skills:***

At the end of the practical sessions, the student who have attended regularly and completed required work will be able for:

C1 - provide the necessary skills and training for further study or research in applied matrices mathematics.

C2- identifying, formulating and solving applied problems in the subject.

***D. General and transferable skills:***

D1- extending course material to solve original problems

D2- applying knowledge of program package to the solution of problems

**3. Contents**

| | |
|---|---|
| Lecture 1 | The equation of motion of the Newtonian fluids with boundary conditions 1 |
| Lecture 2 | The equation of motion of the Newtonian fluids with boundary conditions 2 |
| Lecture 3 | The equation of motion of the Newtonian fluids with boundary conditions 3 |
| Lecture 4 | The rotation and vorticity 1 |
| Lecture 5 | The rotation and vorticity 2 |
| Lecture 6 | The rotation and vorticity 3 |
| Lecture 7 | The boundary layers theory 1 |
| Lecture 8 | The boundary layers theory 2 |
| Lecture 9 | The boundary layers theory 3 |
| Lecture 10 | The vortex sheets theory 1 |
| Lecture 11 | The vortex sheets theory 2 |
| Lecture 12 | The vortex sheets theory 3 |
| Lecture 13 | Newtonian versus Non-Newtonian fluids 1 |
| Lecture 14 | Newtonian versus Non-Newtonian fluids 2 |
| Lectures 15,16 | Newtonian versus Non-Newtonian fluids 3 |
| Lectures 17,18 | Examples on Non-Newtonian fluids 1 |
| Lectures 19,20 | Examples on Non-Newtonian fluids 2 |
| Lectures 21,22 | Examples on Non-Newtonian fluids 3 |
| Lectures 23,24 | Examples on Non-Newtonian fluids 4 |
| Lecture25 | The shocks in the gas dynamics 1 |
| Lecture26 | The shocks in the gas dynamics 2 |
| Lecture27 | The shocks in the gas dynamics 3 |
| Lecture28 | The shocks in the gas dynamics 4 |
| Lecture29,30 | **Assessment** |

**4. Teaching and Learning Methods**

- Lectures
- Computer modeling
- Discussions
- Term paper and reports
- Web searching
- Assignments

### 5. Student Assessment

| Assessment Method | Skills assessed* | Assessment Length | Schedule | Proportion |
|---|---|---|---|---|
| Written Examination | KU, I,P,T | 3 Hour Examination | | 100% |

*KU: Knowledge and Understanding, I: Intellectual, P: Professional, T: Transferable

### 6. List of references

*Essential Books:*

- Philip Drazin, Introduction to Hydrodynamic Stability, CAMBRIDGE UNIVERSITY PRESS, 2002

*Recommended Books:*

- Raouf A. Ibrah, Liquid Sloshing Dynamics, Cambridge University Press 2005

-Deyi Shang, Free Convection Film Flows and Heat Transfer, Springer-Verlag Berlin Heidelberg 2006

*Periodicals Web Sites*

- www.eulc.edu.eg

### 7. Facilities required for teaching and learning

- Projectors: Video and Overhead.
- Software package

| Course Contents | Course outcomes ILOs | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | Intellectual | | | Practical | | Transferable | |
| | A1 | A2 | A3 | A4 | B1 | B2 | B3 | C1 | C2 | D1 | D2 |
| The equation of motion of the Newtonian fluids with boundary conditions | √ | √ | | √ | √ | √ | √ | √ | √ | √ | √ |
| The rotation and vorticity | √ | | √ | | √ | | √ | √ | | | √ |
| The boundary layers theory | √ | √ | | | √ | √ | √ | √ | √ | √ | √ |
| The vortex sheets theory | √ | | | √ | √ | | √ | √ | | | √ |
| Newtonian versus Non-Newtonian fluids | √ | | √ | √ | √ | | √ | √ | | | √ |
| Examples on Non-Newtonian fluids | √ | √ | √ | | √ | √ | √ | √ | √ | √ | √ |
| The shocks in the gas dynamics | √ | | √ | | √ | | √ | √ | | | √ |

**Learning and Teaching Methods**

| Learning Method | Course outcomes ILOs | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | Intellectual Skills | | | Professional and Practical Skills | | General and Transferable Skills | |
| | A1 | A2 | A3 | A4 | B1 | B2 | B3 | C1 | C2 | D1 | D1 |
| Lecture | √ | | √ | | √ | | | √ | | | |
| Discussion | | √ | √ | | √ | | √ | √ | √ | | √ |
| Computer modelling | | | | | | | | √ | v | √ | |
| Report | √ | | | √ | | √ | | √ | √ | | |
| Web searching | √ | √ | | | | | | | | √ | √ |

**Assessment Methods**

| Assessment Methods | Course outcomes ILOs | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | Intellectual Skills | | | Professional and Practical Skills | | General and Transferable Skills | |
| | A1 | A2 | A3 | A4 | B1 | B2 | B3 | C1 | C2 | D1 | D1 |
| Written Examination | √ | | √ | √ | | √ | √ | √ | | √ | |

| | Course Coordinator | Head of Department |
|---|---|---|
| Name | Prof. Kadry Zakaria | Prof. Kadry Zakaria |
| Name (Arabic) | أ. د. قدرى زكريا الشربينى | ا.د.قدرى زكريا |
| Signature | …………………………… | ………………………….. |
| Date | /9/2014 | /9/2014 |

| Course Title | Theory of Elasticity | |
|---|---|---|
| Course Code | 1121 | |
| Academic Year | 2014/2015 | |
| Coordinator | Dr. Magdy Serwah | |
| Level | Postgraduate M. Sc. | |
| Semester | Semesters One and Two | |
| Pre-Requisite | B. Sc. Mathematics | |
| Course Delivery | Lecture | 28 x 2H Lectures |
| Parent Department | Mathematics Department | |
| Date of Approval | September, 2014 | |

**1. Aims**

This course gives student an opportunity to:

Review the fundamental definitions of the Strain, Stress and the relation between for isotropic materials (Hooke's Law) - strain Energy and related principles- Two dimensional problems and solutions- Complex Formulation of the Plane Elasticity Problem- Complex Potentials- Applications to the Fracture Mechanics-Basic Concepts of anisotropic elasticity with tensor analysis- stress functions – Thermo-elasticity and the related problems.

**2. Intended Learning outcomes**

By the end of the course, the student will be able to:

***A. Knowledge and understanding:***

- A1. Review the fundamental definitions of the Strains and Stresses.
- A2. Explain the difference between plane stress and plane strain.
- A3 Identify the concepts of anisotropic elasticity and fracture mechanics.
- A4 Recognize Torsion, and Flexure of Elastic Cylinders

***B. Intellectual skills:***

- B1. Apply Hook's law in elasticity problems
- B2. Employ strain energy principles for solving problems.
- B3 Create the constitutive relations for thermo-elasticity and anisotropic domain.
- B4 Compare between real and complex Formulation of the Elasticity Problem

***C. Professional and practical skills:***

- C1. Able to Solve Plane Elasticity Problem in real and complex Formulation.
- C2. Explain the principles of Energy as practical techniques.
- C3. Preserve formulation problems by Tensor properties.

***D. General and transferable skills:***

- D1. Explore the main role of stress functions in all elasticity fields.
- D2. Analysis some results of the solution of problems.
- D3. Work cooperatively with others in formulation problems in2D.

**3. Contents:**

Week 1 **Review on the Basic concepts of elasticity.**

| | |
|---|---|
| Week 2 | **Two-Dimensional Problem Solution** |
| Week 3 | Cartesian Co- solutions using polynomials and Fourier methods |
| Week 4 | General Solutions in Polar Coordinates |
| Week 5 | **Extension, Torsion, and Flexure of Elastic Cylinders** |
| Week 6 | General and Extension Formulation |
| Week 7 | Torsion Formulation |
| Week 8 | Torsion Solutions Derived from Boundary Equation |
| Week 9 | Torsion Solutions Using Fourier Methods |
| Week 10 | Torsion of Cylinders With Hollow Sections |
| Week 11 | Flexure Formulation |
| Week 12 | Flexure Problems Without Twist |
| Week 13 | **Complex Variable Methods** |
| Week 14 | Complex Formulation of the Plane Elasticity Problem |
| Week 15 | Resultant Boundary Conditions |
| Week 16 | General Structure of the Complex Potentials |
| Week 17 | Circular Domain Examples |
| Week 18 | Plane and Half-Plane Problems |
| Week 19 | Applications to Fracture Mechanics |
| Week 20 | Westergard Method for Crack Analysis |
| Week 21-22 | **Anisotropic Elasticity** |
| Week 23 | Plane Deformation Problems |
| Week 24 | Applications to Fracture Mechanics in anisotropic medium |
| Week 25-27 | **Thermo-elasticity** |
| Week 28-29 | Stress Function Formulation |
| Weeks 30 | Assessment |

**4. Teaching and Learning Methods:**

**Lecture**

**Discussion and Web searching**

**Computer modelling**

**Report**

**5. Student Assessment:**

| **Assessment Method** | **Skills assessed*** | **Assessment Length** | **Schedule** | **Proportion** |
|---|---|---|---|---|
| Written Examination | KU, I, P | 2 Hour Examination | The 16th Week | 100% |

*KU: Knowledge and Understanding, I: Intellectual, P:Professional , T : Transferable

**6. List of references:**

*Course notes:*

Course notes and Laboratory manual authorized by the Council of Department of Mathematics.

*Essential Books:*

1. Martin H. Sadd, 2005 "Elasticity Theory, Applications, and Numerics", Elsevier Inc.

**7. Facilities required for teaching and learning**

Projectors: Data show( Computer Presentations)

Writing Boards.
Library

Course Matrix

| Course Contents | Course outcomes ILOs | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Knowledge and Understanding** | | | | **Intellectual** | | | | **Practical** | | | **Transferable** | | |
| | A1 | A2 | A3 | A4 | B1 | B2 | B3 | B4 | C1 | C2 | C3 | D1 | D2 | D3 |
| Review on the Basic concepts of elasticity | √ | √ | | | √ | | | √ | √ | | √ | | | |
| Two-Dimensional Problem Solution | √ | √ | | | √ | √ | | √ | √ | | | | | √ |
| Cartesian Co-solutions using polynomials and Fourier methods | | √ | | | √ | | | | √ | | | | √ | √ |
| General Solutions in Polar Coordinates | | √ | | | | | | | √ | | | | √ | √ |
| Extension, Torsion, and Flexure of Elastic Cylinders | √ | | | √ | √ | √ | | √ | √ | √ | | √ | √ | |
| General and Extension Formulation | | | | √ | √ | √ | | √ | √ | √ | | | √ | |
| Torsion Formulation | √ | | | √ | √ | √ | | √ | | √ | | √ | √ | |
| Torsion Solutions Derived from Boundary Equation | | | | √ | √ | | | √ | | | | √ | | |
| Torsion Solutions Using Fourier Methods | | | | √ | √ | √ | | √ | | √ | | √ | √ | |
| Torsion of Cylinders With Hollow Sections | | | | √ | √ | √ | | √ | | √ | | √ | √ | |
| Flexure Formulation | | | | | √ | √ | | √ | | | | √ | √ | |
| Flexure Problems Without Twist | | | | √ | √ | √ | | √ | | √ | | √ | √ | |
| **Complex Variable Methods** | | | | | | √ | | √ | √ | √ | | √ | √ | √ |
| Complex Formulation of the Plane Elasticity Problem | √ | √ | | | | √ | | √ | √ | √ | | √ | √ | √ |
| Resultant Boundary Conditions | √ | √ | | | | √ | | √ | √ | √ | | √ | √ | √ |
| General Structure of the Complex Potentials | √ | √ | | | | √ | | √ | √ | √ | | √ | √ | √ |
| Circular Domain Examples | √ | | | | | | | √ | √ | | | | | |
| Plane and Half-Plane | √ | √ | | | √ | | | | | √ | | | √ | |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Problems | | | | | | | | | | | | | | |
| Applications to Fracture Mechanics | | | √ | | | | √ | | | | √ | √ | √ | √ |
| Westergaard Method for Crack Analysis | | | √ | | | | √ | | | | √ | √ | | |
| Anisotropic Elasticity | | | √ | | | | √ | | | | √ | √ | √ | √ |
| Plane Deformation Problems in anisotropic | √ | | √ | | | | √ | | | | √ | √ | √ | √ |
| Thermoelasticity | | | √ | | | | √ | | | | √ | √ | | |
| Applications to Fracture Mechanics in anisotropic medium | | | √ | | | | √ | | | | √ | √ | √ | √ |
| Stress Function Formulation | √ | √ | | | | √ | | | | | √ | √ | | √ |

**Learning and Teaching Methods**

| Learning Method | Course outcomes ILOs | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | Intellectual | | | | Practical | | | Transferable | | |
| | A1 | A2 | A3 | A4 | B1 | B2 | B3 | B4 | C1 | C2 | C3 | D1 | D2 | D3 |
| **Lecture** | √ | √ | | √ | √ | √ | | | √ | | √ | | | |
| **Discussion and Web searching** | | √ | √ | | | | √ | √ | √ | | | | | √ |
| **Computer modelling** | | | | | √ | | | | √ | | √ | √ | | √ |
| **Report** | | | √ | | | | √ | | √ | √ | √ | | √ | |

**Assessment Methods**

| Assessment Methods | Course outcomes ILOs | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | Intellectual | | | | Practical | | | Transferable | | |
| | A1 | A2 | A3 | A4 | B1 | B2 | B3 | B4 | C1 | C2 | C3 | D1 | D2 | D3 |
| Written Examination | | | √ | √ | | √ | | √ | √ | √ | √ | | | |

| | | Course Coordinator | Head of Department |
|---|---|---|---|
| Name | | Dr. Magdy Serwah | Prof. Kadry Zakaria |
| Name (Arabic) | | د. مجدى سرواح | ا.د.قدرى زكريا |
| Signature | | | |
| Date | | **2014** | 2014 |

| | | |
|---|---|---|
| Course Title | **Introduction to Computer Science** | |
| | | |
| Course Code | 1317 | |
| Academic Year | **2014/2015** | |
| Coordinator | **Prof. Mahmoud Kamel** | |
| Other Staff | **Prof. Mahamed El-Awady, Mohmed Ghoneim, Prof. Qadry Zakaria, Prof Saad Abo elenen** | |
| Semesters | **Two Semesters** | |
| Pre-Requisite | **B.Sc.** | |
| Course Delivery | **Lecture** | **1h/week** |
| | **Practical** | **1h/week** |
| Parent Department | **Computer Centre** | |
| Date of Approval | **September, 2014** | |

**1. Aims**

This course will enable students to acquire a range of transferable skills that are important for post graduate M. Sc. students to:

- Develop their capability for information retrieval and presentation, and proficiency in the use of IT effectively in the context of their studies.
- Underpin academic work throughout postgraduate studies.
- Provide opportunities to develop skills required for team working, oral presentation of scientific material, and career choices.

***A. Knowledge and understanding:***

Upon successful completion of this course the students should be able to:

A1. Demonstrate knowledge and understanding of the use of IT in the context of their postgraduate studies.

A2. Know the diverse media and hardware and software that help to benefit of the IT in the context of the postgraduate studies.

A3. Carry out necessary graphical, statistical and frequency analyses of different types of data.

A4. Create powerful presentation using sophisticated software packages.

A5. Make use of different internet resources.

A6. Solve scientific problems using computer programming.

A7. Make use of different photo enhancing and manipulation techniques.

***B. Intellectual skills:***

They should also acquire the ability to:

B1. Integrate different application programs to develop effective information analysis and presentation.

***C. Professional and practical skills:***

C1. Use a number of computer packages to present information.

***D. General and transferable skills:***

D1. Use the internet/electronic resources to obtain subject specific information, and to develop lifelong learning skills that can be applied to suitable research problems.

**3. Contents**

| | |
|---|---|
| Lectures 1-5 | **Assignment 1** : **information technology**<br>Types and generations of computers<br>Hardware and Software computer structure<br>Types and development of operating systems<br>Working with windows<br>File and folder manipulations |
| Lectures 6-12 | **Assignment2** : **Using PowerPoint program**<br>Working with PowerPoint program<br>Insert slides and animations<br>Different methods of slide editing<br>Insert tables ,charts, video, pictures, hyperlinks ,web pages and different objects<br>Design a real and powerful presentation with different acquired skills |
| Lecture 13-18 | **Assignment 3** : **Using Access program**<br>Working with Access program<br>Define data and information<br>Creating data base tables , sorting and filtering records and fields<br>Creating different types of queries to extract useful information<br>Creating forms for data entries and calculations<br>Creating and printing final reports |
| Lecture 19-23 | **Assignment 4: Using the Internet**<br>Define different types of protocols and network<br>Different levels of internet connections<br>Email and methods of file transfer<br>Use of internet capabilities and searching engines<br>Life search on the internet for some real information |
| Lecture 24-28 | **Assignment 5**: Programming using Visual Basic 6<br>Different types of computer languages<br>Concept of visual programming language<br>Working with visual basic language<br>Steps necessary for creating a project with visual basic<br>Solving real problems using a visual basic computer language |

**4. Teaching and Learning Methods**

- Lectures
- Practical classes
- Assignments

The course is delivered through lectures, practical sessions and assignments. Team working skills are developed on a week-long laboratory exercises and the students present and defend their findings in a public seminar.

**5. Student Assessment**

| Assessment Method | Skills assessed* | Assessment Length | Schedule | Proportion |
|---|---|---|---|---|
| Written Examination | KU, I | 1 Hour Examination | Term Final | 60% |
| Practical Examination | KU, I | 1 Hour Examination t | Term Final | 30% |
| Semester work | P, T | Continuous Assessment | | 10% |

*KU: Knowledge and Understanding, I: Intellectual, P: Professional, T: Transferable

**6. List of references**
*Course notes:*
- Notes given to students at each section describe the tasks to be completed, therefore no particular book(s) recommended.

**7. Facilities required for teaching and learning**
- Projectors; Video and Overhead
- LCD screens and writing Boards
- Commercial computer scientific software packages.

Course Contents – Course ILOs Matrix

**Course code: 1317 Chemistry, course title: Computer**

| Course Contents | Course outcomes ILOs | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | | | | | | | Intellectual | | | | | Practical | | | | | Transferable | | |
| | A1 | A2 | A3 | A4 | A5 | A6 | A7 | A8 | A9 | A10 | B1 | B2 | B3 | B4 | B5 | C1 | C2 | C3 | C4 | C5 | D1 | D2 | D3 |
| Week #1-2 | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #3-4 | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #5-6 | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #7-8 | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #9-10 | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #11-12 | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #13-14 | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #14-15 | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #16-17 | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #18-19 | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #20-21 | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #22-23 | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #24-25 | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #26-27 | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #28 | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |

# M.Sc. Program of

# Pure Mathematics

## The Academic Reference Standards for Master Degree of pure mathematics

### 1. Academic standards

The Academic Reference Standards of this program is based upon the General Academic Standards of postgraduate programs published by the National Authority of Quality Assurance and Accreditation of Education (ARS) in (2009).

Specific Academic Reference Standards for M. Sc. in Statistics were approved by the Council of Faculty of Science, Tanta University in 20١2-2013 which are listed in the following:

### *1.1 The Attributes of M.Sc. Program in Mathematics.*

The graduate of master's program in mathematics should be able to:
1- Proficiency in applications of basics and methodologies of scientific research
2- Apply the analytical methods in the area of mathematics.
3 – Use mathematical knowledge combined with related knowledge in professional practice.
4- Show awareness of ongoing problems and visions in modern area of Statistics.
5- Identify mathematical problems and find their solutions.
6- Mastery of Statistics skills, and can use appropriate technological means to serve the professional practice.
7- Communicate effectively and the ability to lead teams.
8- Decision-making in different contexts.
9- Use available resources to achieve the highest benefit and its preservation.
10- Show awareness of his role in community development and preservation of the environment.
11- Behave in a manner reflecting the commitment to integrity and credibility of the profession and abide by the rules.
12- Develop his academic capabilities and continuous learning in Statistics.

**1. Knowledge and Understanding:**
By the end of the master's program graduate of applied mathematics the students should be able to:

1. Identify advanced theories, fundamentals, specialized knowledge and professional practice in mathematics.
2. Review all scientific principle and fundamentals in mathematics.
3. Demonstrate scientific developments in the area of mathematics.
4. Explain the specialized subject in the interested field.
5. Classify the interested subject into research points.

**2. Intellectual Skills:**

1. Analyze and evaluate the information in mathematics to solve problems.
2. Solve mathematical problems in case of non-availability of some data.
3. Link between different sciences to solve professional problems.
4. Conduct a research study and / or write a methodology of scientific study onto a research problem.
5. Plan to improve performance in the area of mathematics.

**3. Professional Skills:**

By the end of the study master's program graduate must be able to:

1. Plan, design, conduct and report on the investigated data, using appropriate techniques and considering scientific guidance.
2. Apply techniques and tools considering scientific ethics.
3. Solve problems using a range of formats and approaches.

4. Identify and criticize the different methods used for preparing, processing, interpreting and presenting data.
5. Write and evaluation of mathematical reports

**4. *General and Transition skills***

By the end of the study master's program graduate must be able to:

1. Recognize the basics and ethics of scientific research
2. Effective communication in its different forms.
3. Use of information technology to serve the development of mathematics.
4. Use different sources for information and knowledge in mathematics.
5. Work in a team, and leading teams in various professional contexts.
6. Self- and continuous learning in mathematics.

The M.Sc. Program Structure includes:

- Pre-master courses specified by the Mathematics Department
- Thesis in different branches of Mathematics.

**Thesis**

- The thesis of M.Sc. program is a formal written document representing sustained research into an important intellectual issue. The thesis must be an independent effort which contributes to the accumulated understanding of the field in which it is written. The required research preparation and advanced research methods courses will help the student to focus his or her research effort, and provide general guidelines for research approach and report preparation. Thesis will be reviewed and approved by the candidate's supervising professor and external academic review committee.
- The thesis should contain at least the following:
- Title page (title, name of student, university, faculty,? name of program, date, supervisors
- Table of contents
- Introduction, containing a definition of the thesis? statement, working method, the theoretical framework, and the aim.
- Literature review.
- Materials and methods.
- Results
- Discussion and conclusions
- References.
- Language of the thesis
- The thesis must be written in English language accompanied by a summary in Arabic.

**Formation of Examiners Committees**

- A committee is selected by Mathematics Department Council. The M.Sc. Degree is awarded to the applicant by University, upon the recommendation of the department and the Faculty Council.
- **3- Program Admission Requirements:**
- An applicant for admission to the M.Sc. program in Statistics should hold an B.Sc. degree in Statistics with a minimum grade of (Good = 70%)

- **4- The candidate should pass successfully :**
- **Courses of pre-master academic year**
- Written Thesis
- Oral Presentation
- Defense at least one published paper.

Tanta University
Faculty of Science
Department of Mathematics

1969

**M.Sc. Program (Pure Mathematics)**

**Program Title** **Pure Mathematics**
**Department** **Mathematics**

## A. Program Specification

| Program Title | **Pure Mathematics (M.Sc.)** |
|---|---|
| Award | **M.Sc. Pure Mathematics** |
| Parent Department | **Mathematics Department** |
| Teaching Institution | **Faculty of Science – TU** |
| Awarding Institution | **Tanta University** |
| Coordinator | **Prof. Kadry Zakaria** |
| External Evaluator(s) | **Prof. Samia S. El Azab**<br>**Faculty of Science – Ein Shams University** |
| QAA Benchmarking Standards | **Academic Reference Standards (ARS)** |
| Date of intake | **Every year in September** |
| Review Date | |
| Date of Approval | **September 2014** |

### 1. Aims

This Program provides graduate students with the skills and techniques needed for advanced research in mathematics with the help of computer science. You will understand how these can be applied to the formulation and solution of problems from scientific, technological, business, and other areas. We also encourage graduate to research more about these subjects and how to use in life.

The M.Sc. graduates of pure mathematics must have the ability to:

- Gain new knowledge and continually enhance information to improve the understanding and handling issues in one of the different branches of pure mathematics.
- Analysis the Mathematical structure problems and solutions techniques in many researching fields as: algebra, numerical analysis, functional analysis, and differential equations.
- Use and apply mathematical knowledge combined with related topics in building a mathematical model.
- Identify mathematical problems and find their solutions.
- Show awareness of ongoing problems and visions in modern areas of mathematics.
- Hold professional values that maintain individuality, positive thinking and self- learning.
- Use modern technology effectively and develop his mathematical professional skills.
- Be a competent, creative, and critical.

| **2. Intended Learning outcomes (ILOs) of M.Sc. program in pure Mathematics.** |
|---|
| At the end of the Program, a successful student must be able to: |
| **A. Knowledge and understanding:** |

A1. Recognize the advanced theories of algebra, functional analysis, numerical analysis, differential equations theory.
A2. Understand advanced knowledge, theories, proofs and new solutions techniques from the scientific papers.
A3. Describe and express the details of interested research points.
A4. Identify the recent problems and modern vision in the field of study.
A5. Know the importance of fundamental Numerical analysis and their application in different area.
A6 Identify advanced concepts of algebraic structures and functional analysis.

**B. Intellectual skills:**

B1. Develop mathematical knowledge to solve problems of the surrounding environment.
B2. Apply logical thinking principle for solving advanced problems.
B3. Analyze and estimate mathematical knowledge and use it for solving interested problems.
B4. Solve problems using appropriate techniques and recent approaches.
B5. Construct mathematical structure for real-world problems.

**C. Professional Skills:**

C1. Evaluate and present research results objectively.
C2. Use accuracy principal for analyzing and presenting the research results.
C3. Apply rules and techniques of mathematics to model and solve real world problem
C4. Write and present professional reports.
C5. Use mathematical software to solve mathematical problems.

**D. General Skills:**

D1. Work effectively as part of a team.
D2. Apply technology to enhance mathematical thinking and understanding.
D3. Convey the meaning of mathematics concepts to others
D4. Be appropriate the ethics of scientific research
D5. Demonstrate ability to lead a group.

**3. Academic Reference Standards (ARS):**

In order to fulfill National Academic Reference Standards, our students should acquire:

**1. Knowledge and Understanding:**

By the end of the master's program graduate of pure mathematics the students should be able to:

1. Identify advanced theories, fundamentals, specialized knowledge and professional practice in mathematics.
2. Review all scientific principle and fundamentals in mathematics.
3. Demonstrate scientific developments in the area of mathematics.
4. Explain the specialized subject in the interested field.
5. Classify the interested subject into research points.

**2. Intellectual Skills:**

1. Analyze, synthesize, assess and interpret qualitatively and quantitatively science relevant data.
2. Solve mathematical problems in case of non-availability of some data.
3. Develop lines of argument and appropriate judgments in accordance with the scientific theories and concepts.
4. Postulate and deduce mechanisms and procedures to handle scientific problems.
5. Construct several related integrated information to confirm, make evidence and test hypothesis.

6. Use theories of mathematics to interpret results.

**3. Professional Skills:**

By the end of the study master's program graduate must be able to:

1. Plan, design, conduct and report on the investigated data, using appropriate techniques and considering scientific guidance.
2. Apply techniques and tools considering scientific ethics.
3. Solve problems using a range of formats and approaches.
4. Identify and criticize the different methods used for preparing, processing, interpreting and presenting data.
5. Implant comprehensive physical knowledge and understanding as well as intellectual skills in research tasks.

**4. *General and Transition skills***

By the end of the study master's program graduate must be able to:

1. Effective communication in its different forms.
2. Use of information technology to serve the development of mathematics.
3. Use different sources of information and knowledge in mathematics.
4. Work in a team, and leading teams in various professional contexts.
5. Self- and continuous learning in mathematics.

**3. b. Comparison of provision to external references**

**4. Curriculum Structure and contents:**

4.a Programme duration **At most 5 years**

4.b Programme structure:

| | | | | | |
|---|---|---|---|---|---|
| Number of contact hours | per week | | | | |
| | Lectures per week | 12 | | Total | 12 |
| 4. c **Thesis** | | | | | |

**5. Program courses**

| Code | | Course Title | Hours/Week | | | Program ILOs Covered |
|---|---|---|---|---|---|---|
| | | | Lec. | Prac. | Exer. | |
| | | Partial Differential Equations | 2 | | | KU, I, P, T |
| | | Algebra | 2 | | | KU, I, P, T |
| | | Functional analysis | 2 | | | KU, I, P, T |
| | | Numerical analysis | 2 | | | KU, I, P, T |
| | | Introduction to computer science | 2 | | | KU, I, P, T |

**6. Program admission requirements**

Candidates must satisfy the general admission requirements of the University, Faculty and department and also hold a B. Sc. in physics with at least accumulative grade “Good”.

To be qualified to register as a candidate of a master degree in Physics, student must pass in all course units and achieve at least an overall of 70%.

**7. Evaluation of Program intended learning outcomes**

| Evaluator | Tool | Sample |
|---|---|---|
| 1. Senior students | applied | |
| 2. Alumni | Applied | |
| 3. Stakeholders (Employers) | | |
| 4. External Evaluator(s) (External Examiner(s)) | Applied | |

We certify that all of the information required to deliver this programme is contained in the above specification and will be implemented. All course specifications for this program are in place.

## 8.1. Matrix of ARS ILOs and Mathematics Program ILOs

| ARS ILOs | Programme intended learning outcomes ILOs | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | | | Intellectual | | | | | Practical | | | | | Transferable | | | | |
| | A 1 | A 2 | A 3 | A 4 | A 5 | A 6 | B 1 | B 2 | B 3 | B 4 | B 5 | C 1 | C 2 | C 3 | C 4 | C 5 | D 1 | D 2 | D 3 | D 4 | D 5 |
| **Knowledge and Understanding** | | | | | | | | | | | | | | | | | | | | | |
| **A1**. Identify advanced theories, fundamentals, specialized knowledge and professional practice in mathematics | √ | √ | | | √ | | | | | | | | | | | | | | | | |
| **A2.** Review all scientific principle and fundamentals in mathematics | | | | | √ | √ | | | | | | | | | | | | | | | |
| **A3.** Demonstrate scientific developments in the area of mathematics | √ | √ | | √ | | | | | | | | | | | | | | | | | |
| **A4.** Explain the specialized subject in the interested field | | | √ | √ | | | | | | | | | | | | | | | | | |
| **A5.** Classify the interested subject into research points | | | √ | | √ | √ | | | | | | | | | | | | | | | |
| **Intellectual Skills** | | | | | | | | | | | | | | | | | | | | | |
| **B1.** Analyze and evaluate the information in mathematics to solve problems | | | | | | | | | √ | | | | | | | | | | | | |
| **B2.** Solve mathematical problems in case of non-availability | | | | | | | √ | √ | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| of some data | | | | | | | | | | | | | | | | | | | | | |
| **B3.** Link between different sciences to solve professional problems | | | | | | | √ | | | √ | | | | | | | | | | | |
| **B4.** Conduct a research study and / or write a methodology of scientific study onto a research problem | | | | | | | | | | | √ | | | | | | | | | | |
| **B5.** Plan to improve performance in the area of mathematics | | | | | | | √ | | | | √ | | | | | | | | | | |
| **Professional Skills** | | | | | | | | | | | | | | | | | | | | | |
| **C1.** Plan, design, conduct and report on the investigated data, using appropriate techniques and considering scientific guidance | | | | | | | | | | | | √ | √ | | | √ | | | | | |
| **C2.** Apply techniques and tools considering scientific ethics | | | | | | | | | | | | | √ | √ | | | | | | | |
| **C3.** Solve problems using a range of formats and approaches | | | | | | | | | | | | | | √ | | √ | | | | | |
| **C4.** Identify and criticize the different methods used for preparing, processing, interpreting and presenting data | | | | | | | | | | | | | √ | | | √ | | | | | |
| **C5.** Write and evaluation of mathematical reports | | | | | | | | | | | | √ | | | √ | | | | | | |

| General Skills | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **D1**. Access the basics and ethics of scientific research | | | | | | | | | | | | | | | | | | | √ | |
| **D2**. Effective communication in its different forms. | | | | | | | | | | | | | | | | √ | | | | √ |
| **D3.** Use different sources of information and knowledge in mathematics. | | | | | | | | | | | | | | | | | √ | √ | | |
| **D4.** Work in a team, and leading teams in various professional contexts. | | | | | | | | | | | | | | | | √ | | | | √ |
| **D5.** Self- and continuous learning in mathematics. | | | | | | | | | | | | | | | | | | √ | | |

## Course Programme – ILOs. Matrix

| Course code / Title | Course outcomes ILOs | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | | | Intellectual | | | | | Practical | | | | | Transferable | | | | |
| | A 1 | A 2 | A 3 | A 4 | A 5 | A 6 | B 1 | B 2 | B 3 | B 4 | B 5 | C 1 | C 2 | C 3 | C 4 | C 5 | D 1 | D 2 | D 3 | D 4 | D 5 |
| Partial Differential Equations | √ | √ | √ | √ | √ | | | | √ | √ | √ | | √ | √ | | √ | √ | | | √ | √ |
| Algebra | √ | √ | | | | √ | √ | √ | | | | √ | | | | | √ | | √ | | |
| Functional analysis | √ | | | | | √ | √ | | √ | | | √ | | | √ | | √ | | | √ | |
| Numerical analysis | √ | √ | √ | √ | √ | | | √ | | √ | √ | | √ | √ | √ | √ | √ | √ | | | √ |
| Computer Science | | | | √ | | | | | √ | | | | | | √ | | | √ | | | |
| Thesis | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | | | √ | √ | | √ |

We certify that all of the information required to deliver this Program is contained in the above specification and will be implemented. All course specifications for this Program are in place.

| Name | Signature | Date |
|---|---|---|
| *Head of Department:*<br>Prof. Kadrey Zakaria<br>أ.د. قدري زكريا | | 9/2014 |
| *Head of Quality Assurance Unit:*<br>Prof. Hoda kamal El-Sayed<br>أ.د. هدى كمال السيد | | 9/2014 |
| *Dean of the Faculty:*<br>Prof. Tarek Fayed<br>أ.د. طارق فايد | | 9/2014 |

| Course Title | Numerical analysis | |
|---|---|---|
| Course Code | 1113 | |
| Academic Year | 2013-2014 | |
| Coordinator | Prof. Ahmed R. El-Namory | |
| Other Staff | | |
| Level | Post-Graduate | |
| Semester | Semesters One and Two | |
| Pre-Requisite | B.Sc. Mathematics | |
| Course Delivery | Lecture | 28 x 2h Lectures |
| Parent Department | Mathematics Department | |
| Date of Approval | September, 2014 | |

**1. Aims**

This course gives an ability to do the following:

1- Applying numerical difference methods for partial differential equations.

2- Investigating stability, convergence and compatibility of the method of nets.

3- Applying asymptotic iterative procedures for the explicit and implicit difference schemes.

4- Studying the method of iterations for Integral equations of the second kind.

5- Solving Fredholm's integral equation with an unbounded kernel and deriving Fredholm's alternatives.

6- Solving singular integral equations (Abel and Hilbert integral equations).

7- Investigating the stability of the multistep procedures for the initial value problems.

**2. Intended Learning outcomes**

***A. Knowledge and understanding:***

Upon successful completion of this course the students should be able to:

A1. Derive the sufficient conditions that ensure the convergence, stability and compatibility of the constructed difference schemes for P. D. Equations.

A2. Transform Fredholm's integral with an arbitrary kernel to another one of degenerate kernel.

A3. Solve integral equations with multiple integrals.

A4. Understand that not all multistep procedures are stable with respect to its initial values.

***B. Intellectual skills:***

The student will also acquire the ability to:

B1. Construct finite difference schemes in the cylindrical polar coordinates for the parabolic equations.

B2. Apply the alternating-direction implicit process for the elliptic equations.

B3. Derive the inversion of the fractional integral equations.

***C. Professional and practical skills:***

C1. Applying the Fourier series procedure for studying the stability of explicit difference schemes for the hyperpolic equations.

C2. Using computer language to solve the associated difference schemes for P. D. Eqns..

C3. Applying fractional integral equations for mathematical physics problems.

C4. Determining the region of absolute stability for any specified numerical method of the model equations.

***D. General and transferable skills:***

D1. extend course material to solve some problems in applied Mathematics.

D2. Use the tools of integral equations in the area of differential problems.

D3. Write reports and give oral representation.

**3. Contents**

| | |
|---|---|
| **Lecture 1** | **Finite difference formula** |
| **Lecture 2** | **Parabolic equations 1** |
| **Lecture 3** | **Parabolic equations 2** |
| **Lecture 4** | **Convergence and stability 1** |
| **Lecture 5** | **Convergence and stability 2** |
| **Lecture 6** | **Systematic methods** |
| **Lecture 7** | **Hyperbolic equations** |
| **Lecture 8** | **Elliptic equations 1** |
| **Lecture 9** | **Elliptic equations 2** |
| **Lecture 10** | **Iterative methods for integral equations** |
| **Lecture 11** | **Integral equations with arbitrary kernal** |
| **Lecture 12** | **Integeral equations with degenerate kernal** |
| **Lecture 13** | **Applications of Fredholm alternatives 1** |
| **Lecture 14** | **Applications of Fredholm alternatives 2** |
| **Lecture 15** | **Fredholm theorem** |
| **Lecture 16** | **Singular integral equations 1** |
| **Lecture 17** | **Singular integral equations 2** |
| **Lecture 18** | **Abel and Hilbert integral equations 1** |
| **Lectures 19,20** | **Abel and Hilbert integral equations 2** |
| **Lectures 21,22** | **Integral equations with double integration 1** |
| **Lectures 23,24** | **Integral equations with double integration 2** |
| **Lectures 25,26** | **Multi step procedure** |
| **Lectures 27,28** | **Stability of numerical methods** |
| **Weeks 29,30** | **Assessment** |

**4. Teaching and Learning Methods**

- **Lectures**
- **Computer modeling**
- **Discussions**
- **Term paper and reports**
- **Web searching**
- **Assignments**

**5. Student Assessment**

| Assessment Method | Skills assessed* | Assessment Length | Schedule | Proportion |
|---|---|---|---|---|
| Written Examination | KU, I,P,T | 3 Hour Examination | | 100% |

***KU: Knowledge and Understanding, I: Intellectual, P: Professional, T: Transferable**

**6. List of references**

***Essential Books:***

- **Atkinson K. , Elementary numerical analysis, univ. of Iowa, John Wiley and Sons Inc (1985).**
- **Bitsadze A.V. , Equations of mathematical physics, Mir publishers, Moscow (1980).**
- **Samarski A. and Andreev V. , Difference methods for elliptic equations, Nauka Moscow (1978).**
- **Smith G. D. , Numerical solution of partial differential equations, Oxford univ. press 3 rd ed. (2004).**

**7. Facilities required for teaching and learning**

- **Projectors: Video and Overhead.**
- **Software package**

**Course contents – Course ILOs Matrix**

| Course Contents | Course outcomes ILOs | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | Intellectual | | | Practical | | | | Transferable | | |
| | A1 | A2 | A3 | A4 | B1 | B2 | B3 | C1 | C2 | C3 | C4 | D1 | D2 | D3 |
| Finite difference formula | √ | | | | | √ | | √ | | | | | | |
| Parabolic equations 1 | √ | | | | √ | | | | √ | | | √ | | |
| Parabolic equations 2 | √ | | | | √ | | | | √ | | | √ | | |
| Convergence and stability 1 | √ | | | | | √ | | √ | | | | | | |
| Convergence and stability 2 | √ | | | | | √ | | √ | | | | | | √ |
| Systematic methods | V | | | | | √ | | | √ | | | | | √ |
| Hyperbolic equations | √ | | | | | √ | | √ | | | | √ | | |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Elliptic equations 1 | √ | | | | | √ | | √ | | | | √ | | |
| Elliptic equations 2 | √ | | | | | √ | | √ | | | | √ | | |
| Iterative methods for integral equations | | √ | | | | | | | | | | | | √ |
| Integral equations with arbitrary kernel | | √ | | | | | | | | √ | | | √ | |
| Integral equations with degenerate kernel | | √ | | | | | | | | √ | | | √ | |
| Applications of Fredholm alternatives 1 | | | √ | | | | √ | | | √ | | | √ | √ |
| Applications of Fredholm alternatives 2 | | | √ | | | | √ | | | √ | | | √ | √ |
| Fredholm theorem | | | √ | | | | | | | √ | | | √ | |
| Singular integral equations 1 | | √ | | | | | √ | | | √ | | | √ | |
| Singular integral equations 2 | | √ | | | | | √ | | | √ | | | √ | |
| Abel and Hilbert integral equations 1 | | √ | | | | | √ | | | √ | | | √ | |
| Abel and Hilbert integral equations 2 | | √ | | | | | √ | | | √ | | | √ | |
| Integral equations with double integration 1 | | | √ | | | | | | √ | | | | | √ |
| Integral equations with double integration 2 | | | √ | | | | | | √ | | | | | √ |
| Multi step procedure | | | | √ | | | | | | | √ | | | √ |
| Stability of numerical methods. | | | | √ | | | | | | | √ | | | √ |

**Assessment Methods**

| Learning Method | Course outcomes ILOs | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | Intellectual Skills | | | Professional and Practical Skills | | | | General and Transferable Skills | | |
| | A1 | A2 | A3 | A4 | B1 | B2 | B3 | C1 | C2 | C3 | C4 | D1 | D1 | D3 |
| **Lecture** | √ | | √ | | √ | | | √ | | | | | | |
| **Discussion** | | √ | √ | | √ | | √ | √ | √ | | √ | | √ | √ |
| **Computer** | | | | | | | | √ | v | √ | √ | √ | | √ |

| Learning Method | Course outcomes ILOs | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | Intellectual Skills | | | Professional and Practical Skills | | | | General and Transferable Skills | | |
| | A1 | A2 | A3 | A4 | B1 | B2 | B3 | C1 | C2 | C3 | C4 | D1 | D1 | D3 |
| modelling | | | | | | | | | | | | | | |
| Report | √ | | | √ | | √ | | √ | √ | √ | √ | | | √ |
| Web searching | √ | √ | | | | | | | | | | √ | √ | |

**Learning and Teaching Methods**

| Assessment Methods | Course outcomes ILOs | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | Intellectual Skills | | | Professional and Practical Skills | | | | General and Transferable Skills | | | |
| | A1 | A2 | A3 | A4 | B1 | B2 | B3 | C1 | C2 | C3 | C4 | D1 | D2 | D3 | D4 |
| Written Examination | √ | | √ | √ | | √ | √ | √ | | √ | | √ | √ | √ | |

| | Course Coordinator | Head of Department |
|---|---|---|
| **Name** | **Prof. Ahmed R. El-Namory** | Prof. Kadry Zakaria |
| **Name (Arabic)** | أ. د. احمد رضا النمورى | ا.د.قدرى زكريا |
| **Signature** | ……………………………. | ……………………………. |
| **Date** | **/9/2014** | **/9/2014** |

| Course Title | Partial Differential Equations | |
|---|---|---|
| Course Code | 1111 | |
| Academic Year | 2014/2015 | |
| Coordinator | Entesar Elkholy | |
| Other Staff | | |
| Level | Post-Grad. | |
| Semester | Semesters One and Two | |
| Pre-Requisite | B.Sc. Mathematics | |
| Course Delivery | Lecture | 28 x 2h Lectures |
| Parent Department | Mathematics Department | |
| Date of Approval | September, 2014 | |

**1. Aims**

This course aims to:
1- -Solving systems of first order PDEs equations.
2- Use different integral transform methods for solving linear and linear PDEs.
3- Take finite transform methods to solve homogenous and non homogenous PDEs
4- Using multiple transform methods in solving initial and boundary value problems in higher dimensions.

**2- Intended Learning Outcomes**

By the end this course, students will be able to:

**A- Knowledge and Understanding**

A1- Recognize between different concepts of PDEs .
A2- Explain the more advanced concepts which lie behind the basic mathematics objects and ideas.
A3- Knows and explains the advanced mathematical problems related by PDEs

**B- Intellectual Skills**

B1- Show logical thinking in problem solving of nonlinear PDEs.
B2- Compare the underlying assumptions and issues in complex problems.
B3- Analyze the knowledge of some methods to solve real problems

**C. Professional and practical skills:**

C1- Provide accurate solutions to different mathematical problems.
C2- Diagnose and describe the various branches of mathematics and the relationship between them.
C3- Apply rules and techniques of mathematics to model and solve real world problem.

**D. General and transferable skills:**

D1- Conveys the meaning of basic partial differential equations concepts and techniques to others.
D2- Demonstrate ability to work in groups.
D3- Communicates with others written and oral.
D4- Be appropriate the ethics of scientific research.

## 3. Contents

| | |
|---|---|
| **Weak 1** | Review of previous studies. |
| **Weak 2** | First order PDE (method of characteristics). |
| **Weak 3** | Nonlinear first order PDEs. |
| **Weak 4** | Systems of PDEs (using the eigenvalues and eigenvectors of the matrix of coefficients). |
| **Weak 5** | Solution of boundary value problems using Laplace transform |
| **Weak 6** | Using Laplace transform to solve nonhomogeneous equations. |
| **Weak 7** | Exercises |
| **Weak 8** | Some common Fourier transforms. |
| **Weak 9** | Fourier transformation of partial derivatives and convolution property. |
| **Weak 10-11** | Solution of initial value problems by using Fourier transforms (Cauchy problem, Dirichlet's problem and Neumann's problem). |
| **Weak 12** | Multiple Fourier transform and initial boundary problems. |
| **Weak 13** | Green's function |
| **Weak 14** | Green's function for the one and two dimensional nonhomogeneous diffusion equation. |
| **Weak 15** | Exercises |
| **Weak 16** | Error function and its use in solving boundary value problems. |
| **Weak 17** | Fourier integrals. |
| **Weak 18** | Cosine and sine integrals. |
| **Weak 19** | Applications of Fourier integrals to boundary value problems. |
| **Weak20,21** | Fourier cosine and sine transforms |
| **Weak22** | Exercises |
| **Weak23** | Finite sine and cosine transform. |
| **Weak24** | Finite sine and cosine transforms of derivatives. |
| **Weak25** | Using Finite sine and cosine transforms to solve non homogeneous PDE |
| **Weak 26-27** | Superposition( the backbone of linear systems). |
| **Weak 28** | Exercises |

## 4. Teaching and Learning Methods

- **Lectures**
- **Computer modeling**
- **Discussions**
- **Term paper and reports**
- **Web searching**
- **Assignments**

**5. Student Assessment**

| Assessment Method | Skills assessed* | Assessment Length | Schedule | Proportion |
|---|---|---|---|---|
| Written Examination | KU, I,P,T | 3 Hour Examination | | 100% |

*KU: Knowledge and Understanding, I: Intellectual, P: Professional, T: Transferable

**6. List of references**

*Essential Books*

-Dennis G.Zill), Differential equations with boundary value problem ,PWS-KENT pub. Comp. Boston,1989.
- Lokenath Debnath, Non-linear partial differential equations for scientists and engineers, Library of Congress Cataloging –in-Publication Data,U.S.A,1997.
- G.Stephenson, An introduction to partial differential equations for science students , 2nd edition , logman Inc. New work, 1968.

*Recommended Books:*

- *Ian N.sneddon , Elements of partial differential equations , Mc Graw-Hill book company , London , 1975 .*
- *Earl D.Rainvile & Phillip E.Bedient , Elements of differential equations , Macmillon Pub.Co. Inc . New York , 1981 .*

*Periodicals, Web sites:*

- www.eulc.edu.eg

**7. Facilities required for teaching and learning**

- Projectors: Video and Overhead.
- Software package

**Course contents – Course ILOs Matrix**

| Course Contents | Course outcomes ILOs | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | Intellectual | | | Practical | | | Transferable | | | |
| | A 1 | A 2 | A 3 | B 1 | B 2 | B 3 | C1 | C2 | C3 | D 1 | D 2 | D 3 | D 4 |
| Nonlinear first order PDEs | √ | √ | | √ | | | | | | | | | |
| Systems of first order PDEs (using the eigen values and eigenvectors of the matrix of coefficients). | √ | | √ | | √ | | | √ | √ | | | | |
| Solution of boundary value problems using Laplace transform | | √ | √ | | | √ | √ | | | √ | | | |
| Using Laplace transform to solve non homogeneous equations. | | | √ | √ | | √ | | √ | √ | | | | |
| Some common Fourier transforms | √ | | | √ | √ | | √ | | | | | √ | √ |
| Solution of initial value problems by using Fourier transforms (Cauchy problem, Dirichlet's problem and Neumann's problem). | | √ | √ | | | √ | √ | | √ | | | | |
| Multiple Fourier transform and initial boundary problems in higher dimensions and Green function | | | √ | | √ | | √ | √ | √ | √ | | | |
| Error function and its use in solving boundary value problems. | | | √ | √ | | √ | √ | | | | | √ | √ |
| Fourier integrals and its application to boundary value problems. | | √ | √ | | | √ | √ | √ | √ | √ | | | |
| Cosine and sine integrals | √ | | √ | √ | | | √ | | √ | | | | |
| Fourier cosine and sine transforms | | | √ | | √ | | | √ | √ | √ | | | |
| Finite sine and cosine transforms. | | √ | | √ | | √ | | √ | √ | √ | | √ | √ |
| Using finite sine and cosine transforms to solve nonhomogeneous PDE. | | | √ | | √ | | √ | | | | | √ | √ |
| Superposition (the backbone of linear systems). | | | √ | | √ | √ | √ | √ | √ | √ | | √ | √ |
| Exercises | | | | | | | | | | √ | √ | √ | √ |

## Learning and Teaching Methods

| Learning Method | Course outcomes ILOs | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | Intellectual Skills | | | Professional and Practical Skills | | | General and Transferable Skills | | | |
| | A1 | A2 | A3 | B1 | B2 | B3 | C1 | C2 | C3 | D1 | D1 | D3 | D4 |
| **Lecture** | √ | | √ | √ | | | √ | | | | | | |
| **Discussion** | | √ | √ | √ | | √ | √ | √ | | | √ | √ | √ |
| **Computer modelling** | | | | | | | √ | v | √ | √ | | √ | √ |
| **Report** | √ | | | | √ | | √ | √ | √ | | | √ | √ |
| **Web searching** | √ | √ | | | | | | | | √ | √ | | |

## Assessment Methods

| Assessment Methods | Course outcomes ILOs | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | Intellectual Skills | | | Professional and Practical Skills | | | General and Transferable Skills | | | |
| | A1 | A2 | A3 | B1 | B2 | B3 | C1 | C2 | C3 | D1 | D2 | D3 | D4 |
| Written Examination | √ | | √ | | √ | √ | √ | | √ | √ | √ | √ | |

| | Course Coordinator | Head of Department |
|---|---|---|
| Name | Prof.Dr. Entesar Elkholy | Prof. Kadry Zakaria |
| Name (Arabic) | أ. د.انتصار الخولي | ا.د. قدرى زكريا |
| Signature | ……………………………… | ………………………….. |
| Date | /9/2014 | /9/2014 |

| | | |
|---|---|---|
| **Course Title** | **Functional analysis** | |
| **Course Code** | **1112** | |
| **Academic Year** | **2014/2015** | |
| **Coordinator** | **Dr. Saied Abo El-ela** | |
| **Other Staff** | | |
| **Level** | **Graduate-M. Sc.** | |
| **Semester** | **Semesters One and Two** | |
| **Pre-Requisite** | **B.Sc. Mathematics** | |
| **Course Delivery** | **Lecture** | **28 x 2h Lectures** |
| | | |
| **Parent Department** | **Mathematics Department** | |
| **Date of Approval** | **September, 2014** | |

**1- Aims**

- Provide the student with fixed point theory and its applications in different branch of mathematics.
- Know and understand the concepts of normed space, Banach space, and Hilbert space, spectral theory of linear and nonlinear operators on Hilbert spaces.
- Be familiar with unbounded linear operators on Hilbert spaces.
- Develop the student skills to solve the problems and build a new mathematical knowledge in analysis

2- Intended Learning Outcomes

By the end this course, students will be able to

**A- Knowledge and Understanding**

A1- Define the difference between all spaces and operators.

A2- explains the more advanced concepts which lie behind the basic mathematical objects and ideas.

A3- analyze the key theoretical concepts in functional analysis such as, the Hahn Banach theorem and the result of spectral theory

**B- Intellectual Skills**

B1- show logical thinking in problems solving.

B2. compare the underlying assumptions and issues in advanced problems.

B3-analyze knowledge of, spectral theory to use it in solving some problems in approximation theory.

**C- Professional Skills**

C1- provides accurate solutions. To different mathematical problems.

C2- diagnoses and describes the various branches of mathematics and the relationship between them.

**D- General Skills**

D1- demonstrate ability to work in groups

D2- communicates with others written and oral.

D3- be appropriate the topics of scientific research.

**3- Course Content**

| | |
|---|---|
| **Lecture 1** | **Introduction** |
| **Lecture 2** | **Hilbert spaces** |
| **Lecture ٣** | **Completion of Metric.Space** |
| **Lecture ٤** | **Compactness** |
| **Lecture ٥** | **Complete orthonormal spaces** |
| **Lecture ٦** | **Han Banach theorem** |
| **Lecture ٧** | **Linear transform, convergence** |
| **Lecture ٨** | **Uniform boundedness** |
| **Lecture 9,10** | **spectrum-resolving set of operators** |
| **Lecture11** | **Spectral theory for bounded operators** |
| **Lecture 12** | **Spectral thepry for unbounded operators** |
| **Lectures13-15** | **Self adjoint operators** |

**Lectures 16** **Sturm Liovelle operators**
**Lecture 17** **Applications**
**Lecture 18** **Assessment**

**4. Teaching and Learning Methods**

- Lectures
- Computer modeling
- Discussions
- Term paper and reports
- Web searching
- Assignments

**5. Student Assessment**

| Assessment Method | Skills assessed* | Assessment Length | Schedule | Proportion |
|---|---|---|---|---|
| **Written Examination** | **KU, I,P,T** | **3 Hour Examination** | | **100%** |

***KU: Knowledge and Understanding, I: Intellectual, P: Professional, T: Transferable**

**6. List of references**

Essential Books:-

**M.Rudin ,Functional analysis , Springer 2007.**

Recommended Books:-

**Dynkin, E.B. ( 2006) ,Theory of functions of real variables , Cambridge univ.**

***Periodicals, Web sites:***

**- www.eulc.edu.eg**

**7. Facilities required for teaching and learning**

- Projectors: Video and Overhead.
- Software package

**Course contents – Course ILOs Matrix**

| Course Contents | Course outcomes ILOs | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | Intellectual | | | Practical | | Transferable | | |
| | A1 | A2 | A3 | B1 | B2 | B3 | C1 | C2 | D1 | D2 | D3 |
| Hilbert spaces | √ | | | | | | | | | | |
| Compactness and Compact metric spaces | √ | √ | | | | | | | | | |
| Completion of metric spaces | √ | | √ | | | | | | | | |
| Compactness | √ | | | | | | | | | | |
| Complete orthonormal spaces | | | | √ | | | | | | | |
| Han Banach theorem | √ | | √ | | | | | | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Linear transform, convergence | √ | √ | | | | √ | | √ | | | |
| Uniform boundedness | √ | | | | | | | | | | |
| Spectrum – resolving set of operators | √ | √ | | | | √ | | √ | | | |
| Spectral theory for and linear operators | √ | √ | | | √ | | | √ | | | |
| Self adjoint operators | √ | √ | | | | | √ | | | | |
| Sturm Liovelle operators | √ | | | | | | | | | | |
| Applications | | | | | | | | | √ | √ | √ |

**Learning and Teaching Methods**

| Learning Method | Course outcomes ILOs | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | Intellectual Skills | | | Professional and Practical Skills | | General and Transferable Skills | | |
| | A1 | A2 | A3 | B1 | B2 | B3 | C1 | C2 | D1 | D1 | D3 |
| **Lecture** | √ | | √ | √ | | | √ | | | | |
| **Discussion** | | √ | √ | √ | | √ | √ | √ | | √ | √ |
| **Computer modelling** | | | | | | | √ | v | √ | | √ |
| **Report** | √ | | | | √ | | √ | √ | | | √ |
| **Web searching** | √ | √ | | | | | | | √ | √ | |

**Assessment Methods**

| Assessment Methods | Course outcomes ILOs | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | Intellectual Skills | | | Professional and Practical Skills | | General and Transferable Skills | | |
| | A1 | A2 | A3 | B1 | B2 | B3 | C1 | C2 | D1 | D2 | D3 |
| Written Examination | √ | | √ | | √ | √ | √ | | √ | √ | √ |

| | Course Coordinator | Head of Department |
|---|---|---|
| Name | Dr. Saied Abo El-ela | Prof. Kadry Zakaria |
| Name (Arabic) | أ. د. سعيد أبو العلا | ا.د.قدرى زكريا |
| Signature | ………………………………….. | ………………………….. |
| Date | /9/2014 | /9/2014 |

| | | |
|---|---|---|
| Course Title | **Algebra (1)** | |
| Course Code | **1114** | |
| Academic Year | **2014/2015** | |
| Coordinator | **Prof. Sanaa M. El-Assar** | |
| Other Staff | | |
| Level | **Post-Grad.** | |
| Semester | **Semesters One and Two** | |
| Pre-Requisite | **B.Sc. Mathematics** | |
| Course Delivery | **Lecture** | **28 x 2h Lectures** |
| Parent Department | **Mathematics Department** | |
| Date of Approval | **September, 2014** | |

## 1. Aims

The study of this course will enable student to:

1- Realize the importance of rings and modules as central objects in algebra and to study some of their applications.

2- Familiarize students with the concept of a module as a generalization of a vector space and an Abelian group.

3- study modules over a ring R which provides students with an insight into the structure of a ring, and leading them to the fundamental theorems, applicable in other fields.

4- Study some ordered structures as lattices, Boolean algebras and extended knowledge from lattices to a class of modules

## 2. Intended Learning outcomes

### *A. Knowledge and understanding:*

Upon successful completion of this course the students should be able to:

A1. Understand the importance of rings and modules as fundamental objects in algebra.

A2. Extending as many as possible desirable properties of vector spaces to the realm of modules over a well – behaved rings, knowing that modules are more complicated than vector spaces.

A3. be familiar with the main theorems and be acquainted with some applications in Theory of numbers and Geometry.

### *B. Intellectual skills:*

They will also acquire the ability to:

B1. Demonstrate the ability to understand the concepts of some algebraic structures and their applications in different areas.

B2. Have acquire skills needed to give a mathematical model of some problems.

B3. Transfer appropriate knowledge and methods from one topic within the subject to another

### *C. Professional and practical skills:*

Students will be able to:

C1. Develop a professional attitude and approach to the solution of technical problems.

C2. Develop and gain techniques of proofs by logical methods.

C3. Develop skills related to creative thinking and problem solving.

### *D. General and transferable skills:*

D1. work effectively in team.

D2. gain the principles of logical proofs.

D3. develop skills related to creative thinking, problem solving, oral and written communication.

D4. Transfer appropriate knowledge and methods from one topic within the subject to another.

### 3. Contents

| | |
|---|---|
| Lectures 1, 2 | Commutative rings – Ideals in commutative rings. |
| Lectures 3, 4 | Modules, sub-modules, factor modules and congruencies. |
| Lectures 5, 6, 7 | Homomorphisms of modules and main isomorphism theorems. |
| Lectures 8, 9 | Groups of homomorphisms |
| Lectures 10, 11 | Direct products and sums |
| Lectures 12-14 | Free projective and injective modules |
| Lectures 15, 16, 17 | Artinian and Northerian modules |
| Lectures 18, 19 | Noetherian rings and Hilbert's Basis Theorem |
| Lectures 20, 21 | Artinian rings and basic theorems<br>Assessment |
| Lectures 22, 23 | Ordered sets – Lattices – Ordered structures |
| Lectures 24-26 | Distributive and modular lattices |
| Week 27 | Boolean lattices |
| Week 28 | Lattice of sub-modules |
| Week 29 | Assessment |

### 4. Teaching and Learning Methods

- Lectures
- Discussions
- Term paper and reports
- Web searching

### 5. Student Assessment

| Assessment Method | Skills assessed* | Assessment Length | Schedule | Proportion |
|---|---|---|---|---|
| Written Examination | KU, I,,P,T | 3 Hour Examination | | 100% |

*KU: Knowledge and Understanding, I: Intellectual, P: Professional, T: Transferable

### 6. List of references

*Recommended text Books:*

1. Elementary Rings and Modules; by I. T. Adamson, 1972.
2. Rings and Categories of Modules; by Anderson & Fuller, 1974.
3. Introduction to lattices and order; by Davey & Pristley, 2002.

*Recommended Books:*

1. The Theory of Rings by N.H. McCoy, 1969.
2. Abstract Algebra: The Basic Graduate Year by R.B. Ash (available on the net).
3. Algebra; by Hungerford, 1973.

*Periodicals, Web sites:*

- Module (mathematics), Wikipedia

### 7. Facilities required for teaching and learning

- Library services and data show.
- Recently published books
- Software packages
- Internet web connection

**Course Code / Course Title: Discrete Math**

| Course Contents | Course outcomes ILOs | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | Intellectual | | | Practical | | | Transferable | | | |
| | A1 | A2 | A3 | B1 | B2 | B3 | C1 | C2 | C3 | D1 | D2 | D3 | D4 |
| Commutative rings- Ideal in commutative rings | √ | | | √ | | | | | √ | | √ | √ | |
| Modules, sub-modules, factor modules and congruencies | √ | | | √ | | | √ | | √ | | √ | √ | |
| Homomorphisms of modules and main isomorphism theorems | | √ | | | √ | | | √ | √ | √ | √ | √ | |
| Groups of homomorphisms | | √ | | √ | √ | √ | | | √ | √ | √ | √ | √ |
| Direct products and sums | | √ | | | √ | | √ | | | √ | √ | √ | √ |
| Free projective and injective modules | √ | | | √ | √ | | √ | | √ | | √ | √ | |
| Artinian and Northerian modules | √ | | √ | √ | | | | | √ | √ | √ | √ | √ |
| Noetherian rings and Hilbert's Basis Theorem | | √ | √ | | √ | √ | | √ | | √ | √ | √ | |
| Artinian rings and basic theorems assessment | | √ | √ | | √ | | √ | √ | | | √ | √ | |
| Ordered sets – Lattices – Ordered structures | √ | | | √ | | √ | √ | | | | √ | √ | |
| Distributive and modular lattices | √ | | | √ | | √ | √ | | | √ | √ | √ | √ |
| Boolean lattices | √ | | | √ | | √ | | | | | √ | √ | √ |
| Lattice of submodules | √ | | √ | | √ | √ | | √ | √ | √ | √ | √ | √ |

**Learning and Teaching Methods**

| Learning Method | Course outcomes ILOs | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | Intellectual Skills | | | Professional and Practical Skills | | | General and Transferable Skills | | | |
| | A1 | A2 | A3 | B1 | B2 | B3 | C1 | C2 | C3 | D1 | D1 | D3 | D4 |
| Lecture | √ | | √ | √ | | | √ | | | | | | |
| Discussion | | √ | √ | √ | | √ | √ | √ | √ | | √ | √ | √ |
| Computer modelling | | | | | | | √ | v | √ | √ | | √ | √ |
| Report | √ | | | | √ | | √ | √ | | | | √ | √ |
| Web searching | √ | √ | | | | | | | | √ | √ | | |

**Assessment Methods**

| Assessment Methods | Course outcomes ILOs | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | Intellectual Skills | | | Professional and Practical Skills | | | General and Transferable Skills | | | |
| | A1 | A2 | A3 | B1 | B2 | B3 | C1 | C2 | C3 | D1 | D2 | D3 | D4 |
| Written Examination | √ | | √ | | √ | √ | √ | | √ | √ | √ | √ | √ |

| | Course Coordinator | Head of Department |
|---|---|---|
| Name | Prof. Sanaa M. El-Assar | Prof. Kadry Zakaria |
| Name (Arabic) | أ. د. سناء العصار | ا.د.قدرى زكريا |
| Signature | …………………………………. | …………………………. |
| Date | /9/2014 | /9/2014 |

| Course Title | **Introduction to Computer Science** | |
|---|---|---|
| | | |
| Course Code | 1317 | |
| Academic Year | **2014/2015** | |
| Coordinator | **Prof. Mahmoud Kamel** | |
| Other Staff | **Prof. Mahamed El-Awady, Mohmed Ghoneim, Prof. Qadry Zakaria, Prof Saad Abo elenen** | |
| Semesters | **Two Semesters** | |
| Pre-Requisite | **B.Sc.** | |
| Course Delivery | **Lecture** | **1h/week** |
| | **Practical** | **1h/week** |
| Parent Department | **Computer Centre** | |
| Date of Approval | **September, 2014** | |

**1. Aims**

This course will enable students to acquire a range of transferable skills that are important for post graduate M. Sc. students to:

- Develop their capability for information retrieval and presentation, and proficiency in the use of IT effectively in the context of their studies.
- Underpin academic work throughout postgraduate studies.
- Provide opportunities to develop skills required for team working, oral presentation of scientific material, and career choices.

***A. Knowledge and understanding:***

Upon successful completion of this course the students should be able to:

A8. Demonstrate knowledge and understanding of the use of IT in the context of their postgraduate studies.

A9. Know the diverse media and hardware and software that help to benefit of the IT in the context of the postgraduate studies.

A10. Carry out necessary graphical, statistical and frequency analyses of different types of data.

A11. Create powerful presentation using sophisticated software packages.

A12. Make use of different internet resources.

A13. Solve scientific problems using computer programming.

A14. Make use of different photo enhancing and manipulation techniques.

***B. Intellectual skills:***

They should also acquire the ability to:

B2. Integrate different application programs to develop effective information analysis and presentation.

***C. Professional and practical skills:***

C1. Use a number of computer packages to present information.

***D. General and transferable skills:***

D2. Use the internet/electronic resources to obtain subject specific information, and to develop lifelong learning skills that can be applied to suitable research problems.

**3. Contents**

| | |
|---|---|
| Lectures 1-5 | **Assignment 1** : **information technology**<br>Types and generations of computers<br>Hardware and Software computer structure<br>Types and development of operating systems<br>Working with windows<br>File and folder manipulations |
| Lectures 6-12 | **Assignment2** : **Using PowerPoint program**<br>Working with PowerPoint program<br>Insert slides and animations<br>Different methods of slide editing<br>Insert tables ,charts, video, pictures, hyperlinks ,web pages and different objects<br>Design a real and powerful presentation with different acquired skills |
| Lecture 13-18 | **Assignment 3** : **Using Access program**<br>Working with Access program<br>Define data and information<br>Creating data base tables , sorting and filtering records and fields<br>Creating different types of queries to extract useful information<br>Creating forms for data entries and calculations<br>Creating and printing final reports |
| Lecture 19-23 | **Assignment 4: Using the Internet**<br>Define different types of protocols and network<br>Different levels of internet connections<br>Email and methods of file transfer<br>Use of internet capabilities and searching engines<br>Life search on the internet for some real information |
| Lecture 24-28 | **Assignment 5**: Programming using Visual Basic 6<br>Different types of computer languages<br>Concept of visual programming language<br>Working with visual basic language<br>Steps necessary for creating a project with visual basic<br>Solving real problems using a visual basic computer language |

**4. Teaching and Learning Methods**
- Lectures
- Practical classes
- Assignments

The course is delivered through lectures, practical sessions and assignments. Team working skills are developed on a week-long laboratory exercises and the students present and defend their findings in a public seminar.

**5. Student Assessment**

| **Assessment Method** | **Skills assessed*** | **Assessment Length** | **Schedule** | **Proportion** |
|---|---|---|---|---|
| Written Examination | KU, I | 1 Hour Examination | Term Final | 60% |
| Practical Examination | KU, I | 1 Hour Examination t | Term Final | 30% |
| Semester work | P, T | Continuous Assessment | | 10% |

*KU: Knowledge and Understanding, I: Intellectual, P: Professional, T: Transferable

**6. List of references**

*Course notes:*

- Notes given to students at each section describe the tasks to be completed, therefore no particular book(s) recommended.

**7. Facilities required for teaching and learning**

- Projectors; Video and Overhead
- LCD screens and writing Boards
- Commercial computer scientific software packages.

Course Contents – Course ILOs Matrix

**Course code: 1317 Chemistry, course title: Computer**

| Course Content | Course outcomes ILOs | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | | | | | | | Intellectual | | | | | Practical | | | | | | Transferable | |
| | A1 | A2 | A3 | A4 | A5 | A6 | A7 | A8 | A9 | A10 | B1 | B2 | B3 | B4 | B5 | C1 | C2 | C3 | C4 | C5 | D1 | D2 | D3 |
| Week #1-2 | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #3-4 | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #5-6 | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #7-8 | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #9-10 | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #11-12 | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #13-14 | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #14-15 | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #16-17 | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #18-19 | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #20-21 | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #22-23 | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #24-25 | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #26-27 | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #28 | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |

| | Course Coordinator | Head of Computer Center |
|---|---|---|
| Name | Prof. Mahmoud M. Kamel | **Prof. El-Sayed T. Rizk** |
| Name (Arabic) | أ.د.محمود مصطفى كامل | أ.د. السيد طه رزق |
| Signature | | |
| Date | 9/2014 | 9/2014 |

# M.Sc. Program of Statistics

## The Academic Reference Standards for Master Degree of statistics

### 1. Academic standards

The Academic Reference Standards of this program is based upon the General Academic Standards of postgraduate programs published by the National Authority of Quality Assurance and Accreditation of Education (ARS) in (2009).

Specific Academic Reference Standards for M. Sc. in Statistics were approved by the Council of Faculty of Science, Tanta University in 2012-2013 which are listed in the following:

### *1.1 The Attributes of M.Sc. Program in Mathematics.*

The graduate of master's program in mathematics should be able to:
1- Proficiency in applications of basics and methodologies of scientific research
2- Apply the analytical methods in the area of mathematics.
3 – Use mathematical knowledge combined with related knowledge in professional practice.
4- Show awareness of ongoing problems and visions in modern area of Statistics.
5- Identify mathematical problems and find their solutions.
6- Mastery of Statistics skills, and can use appropriate technological means to serve the professional practice.
7- Communicate effectively and the ability to lead teams.
8- Decision-making in different contexts.
9- Use available resources to achieve the highest benefit and its preservation.
10- Show awareness of his role in community development and preservation of the environment.
11- Behave in a manner reflecting the commitment to integrity and credibility of the profession and abide by the rules.
12- Develop his academic capabilities and continuous learning in Statistics.

**1. Knowledge and Understanding:**
By the end of the master's program graduate of applied mathematics the students should be able to:

1. Identify advanced theories, fundamentals, specialized knowledge and professional practice in mathematics.
2. Review all scientific principle and fundamentals in mathematics.
3. Demonstrate scientific developments in the area of mathematics.
4. Explain the specialized subject in the interested field.
5. Classify the interested subject into research points.

**2. Intellectual Skills:**

1. Analyze and evaluate the information in mathematics to solve problems.
2. Solve mathematical problems in case of non-availability of some data.
3. Link between different sciences to solve professional problems.
4. Conduct a research study and / or write a methodology of scientific study onto a research problem.
5. Plan to improve performance in the area of mathematics.

**3. Professional Skills:**

By the end of the study master's program graduate must be able to:

1. Plan, design, conduct and report on the investigated data, using appropriate techniques and considering scientific guidance.
2. Apply techniques and tools considering scientific ethics.
3. Solve problems using a range of formats and approaches.
4. Identify and criticize the different methods used for preparing, processing, interpreting and presenting data.
5. Write and evaluation of mathematical reports

4. ***General and Transition skills***

By the end of the study master's program graduate must be able to:

1. Recognize the basics and ethics of scientific research
2. Effective communication in its different forms.
3. Use of information technology to serve the development of mathematics.
4. Use different sources for information and knowledge in mathematics.
5. Work in a team, and leading teams in various professional contexts.
6. Self- and continuous learning in mathematics.

The M.Sc. Program Structure includes:

- Pre-master courses specified by the Mathematics Department
- Thesis in different branches of Mathematics.

**Thesis**

- The thesis of M.Sc. program is a formal written document representing sustained research into an important intellectual issue. The thesis must be an independent effort which contributes to the accumulated understanding of the field in which it is written. The required research preparation and advanced research methods courses will help the student to focus his or her research effort, and provide general guidelines for research approach and report preparation. Thesis will be reviewed and approved by the candidate's supervising professor and external academic review committee.
- The thesis should contain at least the following:
- Title page (title, name of student, university, faculty,? name of program, date, supervisors
- Table of contents
- Introduction, containing a definition of the thesis? statement, working method, the theoretical framework, and the aim.
- Literature review.
- Materials and methods.
- Results
- Discussion and conclusions
- References.
- Language of the thesis
- The thesis must be written in English language accompanied by a summary in Arabic.

**Formation of Examiners Committees**

- A committee is selected by Mathematics Department Council. The M.Sc. Degree is awarded to the applicant by University, upon the recommendation of the department and the Faculty Council.

**3- Program Admission Requirements:**

- An applicant for admission to the M.Sc. program in Statistics should hold an B.Sc. degree in Statistics with a minimum grade of (Good = 70%)

**4- The candidate should pass successfully:**

**Courses of pre-master academic year**

- Written Thesis
- Oral Presentation
- Defense at least one published paper.

Tanta University
Faculty of Science
Department of Mathematics
1969

**M.Sc. Program (Statistics)**

**Program Title** **Statistics**
**Department** **Mathematics**

## A. Program Specification

| | |
|---|---|
| Program Title | **Statistics (M.Sc.)** |
| Award | **M.Sc. Statistics** |
| Parent Department | **Mathematics Department** |
| Teaching Institution | **Faculty of Science – TU** |
| Awarding Institution | **Tanta University** |
| Coordinator | **Prof. Kadry Zakaria** |
| External Evaluator(s) | **Prof. Samia S. El Azab**<br>**Faculty of Science – Ein Shams University** |
| QAA Benchmarking Standards | **Academic Reference Standards (ARS)** |
| Other Reference Points | |
| Date of intake | **Every year in September** |
| Review Date | |
| Date of Approval | **September 2014** |

### 1. Aims

This Program provides graduate students with the skills and techniques needed for advanced research in mathematical Statistics with the help of computer science. You will understand how these can be applied to the formulation and solution of problems from scientific, technological, business, and other areas. We also encourage graduate to research more about these subjects and how to use in life.

The M.Sc. graduates of Statistics must have the ability to:

- Gain new knowledge and continually enhance information to improve the understanding and handling issues in one of the different branches of Statistics.
- Analysis the statistical structure problems and solutions techniques in many researching fields as:stochastic processes, queues, probability theory and distribution functions.
- Use and apply statistical knowledge combined with related topics in building a statistical model.
- Identify statistical problems and find their solutions.
- Show awareness of ongoing problems and visions in the modern area of statistics.
- Hold professional values that maintain individuality, positive thinking and self learning.
- Use modern technology effectively and develop his mathematical and statistical professional skills.
- Be a competent, creative, and critical.

| **2. Intended Learning outcomes (ILOs) of M.Sc. program in pure Mathematics.** |
|---|
| At the end of the Program, a successful student must be able to: |
| **A. Knowledge and understanding:** |

A1. Have specialized knowledge and understanding of selected statistical topics at an advanced level which take into account recent advances in the subject.
A2. Use acquired knowledge and skills to enable them to apply and adapt statistical methodology and modeling techniques to real- life problems in both observational and designed studies.
A3. Formulate and analyze problems/ hypotheses and interpret scientific evidence using appropriate statistical methodology.
A4. Use their knowledge and expertise for the development of a research inquiry and to select the tools necessary for executing the research; have the skills to pursue independent learning, analyze and interpret statistical data and present the results in a form that is appropriate.
A5. Have a critical awareness of research issues and methodology in statistics, combined with knowledge of the corresponding skills required to plan and manage a research project.
A6 Identify advanced concepts of stochastic processes and applied probability.

**B. Intellectual skills:**

B1. Develop mathematical statistics knowledge to solve applied problems
B2. Demonstrate a comprehensive understanding of statistical theory and methodology and be able to use it to formulate and analyze statistical problems.
B3. Integrate statistical theory and practice.
B4. Plan, execute and report on a piece of independent research, thus demonstrating both self- direction and independent learning.
B5. Convert statistical mathematics problems in symbolic form.

**C. Professional Skills:**

C1. Write reports and be able to communicate the results of statistical analyses to a wide audience, including non-statisticians.
C2. Present and interpret quantitative information.
C3. Organize, carry out and present a significant project.
C4. Write and present professional reports.
C5. Use statistical data to solve different applications.

**D. General Skills:**

D1. Work effectively as part of a team.
D2. Apply technology to enhance statistical mathematics thinking and understanding.
D3. Convey the meaning of statistical methods concepts to others
D4. Be appropriate the ethics of scientific research
D5. Demonstrate ability to lead a group.

**3. Academic Reference Standards (ARS):**

In order to fulfill National Academic Reference Standards, our students should acquire:

**1. Knowledge and Understanding:**

By the end of the master's program graduate of pure mathematics the students should be able to:

1. Identify advanced theories, fundamentals, specialized knowledge and professional practice in mathematical statistics.
2. Review all scientific principle and fundamentals of mathematical statistics.
3. Demonstrate scientific developments in the area of mathematical statistics.
4. Explain the specialized subject in the interested field.
5. Classify the interested subject into research points.

**2. Intellectual Skills:**

1. Analyze and evaluate the information in mathematical statistics to solve problems.
2. Solve mathematical problems in case of non-availability of some data.
3. Link between different sciences to solve professional problems.
4. Conduct a research study and / or write a methodology of scientific study onto a research problem.
5. Plan to improve performance in the area of mathematical statistics.

**3. Professional Skills:**

By the end of the study master's program graduate must be able to:

1. Plan, design, conduct and report on the investigated data, using appropriate techniques and considering scientific guidance.
2. Apply techniques and tools considering scientific ethics.
3. Solve problems using a range of formats and approaches.
4. Identify and criticize the different methods used for preparing, processing, interpreting and presenting data.
6. Write and evaluation of mathematical reports.

**4. *General and Transition skills***

By the end of the study master's program graduate must be able to:

1. Access the basics and ethics of scientific research.
2. Effective Access the basics and ethics of scientific research.
3. Use different sources of information and knowledge in mathematical statistics.
4. Work in a team, and leading teams in various professional contexts.
5. Self- and continuous learning in mathematical statistics.

**3. b. Comparison of provision to external references**

**4. Curriculum Structure and contents:**

4.a Programme duration **At most 5 years**

4.b Programme structure:

Number of contact hours per week

Lectures per week 12 Total 12

4. c Thesis

| Code | | Course Title | Hours/Week | | | Program ILOs Covered |
|---|---|---|---|---|---|---|
| | | | Lec. | Prac. | Exer. | |
| | | Markov Processes and their application | 2 | | | KU, I, P, T |
| | | Queuing Theory | 2 | | | KU, I, P, T |
| | | Probability Theory and its Applications | 2 | | | KU, I, P, T |
| | | Distributions Theory | 2 | | | KU, I, P, T |
| | | Introduction to computer science | 2 | | | KU, I, P, T |

**6. Program admission requirements**

Candidates must satisfy the general admission requirements of the University, Faculty and department and also hold a B. Sc. in physics with at least accumulative grade “Good”.

To be qualified to register as a candidate of a master degree in Physics, student must pass in all course units and achieve at least an overall of 70%.

**7. Evaluation of Program intended learning outcomes**

| Evaluator | Tool | Sample |
|---|---|---|
| 1. Senior students | applied | |
| 2. Alumni | Applied | |
| 3. Stakeholders (Employers) | | |
| 4. External Evaluator(s) (External Examiner(s)) | Applied | |

We certify that all of the information required to deliver this programme is contained in the above specification and will be implemented. All course specifications for this program are in place

**8.1. Matrix of ARS ILOs and Mathematics Program ILOs**

| ARS ILOs | Programme intended learning outcomes ILOs | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | | | Intellectual | | | | | Practical | | | | | Transferable | | | | | |
| | A 1 | A 2 | A 3 | A 4 | A 5 | A 6 | B 1 | B 2 | B 3 | B 4 | B 5 | C 1 | C 2 | C 3 | C 4 | C 5 | D 1 | D 2 | D 3 | D 4 | D 5 |
| **Knowledge and Understanding** | | | | | | | | | | | | | | | | | | | | | |
| **A1.** Identify advanced theories, fundamentals, specialized knowledge and professional practice in mathematics | √ | √ | | √ | | | | | | | | | | | | | | | | | |
| **A2.** Review all scientific principle and fundamentals of mathematics | √ | √ | √ | | √ | | | | | | | | | | | | | | | | |
| **A3.** Demonstrate scientific developments in the area of mathematics | | | √ | | √ | √ | | | | | | | | | | | | | | | |
| **A4.** Explain the specialized subject in the interested field | | | √ | | √ | | | | | | | | | | | | | | | | |
| **A5.** Classify the | √ | √ | | | √ | √ | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| interested subject into research points | | | | | | | | | | | | | | | | | | | | | |
| **Intellectual Skills** | | | | | | | | | | | | | | | | | | | | | |
| **B1.** Analyze and evaluate the information in mathematics to solve problems | | | | | | | √ | √ | | √ | | | | | | | | | | | |
| **B2.** Solve mathematical problems in case of non-availability of some data | | | | | | | √ | | √ | | √ | | | | | | | | | | |
| **B3.** Link between different sciences to solve professional problems | | | | | | | √ | √ | √ | | | | | | | | | | | | |
| **B4.** Conduct a research study and / or write a methodology of scientific study onto a research problem | | | | | | | | √ | √ | | √ | | | | | | | | | | |
| **B5.** Plan to improve performance in the area of mathematics | | | | | | | | √ | | √ | √ | | | | | | | | | | |
| **Professional Skills** | | | | | | | | | | | | | | | | | | | | | |
| **C1.** Plan, design, | | | | | | | | | | | | √ | √ | | √ | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| conduct and report on the investigated data, using appropriate techniques and considering scientific guidance | | | | | | | | | | | | | | | | | | | | | |
| **C2.** Apply techniques and tools considering scientific ethics | | | | | | | | | | | | √ | √ | | √ | | | | | | |
| **C3.** Solve problems using a range of formats and approaches | | | | | | | | | | | | √ | √ | | | | | | | | |
| **C4.** Identify and criticize the different methods used for preparing, processing, interpreting and presenting data | | | | | | | | | | | √ | | | √ | √ | | | | | | |
| **C5.** Write and evaluation of mathematical reports | | | | | | | | | | | | √ | √ | √ | | | | | | | |
| **General Skills** | | | | | | | | | | | | | | | | | | | | | |
| **D1**. Access the basics and ethics of scientific | | | | | | | | | | | | | | | | | | | | √ | |

| | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| research | | | | | | | | | | | | | | | | | | | | | |
| **D2**. Effective communication in its different forms. | | | | | | | | | | | | | | | | | √ | √ | | | √ |
| **D3.** Use different sources of information and knowledge in mathematics. | | | | | | | | | | | | | | | | | | √ | √ | | |
| **D4.** Work in a team, and leading teams in various professional contexts. | | | | | | | | | | | | | | | | | √ | | | | √ |
| **D5.** Self- and continuous learning in mathematics. | | | | | | | | | | | | | | | | | √ | √ | √ | | |

## Course Programme – ILOs. Matrix

| Course code / Title | Course outcomes ILOs | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | | | Intellectual | | | | | Practical | | | | | Transferable | | | | |
| | A 1 | A2 | A 3 | A 4 | A 5 | A 6 | B 1 | B 2 | B 3 | B 4 | B 5 | C1 | C 2 | C 3 | C 4 | C 5 | D 1 | D 2 | D 3 | D 4 | D 5 |
| Markov Processes and their application | √ | √ | | √ | | √ | √ | | √ | | √ | √ | √ | √ | | √ | √ | √ | | √ | √ |
| Queuing Theory | √ | | √ | √ | √ | √ | √ | | | √ | √ | √ | √ | | √ | √ | | √ | √ | | √ |
| Probability Theory and its Applications | **c** | √ | | √ | √ | | √ | √ | | √ | √ | √ | | √ | | √ | √ | | √ | | √ |
| Distributions Theory | √ | √ | √ | | √ | √ | √ | | √ | √ | √ | √ | | √ | √ | | √ | √ | | √ | √ |
| Computer Science | | √ | | √ | √ | | | | √ | | √ | | √ | | | √ | | √ | | | |
| Thesis | √ | √ | √ | | √ | √ | √ | | √ | √ | √ | √ | | √ | √ | √ | | √ | | | |

We certify that all of the information required to deliver this Program is contained in the above specification and will be implemented. All course specifications for this Program are in place.

| Name | Signature | Date |
|---|---|---|
| *Head of Department:*<br>Prof. Kadrey Zakaria<br>أ.د. قدري زكريا | | 9/2014 |
| *Head of Quality Assurance Unit:*<br>Prof. Hoda kamal El-Sayed<br>أ.د. هدى كمال السيد | | 9/2014 |
| *Dean of the Faculty:*<br>Prof. Tarek Fayed<br>أ.د. طارق فايد | | 9/2014 |

| | | |
|---|---|---|
| **Course Title** | **Probability theory and its Applications** | |
| **Course Code** | **1132** | |
| **Academic Year** | **2014/2015** | |
| **Coordinator** | **Prof.Dr. Hala. A. Fergany** | |
| **Semester** | **Semesters One and Two** | |
| **Level** | **Post-Grad.** | |
| **Other staff** | **-** | |
| **Pre-Requisite** | **B. Sc. Mathematics** | |
| **Course delivery** | **Lecture** | **14 x 2h** |
| **Parent Department** | **Mathematics Department** | |
| **Date of Approval** | **September, 2014** | |

**1. Aims**

This course gives an opportunity to:

1- Studying the probabilities formulas

2- Applying knowledge of probability functions

3- Analyzing and interpreting the distributions functions

4-Knowing the kinds of sampling.

**2. <u>Intended Learning outcomes</u>**

***A. Knowledge and understanding:***

By the end of the programmed successful students who have attended regularly and completed required work will be able to:

A1. Define random experiment and probability measures.

A2. Explain the conditional probability, the Bayes theorem and random variables.

A3. Define the generating functions and sampling space.

A4. Understand the mean of linear regression and correlation.

***B. Intellectual skills***:

By the end of the programmed successful students who have attended regularly and completed required work will

B1. Apply the conditional probability and Bayes theorem.

B2. Design the characteristic functions of the random variables.

B3. Apply the multi regression and Categorized data.

**C. Professional and practical skills**

At the end of the practical sessions, the student who have attended regularly and completed required work will be able:

C1. Drive the distribution of the sample mean.

C2. Deduce the linear regression and correlation.

C3. Solve the goodness of fit for the different distribution.

**D. transferable skills**

By the end of the programmed successful students who have attended regularly and completed required work will be able to:

D1. Use the SPSS program to identify the testing of hypothesis and ratio test.

D2. Use the testing of hypothesis for goodness of fit.

**3. Content**

| | |
|---|---|
| Lecture 1 | Random experiments - probability function |
| Lecture 2 | Class of events and Probability measure. Laws of total and compound probability |
| Lecture 3 | Conditional probability -Bayes theorem – Independence |
| Lecture 4 | Random variables - discrete and continuous |
| Lecture 5 | Characteristic function ,moment and probability generating functions |
| Lecture 6 | Classical definitions of Sample space |
| Lecture 7 | Distribution of sample mean |

| | |
|---|---|
| Lecture 8 | Operating characteristic function and expected sample size |
| Lecture 9 | Testing of hypothesis |
| Lecture10 | Sequential probability ratio test |
| Lecture11 | Simple linear Regression and correlation |
| Lecture12 | Multi-regression – Categorized data |
| Lecture13-14 | Goodness of fit – Some non – parametric tests |

## 4. Teaching and Learning Methods

- Lectures
- Computer modeling
- Discussions
- Reports
- Web searching
- Assignments

## 5. Student Assessment

| Assessment Method | Skills assessed* | Assessment Length | Schedule | Proportion |
|---|---|---|---|---|
| Written Examination | KU, I,P,T | 3 Hour Examination | Term Final | 100% |

*KU: Knowledge and Understanding, I: Intellectual, P: Professional, T: Transferable

## 6. List of references

-E. Freund and Ronald E. Walpole, Mathematical Statistics Prentice - Hall John, ,
-Sheldon M. Introduction to probability Mode, Ross Academic Press, Inc.
-Richard J. Larsen and Morris L. Marx (1986): An Introduction to Mathematical Statistics and Its Applications. Prentice- Hall.
-Krishna B. Athreya &Soumendra N. Lahiri ,(2006) "Measure Theory and Probability Theory" Springer.

## 7. Facilities required for teaching and learning

Data show, laptop

**8- Course contents – Course ILOs Matrix Course Code / Course Title: ST3132 Probability Theory and its applications**

| Course Contents | Course outcomes ILOs | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | Intellectual | | | Practical | | | Transferable | |
| | A1 | A2 | A3 | A4 | B1 | B2 | B3 | C1 | C2 | C3 | D1 | D2 |
| Random experiments- Probability function | √ | | | | | | | | | | | |
| Class of events and probability measures- law of total and compound probability | √ | | | | | | | | | | | |
| Conditional probability- Bayes theorem- independence | | √ | | | √ | | | | | | | |
| Random variables- discrete and continuous | | √ | | | | | | | | | | |
| Characteristic function, moment and probability generating functions | | | √ | | | √ | | | | | | |
| Classical definitions of sample space | | | √ | | | | | | | | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Distribution of sample mean | | | | | | | | √ | | | | |
| Operating characteristic function and expected sample size | | | | | | √ | | | | | | |
| Testing of hypothesis | | | | | | | | | | | √ | |
| Sequential probability ratio test | | | | | | | | | | | √ | |
| Simple linear regression and correlation | | | | √ | | | √ | | √ | | | |
| Multi regression- categorized data | | | | | | | √ | | | | | |
| Goodness of fit – some non-parametric tests | | | | | | | | | | √ | | √ |

## Learning and Teaching Method

| **Learning Method** | Course outcomes ILOs | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | Intellectual | | | Practical | | | Transferable | |
| | A1 | A2 | A3 | A4 | B1 | B2 | B3 | C1 | C2 | C3 | D1 | D2 |
| Lectures | √ | √ | √ | √ | √ | √ | √ | | | √ | | |
| Computer modeling | | | | | | | | √ | √ | | √ | √ |
| Discussions | | | √ | √ | | | √ | √ | | | | √ |
| Reports | | | | | | √ | √ | | √ | √ | | |
| Web searching | | | | | | √ | | √ | | | √ | √ |

## Assessment Methods

| **Assessment Methods** | Course outcomes ILOs | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | **Intellectual Skills** | | | **Professional and Practical Skills** | | | **General and Transferable Skills** | |
| | A1 | A2 | A3 | A4 | B1 | B2 | B3 | C1 | C2 | C3 | D1 | D2 |
| **Written Examination** | √ | √ | √ | √ | √ | √ | √ | | | | | |

| | **Course Coordinator** | **Head of Department** |
|---|---|---|
| **Name** | Prof. Hala A. Fergany | Prof. Dr. Kadry Zakria |
| **Name (Arabic)** | أ. د. هالة على فرجانى | أ.د. قدرى زكريا |
| **Signature** | …………………………. | ………………………….. |
| **Date** | /9/2014 | /9/2014 |

| Course Title | **Markov Processes and their application** | |
|---|---|---|
| | | |
| Course Code | 1134 | |
| Academic Year | 2014/2015 | |
| Coordinator | Dr. medht el demsessy | |
| Other Staff | | |
| Level | Graduate-M. Sc. | |
| Semester | Semesters One and Two | |
| Pre-Requisite | B.Sc. Mathematics | |
| Course Delivery | Lecture | 28 x 2h Lectures |
| | | |
| Parent Department | Mathematics Department | |
| Date of Approval | September, 2014 | |

## 1. Aims

This course gives an opportunity to:

5- extend course to solve stochastic processes,

6- understand the different method of Markov processes,

7- understand the theories concerning the Markov processes,

8- Apply knowledge and theories of Markov processes to the solution of applied problems.

## 2. Intended Learning outcomes

### *A. Knowledge and understanding:*

Upon successful completion of this course the students should be able to:

A1. Understand and construct mathematical proofs.

A2. Think by mathematical induction.

A3. Know and understand the different definitions of the methods.

A4. Learn how to application Markov processes.

### *B. Intellectual skills:*

They will also acquire the ability to:

B1. Demonstrate an understanding and appreciation for the relationship of statistics.

B2. Apply statistics (Markov processes) /computer science to solve problems.

B3. work in cooperative multi-disciplinary teams.

### *C. Professional and practical skills:*

Students will be able to:

C1. Interpreting written material in statistics (Markov processes) /computer.

C2. Identify, formulate and solve statistics (Markov processes) problems

### *D. General and transferable skills:*

D1. Write reports and give oral representation.

D2. Use PC packages to write, plot and present information.

D3. Find effective solution for problem involving complex information.

D4. Work independently in a team.

## 3. Contents

| | |
|---|---|
| Lecture 1 | Principles and definitions ; Basic concepts |
| Lecture 2 | Markov chain |
| Lecture 3 | P-matrix |
| Lecture 4 | Random variables |
| Lecture 5 | Stochastic process |
| Lecture 6 | Markov property |
| Lecture 7 | Wiener process |
| Lecture 8 | Random walk |
| Lecture 9 | Semi-Markov process |
| Lecture 10 | Laplace transform |
| Lecture 11 | Stationary process |
| Lecture 12 | Stationary distribution |
| Lecture 13 | Chapman-Kolmogorov |
| Lecture 14 | Diffusion process |
| Lecture 15 | Transition probabilities |
| Lecture 16 | Markov states of Stochastic process |
| Lecture 17 | Markov characteristic matrix |
| Lecture 18 | Adjoint matrix |
| Lectures 19,20 | Renewal process |
| Lectures 21,22 | Reliability and availability (1) |
| Lectures 23,24 | Reliability and availability (2) |
| Lectures 25,26 | Maintenance (1) |
| Lectures 27,28 | Maintenance (2) |
| Weeks 29, 30 | **Assessment** |

## 4. Teaching and Learning Methods

- Lectures
- Computer modeling
- Discussions
-Reports
- Web searching
- Assignments

## 5. Student Assessment

| Assessment Method | Skills assessed* | Assessment Length | Schedule | Proportion |
|---|---|---|---|---|
| Written Examination | KU, I.P,T | 3 Hour Examination | | 100% |

*KU: Knowledge and Understanding, I: Intellectual, P: Professional, T: Transferable

## 6. List of references

*Essential Books:*


- Masaaki Kijima (1997), Theory of Markov Processes for Stochastic Modeling, Published by CRC Press.
- Daniel W. Stroock (2005), An Introduction to Markov Processes .


*Recommended Books:*


- Dynkin, E.B. (2006), Theory of Markov processes, amazon.com.


*Periodicals, Web sites:*

- www.eulc.edu.eg

## 7. Facilities required for teaching and learning

- Projectors: Video and Overhead.

- Software package

## Course contents – Course ILOs Matrix Course Code / Course Title: ST3134 Markov Processes and their applications

| Course Contents | Course outcomes ILOs | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | Intellectual | | | Practical | | Transferable | | | |
| | A1 | A2 | A3 | A4 | B1 | B2 | B3 | C1 | C2 | D1 | D2 | D3 | D4 |
| Principles and definitions ; Basic concepts | √ | | √ | | | | | | | | | | |
| Markov chain | | | | √ | | | | | | | | | |
| P-matrix | | | | √ | | | | | | | | | |
| Random variables | √ | | | | | | | | | | | | |
| Stochastic process | √ | | | | | | | | | | | | |
| Markov property | | | | √ | | √ | | √ | √ | | | | |
| Wiener process | | | | | | | | √ | | | | | |
| Random walk | | | | | | √ | | | | | | | |
| Semi-Markov process | | | | | | | | | | √ | | | |
| Laplace transform | | | | | | | | | | √ | | | |
| Stationary process | | | | √ | | | √ | | √ | | | | |
| Chapman-Kolmogorov | | | | | | | √ | | | | | | |
| Diffusion process | | | | | | | | | | √ | √ | | |
| Transition probabilities | | | | √ | | | | | | | | | |
| Markov states of Stochastic process | | | | √ | | | | | | | | | |
| Markov characteristic matrix | | | | √ | | | | | | | | | |
| Adjoint matrix | | | | | | | | | | | | | √ |
| Renewal process | | | √ | | | | | | | | | | |
| Reliability and availability (1) | | √ | | | | | | | | | | | |
| Reliability and availability (2) | √ | | | | | | | | | | | | |
| Maintenance (1) | | | | | | | | | | | | | √ |
| Maintenance (2) | | | | | | | | | | | | √ | |
| **Assessment** | | | | | | | | | | | | | |

## Learning and Teaching Method

| **Learning Method** | Course outcomes ILOs | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | Intellectual | | | Practical | | Transferable | | | |
| | A1 | A2 | A3 | A4 | B1 | B2 | B3 | C1 | C2 | D1 | D2 | D3 | D4 |
| Lectures | √ | √ | √ | √ | √ | √ | √ | √ | √ | | | | |
| Computer modeling | | | | | | | | √ | √ | √ | | | |
| Discussions | | √ | | | √ | | √ | √ | | √ | | √ | |
| Reports | | | | | | | | | | | | | |
| Web searching | | | | | | | | | | | | | |

## Assessment Methods

| Assessment Methods | Course outcomes ILOs | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | Intellectual Skills | | | Professional and Practical Skills | | | General and Transferable Skills | |
| | A1 | A2 | A3 | A4 | B1 | B2 | B3 | C1 | C2 | C3 | D1 | D2 |
| **Written Examination** | √ | √ | √ | √ | √ | √ | √ | | | | | |

| | **Course Coordinator** | **Head of Department** |
|---|---|---|
| Name | Prof. Medht el demsessy | Prof. Dr. Kadry Zakria |
| Name (Arabic) | د. مدحت الدمسيسي | ا.د. قدرى زكريا |
| Signature | ..................................... | ............................... |
| Date | /9/2014 | /9/2014 |

| | | |
|---|---|---|
| **Course Title** | **Queuing Theory** | |
| | | |
| **Course Code** | **1133** | |
| **Academic Year** | **2014/2015** | |
| **Coordinator** | **Dr. Mohamed abd el hady** | |
| **Other Staff** | | |
| **Level** | **Graduate-M. Sc.** | |
| **Semester** | **Semesters One and Two** | |
| **Pre-Requisite** | **B.Sc. Mathematics** | |
| **Course Delivery** | **Lecture** | **28 x 2h Lectures** |
| | | |
| **Parent Department** | **Mathematics Department** | |
| **Date of Approval** | **September, 2014** | |

## 1. Aims

1- Identify and deal with the Markovian birth-death processes.

2- Deduce the steady states of the Markovian queues.

3- Derive, know and use of the measures of effectiveness.

4- Evaluate and explore the transient solution of different queues.

***A. Knowledge and understanding:***

Upon successful completion of this course the students should be able to:

A1. Review prerequisite mathematical knowledge for subsequent introductory probability courses.

A2. Recognize the concept of the queuing theory.

A3. Indicate the difference between different types of queues.

A4. Define the steady state and the transient solutions in the queueing theory.

***B. Intellectual skills:***

They will also acquire the ability to:

B1. demonstrate the structure of the birth-death process.

B2. apply the appropriate for different real problems.

B3. construct the systems equations for each queue.

***C. Professional and practical skills:***

Students will be able to:

C1. Able to use the queuing concept in the real life problems.

C2. use the mathematical steps for finding the transient solution.

***D. General and transferable skills:***

D1. Analyze the mathematical steps for finding the transient solution.

D2. Select and explore the appropriate queue to perform a range of advanced mathematical applications.

D3. Solving the transient solutions using the complex analysis.

## 3. Contents

| | |
|---|---|
| Lecture 1 | Discrete-Time Markov Chain |
| Lecture 2 | Continuous-Time Markov Chain |
| Lecture 3 | Birth and death process |
| Lecture 4 | Description of the queuing problem |
| Lecture 5 | Characteristics of the queuing problem |
| Lecture 6 | Special distributions |
| Lecture 7 | The M/M/1 Queue |
| Lecture 8 | Measures of effectiveness |
| Lecture 9 | Applications |
| Lecture 10 | The M/M/1/K Queue |
| Lecture 11 | Applications |
| Lecture 12 | The M/M/1/C Queue |
| Lecture 13 | Applications |
| Lecture 14 | The M/M/1/C/K Queue |
| Lecture 15 | Applications |
| Lecture 16 | The M/M/$\infty$ Queue |
| Lecture 17 | Applications |
| Lecture 18 | The M/M/1 with bulking |
| Lecture 19 | Applications |
| Lecture 20 | The M/M/1 with reneging |
| Lecture 21 | Applications |
| Lectures 22-24 | The M/M/1 with barriers |
| Lectures 25-28 | Complex analysis and Transient solution |
| Weeks 29,30 | **Assessment** |

## 4. Teaching and Learning Methods

- Lectures
- Computer modeling
- Discussions
- Reports
- Web searching
- Assignments

## 5. Student Assessment

| Assessment Method | Skills assessed* | Assessment Length | Schedule | Proportion |
|---|---|---|---|---|
| Written Examination | KU, I,P,T | 3 Hour Examination | | 100% |

*KU: Knowledge and Understanding, I: Intellectual, P: Professional, T: Transferable

## 6. List of references

*Essential Books:*

- Fundamentals of Queuing theory, By: Donald Gross, John F. shortle, James M. Thompson, Carl M. Harris.

*Recommended Books:*

- Basic elements of queuing theory, By: Philippe Nain.

*Periodicals, Web sites:*

- www.mqth.hawaii.edu/Latthy/
- Wikipedia.org/Lattice order
- Mathworld.wolfram.com/Lattice Theory

## 7. Facilities required for teaching and learning

- Projectors: Video and Overhead.
- Software package

**Course contents – Course ILOs Matrix Course Code / Course Title: ST3133 Queuing Theory**

| Course Contents | Course outcomes ILOs | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | Intellectual | | | Practical | | Transferable | | |
| | A1 | A2 | A3 | A4 | B1 | B2 | B3 | C1 | C2 | D1 | D2 | D3 |
| Discrete-Time Markov Chain | √ | | √ | | | √ | | √ | | | √ | |
| Continuous-Time Markov Chain | | √ | | | | | | | | √ | | √ |
| Birth and death process | √ | | | | | √ | | | | √ | | √ |
| Description of the queuing problem | √ | | √ | | | √ | | √ | | | √ | |
| Characteristics of the queuing problem | | √ | | √ | | | | | √ | | | √ |
| Special distributions | | | | √ | | √ | | | √ | | √ | √ |
| The M/M/1 Queue | | | | | | | | | √ | | | |
| Measures of effectiveness | √ | | | √ | | √ | | √ | | | | |
| Applications | | | | | √ | | √ | | | √ | | √ |
| The M/M/1/K Queue | √ | | | | | | √ | | | | | |
| Applications | | | | √ | | | | √ | √ | | | |
| The M/M/1/C Queue | | √ | | √ | | | | √ | | √ | | √ |
| Applications | | | | | | | | | | | | |
| The M/M/1/C/K Queue | | | | | | | | √ | | √ | | √ |
| Applications | | | | | √ | | √ | | √ | √ | | |
| The M/M/∞ Queue | √ | | √ | | | √ | | | | √ | | √ |
| Applications | | | | | | √ | | √ | | | | |
| The M/M/1 with bulking | √ | | √ | | √ | | | | √ | | √ | √ |
| Applications | | | | | | √ | | √ | | √ | √ | |
| The M/M/1 with reneging | | | √ | | √ | | √ | | | √ | | |
| Applications | | | | | | √ | | | | √ | | |
| The M/M/1 with barriers | √ | | √ | | √ | | | | | | | √ |
| Complex analysis and Transient solution | √ | | √ | | √ | | | √ | | √ | √ | |
| **Assessment** | | | | | | √ | | √ | | √ | √ | |

# Learning and Teaching Method

| **Learning Method** | Course outcomes ILOs | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | Intellectual | | | Practical | | Transferable | | |
| | A1 | A2 | A3 | A4 | B1 | B2 | B3 | C1 | C2 | D1 | D2 | D3 |
| Lectures | √ | √ | √ | √ | √ | √ | √ | √ | √ | | | |
| Computer modeling | | | | | | | | √ | | √ | | √ |
| Discussions | | √ | | √ | √ | | √ | | √ | √ | | |
| reports | | | | | | √ | | √ | | | | |
| Web searching | | | | | | | √ | √ | √ | | √ | √ |

## Assessment Methods

| Assessment Methods | Course outcomes ILOs | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | Intellectual Skills | | | Professional and Practical Skills | | | General and Transferable Skills | |
| | A1 | A2 | A3 | A4 | B1 | B2 | B3 | C1 | C2 | C3 | D1 | D2 |
| **Written Examination** | √ | √ | √ | √ | √ | √ | √ | | | | | |

| | **Course Coordinator** | **Head of Department** |
|---|---|---|
| Name | Dr. Mohamed abd el hady | Prof: Dr. Kadry Zakria |
| Name (Arabic) | د. محمد عبد الهادي قاسم | ا.د. قدرى زكريا |
| Signature | ……………………………. | ……………………………. |
| Date | /9/2014 | /9/2014 |

| | | |
|---|---|---|
| **Course Title** | **Distributions Theory** | |
| | | |
| **Course Code** | **1131** | |
| **Academic Year** | **2014/2015** | |
| **Coordinator** | **Dr. Abd elnaser Masood** | |
| **Other Staff** | | |
| **Level** | **Graduate-M. Sc.** | |
| **Semester** | **Semesters One and Two** | |
| **Pre-Requisite** | **B.Sc. Mathematics** | |
| **Course Delivery** | **Lecture** | **28 x 2h Lectures** |
| | | |
| **Parent Department** | **Mathematics Department** | |
| **Date of Approval** | **September, 2014** | |

## 1. Aims

This course gives an opportunity to:

1- Extend course to solve probability and statistics ,

2- Understand the different method of distribution theory,

3- Understand the theories concerning the discreet and continuous random variable or multivariate distribution,

4- Apply knowledge and theories of distribution theory to the solution of applied problems.

***A. Knowledge and understanding:***

Upon successful completion of this course the students should be able to:

A1. Understand and construct mathematical proofs.

A2. Think by mathematical induction.

A3. Understand the different definitions of the methods.

A4. Learn how to application Markov processes.

***B. Intellectual skills:***

They will also acquire the ability to:

B1. Demonstrate an understanding and appreciation for the relationship of statistics.

B2. Apply statistics (Markov processes) /computer science to solve problems in other fields.

B3. Work in cooperative multi-disciplinary teams.

***C. Professional and practical skills:***

C1. Interpret written material in statistics (Markov processes) /computer.

C2. Formulate and solve statistics (Markov processes) problems.

***D. General and transferable skills:***

D1. Extend course material to solve original problems.

D2. Write reports and give oral representation.

D3. Use PC packages to write, plot and present information.

## 3. Contents

| | |
|---|---|
| Lecture 1 | Introduction to probability and statistics. Discrete random variables and their probability distributions. |
| Lectures 2-3 | Continuous random variables and their probability distribution. Probability, Moment and cumulate Generating Functions. |
| Lectures 4-5 | Multivariate probability distributions. Functions of random variables. |
| Lecture 6 | Laws of Large Numbers. |
| Lecture 7 | Central Limit Theorem. |
| Lectures 8-9 | Mixture Distributions. |
| Lectures 10-11 | Truncated Distributions. |
| Lectures 12-13 | Distribution of Random Sum. |
| Lectures 14-15 | Distribution of Order Statistics. |
| Lectures 16-17 | Empirical Functional. Asymptotic Theory. |
| Lectures18-120 | Estimation and properties of estimators. |
| Lectures 21-24 | Hypotheses testing and properties of tests. |
| Lectures 25-28 | Linear Models and properties of the Least Squares Estimators. |
| Weeks 29,30 | **Assessment** |

## 4. Teaching and Learning Methods

- Lectures
- Computer modeling
- Discussions
- Reports
- Web searching
- Assignments

## 5. Student Assessment

| Assessment Method | Skills assessed* | Assessment Length | Schedule | Proportion |
|---|---|---|---|---|
| Written Examination | KU, I,P,T | 3 Hour Examination | | 100% |

*KU: Knowledge and Understanding, I: Intellectual, P: Professional, T: Transferable

## 6. List of references

*Essential Books:*


- Freund J. E. (1992), Mathematical Statistics, Fifth Edition,
- Pathak R. S. (2000), Course In Distribution Theory And Applications.

*Recommended Books:*

- Balakrishnan, N.(2006), Advanced in Distribution Theory, Order Statistics, and Inference .

*Periodicals, Web sites:*

- www.eulc.edu.eg


## 7. Facilities required for teaching and learning

- Projectors: Video and Overhead.
- Software packag

**Course contents – Course ILOs Matrix Course Code / Course Title: ST3131 Distributions Theory**

| Course Contents | Course outcomes ILOs | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | Intellectual | | | | Practical | | Transferable | | |
| | A1 | A2 | A3 | A4 | B1 | B2 | B3 | | C1 | C2 | D1 | D2 | D3 |
| Introduction to probability and statistics. Discrete random variables and their probability distributions. | √ | | √ | | | √ | | √ | √ | | √ | | √ |
| Continuous random variables and their probability distribution. Probability, Moment and cumulate Generating Functions. | | √ | | √ | | | √ | | √ | √ | | √ | |
| Multivariate probability distributions. Functions of random variables. | √ | | | √ | | √ | √ | | √ | √ | | √ | √ |
| Laws of Large Numbers. | √ | | √ | | | √ | | √ | √ | | √ | | √ |
| Central Limit Theorem. | | √ | | √ | | | | | √ | √ | | √ | |
| Mixture Distributions. | | | | √ | | √ | | | √ | | √ | √ | |
| Truncated Distributions. | | | | | | | | | √ | √ | | | |
| Distribution of Random Sum. | √ | | | √ | | √ | | √ | | | | | √ |
| Distribution of Order Statistics. | | | | | √ | | √ | | √ | √ | √ | √ | |
| Empirical Functional. Asymptotic Theory. | √ | | √ | | √ | √ | √ | | | | | | √ |
| Estimation and properties of estimators. | | | | √ | | √ | | √ | √ | | | | |
| Hypotheses testing and properties of tests. | √ | | √ | | √ | √ | √ | | | | | | |
| Linear Models and properties of the Least Squares Estimators. | | | | | √ | | √ | | √ | | √ | | |
| **Assessment** | | | | | | | √ | | √ | | √ | √ | √ |

## Learning and Teaching Method

| Learning Method | Course outcomes ILOs | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | Intellectual | | | Practical | | Transferable | | |
| | A1 | A2 | A3 | A 4 | B1 | B2 | B3 | C1 | C2 | D1 | D2 | D3 |
| Lectures | √ | √ | √ | √ | √ | √ | √ | √ | √ | | | |
| Computer modeling | | | | | | | | √ | √ | √ | √ | √ |
| Discussions | √ | | | √ | √ | | √ | √ | √ | √ | | |
| reports | | | | | | √ | | √ | | | | |
| Web searching | | | | | | √ | √ | √ | √ | √ | √ | √ |

## Assessment Methods

| Assessment Methods | Course outcomes ILOs | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | Intellectual Skills | | | Professional and Practical Skills | | | General and Transferable Skills | |
| | A1 | A2 | A3 | A4 | B1 | B2 | B3 | C1 | C2 | C3 | D1 | D2 |
| **Written Examination** | √ | √ | √ | √ | √ | √ | √ | | | | | |

| | Course Coordinator | Head of Department |
|---|---|---|
| Name | Dr. Abd elnaser Masood | Prof Dr. Kadry Zakria |
| Name (Arabic) | د.عبد الناصر مسعود | ا.د. قدرى زكريا |
| Signature | ……………………………… | …………………………… |
| Date | /9/2014 | /9/2014 |

| Course Title | **Introduction to Computer Science** | |
|---|---|---|
| | | |
| Course Code | 1317 | |
| Academic Year | **2014/2015** | |
| Coordinator | **Prof. Mahmoud Kamel** | |
| Other Staff | **Prof. Mahamed El-Awady, Mohmed Ghoneim, Prof. Qadry Zakaria, Prof Saad Abo elenen** | |
| Semesters | **Two Semesters** | |
| Pre-Requisite | **B.Sc.** | |
| Course Delivery | **Lecture** | **1h/week** |
| | **Practical** | **1h/week** |
| Parent Department | **Computer Centre** | |
| Date of Approval | **September, 2014** | |

**1. Aims**

This course will enable students to acquire a range of transferable skills that are important for post graduate M. Sc. students to:

- Develop their capability for information retrieval and presentation, and proficiency in the use of IT effectively in the context of their studies.
- Underpin academic work throughout postgraduate studies.
- Provide opportunities to develop skills required for team working, oral presentation of scientific material, and career choices.

***A. Knowledge and understanding:***

Upon successful completion of this course the students should be able to:

A15. Demonstrate knowledge and understanding of the use of IT in the context of their postgraduate studies.

A16. Know the diverse media and hardware and software that help to benefit of the IT in the context of the postgraduate studies.

A17. Carry out necessary graphical, statistical and frequency analyses of different types of data.

A18. Create powerful presentation using sophisticated software packages.

A19. Make use of different internet resources.

A20. Solve scientific problems using computer programming.

A21. Make use of different photo enhancing and manipulation techniques.

***B. Intellectual skills:***

They should also acquire the ability to:

B3. Integrate different application programs to develop effective information analysis and presentation.

***C. Professional and practical skills:***

C1. Use a number of computer packages to present information.

***D. General and transferable skills:***

D3. Use the internet/electronic resources to obtain subject specific information, and to develop lifelong learning skills that can be applied to suitable research problems.

## 3. Contents

| | |
|---|---|
| Lectures 1-5 | **Assignment 1** : **information technology**<br>Types and generations of computers<br>Hardware and Software computer structure<br>Types and development of operating systems<br>Working with windows<br>File and folder manipulations |
| Lectures 6-12 | **Assignment2** : **Using PowerPoint program**<br>Working with PowerPoint program<br>Insert slides and animations<br>Different methods of slide editing<br>Insert tables ,charts, video, pictures, hyperlinks ,web pages and different objects<br>Design a real and powerful presentation with different acquired skills |
| Lecture 13-18 | **Assignment 3** : **Using Access program**<br>Working with Access program<br>Define data and information<br>Creating data base tables , sorting and filtering records and fields<br>Creating different types of queries to extract useful information<br>Creating forms for data entries and calculations<br>Creating and printing final reports |
| Lecture 19-23 | **Assignment 4: Using the Internet**<br>Define different types of protocols and network<br>Different levels of internet connections<br>Email and methods of file transfer<br>Use of internet capabilities and searching engines<br>Life search on the internet for some real information |
| Lecture 24-28 | **Assignment 5**: Programming using Visual Basic 6<br>Different types of computer languages<br>Concept of visual programming language<br>Working with visual basic language<br>Steps necessary for creating a project with visual basic<br>Solving real problems using a visual basic computer language |

## 4. Teaching and Learning Methods

- Lectures
- Practical classes
- Assignments

The course is delivered through lectures, practical sessions and assignments. Team working skills are developed on a week-long laboratory exercises and the students present and defend their findings in a public seminar.

## 5. Student Assessment

| Assessment Method | Skills assessed* | Assessment Length | Schedule | Proportion |
|---|---|---|---|---|
| Written Examination | KU, I | 1 Hour Examination | Term Final | 60% |
| Practical Examination | KU, I | 1 Hour Examination t | Term Final | 30% |
| Semester work | P, T | Continuous Assessment | | 10% |

*KU: Knowledge and Understanding, I: Intellectual, P: Professional, T: Transferable

## 6. List of references

*Course notes:*

- Notes given to students at each section describe the tasks to be completed, therefore no particular book(s) recommended.

## 7. Facilities required for teaching and learning

- Projectors; Video and Overhead
- LCD screens and writing Boards
- Commercial computer scientific software packages.

Course Contents – Course ILOs Matrix

**Course code: 1317 Chemistry, course title: Computer**

| Course Contents | Course outcomes ILOs | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | | | | | | | Intellectual | | | | | Practical | | | | | Transferable | | |
| | A1 | A2 | A3 | A4 | A5 | A6 | A7 | A8 | A9 | A10 | B1 | B2 | B3 | B4 | B5 | C1 | C2 | C3 | C4 | C5 | D1 | D2 | D3 |
| Week #1-2 | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #3-4 | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #5-6 | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #7-8 | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #9-10 | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #11-12 | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #13-14 | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #14-15 | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #16-17 | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #18-19 | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #20-21 | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #22-23 | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #24-25 | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #26-27 | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #28 | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |

| | Course Coordinator | Head of Computer Center |
|---|---|---|
| Name | Prof. Mahmoud M. Kamel | Prof. El-Sayed T. Rizk |
| Name (Arabic) | أ.د.محمود مصطفى كامل | أ.د. السيد طه رزق |
| Signature | | |
| Date | 9/2014 | 9/2014 |

# Postgraduate
# Program and Course Specifications

# Physics

**2014-2015**

# Contents

# Master of Science
# Degree in Physics

## Academic Standards for the M.Sc. of Physics

The Academic Reference Standards for the award of the M.Sc. degree in physics as well the attributes and capabilities of the graduate were based on the General Academic Reference Standards (ARS) for graduate studies published by the National Authority for Quality Assurance and Accreditation of Education for M.Sc. degree. The following Specific Academic Standards for the **M.Sc. of Physics** were approved by the Council of the physics department, on 30/12/2014**.**

- ### Graduate Attributes

**The M.Sc. graduate of Physics must have the ability to:**

**1.** Apply the knowledge of physics, its related disciplines, applications and tools to the solution of the scientific research problems in one of the available fields of research in the physics department such as: radiation physics, laser physics, plasma physics, materials physics, digital electronics and renewable energy resources.

**2.** Gain new knowledge and continually enhance information to improve the understanding and handling issues in one of the different branches of Physics.

**3.** Participate in the development and implementation of Physics study in the professional practice.

**4.** Participate in university and community development.

**5.** Share in multidisciplinary team work and have the ability to work under contradictory conditions.

**6.** Hold professional values that maintain individuality, positive thinking and self-confidence.

**7.** Collect, summarize and present data, undertake professional and ethical responsibilities.

**8.** Use modern technology effectively and develop professional skills.

1. **Knowledge and understanding:**

*By the end of the master's program, graduate must be able to:*

1. Explain theories and fundamentals of physics as well as in related and supporting areas.
2. Recognize mutual influence between professional practice and its impacts on the environment.
3. Demonstrate scientific developments in one of the fields of research of physics for example: radiation physics, laser physics, plasma physics, materials physics, digital electronics and renewable energy resources.
4. Recognize the basics and ethics of scientific research in physics.

2. **Intellectual skills**

*By the end of the master's program, graduate must be able to:*

1. Analyze and evaluate results the in one the fields of research of physics.

2. Solve specialized problems in the field of specialty in physics .
3. Link between different knowledge to solve professional problems in the field of specialty in physics.
4. Conduct a research study and / or write a methodology of a scientific study on a research problem in the field of specialty in physics.
5. Evaluate risk in professional practices in the field of specialty in physics.
6. Plan to improve performance in the field of specialty in physics.
7. Make professional decision in diverse professional contexts.

### 3. Professional skills:

*By the end of the study master's program, graduate must be able to:*

1. Recognize modern professional basic skills in the field of specialty in physics.
2. Write and evaluate professional reports.
3. Evaluate and use methods and tools in the field of specialty in physics.

### 4. General and transferable skills:

*By the end of the study master's program, graduate must be able to:*

1. Effectively communicate in different forms.
2. Use of information technology to serve the professional practice.
3. Self-evaluate and identify personal learning needs.
4. Use different sources for acquire information and knowledge.
5. Develop rules and indicators for assessing the performance of others.
6. Work in a team, and lead teams in various professional contexts.
7. Manage time efficiently.
8. Enhance self- and continuous learning in the field of specialty in physics.

# The M.Sc. Program Structure includes:

- Pre-master courses specified by the Physics Department
- Thesis in different branches of Physics.

## Thesis

- The thesis of M.Sc. program is a formal written document representing sustained research into an important intellectual issue. The thesis must be an independent effort which contributes to the accumulated understanding of the field in which it is written. The required research preparation and advanced research methods courses will help the student to focus his or her research effort, and provide general guidelines for research approach and report preparation. Thesis will be reviewed and approved by the candidate's supervising professor and external academic review committee.

The thesis should contain at least the following:

- Title page (title, name of student, university, faculty, name of program, date, supervisors
- Table of contents
- Introduction, containing a definition of the thesis statement, working method, the theoretical framework, and the aim.
- Literature review.
- Materials and methods.
- Results.
- Discussion and conclusions.
- References.

Language of the thesis:

- The thesis must be written in English language accompanied by a summary in Arabic.

Formation of Examiners Committees

- A committee is selected by Physics Department Council. The M.Sc. Degree is awarded to the applicant by University, upon the recommendation of the department and the Faculty Council.

Program Admission Requirements:

- An applicant for admission to the M.Sc. program in physics should hold an B.Sc. degree in Physics with a minimum grade of (Good = 70%)

The candidate should pass successfully:

- Courses of pre-master academic year
- Written Thesis
- Oral Presentation
- Defense
- At least one published paper

## A. Program Specification

| Program Title | **Physics (M. Sc.)** |
|---|---|
| Award | **M. Sc. Physics** |
| Parent Department | **Physics Department** |
| Teaching Institution | **Faculty of Science – TU** |
| Awarding Institution | **Tanta University** |
| Coordinator | **Prof. Riyad Abdel-Wahhab Ghazy** |
| External Evaluator(s) | **Prof. Salah Y. El Bakry**<br>**Faculty of Science - Ein-Shams University** |
| QAA Benchmarking Standards | **Academic Reference Standards (ARS)** |
| Other Reference Points | |
| Date of intake | **Every year in October** |
| Review Date | |
| Date of Approval | **September, 2014** |

### 1. Program Aims

This programme will enable students to acquire knowledge and understanding of:

advanced theoretical background knowledge in different branches of physics - current research in selected topics with understanding of physics and its role in community development - a range of interpersonal and transferable skills that maximize their prospects for future employment; including - writing, oral presentation and team-working, as well as information technology skills.

The programme also promotes the free pursuit of knowledge and develops students' ability to find, understand, and analyse physical information – develops students' ability to apply their physical knowledge and skills to solve theoretical and practical problems in different areas based on ethical, economical and environmental aspects and prepare students to finish successfully the research part of the master degree in physics.

### 2. Intended Learning outcomes (ILOS)

Upon successful completion of this Programme, students should be able to:

***A. Knowledge and understanding:***

A1. Recognize different renewable energy resources, types of radiation detection, pulse shaping, differentiation and integration circuits and vacuum techniques.

A2. Define crystal structure, lattice vibrations, free electron gas and energy bands, semiconductors, metals and glasses.

A3. Illustrate how to construct electronic circuits for digital gates, shift registers in useful applications, methods of circuit simplifications, digital to analog converters and analog to digital converters.

A4. Discuss the neutron activation analysis, computer controlled electronics: CAMAC, ion beam spectroscopic techniques and signal transmission.

A5. Explain the variation method, the perturbation theory and the hydrogen like atoms - equilibrium absorption and stimulated emission, conditions for producing LASER, processes that inhibit or destroy inversions, LASER cavity modes - LASER pumping requirements and techniques - LASER systems involving low and high density gain media.

A6. Identify nuclear energy – fusion reactions – fusion energy production and confinement of a hot plasma, motion of charged particles in electric and magnetic fields, transport phenomena in plasma, linear Pinch effect, waves in plasma, heating of plasma.

***B. Intellectual skills:***

B1. Explain advanced physics concepts and theories.

B2. Analyse critically the results of model calculations with those from experiments and observations.

B3. Solve advanced problems in their research projects using appropriate mathematical tools.

B4. Know how to connect the experimental results by its theoretical discussion.

B5. Develop performance in the specialty field.

B6. Use different methods to solve professional problems.

B7. Discuss the experimental data and its environmental applications.

***C. Professional and practical skills:***

C1. Design requirements of standard experimental procedures involved in different research projects.

C2. Collect, evaluate, represent and interpret data.

C3. Plan and execute their research projects, from the problem-recognition stage to the results and conclusions.

***D. General and transferable skills:***

D1. Communicate effectively in written and oral manners.

D2. Apply numerical and IT skills with confidence and accuracy.

D3. Work independently or with others in a team and manage time.

D4. Adopt self and long life learning for personal and professional development.

D5. Work effectively as part of a team.

D6. Develop rules of special physics

D7. Use information technology to collect knowledge and information.

D8. Able to manage time

3. **Academic references of standards (Benchmarks):**

Academic reference standards (ARS)

The Academic Reference Standards for the award of the M.Sc. degree in physics as well the attributes and capabilities of the graduate were based on the General Academic Reference Standards (ARS) for graduate studies published by the National Authority for Quality Assurance and Accreditation of Education for M.Sc. degree. The following Specific Academic Standards for the **M.Sc. of Physics** were approved by the Council of the physics department, on 30/12/2014**.**

## • Graduate Attributes

**The M.Sc. graduate of Physics must have the ability to:**

**1.** Apply the knowledge of physics, its related disciplines, applications and tools to the solution of the scientific research problems in one of the available fields of research in the physics department such as: radiation physics, laser physics, plasma physics, materials physics, digital electronics and renewable energy resources.

**2.** Gain new knowledge and continually enhance information to improve the understanding and handling issues in one of the different branches of Physics.

**3.** Participate in the development and implementation of Physics study in the professional practice.

**4.** Participate in university and community development.

**5.** Share in multidisciplinary team work and have the ability to work under contradictory conditions.

**6.** Hold professional values that maintain individuality, positive thinking and self-confidence.

**7.** Collect, summarize and present data, undertake professional and ethical responsibilities.

**8.** Use modern technology effectively and develop professional skills.

1. **Knowledge and understanding:**

*By the end of the master's program, graduate must be able to:*

1. Explain theories and fundamentals of physics as well as in related and supporting areas.
2. Recognize mutual influence between professional practice and its impacts on the environment.
3. Demonstrate scientific developments in one of the fields of research of physics for example: radiation physics, laser physics, plasma physics, materials physics, digital electronics and renewable energy resources.
4. Recognize the basics and ethics of scientific research in physics.

2. **Intellectual skills**

*By the end of the master's program, graduate must be able to:*

1. Analyze and evaluate results the in one the fields of research of physics.

2. Solve specialized problems in the field of specialty in physics .
3. Link between different knowledge to solve professional problems in the field of specialty in physics.
4. Conduct a research study and / or write a methodology of a scientific study on a research problem in the field of specialty in physics.
5. Evaluate risk in professional practices in the field of specialty in physics.
6. Plan to improve performance in the field of specialty in physics.
7. Make professional decision in diverse professional contexts.

### 3. Professional skills:

*By the end of the study master's program, graduate must be able to:*

1. Recognize modern professional basic skills in the field of specialty in physics.
2. Write and evaluate professional reports.
3. Evaluate and use methods and tools in the field of specialty in physics.

### 4. General and transferable skills:

*By the end of the study master's program, graduate must be able to:*

1. Effectively communicate in different forms.
2. Use of information technology to serve the professional practice.
3. Self-evaluate and identify personal learning needs.
4. Use different sources for acquire information and knowledge.
5. Develop rules and indicators for assessing the performance of others.
6. Work in a team, and lead teams in various professional contexts.
7. Manage time efficiently.
8. Enhance self- and continuous learning in the field of specialty in physics.

## *3. b. Comparison of provision to external references:*

Academic reference Standards (ARS).

## 4. Curriculum Structure and contents:

4.a Program duration **At most 5 years**

4.b Program structure:

Number of contact hours per week

| | | | | | |
|---|---|---|---|---|---|
| | Lectures per week | 12 | | Total | 12 |
| 4. c Thesis | | | | | |

## 5. Courses contributing to the program

**Obligatory: Student must study the following modules**

| Code | Course Title | Hours/Week | | | Program ILOs Covered |
|---|---|---|---|---|---|
| | | Lec. | Prac. | Exer. | |
| 1201 | (Nuclear physics & Quantum Mechanics) | 2 | | | KU, I, P, T |
| 1202 | (Laser Physics & Plasma physics) | 2 | | | KU, I, P, T |
| 1203 | (Crystalline and non-crystalline solid state physics & Digital Electronics) | 2 | | | KU, I, P, T |
| 1204 | (Renewable Energy Resources & Physical Electronics ) | 2 | | | KU, I, P, T |
| 1205 | Special course | 2 | | | KU, I, P, T |
| 1207 | Introduction to computer science | 2 | | | KU, I, P, T |

Course ILO Matrix is attached.

## 6. Program admission requirements

Candidates must satisfy the general admission requirements of the University, Faculty and department and also hold a B. Sc. in physics with at least accumulative grade "Good".

To be qualified to register as a candidate of a master degree in Physics, student must pass in all course units and achieve at least an overall of 70%.

## 7. Evaluation of program intended learning outcomes

| Evaluator Tool | | Sample |
|---|---|---|
| 1. Senior students | applied | |
| 2. Alumni | applied | |
| 3. Stakeholders(Employers) | Applied | |
| 4. External Evaluator(s)(External Examiner(s)) | Applied | Prof. Salah Eddin Mohamed Yassin |
| 5. student questionnaire | Applied | Applied on courses individually |

We certify that all of the information required to deliver this programme is contained in the above specification and will be implemented. All course specifications for this programme are in place.

**M.Sc. Courses: Programme Matrix**
**Program Title: Master of Science (M.Sc.) degree in Physics**

| Program intended learning outcomes ILOs | Academic standards intended learning outcomes ILOs | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | Intellectual skills | | | | | | | Practical skills | | | Transferable skills | | | | | | | |
| | A1 | A2 | A3 | A4 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | D1 | D2 | D3 | D4 | D5 | D6 | D7 | D8 |
| **1.1** Recognize different renewable energy resources, types of radiation detection, pulse shaping, differentiation and integration circuits and vacuum techniques | √ | √ | √ | | | | | | | | | | | | | | | | | | | |
| **1.2** Define crystal structure, lattice vibrations, free electron gas and energy bands, semiconductors, metals and glasses. | √ | | √ | | | | | | | | | | | | | | | | | | | |
| **1.3** Illustrate how to construct electronic circuits for digital gates, shift registers in useful applications, methods of circuit simplifications, | √ | | √ | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| digital to analog converters and analog to digital converters. | | | | | | | | | | | | | | | | | | | | | | |
| **1.4** Discuss the neutron activation analysis, computer controlled electronics: CAMAC, ion beam spectroscopic techniques and signal transmission. | √ | | √ | | | | | | | | | | | | | | | | | | | |
| **1.5** Explain the variation method, the perturbation theory and the hydrogen like atoms - equilibrium absorption and stimulated emission, conditions for producing LASER, processes that inhibit or destroy inversions, LASER cavity modes - LASER pumping requirements and techniques - LASER systems involving low and high density gain media. | √ | | √ | | | | | | | | | | | | | | | | | | | |
| **1.6** Identify nuclear energy – fusion reactions – fusion | √ | √ | √ | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| energy production and confinement of a hot plasma, motion of charged particles in electric and magnetic fields, transport phenomena in plasma, linear Pinch effect, waves in plasma, heating of plasma. | | | | | | | | | | | | | | | | | | | | | | |
| **2.1** Explain advanced physics concepts and theories. | √ | | √ | | | √ | √ | | | | | | | | | | | | | | | |
| **2.2** Analyse critically the results of model calculations with those from experiments and observations. | | | | | √ | √ | √ | | | √ | | | | | | | | | | | | |
| **2.3** Solve advanced problems in their research projects using appropriate mathematical tools. | | | | | | √ | | √ | | | | | | | | | | | | | | |
| **3.1** Design requirements of standard experimental procedures involved in different research projects. | | | | | | | | √ | | √ | | | | | | | | | | | | |
| **3.2** Collect, evaluate, represent and interpret | | | √ | √ | √ | | | | | | √ | | √ | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| data. | | | | | | | | | | | | | | | | | | | | | | |
| **3.3** Plan and execute their research projects, from the problem-recognition stage to the results and conclusions. | | √ | | | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | | | | | | | | |
| **4.1** Communicate effectively in written and oral manners. | √ | | √ | | | | | | | | | | √ | | √ | | | | | √ | | |
| **4.2** Apply numerical and IT skills with confidence and accuracy. | | | | | | | √ | | | | | | | | | √ | | | | | | |
| **4.3** Work independently or with others in a team and manage time. | | | | | | | | | | √ | | | | | | | | | | | √ | √ |
| **4.4** Adopt self and long life learning for personal and professional development. | | | | | | | | | | | | | | | | | | | | | | √ |

## Course - Program ILOs Matrix (Curriculum Map)

| Course code / Title | ILO's | A1 | A2 | A3 | A4 | A5 | A6 | B1 | B2 | B3 | C1 | C2 | C3 | D1 | D2 | D3 | D4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1201 | (Nuclear physics & Quantum Mechanics) | | | √ | √ | √ | | √ | √ | √ | √ | √ | √ | √ | | √ | √ |
| 1202 | (Laser Physics & Plasma physics) | | | | | √ | √ | √ | √ | | √ | √ | √ | √ | | √ | √ |
| 1203 | (Crystalline and non-crystalline solid state physics & Digital Electronics) | | √ | √ | | | | √ | √ | | √ | √ | √ | √ | | √ | √ |
| 1204 | (Renewable Energy Resources & Physical Electronics ) | √ | | | | | | √ | √ | | √ | √ | √ | √ | | √ | √ |
| 1205 | Special course | √ | | | | | | √ | √ | | √ | √ | √ | √ | | √ | √ |
| 1207 | Introduction to computer science | √ | √ | √ | | √ | √ | √ | √ | √ | √ | √ | | √ | √ | √ | √ |
| | Thesis | √ | √ | √ | | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |

| Name | Signature | Date |
|---|---|---|
| *Program Coordinator:*<br>Prof. Riyad A. Ghazy<br>**(أ. د. رياض غازى)** | ……………………………… | 2014 |
| *Head of Quality Assurance Unit:*<br>Prof. Hoda K. M. ElSayed<br>**( أ. د. هدى كمال السيد)** | ……………………………… | 2014 |
| *Dean of the Faculty:*<br>Prof. Tarek A. Fayed<br>**(أ. د. طارق فايد)** | ……………………………… | 2014 |

| **Course Title** | **Nuclear physics & Quantum Mechanics** | |
|---|---|---|
| Course Code | **1201** | |
| Academic Year | **2014/2015** | |
| Coordinator | **Prof. Nabil El-Siragy** | |
| Other staff | **Prof. Ibrahim Bondok** | |
| Semester | | |
| Level | **Pre-master courses** | |
| Pre-Requisite | | |
| Course delivery | **Lecture** | **2h per week** |
| | | |
| | **Exercises** | |
| Parent Department | **Physics Department** | |
| Date of Approval | **2014** | |

**1. Aims**

This course aims to enable students to acquire good awareness of:

pulse signals in nuclear electronics- the NIM standard - signal transmission - electronics for pulse signal processing - timing methods and systems - computer controlled electronics: CAMAC - X-ray florescence – Mössbauer XPS - neutron activation analysis – the solution of the hydrogen atom problem – the perturbation theory and several exact soluble problems - the problems of hydrogen like atoms and helium atom as final application –the variation method - standard problems on the variation method , and also some basic laboratory and communication skills.

**2. Intended Learning outcomes**

***A. Knowledge and understanding:***

At the end of this module students should be able to:

A1. Define single-channel analyzer, analog signals, losses in coaxial cables, CAMAC, time to amplitude converters, trigger, and X-ray florescence.

A2. Explain the role of pulse signals in nuclear electronics and the role of Coaxial Cables in signal transmission.

A3. Discuss the neutron activation analysis, computer controlled electronics: CAMAC, ion beams spectroscopic techniques, signal transmission, and Mössbauer XPS.

A4. Illustrate the variation method.

A5. Explain the perturbation theory.

A6. Discuss the hydrogen like atoms and helium atom.

***B. Intellectual skills:***

They will also acquire the ability to apply, evaluation and interpret this knowledge to

B1. Recognize the pulse height selection and basic coincidence technique.

B2. Demonstrate electronics for pulse signal processing

B3. Differentiate between single-channel analyzer and multi-channel analyzers.

B4. Demonstrate in details the variation method.

B5. debate problems on the variation method and the perturbation theory and problems of hydrogen like atoms

***C. Professional and practical skills:***

Students will be able to

C1. Compare between different timing methods.

C2. Manage devices and experimental data in the field of radiation.

***D. General and transferable skills:***

Students will be able to

D1. Join a scientific team work working in the field of theoretical physics.

D2. Self learning by searching for information in text books and internet.

**3. Content**

| ***Section I*** | ***Nuclear physics*** |
|---|---|
| Lecture 1 | Introduction, Pulse signals in nuclear electronics: Pulse Signal Terminology - Analog and Digital Signals - Fast and Slow Signals - The Frequency Domain. Bandwidth |
| Lecture 2 | The NIM standard : Modules - Power Bins - NIM Logic Signals – TTL and ECL Logic Signals -Analog Signals |
| Lecture 3 | 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 |
| Lecture 4 | Electronics for pulse signal processing : Preamplifiers - Main Amplifiers - Pulse Shaping Networks in Amplifiers - Biased Amplifiers - Pulse Stretchers - Linear Transmission Gate - Fan-out and Fan-in - Delay Lines – Discriminators - Single-Channel Analyzer (Differential Discriminator) - Analog-to-Digital Converters (ADC or A/D) – Multi-channel Analyzers - Digital-to-Analog Converters (DAC or D/A) -Time to Amplitude Converters (TAC or TPHC) - Scalars - Rate meter -Coincidence Units - Majority Logic Units -Flip-Flops -Registers (Latches) - Gate and Delay Generators - Filtering and Shaping . |
| Lecture 5 | Pulse height selection and coincidence technique. |
| Lecture 6 | Electronic logic for experiments: Basic Logic Gates: Symbols - |

| | |
|---|---|
| | Boolean Laws and Identities - The Inhibitor Busy – Triggers. |
| Lecture 7 | Timing methods and systems: Walk and Jitter - Time-Pickoff Methods - Analog Timing Methods - Digital Timing Methods. |
| Lecture 8 | Assessment |
| Lecture 9 | Computer controlled electronics: CAMAC |
| Lecture 10 | X-ray florescence |
| Lecture 11 | Mössbauer XPS |
| Lecture 12 | Neutron activation analysis |
| Lecture 13 | Ion beam spectroscopic techniques |
| ***Section II*** | ***Quantum Mechanics*** |
| Lecture 1 | the hydrogen atom |
| Lecture 2 | Solved problems |
| Lecture 3 | Problems |
| Lecture 4 | Perturbation Theory |
| Lecture 5 | Solved problems |
| Lecture 6 | Problems |
| Lecture 7 | Exact soluble problems |
| Lecture 8 | Solved problems |
| Lecture 9 | Problems |
| Lecture 10 | Hydrogen Like Atoms |
| Lecture 11 | Solved problems |
| Lecture 12 | Problems |
| Lecture 13 | Helium atom |
| Lecture 14 | Helium atom |
| Lecture 15 | the variation method |
| Lecture 16 | Solved problems |

## 4. Teaching and Learning Methods

- Lectures
- Discussions
- Self-learning

## 5. Student Assessment

| Assessment Method | Skills assessed* | Assessment Length | Schedule | Proportion |
|---|---|---|---|---|
| Written Examination | KU, I, T | 3 Hour Examination | At the end of the course | 100% |

*KU: Knowledge and Understanding, I: Intellectual, P: Professional, T: Transferable

## 6. List of references

*Course notes*

- Notes of the professor of the course.

- Handouts and exercise sheets given regularly.

*Essential books*

- Techniques for Nuclear and Particle Physics Experiments: A How-to Approach by: William R. Leo

- Atomic and Nuclear Analytical Methods: XRF, Mössbauer XPS, NAA and Ion-Beam Spectroscopic Techniques by: H. R. Verma

*Recommended Text*

- Quantum Mechanics", L.I. Schiff, Wiely and Sons, 1985.

**7. Facilities required for teaching and learning**

- Board and dustless chalk or board pens

- Over-head Projector

- Data show

## Course matrices

### Course contents – Course ILOs Matrix

### Course Code / Course Title: 1201- Nuclear Physics& Quantum Mechanics

| Course Contents | Course intended learning outcomes ILOs | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | | | Intellectual | | | | | Practical | | Transferable | |
| | A1 | A2 | A3 | A4 | A5 | A6 | B1 | B2 | B3 | B4 | B5 | C1 | C2 | D1 | D2 |
| 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 | √ | √ | | | | | | | | | | | | | |
| Electronics for pulse signal processing : Preamplifiers - Main Amplifiers - Pulse Shaping Networks in Amplifiers - Biased Amplifiers - Pulse Stretchers - Linear Transmission Gate - Fan-out and Fan-in - Delay Lines – Discriminators - Single-Channel Analyzer (Differential Discriminator) - Analog-to-Digital Converters (ADC or A/D) – Multi-channel Analyzers - Digital-to-Analog Converters (DAC or D/A) -Time to Amplitude Converters (TAC or TPHC) - Scalars - Rate meter -Coincidence Units - Majority Logic Units -Flip-Flops -Registers (Latches) - Gate and Delay Generators - Filtering and Shaping . | √ | | | | | | | √ | √ | | | | | | |
| Pulse height selection and coincidence technique. | √ | | | | | | √ | √ | | | | | √ | | |
| Electronic logic for experiments: Basic Logic Gates: Symbols - Boolean Laws and Identities - The Inhibitor Busy – Triggers. | | | | | | | | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Timing methods and systems: Walk and Jitter - Time-Pickoff Methods - Analog Timing Methods - Digital Timing Methods. | | | | | | | | | | | | | | | |
| Assessment | | | | | | | | | | | √ | | √ | √ |
| Computer controlled electronics: CAMAC | √ | | √ | | | | | | | | | | | | |
| X-ray florescence | √ | | | | | | | | | | | | | | |
| Mössbauer XPS | | | √ | | | | | | | | | | | | |
| Neutron activation analysis | | | √ | | | | | | | | | | | | |
| Ion beam spectroscopic techniques | | | √ | | | | | | | | | | | | |
| ***Quantum Mechanics*** | | | | | | | | | | | | | | | |
| the hydrogen atom | | | | | | | | | | | | | | | |
| Solved problems | | | | | | | | | | | | | | | |
| Problems | | | | | | | | | | | | | | | |
| Perturbation Theory | | | | | √ | | | | | | | | | | |
| Solved problems | | | | | √ | | | | | | √ | | | √ | √ |
| Problems | | | | | | | | | | | | | | | |
| Exact soluble problems | | | | | | | | | | | | | | | |
| Solved problems | | | | | | | | | | | | | | | |
| Problems | | | | | | | | | | | | | | | |
| Hydrogen Like Atoms | | | | | | √ | | | | | | | | | |
| Solved problems | | | | | | √ | | | | | √ | | | √ | √ |
| Problems | | | | | | | | | | | √ | | | √ | √ |
| Helium atom | | | | | | √ | | | | | | | | | |
| Helium atom | | | | | | √ | | | | | | | | | |
| the variation method | | | | √ | | | | | | √ | √ | | | √ | √ |
| Solved problems | | | | | | | | | | | √ | | | √ | √ |

**Learning and Teaching Methods**

| Learning Methods | Course outcomes ILOs | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | | | Intellectual Skills | | | | | Professional and Practical Skills | | General and Transferable Skills | |
| | A1 | A2 | A3 | A4 | A5 | A6 | B1 | B2 | B3 | B4 | B5 | C1 | C2 | D1 | D2 |
| Lectures | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | | | | |
| Discussions | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | | | | |
| Self-learning | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |

**Assessment Methods**

| Assessment Methods | Course outcomes ILOs | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | | | Intellectual Skills | | | | | Professional and Practical Skills | | General and Transferable Skills | |
| | A1 | A2 | A3 | A4 | A5 | A6 | B1 | B2 | B3 | B4 | B5 | C1 | C2 | D1 | D2 |
| Written Examination | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | | |

| | Course Coordinator | Head of Department |
|---|---|---|
| Name | Prof. Nabil El Siragy | Prof. Riyad Ghazy |
| Name (Arabic) | أ. د. نبيل السراجى | أ. د. رياض غازى |
| Signature | | |
| Date | 2014 | 2014 |

| | | |
|---|---|---|
| **Course Title** | **Laser Physics & Plasma physics** | |
| Course Code | **1202** | |
| Academic Year | **2014/2015** | |
| Coordinator | **Prof. Nabil El-Siragy** | |
| Other staff | **Prof. Farouk Mostafa ElMekkawy** | |
| Semester | | |
| Level | **Pre-master courses** | |
| Pre-Requisite | | |
| Course delivery | **Lecture** | |
| | | |
| | **Exercises** | |
| Parent Department | **Physics Department** | |
| Date of Approval | **September, 2014** | |

## 1. Aims

This course aims to enable students to acquire good awareness of:

the radiation transitions and emission line width – radiation and thermal equilibrium absorption and stimulated emission - conditions for producing LASER and requirements for obtaining population inversions - specific laser systems- He-Ne laser- Argon ion laser-Ruby laser -significance of plasma physics in modern science – fusion reactions – fusion energy production - confinement of a hot plasma - motion of charged particles in electric and magnetic fields– adiabatic invariance of the magnetic moment – motion in the field of electromagnetic waves - crossed r.f. in electric field and magneto static fields - the radiation from moving of charged particles (Bremsstrahlung radiation – Cyclotron radiation) - the interaction of charged particles (Debye shielding distance – elastic collisions of charged particles – short range interactions – multiple scattering) - kinetic description of plasma - fluid description of plasma - transport phenomena in plasma -the linear Pinch effect - the waves in plasma, and also communication skills.

## 2. Intended Learning outcomes

### *A. Knowledge and understanding:*

At the end of this module students should be able to:

A1. Illustrate the radiation transitions, emission broadening and line width due to radiation decay - equilibrium absorption and stimulated emission

A2. Recognize conditions for producing LASER - LASER pumping requirements and techniques - LASER cavity modes - LASER systems involving low and high density gain media.

A3. Define plasma state – characteristic parameters of plasma ,Debye length, cyclotron frequency and collision frequency.

A4. Explain motion of single charged particle motions in different fields configurations, radiation of moving charged particles - interaction of charged particles.

A5. Discuss kinetic description of plasma and the moment equations, fluid description of plasma, transport phenomena in plasma, interaction of plasma with magnetic fields (e.g. linear pinch effect, Z-pinch, θ-pinch, Tokamak)

A6. Explain waves in plasma – different techniques used in heating plasma.

***B. Intellectual skills:***

They will also acquire the ability to apply, evaluation and interpret this knowledge to

B1. Demonstrate conditions for producing LASER.

B2. Distinguish between longitudinal and transverse LASER cavity modes.

B3. Distinguish between LASER systems involving low density gain media and LASER systems involving high density gain media .

B4. Demonstrate fusion reactions – fusion energy production and confinement of hot plasma.

B5. Formulate equations describing the motion of charged particles in different configurations of electric and magnetic fields, r.f. electric field and magnetic mirror system.

B6. Distinguish between kinetic description of plasma and fluid description of plasma, solving some problems for waves in plasma.

***C. Professional and practical skills:***

Students will be able to

C1. Explain laser systems.

C2. Use mathematical equations to describe physical situations.

***D. General and transferable skills:***

Students will be able to

D1. Search in text books and internet materials to improve his knowledge and designs.

D2. Communicate with other scientific teams.

**3. Content**

| ***Section I*** | ***Laser*** |
|---|---|
| Lecture 1 | Radiation Transitions and Emission line width - Decay of excited states - Emission broadening and line width due to radiation decay -Additional emission broadening processes |
| Lecture 2 | Radiation and Thermal Equilibrium Absorption and Stimulated Emission – Equilibrium - Radiation Bodies - Cavity radiation - Absorption and Stimulated emission |
| Lecture 3 | Conditions for producing LASER - Absorption and gain - Population inversion - Saturation intensity - Development and growth of a LASER beam |

| | |
|---|---|
| Lecture 4 | Requirements for obtaining population inversions - Inversion and two level systems - Processes that inhibit or destroy inversions |
| Lecture 5 | LASER Pumping Requirements and Techniques - Excitation or pumping threshold requirements - Specific excitation parameters associated with particle pumping |
| Lecture 6 | LASER cavity Modes - Longitudinal and Transverse LASER cavity modes - Properties of LASER modes |
| Lecture 7 | LASER Systems Involving Low density Gain Media - He- Ne and Argon ion LASERS |
| Lecture 8 | LASER Systems Involving High Density Gain Media - Dye , Ruby and Neodymium LASERS |
| ***Section II*** | ***Plasma physics*** |
| Lecture 1 | Introduction: Significance of plasma physics in Modern science– Fusion reactions – Fusion energy production – Confinement of a hot plasma. |
| Lecture 2 | Motion of charged particles in electric and magnetic fields: Homogeneous magnetic fields - drift of charged particles – inhomogeneous magnetic fields – adiabatic invariance of the magnetic moment – motion in the field of electromagnetic waves – in crossed r.f. electric field and magneto static fields. |
| Lecture 3 | Radiation from moving charged particles: Bremsstrahlung radiation – Cyclotron radiation |
| Lecture 4 | Interaction of charged particles: Debye shielding distance – elastic collisions of charged particles – short range interactions – multiple scattering. |
| Lecture 5 | Kinetic description of plasma. |
| Lecture 6 | Fluid description of plasma. |
| Lecture 7 | Transport phenomena in plasma. |
| Lecture 8 | Linear Pinch Effect. |
| Lecture 9 | Waves in Plasma. |
| Lecture 10 | Heating of Plasma. |

## 4. Teaching and Learning Methods

- Lectures
- Discussions
- Self-learning

## 5. Student Assessment

| Assessment Method | Skills assessed* | Assessment Length | Schedule | Proportion |
|---|---|---|---|---|
| Written Examination | KU, I, T | 3 Hour Examination | At the end of the course | 100% |

*KU: Knowledge and Understanding, I: Intellectual, P: Professional, T: Transferable

## 6. List of references

*Course notes*

- Notes of the professor of the course.

- Handouts and exercise sheets given regularly.

*Essential books*

- Laser Fundamentals, William T. Silfvast, Cambridge University Press, (1996).
- Introduction to Plasma Physics", D. A.Gunett and A. Bhattacharjee Cambridge University Press (2005).

**7. Facilities required for teaching and learning**

- Board and dustless chalk or board pens
- Over-head Projector
- Data show

## Course Code / Course Title: 1202- Laser Physics & Plasma physics

| Course Contents | Course intended learning outcomes ILOs | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | | | Intellectual | | | | | | Practical | | Transferable | |
| **Part - 1 Laser Physics** | **A1** | **A2** | **A3** | **A4** | **A5** | **A6** | **B1** | **B2** | **B3** | **B4** | **B5** | **B6** | **C1** | **C2** | **D1** | **D2** |
| Radiation Transitions and Emission line width<br>Decay of excited states.<br>Emission broadening and line width due to radiation decay<br>Additional emission broadening processes | √ | | | | | | | | | | | | | | | |
| Radiation and Thermal Equilibrium Absorption and Stimulated Emission<br>Equilibrium<br>Radiation Bodies<br>Cavity radiation | √ | | | | | | | | | | | | | | | |
| Conditions for producing LASER<br>Absorption and gain<br>Population inversion<br>Saturation intensity<br>Development and growth of a LASER beam | | √ | | | | | √ | | | | | | √ | | √ | √ |
| Requirements for obtaining population inversions<br>Inversion and two level systems<br>Processes that inhibit or destroy inversions | | √ | | | | | √ | | | | | | √ | | √ | √ |
| LASER Pumping Requirements and Techniques<br>Excitation or pumping threshold requirements<br>Specific excitation parameters associated with particle pumping | | √ | | | | | √ | | | | | | √ | | √ | √ |
| LASER cavity Modes<br>Longitudinal and Transverse LASER cavity modes<br>Properties of LASER mode | | √ | | | | | | √ | | | | | | | √ | √ |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LASER Systems Involving Low density Gain Media<br>He- Ne and Argon ion LASERS | | √ | | | | | | | √ | | √ | | | | | |
| LASER Systems Involving High Density Gain Media<br>Dye , Ruby and Neodymium LASERS | | √ | | | | | | | √ | | | | √ | √ | √ | √ |
| ***Part 2 Plasma physics*** | | | | | | | | | | | | | √ | | √ | √ |
| Introduction:<br>Significance of plasma physics in Modern science– Fusion reactions – Fusion energy production – Confinement of a hot plasma. | | | √ | | | | | | | | | √ | √ | | √ | √ |
| Motion of charged particles in electric and magnetic fields:<br>Homogeneous magnetic fields - drift of charged particles – inhomogeneous magnetic fields – adiabatic invariance of the magnetic moment – motion in the field of electromagnetic waves – in crossed r.f. electric field and magneto static fields. | | | | √ | | | | | | √ | | √ | √ | | √ | √ |
| Radiation from moving charged particles:<br>Bremsstrahlung radiation – Cyclotron radiation | | | | √ | | | | | | √ | | √ | √ | √ | √ | √ |
| Interaction of charged particles:<br>Debye shielding distance – elastic collisions of charged particles – short range interactions – multiple scattering. | | | | √ | | | | | | √ | √ | | | | √ | |
| Kinetic description of plasma. | | | | | √ | | | | | | √ | | | | √ | |
| Fluid description of plasma. | | | | | √ | | | | | | √ | | | | | |
| Transport phenomena in plasma. | | | | | | √ | | | | √ | | | | | | |
| Linear Pinch Effect. | | | | | | √ | | | | | √ | | | | | |
| Waves in Plasma. | | | | | | √ | | | | | √ | | | | | |
| Heating of Plasma. | | | | | | √ | | | √ | | | | | | | |

**Learning and Teaching Methods**

| Learning Methods | Course outcomes ILOs | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | | | Intellectual Skills | | | | | | Professional and Practical Skills | | General and Transferable Skills | |
| | A1 | A2 | A3 | A4 | A5 | A6 | B1 | B2 | B3 | B4 | B5 | B6 | C1 | C2 | D1 | D2 |
| Lectures | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | | | | |
| Discussions | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | | | | |
| Self-learning | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |

**Assessment Methods**

| Assessment Methods | Course outcomes ILOs | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | | | | Intellectual Skills | | | | | Professional and Practical Skills | | General and Transferable Skills | |
| | A1 | A2 | A3 | A4 | A5 | A6 | B1 | B2 | B3 | B4 | B5 | B6 | C1 | C2 | D1 | D2 |
| Written Examination | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | | |

| | Course Coordinator | Head of Department |
|---|---|---|
| Name | Prof. Nabil El-Siragy | Prof. Riyad Ghazy |
| Name (Arabic) | أ. د. نبيل السراجى | أ. د. رياض غازى |
| Signature | | |
| Date | 2014 | 2014 |

| | | |
|---|---|---|
| Course Title | **Crystalline and non-crystalline solid state physics<br>& Digital Electronics** | |
| Course Code | **1203** | |
| Academic Year | **2014/2015** | |
| Coordinator | **Prof. Hassanein ElLabany** | |
| Other staff | **Prof. Mahmoud Moustafa Kamel - Prof. Samia Ahmed Saafan** | |
| Level | **Pre-master courses** | |
| Other staff | | |
| Pre-Requisite | | |
| Course delivery | **Lecture** | |
| | | |
| | **Exercises** | |
| Parent Department | **Physics Department** | |
| Date of Approval | **September, 2014** | |

**1. Aims**

This course aims to enable students to acquire good awareness of:

Atomic structure and bonds- crystalline solids – imperfection in solids - structure and properties of ceramics and polymers - electrical properties – thermal properties – magnetic properties – optical properties- electronic circuits for digital gates - shift registers concept - different types of loading data- memory concepts - different types of memory - methods of simplifying logic circuits and its application - interfacing analog and digital signals, and also communication skills.

**2. Intended Learning outcomes**

***A. Knowledge and understanding:***

At the end of this module students should be able to:

A1. Describe crystal structure, interatomic bonding and lattice vibrations.

A2. Recognize imperfections in solids.

A3. Identify ceramics and polymers.

A4. Explain how to construct electronic circuits for Digital gates, to use Shift registers in useful applications and to read and write using memory.

A5. Illustrate methods of circuit simplifications - digital to analog converters and analog to digital converters.

***B. Intellectual skills:***

They will also acquire the ability to apply, evaluation and interpret this knowledge to

B1. Demonstrate the crystal structures.

B2. Discuss the imperfections in solids.

B3. Distinguish between ceramics and polymers and other materials of importance.

B4. Demonstrate how to simplify logic circuits and apply them in system design and how to use shift registers in useful applications

B5. Distinguish between interfacing with different types of data.

### *C. Professional and practical skills:*

Students will be able to

C1. Prepare some inorganic glasses and measure their dielectric properties.

C2. Conduct logic circuits, use shift registers in useful applications and interfacing with different types of data.

C3. Use experimental results to calculate physical constants and be able to write reports.

### *D. General and transferable skills:*

Students will be able to

D1. Search in text books and internet materials to improve their knowledge and designs.

D2. Communicate with other scientific teams.

### 3. Content

| | |
|---|---|
| ***Section I*** | ***Crystalline and non-crystalline solid state physics*** |
| Lecture 1 | Introduction -Atomic structure and interatomic bonding |
| Lecture 2 | The structure of crystalline solids |
| Lecture 3 | Imperfections in solids (defects) |
| Lecture 4 | Imperfections in solids (impurities) |
| Lecture 5 | Structure and properties of ceramics |
| Lecture 6 | Advanced ceramics |
| Lecture 7 | Polymers |
| Lecture 8 | Assessment |
| Lecture 9 | Characteristics, applications, and processing of polymer |
| Lecture 10 | Electrical properties |
| Lecture 11 | Thermal properties |
| Lecture 12 | Magnetic properties |
| Lecture 13 | Optical properties |
| Lecture 14 | Open discussion and revision |
| ***Section II*** | ***Digital Electronics*** |
| Lecture 1 | Diode-resistor circuits analyses for principal gates AND & OR |
| Lecture 2 | Transistor-resistor circuits analyses for NOT gates |
| Lecture 3 | Transistor-diode-resistor circuits analyses for NAND gates |
| Lecture 4 | Shift register Types and functions |
| Lecture 5 | Shift register Applications |
| Lecture 6 | Memory concepts and memory types |
| Lecture 7 | Read and Write memory operations |
| Lecture 8 | Basic structure of memory |
| Lecture 9 | Simplifying logic circuits using Karnugh Maps |
| Lecture 10 | Code Conversions |
| Lecture 11 | Interfacing the analog and digital signals |
| Lecture 12 | Digital – to- Analog (D/A) circuit analyses |

Lecture 13 Analog – to- Digital (A /D) circuit analyses
Lecture 14 Applications and discussions

**4. Teaching and Learning Methods**

- Lectures
- Discussions
- Self-learning

**5. Student Assessment**

| Assessment Method | Skills assessed* | Assessment Length | Schedule | Proportion |
|---|---|---|---|---|
| Written Examination | KU, I, T | 3 Hour Examination | At the end of the course | 100% |

*KU: Knowledge and Understanding, I: Intellectual, P: Professional, T: Transferable

**6. List of references**

*Course notes*

- Notes of the professor of the course.
- Handouts and exercise sheets given regularly.

*Essential books*

-W. D. Callister Jr., Materials Science and Engineering, An Introduction, John Wiely 5th edition 2007.

- Roger l. Tokheim, Digital Principles Schaum's Outline Series, 1985.
- Introduction to Solid State Physics, C. Kittel, Wiley eastern pub. Co., India, 1984.

*Recommended Text*

- Paul Horowitz and Winfield Hill, "The art of electronics", Cambridge University Press, Cambridge 1989.

**7. Facilities required for teaching and learning**

- Board and dustless chalk or board pens
- Over-head Projector
- Data show

**Course Code / Course Title: 1203- Crystalline and non-crystalline solid state physics& Digital Electronics**

| Course Contents | Course intended learning outcomes ILOs | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | | Intellectual | | | | | Practical | | | Transferable | |
| **Part - 1 Crystalline and non-crystalline solid state physics** | **A1** | **A2** | **A3** | **A4** | **A5** | **B1** | **B2** | **B3** | **B4** | **B5** | **C1** | **C2** | **C3** | **D1** | **D2** |
| Introduction -Atomic structure and interatomic bonding | √ | | | | | √ | √ | | | | | | | | |
| The structure of crystalline solids | | √ | | | | | | | | | | | | | |
| Imperfections in solids (defects) | | √ | | | | | | | | | | | | | |
| Imperfections in solids (impurities) | | | √ | | | | √ | √ | | | | | | | |
| Structure and properties of ceramics | | | √ | | | | | √ | | | | | | | |
| Advanced ceramics | | | √ | | | | | | | | | | | | |
| Polymers | | | | | | | | | | | | | | | |
| Assessment | √ | √ | √ | | | √ | √ | √ | | | | | | | |
| Characteristics, applications, and processing of polymer | | | | | | | | √ | | | √ | | | √ | |
| Electrical properties | | | √ | | | | | √ | | | | | | √ | |
| Thermal properties | | | √ | | | | | | | | | | | √ | |
| Magnetic properties | | | √ | | | | | | | | √ | | | | |
| Optical properties | | | √ | | | | | | | | | | | √ | |
| Discussion and revision | √ | √ | √ | | | √ | √ | √ | | | | | | | |
| **Part -2 Digital 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 and discussions | | | | √ | √ | | | | | | | √ | √ | | |

## Learning and Teaching Methods

| Learning Methods | Course outcomes ILOs | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | | Intellectual Skills | | | | | Professional and Practical Skills | | | General and Transferable Skills | |
| | A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | C1 | C2 | C3 | D1 | D2 |
| **Lectures** | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | | | | | |
| **Discussions** | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | | | | | |
| **Self-learning** | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |

## Assessment Methods

| Assessment Methods | Course outcomes ILOs | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | | Intellectual Skills | | | | | Professional and Practical Skills | | | General and Transferable Skills | |
| | A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | C1 | C2 | C3 | D1 | D2 |
| **Written Examination** | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | | |

| | Course Coordinator | Head of Department |
|---|---|---|
| Name | Prof. Hassanein ElLabany | Prof. Riyad Ghazy |
| Name (Arabic) | أ. د. حسنين اللبانى | أ. د. رياض غازى |
| Signature | | |
| Date | 2014 | 2014 |

| | | |
|---|---|---|
| Course Title | **Renewable Energy Resources & Physical Electronics** | |
| Course Code | **1204** | |
| Academic Year | **2014/2015** | |
| Coordinator | **Prof. Mohamed Raafat Ismail Ramadan** | |
| Other staff | **Prof. Talaat Mohamed Meaz** | |
| Level | **Pre-master courses** | |
| Other staff | | |
| Pre-Requisite | | |
| Course delivery | **Lecture** | |
| | | |
| | **Exercises** | |
| Parent Department | **Physics Department** | |
| Date of Approval | **September, 2014** | |

**1. Aims**

This course aims to enable students to acquire good awareness of:

conventional energy resources - solar energy - thermal and electrical applications of solar energy - wind energy - biomass energy - geothermal energy - hydropower - nuclear energy - ocean thermal energy conversion – hydrogen - energy storage - energy saving - types of detectors - circuits of pulse shaping - integration and differentiation - delay line shaping – pre and main amplifier - discrimination and Schmitt trigger – single and multi-channel analyzer - coincidence measurements and vacuum techniques, and also communication skills.

**2. Intended Learning outcomes**

***A. Knowledge and understanding:***

At the end of this module students should be able to:

A1. Define energy and its resources.

A2. Recognize thermal and electrical applications of solar energy.

A3. Illustrate wind energy, biomass energy, geothermal energy, hydropower and nuclear energy.

A4. Discuss the basic Concepts of radiation detection and the different types of detectors.

A5. Explain Pulse shaping, differentiation and integration.

***B. Intellectual skills**:*

Students will also acquire the ability to apply, evaluation and interpret this knowledge to

B1. Demonstrate in details different renewable energy resources.

B2. Discuss examples of thermal and electrical applications of solar energy.

B3. Distinguish between the conventional and renewable energy sources and utilizations.

B4. Design amplifier circuits.

B5. Distinguish between single channel and multi-channel analyzers.

***C. Professional and practical skills:***

Students will be able to

C1. Explain photovoltaic cells.

C2. Join a scientific team work working in the field of solar energy and renewable energy resources.

C3. Formulate mathematical equations that can describe accurately physical states.

C4. Use vacuum techniques.

***D. General and transferable skills:***

Students will be able to

D1. Search in text books and internet materials to improve this knowledge.

D2. Communicate with other scientific teams.

**3. Contents**

| | |
|---|---|
| ***Section I*** | ***Renewable Energy Resources*** |
| Lecture 1 | Energy. |
| Lecture 2 | Conventional Energy Resources (Fossil Fuels: Coal, Oil and Natural Gas). |
| Lecture 3 | Solar Energy (Solar Radiation). |
| Lecture 4 | Solar Energy (Thermal and Electrical applications). |
| Lecture 5 | Wind Energy |
| Lecture 6 | Biomass Energy |
| Lecture 7 | Geothermal Energy |
| Lecture 8 | Assessment |
| Lecture 9 | Hydropower |
| Lecture 10 | Nuclear Energy (Fission and Fusion) |
| Lecture 11 | Ocean Thermal Energy Conversion (OTEC) |
| Lecture 12 | Hydrogen |
| Lecture 13 | Energy Storage |
| Lecture 14 | Saving Energy and Energy Efficiency |
| ***Section II*** | ***Physical Electronics*** |
| Lecture 1 | Introduction and overview |
| Lecture 2 | Basic Concepts of radiation detection |
| Lecture 3 | Different types of detectors |
| Lecture 4 | Pulse shaping, integration and differentiation, delay line shaping |
| Lecture 5 | Pre-amplifier |
| Lecture 6 | Main amplifier ( two stage and Three stage) |
| Lecture 7 | FET (field effect transistor): types, characteristics and uses. |
| Lecture 8 | Assessment |
| Lecture 9 | Discrimination, Schmitt trigger |
| Lecture 10 | Single channel analyzer, multi-channel analyzer |

Lecture 11    Scalar and data recording, data output
Lecture 12    Coincidence measurements
Lecture 13    Vacuum techniques
Lecture 14    Vacuum techniques

## 4. Teaching and Learning Methods

- Lectures
- Discussions
- Self-learning

## 5. Student Assessment

| Assessment Method | Skills assessed* | Assessment Length | Schedule | Proportion |
|---|---|---|---|---|
| Written Examination | KU, I, T | 3 Hour Examination | At the end of the course | 100% |

*KU: Knowledge and Understanding, I: Intellectual, P: Professional, T: Transferable

## 6. List of references

*Course notes*

- notes of the professor of the course.
- Handouts and exercise sheets given regularly.

*Essential books*

- Paul Horowitz and Winfield Hill, "The art of electronics", Cambridge University Press, Cambridge 1989.
- G. D. Rai, Utilization of solar energy, Khanna Publishers, Delhi, 1980.

*Recommended Text:*

- J. A. Duffie and W. A. backman Solar engineering of thermal processors, Wiley & Sons, NewYork,1980.

## 7. Facilities required for teaching and learning

- Board and dustless chalk or board pens
- Over-head Projector
- data show

**Course Code / Course Title: 1204- Renewable Energy Resources & Physical Electronics**

| Course Contents | Course intended learning outcomes ILOs | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | | Intellectual | | | | | Practical | | | | Transferable | |
| **Part - 1 Renewable Energy Resources** | **A1** | **A2** | **A3** | **A4** | **A5** | **B1** | **B2** | **B3** | **B4** | **B5** | **C1** | **C2** | **C3** | **C4** | **D1** | **D2** |
| Energy. | √ | | | | | | | | | | | | | | | |
| Conventional Energy Resources (Fossil Fuels: Coal, Oil and Natural Gas) | √ | √ | | | | | | | | | | | | | | |
| Solar Energy (Solar Radiation). | | √ | | | | | | | | √ | | | | | | |
| Solar Energy (Thermal and Electrical applications). | | √ | | | | | √ | | | | | | | | | |
| Wind Energy | √ | | √ | | | √ | | | | √ | | | | | | |
| Biomass Energy | √ | | √ | | | √ | | | | √ | | | | | √ | |
| Geothermal Energy | √ | | √ | | | √ | | | √ | | √ | | | √ | | √ |
| Assessment | | | | | | √ | | | √ | | √ | | | √ | | √ |
| Hydropower | | | √ | | | √ | | | √ | | √ | | | √ | | √ |
| Nuclear Energy (Fission and Fusion) | √ | √ | | | | | | | | | | | | √ | | |
| Ocean Thermal Energy Conversion (OTEC) | | √ | | | | √ | | | | | √ | | | √ | | |
| Hydrogen | √ | | | | | √ | | | √ | √ | | | | | | √ |
| Energy Storage | | √ | | | | | | | | | | | | | | |
| Saving Energy and Energy Efficiency | | | √ | | | | | | | | | | | | | |
| **Part 2 Physical Electronics** | | | | | | | | | | | | | | | | |
| Introduction and overview | | | | √ | | | | | | | | | | | | |
| Basic Concepts of radiation detection | | | | √ | | | | | | | | | | | | |
| Different types of detectors | | | | √ | | | | | | √ | | | | | | |
| Pulse shaping, integration and differentiation, delay line shaping | | | | | √ | | | | | √ | | | | | √ | |
| Pre-amplifier | | | | | √ | | | | √ | | √ | | | √ | | √ |
| Main amplifier ( two stage and Three stage) | | | | | √ | | | | √ | | √ | | | √ | | √ |
| FET (field effect transistor): types, characteristics and uses. | | | | | √ | | | | √ | | √ | | | √ | | √ |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Assessment | | | | √ | √ | | | | | | | | | √ | | |
| Discrimination, Schmitt trigger | | | | | √ | | | | | | √ | | | √ | | |
| Single channel analyzer, multi channel analyzer | | | | | √ | | | | | | | | | | | |
| Scalar and data recording, data output | | | | | √ | | | | | | | | | | | |
| Coincidence measurements | | | | | √ | | | | | | | √ | | | | |
| Vacuum techniques | | | | | √ | | | | | | | √ | | | | |
| Vacuum techniques | | | | | √ | | | | | | √ | | √ | | | √ |

## Learning and Teaching Methods

| **Learning Methods** | **Course outcomes ILOs** | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Knowledge and Understanding** | | | | | **Intellectual Skills** | | | | | **Professional and Practical Skills** | | | | **General and Transferable Skills** | |
| | **A1** | **A2** | **A3** | **A4** | **A5** | **B1** | **B2** | **B3** | **B4** | **B5** | **C1** | **C2** | **C3** | **C4** | **D1** | **D2** |
| **Lectures** | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | | | | | | |
| **Discussions** | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | | | | | | |
| **Self-learning** | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |

## Assessment Methods

| **Assessment Methods** | **Course outcomes ILOs** | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Knowledge and Understanding** | | | | | **Intellectual Skills** | | | | | **Professional and Practical Skills** | | | | **General and Transferable Skills** | |
| | **A1** | **A2** | **A3** | **A4** | **A5** | **B1** | **B2** | **B3** | **B4** | **B5** | **C1** | **C2** | **C3** | **C4** | **D1** | **D2** |
| **Written Examination** | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | | |

| | **Course Coordinator** | **Head of Department** |
|---|---|---|
| Name | **Prof. Mohamed Raafat Ramadan** | **Prof. Riyad Ghazy** |
| Name (Arabic) | أ. د. محمد رأفت اسماعيل رمضان | أ. د. رياض غازي |
| Signature | | |
| Date | 2014 | 2014 |

| | | |
|---|---|---|
| Course Title | **Special Course** | |
| | | |
| Course Code | **1205** | |
| Academic Year | **2014/2015** | |
| Coordinator | **Prof. Riyad Ghazy** | |
| Other Staff | **All Staff members** | |
| Semester | 1 and 2 | |
| Level | **Pre master year** | |
| Pre-Requisite | | |
| Course Delivery | **Lectures** | |
| | | |
| Parent Department | **Physics** | |
| Date of Approval | **September, 2014** | |

**Aims**

- This module aims to acquire knowledge and understanding in a specific branch of Physics that will be explored intensively in the master thesis and develop reading and writing skills.
- The available branches for special course in Physics:

Radiation physics, high energy physics, biophysics, solid state physics, materials science, electronics, solar energy and plasma physics.

**Intended Learning outcomes**

***A. Knowledge and understanding:***

Upon successful completion of this course the student should be able to:

A1. Obtain information on a specified topic in physics from variety of sources including the primary scientific literature.

A2. Organize and integrate information into an effective argument.

A3. Demonstrate awareness of current developments in the physics, their applications and any ethical issues involved.

***B. Intellectual skills:***

They will also acquire the ability to

B1. Read and use literature with critical understanding, give a clear and accurate account of the subject matter, think independently, formulate arguments and engage in debate.

B2. Analyze, synthesize and summarize information critically. Apply subject knowledge and understanding.

***C. Professional and practical skills:***

C1. Recognize and apply subject-specific concepts and principles.

C2. Analyze, summarize and integrate information critically from a variety of media.

C3. Design, plane, conduct and report on investigations, with appropriate regard to safety and ethical issues.

C4. Present scientific information in the form of a poster.

***D. General and transferable skills:***

D1. Develop an appreciation of the interdisciplinary nature of science. Recognize and respect the views and opinions of peers in the tutorial setting.

D2. Self-management and professional development.

D3. Use IT skills in production of the project report, and use of statistical and other data analysis software packages. Communicating in written, verbal, graphical and visual forms.

D4. Develop study skills for lifelong learning: independent working, time management and organization

**3. Content**

This module is given over two semesters with no fixed program. It will give students the opportunity to develop their written communication skills by being given practice at obtaining information from a variety of sources, organizing and presenting it as a cogent argument.

**4. Teaching and Learning Methods**

- Students are encouraged to devote private study time to reading from a collection of general texts held in the library and to be aware of current developments via the popular scientific press.
- **Supervision**: The level of contact between students and supervisors during course work will vary across the different disciplines in the Faculty but all students are required to maintain regular contact with the supervisor. This is the student responsibility. Student should note that they are required to meet with the supervisor at least once every two weeks during the semesters to discuss progress. Student may, of course, make an appointment to see his supervisor at any time. Students who fail to make regular contact with the Supervisor will be reported to the coordinator of Teaching. Students should remember, the supervisor is also his personal tutor with whom he should raise any issues of concern which may be affecting his work.

**5. Student Assessment**

**One written exam 100%**

**6. List of references**

Initially, students are provided with a limited number of references relating to their subject area, but then are expected to search the literature on their own.

***Essential Books:***

***Vary from topic to topic***

***Recommended Books:***

***Vary from topic to topic***

**7. Facilities required for teaching and learning**

Library – Internet- data show

| Course Coordinator | | Head of Department | |
|---|---|---|---|
| Name (Arabic) | : أ.د. رياض غازى | Name (Arabic) | : أ.د. رياض غازى |
| Name Signature | Prof. Riyad Ghazy<br>: ................................... | Name Signature | : Prof. Riyad Ghazy<br>: ...................................... |
| | | Date | : 2014 |

| Course Title | **Introduction to Computer Science** | |
|---|---|---|
| | | |
| Course Code | **1207** | |
| Academic Year | **2014/2015** | |
| Coordinator | **Prof. Mohamed El-Awady** | |
| Other Staff | **Prof. Mahmoud Kamel, Prof. Qadry Zakaria** | |
| Semester | **Pre-master courses : Taught over 2 semesters** | |
| Pre-Requisite | **B.Sc.** | |
| Course Delivery | **Lecture** | **28 x 1h lectures** |
| | **Practical** | **28 x 1h practical** |
| Parent Department | **Computer Centre** | |
| Date of Approval | **September, 2014** | |

**Aims**

This course will enable students to acquire knowledge and understanding of:

This course will enable students to acquire a range of transferable skills that are important for post graduate M. Sc. students to:

- Develop their capability for information retrieval and presentation, and proficiency in the use of IT effectively in the context of their studies.
- Underpin academic work throughout postgraduate studies.
- Provide opportunities to develop skills required for team working, oral presentation of scientific material, and career choices.

***A. Knowledge and understanding:***

Upon successful completion of this course the students should be able to:

A1. Demonstrate knowledge and understanding of the use of IT in the context of their postgraduate studies.

A2. Know the diverse media and hardware and software that help to benefit of the IT in the context of the postgraduate studies.

A3. Create powerful presentation using sophisticated software packages.

A4. Make use of different internet resources.

A5. Make use of different photo enhancing and manipulation techniques.

***B. Intellectual skills:***

They should also acquire the ability to:

B1. Integrate different application programs to develop effective information analysis and presentation.

B2. Carry out necessary graphical, statistical and frequency analyses of different types of data.

***C. Professional and practical skills:***

C1. Use a number of computer packages to present information.

C2. Solve scientific problems using computer programming.

***D. General and transferable skills:***

D1. Use the internet/electronic resources to obtain subject specific information, and to develop lifelong learning skills that can be applied to suitable research problems.

**3. Contents**

| | |
|---|---|
| Lectures 1-2 | Methods for graphical representations, Data analysis and Data modeling<br>Assignment 1 : Using Application programs<br>Calculation of Slope and intersection of lines ,<br>Best fitting for data,<br>Extracting Trend , and Equations for acquired data (linear – exponential- logarithmic ….etc ) |
| Lectures 3-5 | Statistical Data analysis<br>Assignment 2 : Using Application programs<br>Apply some statistical function such as Average, Median, STDEV, and Correlation on a simulated data |
| Lecture 6-7 | Creating powerful presentation including charts, images, video, etc and different attractive animations<br>Assignment 3 : Using PowerPoint program<br>Design a real and powerful presentation with different acquired skills |
| Lecture 8-9 | Use of internet capabilities and searching engines<br>Assignment 4: Using the Internet<br>Life search on the internet for some real information |
| Lecture 10-11 | Creating Data Base and related Queries and Reports<br>Assignment 5: Using Application programs<br>Creating a real Data Base and apply different queries and reports to extract useful information |
| Lecture 12-13 | Computer programming language<br>Assignment 6: Programming using Visual Basic 6<br>Solving real problems using a computer language |
| Lecture 14-15 | Photo manipulation and enhancement using the photoshop<br>Assignment 7: Using the Photoshop program<br>Practicing on manipulation and enhancing of images |
| Lectures 16 | Introduction to Data frequency analysis using Fourier analysis and Fourier transformation searching for periodicities |

### 4. Teaching and Learning Methods

- Lectures
- Discussions
- Self-learning
- Practical

The course is delivered through lectures, practical sessions and assignments. Team working skills are developed on a week-long laboratory exercises and the students present and defend their findings in a public seminar.

### 5. Student Assessment

| Assessment Method | Skills assessed* | Assessment Length | Schedule | Proportion |
|---|---|---|---|---|
| Written Examination | KU, I, T | 3 Hour Examination | At the end of the course | 60% |
| Practical Examination | KU, I, T, P | 3 Hour Examination | At the end of the course | 40% |

*KU: Knowledge and Understanding, I: Intellectual, P: Professional, T: Transferable

### 6. List of references

*Course notes:*

- Notes given to students at each section describe the tasks to be completed, therefore no particular book(s) recommended.

### 7. Facilities required for teaching and learning

- Projectors; Video and Overhead
- LCD screens and writing Boards
- Commercial computer scientific software packages.

**Course Code / Course Title: 1207- Introduction to Computer Science**

| Course Contents | Course intended learning outcomes ILOs | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | | Intellectual | | Practical | | Transferable |
| | A1 | A2 | A3 | A4 | A5 | B1 | B2 | C1 | C2 | D1 |
| Methods for graphical representations, Data analysis and Data modeling<br>Assignment 1 : Using Application programs<br>Calculation of Slope and intersection of lines ,<br>Best fitting for data,<br>Extracting Trend , and Equations for acquired data (linear – exponential- logarithmic ….etc ) | √ | √ | | √ | | | √ | | √ | √ |
| Statistical Data analysis<br>Assignment 2 : Using Application programs<br>Apply some statistical function such as Average, Median, STDEV, and Correlation on a simulated data | √ | | | √ | √ | √ | √ | √ | | √ |
| Creating powerful presentation including charts, images, video, etc and different attractive animations<br>Assignment 3 : Using PowerPoint program<br>Design a real and powerful presentation with different acquired skills | √ | | | √ | √ | | | √ | | |
| Use of internet capabilities and searching engins<br>Assignment 4: Using the Internet<br>Life search on the internet for some real information | √ | | √ | | | √ | | | √ | |
| Creating Data Base and related Queries and Reports<br>Assignment 5: Using Application programs<br>Creating a real Data Base and apply different queries and reports to extract useful information | | | √ | | √ | √ | | √ | | √ |
| Computer programming language<br>Assignment 6: Programming using Visual Basic 6<br>Solving real problems using a computer language | √ | √ | | √ | | | √ | | | √ |
| Photo manipulation and enhancement using the Photoshop | √ | √ | | | | √ | | | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Assignment 7: Using the Photoshop program<br>Practicing on manipulation and enhancing of images | | | | | | | | | | |
| Introduction to Data frequency analysis using Fourier analysis and Fourier transformation searching for periodicities | | | √ | | √ | | √ | √ | | √ |

## Learning and Teaching Methods

| Learning Methods | Course outcomes ILOs | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | | Intellectual Skills | | Professional and Practical Skills | | General and Transferable Skills |
| | A1 | A2 | A3 | A4 | A5 | B1 | B2 | C1 | C2 | D1 |
| **Lectures** | √ | √ | √ | √ | √ | √ | √ | | | |
| **Discussions** | √ | √ | √ | √ | √ | √ | √ | | | |
| **Self-learning** | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| **Practical** | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |

## Assessment Methods

| Assessment Methods | Course outcomes ILOs | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | | Intellectual Skills | | Professional and Practical Skills | | General and Transferable Skills |
| | A1 | A2 | A3 | A4 | A5 | B1 | B2 | C1 | C2 | D1 |
| **Written Examination** | √ | √ | √ | √ | √ | √ | √ | √ | √ | |
| **Practical Examination** | √ | √ | √ | √ | √ | √ | √ | √ | √ | |

| | **Course Coordinator** | **Head of Department** |
|---|---|---|
| Name | Prof. ………………………. | Prof. Elsaid Taha Rizk |
| Name (Arabic) | ……………………………. | أ.د. السيد طه رزق |
| Signature | | |
| Date | /9/2014 | /9/2014 |

## Ph. D. Program of Physics

### Academic Standards For Ph. D. of Physics

The Academic Reference Standards for the award of the Ph.D. degree in physics as well the attributes and capabilities of the graduate were based on the General Academic Reference Standards (ARS) for graduate studies published by the National Authority for Quality Assurance and Accreditation of Education for Ph.D. degree. The following Specific Academic Standards for the **Ph.D. of Physics** were approved by the Council of the physics department, on 30/12/2014**.**

- **Graduate Attributes**

**The Ph.D. holder of Physics must have the ability to:**

- apply perfectly the basis and methodologies of scientific research in the field of specialty in physics for example: radiation physics, laser physics, plasma physics, materials physics, digital electronics and renewable energy resources.
- work continuously to add new knowledge in the field of specialty in physics.
- apply the critical and analytical methods in physics and in the related fields.
- merge/mix specialized knowledge with other related knowledge to deduce interrelations knowledge.
- show deep awareness of current problems and modern theories in the field of specialty in physics.
- go on developing himself/ herself and to transfer his/her knowledge and experience to others.
- be aware of his/her role in developing society and environment control.
- communicate effectively and lead a work team in different professional situations.
- design and implement a project for the generation of new knowledge and applications
- know a detailed understanding of applicable techniques for research and advanced academic enquiry.
- act in a way that reflects objectively, truthfulness and professional rules.
- be a decision maker on the light of the available information.

The Academic Reference Standards for the award of the Ph.D. degree in physics as well the attributes and capabilities of the graduate were based on the General Academic Reference Standards (ARS) for graduate studies published by the National Authority for Quality Assurance and Accreditation of Education for Ph.D. degree. The following Specific Academic Standards for the **Ph.D. of Physics** were approved by the Council of the physics department, on 30/12/2014**.**

### 3.1. Graduate Attributes

The Ph.D. degree Holders in Physics must be able to:

1- Apply perfectly the basis and methodologies of scientific research in physics.

2- Work continuously to add new knowledge in the field of physics.

3- Apply the critical and analytical methods in physics and in the related fields.

4- Merge specialized knowledge with other related knowledge to deduce interrelations knowledge.

5- Show deep awareness of current problems and modern theories in physics.

6- Go on developing himself and to transfer his knowledge and experience to others.

7- Be aware of his/her role in developing society and environment control.

8- Communicate effectively and lead a work team in different professional situations.

9- Design and implement a project for the generation of new knowledge, applications or understanding at the forefront of the discipline, and to adjust the project design in the light of unforeseen problems.

10- Known a detailed understanding of applicable techniques for research and advanced academic enquiry.

11- Act in a way that reflects objectively, truthfulness and professional rules.

12- Be a decision maker on the light of the available information.

### 3.2. Knowledge and understanding

By the end of the Physics Ph.D. program, graduate must be able to:

3.2.1. Explain theories and fundamentals and modern knowledge in the field of physics and related areas.

3.2.2. Illustrate fundamentals and methodologies and the ethics of scientific research and its various tools.

3.2.3. Recognize legal and ethical principles for professional practice in the field of physics.

3.2.4. Define principles and fundamentals of quality in professional practice in field of physics.

3.2.5. Recognize the effects of professional practice on the environment and ways of development and preservation of the environment.

**3.3. Intellectual skills**

By the end of the Physics Ph.D. program, graduate must be able to:

3.3.1. Analyze and evaluate the information in field of physics and analogies to solve problems.

3.3.2. Solve physics problems on the basis of available data.

3.3.3. Execute research studies that can contribute and add to the knowledge in the field of physics.

3.3.4. Write scientific papers in his specialty.

3.3.5. Manage risk in professional practice.

3.3.6. Develop decision-making in different professional contexts.

3.3.7. Discuss subjects based on scientific evidences.

**3.4. Professional skills**.

By the end of the physics Ph.D. program, graduate must be able to:

3.4.1 Use basic, professional and modern skills in the field of physics.

3.4.2 Write professional reports.

3.4.3 Evaluate and develop methods and tools existing in the field of physics.

3.4.4 Use technological means to serve the professional practice.

3.4.5 Plan for the development of professional practice and development of the performance of others.

**3.5. General skills and transition**.

By the end of the Physics Ph.D. program, graduate must be able to:

3.5.1. communicate effectively with colleagues and others.

3.5.2. use information technology to serve the development of professional practice .

3.5.3. teach others and evaluate their performance.

3.5.4. develop self-evaluation and continuous learning.

3.5.5. use different sources of information and knowledge.

3.5.6. work in a team and be able to lead working groups.

3.5.7. manage scientific meetings and time.

## A. Program Specification

| | |
|---|---|
| Program Title | **Physics (Ph.D.)** |
| Award | **Ph.D. Physics** |
| Parent Department | **Physics Department** |
| Teaching Institution | **Faculty of Science – TU** |
| Awarding Institution | **Tanta University** |
| Coordinator | **Prof. Riyad Ghazy** |
| External Evaluator(s) | |
| Benchmarking Standards | **Academic Reference Standards (ARS)** |
| Other Reference Points | |
| Date of intake | **Every year in October** |
| Review Date | |
| Date of Approval | **September, 2014** |

### 1. Aims

The Program aims to:

1- Provide an in-depth understanding of current topics related to the accurate specialization in Physics of the students.

2- Enable the students to employ their advanced physics knowledge in doing research in various current branches of physics.

3- Qualify the students to be independent researchers in the same field of study.

4- Qualify the students to become effective staff members of their university or equivalent employees in public or private sectors.

### 2. Intended Learning outcomes

***A. Knowledge and understanding:***

By the end of this programme students should be able to:

A1. recognize the modern theories and basis knowledge in physics.

A2. illustrate fundamentals, methodologies and ethics of the scientific research and its

different tools.

A3. recognize legal and moral principles of professional practices in physics.

A4. define principles and basis of quality in the professional practices in physics.

A5. recognize connection with his/her professional practice to the environment development and maintenance

***B. Intellectual skills:***

By the end of this programme students will also acquire the ability to:

B1. Analyse professional problems and find innovative solutions to solve them.

B2. Make decisions in the light of available knowledge.

B3. Examine critically scientific evidence, both quantitative and qualitative, in order to arrive at evidence-based conclusions.

B4. Evaluate the risks in professional practices in physics.

B5. Publish scientific articles.

***C. Professional and practical skills:***

By the end of this programme students will also acquire the ability to:

C1. Functionalize the available resources effectively and develop them and find new resources.

C2. Use new technology to serve professional practices in physics.

C3. Write and evaluate professional reports.

C4. Estimate and develop methods and tools in physics.

C5. Prepare and execute annual management plans based on scientific observation.

***D. General and transferable skills:***

By the end of this program students will also acquire the ability to:

D1. Communicate effectively in written and oral manners.

D2. Apply numerical and IT skills with confidence and accuracy.

D3. Work independently or with others in a team and manage time.

D4. Adopt self and long life learning for personal and professional development.

D5. Manage scientific meetings and time control.

**3. Academic standards**

**General Academic Reference Standards (ARS)**

**4- Curriculum Structure and Contents:**

**4.a. Program duration**: At least two years for the thesis preparation.

**4.b. Program Structure**

Thesis in different branches of Physics

**Thesis**

The thesis of Ph. D. program is a formal written document representing sustained research into an important intellectual issue. The thesis must be an independent effort which contributes to the accumulated understanding of the field in which it is written. The required research preparation and advanced research methods courses will help the student to focus his or her research effort, and provide general guidelines for research approach and report preparation. Thesis will be reviewed and approved by the candidate's supervising professor and external academic review committee.

The thesis should contain at least the following:

- Title page (title, name of student, university, faculty, name of program, date, supervisors
- Table of contents
- Introduction, containing a definition of the thesis statement, working method, the theoretical framework, and the aim.
- Literature review.
- Materials and methods.
- Results
- Discussion and conclusions
- References.

Language of the thesis

The thesis must be written in English language accompanied by a summary in Arabic.

**Formation of Examiners Committees**

A committee is selected by Physics Department Council. The Ph. D. Degree is awarded to the applicant by University, upon the recommendation of the department and the Faculty Council.

**6- Program Admission Requirements:**

An applicant for admission to the doctor's program in physics should hold an M.Sc. degree in Physics or equivalent degree.

**7- Program Student Evaluation**

a - Written Thesis

b – Oral Presentation

c- Defense

d- At least one published paper in a peer reviewed journal.

| **Name** | **Signature** | **Date** |
|---|---|---|
| *Program Coordinator:*<br>Prof. Riyad Ghazy<br>**(أ. د. رياض غازى)** | ……………………………… | 2014 |
| *Head of Quality Assurance Unit:*<br>Prof. Hoda Kamal M. ElSayed<br>**(أ. د. هدى كمال السيد )** | ……………………………… | 2014 |
| *Dean of the Faculty:*<br>Prof. Tarek Fayed<br>**(أ. د. طارق فايد)** | ……………………………… | 2014 |

# Postgraduate

# Program and Course Specifications

# Chemistry

## 2014-2015

# *Contents*

# Diploma of Science Degree in Analytical Chemistry

## Academic Standards for the Diploma in Analytical Chemistry

- **Academic Reference Standards:** The National Academic Reference Standards (NARS) for Diploma program degree in analytical chemistry as well as the attributes and capabilities of the graduates were based on the National Academic Reference Standards (NARS) for graduate studies published by the National Authority for Quality Assurance and Accreditation of Education for Diploma. Specific reference standard for the Diploma in Analytical Chemistry were approved by the Council of the Faculty of Science, Tanta University in 2014.

**1.1. Graduate Attributes.**

*The graduate of the Diploma must be able to:*

1.1.1. Apply the basic concepts of scientific research.

1.1.2. Apply the concepts of "analysis" and its use in the field of chemistry.

1.1.3. Construct related subjects and information to be applied professionally.

1.1.4. Show deep knowledge of the current problems in chemistry.

1.1.5. Solve problems using a range of formats and approaches.

1.1.6. Choose the appropriate technological techniques.

1.1.7. Communicate effectively and show a perfect professional leadership.

1.1.8. Make decisions regarding the professional activities.

1.1.9. Make use of the available facilities.

1.1.10. Recognize his/her role for society development.

1.1.11. Self–learning in both academic and professional areas.

**1.2. Knowledge and Understanding**:

*By the end of the study program of graduate of Diploma must able to:*

1.2.1. Know the theories and fundamentals related to the area of study as well as related areas.

1.2.2. Mutual influence between professional practice and its impacts on the environment.

1.2.3. Understand the legal and ethical principles of professional practice in the area of study specialization.

1.2.4. Know the basis of quality in professional practice in the area of specialization.

**1.3. Intellectual skills**

*By the end of the study program of graduate of Diploma must able to:*

1.3.1. Analyze and evaluate the information in the field of specialization.

1.3.2. Solve specialized problems in case of lack of information.

1.3.3. Link between different knowledge to solve professional problems.

1.3.4. Conduct a research study and / or write a methodology of a scientific investigation.

1.3.5. Risk assessment in professional practices in the area of interest.

1.3.6. Planning to improve performance in the field of interest.

1.3.7. Make the proper decision in diverse professional contexts.

**1.4. Professional skills**.

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

1.4.1. Mastery of, modern professional basic skills in the area of specialization.

**1.5. General and transferable skills**.

*By the end of the master's program graduate must be able to:*

1.5.1. Communicate effectively to obtain required knowledge.

1.5.2. Use of information technology to serve the professional practice.

1.5.3. Develop rules and indicators for assessing the performance of others.

1.5.4. Work in a team, and leading team work in professional contexts.

## A. Program Specification

| Program Title | Diploma of Science Degree in Analytical Chemistry |
|---|---|
| Award | Diploma of Science Degree in Analytical Chemistry |
| Parent Department | Chemistry Department |
| Teaching Institution | Faculty of Science – Tanta University |
| Awarding Institution | Tanta University |
| Coordinator | Prof. Tarek A. Fayed |
| External Evaluator(s) | Prof. Magdi S. Farag<br>Faculty of Science –Cairo University |
| QAA Benchmarking Standards | National Academic Reference Standards (NARS) |
| Other Reference Points | Egyptian Code of Assessment |
| Date of delivery | Every year in September |
| Review Date | Internal Periodic Review, Summer 2014 |
| Date of Approval | September, 2014 |

### 1. Aims

The graduate program in Analytical Chemistry Diploma is a professional degree and aims to:

1.1 Meet the requirements of the rapidly increasing demands of research and development needs of industry and environment.

1.2 Provide flexibility, knowledge and motivation required to strengthen the students' background in analytical chemistry and its applications in industry and health control or environmental science and environmental management through offering general and special courses and holding seminars to study related subjects and discuss how to get suitable solutions for chemical constitution problems especially in quality control and consultation aspects.

1.3 Provide opportunities of students to develop and strengthen their abilities and higher skills (professional, communication, responsibility, ethical and IT) in a scientific and technological context necessary to be competent analytical chemists and work as a professional chemist in different carries.

1.4 Develop an appreciation of the importance of chemistry in an industrial, health, environmental and social context

### 2. Intended Learning outcomes

*A. Knowledge and understanding:*

At the end of this module students should be able to:

A1.Recognize the different underlying concepts and principles of analytical chemistry in particular advanced analytical techniques relevant to industrial, health and environmental applications.

A2.Identify the principles and procedures used in sampling, chemical analysis and the characterization of different chemical compounds based on ethical and economical aspects.

A3. Explain the scientific procedures and methodology of deducing and solving chemical problems in different areas for consultation inquiry and industrial-based scientific research.

A4.Indicate theories and applications of wide range of advanced analytical techniques utilized in various applications.

*B. Intellectual skills:*

They should be also acquiring the ability to:

B1. Formulate hypotheses, plan and execute laboratory investigation.

B2. Identify and analyze complex analytical problems.

B3. Apply subject knowledge and understanding to formulate chemical problems within a given frame.

B4. Analyse, synthesize and assimilate diverse information in a critical manner.

B5. Correctly document the scientific work, and comprehensively discuss the results and conclusions.

B6. Develop work, evaluate the outcomes and draw valid conclusions.

B7. Present logical solutions that display originality or creativity in industrial, health and environmental fields

*C. Professional and practical skills:*

They should be also acquiring the ability to:

C1. Record, collect, analyse and report data of laboratory and field investigations.

C2. Undertake laboratory investigations in a responsible, safe and ethical manner to control and develop chemical industries and environment.

C3. Plan, design and execute practical investigations competently, from the problem-recognition stage through to the evaluation and appraisal of results and findings on ethical, legal and quality assurance principles.

C4. Select and conduct appropriate strategies, analytical techniques and procedures for the collection, examination and analyzing of different samples.

*D. General and transferable skills:*

They should be also acquiring the ability to:

D1. Communicate clearly, confidently and effectively using a range of presentational techniques.

D2. Apply numerical and IT skills for information and data collection as well as professional development.

D3. Work both independently and in collaboration with others in a team.

D4. Take responsibility for long-life self-learning and personal/professional development.

3. Academic standards

- **Academic Reference Standards:** The National Academic Reference Standards (NARS) for Diploma program degree in chemistry as well as the attributes and capabilities of the graduates were based on the National Academic Reference Standards (NARS) for graduate studies published by the National Authority for Quality Assurance and Accreditation of Education for Diploma. Specific reference standard for the Diploma in Analytical Chemistry were approved by the Council of the Faculty of Science, Tanta University in 2014.

**3.1. Graduate Attributes.**

*The graduate of the Diploma must be able to:*

3.1.1. Apply the basic concepts of scientific research.
3.1.2. Apply the concepts of "analysis" and its use in the field of chemistry.
3.1.3. Construct related subjects and information to be applied professionally.
3.1.4. Show deep knowledge of the current problems in chemistry.
3.1.5. Solve problems using a range of formats and approaches.
3.1.6. Choose the appropriate technological techniques.
3.1.7. Communicate effectively and show a perfect professional leadership.
3.1.8. Make decisions regarding the professional activities.
3.1.9. Make use of the available facilities.
3.1.10. Recognize his/her role for society development.
3.1.11. Self–learning in both academic and professional areas.

**3.2. Knowledge and Understanding**:
*By the end of the study program of graduate of Diploma must able to:*

3.2.1. Know the theories and fundamentals related to the area of study as well as related areas.
3.2.2. Mutual influence between professional practice and its impacts on the environment.
3.2.3. Scientific developments in the area of specialization.
3.2.4. Understand the legal and ethical principles of professional practice in the area of study specialization.
3.2.5. Know the basis of quality in professional practice in the area of specialization.
3.2.6. Know the principles and ethics of scientific research

**3.3. Intellectual skills**
*By the end of the study program of graduate of Diploma must able to:*

3.3.1. Analyze and evaluate the information in the field of specialization.
3.3.2. Solve specialized problems in case of lack of information.
3.3.3. Link between different knowledge to solve professional problems.
3.3.4. Conduct a research study and / or write a methodology of a scientific investigation.
3.3.5. Risk assessment in professional practices in the area of interest.
3.3.6. Planning to improve performance in the field of interest.
3.3.7. Make the proper decision in diverse professional contexts.

**3.4. Professional skills**.
*By the end of the Diploma program graduate must be able to:*

3.4.1. Mastery of, modern professional basic skills in the area of specialization.

**3.5. General and transferable skills**.
*By the end of the master's program graduate must be able to:*

3.5.1. Communicate effectively to obtain required knowledge.
3.5.2. Use of information technology to serve the professional practice.
3.5.3. Develop rules and indicators for assessing the performance of others.
3.5.4. Work in a team, and leading team work in professional contexts.

4. Curriculum Structure and contents:

| | | | |
|---|---|---|---|
| 4.A | Program duration | One Year | |
| 4.B | Program structure | per Week | |
| 4.B.1 | Number of contact hours | Lectures 6 | 24 Total 30 |
| 4.B.2 | Number of credit hours of other courses:(computer) | Lectures 1 | Lab. 1 |

5. Program courses

| Year 1 | Course Title | Lec. | lab. | Exer. | Program ILOs Covered |
|---|---|---|---|---|---|
| Code | Student must do the following modules: | | Hours | | |
| 2011 | Instrumental Analysis (Polarography, Optical Spectroscopy, Thermal Analysis, Analysis by Radioactive isotopes ) | 2 | 8 | - | KU, I, P, G |
| 2012 | Advanced Analytical Chemistry I (Analysis of Food and Carbohydrates, Analysis of Fats and Oils, Analysis of Alloys ) | 2 | 8 | - | KU, I, P, G |
| 2013 | Advanced Analytical Chemistry II (Microanalysis of Elements, Soil Analysis, Analysis of Organic Compounds in Industry, Smoke Analysis) | 2 | 8 | - | KU, I, P, G |
| 1317 | Computer | 1 | 1 | - | KU, I, P, G |

6. Program admission requirements

Arrangements for admission are based on the national guidelines with no Faculty control on the number of newly enrolled students.

Candidates must satisfy the general admission requirements of the University, Faculty and Chemistry Department and also hold B. Sc. in Chemistry.

7. Regulations for progression and program completion

The Faculty has the following system to follow student's progression through the programs in which they are enrolled:

- This program is offered through two semesters over one year.

- Assessment is held by the end of the second semester and student will be eligible only on attaining pass degree (60%)

- Student who fails one to two courses must attend a reset exam at final examination

Students who fail more than two courses at the first attempt will be eligible only for a “Pass” degree following any re-set examinations in all courses.

**8. Evaluation of program intended learning outcomes**

| Evaluator | Tool | Sample |
|---|---|---|
| 1. Senior students | applied | 20 |
| 2. Alumni | applied | 20 |
| 3. Stakeholders(Employers) | applied | 20 |
| 4. External Evaluator(s)(External Examiner(s)) | applied | 1 |

**Matrix of ARS ILOs and Analytical Chemistry Diploma Program ILOs**

| ARS ILOs | Program intended learning outcomes ILOs | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | Intellectual | | | | | | | Practical | | | | Transferable | | | |
| | A1 | A2 | A3 | A4 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 | D1 | D2 | D3 | D4 |
| **Knowledge and Understanding** | | | | | | | | | | | | | | | | | | | |
| **1**. Know the theories and fundamentals related to the area of study as well as related areas. | √ | √ | | | | | | | | | | | | | | | | | |
| **2.** Mutual influence between professional practice and its impacts on the environment. | √ | √ | | √ | | | | | | | | | | | | | | | |
| **3.** Understand the legal and ethical principles of professional practice in the area of study specialization | | | √ | | | | | | | | | | | | | | | | |
| **4.** Know the basis of quality in professional practice in the area of specialization. | | | √ | √ | | | | | | | | | | | | | | | |
| **Intellectual Skills** | | | | | | | | | | | | | | | | | | | |
| **1.** Analyze and evaluate the information in the field of specialization. | | | | | √ | √ | | | | | | | | | | | | | |
| **2.** Solve specialized problems in case of lack of information. | | | | | √ | √ | √ | | | | | | | | | | | | |
| **3.** Link between different knowledge to solve professional problems. | | | | | √ | | √ | √ | | | | | | | | | | | |
| **4.** Conduct a research study and / or write a methodology of a scientific investigation. | | | | | | √ | | √ | √ | | | | | | | | | | |
| **5.** Risk assessment in professional practices in the area of interest. | | | | | √ | | | | √ | √ | | | | | | | | | |
| **6.** Planning to improve performance in the field of interest. | | | | | √ | √ | | | | √ | | | | | | | | | |
| **7.** Make the proper decision in diverse professional contexts. | | | | | | | | | √ | √ | | | | | | | | | |
| **Professional Skills** | | | | | | | | | | | | | | | | | | | |
| **1.** Mastery of, modern professional basic | | | | | | | | | | | | | | √ | √ | | | | |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| skills in the area of specialization. | | | | | | | | | | | | | | | | | | | |
| **General Skills** | | | | | | | | | | | | | | | | | | | |
| **1**. Communicate effectively to obtain required knowledge. | | | | | | | | | | | | | | | √ | | | | |
| **2**. Use of information technology to serve the professional practice. | | | | | | | | | | | | | | | √ | √ | | | |
| **3**. Develop rules and indicators for assessing the performance of others. | | | | | | | | | | | | | | | √ | √ | | | |
| **4**. Work in a team, and leading team work in professional contexts. | | | | | | | | | | | | | | | | | | √ | √ |

## Diplooma of Science Degree in Analytical Chemistry Program's Matrix

| Code | Courses | Knowledge and Understanding | | | | Intellectual Skills | | | | | Professional Skills | | | | General Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | A1 | A2 | A3 | A4 | B1 | B2 | B3 | B4 | B5 | C1 | C2 | C3 | C4 | D1 | D2 | D3 | D4 |
| 2011 | Instrumental Analysis (Polarography, Optical Spectroscopy, Thermal Analysis, Analysis by Radioactive isotopes ) | | √ | | √ | √ | | √ | √ | √ | √ | | √ | √ | | | √ | √ |
| 2012 | Advanced Analytical Chemistry I (Analysis of Foods and Carbohydrates, Analysis of Fats and Oils, Analysis of Alloys) | √ | √ | √ | | √ | √ | √ | | | √ | √ | √ | √ | √ | | √ | √ |
| 2013 | Advanced Analytical Chemistry II (Microanalysis of Elements, Soil Analysis, Analysis of organic Compounds in Industry, Smoke Analysis) | √ | √ | √ | | √ | √ | √ | √ | | √ | √ | √ | √ | √ | | √ | √ |
| 1317 | Computer | √ | √ | √ | | | √ | | | √ | √ | √ | √ | | | √ | | |

## Learning and Teaching Methods

| Learning Methods | Course outcomes ILOs | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | | Intellectual Skills | | | | | Professional and Practical Skills | | | | | General and Transferable Skills | | | | |
| | **A1** | **A2** | **A3** | **A4** | **A5** | **B1** | **B2** | **B3** | **B4** | **B5** | **C1** | **C2** | **C3** | **C4** | | **D1** | **D2** | **D3** | **D4** | |
| **Lecture** | √ | √ | √ | √ | | √ | √ | √ | √ | √ | | | √ | | | √ | | | | |
| **Discussion (Brain Storming)** | | | | | | | | | √ | | | | | √ | | √ | √ | | | |
| **Self-learning (Essay)** | √ | | √ | √ | | √ | √ | | | | √ | √ | | √ | | √ | √ | √ | | |
| **Practical** | √ | √ | | √ | | √ | | | | √ | √ | √ | √ | √ | | | | | √ | |

## Assessment Methods

| Assessment Methods | Course outcomes ILOs | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | | Intellectual Skills | | | | | Professional and Practical Skills | | | | | General and Transferable Skills | | | | |
| | A1 | A2 | A3 | A4 | | B1 | B2 | B3 | B4 | B5 | C1 | C2 | C3 | C4 | | D1 | D2 | D3 | D4 | |
| **Essay Question** | | √ | √ | √ | | √ | √ | √ | √ | √ | √ | | | | | | | | | |
| **MCQ** | | √ | | | | | √ | | √ | | | | | | | | | | | |
| **Student Activity** | √ | | √ | | | √ | √ | √ | √ | | √ | √ | √ | | | √ | √ | √ | √ | |
| **Practical** | √ | | | | | | | | | √ | √ | √ | √ | √ | | | | √ | √ | |

| Name | Signature | Date |
|---|---|---|
| *Program Coordinator:* **Prof. Mohamed Y. El sheikh** **(أ. د. محمد يسري الشيخ)** | ………………………… | 9/2014 |
| *Head of Department* **Prof. Dr. El-Refaie Kenawy** **أ. د / الرفاعى صبحى قناوى** | ………………………… | 9/2014 |
| *Head of Quality Assurance Unit:* **Prof. Hoda K. El-Sayed** **(أ. د. هدى كمال السيد)** | ………………………… … | 9/2014 |
| *Dean of the Faculty:* **Prof. Tarek A. Fayed** **(أ. د. طارق فايد)** | ………………………… … | 9/2014 |

| | | |
|---|---|---|
| **Course Title** | **Instrumental Analysis (Polarography, Optical Spectroscopy, Thermal Analysis, Analysis by Radioactive isotopes )** | |
| **Course Code** | **2011** | |
| **Academic Year** | **2014/2015** | |
| **Coordinator** | **Prof. Mohamed G. Abu-El-Azm** | |
| **Other Staff** | **Prof. Morsi M. Abo-Sekkina , Prof. Amera Hassanien, Prof. Shaker T. Abdel Halim** | |
| **Semesters** | **Two Semesters** | |
| **Pre-Requisite** | **B.Sc. in Chemistry** | |
| **Course Delivery** | **Lecture** | **2h /week** |
| | **Practical** | **8h / week** |
| **Parent Department** | **Chemistry** | |
| **Date of Approval** | **September, 2014** | |

1. **Aims**

The aims of this course are to:

- Provide students with the basics and theoretical principles of near infrared spectroscopy. Students should know the differences this technique and that of medium infrared. Also, the basic theories of infrared attenuated total reflection and optical fibers are also addressed. The application medium infrared, near infrared and optical fibers in biology, medicine, food, polymer industries, environmental science, Forensics and pharmaceutical are provided.
- Discuss in details the bases and theoretical principles of thermal analysis techniques including the common techniques (TGA, DTA and DSC), thermal mechanical (TMA) and dynamic mechanical (DMA) techniques, with emphasize on the constituent components and function of each technique, types and analysis of different thermograms and its applications as quality control tools in different areas (including; food and polymer industries, pharmaceuticals, materials sciences and scientific research).
- Acquire students the knowledge necessary for sampling, preparing of samples for analysis, separation and the trace and quantification of inorganic and organic species. Also this course will provide insights on the following analytical techniques: Polarography and Stripping voltammetry.
- Give students best information about nuclear science in both academic and applied branches focusing on the usage of radioactive isotopes in analysis of elements. It also expands to cover the industrial applications of ceramics and building materials which occupies about one third of the world's industries.

**2. Intended Learning outcomes**

***A. Knowledge and understanding:***

By the end of this course the students should be able to demonstrate knowledge and understanding of:

A1. The bases of thermal analysis techniques, voltammetry and polarographic methods, and spectroscopic techniques and related theories.

A2. The constituent components and function of each technique as well as the factors affecting its sensitivity.

A3. The importance and applications of such techniques different industrial, environmental and research areas.

A4. The basics of near infrared spectroscopy, infrared attenuated total reflection and optical fibers.

A5. The principles and techniques of application of radio-isotopes in elemental analysis.

A6. The nature, properties and different types of glasses, ceramics and cements.

***B. Intellectual skills:***

By the end of this course the students should be able to:

B1. Recognize the main differences between the mentioned analytical techniques based on the theoretical bases behinds.

B2. Evaluate and analyze data collected from different thermal analysis techniques, voltammetry and polarographic methods, and spectroscopic techniques, to assess the quality of industrial products.

B3. Explain the theoretical bases related to infrared analysis techniques

B4. Solve problems related to industrial applications and research using the mentioned analytical techniques.

B5. Characterize and differentiate between the types of glasses, ceramics and cements.

***C. Professional and practical skills:***

By the end of this course the students should be able to:

C1. Conduct laboratory procedures to analyze materials using the mentioned analytical techniques.

C2. Interpret data derived from laboratory observations and measurements concerning such analytical methods.

C3. Apply the mentioned analytical techniques in quality control and research areas.

***D. General and transferable skills:***

By the end of this course the students should be able to:

D1. Communicate effectively in written and oral manners.

D2. Use information technology and resources to collect and represent scientific data.

D3. Work effectively as a member of team and manage time to achieve jobs and solve problems.

**3. Contents:**

| **Part-1** | **Thermal Analysis (An hour/Week) for one Semester** |
|---|---|
| Lecture 1 | Introduction (definitions, bases and principles of thermal analysis techniques) |
| Lectures 2, 3 | Instrumentations of TGA, DTA and DSC, and the factors affecting its sensitivity. |
| Lecture 4 | Theory and instrumentations of thermal mechanical analysis (dilatometer) |
| Lecture 5 | Cont. theory and instrumentations of dynamic mechanical analysis |

| | |
|---|---|
| Lecture 6 | Applications of thermal analysis techniques in chemical research (elucidation of structures, kinetic studies and determination of thermodynamic parameters) |
| Lecture 7 | Applications of thermal analysis techniques in food industries (gelation, moisture content, SFI of fats, heat capacity, phase transition). |
| Lectures 8-10 | Applications of thermal analysis techniques in polymers industry (studying the structural and phase changes, transition temperatures and mechanical properties) |
| Lectures 11, 12 | Applications of thermal analysis techniques in drugs industry (purity, moisture content, water of crystallization, stability of coatings and shelf-life). |
| Lectures 13-14 | Some applications of thermal analysis techniques in cosmetics |
| **Part-2** | **Voltammetry and Polarography (An hour/week) ) for one Semester** |
| Lectures 1,2 | Instrumentation and apparatus cells / Electrodes / Potentiostats. |
| Lecture 3 | Measurement of Volta metric and polarographic curves, determination of concentration calibration curves. |
| Lectures 4-6 | Applications of Dc polarography inorganic cations, anions and molecules, organic compounds, manganese and from in ores, lead in tinned food, morphine, DDT, Ascorbic acid in fruit and vegetables. |
| Lecture 7 | Pulse polarography |
| Lecture 8 | Differential pulse polarography |
| Lecture 9 | wave forms for pulse and Differential –pulse polarography |
| Lectures 10, 11 | Linear sweep voltammetry and cyclic voltammetry |
| Lecture 12 | Stripping voltammetry |
| Lectures 13. 14 | Application of Voltammetric methods |
| **Part-3** | **Applications of Radioisotopes in Elemental Analysis and Glass works (An hour/Week) ) for one Semester** |
| Lecture 1 | Preparation of radioisotopes – Applications of radioisotopes in fields other than elemental analysis |
| Lectures 2,3 | Preparation of radiolabelled compounds (direct chemical synthesis – synthesis by isotope exchange – physicochemical synthesis), Synthesis of multi-labeled compounds. |
| Lecture 4 | Analysis of radioactive substances. |
| Lecture 5 | Uses of radio-isotopes and nuclear radiations in analytical chemistry |
| Lecture 6 | Direct determination of chemical elements by radioactive reagents – radiometric titration |
| Lecture 7 | Analysis by isotope dilution – activation analysis |
| Lecture 8 | Determination of the content of chemical elements from their radioactivity |
| Lecture 9 | Types, preparation and properties of glasses and ceramics |

| | |
|---|---|
| Lecture 10 | Importance of ceramics |
| Lecture 11, 12 | Cements (raw materials – preparation – types – usual tests – phases in cements and their role in the final products) |
| Lectures 13,14 | Mechanical properties of cements |
| **Part-4** | **Optical Spectroscopy (An hour/Week) ) for one Semester** |
| Lectures 1-3 | Theory, UV/Visible spectrophotometers analysis, quantitative analysis, confirmation analysis, distribution of relative error due to instruments, baseline correction, multicomponent analysis, derivative spectroscopy. |
| Lecture 4,5 | Origin of fluorescence and phosphorescence, Rayleight and Raman bands, instrumentation, chemiluminescence, application. |
| Lectures 6-8 | X-ray fluorescence spectrometry, theory, X-ray fluorescence spectrum, x-ray absorption, excitation modes, different type of instruments, and quantitative analysis by x-ray fluorescence, x-ray applications.) |
| Lectures 9,10 | Atomic and flame emission spectroscopy.<br>Principles, interpretation of phenomena involved, atomic absorption vs flame emission, instrumentation, flame photometer, applications, and correction of interfering absorptions. |
| Lectures 11-14 | Atomic emission spectroscopy.<br>Excitation by coupled plasma, ionization by arc, spark or electronic impact, application of atomic emission spectrometry |

Part-5 practical **Polarography**

Data analysis of:

1- Determination of the chemical nature of the ion

A- The half-wave potential of Ti+ solution.

B- Number of electrons participating in the reduction of Ti+ and reversibility.

2- Determination of the amount of Cd2+ present in an unknown solution.

A- Wave height-concentration plots (calibration).

B-Method of standard addition.

3- Determination of lead and copper in carbon steels.

4-Polarographic determination of Cd in a sample of Zn.

5- Determination of ascorbic acid (Vitamin C) in the Citrus Juice by the standard addition and calibration curve methods

6-Determination of manganese and iron in ores

7- Determination of copper and other impurities in lead.

8- Determination of lead in tinned food.

9- Determination of morphine.

**Optical Spectroscopy**

Data analysis of:

1- Determination of warfarin in rodenticide formulation by spectrophotometric method

2-Determination of sulfoxide in pesticide formulation by spectrophotometric method

3- Determination of alkali metals by spectrophotometric method

4-Determination of total hardness of water by spectrophotometric method

5- Preparation of gold nanoparticls and their application as sensors.

**Thermal Analysis**

1-Study the thermal behavior of solid metal complexes

2-Determination of the kinetic parameters and mechanism of the thermal decomposition reactions

## 4. Teaching and Learning Methods

4.1. Theoretical lectures.

4.2. Library and net search for Assignments.

4.3. Seminars.

## 5. Student Assessment

| Assessment Method | Skills assessed* | Assessment Length | Weight |
|---|---|---|---|
| Written Examination | KU, I | 3 Hour Examination | 60% |
| Practical Exam | p | 3 Hour Examination | 40% |

*KU: Knowledge and Understanding, I: Intellectual, P: Professional.

## 6. List of references


*Essential Books:*

1. E. M. Ebeid and S. M. AlHazmy " Photophysical and Laser-Based Techniques in Chemistry, Biology and medicine"BookSurge,LLC(2006).
2. F. G .Helfferich, Ion exchange, McGraw- Hill Book Co., Inc. New York, 1962.
3. L. Liberti and F. G. Helfferich, Mass transfer and kinetics of ion exchange, Martinus Nijhoff Publishers Boston, NATO ASI series, 1983.
4. Allen J. Bard and Larry R. Faulkner "Electrochemical Methods. Fundamentals and Applications", John Wiley & Sons, New York 1980.

*Recommended Books:*

5. Instrumental Methods in Electrochemistry", John Wiley & Sons, New York 1985.
6. Philip H. Rieger "Electrochemistry", Prentice- Hall International , Inc., New Jersey 1987.
7. D.R. Crow " Principles and Application of Electrochemistry",
8. Chapman & Hall, 1988
9. Pharmaceutical and Medical Applications of Near-lnfrared Spectroscopy
10. Emil W. Ciurczak and James K. Drennen Ill, 2002 by Marcel Dekker, Inc.


## 7. Facilities required for teaching and learning

Teaching rooms equipped with white and blackboards, and data show.

**Course Matrix**

| Course Contents | Intended Learning Outcomes ILOs | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | KU | | | | | | I | | | | | P | | | T | | |
| **Part 1:- Thermal Analysis (An hour/Week for one Semester)** | A1 | A2 | A3 | A4 | A5 | A6 | B1 | B2 | B3 | B4 | B5 | C1 | C2 | C3 | D1 | D2 | D3 |
| Introduction (definitions, bases and principles of thermal analysis techniques) | ✓ | | | | | | ✓ | | | | | | | | | | |
| Instrumentations of TGA, DTA and DSC, and the factors affecting its sensitivity. | | ✓ | | | | | ✓ | | | | | | | | ✓ | | |
| Theory and instrumentations of thermal mechanical analysis (dilatometry) | | ✓ | | | | | ✓ | | | | | | | | | ✓ | ✓ |
| Theory and instrumentations of dynamic mechanical analysis | | ✓ | | | | | ✓ | | | | | | | | ✓ | | |
| Applications of thermal analysis techniques in chemical research (elucidation of structures, kinetic studies and determination of thermodynamic parameters) | | | ✓ | | | | | ✓ | | ✓ | | ✓ | | | | ✓ | ✓ |
| Applications of thermal analysis techniques in food industries (gelation, moisture content, SFI of fats, heat capacity, phase transition). | | | ✓ | | | | | ✓ | | ✓ | | ✓ | ✓ | | ✓ | | |
| Applications of thermal analysis techniques in polymers industry (studying the structural and phase changes, transition temperatures and mechanical properties) | | | ✓ | | | | | ✓ | | ✓ | | | | | | ✓ | ✓ |
| Applications of thermal analysis techniques in drugs industry (purity, moisture content, water of crystallization, stability of coatings and shelf-life). | | | ✓ | | | | | ✓ | | ✓ | | | ✓ | | ✓ | ✓ | |
| Some applications of thermal analysis techniques in cosmetics | | | ✓ | | | | | ✓ | | ✓ | | | | | ✓ | | ✓ |
| **part 2 :- Voltammetry and Polarography (An hour/week for one Semester)** | | | | | | | | | | | | | | | | | |
| Instrumentation and apparatus cells / Electrodes / Potentiostats. | ✓ | ✓ | | | | | ✓ | | | | | | | | | ✓ | |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Measurement of Volta metric and polarographic curves, determination of concentration calibration curves. | ✓ | ✓ | | | | | ✓ | | | | | | | | | ✓ | ✓ |
| Applications of Dc polarography inorganic cations, anions and molecules, organic compounds, manganese and from in ores, lead in tinned food, morphine, DDT, Ascorbic acid in fruit and vegetables. | | | ✓ | | | | | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | | | ✓ |
| Pulse polarography | ✓ | ✓ | | | | | ✓ | | | | | | | | | ✓ | |
| Differential pulse polarography | ✓ | ✓ | | | | | ✓ | | | | | | | | | ✓ | ✓ |
| wave forms for pulse and Differential –pulse polarography | ✓ | ✓ | | | | | ✓ | | | | | | | | | ✓ | |
| Linear sweep voltammetry and cyclic voltammetry | ✓ | ✓ | | | | | ✓ | | | | | | | | | | ✓ |
| Stripping voltammetry | ✓ | ✓ | | | | | ✓ | | | | | | | | | ✓ | |
| Application of Voltammetric methods | | | ✓ | | | | | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | | | |
| **Part 3:- Applications of Radioisotopes in Elemental Analysis and Glass works (An hour/Week for one Semester)** | | | | | | | | | | | | | | | | | |
| Preparation of radioisotopes – Applications of radioisotopes in fields other than elemental analysis | | | | | ✓ | | | | | | | | | | ✓ | ✓ | |
| Preparation of radiolabelled compounds (direct chemical synthesis – synthesis by isotope exchange – physicochemical synthesis), Synthesis of multi-labeled compounds. | | | ✓ | | ✓ | | | | | | | ✓ | ✓ | ✓ | | ✓ | ✓ |
| Analysis of radioactive substances. | | | | | ✓ | | | | | | | | | | ✓ | ✓ | |
| Uses of radio-isotopes and nuclear radiations in analytical chemistry | | | ✓ | | ✓ | | | | | | | | | | | ✓ | ✓ |
| Direct determination of chemical elements by radioactive reagents – radiometric titration | | | | | ✓ | | | | | | | | | | ✓ | ✓ | |
| Analysis by isotope dilution – activation analysis | | | | | ✓ | | | | | | | ✓ | ✓ | ✓ | ✓ | | ✓ |
| Determination of the content of chemical elements from their radioactivity | | | ✓ | | | | | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | |
| Types, preparation and properties of glasses and ceramics | | | | | | ✓ | | | | | ✓ | | | | | ✓ | ✓ |
| Importance of ceramics | | | | | | ✓ | | | | | ✓ | | | | ✓ | ✓ | |
| Cements (raw materials – preparation – types – usual tests – phases in cements and their role in the final products) | | | | | | ✓ | | | | | ✓ | | | | | ✓ | ✓ |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mechanical properties of cements | | | | | | ✓ | | | | | ✓ | | | | ✓ | ✓ | |
| **Part 4:- Optical Spectroscopy (An hour/Week for one Semester)** | | | | | | | | | | | | | | | ✓ | | ✓ |
| Theory, UV/Visible spectrophotometers analysis, quantative analysis, confirmation analysis, distribution of relative error due to instruments, baseline correction, multicomponent analysis, derivative spectroscopy. | ✓ | ✓ | ✓ | | | | | | | | | | ✓ | | ✓ | ✓ | |
| Origin of fluorescence and phosphorescence, Rayleight and Raman bands, instrumentation, chemiluminescence, application. | | ✓ | ✓ | ✓ | | | | ✓ | ✓ | ✓ | | | ✓ | ✓ | | ✓ | ✓ |
| X-ray fluorescence spectrometry, theory, X-ray fluorescence spectrum, x-ray absorption, excitation modes, different type of instruments, and quantitative analysis by x-ray fluorescence, x-ray applications.) | | ✓ | ✓ | | | | ✓ | ✓ | ✓ | | | ✓ | ✓ | ✓ | ✓ | ✓ | |
| Atomic and flame emission spectroscopy. Principles, interpretation of phenomena involved, atomic absorption vs flame emission, instrumentation, flame photometer, applications, and correction of interfering absorptions. | | ✓ | ✓ | | | | | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | | ✓ | ✓ |
| Atomic emission spectroscopy. Excitation by coupled plasma, ionization by arc, spark or electronic impact, application of atomic emission spectrometry | | ✓ | ✓ | | | | | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | | ✓ |

## Learning and Teaching Methods

| Learning Methods | Course outcomes ILOs | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | | | Intellectual Skills | | | | | Professional and Practical Skills | | | | | General and Transferable Skills | | | | |
| | A1 | A2 | A3 | A4 | A5 | A6 | B1 | B2 | B3 | B4 | B5 | C1 | C2 | C3 | | | D1 | D2 | D3 | | |
| **Lecture** | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | | | | | | | | | | |
| **Discussion (Brain Storming)** | | | | | | | | | | √ | | | | | | | √ | √ | | | |
| **Self-learning (Essay)** | √ | | √ | √ | | | | √ | | | | √ | √ | √ | | | √ | √ | √ | | |

| Learning Methods | Course outcomes ILOs | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | | | Intellectual Skills | | | | | Professional and Practical Skills | | | | | General and Transferable Skills | | | | |
| | A1 | A2 | A3 | A4 | A5 | A6 | B1 | B2 | B3 | B4 | B5 | C1 | C2 | C3 | | | D1 | D2 | D3 | | |
| Field Trips | | | | | | | | | | | | | | | | | | | | | |
| Practical | | √ | √ | | | | | | | √ | | √ | √ | √ | | | | | √ | | |

## Assessment Methods

| Assessment Methods | Course outcomes ILOs | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | | | Intellectual Skills | | | | | Professional and Practical Skills | | | | | General and Transferable Skills | | | | |
| | A1 | A2 | A3 | A4 | A5 | A6 | B1 | B2 | B3 | B4 | B5 | C1 | C2 | C3 | C4 | | D1 | D2 | D3 | D4 | |
| Essay Question | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | | | | | | | | | | |
| MCQ | | √ | | √ | | | | | | | | | | | | | | | | | |
| Student Activity | √ | | √ | | | | √ | √ | √ | √ | √ | √ | √ | √ | √ | | √ | √ | √ | √ | |
| Practical | | | √ | | | | | √ | | | | √ | √ | √ | √ | | | | √ | √ | |

| | Course Coordinator | Head of Department |
|---|---|---|
| Name (Arabic) | أ. د / محمد جابر ابوالعزم | أ. د / الرفاعى صبحى قناوى |
| Name | Prof. Mohamed G. Abu-El-Azm | Prof. Dr. El-Refaie Kenawy |
| Signature | | |
| | ………………………… | ……………………………………….. |
| | 9/2014 | 9/2014 |

| ourse Title | Advanced Analytical Chemistry I (Analysis of Foods and Carbohydrates, Analysis of Fats and Oils, Analysis of Alloys) | |
|---|---|---|
| Course Code | 2012 | |
| Academic Year | 2014/2015 | |
| Coordinator | Prof. Mohamed A. El-Borai | |
| Other Staff | Prof. Mohamed F. Abdul Mageed, Prof. Ibrahim Shebl | |
| Semesters | Two Semesters | |
| Pre-Requisite | B.Sc. in Chemistry | |
| Course Delivery | Lecture | 2h / week |
| | Practical | 8h /week |
| Parent Department | Chemistry | |
| Date of Approval | September, 2014 | |

## 1. Aims

The aims of this course are to:

Provide students with the basics , theoretical principles and techniques used for foods, fats, oils and alloys analysis , with emphasize on the discussion of the used technique for specific food components, e.g. lipids, protein, water, carbohydrates, ferro-alloys, alloy steels, carbon steel, saturated and unsaturated fatty acids as well as antioxidants.

## 2. Intended Learning outcomes

*A. Knowledge and understanding:*

By the end of this course the students should be able to demonstrate knowledge and understanding of:

A1. The government regulations required for the manufacture and sale of food products.

A2. The basic principles for analyzing foods and alloys.

A3. The chemistry underlying the properties and reactions of various food and alloys components.

A4. The principles of selecting samples and define a sampling plan for analysis.

A5. Principles of the data analysis.

***B. Intellectual skills:***

By the end of this course the students should be able to:

B1. Aware of current topics of importance to the food industry.

B2. Select the appropriate analytical technique when presented with a practical problem.

B3. Use the laboratory techniques common to basic and applied food and alloy chemistry

B4. Select samples to be analyzed and define a sampling plan.

B5. Analyzing and interpret experimental data.

### *C. Professional and practical skills:*

By the end of this course the students should be able to:

C1. Conduct laboratory procedures to analyze food and alloys components using appropriate technique.

C2. Selecting and preparing samples for analysis.

C3. Interpret and analyzing experimental data.

### *D. General and transferable skills:*

By the end of this course the students should be able to:

D1.Communicate effectively in written and oral.

D2.Use information technology and resources to collect and represent scientific data.

D3.Work effectively as a member of team and manage time.

### 3. Contents:

| | |
|---|---|
| **Part-1** | **Analysis of Foods and Carbohydrates (Two hours/ week) for one Semester** |
| Lectures 1,2 | Introduction<br>Composition of food products<br>Reasons for analyzing foods |
| Lectures 3,4 | Sampling and data analysis<br>Sample Selection and Sampling Plans<br>Preparation of Laboratory Samples<br>Data Analysis and Reporting |
| Lectures 5,6 | Determination of Moisture and Total Solids<br>Properties of Water in Foods<br>Sample preparation<br>Evaporation methods<br>Distillation Methods<br>Chemical Reaction Methods<br>Physical Methods<br>Spectroscopic Methods<br>Methods to Determine Water in Different Molecular Environments |
| Lectures 7,8 | Analysis of Ash and Minerals: Determination of Ash Content<br>Determination of Specific Mineral Content |
| Lectures 9,10 | Analysis of Lipids<br>Properties of Lipids in Foods<br>Determination of Total Lipid Concentration<br>Determination of Lipid Composition<br>Methods of Analyzing Lipid Oxidation in Foods<br>Characterization of Physicochemical Properties |
| Lectures 11,12 | Analysis of Proteins<br>Determination of Overall Protein Concentration<br>Protein Separation and Characterization |
| Lectures 13,14 | Analysis of Carbohydrates<br>Introduction<br>Classification of Carbohydrates<br>Methods of Analysis<br>Mono-saccharides and Oligosaccharides<br>Analysis of Polysaccharides and Fiber |
| **Part-2** | **Fats and oils analysis (An hour/week) for one Semester** |
| Lectures 1,2 | Introduction<br>fatty acids, Classification of lipids, Glycerol lipids<br>Synthesis of glycerids |

| | |
|---|---|
| Lectures 3-5 | Quantitative tests lipid<br>Solubility, Acrolein test, Dustan's test, Bayer's test<br>Copper acetate, Cholesterol test |
| Lectures 6-8 | Analysis of Fats & Oils<br>Iodine number, Saponification value, acid value<br>Unsaponifiable matter , Rancidity, Peroxide value<br>Impurities, Unsaturation |
| Lectures 9-11 | Estimation of diet additives<br>Antioxidants, Emulsifiers, Antifoaming, Natural color |
| Lectures 12-14 | Refining and manufacture of oils<br>Olive oil, Palm oil, Palm lernel oil, Fish oil, Cotton seed oil<br>Sesam oil determination of thermodynamic parameters |
| **Part-3** | **Alloys analysis (An hour/week) for one Semester** |
| Lectures 1,2 | Introduction : Classification of alloys, Cooling curves and phase diagrams of alloys, Mixed crystal formation, metallic bond, Ferro-alloys: Carbon sttels, Alloy steels, stainless steel<br>General characteristics of alloys, supper alloys, Ferrous alloys in technology, non-ferrous alloys: copper - nickel alloys |
| Lectures 3,4 | Titremetric Analysis<br>Analysis of nickel in steel: Determination of nickel in presence of iron<br>Analysis of solder: Determination of lead and tin in a mixture<br>Analysis of a low melting alloys: Determination of bismuth, cadmium and lead in a mixture<br>Determination of copper in brass via iodometry<br>Complexometric determination of thallium (III) in alloys |
| Lectures 5,6 | Dc-Polarography<br>Determination of lead and copper in steel using polarography<br>Polarographic determination of copper and zinc in brass<br>Polarographic determination of rhenium in its alloys with molybdenum |
| Lecture 7 | Square wave voltammetry<br>Voltammetric determination of Zn(II) in Zn-Fe Alloy using square wave voltammetry<br>Potentiometry<br>Potentiometric determination of rhenium in alloys |
| Lecture 8 | Photometry<br>Photometric determination of Scandium in magnesium alloys using xylenol orange<br>Photometric determination of beryllium in aluminum alloys with beryllium IV |
| Lecture 9 | Atomic emission spectroscopy<br>Qualitative spectroscopic analysis of a non-ferrous alloy and a complex inorganic mixture<br>Determination of trace lead in a ferrous alloys |
| Lecture 10 | Atomic absorption spectroscopy<br>Determination of lead in brass by atomic absorption spectroscopy |
| Lectures 11-14 | Gravimetry<br>Gravimetric determination of beryllium in alloys using hex-ammine cobalt chloride |
| Part-4 practical | **Analysis of Foods and Carbohydrates**<br>Data analysis of:-<br>1-Milk of cream (specific gravity -acidity)<br>2- Cheese (protein content)<br>2- Oils and fats (chlogesterol)<br>4- Sugar food (total carbohydrate content)<br>5- Analysis of jams and jellies.<br>6-Analysis of vegetable (Sugar, Vitamins, Wakes, Nate &Nat product)<br>7- Spices and flares<br>8- Caffeine in tea and coffee<br>9-Solid fat index (SFI) by analysis of DSC calorigram<br>10-Sugar content in food samples by Brix value (refractometry) |

11- Fruit analysis
12- Utilization of fruit and vegetable wastes
13- Study of adulteration of food materials
14- Comparative study of commercial antacids

**Analysis of Fats and Oils**

Data analysis of:
Analytical methods to measure the concentration of fat and oil
1-Acid value
2-Saponification value
3- Iodine value
4- Liquid chromatography
5- Cholesterol determination

**Analysis of Alloys**

Data analysis of:
1-Differential pulse polarographic analysis of a thin film in cadmium alloy deposited over mild steel.
2-Determination of lead and copper in carbon steels
3-Cyclic and convolutive voltammetric analysis of copper base alloys (Pb, Sn, Ni, Zn)
4-Analysis of nickel alloys and nickel compounds (Cu, Pb, Fe) using DC. polarography
5-Determination of silver in alloys using cyclic voltammetry and controlled potential coloumetry techniques
6- Estimation of gold in alloys via differential pulse polarography and convolutive voltammetry

## 4. Teaching and Learning Methods

4.1. Lectures.
4.4. Library and net search for Assignments.
4.5. Seminars.

## 5. Student Assessment

| Assessment Method | Skills assessed* | Assessment Length | Weight |
|---|---|---|---|
| Written Examination | KU, I | 3 Hour Examination | 60% |
| Practical Examination | P | 2 Hour Examination | 40% |

*KU: Knowledge and Understanding, I: Intellectual, P: Professional.

## 6. List of references

*Essential Books:*


1. Chemistry in Focus. N. J. Tro, 1998. Brooks / Cole Publishing Company, Chapter 17, pp. 407.
2. Introduction to Food Analysis. S.S. Nielsen, 1998. Aspen Publishers.
3. Introduction to Food Chemistry, R. O. Arpenten, 2004. Boca Raton, Fla. : CRC Press
4. Food Analysis: Principles and Techniques. D. W. Gruenwedel and J.R. Whitaker, 1984, Marcel Dekker.


*Recommended Books:*


5. Analytical Chemistry of Foods. C.S. James, 1995, Blackie Academic and Professional.
6. Siakotos, A.N., and Rouser, G, (1965), Analytical separation of non-liquid water soluble substances and gangliosides from other liquids by desetran column chromatography, J .Am .oil. Chemist'Soc, 42, 913-919.
7. Taylor, J.R., Pohle, W .D . and Gregory , R.J. , (1964), Measurement of solids in triglycerides by using nuclear resonance spectroscopy , J .Am.oil. Chemist' Soc, 41, 147-180.
8. Wels, M.A. and Dittmer, J .C. (1966), A micro-analytical technique for the quantitative determination of twenty-four classes of brain lipids. Biochem. 5, 3405-3408.


## 7. Facilities required for teaching and learning

Teaching rooms equipped with white and blackboards, and data show.

**Advanced Analytical Chemistry I (Analysis of Foods and Carbohydrates, Analysis of Fats and Oils, Analysis of Alloys (Course Code:- 2012)**

| **Course Contents** | **Course intended learning outcomes ILOs** | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | | Intellectual | | | | | Practical | | | Transferable | | |
| **Part 1: Analysis of Foods and Carbohydrates (An hour/week for one Semester)** | A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | C1 | C2 | C3 | D1 | D2 | D3 |
| Introduction<br>Composition of food products<br>Reasons for analyzing foods | ✓ | | | | | ✓ | | | | | ✓ | ✓ | | ✓ | ✓ | |
| Sampling and data analysis<br>Sample Selection and Sampling Plans<br>Preparation of Laboratory Samples<br>Data Analysis and Reporting | | | ✓ | ✓ | | | ✓ | ✓ | ✓ | | ✓ | ✓ | | | ✓ | ✓ |
| Determination of Moisture and Total Solids<br>Properties of Water in Foods<br>Sample preparation<br>Evaporation methods<br>Distillation Methods<br>Chemical Reaction Methods<br>Physical Methods<br>Spectroscopic Methods<br>Methods to Determine Water in Different Molecular Environments | | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ |
| Analysis of Ash and Minerals: Determination of Ash Content<br>Determination of Specific Mineral Content | | ✓ | ✓ | ✓ | ✓ | | | | | | ✓ | ✓ | ✓ | | ✓ | ✓ |
| Analysis of Lipids | | | ✓ | ✓ | | | | | | | ✓ | ✓ | ✓ | ✓ | | ✓ |
| Analysis of Proteins | | | ✓ | ✓ | | | | | | | ✓ | ✓ | ✓ | | ✓ | ✓ |
| Analysis of Carbohydrates | | | ✓ | ✓ | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | |
| **Part 2: Fats and oils analysis (An hour/wee for one Semester k)** | | | | | | | | | | | | | | | | |
| Introduction<br>fatty acids, Classification of lipids, Glycerol lipids<br>Synthesis of glycerids | ✓ | | | | | | | | | | | | | | | |
| Quantitative tests lipid | | ✓ | ✓ | ✓ | | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | | | ✓ | ✓ |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Analysis of Fats & Oils | | ✓ | ✓ | ✓ | | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | |
| Estimation of diet additives | | ✓ | ✓ | ✓ | | ✓ | ✓ | | | | | | | | ✓ | ✓ |
| Refining and manufacture of oils<br>Olive oil, Palm oil, Palm lernel oil, Fish oil, Cotton seed oil Sesam oil determination of thermodynamic parameters | | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | | | ✓ | ✓ | ✓ | | ✓ | ✓ |
| **Part 3: Alloys analysis (An hour/week for one Semester)** | | | | | | | | | | | | | | | | |
| Introduction : Classification of alloys, Cooling curves and phase diagrams of alloys, Mixed crystal formation, metallic bond, Ferro-alloys: Carbon sttels, Alloy steels, stainless steel<br>General characteristics of alloys, super alloys, Ferrous alloys in technology, non-ferrous alloys: copper - nickel alloys | ✓ | | | | | | | | | | | | | ✓ | ✓ | ✓ |
| Titremetric Analysis | | ✓ | ✓ | ✓ | ✓ | | | | | | ✓ | ✓ | | | ✓ | ✓ |
| Dc-Polarography | | ✓ | ✓ | | ✓ | | | | | | ✓ | | ✓ | ✓ | | ✓ |
| Square wave voltammetry | | ✓ | | | | | | | | | | ✓ | ✓ | | ✓ | |
| Photometry | | | ✓ | ✓ | ✓ | | | | | | | | | ✓ | | ✓ |
| Atomic emission spectroscopy | | ✓ | ✓ | | ✓ | | | | | | ✓ | ✓ | ✓ | | ✓ | |
| Atomic absorption spectroscopy | | ✓ | | ✓ | | | | | | | ✓ | | ✓ | ✓ | | ✓ |
| Gravimetry | | ✓ | ✓ | ✓ | ✓ | | | | | | ✓ | ✓ | ✓ | | ✓ | ✓ |
| Assessment | | | | | | | | | | | | | | | | |

**Learning and Teaching Methods**

| Learning Method | Course outcomes ILOs | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | | | Intellectual Skills | | | | | Professional and Practical Skills | | | | | General and Transferable Skills | | | | |
| | A1 | A2 | A3 | A4 | A5 | | B1 | B2 | B3 | B4 | B5 | C1 | C2 | C3 | | | D1 | D2 | D3 | | |
| Lecture | √ | √ | √ | √ | √ | | √ | √ | √ | √ | √ | | | | | | | | | | |
| Discussion (Brain Storming) | | | | | | | | | | √ | | | | | | | √ | √ | | | |
| Self-learning (Essay) | √ | | √ | √ | | | √ | √ | | | | √ | √ | √ | | | √ | √ | √ | | |
| Practical | | | | | | | | √ | | √ | √ | √ | √ | √ | | | | | √ | | |

**Assessment Methods**

| Assessment Methods | | Course outcomes ILOs | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | | | Intellectual Skills | | | | | Professional and Practical Skills | | | | | General and Transferable Skills | | | | |
| | A1 | A2 | A3 | A4 | A5 | A6 | B1 | B2 | B3 | B4 | B5 | C1 | C2 | C3 | C4 | | D1 | D2 | D3 | D4 | |
| **Essay Question** | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | | | | | | | | | | |
| **MCQ** | | √ | | √ | | | | | | | | | | | | | | | | | |
| **Student Activity** | √ | | √ | | | | √ | √ | √ | √ | √ | √ | √ | √ | √ | | √ | √ | √ | √ | |
| **Practical** | | | √ | | | | | √ | | | | √ | √ | √ | √ | | | | √ | √ | |

| | Course Coordinator | Head of Department |
|---|---|---|
| Name (Arabic) | أ.د محمد عبدالعزيز البرعى | أ. د / الرفاعى صبحى قناوى |
| Name | **Prof. Mohamed A. El-Borai** | **Prof. Dr. El-Refaie Kenawy** |
| Signature | ………………………… | …………………………………………… |
| | 9/2014 | 9/2014 |

| Course Title | Advanced Analytical Chemistry II (Microanalysis of Elements, Soil Analysis, Analysis of organic Compounds in Industry, Smoke Analysis) | |
|---|---|---|
| Course Code | 2013 | |
| Academic Year | 2014/2015 | |
| Coordinator | Prof. Hanaa S. El-Dessoky | |
| Other Staff | Prof. Amera Hassanien, prof. Ahmed Elbarbary | |
| Semesters | Two Semesters | |
| Pre-Requisite | B.Sc. in Chemistry | |
| Course Delivery | Lecture | 2h/week |
| | Practical | 8h/week |
| Parent Department | Chemistry | |
| Date of Approval | September, 2014 | |

## 1. Aims

The aims of this course are to:

- Study the analysis of different organic compounds used in industry using non-instrumental or instrumental methods.
- Discuss the different methods used for smoke constituent's analysis, and explains the atmospheric sampling and interpretation of the analytical results.
- Give students background about the steps of preparation of soil samples for analysis and analysis of the soil's multi-elemental and organic matter contents.
- Discuss the votammetric techniques with emphasize on stripping voltammetry as a very efficient technique for trace analysis of organic and inorganic species in various matrixes.

## 2. Intended Learning outcomes

### *A. Knowledge and understanding:*

By the end of this course the students should be able to demonstrate knowledge and understanding of:

A1. The structure and properties of common organic compounds used as raw materials, intermediates and final products in industry as well as the basic theories of different analytical techniques used for their analysis.

A2. The essential methods used in preparation of the atmospheric samples. The main tools used for determination of any smoke constituent present.

A3. The various methods employed in analysis of the soil and it's properties-especially acidity, alkalinity and nutrient status.

A4. Analysis of the elements in most demand by crops which are supplied by fertilizers: nitrogen, phosphorus, and potassium, the secondary nutrients and micronutrients and the toxic levels of some elements, and theories and ideas of different types of stripping voltammetry, electrochemical cells and working electrodes as well as their analytical applications.

### *B. Intellectual skills:*

By the end of this course the students should be able to:

B1. Explain the bases of analysis of organic compounds used in different stages in industry, smoke and soil samples.

B2. Analyze and evaluate the data obtained from analysis of different samples (organic compounds in industry, smoke and soil).

B3. Use different techniques of stripping voltammetry in determination of constituents from real samples.

B4. Solve problems in the mentioned areas.

*C. Professional and practical skills:*

By the end of this course the students should be able to:

C1. Interpret data from analysis of different organic compounds, smoke and soil samples.

C2. Conduct laboratory procedures to analyze different samples using stripping Voltammetry techniques.

C3. Apply common analytical techniques in quality control of industrial organic products and smoke samples.

D. General and transferable skills:

By the end of this course the students should be able to:

D1. Communicate effectively in written and oral.

D2. Use information technology and resources to collect and represent scientific data.

D3. Work effectively as a member of team and manage time.

**3. Contents**

| | |
|---|---|
| **Part-1** | **Analysis of organic compounds in industry (An hour/week) for one Semester** |
| Lecture 1 | Introduction: Course description, course objectives, and course units as well as common analytical techniques. |
| Lectures 2, 3 | Analysis of animal feed (e.g., protein, fat, fiber and sugars). |
| Lectures 4, 5 | Analysis of plant products (e.g., vegetables, sugars and flavors). |
| Lectures 6, 7 | Analysis of some pesticides formulations. |
| Lecture 8 | Analysis of some sugar products. |
| Lectures 9, 10 | Analysis of some drugs. |
| Lectures 11-13 | Analysis of some industrial residues. |
| Lecture 14 | Result and data treatment for some industrial problems. |
| **Part-2** | **Analysis of smoke(An hour/week) for one Semester** |
| Lecture 1 | Classification of smoke constituents, definition of air pollution and definition of atmosphere. |
| Lectures 2-5 | Analysis of inorganic smoke constituents: Carbon compounds (e.g., CO and $CO_2$), nitrogen compounds (e.g., NO and $NH_3$), sulfur compounds (e.g., $H_2S$, $SO_2$ and $SO_3$) and halogen compounds (e.g., HF and HCl). |
| Lectures 6-8 | Analysis of organic smoke constituents: Hydrocarbons, aldehydes, ketones, amines and alcohols. |
| Lectures 9,10 | Analysis of particulates (e.g., $Fe_3O_4$, $V_2O_5$, CaO, $PbCl_2$, $PbBr_2$, fly ash etc.). |
| Lectures 11-13 | Sampling methods and techniques used in smoke sampling: Gravity technique, filtration technique, precipitation technique and adsorption sampling. |
| Lecture 14 | Interpretation and treatment of the obtained data. |
| **Part-3** | **Analysis of soil (An hour/week) for one Semester** |
| Lecture 1 | Introduction: Origin and nature of soils, purpose of soil analysis as well as precision and accuracy. |
| Lectures 2,3 | Soil physics: Mechanical composition (texture), soil structure, specific and volumetric masses of soils, porosity of soils, soil aeration, water in soils, water properties of soils, soil moisture and plants, soil temperature, soil chemistry and total chemical composition. |
| Lectures 4,5 | Forms of compounds of main chemical elements in soils: Soil macronutrients, soil micronutrient, heavy metals in soil, the role of iron and aluminum in soil formation and methods to determine oxides and their forms in soils |
| Lecture 6 | Physical chemistry of soils: Electronic properties of soils, soil colloids and their properties, physical properties of colloids and cation exchange in soils. |
| Lecture 7 | Preparation of soil sample for analysis: Reception at the laboratory, drying, grinding |

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| | and sieving and storage. |
| Lecture 8 | Soil physical analysis: Soil moisture content, particle size distribution and saturated past. |
| Lecture 9 | Soil chemical analysis: ph, electrical conductivity, calcium carbonate, organic matter, cation exchange capacity and gypsum. |
| Lectures 10-12 | Soil nutrients, cation and anion analysis: Macronutrients (nitrogen, phosphorus, potassium, sodium, soluble calcium, magnesium, carbonate and bicarbonate, chloride, sulfate and born) and micronutrient cations (iron, zinc, manganese and copper). |
| Lectures13,14 | General methodological aspects: Atomic absorption spectrometry (principle of aas analysis, advantages and disadvantages of aas analysis) and x-ray fluorescence spectrometry (principle of x-ray analysis, types of spectrometers used, wavelength dispersive instruments (edxrf), energy dispersive instruments (edxrf) as well as advantages and disadvantages of edxrf analysis. |
| **Part-4** | **Stripping Volumetry (An hour/week) for one Semester** |
| Lectures 1-3 | Introduction: Stripping voltammetry techniques (anodic stripping voltammetry, cathodic stripping voltammetry, potentiometric stripping voltammetry and adsorptive stripping voltammetry). |
| Lecture 4 | Electrochemical cells. |
| Lectures5,6 | Working electrodes: Mercury electrodes, carbon electrodes, metal electrodes and chemically modified electrodes. |
| Lectures7,8 | Methods validation: Linearity, calibration curves, limit of detection (LOD), limit of quantification, reproducibility, recovery, accuracy, precision, selectivity, interferences, robustness and raggedness. |
| Lectures 9-11 | Some practical applications:<br>Analysis of various metal ions in water samples. |
| Lectures12-14 | Analysis of pharmaceutical compounds in bulk form, formulation and biological fluids. |
| **Part -5** | **Stripping analysis of metals**<br>Data analysis of:-<br>1- Determination of the concentration of zinc, cadmium, lead and copper in a sample of drinking water.<br>2-Determination of nickel by adsorptive stripping voltammetry<br>3- Determination of selenium by cathodic stripping voltammetry<br>4- Determination of molybdenum in iron by utilizing a catalytic reaction<br>5-Determination of bismuth in the presence of copper and lead<br>6- Determination of thallium in the presence of cadmium and lead<br>**Soil chemical analysis**<br>Data analysis of:<br>1- Soil sample preparation and bulk density, water content and coarse fragment content determinations<br>2- Saturating the soil sample with water and subsequent extraction under partial vacuum of the liquid phase for determination of dissolved salts<br>3- Determination of pH value of a given soil sample by pH- meter with combined electrodes<br>4-Determination of inorganic carbon ($CaCO_3$) content in soil samples by neutralization titration reaction<br>5-Determination of the soluble calcium and magnesium content in a given soil sample using complexmetric titration reaction<br>6- Determination of soluble chloride content in a given soil sample using $AgNO_3$ titration<br>7- Determination of total organic carbon content in soil samples using dichromate oxidation with heating method<br>8-Extraction and determination of Fe, Zn, Mg, Cu in soil samples by flame photometry<br>9- Analysis of soil samples<br>**Smoke Analysis** |

| | |
|---|---|
| | Data analysis of:-<br>1-Determination of moisture in tobacco by gravimetric method.<br>2-Analysis of chloride content in tobacco by potentiometric method<br>3- Determination of potassium in tobacco by flame photometric method<br>4-Estimation of nicotine in tobacco by distillation method<br>5- Investigation of nicotine in tobacco products<br>6- Comparative study of air pollution of Tanta and Kafr El-Zayat cities<br>**Analysis of Organic materials in industry**<br>Data analysis of:<br>1- Analysis of fats and oils by (acid value, iodine number, acetylene value, rancidity)<br>2- Quantitative analysis of sugars.<br>3- Analysis of organic acids.<br>4- Analysis of polysaturated acids by peroxidation method.<br>5-Techniques for separation and identification of proteins by chromatography.<br>6- Estimation of proteins by biuret assa<br>7- Comparative study of commercial bleaches by redox reactions |

**4. Teaching and Learning Methods**

- Theoretical lectures.
- Practical program as a completive course.

**5. Student Assessment**

| Assessment Method | Skills assessed* | Assessment Length | Weight |
|---|---|---|---|
| Written Examination | KU, I | 3 Hour Examination | 60% |
| Practical Examination | P | 2 Hour Examination | 40% |

*KU: Knowledge and Understanding, I: Intellectual, P: Professional.

**6. List of references**

*Essential Books:*

i. S. Williams "OFFICIAL METHODS OF ANALYSIS" 4th edition, published by the Association of Official Analytical Chemists, Inc., Alrington, Virginia-22209, USA (1984).
ii. M. Singh "Analytical Chemistry Instrumental Techniques" 1st edition, Dominques Publishers and Distributors, South Anarkali, Delhi-110051, India (2003).
iii. S. Hooda and Sumanjeet Kaur "Laboratory Manual Foe Enviromental Chemistry" 1st edition, published by S. Chand & Company Ltd. Ram. Nagar, New Delhi- 110055 (1999).
iv. I. C. Shaw and John Chadwick "Principles of Environmental Toxicology" 2nd edition, Taylor & Francis td., Padstow, UK (1998).

*Recommended Books:*

v. S. Holler. Nieman," Instrumental analysis", 5th edition, (1996).
vi. Applications notes at the website; www.perkinelmer.com.

**7. Facilities required for teaching and learning**

Teaching rooms equipped with white and blackboards, and data show.

**Course Matrix**

| Course Contents | Course intended learning outcomes ILOs | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | Intellectual | | | | Practical | | | Transferable | | |
| | A1 | A2 | A3 | A4 | B1 | B2 | B3 | B4 | C1 | C2 | C3 | D1 | D2 | D3 |
| **Part 1: Analysis of organic compounds in industry** | | | | | | | | | | | | | | |
| Introduction: Course description, course objectives, and course units as well as common analytical techniques. | ✓ | | | | ✓ | | | | | | | | | |
| Analysis of animal feed (e.g., protein, fat, fiber and sugars). | ✓ | | | | ✓ | ✓ | | | ✓ | ✓ | | | | |
| Analysis of plant products (e.g., vegetables, sugars and flavors). | ✓ | | | | ✓ | ✓ | | | ✓ | ✓ | | | ✓ | ✓ |
| Analysis of some pesticides formulations. | ✓ | | | | ✓ | ✓ | | | ✓ | ✓ | | ✓ | | |
| Analysis of some sugar products. | ✓ | | | | ✓ | ✓ | | | ✓ | | | ✓ | | |
| Analysis of some drugs. | ✓ | | | | ✓ | ✓ | | | ✓ | ✓ | | | ✓ | ✓ |
| Analysis of some industrial residues. | ✓ | | | | ✓ | ✓ | | | ✓ | ✓ | | | | |
| Result and data treatment for some industrial problems. | ✓ | | | | ✓ | ✓ | | | ✓ | ✓ | | ✓ | | |
| **Part 2: Analysis of smoke** | | | | | | | | | | | | | | |
| Classification of smoke constituents, definition of air pollution and definition of atmosphere. | | ✓ | | | ✓ | ✓ | | | | | | | ✓ | ✓ |
| Analysis of inorganic smoke constituents: Carbon compounds (e.g., CO and $CO_2$), nitrogen compounds (e.g., NO and $NH_3$), sulfur compounds (e.g., $H_2S$, $SO_2$ and $SO_3$) and halogen compounds (e.g., HF and HCl). | | ✓ | | | ✓ | ✓ | | | | | | ✓ | ✓ | |
| Analysis of organic smoke constituents: Hydrocarbons, aldehydes, ketones, amines and alcohols. | | ✓ | | | ✓ | ✓ | | | ✓ | | | ✓ | ✓ | |
| Analysis of particulates (e.g., $Fe_3O_4$, $V_2O_5$, CaO, $PbCl_2$, $PbBr_2$, fly ash etc). | | ✓ | | | ✓ | ✓ | | | ✓ | | | | | ✓ |
| Sampling methods and techniques used in smoke sampling: Gravity technique, filtration technique, precipitation technique and adsorption sampling. | | ✓ | | | ✓ | ✓ | | | ✓ | | | ✓ | ✓ | |
| Interpretation and treatment of the obtained data. | | ✓ | | | ✓ | ✓ | | | | | | ✓ | ✓ | |
| **Part3: Analysis of soil** | | | | | | | | | | | | | | |
| Introduction: Origin and nature of soils, purpose of soil analysis as well as precision and accuracy. | | | ✓ | | ✓ | ✓ | | | | | | ✓ | ✓ | |
| Soil physics: Mechanical composition (texture), soil structure, specific and volumetric masses of soils, porosity of soils, soil aeration, water in soils, water properties of soils, soil moisture and plants, soil temperature, soil chemistry and total chemical composition. | | | ✓ | | ✓ | ✓ | | | | | | | | ✓ |
| Forms of compounds of main chemical elements in soils: Soil macronutrients, | | | ✓ | | ✓ | ✓ | | | | | | ✓ | | ✓ |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| soil micronutrient, heavy metals in soil, the role of iron and aluminum in soil formation and methods to determine oxides and their forms in soils | | | | | | | | | | | | | | |
| Physical chemistry of soils: Electronic properties of soils, soil colloids and their properties, physical properties of colloids and cation exchange in soils. | | | ✓ | | ✓ | ✓ | | | | | | ✓ | | ✓ |
| Preparation of soil sample for analysis: Reception at the laboratory, drying, grinding and sieving and storage. | | | ✓ | | ✓ | ✓ | | | ✓ | ✓ | | | | ✓ |
| Soil physical analysis: Soil moisture content, particle size distribution and saturated past. | | | ✓ | | ✓ | ✓ | | | ✓ | ✓ | | | | ✓ |
| Soil chemical analysis: ph, electrical conductivity, calcium carbonate, organic matter, cation exchange capacity and gypsum. | | | ✓ | | ✓ | ✓ | | | ✓ | ✓ | | | ✓ | |
| Soil nutrients, cation and anion analysis: Macronutrients (nitrogen, phosphorus, potassium, sodium, soluble calcium, magnesium, carbonate and bicarbonate, chloride, sulfate and born) and micronutrient cations (iron, zinc, manganese and copper). | | | ✓ | | ✓ | ✓ | | | ✓ | ✓ | | ✓ | | |
| General methodological aspects: Atomic absorption spectrometry (principle of aas analysis, advantages and disadvantages of aas analysis) and x-ray fluorescence spectrometry (principle of x-ray analysis, types of spectrometers used, wavelength dispersive instruments (edxrf), energy dispersive instruments (edxrf) | | | ✓ | | ✓ | ✓ | | | ✓ | ✓ | | | ✓ | ✓ |
| **Part4: Stripping voltammetry** | | | | | | | | | | | | | | |
| Introduction: Stripping voltammetry techniques (anodic stripping voltammetry, cathodic stripping voltammetry, potentiometric stripping voltammetry and adsorptive stripping voltammetry). | | | | ✓ | | | ✓ | ✓ | | | | | ✓ | |
| Electrochemical cells. | | | | ✓ | | | ✓ | ✓ | | | | | ✓ | ✓ |
| Working electrodes: Mercury electrodes, carbon electrodes, metal electrodes and chemically modified electrodes. | | | | ✓ | | | ✓ | ✓ | | | | | | |
| Methods validation: Linearity, calibration curves, limit of detection (LOD), limit of quantification, reproducibility, recovery, accuracy, precision, selectivity, interferences, robustness and raggedness. | | | | ✓ | | | ✓ | ✓ | | | | ✓ | | ✓ |
| Some practical applications:<br>Analysis of various metal ions in water samples. | | | | ✓ | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ |
| Analysis of pharmaceutical compounds in bulk form, formulation and biological fluids. | | | | ✓ | | | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | |

## Learning and Teaching Methods

| Learning Method | Course outcomes ILOs | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | | | Intellectual Skills | | | | | Professional and Practical Skills | | | | | General and Transferable Skills | | | | |
| | A1 | A2 | A3 | A4 | A5 | | B1 | B2 | B3 | B4 | B5 | C1 | C2 | C3 | | | D1 | D2 | D3 | | |
| Lecture | √ | √ | √ | √ | √ | | √ | √ | √ | √ | √ | | | | | | | | | | |
| Discussion (Brain Storming) | | | | | | | | | | √ | | | | | | | √ | √ | | | |
| Self-learning (Essay) | √ | | √ | √ | | | √ | √ | | | | √ | √ | √ | | | √ | √ | √ | | |
| Field Trips | | | | | | | | | | | | | | | | | | | | | |
| Practical | | | | | | | | √ | | √ | √ | √ | √ | √ | | | | | √ | | |

## Assessment Methods

| Assessment Methods | Course outcomes ILOs | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | | | Intellectual Skills | | | | | Professional and Practical Skills | | | | | General and Transferable Skills | | | | |
| | A1 | A2 | A3 | A4 | A5 | A6 | B1 | B2 | B3 | B4 | B5 | C1 | C2 | C3 | C4 | | D1 | D2 | D3 | D4 | |
| Essay Question | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | | | | | | | | | | |
| MCQ | | √ | | √ | | | | | | | | | | | | | | | | | |
| Student Activity | √ | | √ | | | | √ | √ | √ | √ | √ | √ | √ | √ | √ | | √ | √ | √ | √ | |
| Practical | | | √ | | | | | √ | | | | √ | √ | √ | √ | | | | √ | √ | |

Course Coordinator | Head of Department
Name (Arabic) أ. د /هناء صلاح الدسوقى | أ. د / الرفاعى صبحى قناوى

Name **Prof. Hanaa S. El-Dessoky** | **Prof. Dr. El-Refaie Kenawy**

Signature ................................ | ..............................................

9/2014 | 9/2014

| | | |
|---|---|---|
| Course Title | **Computer** | |
| Course Code | 1317 | |
| Academic Year | **2014/2015** | |
| Coordinator | **Prof. Mahmoud Kamel** | |
| Other Staff | **Prof. Mahamed El-Awady, Mohmed Ghoneim, Prof. Qadry Zakaria, Prof Saad Abo elenen** | |
| Semesters | **Two Semesters** | |
| Pre-Requisite | **B.Sc.** | |
| Course Delivery | **Lecture** | **1h/week** |
| | **Practical** | **1h/week** |
| Parent Department | **Computer Centre** | |
| Date of Approval | **September, 2014** | |

**1. Aims**

This course will enable students to acquire a range of transferable skills that are important for post graduate M. Sc. students to:

- Develop their capability for information retrieval and presentation, and proficiency in the use of IT effectively in the context of their studies.
- Underpin academic work throughout postgraduate studies.
- Provide opportunities to develop skills required for team working, oral presentation of scientific material, and career choices.

***A. Knowledge and understanding:***

Upon successful completion of this course the students should be able to:

A1. Demonstrate knowledge and understanding of the use of IT in the context of their postgraduate studies.
A2. Know the diverse media and hardware and software that help to benefit of the IT in the context of the postgraduate studies.
A3. Carry out necessary graphical, statistical and frequency analyses of different types of data.
A4. Create powerful presentation using sophisticated software packages.
A5. Make use of different internet resources.
A6. Solve scientific problems using computer programming.
A7. Make use of different photo enhancing and manipulation techniques.

***B. Intellectual skills:***

They should also acquire the ability to:

B1. Integrate different application programs to develop effective information analysis and presentation.

***C. Professional and practical skills:***

C1. Use a number of computer packages to present information.

***D. General and transferable skills:***

D1. Use the internet/electronic resources to obtain subject specific information, and to develop lifelong learning skills that can be applied to suitable research problems.

**3. Contents**

**Assignment 1** : **information technology** Lectures 1-5

Types and generations of computers
Hardware and Software computer structure
Types and development of operating systems
Working with windows
File and folder manipulations

**Assignment2** : **Using PowerPoint program** Lectures 6-12

Working with PowerPoint program
Insert slides and animations
Different methods of slide editing
Insert tables ,charts, video, pictures, hyperlinks ,web pages and different objects
Design a real and powerful presentation with different acquired skills

**Assignment 3** : **Using Access program** Lecture 13-18

Working with Access program
Define data and information
Creating data base tables , sorting and filtering records and fields
Creating different types of queries to extract useful information
Creating forms for data entries and calculations
Creating and printing final reports

**Assignment 4: Using the Internet** Lecture 19-23

Define different types of protocols and network
Different levels of internet connections
Email and methods of file transfer
Use of internet capabilities and searching engines
Life search on the internet for some real information

**Assignment 5**: Programming using Visual Basic 6 Lecture 24-28

Different types of computer languages
Concept of visual programming language
Working with visual basic language
Steps necessary for creating a project with visual basic
Solving real problems using a visual basic computer language

**4. Teaching and Learning Methods**

- Lectures
- Practical classes
- Assignments

The course is delivered through lectures, practical sessions and assignments. Team working skills are developed on a week-long laboratory exercises and the students present and defend their findings in a public seminar.

**5. Student Assessment**

| Assessment Method | Skills assessed* | Assessment Length | Schedule | Proportion |
|---|---|---|---|---|
| Written Examination | KU, I | 1 Hour Examination | Term Final | 60% |
| Practical Examination | KU, I | 1 Hour Examination t | Term Final | 30% |
| Semester work | P, T | Continuous Assessment | | 10% |

*KU: Knowledge and Understanding, I: Intellectual, P: Professional, T: Transferable

**6. List of references**

*Course notes:*

- Notes given to students at each section describe the tasks to be completed, therefore no particular book(s) recommended.

**7. Facilities required for teaching and learning**

- Projectors; Video and Overhead
- LCD screens and writing Boards
- Commercial computer scientific software packages.

Course Contents – Course ILOs Matrix

**Course code: 1317 Chemistry, course title: Computer**

| Course Contents | Course outcomes ILOs | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | | | | | | | Intellectual | | | | | Practical | | | | | Transferable | | |
| | A1 | A2 | A3 | A4 | A5 | A6 | A7 | A8 | A9 | A10 | B1 | B2 | B3 | B4 | B5 | C1 | C2 | C3 | C4 | C5 | D1 | D2 | D3 |
| Week #1-2 | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #3-4 | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #5-6 | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #7-8 | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #9-10 | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #11-12 | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #13-14 | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #14-15 | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #16-17 | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #18-19 | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #20-21 | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #22-23 | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #24-25 | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #26-27 | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #28 | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |

| | Course Coordinator | Head of Computer Center |
|---|---|---|
| Name | Prof. Mahmoud M. Kamel | **Prof. El-Sayed T. Rizk** |
| Name (Arabic) | أ.د.محمود مصطفى كامل | أ.د. السيد طه رزق |
| Signature | | |
| Date | 9/2014 | 9/2014 |

# Diploma of Science Degree in Applied Chemistry

- **Academic Reference Standards:** The National Academic Reference Standards (NARS) for Diploma program degree in chemistry as well as the attributes and capabilities of the graduates were based on the National Academic Reference Standards (NARS) for graduate studies published by the National Authority for Quality Assurance and Accreditation of Education for Diploma. Specific reference standard for the Diploma in Applied Chemistry were approved by the Council of the Faculty of Science, Tanta University in 2014.

**1.1. Graduate Attributes.**

*The graduate of the Diploma must be able to:*

1.1.1. Apply the basic concepts of scientific research.

1.1.2. Apply the concepts of "analysis" and its use in the field of chemistry.

1.1.3. Construct related subjects and information to be applied professionally.

1.1.4. Show deep knowledge of the current problems in chemistry.

1.1.5. Solve problems using a range of formats and approaches.

1.1.6. Choose the appropriate technological techniques.

1.1.7. Communicate effectively and show a perfect professional leadership.

1.1.8. Make decisions regarding the professional activities.

1.1.9. Make use of the available facilities.

1.1.10. Recognize his/her role for society development.

1.1.11. Self–learning in both academic and professional areas.

**1.2. Knowledge and Understanding**:

*By the end of the study program of graduate of Diploma must able to:*

1.2.1. Know the theories and fundamentals related to the area of study as well as related areas.

1.2.2. Mutual influence between professional practice and its impacts on the environment.

1.2.3. Understand the legal and ethical principles of professional practice in the area of study specialization.

1.2.5. Know the basis of quality in professional practice in the area of specialization.

**1.3. Intellectual skills**

*By the end of the study program of graduate of Diploma must able to:*

1.3.1. Analyze and evaluate the information in the field of specialization.

1.3.2. Solve specialized problems in case of lack of information.

1.3.3. Link between different knowledge to solve professional problems.

1.3.4. Conduct a research study and / or write a methodology of a scientific investigation.

1.3.5. Risk assessment in professional practices in the area of interest.

1.3.6. Planning to improve performance in the field of interest.

1.3.7. Make the proper decision in diverse professional contexts.

**1.4. Professional skills**.

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

1.4.1. Mastery of, modern professional basic skills in the area of specialization.

**1.5. General and transferable skills**.

*By the end of the master's program graduate must be able to:*

1.5.1. Communicate effectively to obtain required knowledge.

1.5.2. Use of information technology to serve the professional practice.

1.5.3. Develop rules and indicators for assessing the performance of others.

1.5.4. Work in a team, and leading team work in professional contexts.

| program Title | **Diploma of Science Degree in Applied Chemistry** |
|---|---|
| Award | **Diploma of Science Degree in Applied Chemistry** |
| Parent Department | **Chemistry Department** |
| Teaching Institution | **Faculty of Science – Tanta University** |
| Awarding Institution | **Tanta University** |
| Coordinator | **Prof. Tarek A. Fayed** |
| External Evaluator(s) | **Prof. Magdi S. Farag**<br>**Faculty of Science –Cairo University** |
| QAA Benchmarking Standards | **National Academic Reference Standards (NARS)** |
| Other Reference Points | **Egyptian Code of Assessment** |
| Date of intake | **Every year in September** |
| Review Date | **Internal Periodic Review, Summer 2014** |
| Date of Approval | **September, 2014** |

## 1. Aims

1.1 Meet the requirements of the rapidly increasing demands of research and development needs of industry and community.
1.2 Provide flexibility, knowledge and motivation required to strengthen the students' background in many areas related to application of chemistry in foods, polymers, petroleum and petrochemicals, oils, mineral extraction, glass and detergents industries.
1.3 Provide opportunities of students to develop and strengthen their abilities and higher skills (professional, communication, responsibility, ethical and IT) in a scientific and technological context necessary to apply and work as a professional chemist in different carries.
1.4 Develop an appreciation of the importance of chemistry in an industrial, economic, environmental and social context

## 2. Intended Learning outcomes

### *A. Knowledge and understanding:*

At the end of this Diploma students should be able to:

**A1**. Identify the different underlying concepts and principles of chemistry relevant to industrial and community development applications of chemistry.

**A2**. Recognize on safe, ethical and proficient criteria in laboratory practice and dealing with instrumental techniques necessary for their working area.

**A3.** Define bases and advanced concepts of quality control in chemical industries.

**A4.** Explain the scientific procedures and principles of deducing and solving chemical problem in industry and research areas.

***A5.*** Indicate theories and applications of different instrumental techniques related to different industrial chemical applications

***B. Intellectual skills:***

They should be also acquiring the ability to:

B1. Formulate hypotheses, plan and execute laboratory investigation or develop work.

B2. Evaluate the outcomes and draw valid conclusions.

B3. Conduct theoretical and experimental studies.

B4. Find appropriate solutions for the career related problems.

B5. Apply subject knowledge and understanding to formulate chemical problems within a given frame.

B6. Analyse, synthesize and assimilate diverse information in a critical manner.

B7. Correctly document the scientific work, and comprehensively discuss the results and conclusions.

***C. Professional and practical skills:***

They should be also acquiring the ability to:

C1. Record, collect, analyse and report data of laboratory and field investigations.

C2. Undertake laboratory investigations in a responsible, safe and ethical manner to control and develop chemical industries.

C3. Plan and conduct various forms of laboratory investigations in standard, specific, precise and accurate manner utilising relevant and available technologies and techniques.

***D. General and transferable skills:***

They should be also acquiring the ability to:

D1. Communicate clearly, confidently and effectively using a range of presentational techniques.

D2. Apply numerical and IT skills for information and data collection as well as professional development.

D3. Work both independently and in collaboration with others in a team.

D4. Take responsibility for long-life self-learning and personal/professional development.

### 3. Academic standards

- **Academic Reference Standards:** The National Academic Reference Standards (NARS) for Diploma program degree in chemistry as well as the attributes and capabilities of the graduates were based on the National Academic Reference Standards (NARS) for graduate studies published by the National Authority for Quality Assurance and Accreditation of Education for Diploma. Specific reference standard for the Diploma in Applied Chemistry were approved by the Council of the Faculty of Science, Tanta University in 2014.

### 3.1. Graduate Attributes.

*The graduate of the Diploma must be able to:*

3.1.1. Apply the basic concepts of scientific research.

3.1.2. Apply the concepts of "analysis" and its use in the field of chemistry.
3.1.3. Construct related subjects and information to be applied professionally.
3.1.4. Show deep knowledge of the current problems in chemistry.
3.1.5. Solve problems using a range of formats and approaches.
3.1.6. Choose the appropriate technological techniques.
3.1.7. Communicate effectively and show a perfect professional leadership.
3.1.8. Make decisions regarding the professional activities.
3.1.9. Make use of the available facilities.
3.1.10. Recognize his/her role for society development.
3.1.11. Self–learning in both academic and professional areas.

**3.2. Knowledge and Understanding**:
*By the end of the study program of graduate of Diploma must able to:*

3.2.1. Know the theories and fundamentals related to the area of study as well as related areas.
3.2.2. Mutual influence between professional practice and its impacts on the environment.
3.2.3. Scientific developments in the area of specialization.
3.2.4. Understand the legal and ethical principles of professional practice in the area of study specialization.
3.2.5. Know the basis of quality in professional practice in the area of specialization.
3.2.6. Know the principles and ethics of scientific research

**3.3. Intellectual skills**
*By the end of the study program of graduate of Diploma must able to:*

3.3.1. Analyze and evaluate the information in the field of specialization.
3.3.2. Solve specialized problems in case of lack of information.
3.3.3. Link between different knowledge to solve professional problems.
3.3.4. Conduct a research study and / or write a methodology of a scientific investigation.
3.3.5. Risk assessment in professional practices in the area of interest.
3.3.6. Planning to improve performance in the field of interest.
3.3.7. Make the proper decision in diverse professional contexts.

**3.4. Professional skills**.
*By the end of the Diploma program graduate must be able to:*

3.4.1. Mastery of, modern professional basic skills in the area of specialization.

**3.5. General and transferable skills**.
*By the end of the master's program graduate must be able to:*

3.5.1. Communicate effectively to obtain required knowledge.
3.5.2. Use of information technology to serve the professional practice.
3.5.3. Develop rules and indicators for assessing the performance of others.
3.5.4. Work in a team, and leading team work in professional contexts.

## 4. Curriculum Structure and contents:

4.A Program duration One Year

4.B Program structure

4.B.1 Number of contact hours per Week:

| | | | | | |
|---|---|---|---|---|---|
| Lectures | 6 | | 24 | Total | 30 |

4.B.2 Number of credit hours of other courses:(computer)

| | | | |
|---|---|---|---|
| Lectures | 1 | Lab. | 1 |

## 5. Program courses

| Year 1 | Course Title | Lec. | Lab. | Exer. | Program ILOs Covered |
|---|---|---|---|---|---|
| Code | Student must do the following modules: | Hours | | | |
| 2021 | Instrumental Analysis (Polarography, Optical Spectroscopy, Thermal Analysis, Analysis by Radioactive isotopes | 2 | 8 | | KU, I, P, G |
| 2022 | Applied Chemistry I (Water and Sewage Analysis, Extraction of Minerals, High Polymers, Glass technology) | 2 | 8 | | KU, I, P, G |
| 2023 | Applied Chemistry II (Catalysis, Starch and alcohol fermentation, Petroleum and Petrochemicals, Corrosion) | 2 | 8 | | KU, I, P, G |
| 1317 | Computer | 1 | 1 | | KU, I, P, G |

## 6. Program admission requirements

Arrangements for admission are based on the national guidelines with no Faculty control on the number of newly enrolled students.

Candidates must satisfy the general admission requirements of the University, Faculty and Chemistry Department and also hold B. Sc. in Chemistry.

### 7. Regulations for progression and program completion

The Faculty has the following system to follow student's progression through the programs in which they are enrolled:

- This program is offered through two semesters over one year.
- Assessment is held by the end of the second semester and student will be eligible only on attaining pass degree (60%)
- Student who fails one to two courses must attend a reset exam at final examination

Students who fail more than two courses at the first attempt will be eligible only for a "Pass" degree following any re-set examinations in all courses.

### 8. Evaluation of program intended learning outcomes

| Sample | Tool | Evaluator |
|---|---|---|
| 20 | applied | 1. Senior students |
| 20 | applied | 2. Alumni |
| 20 | applied | 3. Stakeholders(Employers) |
| 1 | applied | 4. External Evaluator(s)(External Examiner(s)) |

**Matrix of ARS ILOs and Applied Chemistry Diploma Program ILOs**

| ARS ILOs | Program intended learning outcomes ILOs | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | | Intellectual | | | | | | | Practical | | | | Transferable | | | |
| | A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | | D1 | D2 | D3 | D4 |
| **Knowledge and Understanding** | | | | | | | | | | | | | | | | | | | | |
| **1**. Know the theories and fundamentals related to the area of study as well as related areas. | √ | √ | | | | | | | | | | | | | | | | | | |
| **2.** Mutual influence between professional practice and its impacts on the environment. | √ | √ | | √ | √ | | | | | | | | | | | | | | | |
| **3.** Understand the legal and ethical principles of professional practice in the area of study specialization | | | √ | | | | | | | | | | | | | | | | | |
| **4.** Know the basis of quality in professional practice in the area of specialization. | √ | √ | √ | √ | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| **Intellectual Skills** | | | | | | | | | | | | | | | | | | | | |
| **1.** Analyze and evaluate the information in the field of specialization. | | | | | | √ | √ | | | | | | | | | | | | | |
| **2.** Solve specialized | | | | | | √ | √ | √ | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| problems in case of lack of information. | | | | | | | | | | | | | | | | | | | | |
| **3.** Link between different knowledge to solve professional problems. | | | | | | √ | | √ | √ | | | | | | | | | | | |
| **4.** Conduct a research study and / or write a methodology of a scientific investigation. | | | | | | | √ | | √ | √ | | | | | | | | | | |
| **5.** Risk assessment in professional practices in the area of interest. | | | | | | √ | | | | √ | √ | | | | | | | | | |
| **6.** Planning to improve performance in the field of interest. | | | | | | √ | √ | | | | √ | | | | | | | | | |
| **7.** Make the proper decision in diverse professional contexts. | | | | | | | | | | √ | √ | | | | | | | | | |
| **Professional Skills** | | | | | | | | | | | | | | | | | | | | |
| **1.** Mastery of, modern professional basic skills in the area of specialization. | | | | | | | | | | | | | | | √ | √ | | | | |
| **General Skills** | | | | | | | | | | | | | | | | | | | | |
| **1**. Communicate effectively to obtain required knowledge. | | | | | | | | | | | | | | | | | √ | | | |
| **2**. Use of information technology to serve | | | | | | | | | | | | | | | | | √ | √ | | |

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| the professional practice. | | | | | | | | | | | | | | | | | | | | |
| **3.** Develop rules and indicators for assessing the performance of others. | | | | | | | | | | | | | | | | √ | √ | | | |
| **4.** Work in a team, and leading team work in professional contexts. | | | | | | | | | | | | | | | | | | √ | √ | |

**Diploma of Science Degree in Applied Chemistry**

**Program's Matrix**

| Code | **Courses** | **Knowledge and Understanding** | | | | | **Intellectual Skills** | | | | | **Professional Skills** | | | **General Skills** | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | C1 | C2 | C3 | D1 | D2 | D3 | D4 |
| 2021 | Instrumental Analysis (Polarography and Voltammetry, Optical Spectroscopy, Thermal Analysis, Analysis by Radioactive Isotopes and Glasses) | √ | √ | | √ | | | √ | √ | | √ | √ | | | √ | | √ | √ |
| 2022 | Applied Chemistry 1 ( Extraction and purification of metals, Glass Science and Technology , Analysis of Water and Wastewater , High Polymers) | | | √ | √ | √ | | √ | √ | | √ | √ | √ | √ | √ | | √ | √ |
| 2023 | Applied chemistry II (Catalytic processes, corrosion, fermentation and petrochemicals) | | √ | | √ | | √ | √ | | | √ | | √ | √ | √ | | √ | √ |
| 1317 | Computer | √ | √ | √ | | | | √ | | | √ | √ | √ | √ | | √ | | |

**Learning and Teaching Methods**

| **Learning Methods** | **Course outcomes ILOs** | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Knowledge and Understanding** | | | | | **Intellectual Skills** | | | | | **Professional and Practical Skills** | | | **General and Transferable Skills** | | | |
| | **A1** | **A2** | **A3** | **A4** | **A5** | **B1** | **B2** | **B3** | **B4** | **B5** | **C1** | **C2** | **C3** | **D1** | **D2** | **D3** | **D4** |
| **Lecture** | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | | | | | | | |
| **Discussion (Brain Storming)** | | | | | | | | | √ | | | | | √ | √ | | |
| **Self-learning** | √ | | √ | √ | | √ | √ | | | | √ | √ | √ | √ | √ | √ | √ |

| Learning Methods | Course outcomes ILOs | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | | Intellectual Skills | | | | | Professional and Practical Skills | | | General and Transferable Skills | | | |
| | A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | C1 | C2 | C3 | D1 | D2 | D3 | D4 |
| (Essay) | | | | | | | | | | | | | | | | | |
| Practical | | | | | | | √ | | √ | √ | √ | √ | √ | | | √ | √ |

**Assessment Methods**

| Assessment Methods | Course outcomes ILOs | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | | Intellectual Skills | | | | | Professional and Practical Skills | | | General and Transferable Skills | | | |
| | A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | C1 | C2 | C3 | D1 | D2 | D3 | D4 |
| Essay Question | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | | | | | | | |
| MCQ | | √ | | √ | | | | | | | | | | | | | |
| Student Activity | √ | | √ | | | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| Practical | | | √ | | | | √ | | | | √ | √ | √ | | | √ | √ |

| Name | Signature | Date |
|---|---|---|
| *Program Coordinator:*<br>**Prof. Mohamed Y. El sheikh**<br>**(أ. د. محمد يسري الشيخ)** | ……………………… | 9/2014 |
| *Head of Quality Assurance Unit:*<br>**Prof. Hoda K. El-sayed**<br>**(أ. د. هدى كمال السيد)** | ………………………… | 9/2014 |
| *Dean of the Faculty:*<br>**Prof. Tarek A. Fayed**<br>**(أ. د. طارق فايد)** | ………………………… | 9/2014 |

| | | |
|---|---|---|
| course Title | **Instrumental Analysis (Polarography and Voltammetry, Optical Spectroscopy, Thermal Analysis, Analysis by Radioactive Isotopes and Glasses)** | |
| Course Code | **2021** | |
| Academic Year | **2014/2015** | |
| Coordinator | **Prof. Mohamed G. Abu-El-Azm** | |
| | | |
| Other Staff | **Prof. Morsi M. Abo-Sekkina, Prof. Mohamed A. ElMorsi, prof. Shaker T. Abdel Halim** | |
| Semesters | **Two Semesters** | |
| Pre-Requisite | **B.Sc. in Chemistry** | |
| Course Delivery | **Lecture** | **2h/week** |
| | **Practical** | **8h /week** |
| Parent Department | **Chemistry** | |
| Date of Approval | **September, 2014** | |

## 1. Amis

The aims of this course are to:

1.1 Discuss in details the bases and theoretical principles of thermal analysis techniques
1.2 Provide students with good information about the analysis of inorganic, organic samples as well as analysis of minerals, animal and plant tissues at the different concentration ranges.
1.3 Acquire students the theoretical principles of spectroscopic instrumental analysis techniques.
1.4 Give students best information about nuclear science in academic and applied branches.

## 2. Intended Learning outcomes

### *A. Knowledge and understanding:*

By the end of this course the students should be able to:

A7. Define the bases of thermal analysis techniques, voltammetry and polarographic methods, and spectroscopic techniques and related theories.

A8. Recognize the constituent components and function of each technique as well as the factors affecting its sensitivity.

A9. Explain the importance and applications of such techniques different industrial, environmental and research areas.

### *B. Intellectual skills:*

By the end of this course the students should be able to:

B6. Analyze the main differences between the mentioned analytical techniques based on the theoretical bases behind.

B7. Evaluate and analyze data collected from different thermal analysis techniques, voltammetry and polarographic methods, and spectroscopic techniques, to assess the quality of industrial products.

*B8*. Solve problems related to industrial applications and research using the mentioned analytical techniques.

### *C. Professional and practical skills:*

By the end of this course the students should be able to:

C4. Conduct laboratory procedures to analyze materials using the fore mentioned analytical techniques.

C5. Interpret data derived from and apply the mentioned analytical techniques in quality control and research areas.

### *D. General and transferable skills:*

By the end of this course the students should be able to:

D4. Communicate effectively in written and oral manners.

D5. Use information technology and resources to collect and represent scientific data.

D6. Work effectively as a member of team and manage time to achieve jobs and solve problems.

## 3. Contents

| | |
|---|---|
| **Part-1** | **Thermal Analysis** (An hour/week)for one Semester |
| Lecture 1 | Introduction (definitions, bases and principles of thermal analysis techniques) |
| Lectures 2, 3 | Instrumentations of TGA, DTA and DSC, and the factors affecting its sensitivity. |
| Lecture 4 | Theory and instrumentations of thermal mechanical analysis (dilatometry) |
| Lecture 5 | Theory and instrumentations of dynamic mechanical analysis |
| Lecture 6 | Applications of thermal analysis techniques in chemical research (elucidation of structures, kinetic studies and determination of thermodynamic parameters) |
| Lecture 7 | Applications of thermal analysis techniques in food industries (gelation, moisture content, SFI of fats, heat capacity, phase transition). |
| Lectures 8-10 | Applications of thermal analysis techniques in polymers industry (studying the structural and phase changes, transition temperatures and mechanical properties) |
| Lectures 11, 12 | Applications of thermal analysis techniques in drugs industry (purity, moisture content, water of crystallization, stability of coatings and shelf-life). |
| Lectures 13,14 | Some applications of thermal analysis techniques in cosmetics |
| **Part-2** | **Polarography and Voltammetry** (An hour/week) )for one Semester |
| Lectures 1,2 | Instrumentation and apparatus cells / Electrodes / Potentiostats. |
| Lecture 3 | Measurement of Volta metric and polarographic curves, determination of concentration calibration curves. |
| Lectures 4-6 | Applications of Dc polarography inorganic cations, anions and molecules, organic compounds, manganese and from in ores, lead in tinned food, morphine, DDT, Ascorbic acid in fruit and vegetables. |
| Lecture 7 | Pulse polarography |
| Lecture 8 | Differential pulse polarography |
| Lecture 9 | wave forms for pulse and Differential –pulse polarography |
| Lectures 10, 11 | Linear sweep voltammetry and cyclic voltammetry |
| Lecture 12 | Stripping voltammetry |
| Lectures 13. 14 | Application of Voltammetric methods |
| **Part-3** | **Optical Spectroscopy** (An hour/week) )for one Semester |
| Lectures 1-3 | Theory, UV/Visible spectrophotometers analysis, quantitative analysis, confirmation |

| | |
|---|---|
| | analysis, distribution of relative error due to instruments, baseline correction, multicomponent analysis, derivative spectroscopy. |
| Lecture 4,5 | Origin of fluorescence and phosphorescence, Rayleight and Raman bands, instrumentation, chemiluminescence, application. |
| Lectures 6-8 | X-ray fluorescence spectrometry, theory, X-ray fluorescence spectrum, x-ray absorption, excitation modes, different type of instruments, and quantitative analysis by x-ray fluorescence, x-ray applications.) |
| Lectures 9,10 | Atomic and flame emission spectroscopy. Principles, interpretation of phenomena involved, atomic absorption vs flame emission, instrumentation, flame photometer, applications, and correction of interfering absorptions. |
| Lectures 11-14 | Atomic emission spectroscopy. Excitation by coupled plasma, ionization by arc, spark or electronic impact, application of atomic emission spectrometry |
| **Part-4** | **Analysis by Radioactive Isotopes and Glasses** (An hour/week) ) for one Semester |
| Lecture 1 | Preparation of radioisotopes – Applications of radioisotopes in fields other than elemental analysis |
| Lectures 2, 3 | Preparation of radiolabelled compounds (direct chemical synthesis – synthesis by isotope exchange – physicochemical synthesis), Synthesis of multi-labeled compounds. |
| Lecture 4 | Analysis of radioactive substances. |
| Lecture 5 | Uses of radio-isotopes and nuclear radiations in analytical chemistry |
| Lecture 6 | Direct determination of chemical elements by radioactive reagents – radiometric titration |
| Lecture 7 | Analysis by isotope dilution – activation analysis |
| Lecture 8 | Determination of the content of chemical elements from their radioactivity |
| Lecture 9 | Types, preparation and properties of glasses and ceramics |
| Lecture 10 | Importance of ceramics |
| Lectures 11,12 | Cements (raw materials – preparation – types – usual tests – phases in cements and their role in the final products) |
| Lectures 13,14 | Mechanical properties of cements |
| Weeks 15 | **Assessment** |
| **Part -5** | |
| **Practical** | **Polarography and Voltammetry** |

**Polarography and Voltammetry**

Data analysis of:

1-Dc-polarogram of X M of organic compounds in buffer solutions of different pH- values.

2- Differential pulse polarographic analysis of a mixture of antibiotics.

3- Stripping voltammetric analysis of mixture of ($Cu^{2+}$, $Zn^{2+}$, $Pb^{2+}$)

4-Linear sweep voltammetric analysis of water samples

**Optical Spectroscopy**

Data analysis of:

1-Determination of total hardness of water by spectrophotometric method

2- Determination of alkali metals by spectrophotometric method

3- Determination of warfarine in rodenticide formulation by spectrophotometric method

4-Determination of sulfoxide in pesticide formulation by spectrophotometric method

**Thermal Analysis**

1-Study the thermal behavior of solid metal complexes

2-Determination of the kinetic parameters and mechanism of the thermal decomposition reactions

## 4. Teaching and Learning Methods

4.1. Theoretical lectures.
4.6. Library and net search for Assignments.
4.7. Seminars.
4.8. Practical sessions

## 5. Student Assessment

| Assessment Method | Skills assessed* | Assessment Length | Weight |
|---|---|---|---|
| Written Examination | KU, I | 3 Hour Examination | 60% |
| Practical Examination | P | 3 Hour Examination | 40% |

*KU: Knowledge and Understanding, I: Intellectual, P: Professional.

## 6. List of references


Essential Books:
- T. Hatakeyama, F. X. Quinn "Thermal Analysis, Fundamentals and Applications to Polymer Science", 2nd Ed., John Wiley & Sons, 1999.
- P. Gabbot, Principles and Applications of Thermal Analysis, Blackwell Publishing Ltd., 2008.
- F. Rouessac, A. Rouessac, Chemical Analysis: Modern Instrumentation, Methods and Techniques, John Wiely & Sons Ltd., 2nd Ed., 2007.

Recommended Books:
- S.H. Nieman," Instrumental analysis", 5th edition, Chapter 31.
- Applications notes at the website; www.perkinelmer.com.


## 7. Facilities required for teaching and learning

Teaching rooms equipped with white and blackboards, and data show.

**Instrumental Analysis (Polarography and Voltammetry, Optical Spectroscopy, Thermal Analysis, Analysis by Radioactive Isotopes and Glasses (course code 2021)**

| Course Contents | Intended Learning Outcomes ILOs | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | Intellectual Skills | | | Professional and Practical Skills | | General and Transferable Skills | | |
| **Part1: Thermal Analysis (An hour/week for one Semester)** | A1 | A2 | A3 | B1 | B2 | B3 | C1 | C2 | D1 | D2 | D3 |
| Introduction (definitions, bases and principles of thermal analysis techniques) | ✓ | | | ✓ | | | ✓ | | ✓ | | |
| Instrumentations of TGA, DTA and DSC, and the factors affecting its sensitivity. | ✓ | ✓ | | | ✓ | | ✓ | | ✓ | | ✓ |
| Theory and instrumentations of thermal mechanical analysis (dilatometry) | ✓ | ✓ | | | | | | | | | |
| Theory and instrumentations of dynamic mechanical analysis | | ✓ | | | | | | | | | |
| Applications of thermal analysis techniques in chemical research (elucidation of structures, kinetic studies and determination of thermodynamic parameters) | | | ✓ | | ✓ | ✓ | ✓ | ✓ | | | ✓ |
| Applications of thermal analysis techniques in food industries (gelation, moisture content, SFI of fats, heat capacity, phase transition). | | | ✓ | | ✓ | ✓ | ✓ | ✓ | | ✓ | |
| Applications of thermal analysis techniques in polymers industry (studying the structural and phase changes, transition temperatures and mechanical properties) | | | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| Applications of thermal analysis techniques in drugs industry (purity, moisture content, water of crystallization, stability of coatings and shelf-life). | | | ✓ | | ✓ | ✓ | ✓ | ✓ | | | ✓ |
| Some applications of thermal analysis techniques in cosmetics | | | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | | |
| **Part 2: Polarography and Voltammetry (An hour/week for one semester)** | | | | | | | | | | | |
| Instrumentation and apparatus cells / Electrodes / Potentiostats. | ✓ | | | ✓ | ✓ | | ✓ | | ✓ | | |
| Measurement of Voltametric and polarographic curves, | ✓ | | | ✓ | ✓ | | | ✓ | | ✓ | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| determination of concentration calibration curves. | | | | | | | | | | | |
| Applications of Dc polarography inorganic cations, anions and molecules, organic compounds, manganese and from in ores, lead in tinned food, morphine, DDT, Ascorbic acid in fruit and vegetables. | ✓ | | | ✓ | ✓ | ✓ | ✓ | | ✓ | | |
| Pulse polarography | ✓ | ✓ | | ✓ | ✓ | | ✓ | | ✓ | ✓ | ✓ |
| Differential pulse polarography | ✓ | ✓ | | ✓ | ✓ | | | | | | |
| wave forms for pulse and Differential–pulse polarography | ✓ | ✓ | | ✓ | ✓ | | | ✓ | ✓ | | |
| Linear sweep voltammetry and cyclic voltammetry | ✓ | ✓ | | ✓ | ✓ | | | | ✓ | ✓ | ✓ |
| Stripping voltammetry | ✓ | ✓ | | ✓ | ✓ | | | ✓ | | | |
| Application of Voltammetric methods | ✓ | ✓ | | ✓ | ✓ | | | | | | |
| **Part 3: Optical Spectroscopy (An hour/week for one semester)** | | | | | | | | | | | |
| Theory, UV/Visible spectrophotometers analysis, quantative analysis, confirmation analysis, distribution of relative error due to instruments, baseline correction, multicomponent analysis, derivative spectroscopy. | ✓ | ✓ | ✓ | ✓ | ✓ | | | | ✓ | | ✓ |
| Origin of fluorescence and phosphorescence, Rayleight and Raman bands, instrumentation, chemiluminescence, application. | ✓ | ✓ | ✓ | ✓ | ✓ | | | | ✓ | ✓ | |
| X-ray fluorescence spectrometry, theory, X-ray fluorescence spectrum, x-ray absorption, excitation modes, different type of instruments, and quantitative analysis by x-ray fluorescence, x-ray applications.) | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | ✓ | ✓ |
| Atomic and flame emission spectroscopy.<br>Principles, interpretation of phenomena involved, atomic absorption vs flame emission, instrumentation, flame photometer, applications, correction of interfering absorptions. | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | ✓ | ✓ |
| Atomic emission spectroscopy.<br>Excitation by coupled plasma, ionization by arc, spark or electronic impact, application of atomic emission spectrometry | ✓ | ✓ | ✓ | ✓ | ✓ | | | | ✓ | ✓ | |
| **Part 4: Analysis by Radioactive Isotopes and Glasses (An hour/week for one semester)** | | | | | | | | | | | |
| Preparation of radioisotopes – Applications of radioisotopes in fields | ✓ | | | | ✓ | | | ✓ | | | ✓ |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| other than elemental analysis | | | | | | | | | | | |
| Preparation of radiolabelled compounds (direct chemical synthesis – synthesis by isotope exchange – physicochemical synthesis), Synthesis of multi-labeled compounds. | ✓ | | | | | | | | ✓ | | |
| Analysis of radioactive substances. | | | ✓ | | ✓ | | | | ✓ | | |
| Uses of radio-isotopes and nuclear radiations in analytical chemistry | | | ✓ | | | | | | | ✓ | |
| Direct determination of chemical elements by radioactive reagents – radiometric titration | | | | | ✓ | | | | ✓ | | |
| Analysis by isotope dilution – activation analysis | | | ✓ | | | | | | | | ✓ |
| Determination of the content of chemical elements from their radioactivity | | | | | ✓ | | | | | | ✓ |
| Types, preparation and properties of glasses and ceramics | | | | | ✓ | | | | | ✓ | |
| Importance of ceramics | | | | | | | | | ✓ | | |
| Cements (raw materials – preparation – types – usual tests – phases in cements and their role in the final products) | | | | | ✓ | | | | | ✓ | |
| Mechanical properties of cements | | | | | ✓ | | | | | ✓ | ✓ |
| Assessment | | | | | | | | | | | |

**Learning and Teaching Methods**

| **Learning Methods** | **Course outcomes ILOs** | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Knowledge and Understanding** | | | | | | **Intellectual Skills** | | | | | **Professional and Practical Skills** | | | | | **General and Transferable Skills** | | | | |
| | **A1** | **A2** | **A3** | | | | **B1** | **B2** | **B3** | | | **C1** | **C2** | | | | **D1** | **D2** | **D3** | | |
| **Lecture** | √ | √ | √ | | | | √ | √ | √ | | | | | | | | | | | | |
| **Discussion (Brain Storming)** | | | | | | | | | | | | | | | | | √ | √ | | | |
| **Self-learning (Essay)** | √ | | √ | | | | √ | √ | | | | √ | √ | | | | √ | √ | √ | | |
| **Field Trips** | | | | | | | | | | | | | | | | | | | | | |
| **Practical** | | | | | | | | √ | | | | √ | √ | | | | | | √ | | |

## Assessment Methods

| Assessment Methods | Course outcomes ILOs | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | | | Intellectual Skills | | | | | Professional and Practical Skills | | | | | General and Transferable Skills | | | | |
| | A1 | A2 | A3 | | | | B1 | B2 | B3 | | | C1 | C2 | | | | D1 | D2 | D3 | | |
| **Essay Question** | √ | √ | √ | | | | √ | √ | √ | | | | | | | | | | | | |
| **MCQ** | | √ | | | | | | | | | | | | | | | | | | | |
| **Student Activity** | √ | | √ | | | | √ | √ | √ | | | √ | √ | | | | √ | √ | √ | | |
| **Practical** | | | √ | | | | | √ | | | | √ | √ | | | | | | √ | | |

| | Course Coordinator | Head of Department |
|---|---|---|
| Name (Arabic) | ا.د. / محمد جابر ابوالعزم | أ. د / الرفاعى صبحى قناوى |
| Name | **Prof. Mohamed G. Abu-El-Azm** | **Prof. Dr. El-Refaie Kenawy** |
| Signature | ……………………………… | ………………………………… |
| | 9/2014 | 9/2014 |

| Course Title | **Applied Chemistry 1 ( Extraction and purification of metals, Glass Science and Technology , Analysis of Water and Wastewater , High Polymers)** | |
|---|---|---|
| Course Code | **2022** | |
| Academic Year | **2014/2015** | |
| Coordinator | **Prof. Safaa El-Din H. Etaiw** | |
| Other Staff | **Prof. Mohammed H. Shaban, Prof. Hanaa El-Desoky , prof. Yoseif Moharm** | |
| Semesters | **Two Semesters** | |
| Pre-Requisite | **B.Sc. in Chemistry** | |
| Course Delivery | **Lecture** | **2h /week** |
| | **Practical** | **8h /week** |
| Parent Department | **Chemistry** | |
| Date of Approval | **September, 2014** | |

## 1. Aims

This course aims to:

- Acquire students a good knowledge about the various procedures utilized in the industrial production of metals in the pure state from their Ares.
- Provide students with knowledge and skills of using bacteria in leaching of metals from their low grade sulphide ores.
- Study the various procedures utilized in the condition of the formation of amorphous state and glass structure, the process of glass making, and the relation between the glass composition and the properties of the glass.
- Provide an overview on the sources and importance of water in life.
- Provide the importance of high polymers in our life.
- The condition of the formation of amorphous state and glass structure.
- The process of glass making.
- The relation between the glass composition and the properties of the glass.

## 2. Intended Learning outcomes

### *A. Knowledge and understanding:*

By the end of this course the students should be able to:

A1. Identify the different sources of water and the different impurities that can be present in.

A2. Explain the importance of water treatment and how advanced equipment can be employed to keep our life (health) better.

A3. Define the basics of the electrolytic, thermal dissociation, and zone melting methods in refining of crude metals.

A4. Describe the basics of different methods of glass formation and how to control the degree of crystallinity.

A5. Optical glass applications and new glass former systems.

A6. How things fit together-non covalent interactions-design principle the synthesis of macrocycles receptors

***B. Intellectual skills:***

By the end of this course the students should be able to:

B1. Evaluate the different methods used in water and wastewater treatment.

B2. Analyze and test water content before and after treatment and assess the data obtained and interrelate such data to the properties of the investigated water samples.

B3. Predict the glass structure based on the properties and methods of glass forming and improvement.

B4. Manage the conditions for glass formation and glass surface reaction to control the durability, electrical, optical and mechanical properties of glass.

B5. Present and future applications of supramolecular polymers

***C. Professional and practical skills:***

By the end of this course the students should be able to:

C1. Conduct laboratory procedures to analyze water samples (measuring BOD, COD, ammonia, pH, acidity, alkalinity, calcium, chloride, hardness).

C2. Interpret data derived from laboratory observations and measurements concerning different analysis methods.

***D. General and transferable skills:***

By the end of this course the students should be able to:

D1. Communicate effectively in written and oral manners.

D2. Use information technology and resources to collect and represent scientific data.

D3. Work effectively as a member of team and manage time to achieve jobs and solve problems.

**3. Contents**

| | |
|---|---|
| **Part-1** | **Water Analysis** (An hour/Week) for one Semester |
| Lecture 1 | Introduction (Sources of water and common impurities in water) |
| Lecture 2 | Water sampling |
| Lectures 3,4 | Industrial wastewater treatment (Removal of solid, calcium and other metals, dissolved organics, inorganics, and sludge) |
| Lecture 5 | Natural water purification, reuse and recycling |
| Lectures 6,7 | Analysis and measurements of water quality (Determination of total dissolved solids [TDS}, suspended solids, dissolved oxygen [DO], biological oxygen demand [BOD] |
| Lectures 8,9 | Determination o dissolved carbon dioxide, and total organic carbon [TOC] |
| Lectures10,11 | Determination of pH, acidity and alkalinity, water hardness, silica, chloride, and sulphate |
| Lectures 12,13 | Methods of water analysis (Classical, spectrophotometric, electrochemical, chromatographic, and mass spectrometric methods |
| Lecture 14 | Applications electrochemical methods in industrial wastewater treatment |
| **Part-2** | **Glass Science and Technology** (An hour/Week) for one Semester |
| Lectures 1 | Definition of glass- conditions for glass formation |
| Lecture 2 | Glass structure- The rules of glass forming in oxides proposed by Zachariasen and Sandworth. |
| Lecture 3 | Silicate glass- Borate glass- Phosphate glass .Metallic glass , Chacognide glass and new glass former systems |

| | |
|---|---|
| Lecture 4 | Glass production- Sample preparation –melting- conditioning- Fining- annealing. |
| Lecture 5 | Class furnaces – Commercial glass forming. Recent methods of glass forming (Sol – Gel) |
| Lecture 6 | Glass Surface reaction – surface adsorption - reaction with water, CO2 and SO2. |
| Lecture 7 | Glass durability – effect of glass composition – methods of improvement. |
| Lecture 8 | The electrical properties of glass - effect of glass composition- Electronic conductivity in Chacognide glass. |
| Lecture 9 | Optical properties of glass- Development of optical glasses- Refractive index and density relation- Effect of temperature and pressure. |
| Lecture10 | Color formation in glass- Types of colorants - Effect of radiation on color. |
| Lecture11 | Spectral absorption- Absorption in the visible, ultraviolet and infrared regions. |
| Lectures12,13 | Mechanical properties of glass – Methods of Improvement glass surface stre: Electrolytic conduction- Glass membrane electrodes. |
| **Part-3** | **High Polymers** (An hour/Week) for one Semester |
| Lectures 1,2 | introduction<br>Complementarity in biology :how things fit together-non covalent interactions-design principle :chelate and macrocyclic effects-characterizing supramolecular polymers-solvent effect |
| Lectures 3-5 | cation binding why bind cations?- the synthesis of macrocycles receptors. Coordination template effects-crown ether- Cryptands- Spherands: Preorganized receptors- Siderophores |
| Lectures6,7 | Anion binding (Properties of anions: receptor design principles - Why bind anions?- Recognition using electrostatic interactions - Recognition using hydrogen bonds- Recognition using Lewis acidic hosts- Recognition using combinations of interactions |
| Lectures 8-10 | Self- assembly( An introduction to self-assembly-π-Electron donor- acceptor systems- Transition metal directed assemblies (Catenates and catenands, Double and triple helices, Knots, Molecular macrocycles and boxes, Locked and unlocked molecular boxes, Racks, ladders and grids)- Hydrogen bond directed assemblies (Rosttes and ribbons, Hydrogen bonded rotaxanes and catenanes, Peptide nanotubes- Anion directed assemblies |
| Lectures 11,12 | Present and future applications of supramolecular polymers(Phase transfer agents- Phase transfer agents- Separation of mixtures-- Molecular sensors- Switches and molecular machinery- Catalysis- Pharmaceuticals) |
| **Part-4** | **Extraction of metal** (An hour/Week) for one Semester |
| Lectures 1,2 | Enrichment of ores using Hydraulic, flotation, magnetic separation and chemical separation |
| Lecture 3,4 | Reduction of the minerals to crude metals by some methods namely electrolytic separation from aqueous media and fused salts use of chemical reducing agent (e.g. Al, Mg, H2). |
| Lecture 5 | Reduction with carbon, displacement methods as well as self and auto reduction |
| Lectures 6,7 | Refining of crude metals by electrolytic, thermal dissociation and zone melting methods. |
| Lectures 8,9 | Bacterial leaching of low grade sulphide ores exemplified by Nichel and Copper sulphide ores dealing with:<br>1) Principle of the method ($MS + 2O_2 \xrightarrow[CO_2]{Bacteria} MSO_4$) |
| Lectures 10,11 | 2) Factors affecting the bacterial leaching (concentration of solution used, temperature, oxygen, and carbon dioxide) |
| Lectures 12-14 | 3) Methods utilized (e.g. The dump leaching, the tank leaching, the heap leaching, in situ leaching ….etc. |

**Part-5 Practical** **Water treatment**

Data analysis of:

1- Determination of pH of value of a given water sample
2- Determination of alkalinity of water sample by indicator method
3-Determination of suspended solids of a given water sample
4-Determination of total hardness of water using EDTA method
5-Determination of dissolved Oxygen in a given sample
6-Measurment of Chemical Oxygen Demand (COD) to determine organic pollutants of a waste water sample by using close reflux methods
7-Potentiometric determination of some metal ions in the water samples
8-Determination of Iron in water samples using UV/VIS spectrometry
9- Determination of some heavy metals (K, Ca, Mg, Cu, Mn, Fe, Ni, Co and Zn) in water sample by Flame photometry
10-Efficiency of photocatalytic effect of $TiO_2$ used in industrial wastewater by fluorimetry
11- Effluent water treatment using photocatalysis of $TiO_2$ in sunlight
12- Preparation of superparamagnatic iron oxide (SPIO) and its application in water treatment.
13- Phytomediation: The uptake of heavy metal ions from water by water Hyacinth
14- Paper from water hyacinth (Aquatic weed)

**Glass Science and Technology**

Data analysis of:

1- Estimation of silicate ion concentration in soda-lime silica glass.
2-Effect of heat treatment on silver ion exchanged glass
3- Estimation of chemical durability of glass (study of glass dealkalization)
4- Effect of addition of transition metal ions on glass color.
5-Strenthing of glass surface by $KNO_3$ ion exchange and heat-treatment

## 4. Teaching and Learning Methods

4.1. Theoretical lectures.
4.9. Library and net search for Assignments.
4.10. Seminars.
4.11. Practical sessions

## 5. Student Assessment

| **Assessment Method** | **Skills assessed*** | **Assessment Length** | **Weight** |
|---|---|---|---|
| Written Examination | KU, I | 3 Hour Examination | 60% |
| Practical Examination | P | 3 Hour Examination | 40% |

*KU: Knowledge and Understanding, I: Intellectual, P: Professional.

## 6. List of references

*Essential Books:*


1. 1. P. Patnaik, "Handbook of environmental analysis: chemical pollutants in air, water, soil, and solid wastes", CRC Press, Inc. New, Yrok, 1997
2. J. De Zuane, " Drinking water quality: standard and controls", Van Nostrand Reinhold , New York, 19990.


*Recommended Books:*


1- R. H. Doremus, Glass Science, Wiley-Interscience Publication (1973).
2- C. Babcok, Silicate glass technology methods, John Willy &Sons (1977)


## 7. Facilities required for teaching and learning

Teaching rooms equipped with white and blackboards, and data show.

**Applied Chemistry 1 (Extraction and purification of metals, Glass Science and Technology, Analysis of Water and Wastewater, High Polymers (course code: - 2022)**

| Course Contents | Intended Learning Outcomes ILOs | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Knowledge and Understanding** | | | | | | **Intellectual Skills** | | | | | **Professional and Practical Skills** | | **General and Transferable Skills** | | |
| **Part-1: water Analysis** | A1 | A2 | A3 | A4 | A5 | A6 | B1 | B2 | B3 | B4 | B5 | C1 | C2 | D1 | D2 | D3 |
| Introduction (Sources of water and common impurities in water) | ✓ | | | | | | | | | | | | | ✓ | | |
| Water sampling | | ✓ | | | | | | | | | | | | | | |
| Industrial wastewater treatment (Removal of solid, calcium and other metals, dissolved organics, inorganics, and sludge) | | | | | | | | ✓ | | | | ✓ | ✓ | | ✓ | |
| Natural water purification, reuse and recycling | | ✓ | | | | | | ✓ | | | | | | | | |
| Analysis and measurements of water quality (Determination of total dissolved solids [TDS}, suspended solids, dissolved oxygen [DO], biological oxygen demand [BOD] | | ✓ | | | | | | ✓ | | | | ✓ | ✓ | ✓ | ✓ | |
| Determination o dissolved carbon dioxide, and total organic carbon [TOC] | | ✓ | | | | | | ✓ | | | | ✓ | ✓ | ✓ | | |
| Determination of pH, acidity and alkalinity, water hardness, silica,chloride, and sulphate | | ✓ | | | | | | ✓ | | | | ✓ | ✓ | | ✓ | |
| Methods of water analysis (Classical, spectrophotometric, electrochemical, chromatographic, and mass spectrometric methods | | ✓ | | | | | | ✓ | | | | | | | | ✓ |
| Applications electrochemical methods in industrial wastewater treatment | | ✓ | | | | | | ✓ | | | | ✓ | ✓ | | ✓ | |
| **Part2: Glass Science and Technology** | | | | | | | | | | | | | | | | |
| Definition of glass- conditions for glass formation | | | | ✓ | | | | | | | | | | | | |
| Glass structure- The rules of glass forming in oxides | | | | ✓ | | | | | ✓ | ✓ | | | | ✓ | | |

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| proposed by Zachariasen and Sandworth. | | | | | | | | | | | | | | | | |
| Silicate glass- Borate glass- Phosphate glass .Metallic glass , | | | | ✓ | | | | | | | | | | ✓ | ✓ | |
| Chacognide glass and new glass former systems | | | | ✓ | | | | | ✓ | ✓ | | | | | | ✓ |
| Glass production- Sample preparation –melting-conditioning- fining- annealing. | | | | | | | | | | | | | | | | |
| Class furnaces – Commercial glass forming. Recent methods of glass forming (Sol –Gel) | | | | | | | | | | ✓ | | | | ✓ | | ✓ |
| Glass Surface reaction – surface adsorption - reaction with water, CO2 and SO2. | | | | | | | | | | | | | | | ✓ | |
| Glass durability – effect of glass composition – methods of improvement. | | | | | | | | | | | | | | | ✓ | |
| The electrical properties of glass - effect of glass composition- Electronic conductivity in Chacognide glass. | | | | | | | | | | ✓ | | ✓ | | | | ✓ |
| Optical properties of glass- Development of optical glasses- Refractive index and density relation- Effect of temperature and pressure. | | | | | ✓ | | | | ✓ | | | | | ✓ | | |
| Color formation in glass- Types of colorants - Effect of radiation on color. | | | | | ✓ | | | | ✓ | | | | | | ✓ | |
| Spectral absorption- Absorption in the visible, ultraviolet and infrared regions. | | | | | | | | | | | | | | ✓ | | |
| Mechanical properties of glass – Methods of Improvement glass surface strengthening- Electrolytic conduction- glass membrane electrodes. | | | | | | | | | ✓ | ✓ | | | | | ✓ | ✓ |
| **Part3: High Polymers** | | | | | | | | | | | | | | | | |
| Introduction<br>Complementarity in biology :how things fit together-non covalent interactions-design principle :chelate and macrocyclic effects-characterising supramolecular polymers-solvent effect | | | | | | ✓ | | | | | | | | ✓ | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| cation binding why bind cations?<br>synthesis of macrocycles receptors.<br>Coordination template effects-crown ethe Cryptands-Spherands: Preorganized receptors- Siderophores) | | | | | | ✓ | | | | | | | | | ✓ | |
| Anion binding (Properties of anions: receptor design principles - Why bind anions?- Recognition using electrostatic interactions - Recognition using hydrogen bonds- Recognition using Lewis acidic hosts- Recognition using combinations of interactions | | | | | | ✓ | | | | | | | | ✓ | | ✓ |
| Self- assembly( An introduction to self-assembly-π-Electron donor- acceptor systems-Transition metal directed assemblies (Catenates and catenands, Double and triple helices, Knots, Molecular macrocycles and boxes, Locked and unlocked molecular boxes, Racks, ladders and grids)- Hydrogen bond directed assemblies (Rosttes and ribbons, Hydrogen bonded rotaxanes and catenanes, Peptide nanotubes- Anion directed assemblies | | | | | | ✓ | | | | | ✓ | | | ✓ | ✓ | |
| Present and future applications of supramolecular polymers(Phase transfer agents- Phase transfer agents- Separation of mixtures-- Molecular sensors-Switches and molecular machinery- Catalysis-Pharmaceuticals) | | | | | | ✓ | | | | | ✓ | | | ✓ | | ✓ |
| **Part4: Extraction of metal** | | | | | | | | | | | | | | | | |
| Enrichment of ores using Hydraulic, flotation, magnetic separation and chemical separation | | | | | | | | | | | | | | ✓ | | |
| Reduction of the minerals to crude metals by some methods namely electrolytic separation from aqueous media and fused salts use of chemical reducing agent (e.g. Al, Mg, H2). | | | | | | | | | | | | | | | ✓ | |
| Reduction with carbon, displacement methods as well | | | | | | | | | | | | | | ✓ | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| as self and auto reduction | | | | | | | | | | | | | | | | |
| Refining of crude metals by electrolytic, thermal dissociation and zone melting methods. | | | | | | | | | | | | | | | | ✓ |
| Bacterial leaching of low grade sulphide ores exemplified by Nichel and Copper sulphide ores dealing | | | | | | | | | | | | | | ✓ | | |
| 2) Factors affecting the bacterial leaching (concentration of solution used, temperature, oxygen, and carbon dioxide) | | | | | | | | | | | | | | | ✓ | |
| 3) Methods utilized (e.g. The dump leaching, the tank leaching, the heap leaching, in situ leaching | | | | | | | | | | | | | | | | ✓ |

**Learning and Teaching Methods**

| Learning Method | Course outcomes ILOs | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | | | Intellectual Skills | | | | | Professional and Practical Skills | | | | | General and Transferable Skills | | | | |
| | A1 | A2 | A3 | A4 | A5 | A6 | B1 | B2 | B3 | B4 | B5 | C1 | C2 | | | | D1 | D2 | D3 | | |
| Lecture | √ | √ | √ | √ | √ | | √ | √ | √ | √ | √ | | | | | | | | | | |
| Discussion (Brain Storming) | | | | √ | | √ | | | | √ | | | | | | | √ | √ | √ | | |
| Self-learning (Essay) | √ | | √ | | | √ | √ | √ | | | √ | √ | √ | | | | √ | √ | √ | | |
| Field Trips | | | | | | | | | | | | | | | | | | | | | |
| Practical | | | | | | | | √ | | | | √ | √ | | | | | | √ | | |

**Assessment Methods**

| Assessment Methods | Course outcomes ILOs | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | | | Intellectual Skills | | | | | Professional and Practical Skills | | | | | General and Transferable Skills | | | | |
| | A1 | A2 | A3 | A4 | A5 | A6 | B1 | B2 | B3 | B4 | B5 | C1 | C2 | | | | D1 | D2 | D3 | | |
| Essay Question | √ | √ | √ | | | | √ | √ | √ | | | | | | | | | | | | |
| MCQ | | √ | | √ | | | | | | | √ | | | | | | | | | | |
| Student Activity | √ | | √ | | √ | | √ | √ | √ | | | √ | √ | | | | √ | √ | √ | | |
| Practical | | | √ | | | √ | | √ | | √ | | √ | √ | | | | | | √ | | |

| | Course Coordinator | Head of Department |
|---|---|---|
| Name (Arabic) | أ. د / صفاء الدين عطيو | أ. د / الرفاعى صبحى قناوى |
| Name | Prof. Safaa El-Din H. Etaiw | Prof. Dr. El-Refaie Kenawy |
| Signature | ……………………………… … | ……………………………………….. |
| | 9/2014 | 9/2014 |

| | | |
|---|---|---|
| Course Title | **Applied chemistry II (Catalytic processes, corrosion, fermentation and petrochemicals)** | |
| Course Code | **2023** | |
| Academic Year | **2014/2015** | |
| Coordinator | **Prof. M. El-Sayed Salem** | |
| Other Staff | **Prof M. fargaly, Prof. Mohamed El-Morsi, Prof. Ahmed A. Saafan** | |
| Semesters | **Two Semesters** | |
| Pre-Requisite | **B.Sc. in Chemistry** | |
| Course Delivery | **Lecture** | **2h / week** |
| | **Practical** | **8h / week** |
| Parent Department | **Chemistry** | |
| Date of Approval | **September, 2014** | |

## 1. Aims

The aims of this course are to:

1.1 Provide students with the basics and theoretical principles in many disciplines; catalytic.

1.2 Provide overview on the practical applications of these fields both in industry and environment.

## 2. Intended Learning outcomes

### *A. Knowledge and understanding:*

By the end of this course the students should be able to:

A1. Define the role of a catalyst in relation to activation energy and to appreciate the relevance of catalyst activity, selectivity, deactivation and regeneration.

A2. State the applications of catalysis both in industry and in environmental treatments

A3. Identify the major types of homogeneous and heterogeneous catalysts (metals, metal oxides and solid acids) and be familiar with the general principles of their mode of action.

A4. Identify the corrosion processes of metals and alloys as well as the corrosion protection methods and the different types of corrosion inhibitors, and the meaning of volatile oils and theirs applications.

A5. Recognize the relation between structure of starch and its uses, and petroleum formation by organic theory and how through chemistry we can convert it into fuels to generate power.

### *B. Intellectual skills:*

By the end of this course the students should be able to:

B1. Interpret kinetic data of catalytic reactions in terms of adsorption equilibria and elemental reaction steps

B2. Differentiate between the different types of corrosion processes and which inhibitor should be used for metal protection.

B3. Differentiate between the different types of volatile oils and starch, and know the way of formation of petroleum by organic theory, the composition of crude oil.

B4. Illustrate the classification of petroleum chemicals, different industries based on petrochemicals.

### *C. Professional and practical skills:*

By the end of this course the students should be able to:

C1. Conduct laboratory experiments to check the ability of a substance to be used as a catalyst for specific reaction.

C2. Select and prepare samples for catalysis.

C3. Interpret and analyzing kinetic data from catalytic processes, and prepare perfumes from volatile oils.

C4. Convert starch to mono- and di-saccharides, and produce pesticides for agriculture, dyes to add color to life and drugs to combat diseases from petrochemicals.

C5. Prepare plastics material for life today, tomorrow, synthetic fibers for attractive easy life, cosmetics and perfumes for sensuous living life.

### *D. General and transferable skills:*

By the end of this course the students should be able to:

D1. Communicate effectively in written and oral.

D2. Use information technology and resources to collect and represent scientific data.

D3. Work effectively as a member of team and manage time.

### 3. Contents

| | |
|---|---|
| **Part-I** | **Catalysis and catalytic processes** (An hour/Week)for one Semester |
| Lectures 1,2 | Introduction<br>What are catalysts<br>Catalysts and activation energy<br>Types of catalytic reactions |
| Lectures 3-5 | Catalysis in solution<br>Acid-base catalysis<br>Catalysis in the gas phase<br>Catalysis in dilute aqueous solutions<br>General and specific acid - base catalysis.<br>Catalysis by strong acids.<br>Catalysis by bases<br>Catalysis by metal ions.<br>Hydrocarbon conversion |
| Lectures 6-9 | Catalysis by polymers.<br>Nature of polymers<br>Attachment of catalytic groups to polymer supports<br>Catalysis in polymer gels<br>Adsorption and kinetics of polymer catalyzed reactions<br>The role of the support<br>Porous polymers and surface catalysis<br>Applications of polymer catalysis |
| Lectures 10,11 | Catalysis on surfaces<br>Adsorption |

| | |
|---|---|
| | Surface catalysis |
| Lectures 12-14 | Examples of catalytic reactions |
| | Reduction of nitrogen oxide |
| | Oxidation of ammonia |
| | Epoxidation of alkenes. |
| | Photocatalytic degradation of organic compounds |
| | Photocatalytic degradation of dyes and pigments |
| **Part-2** | **Corrosion** (An hour/Week) for one Semester |
| Lectures 1,2 | Metallic corrosion in various environment |
| | various ways of systematization of the corrosion filed |
| | Corrosion in moist environments |
| | Electrochemical mechanism |
| | Water and aqueous solutions |
| | The atmosphere |
| | The Soil |
| Lecture 3 | Corrosion in fused salts |
| | Corrosion in dry gases |
| Lecture 4 | Corrosion in water-free organic liquids |
| Lecture 5 | Corrosion in molten metals |
| Lecture 6 | Potential – pH Diagrams for some important Metals |
| Lecture 7 | Kinetics of electrochemical corrosion |
| Lecture 8 | Passivity of metals : Iron , chromium |
| Lecture 9 | Hydrogen evolution and oxygen reduction corrosion |
| Lecture 10 | Some important types of electrochemical corrosion |
| Lecture 11 | Corrosion Protection |
| | by change of metal and design |
| | by change in the corrosive medium |
| | Anodic inhibitors |
| | Cathodic inhibitors |
| | Double – acting organic inhibitors |
| | (B ) Corrosion Protection by change of the electrode potential |
| | (c) Corrosion Protection by means of surface coatings |
| Lectures 12-14 | Corrosion testing and control of experimental conditions in laboratory tests |
| **Part-3** | **Fermentation** (An hour/Week) for one Semester |
| Lecture 1 | Introduction on starch. |
| | Occurrence, isolation. |
| Lecture 2 | Structure and properties of starch granules. |
| | Structure and properties of amylose. |
| Lecture 3 | Structure and properties of amylopectin. |
| | Utilization of starch. |
| | Starch ethers, cross-linked starches |
| Lecture 4 | Bottom fermentation. |
| | Top fermentation. |
| Lecture 5 | Continuous processes, rapid methods. |
| | Composition ethanol, extract, acids, nitrogen compounds. |
| Lecture 6 | Minerals, vitamins, aroma substances. |
| | Cellar operations after fermentation storage. |
| Lecture 7 | Chemistry of essential oils. |
| Lecture 8 | Terpenless volatile oils. |

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| | Determination of terpanoids structure. |
| Lecture 9 | Classification of volatile oils constituents. |
| Lecture 10 | Isolation. |
| Lecture 11 | Identification and estimation. |
| Lectures 12-14 | Oxygenated terpenoids.<br>Phenols and phenolic ethers. |
| **Part-4** | **Petrochemicals** (An hour/Week) for one Semester |
| Lectures 1,2 | Petroleum formation, organic theory. |
| Lecture 3 | Natural gas. |
| Lecture 4 | Chemical composition of crude oil. |
| Lecture 5 | Ethyl alcohol and gasoline as modern motor fuel, biogas. |
| Lectures 6, 7 | Ethylene feed, ethylene glycols, ethylene oxide, formaldehyde, methanol, phenol, ammonia. |
| Lectures 8, 9 | Alkylation process, alkyl benzene, application of LAB, hydrocarbon solvents. |
| Lecture 10 | Ethylene, polyethylene, polypropylene, PVC, urea Formaldehyde |
| Lectures 11-14 | Detergents, classification, anionic detergents, cationic detergents, nonionic detergents additives. |
| Assessment | |
| **Part-٥** | |
| **Practical** | **Catalytic processes**<br>Data analysis of:<br>1- Catalytic decomposition of $H_2O_2$.<br>2- Mn (II) - catalyzed reduction of carcinogenic Cr (VI) by citrate.<br>3- Kinetics of Ag (I) - catalyzed decoloraization of organic dyes.<br>4- Kinetic of diffusion-controlled heterogeneous reaction by titration.<br>5- Fe (II) - catalyzed reaction between peroxydisulfate and iodide ions.<br>6-Catalysis of the reaction of sodium thiosulfate with iron (II) nitrate using Cu (II), Ni (II), Co (II), and Fe (II) ions<br>**Corrosion**<br>Data analysis of:<br>1-Measurements of corrosion parameters of steel in aqueous solutions<br>2- Measurements of corrosion inhibition efficiency of steel corrosion<br>3-Galvanostatic and potentiodynamic polarization of copper in aqueous media<br>4-Corrosion parameters of steel from Tafel measurements<br>5- Measurements of adsorption isotherm of iron and determination of activation parameters of the corrosion process<br>6- Investigation of corrosion and rusting of different brands of blades |

## 4. Teaching and Learning Methods

4.1. Lectures.

4.12. Library and net search for Assignments.

4.13. Seminars.

## 5- Student Assessment

| Assessment Method | Skills assessed* | Assessment Length | Weight |
|---|---|---|---|
| Written Examination | KU, I | 3 Hour Examination | 60% |
| Practical Examination | P | 2 Hour Examination | 40% |

*KU: Knowledge and Understanding, I: Intellectual, P: Professional.

## 6. List of references

*Essential Books:*


1. B. C. Gates, *Catalytic chemistry*, John Wiley (1992).
2. G. A. Somorjai, *Introduction to surface chemistry and catalysis*, John Wiley (1994).

I. A. Salem, *Recent studies on the catalytic activity of titanium, zirconium and hafnium oxides,* Catalysis reviews, 45, 205(2003).

3. Butler , G and Ison , Hck , corrosion and its prevention in waters , Leonard Hill , London 1966
4. Tomashov , ND theory of corrosion and protection of Metals , MacMillan , New York 1966.

*Recommended Books:*

1. A.S. Huggett et al., J. Physiol, 113, 258 (1985); r. w. Neil et al., Biochem. J 65, 35 (1975). Fermentation and Glycolysis
2. H.D Belitz, W. Grosch, P. Schieberle. "Food chemistry" P. 317
3. Sherz, H., Bonn, G. Analytical chemistry of carbohydrates, Georg thieme velage, sttutgart, 1998.
4. G.T. maatooq volatile oils, Bitter principles, Resin and Resin combination P. 50.
5. Advanced Petrochemical, G.N. Sarkar, Khorna published (2002).
6. P.Wiseman, An Introduction to Industrial Organic Chemistry. Mc Grow-Hill (1979).
7. Introduction to Petrochemicals ,Sukumar Maiti (1987).


## 7. Facilities required for teaching and learning

Teaching rooms equipped with white and blackboards, and data show.

**Applied chemistry II (Catalytic processes, corrosion, fermentation and petrochemicals) (course code 2023)**

| Course Contents | Intended Learning Outcomes ILOs | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | | Intellectual Skills | | | | Professional and Practical Skills | | | | | General and Transferable Skills | | |
| **Part 1: Catalysis and catalytic processes** | A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 | B4 | C1 | C2 | C3 | C4 | C5 | D1 | D2 | D3 |
| Introduction-What are catalysts<br>Catalysts and activation energy<br>Types of catalytic reactions | ✓ | | | | | ✓ | | | | | | | | | | | |
| Catalysis in solution-Acid-base catalysis<br>Catalysis in the gas phase-Catalysis in dilute aqueous solutions-General and specific acid - base catalysis-Catalysis by strong acids.<br>Catalysis by bases-Catalysis by metal ions.<br>Hydrocarbon conversion | ✓ | | | | | ✓ | | | | ✓ | | | | | ✓ | ✓ | |
| Catalysis by polymers.-Nature of polymers<br>Attachment of catalytic groups to polymer supports-Catalysis in polymer gels<br>Adsorption and kinetics of polymer catalyzed reactions-The role of the support<br>Porous polymers and surface catalysis<br>Applications of polymer catalysis | ✓ | ✓ | | | | ✓ | | | | ✓ | | | | | | ✓ | ✓ |
| Catalysis on surfaces-Adsorption<br>Surface catalysis | | ✓ | | | | ✓ | | | | | ✓ | | | | ✓ | | |
| Examples of catalytic reactions-Reduction of nitrogen oxide-Oxidation of ammonia-Epoxidation of alkenes-Photocatalytic degradation of organic compounds-Photocatalytic degradation of dyes and pigments | | ✓ | ✓ | | | ✓ | | | | | ✓ | | | | ✓ | | ✓ |
| **Part 2: Corrosion** | | | | | | | | | | | | | | | | | |
| Metallic corrosion in various environment<br>various ways of systematization of the corrosion filed-Corrosion in moist environments<br>Electrochemical mechanism-Water and aqueous solutions -The | | | | ✓ | | | ✓ | | | | | | | | | | |

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| atmosphere-The Soil | | | | | | | | | | | | | | | | | |
| Corrosion in fused salts-Corrosion in dry gases | | | | ✓ | | | ✓ | | | ✓ | | | | | ✓ | ✓ | |
| Corrosion in water-free organic liquids | | | | ✓ | | | ✓ | | | | | | | | | ✓ | ✓ |
| Corrosion in molten metals | | | | ✓ | | | ✓ | | | | | | | | ✓ | | |
| Potential – pH Diagrams for some important Metals | | | | ✓ | | | ✓ | | | ✓ | | | | | | ✓ | ✓ |
| Kinetics of electrochemical corrosion | | | | ✓ | | | ✓ | | | | | | | | ✓ | | ✓ |
| Passivity of metals : Iron , chromium | | | | | | | ✓ | | | ✓ | | | | | | | |
| Hydrogen evolution and oxygen reduction corrosion | | | | ✓ | | | ✓ | | | | | | | | ✓ | | |
| Some important types of electrochemical corrosion | | | | ✓ | | | ✓ | | | ✓ | | | | | | ✓ | |
| Corrosion Protection -by change of metal and design by change in the corrosive medium<br>Anodic inhibitors-Cathodic inhibitors- Double acting organic inhibitors-B ) Corrosion Protection by change of the electrode potential-(c) Corrosion Protection by means of surface coatings | | | | ✓ | | | ✓ | | | | | | | | ✓ | | ✓ |
| Corrosion testing and control of experimental conditions in laboratory tests | | | | ✓ | | | ✓ | | | ✓ | | | | | ✓ | | ✓ |
| **Part 3: Fermentation** | | | | | | | | | | | | | | | | | |
| Introduction on starch.<br>Occurrence, isolation. | | | | | ✓ | | | | | | | | | | | | |
| Structure and properties of starch granules.<br>Structure and properties of amylose. | | | | | ✓ | | | ✓ | | | | | ✓ | | ✓ | | ✓ |
| Structure and properties of amylopectin.<br>Utilization of starch.<br>Starch ethers, cross-linked starches | | | | | ✓ | | | ✓ | | | | | ✓ | | | ✓ | |
| Bottom fermentation.<br>Top fermentation. | | | | | ✓ | | | ✓ | | | | | ✓ | | ✓ | | ✓ |
| Continuous processes, rapid methods.<br>Composition ethanol, extract, acids, nitrogen compounds. | | | | | ✓ | | | ✓ | | | | | ✓ | | | ✓ | |
| Minerals, vitamins, aroma substances. Cellar operations after fermentation storage. | | | | | ✓ | | | ✓ | | | | | ✓ | | ✓ | | ✓ |
| Chemistry of essential oils. | | | | | ✓ | | | ✓ | | | | | ✓ | | ✓ | | |
| Terpenless volatile oils.<br>Determination of terpanoids structure. | | | | | ✓ | | | ✓ | | | | | ✓ | | | ✓ | |
| Classification of volatile oils constituents. | | | | | ✓ | | | ✓ | | | | | ✓ | | | ✓ | ✓ |
| Isolation. | | | | | ✓ | | | ✓ | | | | | ✓ | | ✓ | | |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Identification and estimation. | | | | | ✓ | | | ✓ | | | | | ✓ | | | | ✓ |
| Oxygenated terpenoids.<br>Phenols and phenolic ethers. | | | | | ✓ | | | ✓ | | | | | ✓ | | ✓ | ✓ | |
| **Part4: -Petrochemicals** | | | | | | | | | | | | | | | | | |
| Petroleum formation, organic theory. | | | | | ✓ | | | | ✓ | | | | | | ✓ | ✓ | |
| Natural gas. | | | | | ✓ | | | | ✓ | | | | | | | ✓ | ✓ |
| Chemical composition of crude oil. | | | | | ✓ | | | | ✓ | | | | | | ✓ | | |
| Ethyl alcohol and gasoline as modern motor fuel, biogas. | | | | | ✓ | | | | ✓ | | | | | | | ✓ | ✓ |
| Ethylene feed, ethylene glycols, ethylene oxide,formaldehyde,methanol,phenol,ammonia. | | | | | ✓ | | | | ✓ | | | | | | ✓ | | ✓ |
| Alkylation process, alkyl benzene, application of LAB, hydrocarbon solvents. | | | | | ✓ | | | | ✓ | | | | | | | ✓ | |
| Ethylene,polyethylene,polypropylene,PVC,<br>urea Formaldehyde | | | | | ✓ | | | | ✓ | | | | | | ✓ | | ✓ |
| Detergents, classification, anionic detergents, cationic detergents, nonionic detergents additives. | | | | | ✓ | | | | ✓ | | | | | | | ✓ | |

**Learning and Teaching Methods**

| Learning Methods | Course outcomes ILOs | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | | | Intellectual Skills | | | | | Professional and Practical Skills | | | | | General and Transferable Skills | | | | |
| | A1 | A2 | A3 | A4 | A5 | | B1 | B2 | B3 | B4 | | C1 | C2 | C3 | C4 | C5 | D1 | D2 | D3 | | |
| Lecture | √ | √ | √ | √ | √ | | √ | √ | √ | √ | | | | | √ | | | | | | |
| Discussion (Brain Storming) | | | | √ | | | | | | √ | | | | √ | | | √ | √ | √ | | |
| Self-learning (Essay) | √ | | √ | | √ | | √ | √ | | | | √ | √ | | | √ | √ | √ | √ | | |
| Field Trips | | | | | | | | | | | | | | | | | | | | | |
| Practical | | | | | | | | √ | | √ | | √ | √ | √ | √ | √ | | | √ | | |

**Assessment Methods**

| Assessment Methods | | Course outcomes ILOs | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | | | Intellectual Skills | | | | | Professional and Practical Skills | | | | | General and Transferable Skills | | | | | |
| | A1 | A2 | A3 | A4 | A5 | | B1 | B2 | B3 | B4 | | C1 | C2 | C3 | C4 | C5 | D1 | D2 | D3 | | |
| **Essay Question** | √ | √ | √ | | | | √ | √ | √ | | | | | | | √ | | | | | |
| **MCQ** | | √ | | √ | | | | | | | | | | √ | | √ | | | | | |
| **Student Activity** | √ | | √ | | √ | | √ | √ | √ | | | √ | √ | | √ | | √ | √ | √ | | |
| **Practical** | | | √ | | | | | √ | | √ | | √ | √ | | | √ | | | √ | | |

| | **Course Coordinator** | **Head of Department** |
|---|---|---|
| Name | أ.د محمد سالم | أ. د / الرفاعى صبحى قناوى |
| Name (Arabic) | Prof. Mohamed salem | Prof. Dr. El-Refaie Kenawy |
| Signature | ……………………………. | ………………………………………. |
| Date | 9/2014 | 9/2014 |

| | | |
|---|---|---|
| Course Title | **Computer** | |
| Course Code | 1317 | |
| Academic Year | **2014/2015** | |
| Coordinator | **Prof. Mahmoud Kamel** | |
| Other Staff | **Prof. Mahamed El-Awady, Mohmed Ghoneim, Prof. Qadry Zakaria, Prof Saad Abo elenen** | |
| Semesters | **Two Semesters** | |
| Pre-Requisite | **B.Sc.** | |
| Course Delivery | **Lecture** | **1h/week** |
| | **Practical** | **1h/week** |
| Parent Department | **Computer Centre** | |
| Date of Approval | **September, 2014** | |

**1. Aims**

This course will enable students to acquire a range of transferable skills that are important for post graduate M. Sc. students to:

- Develop their capability for information retrieval and presentation, and proficiency in the use of IT effectively in the context of their studies.
- Underpin academic work throughout postgraduate studies.
- Provide opportunities to develop skills required for team working, oral presentation of scientific material, and career choices.

***A. Knowledge and understanding:***

Upon successful completion of this course the students should be able to:

A1. Demonstrate knowledge and understanding of the use of IT in the context of their postgraduate studies.
A2. Know the diverse media and hardware and software that help to benefit of the IT in the context of the postgraduate studies.
A3. Carry out necessary graphical, statistical and frequency analyses of different types of data.
A4. Create powerful presentation using sophisticated software packages.
A5. Make use of different internet resources.
A6. Solve scientific problems using computer programming.
A7. Make use of different photo enhancing and manipulation techniques.

***B. Intellectual skills:***

They should also acquire the ability to:

B1. Integrate different application programs to develop effective information analysis and presentation.

***C. Professional and practical skills:***

C1. Use a number of computer packages to present information.

***D. General and transferable skills:***

D1. Use the internet/electronic resources to obtain subject specific information, and to develop lifelong learning skills that can be applied to suitable research problems.

**3. Contents**

| | |
|---|---|
| Lectures 1-5 | **Assignment 1** : **information technology**<br>Types and generations of computers<br>Hardware and Software computer structure<br>Types and development of operating systems<br>Working with windows<br>File and folder manipulations |
| Lectures 6-12 | **Assignment2** : **Using PowerPoint program**<br>Working with PowerPoint program<br>Insert slides and animations<br>Different methods of slide editing<br>Insert tables ,charts, video, pictures, hyperlinks ,web pages and different objects<br>Design a real and powerful presentation with different acquired skills |
| Lecture 13-18 | **Assignment 3** : **Using Access program**<br>Working with Access program<br>Define data and information<br>Creating data base tables , sorting and filtering records and fields<br>Creating different types of queries to extract useful information<br>Creating forms for data entries and calculations<br>Creating and printing final reports |
| Lecture 19-23 | **Assignment 4: Using the Internet**<br>Define different types of protocols and network<br>Different levels of internet connections<br>Email and methods of file transfer<br>Use of internet capabilities and searching engines<br>Life search on the internet for some real information |
| Lecture 24-28 | **Assignment 5**: Programming using Visual Basic 6<br>Different types of computer languages<br>Concept of visual programming language<br>Working with visual basic language<br>Steps necessary for creating a project with visual basic<br>Solving real problems using a visual basic computer language |

**4. Teaching and Learning Methods**

- Lectures
- Practical classes
- Assignments

The course is delivered through lectures, practical sessions and assignments. Team working skills are developed on a week-long laboratory exercises and the students present and defend their findings in a public seminar.

**5. Student Assessment**

| Assessment Method | Skills assessed* | Assessment Length | Schedule | Proportion |
|---|---|---|---|---|
| Written Examination | KU, I | 1 Hour Examination | Term Final | 60% |
| Practical Examination | KU, I | 1 Hour Examination t | Term Final | 30% |
| Semester work | P, T | Continuous Assessment | | 10% |

*KU: Knowledge and Understanding, I: Intellectual, P: Professional, T: Transferable

**6. List of references**

*Course notes:*

- Notes given to students at each section describe the tasks to be completed, therefore no particular book(s) recommended.

**7. Facilities required for teaching and learning**

- Projectors; Video and Overhead
- LCD screens and writing Boards
- Commercial computer scientific software packages.

Course Contents – Course ILOs Matrix

**Course code: 1317 Chemistry, course title: Computer**

| **Course Contents** | **Course outcomes ILOs** | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Knowledge and Understanding** | | | | | | | | | **Intellectual** | | | | | **Practical** | | | | | **Transferable** | | | |
| | **A1** | **A2** | **A3** | **A4** | **A5** | **A6** | **A7** | **A8** | **A9** | **A10** | **B1** | **B2** | **B3** | **B4** | **B5** | **C1** | **C2** | **C3** | **C4** | **C5** | **D1** | **D2** | **D3** |
| **Week #1-2** | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| **Week #3-4** | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| **Week #5-6** | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| **Week #7-8** | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| **Week #9-10** | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| **Week #11-12** | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| **Week #13-14** | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| **Week #14-15** | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| **Week #16-17** | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| **Week #18-19** | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| **Week #20-21** | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| **Week #22-23** | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| **Week #24-25** | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| **Week #26-27** | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| **Week #28** | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |

| | **Course Coordinator** | **Head of Computer Center** |
|---|---|---|
| Name | Prof. Mahmoud M. Kamel | **Prof. El-Sayed T. Rizk** |
| Name (Arabic) | **أ.د.محمود مصطفى كامل** | **أ.د. السيد طه رزق** |
| Signature | | |
| Date | 9/2014 | 9/2014 |

# Master of Science Degree in Physical and inorganic Chemistry

- **Academic Reference Standards:** The Academic Reference Standards (ARS) for MSc. program degree in chemistry as well as the attributes and capabilities of the graduates were based on the General Academic Reference Standards (ARS) for graduate studies published by the National Authority for Quality Assurance and Accreditation of Education (2009) for M.Sc. Degree. Specific reference standard for the M.Sc. in chemistry were approved by the Council of the Faculty of Science, Tanta University in 2014.

**1.1. Graduate Attributes.**

*The graduate of the M.Sc. (Chemistry) must be able to:*

1.1.1. Apply the basic concepts of scientific research.
1.1.2. Apply the concepts of "analysis" and its use in the field of chemistry.
1.1.3. Construct related subjects and information to be applied professionally.
1.1.4. Show deep knowledge of the current problems in chemistry.
1.1.5. Solve problems using a range of formats and approaches.
1.1.6. Choose the appropriate technological techniques.
1.1.7. Communicate effectively and show a perfect professional leadership.
1.1.8. Make decisions regarding the professional activities.
1.1.9. Make use of the available facilities.
1.1.10. Recognize his/her role for society development.
1.1.11. Self–learning in both academic and professional areas.

**1.2. Knowledge and Understanding**:

*By the end of the study program of graduate of MSc. must able to:*

1.2.1. Know the theories and fundamentals related to the area of study as well as related areas.
1.2.2. Mutual influence between professional practice and its impacts on the environment.
1.2.3. Scientific developments in the area of specialization.
1.2.4. Understand the legal and ethical principles of professional practice in the area of study specialization.
1.2.5. Know the basis of quality in professional practice in the area of specialization.
1.2.6. Know the principles and ethics of scientific research

**1.3. Intellectual skills**

*By the end of the study program of graduate of MSc. must able to:*

1.3.1. Analyze and evaluate the information in the field of specialization.
1.3.2. Solve specialized problems in case of lack of information.
1.3.3. Link between different knowledge to solve professional problems.
1.3.4. Conduct a research study and / or write a methodology of a scientific investigation.
1.3.5. Risk assessment in professional practices in the area of interest.
1.3.6. Planning to improve performance in the field of interest.
1.3.7. Make the proper decision in diverse professional contexts.

**1.4. Professional skills**.
*By the end of the master's program graduate must be able to:*

1.4.1. Mastery of, modern professional basic skills in the area of specialization.
1.4.2. Write and evaluate of professional reports.
1.4.3. Assess the efficiency of methods and tools in the area of study or work area.

**1.5. General and transferable skills**.
*By the end of the master's program graduate must be able to:*

1.5.1. Communicate effectively to obtain required knowledge.
1.5.2. Use of information technology to serve the professional practice.
1.5.3. Develop rules and indicators for assessing the performance of others.
1.5.4. Work in a team, and leading team work in professional contexts.

## A. Program Specification

| Program Title | **Master of Science Degree in Physical and inorganic Chemistry** |
|---|---|
| Award | **Master of Science Degree in Chemistry** |
| Parent Department | **Chemistry Department** |
| Teaching Institution | **Faculty of Science – Tanta University** |
| Awarding Institution | **Tanta University** |
| Coordinator | **Prof. Tarek A. Fayed** |
| External Evaluator(s) | **Prof. Magdi S. Farag**<br>**Faculty of Science –Cairo University** |
| QAA Benchmarking Standards | **Academic Reference Standards (ARS)** |
| Date of intake | **Every year in September** |
| Review Date | **Internal Periodic Review, Summer 2009** |
| Date of Approval | **Sept. 2014** |

### 1. Aims

- It is aimed to extend students comprehension of key chemical concepts and to provide students with an in–depth understanding of specialized areas of Chemistry. In addition, the program aims to prepare students effectively to doctoral studies in chemical sciences or to professional employment.

### 2. Intended Learning outcomes

#### *A. Knowledge and understanding:*

By the end of the master's program graduate should be able to:

A1. Acquire in–depth knowledge in the field of interest.
A2. Illustrate his/ her contemporary professional practice in the field of specialty and describe its impact on the environment.
A3. Identify the basics of the lab, quality assurance and its application in field of interest.

A4. Explain the basis of ethical behavior in scientific research

#### *.B. Intellectual skills:*

They will also acquire the ability to:

B1. Formulate hypotheses, plan and execute laboratory investigation.

B2. Identify and analyze complex analytical problems.

B3. Apply subject knowledge and understanding to formulate chemical problems within a given frame.
B4. Analyse, synthesize and assimilate diverse information in a critical manner.
B5. Correctly document the scientific work, and comprehensively discuss the results and conclusions.

B6. Develop work, evaluate the outcomes and draw valid conclusions.

B7. Present logical solutions that display originality or creativity in industrial, health and environmental fields

***C. Professional and practical skills:***

C1. Apply the practical he acquired in various professional contexts.
C2. Reform and present precise results objectively.

C3. Develop the practical knowledge he gained in the professional work.

***D. General and transferable skills:***

D1. Provide responsible initiatives in his work.
D2. Communicate and exchange ideas effectively in his/field.
D3. Use several and different resources of reliable scientific information.
D4. Work within a team and manage the time properly.
D5. Lead work group efficiently.

**3. Academic standards:**

**3. Academic Reference Standards** The Academic Reference Standards for MSc .program degree in chemistry as well as the attributes and capabilities of the graduates were based on the General Academic Reference Standards (ARS) for graduate studies published by the National Authority for Quality Assurance and Accreditation of Education (2009) for MSc. Degree. Specific reference standard for the M.Sc. in chemistry were approved by the Council of the Faculty of Science, Tanta University in 2014.

**3.1. Graduate Attributes.**
*The graduate of the M.Sc. (Chemistry) must be able to:*

3.1.1. Apply the basic concepts of scientific research.
3.1.2. Apply the concepts of "analysis" and its use in the field of chemistry.
3.1.3. Construct related subjects and information to be applied professionally.
3.1.4. Show deep knowledge of the current problems in chemistry.
3.1.5. Solve problems using a range of formats and approaches.
3.1.6. Choose the appropriate technological techniques.
3.1.7. Communicate effectively and show a perfect professional leadership.
3.1.8. Make decisions regarding the professional activities.
3.1.9. Make use of the available facilities.
3.1.10. Recognize his/her role for society development.
3.1.11. Self–learning in both academic and professional areas.

**3.2. Knowledge and Understanding**:
*By the end of the study program of graduate of MSc. must able to:*

3.2.1. Know the theories and fundamentals related to the area of study as well as related areas.
3.2.2. Mutual influence between professional practice and its impacts on the environment.
3.2.3. Scientific developments in the area of specialization.
3.2.4. Understand the legal and ethical principles of professional practice in the area of study specialization.
3.2.5. Know the basis of quality in professional practice in the area of specialization.
3.2.6. Know the principles and ethics of scientific research

**3.3. Intellectual skills**

*By the end of the study program of graduate of MSc. must able to:*

3.3.1. Analyze and evaluate the information in the field of specialization.
3.3.2. Solve specialized problems in case of lack of information.
3.3.3. Link between different knowledge to solve professional problems.
3.3.4. Conduct a research study and / or write a methodology of a scientific investigation.
3.3.5. Risk assessment in professional practices in the area of interest.
3.3.6. Planning to improve performance in the field of interest.
3.3.7. Make the proper decision in diverse professional contexts.

**3.4. Professional skills**.

*By the end of the master's program graduate must be able to:*

3.4.1. Mastery of, modern professional basic skills in the area of specialization.
3.4.2. Write and evaluate of professional reports.
3.4.3. Assess the efficiency of methods and tools in the area of study or work area.

**3.5. General and transferable skills**.

*By the end of the master's program graduate must be able to:*

3.5.1. Communicate effectively to obtain required knowledge.
3.5.2. Use of information technology to serve the professional practice.
3.5.3. Develop rules and indicators for assessing the performance of others.
3.5.4. Work in a team, and leading team work in professional contexts.

**4- Curriculum Structure and contents**

4.1. Program duration:

One Year for completion of Course Work, and at least one Year for thesis Preparation (according to the regulation of the Faculty of Science).

4.2. Program structure:

No. of hours per week: Lectures (6h/w), Computer science: Lectures (1h/week), total (7h/w)

Exams. (writ. 7), Computer Science (practical)

**Curriculum structure and contents:**

| | | | | | |
|---|---|---|---|---|---|
| 4.A | Program duration | One Year | | | |
| 4.B | Program structure | | | | |
| 4.B.1 | Number of contact hours | per Week: | | | |
| | | Lectures | 6 | | |
| 4.B.2 | Number of credit hours of other courses:(computer) | Lectures | 1 | Lab. | 1 |

## 5. Program courses

| Year | Course Title | Lec. | Prac. | Exer. | Program ILOs Covered |
|---|---|---|---|---|---|
| Code | Student must do the following modules | Hours | | | |
| 1311 | Physical Chemistry (Kinetics of Ion Exchange, Electrochemistry, Laser in Chemistry and Quantum Chemistry) | 2 | - | - | KU, I, G |
| 1312 | Inorganic Chemistry (Inorganic Reactions Mechanism, Bio-inorganic Chemistry, Molecular Spectroscopy and Industrial Inorganic Chemistry) | 2 | - | - | KU, I, G |
| 1313 | Organic Chemistry (Advanced Polymer Chemistry, Organic Spectroscopy, Catalysis in Organic Reactions and Rearrangement in Organic Reactions) | 2 | - | - | KU, I, G |
| 1317 | Computer | 1 | 1 | - | KU, I, P, T |

## 6. Program admission requirements

Arrangements for admission are based on the national guidelines with no Faculty control on the number of newly enrolled students.

Candidates must satisfy the general admission requirements of the University, Faculty and chemistry Department and also hold B. Sc. in Chemistry

## 7. Regulations for progression and program completion

The Faculty has the following system to follow student's progression:

- The program includes one year of coursework, followed by a research project, i.e. the Master thesis, by laboratory investigation in a mentored environment.

- Assessment is held by the end of the first year, and student will be eligible only on attaining a “pass” degree (60%).

- The student who fails certain course at the first attempt will be eligible for only a “Pass” degree following only one re-set examination.

- The student can submit his thesis only after one year from the date of the Faculty Council approval on the thesis subject.

## 8. Evaluation of program intended learning outcomes

| Evaluator | Tool | Sample |
|---|---|---|
| 1. Senior students | applied | 20 |
| 2. Alumni | applied | 20 |
| 3. Stakeholders(Employers) | applied | 20 |
| 4. External Evaluator(s)(External Examiner(s)) | applied | 1 |

## Matrix of ARS ILOs and M.Sc. Physical and inorganic Chemistry Program ILOs

| ARS ILOs | **Program intended learning outcomes ILOs** | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | | Intellectual | | | | | | | Practical | | | | Transferable | | | |
| | A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | | D1 | D2 | D3 | D4 |
| **Knowledge and Understanding** | | | | | | | | | | | | | | | | | | | | |
| **1**. Know the theories and fundamentals related to the area of study as well as related areas. | √ | √ | | | | | | | | | | | | | | | | | | |
| **2.** Mutual influence between professional practice and its impacts on the environment. | √ | √ | | √ | √ | | | | | | | | | | | | | | | |
| **3.** Understand the legal and ethical principles of professional practice in the area of study specialization | | | √ | | | | | | | | | | | | | | | | | |
| **4.** Know the basis of quality in professional practice in the area of specialization. | √ | √ | √ | √ | | | | | | | | | | | | | | | | |
| **Intellectual Skills** | | | | | | | | | | | | | | | | | | | | |
| **1.** Analyze and evaluate the information in the field of specialization. | | | | | | √ | √ | | | | | | | | | | | | | |
| **2.** Solve specialized problems in case of lack of information. | | | | | | √ | √ | √ | | | | | | | | | | | | |
| **3.** Link between different knowledge to solve professional problems. | | | | | | √ | | √ | √ | | | | | | | | | | | |
| **4.** Conduct a research study and / or write a methodology of a scientific investigation. | | | | | | | √ | | √ | √ | | | | | | | | | | |
| **5.** Risk assessment in professional practices in the area of interest. | | | | | | √ | | | | √ | √ | | | | | | | | | |
| **6.** Planning to improve performance in the field of interest. | | | | | | √ | √ | | | | √ | | | | | | | | | |
| **7.** Make the proper decision in diverse | | | | | | | | | | √ | √ | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| professional contexts. | | | | | | | | | | | | | | | | | | | | |
| **Professional Skills** | | | | | | | | | | | | | | | | | | | | |
| **1.** Mastery of, modern professional basic skills in the area of specialization. | | | | | | | | | | | | | √ | √ | | | | | | |
| 2. Write and evaluate of professional reports. | | | | | | | | | | | | | | √ | √ | | | | | |
| 3. Assess the efficiency of methods and tools in the area of study or work area. | | | | | | | | | | | | | | √ | √ | | | | | |
| **General Skills** | | | | | | | | | | | | | | | | | | | | |
| **1**. Communicate effectively to obtain required knowledge. | | | | | | | | | | | | | | | | | √ | | | |
| **2**. Use of information technology to serve the professional practice. | | | | | | | | | | | | | | | | | √ | √ | | |
| **3.** Develop rules and indicators for assessing the performance of others. | | | | | | | | | | | | | | | | | √ | √ | | |
| **4.** Work in a team, and leading team work in professional contexts. | | | | | | | | | | | | | | | | | √ | | √ | √ |

We certify that all of the information required to deliver this program is contained in the above specification and will be implemented. All course specifications for this program are in place

**Program's Matrix**

| Code | Courses | Knowledge and Understanding | | | | Intellectual Skills | | | | | | | Professional Skills | | | General Skills | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | A1 | A2 | A3 | A4 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | D1 | D2 | D3 | D4 | D5 |
| 1311 | Physical Chemistry (Kinetics of Ion Exchange, Electrochemistry, Laser in Chemistry and Applied Spectroscopy) | √ | √ | √ | | √ | √ | √ | | √ | √ | √ | | | | | √ | √ | | √ |
| 1312 | Inorganic Chemistry (Inorganic Reactions Mechanism, Bio-inorganic Chemistry, Molecular Spectroscopy and Industrial Inorganic Chemistry) | √ | √ | | √ | √ | | √ | | √ | √ | √ | | | | | √ | √ | √ | √ |

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1313 | Organic Chemistry (Advanced Polymer Chemistry, Organic Spectroscopy, Catalysis in Organic Reactions and Rearrangement in Organic Reactions) | √ | √ | | √ | √ | √ | √ | √ | √ | | √ | | | | | √ | √ | √ | √ |
| 1317 | Computer | √ | √ | √ | | | √ | | √ | √ | | | √ | √ | √ | | | √ | | √ |
| | Thesis | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |

| Name | Signature | Date |
|---|---|---|
| *Program Coordinator:*<br>**Prof. Mohamed Y. El sheikh**<br>**(أ. د. محمد يسري الشيخ)** | ………………………………… | 9/2014 |
| *Head of Quality Assurance Unit:*<br>Prof. Hoda K. El-sayed<br>**(أ. د.هدى كمال السيد)** | ………………………………… | 9/2014 |
| *Dean of the Faculty:*<br>Prof. Tarek A. Fayed<br>**(أ. د. طارق عبدالمنعم فايد)** | ………………………………… | 9/2014 |

| | | |
|---|---|---|
| Course Title | **Physical Chemistry (Kinetics of Ion Exchange, Electrochemistry, Laser in Chemistry and Quantum Chemistry)** | |
| Course Code | **1311** | |
| Academic Year | **2014/2015** | |
| Coordinator | **Prof. Mohamad M. Ghoniem** | |
| Other Staff | **Prof. Ahmed B. Zaki , Prof. El-Zeiny M. Ebeid, and Prof. Mohamed Kh. Awad** | |
| Semesters | **Two Semesters** | |
| Pre-Requisite | **B.Sc. in Chemistry** | |
| Course Delivery | **Lecture** | **2h/week** |
| Parent Department | **Chemistry** | |
| Date of Approval | **September, 2014** | |

## 1. Aims

The aims of this course are to:

- Highlight the unique applications of lasers in photochemical synthesis and the various aspects in which lasers differ from traditional light sources.
- Study the current-potential relationship for a slow or irreversible system and the electrode kinetics and dependence of current density on overvoltage (The Tafel equation).
- Discuss the chemical theory of ion exchange, the ion- exchange techniques as well as kinetics and mechanisms of ion-exchange processes.
- Apply quantum mechanics to solve problems in chemistry using different kinds of techniques.

## 2. Intended Learning outcomes

### *A. Knowledge and Understanding:*

By the end of this course the students should be able to:

A10. Recognize the importance of quantum mechanics in different branches of chemistry.

A11. Identify the importance and applications of laser techniques in different areas.

A12. Explain the theory of polarographic and voltammetric techniques.

A13. Explain the Ion-exchange techniques, Kinetics of ion exchange and mechanisms of ion-exchange processes

### *B. Intellectual skills:*

By the end of this course the students should be able to:

B1. Discuss the chemical theory of ion exchange and ion- exchange techniques as well as kinetics and mechanisms of ion-exchange processes

B2. Evaluate and analyze spectral and electrochemical data and interrelate such data to the properties and structure of the investigated systems.

B3. Solve problems in industry and scientific research using such techniques.

B4. Apply quantum mechanics in solving problems in chemistry using different kinds of techniques..

### *C. Professional and practical skills:*

By the end of this course the students should be able to:

C6. Conduct different applications of lasers in photochemical synthesis and the various aspects in which lasers differ from traditional light sources.
C7. Perform industrial electrolysis processes: electroplating, anodization and electrometallurgy.
C8. Apply spectroscopy techniques in quality control and scientific research.
C9. Synthesis fibers and many plastics based on ion-exchange processes.

***D. General and transferable skills:***

By the end of this course the students should be able to:

D7. Communicate effectively in written and oral manners.
D8. Use information technology and resources to collect and represent scientific data in different branches of chemistry.
D9. Work effectively as a member of team and manage time.
D10. Solve problems in industry and scientific research areas related to chemistry.

**3. Contents**

| | |
|---|---|
| **Part-1** | **Laser in Chemistry** (An hour/week) for one Semester |
| Lectures 1,2 | Electronic states (Multiplicity of states, Fluorescence and phosphorescence, Electronic states in molecular oxygen Singlet oxygen application in photodynamic therapy (PDT), Electronic states in solids. The exciton concept and Color centers) |
| Lectures 3 | Modes of deactivation of electronically-excited states (Internal and external photophysical deactivation pathways) Lifetime of electronically-excited states and Measurement of excited-state lifetimes |
| Lectures 4 | Time-resolved spectroscopy (Picosecond and Femtosecond Flash Photolysis, Femtosecond photochemical processes and Femtosecond primary dynamics of some anticancer drugs)) |
| Lectures 5,6 | Applications based on internal conversion and vibrational cascades (Salmonella detection by MUCAP reagent, Laser application in fingerprint detection, Thermal lensing technique, Laser welding of detached eye retina, DNA quantification using fluorescent stains and SYBR Green I (SG) and Pico green) |
| Lectures 7 | Applications based on molecular fluorescence (Excitation spectroscopy, Shpol'skii spectrum, Criminology and forensic science, Tire marks identification and Aflatoxin analysis) |
| Lectures 8,9 | Applications based on time-resolved spectroscopy (Diagnosis of tumors using nicotinamide adenosine dinucleotide NADH), Cell uptake of benz[a]pyrine carcinogen, Phenanthrene content in coal tar, Laser thermometry, Fluorescence lifetime imaging (FLIM) and FLIM in ion imaging) |
| Lectures 10 | Fluorescence probes in biological systems (Fluoroimmunoassay (FIA) Fluorescent probes for labeling proteins, Determination of a female sex hormone by (FIA), Fluorescence-activated cell sorting (FACS) Intracellular Ca2+ indicator, Measurement of intravascular pH using distribution-probe method, Fluorescence in situ hybridization (FISH) |
| Lectures 11,12 | Nanomaterials and their applications (theoretical models, Semiconductor features, Intermittency, Model for blinking, Metallic features, Nanoparticles and nanorods - Applications on nanomaterials: Semiconductor nanocrystals as fluorescent probes in biological labeling, Drug delivery systems based on nanocrystals, Nanomaterials |

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|---|---|
| | in DNA sequence, Magnetic nanoparticles , Contrast agents for MRI, Paramagnetic contrast agents. Immuno-agglutination, Ultra-sensitive bioassay using nanoparticles, Biomarkers. Biosensors, Gold nanoparticles in staining, Quantum well and quantum dot lasers |
| Lectures 13 | Applications based on energy transfer **(**Fluoro-sensors based on fluorescence quenching, Fluorescence quenching caused by humic acids, Energy transfer dye lasers (ETDL), Energy transfer in photochemical reactions, Probing the structure of a four-way DNA junction, Fluorescence resonance energy transfer (FRET) in enzyme kinetics, Drug –protein interaction, Gene expression measurement, Concentration depolarization**)** |
| Lectures 14 | Applications based on laser mono-chromaticity, coherence and mode **(**Raman Spectroscopy**:** Coherent anti-Stokes Raman spectroscopy (CARS), Some applications of Raman spectroscopy,<br>Group frequencies, Raman melting curves in biological systems, Raman spectroscopy in the study of membranes, Raman spectroscopy in oxygen carrier proteins, Raman LIDAR system, Surface-enhanced Raman scattering (SERS) |
| **Part-2** | **Electrochemistry** (An hour/week) for one Semester |
| Lectures 1 | Electrode processes: Non-equilibrium electrode potentials, Ideal-current relationship, Current-potential relationship for a slow or irreversible system. |
| Lectures 2 | Electrode kinetics - Dependence of current density on overvoltage (The Tafel equation) |
| Lectures 3 | Electrolysis and overvoltage - Activation overvoltage – Resistance overvoltage - Concentration overvoltage - Overvoltage phenomena and their distinguishing features |
| Lectures 4 | Hydrogen and oxygen overvoltage - Decomposition potentials and overvoltage - Individual electrode overvoltage |
| Lectures 5 | Theories of hydrogen overvoltage - The Catalytic theory - The slow discharge theory - The electrochemical theory |
| Lectures 6 | The Exploitation of Electrode processes - Polarography and voltammetry - Types of working electrodes - Characteristics of diffusion-controlled polarographic waves. |
| Lectures 7 | Other types of polarographic waves - Pulse and differential pulse voltammetry |
| Lecture 8 | Cyclic voltammetry - Stripping voltammetry and some of its applications. |
| Lecture 9 | Electro-generated fenton reagent and its application for removal of pollutant from industrial waste water. |
| Lecture 10 | Electro-synthesis - Reductive elimination reactions Electro-synthesis - Reductive elimination reactions |
| Lecture 12 | Industrial electrolysis processes - Electroplating |
| Lecture 13 | Anodization |
| Lecture 14 | Electrometallurgy |
| **Part-3** | **Ion exchange** (An hour/week) for one Semester |
| Lectures 1 | Introduction - Types of resins and their structures - Capacity of ion exchangers. |
| Lectures 2 | Ion-exchange techniques: Batch, fixed- bed, fluidized bed and continuous bed techniques. |

| | |
|---|---|
| Lectures 3 | Ion exchange in columns (fixed bed): breakthrough curves-determination of bed capacity from breakthrough curves – calculation of zone height – factors affecting the ion – exchange zone. |
| Lectures 4,5 | Sorption of solutes: sorption isotherms and distribution coefficients. |
| Lectures 6,7 | Sorption of strong electrolytes: Donnan potential and its thermodynamic treatment. |
| Lectures 8,9 | Ion-exchange equilibria: Ion-exchange isotherm and separation factor – selectivity and selectivity coefficients. |
| Lectures 10,11 | Kinetics of ion exchange: mechanisms of ion exchange-The rate determining step in the ion exchange process. |
| Lectures 12-14 | Applications using ion-exchange resins: water treatment – ion exchangers as catalysts. |
| **Part-4** | **Quantum Chemistry** (An hour/week) for one Semester |
| Lectures 1 | Introduction**:** Background to the principles of quantum chemistry and the electronic structures of Molecules |
| Lectures 2,3 | The variation Method**:** Study of the variation principle- Definition of trial variation-function and variational integral- Extension of the variation method- study the properties of determinants- Investigation of molecules using the linear variation function. |
| Lectures 4 | The perturbation theory: Differentiation between unperturbed and perturbed systems- Study of non-degenerate perturbation theory- Investigation of perturbation of the ground state of the He-atom- Perturbation theory for a degenerate energy level- Make a comparison between the variation and perturbation methods. |
| Lectures 5,6 | Electron spin and Pauli principle: Definition of spin angular momentum in quantum mechanics- Importance of Ladder operator for electron spin-Pauli principle or exclusion principle- Study of electron spin and Pauli principle for (He) atom in ground and excited states-Definition of Slater determinants. |
| Lectures 7 | Electronic Structure methods: Differentiate between the adiabatic and non-adiabatic systems- Born-Oppenheimer approximation- Study of Self-Consistent field (SCF) theory with Hartree-Fock (HF) equations- The Nature of the basis set- Restricted and Unrestricted Hartree-Fock (RHF and UHF). |
| Lectures 8 | Ab initio methods: Study of different ab initio methods such as Configuration Interaction (CI)$^{-}$ Moller-Plessat-Perturbation (MPP) theory- Correlation- Multi-configuration Self- Consistent (MCSCF)- Quantum Monte-Carlo method. |
| Lectures 9,10 | Semi-empirical methods: Study of different semi-empirical methods such as Complete neglect of differential overlap (CNDO)- Modified intermediate of neglecting differential overlap (MINDO)- Intermediate neglecting differential overlap (INDO)- Austin model 1 (AM1)-Perturbation model 3 (PM3)- Extended Huckel (EH)- (ZINDO0-(PPP)- semi-empirical-AB initio method. |
| Lectures 11 | Electronic structures of polyatomic molecules: Investigation of the shapes of polyatomic molecules- study Walsh-Diagrams for different systems- The role of Frontier Orbitals and its effect on the reaction activity. |
| Lectures 12 | Application of Molecular Orbital theory in Chemistry: Study of bond activation and heterogeneous catalysis- Organic compounds as corrosion inhibitors in acid medium- Mechanism of attacking of water molecules on dyes and its effect on solvatochromism- Study of band structures of solid state. |
| Lectures 13,14 | How to Conduct a Computational Research Project. |

## 4. Teaching and Learning Methods

4.1. Theoretical lectures.

4.14. Library and net search for Assignments.

4.15. Seminars.

## 5. Student Assessment

| Assessment Method | Skills assessed* | Assessment Length | Weight |
|---|---|---|---|
| Written Examination | KU, I,P | 3 Hour Examination | 100% |

*KU: Knowledge and Understanding, I: Intellectual, P: Professional.

## 6. List of references


***Essential Books:***

**1-** F. G .Helfferich, "Ion exchange", McGraw- Hill Book Co., Inc. New York, **1962.**

2- L. Liberti and F. G. Helfferich, "Mass transfer and kinetics of ion exchange", Martinus Nijhoff Publishers Boston, NATO ASI series, 1983.

3- Allen J. Bard and Larry R. Faulkner "Electrochemical Methods. Fundamentals and Applications", John Wiley & Sons, New York **1980**.

4- Instrumental Methods in Electrochemistry, John Wiley & Sons, New York **1985**.

***Recommended Books:***

5- P. H. Rieger, "Electrochemistry", Prentice- Hall International, Inc., New Jersey **1987**.

6- D. R. Crow, "Principles and Application of Electrochemistry", Chapman & Hall, **1988**.

7-E. M. Ebeid and S. M. Al Hazmy, "Photophysical and Laser-Based Techniques in Chemistry, Biology and Medicine" Book Surge, LLC, **2006**.

8- D. Young, "Computational Chemistry (A practical guide for applying techniques to real world problems)".

8- I. Levine, " Quantum Chemistry "

9- J. P. Lowe," Quantum Chemistry"

10- P.W. Atkins, "Molecular Quantum Mechanics"

11- J.M. Anderson, "Mathematics for Quantum Mechanics"


## 7. Facilities required for teaching and learning

Teaching rooms equipped with white and blackboards, and data show.

## Learning and Teaching Methods

| Course outcomes ILOs | | | | | | | | | | | | | | | | | | | | Learing Method |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| General and Transferable Skills | | | | | Professional Skills | | | | | Intellectual Skills | | | | | Knowledge and Understanding | | | | | |
| D5 | D4 | D3 | D2 | D1 | C5 | C4 | C3 | C2 | C1 | B5 | B4 | B3 | B2 | B1 | A5 | A4 | A3 | A2 | A1 | |
| | | | √ | √ | | √ | | √ | | | | | √ | | | √ | √ | √ | √ | Lecture |
| | | | √ | √ | | | | | | | √ | | √ | | | | | | | Discussion (Brain Storming) |
| √ | | √ | | | √ | | √ | | √ | | | | | √ | √ | | √ | | √ | Self-learning (Essay) |
| | | | | | | | | | | | | | | | | | | | | Field Trips |
| | | | | | | | | | | | | | | | | | | | | Practical |

## Assessment Methods

| Course outcomes ILOs | | | | | | | | | | | | | | | | | | | | Assessment Methods |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| General and Transferable Skills | | | | | Professional and Practical Skills | | | | | Intellectual Skills | | | | | Knowledge and Understanding | | | | | |
| D5 | D4 | D3 | D2 | D1 | C5 | C4 | C3 | C2 | C1 | B5 | B4 | B3 | B2 | B1 | A5 | A4 | A3 | A2 | A1 | |
| | | | √ | √ | | | | √ | √ | | | | √ | | | | | √ | √ | Essay Question |
| | | | | √ | | | | | | | √ | √ | √ | √ | | | | | √ | MCQ |
| √ | √ | | √ | | | | | √ | √ | | | | √ | √ | | | | | | Student Activity |
| | | | | | | | | | | | | | | | | | | | | Practical |

| | Course Coordinator | Head of Department |
|---|---|---|
| Name (Arabic) | أ. د / محمد المتولى غنيم | أ. د / الرفاعى صبحى قناوى |
| Name | Prof. Mohamad M. Ghoniem | Prof. El-Refaie S. Kenawy |
| Signature | | |
| | 9/2014 | 9/2014 |

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|---|---|
| Course Title | **Inorganic Chemistry (Inorganic Reactions Mechanism, Bio-inorganic Chemistry, Molecular Spectroscopy and Industrial Inorganic Chemistry)** |
| Course Code | **1312** |
| Academic Year | **2014/2015** |
| Coordinator | **Prof. Mohamed Gaber Abu-Elazm** |
| Other Staff | **Prof. Tarek A. Fayed, prof. Ekhlas Abdelhay** |
| Semesters | **Two Semesters** |
| Pre-Requisite | **B.Sc. in Chemistry** |
| Course Delivery | **Lecture** — **2h/week** |
| Parent Department | **Chemistry** |
| Date of Approval | **September, 2014** |

## 1. Aims

The aims of this course are to:

- Acquire students the basic and advanced concepts of interaction between light and matter.
- Discuss the principles of the different methods used in determining mechanisms of inorganic reactions.
- Provide students with the economic and industrial importance of metals, fertilizers, construction materials, pigments and glass, and other raw materials
- Highlight the applications of metal complexes in biological system, electron transfer reaction and metallic enzymes.

## 2. Intended Learning outcomes

### *A. Knowledge and Understanding:*

By the end of this course the students should be able to:

A1. Define the terms and basic concepts related to industrial inorganic chemistry **and** Recognize the great economic and industrial importance of raw materials.
A2. Indicate the features of different manufacturing processes and Identify the characteristics of nucleophiles, electrophiles and leaving groups participated in reactions of inorganic complexes.
A3. Report the rules, conditions and mechanisms of inorganic substitution and oxidation-reduction reactions.
A4. Define the terms and basic concepts related to advanced molecular spectroscopy and the theoretical basic principles of different spectroscopic techniques used in identification and characterization of molecular structure.
A5. Identify the applications of metal complexes in biological system, electron transfer reaction and metallic enzymes.

### *B. Intellectual skills:*

By the end of this course the students should be able to:

B1. Evaluate the economic and chemical aspects of different manufacturing processes utilized inorganic materials **and** Synthesize data to characterize fertilizers, construction materials, pigments and glasses.

B2. Postulate the sequence of inorganic reaction pathways and mechanisms ,Predict the behavior of a specific reacting group towards a specific metal complex
B3. Identify the importance of metal ions in biological system and Explain the advanced theories of molecular spectroscopy.
B4. Synthesize and analyze spectral data to characterize and identify molecular structures.

### *C. Professional and practical skills:*

By the end of this course the students should be able to:

C1. Conduct requirements of standard procedure involved in synthetic.
C2. Mastery of, modern professional basic skills in the area of specialization.
C3. Write and evaluate of professional reports.
C4. Assess the efficiency of methods and tools in the area of study or work.

### *D. General and transferable skills:*

By the end of this course the students should be able to:

D1. Use of information technology to serve the professional practice.
D2. Develop rules and indicators for assessing the performance of others.
D3. Work in a team, and leading team work in professional contexts.
D4. Self- and continuous learning.

## 3- Contents

| | |
|---|---|
| **Part- 1** | **Molecular Spectroscopy** (An hour/week) for one Semester |
| Lectures 1,2 | Introduction: Concepts of molecular spectroscopy. |
| Lectures 3,4 | Microwave spectroscopy, Rotation of molecules rotational spectra diatomic molecules, polyatomic molecules, application, technique and instrumentation. |
| Lectures 5,6 | Infrared spectroscopy, Vibration-rotation spectroscopy, break down of Born-Openheimer approximation, the influence of rotation on the spectra of polyatomic molecules, analysis by infrared technique, FT-infrared spectroscopy, application of far and near infrared spectroscopy. |
| Lectures 7,8 | Raman spectroscopy, Theoretical principles, structure determination from Raman and Infrared spectroscopy, technique and instrumentation. |
| Lectures 9,10 | Electronic spectroscopy of molecules, theoretical principles, chromophores and solvent effects, application (benzene and its derivatives), the ligand field theory (the spectra of inorganic complex) |
| Lectures 11,12 | Spin resonance spectroscopy-Nuclear magnetic resonance spectroscopy, Analysis of the complex spectra, relaxation, theory and application of double resonance, pulse Fourier transform methods, used of NMR in quantitative analysis. |
| Lectures 13,14 | Fluorescence probes in biological systems (Fluoroimmunoassay Electronic spin resonance spectroscopy, Theoretical principles, application, technique and instrumentation. |
| **Part- 2** | **Inorganic Reaction Mechanism** (An hour/week) for one Semester |
| Lectures 1 | Ligand substitution reactions, Classification of mechanisms |
| Lectures 2 | Substitution reaction in square planar complexes, Trans effect- Trans effect series, uses of trans effect, (synthesis of cis and trans Pt(II) complexes, Distinguish between cis and trans isomers) theories of trans effect (electrostatic polarization theory, bonding theory), Mechanism of substitution reactions, factors effecting the rate of substitution Reaction in square planar complexes ( trans effect, effect of leaving group, solvent effect, effect of charge on the complex), cis-trans isomerization in planar complexes |
| Lectures 3,4 | Substitution reaction in octahedral complexes, Transition state or activated complexes, substrate, attacking reagents, Electrophilic and nucleophilic reagents, nucleophilic or ligand substitution |
| Lectures 5,6 | electrophilic or metal substitution reactions, dissociation mechanism, association mechanism, labile and inert complexes, |
| Lectures 7,8 | hydrolysis reactions, aquation or acid hydrolysis reactions of Co(III) octahedral complexes, |
| Lectures 9,10 | base hydrolysis Co(III) octahedral complexes |
| Lectures 11,12 | substitution reaction in octahedral complexes without breaking M-L bond |

| | |
|---|---|
| Lectures 13,14 | Electron transfer( oxidation reduction reactions) in coordination compounds, inner sphere mechanism, direct electron transfer or outer sphere mechanism |
| **Part- 3** | **Industrial Inorganic Chemistry** (An hour/week) for one Semester |
| Lectures 1 | Primary inorganic materials: Production of potable water, production of fresh water from sea water and brackish water. |
| Lectures 2 | Hydrogen: manufacture and applications. |
| Lectures 3,4 | Hydrogen peroxide and inorganic peroxo compounds: manufacture and applications. |
| Lectures 5,6 | Nitrogen and nitrogen compounds: Ammonia, hydrazine and hydroxyl amine: manufacture and applications. |
| Lectures 7,8 | Phosphorous and its compounds: phosphoric and phosphorous acids and their salts (manufacture and applications). |
| Lectures 9,10 | Chlorine oxygen compounds: manufacture and applications. |
| Lectures 11 | Mineral fertilizers: Phosphorus, nitrogen and potassium containing fertilizers: manufacture and applications |
| Lectures 12 | Silicon products: Structures, properties, manufactures (silicon oils, rubber and resins). |
| Lectures 13 | Silicates products: Glass and Cements (compositions, manufacture, properties and applications). |
| Lectures 14 | Ceramics and Inorganic pigments: Classification, manufacture and properties of ceramic products and Inorganic pigments. |
| **Part- 4** | **Bio-inorganic Chemistry** (An hour/week) for one Semester |
| Lectures 1 | Introduction: metal ions in biological systems, elements in living systems |
| Lectures 2 | Electron transfer in biological systems, cytochromes, structure, importance |
| Lectures 3,4 | Iron sulfure proteins, introduction, Rubredoxin proteins, Ferredoxins proteins, Ferredoxins |
| Lectures 5,6 | Metalloenzymes-proteins (introduction, carboxypeptidase-A (Zn-enzyme), carbonic anhydrase |
| Lectures 7,8 | Nitrogenase and other Molybdenum enzymes, metallo-enzymes |
| Lectures 9,10 | Metal storage transport and biomineralization, Ferritin, transferring, siderophores |
| Lectures 11 | Roles of Ca in biology |
| Lectures 12 | Metals in medicine |
| Lectures 13 | platinum binding to DNA |
| Lectures 14 | $Na^+$/ $K^+$ pump |

## 4. Teaching and Learning Methods

- Theoretical lectures.
- Library and net search – Assignments.

## 5. Student Assessment

| Assessment Method | Skills assessed* | Assessment Length | Weight |
|---|---|---|---|
| Written Examination | KU, I,P | 3 Hour Examination | 100% |

*KU: Knowledge and Understanding, I: Intellectual, P: Professional.

## 6. List of references

*Essential Books:*

1- W. Büchner, R. Schliebs, G. Winer and K.H.Büchel,"Industurial inorganic Chemistry", VCH publisher, Germany (**1989**).

2- R. Norris Shreve, A. Joseph and JR. Brink, "Chemical Process Industries", McGraw-Hill, Kogakusha (**1977**).

3- V. Shriver, P.W. Atkins and C.H. Langford "Inorganic Chemistry", $2^{nd}$ Edition, (**1994**)

4- Alan G. Sharpe "Inorganic Chemistry", $3^{rd}$ Edn, 1992

*Recommended Books:*

5- W.U. Malik, G.D. Tuli and R.D. Madan, "Selected Topics in Inorganic Chemistry", $1^{st}$ Edn, (**1986**).

### 7. Facilities required for teaching and learning

Teaching classes equipped with boards, over head projector and data show. Library containing enough textbooks and computers connected to the internet.

**Course contents – Course ILOs Matrix Course Code / Inorganic Chemistry (Inorganic Reactions Mechanism, Bio-inorganic Chemistry, Molecular Spectroscopy and Industrial Inorganic Chemistry (Course Code:-1312)**

| Course contents | Course intended learning ILOS | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and understanding | | | | | Intellectual | | | | Practical | | | | Transferable | | | |
| | **A1** | **A2** | **A3** | **A4** | **A5** | **B1** | **B2** | **B3** | **B4** | **C1** | **C2** | **C3** | **C4** | **D1** | **D2** | **D3** | **D4** |
| **Part 1-Molecular Spectroscopy** | | | | | | | | | | | | | | | | | |
| Introduction: Concepts of molecular spectroscopy. | ✓ | ✓ | | | | ✓ | ✓ | ✓ | ✓ | | ✓ | | ✓ | | ✓ | | |
| Microwave spectroscopy, Rotation of molecules rotational spectra diatomic molecules, polyatomic molecules, application, technique and instrumentation. | ✓ | ✓ | | | | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | | ✓ | | | |
| Infrared spectroscopy, Vibration-rotation spectroscopy, break down of Born-Openheimer approximation, the influence of rotation on the spectra of polyatomic molecules, analysis by infrared technique, FT-infrared spectroscopy, application of far and near infrared spectroscopy. | ✓ | | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | | ✓ | | ✓ |
| Raman spectroscopy, Theoretical principles, structure determination from Raman and Infrared spectroscopy, technique and instrumentation. | | ✓ | | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | | | ✓ | |
| Electronic spectroscopy of molecules, theoretical principles, chromophores and solvent effects, application (benzene and its derivatives), the ligand field theory (the spectra of inorganic complex) | | | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | | ✓ | | ✓ |
| Spin resonance spectroscopy-Nuclear magnetic resonance spectroscopy, Analysis of the complex spectra, relaxation, theory and application of double resonance, pulse Fourier transform methods, used of NMR in quantitative analysis. | | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | ✓ | ✓ | | ✓ |
| Fluorescence probes in biological systems (Fluoroimmunoassay Electronic spin resonance spectroscopy, Theoretical principles, application, technique and instrumentation. | | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | | ✓ | ✓ |
| **Part 2- Inorganic Reaction Mechanism** | | | | | | | | | | | | | | | | | |
| Ligand substitution reactions, Classification of mechanisms | ✓ | ✓ | | ✓ | ✓ | | | | | ✓ | | ✓ | | ✓ | ✓ | | ✓ |
| Substitution reaction in square planar complexes, Trans effect- Trans effect series, uses of trans effect, (synthesis of cis and trans Pt(II) complexes, Distinguish between cis and trans isomers) theories of trans effect (electrostatic polarization theory, bonding theory), Mechanism of substitution reactions, factors effecting the rate of substitution | ✓ | ✓ | | ✓ | ✓ | | | | | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Reaction in square planar complexes ( trans effect, effect of leaving group, solvent effect, effect of charge on the complex), cis-trans isomerization in planar complexes | | | | | | | | | | | | | | | | | |
| Substitution reaction in octahedral complexes, Transition state or activated complexes, substrate, attacking reagents, Electrophilic and nucleophilic reagents, nucleophilic or ligand substitution | | | | ✓ | ✓ | | | | | ✓ | ✓ | | ✓ | | ✓ | | ✓ |
| electrophilic or metal substitution reactions, dissociation mechanism, association mechanism, labile and inert complexes, | | | | ✓ | ✓ | | | | | ✓ | | ✓ | | | ✓ | | ✓ |
| hydrolysis reactions, aquation or acid hydrolysis reactions of Co(III) octahedral complexes, | | | | ✓ | ✓ | | | | | | ✓ | ✓ | | ✓ | | | ✓ |
| base hydrolysis Co(III) octahedral complexes | | | | ✓ | ✓ | | | | | | | ✓ | ✓ | | | | |
| substitution reaction in octahedral complexes without breaking M-L bond | | | | ✓ | ✓ | | | | | | | | | | | | |
| Electron transfer( oxidation reduction reactions) in coordination compounds, inner sphere mechanism, direct electron transfer or outer sphere mechanism | | | | ✓ | ✓ | | | | | | ✓ | | ✓ | | ✓ | | ✓ |
| **Part 3- Industrial Inorganic Chemistry (An hour/week for one Semester)** | | | | | | | | | | ✓ | | ✓ | | ✓ | | ✓ | |
| Primary inorganic materials: Production of potable water, production of fresh water from sea water and brackish water. | ✓ | | | | | | | | | ✓ | | | ✓ | | ✓ | | ✓ |
| Hydrogen: manufacture and applications. | | ✓ | ✓ | | | | | | | ✓ | | ✓ | | ✓ | | | ✓ |
| Hydrogen peroxide and inorganic peroxo compounds: manufacture and applications. | | ✓ | ✓ | | | | | | | ✓ | | | | | ✓ | | |
| Nitrogen and nitrogen compounds: Ammonia, hydrazine and hydroxyl amine: manufacture and applications. | | ✓ | ✓ | | | | | | | | | ✓ | ✓ | | | ✓ | ✓ |
| Phosphorous and its compounds: phosphoric and phosphorous acids and their salts (manufacture and applications). | | ✓ | ✓ | | | | | | | ✓ | | | | ✓ | | | |
| Chlorine oxygen compounds: manufacture and applications. | | ✓ | ✓ | | | | | | | ✓ | ✓ | ✓ | | | | ✓ | ✓ |
| Mineral fertilizers: Phosphorus, nitrogen and potassium containing fertilizers: manufacture and applications | | ✓ | ✓ | | | | | | | | ✓ | | ✓ | ✓ | | ✓ | ✓ |
| Silicons products: Structures, properties, manufactures (silicon oils, rubber and resins). | | ✓ | ✓ | | | | | | | ✓ | ✓ | | | ✓ | ✓ | | ✓ |
| Silicates products: Glass and Cements (compositions, manufacture, properties and applications). | | ✓ | ✓ | | | | | | | | | ✓ | | | | ✓ | ✓ |
| Ceramics and Inorganic pigments: Classification, manufacture and properties of ceramic products and Inorganic pigments. | | ✓ | ✓ | | | | | | | | | | | | ✓ | | |

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| **Part 4- Bio-inorganic Chemistry (An hour/week for one Semester)** | | | | | | | | | | ✓ | ✓ | | | ✓ | | ✓ | ✓ |
| Introduction: metal ions in biological systems, elements in living systems | | | | ✓ | ✓ | | | | | | ✓ | | ✓ | | | ✓ | ✓ |
| Electron transfer in biological systems, cytochromes, structure, importance | | | | ✓ | ✓ | | | | | ✓ | | ✓ | | | ✓ | | ✓ |
| Iron sulfure proteins, introduction, Rubredoxin proteins, Ferredoxins proteins, Ferredoxins | | | | ✓ | ✓ | | | | | | | | ✓ | | ✓ | ✓ | |
| Metalloenzymes-proteins (introduction, carboxypeptidase-A (Zn-enzyme), carbonic anhydrase | | | | ✓ | ✓ | | | | | ✓ | | ✓ | | | ✓ | | ✓ |
| Nitrogenase and other Molybdenum enzymes, metallo-enzymes | | | | ✓ | ✓ | | | | | | ✓ | ✓ | | ✓ | | | ✓ |
| Metal storage transport and biomineralization, Ferritin, transferring, siderophores | | | | ✓ | ✓ | | | | | | | ✓ | ✓ | | | | |
| Roles of Ca in biology | | | | ✓ | ✓ | | | | | | | | | | | | |
| Metals in medicine | | | | ✓ | ✓ | | | | | | ✓ | | ✓ | | ✓ | | ✓ |
| platinum binding to DNA | | | | ✓ | ✓ | | | | | ✓ | | ✓ | | | | ✓ | |
| $Na^{+}$/ $K^{+}$ pump | | | | ✓ | ✓ | | | | | ✓ | | | ✓ | | ✓ | | ✓ |

**Learning and Teaching Methods**

| Learning Methods | Course outcomes ILOs | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | | Intellectual Skills | | | | | Professional and Practical Skills | | | | | General and Transferable Skills | | | | |
| | A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | C1 | C2 | C3 | C4 | C5 | D1 | D2 | D3 | D4 | D5 |
| **Lecture** | √ | √ | ✓ | ✓ | | | √ | | | | √ | | | | | √ | √ | | | |
| **Discussion (Brain Storming)** | | | ✓ | | | ✓ | √ | | | ✓ | | ✓ | | | | ✓ | ✓ | | ✓ | |
| **Self-learning (Essay)** | ✓ | | | | | ✓ | | | | | ✓ | ✓ | | | | | | ✓ | | |
| **Field Trips** | | | | | | | | | | | | | | | | | | | | |
| **Practical** | | | | | | | | | | | | | | | | | | | | |

**Assessment Methods**

| Assessment Methods | Course outcomes ILOs | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | | Intellectual Skills | | | | | Professional Skills | | | | | General and Transferable Skills | | | | |
| | A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | C1 | C2 | C3 | C4 | C5 | D1 | D2 | D3 | D4 | D5 |
| Essay Question | ✓ | ✓ | | | | | ✓ | | | | ✓ | ✓ | | | | ✓ | ✓ | | | |
| MCQ | ✓ | | | | | ✓ | | ✓ | ✓ | | | | | | | ✓ | | | | |
| Student Activity | | | | | | ✓ | ✓ | | | | ✓ | ✓ | | | | | ✓ | | ✓ | |
| Practical | | | | | | | | | | | | | | | | | | | | |

| Head of Department | Course Coordinator | |
|---|---|---|
| أ. د / الرفاعى صبحى قناوى | أ. د / محمد جابر ابو العزم | Name (Arabic) |
| Prof. EL-Refaie S. Kenawy | Prof. Mohamed Gaber Abu-Elazm | Name |
| ……………………… | ……………………… | Signature |
| 9/2014 | 9/2014 | |

| Course Title | Organic Chemistry (Advanced Polymer Chemistry, Organic Spectroscopy, Catalysis in Organic Reactions and Rearrangement in Organic Reactions) | |
|---|---|---|
| Course Code | **1313** | |
| Academic Year | **2014/2015** | |
| Coordinator | **Prof. Mohamed EL-Boraie** | |
| Other Staff | **Prof. Mahmoud Taha , Prof. Elrefaie Kenawy and Prof. Dr. El-Saied A. Aly** | |
| Semesters | **Two Semesters** | |
| Pre-Requisite | **B.Sc. in Chemistry** | |
| Course Delivery | **Lecture** | **2h/week** |
| Parent Department | **Chemistry** | |
| Date of Approval | **September, 2014** | |

## 1. Aims

The aims of this course are to:

- Discuss the principles of composite materials types and classification.
- discuss the basic principle of C.W. (continuous wave) NMR, pulse NMR technique
- Explain theory and applications of acids and bases in controlling organic reactions, and the principles and applications of phase-transfer and micellar catalysis.
- Give students the detail description of the actual processes by means of which the reactions can proceed
- Stimulate the student skills, which are necessary when building theoretical and mechanistic frameworks to understand the general features of physical and chemical processes.

2. Intended Learning outcomes:

***A. Knowledge and Understanding:***

By the end of this course the students should be able to demonstrate knowledge and understanding of:

A1. Recognize the relationship between the composite composition and Explain the kinetic behavior of the formation of different types of copolymers

A2. Explain the origin of nuclear over Houser effect, magnetic dipoles and dipole couple and interrelate of $^{13}C$ NMR spectra with protons.

A3. Identify chemistry and the kinetic behaviors of copolymers and Explain the mechanism and Kinetics of organic molecular rearrangement and elimination reactions.

A4. Explain the Acidity Functions, Strength of weak Bronsted acids, Lewis Acids and Bases, Micellar Catalysis and Principles of Phase-Transfer Catalysis

***B. Intellectual skills:***

By the end of this course the students should be able to:

B1. Design the structure of formulations for use in rubber industry and Analyze the rotating frame, vectors and energy levels, phase errors and phase correction and the different relaxation terms

B2. Postulate the mechanism of fragment formation and interpret of molecular ion region and isotopic contributions.

B3. Employ the theories of acids and bases in interpret catalysis of organic reactions.

B4. Evaluate the rates of different reactions and Predict the different types of elimination reactions and their products.

***C. Professional and practical skills:***

By the end of this course the students should be able to:

C1. Conduct laboratory procedures to analyze materials using infrared analysis methods.

C2. Interpret data derived from laboratory observations and measurements concerning infrared measurements.
C3. Apply spectroscopy techniques in quality control and scientific research.
C4. Synthesis fibers and many plastics based on ion-exchange processes.

***D. General and transferable skills:***

By the end of this course the students should be able to:
D1. Communicate effectively in written and oral manners.
D2. Use information technology and resources to collect and represent scientific data in different branches of chemistry.
D3. Work effectively as a member of team and manage time.
D4. Solve problems in industry and scientific research areas related to chemistry.

**3. Contents**

| | |
|---|---|
| **Part- 1** | **Polymers Chemistry** (An hour/week) for one Semester |
| Lecture 1 | Definitions; a) Dispersed Phase Characteristics, b) Matrix Phase Characteristics. |
| Lecture 2 | Composites Classification: a) Organic-Inorganic Composites, b) Organic-Metal Composites, c) Inorganic-Metal Composites. |
| Lecture 3,4 | Organic-Inorganic Composites Types: a) Particle Reinforced Composites: Small, Large, b) Fiber Reinforced Composites: Continuous, Discontinuous, c) Structural Reinforced Composites: Laminar, Sandwich. |
| Lecture 5 | Rubber Industry: a) Compounding. |
| Lecture 6-8 | b) Elastomers: Natural Rubber, Styrene-Butadiene Rubber, Polybutadiene Rubber, Ethylene-Propylene Rubber, Chloroprene Rubber, Acrylonitrile-Butadiene Rubber, Isoprene-Isobutylene Rubber, Polyisoprene Rubber. |
| Lecture 9,10 | c) Additives: Curatives, Fillers and Reinforcing Agents, Softeners, Antidegradants, Tackifiers, Flame Retardants, Colorants, Blowing Agents. |
| Lectures 11,12 | Copolymerization: Kinetic Behavior: Random, Alternating, Block, Ideal Copolymers. |
| Lecture 13,14 | Blend copolymers. |
| **Part- 2** | **Organic Spectroscopy** (An hour/week) for one Semester |
| Lecture 1 | Basic principle of C.W. NMR, simulating the sample, time frequency, practical implementations |
| Lecture 2 | Basic experimental methods, introduction, sample preparation choice of solvent, sample volume sample handling, nuclei other than proton $N^{15}$, $F^{19}$, $O^{17}$, $C^{13}$, $S^{33}$…etc |
| Lecture 3 | Basic principle description plus NMR technique, different of relaxation times. The NOE and internuclear distance. |
| Lecture 4 | Polarization transfer and spectrum INEPT intensity nuclear enhancement polarization technique DEPT (distortionless, enhancement polarization transfer) |
| Lecture 5 | Interpretation of $^{13}C$ NMR chemical shift related to peak assignment |
| Lecture 6 | New dimension in NMR $^{1}H$-$^{1}H$ connectivity coupling cosy experiment $^{1}H$-$^{13}C$ connectivity coupling APT $^{13}C$-$^{13}C$ connectivity coupling NOESY experiment |
| Lecture 7 | Spin echoes and J-spectroscopy, homonuclear J-spectrum and heteronuclear J-spectrum |
| Lecture 8 | Mass spectrometry instrumentation, determination of molecular ion region e.g. recognition of molecular ion peak, pathway fragmentation (daughter ion, fragmentation, rearrangement process. |
| Lecture 9 | Isotopic labeling and their contribution in molecular ion peak and daughter ions meta stable peaks and their role. |
| Lecture 10 | High resolution mass spectrum types of mass spectra, including EI (electron impact) and chemical ionization (CI), mass spectra of some selected classes of chemical compounds modern techniques in mass spectrometry e.g. plasma desorption, accurate mass spectrometry |

| | |
|---|---|
| Lectures 11-14 | Problem; comprise of different examples e.g. UV-IR, $^{1}H$ NMR set, UV-IR, $^{1}H$ NMR and mass spectra, UV-IR, $^{1}H$ NMR, $^{13}C$ NMR and mass spectra problem with different difficulty levels including NMR range from 100-400 MHz and number of 2-D spectra. |
| **Part- 3** | **Physical organic** (An hour/week) for one Semester |
| Lecture 1 | Bronsted Acids and Bases: Definitions; Strength of weak Bronsted Bases; Leveling Effect. |
| Lecture 2,3 | Acidity Functions: Hammett acidity function; other acidity scales; Bunnett and Olsen acidity function; Cox-Yates acidity function. |
| Lecture 4 | Strength of weak Bronsted acids: Thermodynamic acidity; Kinetic acidity. |
| Lecture 5 | Solution and gas-phase acidity; Acidity of carbon acids. |
| Lecture 6 | Application of acidity functions in mechanism studies. |
| Lecture 7 | Lewis Acids and Bases: Strength of Lewis Acids and Bases; Hard and Soft Acids and Bases (Pearson's Principle HSAB). |
| Lecture 8,9 | Catalysis: Acid-Base Catalysis; Specific and general Acid-Base Catalysis; Bronsted catalysis law and its applications. |
| Lecture 10,11 | Micellar Catalysis: Catalysis by non-covalent binding; Principles of micellar catalysis in aqueous solutions. Kinetic treatments of reactivities in micellar system (kinetic models for unimolecular and bimolecular reactions.) |
| Lecture 12,13 | Principles of Phase-Transfer Catalysis ( PTC) Liquid/Liquid , Solid/Liquid and Triphase-Transfer Catalysis. |
| Lecture 14 | Tutorial (Applications and Questions on the whole course). |
| **Part- 4** | **Rearrangement Reactions** (An hour/week) for one Semester |
| Lecture 1 | Nucleophilic or aninotropic rearrangements |
| Lecture 2 | Electrophilic or cationotropic rearrangements and free-radical rearrangements |
| Lecture 3 | Non 1,2-rearrangements as sigmatropic rearrangement & electrocyclic rearrangement |
| Lecture 4 | Benzyilic acid rearrangement & migratory aptitude |
| Lecture 5 | witting rearrangement under the condition of phase- transfer catalysis |
| Lecture 6 | The favoreskii rearrangement |
| Lecture 7 | The hofmann-lossen-curtis &Schmidt group of Rearrangement |
| Lecture 8 | Unimolecular elimination “E1 mechanism” |
| Lecture 9 | Bimolecular elimination “E2 mechanism” |
| Lecture 10 | Carbanion elimination “E1cB mechanism” |
| Lecture 11 | Tests for the E1CB AND E2 mechanisms |
| Lecture 12 | Differentiations betweenE1cB and E2 mechanisms |
| Lecture 13,14 | The influence of environmental factors on rates &mechanism in elimination reactions |
| | **Assessment** |

### 4. Teaching and Learning Methods

4.1. Theoretical lectures.

4.16. Library and net search for Assignments.

4.17. Seminars.

### 5. Student Assessment

| Assessment Method | Skills assessed* | Assessment Length | Weight |
|---|---|---|---|
| Written Examination | KU, I,P | 3 Hour Examination | 100% |

*KU: Knowledge and Understanding, I: Intellectual, P: Professional.

## 6. List of references

*Essential Books:*

- W. D. Callister, "**Materials Science and Engineering, An Introduction**". 3rd Ed. John Wiley & Sons, Inc, New York, Chapter17, page 513-545, 1994.

- J. S. Dick, "Compounding Materials for the Polymer Industries". Noyes Publications, New Jersey, Chapter 2, page 110-164, 1987.

- Organic spectroscopy, An introduction, S.F. Dyke, A.J. Floyed, M. Sainsbury and R.S. Theobend, Penguis Press Books limited copy right (**1982**).

- Spectroscopic Identification of Organic Compound Fourth edition, Robert M. Silverstein, Clayton G. Bassler and Terence C. Morrill John Willey and Sons Inc. (**1988**).

*Recommended Books:*

- T.H. Lowry and Kathleen S. Richardson "Mechanism and Theory in Organic Chemistry", Harper Collins Publishers, 3rd Edn. **1987**.

- B. Miller "Advanced Organic Chemistry, Reactions and Mechanisms" Pearson Education International, 2nd Edn, **2004**.

- P. Sykes "A guide book to mechanism in organic chemistry ", prentice Hall int., 6th Edn **1992**.

- J. March “advanced organic chemistry; reactions, mechanism and structure”, **2000**.

## 7. Facilities required for teaching and learning

Teaching rooms equipped with white and blackboards, and data show.

**Organic Chemistry (Advanced Polymer Chemistry, Organic Spectroscopy, Catalysis in Organic Reactions and Rearrangement in Organic Reactions)**
**Course code :- 1313**

| **Course contents** | Course intended learning ILOS | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and understanding | | | | Intellectual | | | | practical | | | | Transferable | | | |
| | **A1** | **A2** | **A3** | **A4** | **B1** | **B2** | **B3** | **B4** | **C1** | **C2** | **C3** | **C4** | **D1** | **D2** | **D3** | **D4** |
| **Part1-Polymers Chemistry** | | | | | | | | | | | | | | | | |
| Definitions; a) Dispersed Phase Characteristics, b) Matrix Phase Characteristics. | ✓ | ✓ | | | | | | | | | | | | | | |
| Composites Classification: a) Organic-Inorganic Composites, b) Organic-Metal Composites, c) Inorganic-Metal Composites. | ✓ | ✓ | | | | | | | | | | | | | | |
| Organic-Inorganic Composites Types: a) Particle Reinforced Composites: Small, Large, b) Fiber Reinforced Composites: Continuous, Discontinuous, c) Structural Reinforced Composites: Laminar, Sandwich. | ✓ | ✓ | | | | | | | | | | | | | | |
| b) Elastomers: Natural Rubber, Styrene-Butadiene Rubber, Polybutadiene Rubber, Ethylene-Propylene Rubber, Chloroprene Rubber, Acrylonitrile-Butadiene Rubber, Isoprene-Isobutylene Rubber, Polyisoprene Rubber. | ✓ | ✓ | | | ✓ | | | | | | | | ✓ | | ✓ | ✓ |
| c) Additives: Curatives, Fillers and Reinforcing Agents, Softeners, Antidegradants, Tackifiers, Flame Retardants, Colorants, Blowing Agents. | ✓ | ✓ | | | ✓ | | | | | | | | | ✓ | | ✓ |
| Copolymerization: Kinetic Behavior: Random, Alternating, Block, Ideal Copolymers. | ✓ | ✓ | | | ✓ | | | | | | | | ✓ | | ✓ | |
| Blend copolymers. | ✓ | ✓ | | | ✓ | | | | | | | | | ✓ | ✓ | ✓ |
| **Part 2-Organic Spectroscopy (An hour/week for one Semester)** | | | | | | | | | | | | | ✓ | | ✓ | |
| Basic principle of C.W. NMR, simulating the sample, time frequency, practical implementations | | | ✓ | | | | ✓ | | | | ✓ | | ✓ | | ✓ | ✓ |
| Basic experimental methods, introduction, sample preparation choice of solvent, sample volume sample handling, nuclei other than proton $N^{15}$, $F^{19}$, $O^{17}$, $C^{13}$, $S^{33}$…etc | | | ✓ | | | | ✓ | | | | ✓ | | | ✓ | | |
| Basic principle description plus NMR technique, different of relaxation times. The NOE and internuclear distance. | | | ✓ | | | | ✓ | | | | ✓ | | ✓ | | ✓ | ✓ |
| Polarization transfer and spectrum INEPT intensity nuclear enhancement polarization technique DEPT (distortionless, enhancement polarization transfer) | | | ✓ | | | | ✓ | | | | ✓ | | ✓ | ✓ | | ✓ |
| Interpretation of $^{13}C$ NMR chemical shift related to peak assignment | | | ✓ | | | | ✓ | | | | ✓ | ✓ | ✓ | ✓ | ✓ | |
| New dimension in NMR $^{1}H$-$^{1}H$ connectivity coupling cosy experiment $^{1}H$- | | | ✓ | | | | ✓ | | | | ✓ | ✓ | | ✓ | | ✓ |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $^{13}C$ connectivity coupling APT $^{13}C$-$^{13}C$ connectivity coupling NOESY experiment | | | | | | | | | | | | | | | | |
| Spin echoes and J-spectroscopy, homonuclear J-spectrum and heteronuclear J-spectrum | | | ✓ | | | | ✓ | | | | ✓ | ✓ | ✓ | ✓ | ✓ | |
| Mass spectrometry instrumentation, determination of molecular ion region e.g. recognition of molecular ion peak, pathway fragmentation (daughter ion, fragmentation, rearrangement process. | | | ✓ | | | | ✓ | | | | ✓ | ✓ | | ✓ | ✓ | ✓ |
| Isotopic labeling and their contribution in molecular ion peak and daughter ions meta stable peaks and their role. | | | ✓ | | | | ✓ | | | | ✓ | ✓ | ✓ | ✓ | ✓ | |
| High resolution mass spectrum types of mass spectra, including EI (electron impact) and chemical ionization (CI), mass spectra of some selected classes of chemical compounds modern techniques in mass spectrometry e.g. plasma desorption, accurate mass spectrometry | | | ✓ | | | | ✓ | | | | ✓ | ✓ | | ✓ | ✓ | |
| Problem; comprise of different examples e.g. UV-IR, $^{1}H$ NMR set, UV-IR, $^{1}H$ NMR and mass spectra, UV-IR, $^{1}H$ NMR, $^{13}C$ NMR and mass spectra problem with different difficulty levels including NMR range from 100-400 MHz and number of 2-D spectra. | | | ✓ | | | | ✓ | | | | ✓ | | | ✓ | ✓ | |
| **Part 3- Physical organic (An hour/week for one Semester)** | | | | | | | | | | | | | ✓ | ✓ | ✓ | |
| Bronsted Acids and Bases: Definitions; Strength of weak Bronsted Bases; Leveling Effect. | | | | | | | | ✓ | | | | | | | | |
| Acidity Functions: Hammett acidity function; other acidity scales; Bunnett and Olsen acidity function; Cox-Yates acidity function. | | | | | | | | ✓ | | | | | | | ✓ | ✓ |
| Strength of weak Bronsted acids: Thermodynamic acidity; Kinetic acidity. | | | | | | | | ✓ | | | | | ✓ | ✓ | | |
| Solution and gas-phase acidity; Acidity of carbon acids. | | | | | | | | ✓ | | | | | | | ✓ | ✓ |
| Application of acidity functions in mechanism studies. | | | | | | | | ✓ | | | | ✓ | | | | |
| Lewis Acids and Bases: Strength of Lewis Acids and Bases; Hard and Soft Acids and Bases ( Pearson's Principle HSAB). | | | | | | | | ✓ | | | | ✓ | ✓ | ✓ | | |
| Catalysis: Acid-Base Catalysis; Specific and general Acid-Base Catalysis; Bronsted catalysis law and its applications. | | | | | | | | ✓ | | | | ✓ | | ✓ | ✓ | |
| Micellar Catalysis: Catalysis by non-covalent binding; Principles of micellar catalysis in aqueous solutions. Kinetic treatments of reactivities in micellar system ( kinetic models for unimolecular and bimolecular reactions.) | | | | | | | | ✓ | | | | | ✓ | ✓ | ✓ | |
| Priciples of Phase-Transfer Catalysis ( PTC) Liquid/Liquid , Solid/Liquid and Triphase-Transfer Catalysis. | | | | | | | | ✓ | | | | | | | ✓ | ✓ |
| Tutorial (Applications and Questions on the whole course). | | | | | | | | ✓ | | | | | ✓ | ✓ | | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Part 4-Rearrangement Reactions (An hour/week for one Semester)** | | | | | | | | | | | | | | | | |
| Nucleophilic or aninotropic rearrangements | | | | | | | | | | | | | | | | |
| Electrophilic or cationotropic rearrangements and free-radical rearrangements | | | | | | | | | | | | | | ✓ | ✓ | |
| Non 1,2-rearrangements as sigmatropic rearrangement & electrocyclic rearrangement | | | | | | | | | | | | | ✓ | | | ✓ |
| Benzyilic acid rearrangement & migratory aptitude | | | | | | | | | | | | | | ✓ | ✓ | |
| witting rearrangement under the condition of phase- transfer catalysis | | | | | | | | | | | | | ✓ | | | ✓ |
| The favoreskii rearrangement | | | | | | | | | | | | | | ✓ | ✓ | |
| The hofmann-lossen-curtis &Schmidt group of Rearrangement | | | | | | | | | | | | | | | ✓ | ✓ |
| Unimolecular elimination “E1 mechanism” | | | | | | | | | | | | | ✓ | ✓ | | |
| Bimolecular elimination “E2 mechanism” | | | | | | | | | | | | | | | ✓ | ✓ |
| Carbanion elimination “E1cB mechanism” | | | | | | | | | | | | | ✓ | ✓ | | |
| Tests for the E1CB AND E2 mechanisms | | | | | | | | | | | | | | | ✓ | |
| Differentiations betweenE1cB and E2 mechanisms | | | | | | | | | | | | | | | | |
| The influence of environmental factors on rates &mechanism in elimination reactions | | | | | | | | | | | | | | ✓ | ✓ | |

**Learning and Teaching Methods**

| Learning Methods | Course outcomes ILOs | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | | Intellectual Skills | | | | | Professional Skills | | | | | General and Transferable Skills | | | | |
| | A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | C1 | C2 | C3 | C4 | C5 | D1 | D2 | D3 | D4 | D5 |
| **Lecture** | ✓ | ✓ | ✓ | | | | ✓ | | | | | ✓ | | ✓ | | ✓ | ✓ | | | |
| **Discussion (Brain Storming)** | | | | | | | ✓ | | | | | ✓ | | | | ✓ | ✓ | | | |
| **Self-learning (Essay)** | ✓ | | | ✓ | | ✓ | | | | | ✓ | ✓ | | | | | | | ✓ | ✓ |
| **Field Trips** | | | | | | | | | | | | | | | | | | | | |
| **Practical** | | | | | | | | | | | | | | | | | | | | |

## Assessment Methods

| Assessment Methods | Course outcomes ILOs | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | | Intellectual Skills | | | | | Professional and Practical Skills | | | | | General and Transferable Skills | | | | |
| | A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | C1 | C2 | C3 | C4 | C5 | D1 | D2 | D3 | D4 | D5 |
| **Essay Question** | ✓ | ✓ | | ✓ | | | ✓ | | | | ✓ | ✓ | | | | | | | | |
| **MCQ** | | | ✓ | | | ✓ | | ✓ | ✓ | | | | | ✓ | | ✓ | | ✓ | | |
| **Student Activity** | | | | | | ✓ | ✓ | | | | | | ✓ | | | | ✓ | | ✓ | |
| **Practical** | | | | | | | | | | | | | | | | | | | | |

| | **Course Coordinator** | **Head of Department** |
|---|---|---|
| Name (Arabic) | أ. د / محمد عبدالعزيز البرعى | أ. د / الرفاعى صبحى قناوى |
| Name | Prof. Mohamed EL-Boraie | Prof. El- Refaie S. Kenawy |
| Signature | | |
| | 9/2014 | 9/2014 |

| | | |
|---|---|---|
| Course Title | **Computer** | |
| Course Code | 1317 | |
| Academic Year | **2014/2015** | |
| Coordinator | **Prof. Mahmoud Kamel** | |
| Other Staff | **Prof. Mahamed El-Awady, Mohmed Ghoneim, Prof. Qadry Zakaria, Prof Mahmoud Kamel, Prof Saad Abo elenen** | |
| Semesters | **Two Semesters** | |
| Pre-Requisite | **B.Sc.** | |
| Course Delivery | **Lecture** | **1h/week** |
| | **Practical** | **1h/week** |
| Parent Department | **Computer Centre** | |
| Date of Approval | **September, 2014** | |

**1. Aims**

This course will enable students to acquire a range of transferable skills that are important for post graduate M. Sc. students to:

- Develop their capability for information retrieval and presentation, and proficiency in the use of IT effectively in the context of their studies.
- Underpin academic work throughout postgraduate studies.
- Provide opportunities to develop skills required for team working, oral presentation of scientific material, and career choices.

***A. Knowledge and understanding:***

Upon successful completion of this course the students should be able to:

A1. Demonstrate knowledge and understanding of the use of IT in the context of their postgraduate studies.

A2. Know the diverse media and hardware and software that help to benefit of the IT in the context of the postgraduate studies.

A3. Carry out necessary graphical, statistical and frequency analyses of different types of data.

A4. Create powerful presentation using sophisticated software packages.

A5. Make use of different internet resources.

A6. Solve scientific problems using computer programming.

A7. Make use of different photo enhancing and manipulation techniques.

***B. Intellectual skills:***

They should also acquire the ability to:

B2. Integrate different application programs to develop effective information analysis and presentation.

***C. Professional and practical skills:***

C1. Use a number of computer packages to present information.

***D. General and transferable skills:***

D2. Use the internet/electronic resources to obtain subject specific information, and to develop lifelong learning skills that can be applied to suitable research problems.

**3. Contents**

Lectures 1-5 **Assignment 1**: **information technology**

Types and generations of computers
Hardware and Software computer structure
Types and development of operating systems
Working with windows
File and folder manipulations

Lectures 6-12 **Assignment2**: **Using PowerPoint program**

Working with PowerPoint program
Insert slides and animations

Different methods of slide editing
Insert tables ,charts, video, pictures, hyperlinks ,web pages and different objects
Design a real and powerful presentation with different acquired skills

Lecture 13-18 **Assignment 3**: **Using Access program**
Working with Access program
Define data and information
Creating data base tables , sorting and filtering records and fields
Creating different types of queries to extract useful information
Creating forms for data entries and calculations
Creating and printing final reports

Lecture 19-23 **Assignment 4: Using the Internet**
Define different types of protocols and network
Different levels of internet connections
Email and methods of file transfer
Use of internet capabilities and searching engines
Life search on the internet for some real information

Lecture 24-28 **Assignment 5**: Programming using Visual Basic 6
Different types of computer languages
Concept of visual programming language
Working with visual basic language
Steps necessary for creating a project with visual basic
Solving real problems using a visual basic computer language

**4. Teaching and Learning Methods**
- Lectures
- Practical classes
- Assignments

The course is delivered through lectures, practical sessions and assignments. Team working skills are developed on a week-long laboratory exercises and the students present and defend their findings in a public seminar.

**5. Student Assessment**

| Assessment Method | Skills assessed* | Assessment Length | Schedule | Proportion |
|---|---|---|---|---|
| Written Examination | KU, I | 1 Hour Examination | Term Final | 60% |
| Practical Examination | KU, I | 1 Hour Examination | Term Final | 30% |
| Semester work | P, T | Continuous Assessment | | 10% |

*KU: Knowledge and Understanding, I: Intellectual, P: Professional, T: Transferable

**6. List of references**
*Course notes:*
- Notes given to students at each section describe the tasks to be completed, therefore no particular book(s) recommended.

**7. Facilities required for teaching and learning**
- Projectors; Video and Overhead
- LCD screens and writing Boards
- Commercial computer scientific software packages.

Course Contents – Course ILOs Matrix

**Course code: 1317 Chemistry, course title: Computer**

| Course outcomes ILOs | | | | | | | | | | | | | | | | | | | | | | | Course Contents |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Transferable | | | Practical | | | | | Intellectual | | | | | Knowledge and Understanding | | | | | | | | | | |
| D3 | D2 | D1 | C5 | C4 | C3 | C2 | C1 | B5 | B4 | B3 | B2 | B1 | A10 | A9 | A8 | A7 | A6 | A5 | A4 | A3 | A2 | A1 | |
| ☐ | ☐ | ☒ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | Week #1-2 |
| ☐ | ☐ | ☒ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | Week #3-4 |
| ☐ | ☐ | ☒ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | Week #5-6 |
| ☐ | ☐ | ☒ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | Week #7-8 |
| ☐ | ☐ | ☒ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | Week #9-10 |
| ☐ | ☐ | ☒ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | Week #11-12 |
| ☐ | ☐ | ☒ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | Week #13-14 |
| ☐ | ☐ | ☒ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | Week #14-15 |
| ☐ | ☐ | ☒ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | Week #16-17 |
| ☐ | ☐ | ☒ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | Week #18-19 |
| ☐ | ☐ | ☒ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | Week #20-21 |
| ☐ | ☐ | ☒ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | Week #22-23 |
| ☐ | ☐ | ☒ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | Week #24-25 |
| ☐ | ☐ | ☒ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | Week #26-27 |
| ☐ | ☐ | ☒ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | Week #28 |

| | Course Coordinator | Head of Computer Center |
|---|---|---|
| Name | Prof. Mahmoud M. Kamel | Prof. El-sayed T. Rizk |
| Name (Arabic) | أ.د.محمود مصطفى كامل | أ.د. السيد طه رزق |
| Signature | | |
| Date | 9/2014 | 9/2014 |

# Master of Science Degree in Organic Chemistry

## 1. Academic standards

The Academic Reference Standards (ARS) for M.Sc. program degree in organic chemistry as well as the attributes and capabilities of the graduates were based on the General Academic Reference Standards (ARS) for graduate studies published by the National Authority for Quality Assurance and Accreditation of Education (2009) for M.Sc. Degree. Specific reference standard for the M.Sc. in organic chemistry were approved by the Council of the Faculty of Science, Tanta University in 2014.

### 1.1. Graduate Attributes.

*The graduate of the M.Sc. (Chemistry) must be able to:*

1.1.1. Apply the basic concepts of scientific research.

1.1.2. Apply the concepts of "analysis" and its use in the field of chemistry.

1.1.3. Construct related subjects and information to be applied professionally.

1.1.4. Show deep knowledge of the current problems in chemistry.

1.1.5. Solve problems using a range of formats and approaches.

1.1.6. Choose the appropriate technological techniques.

1.1.7. Communicate effectively and show a perfect professional leadership.

1.1.8. Make decisions regarding the professional activities.

1.1.9. Make use of the available facilities.

1.1.10. Recognize his/her role for society development.

1.1.11. Self–learning in both academic and professional areas.

### 1.2. Knowledge and Understanding:

*By the end of the study program of graduate of MSc. must able to:*

1.2.1. Know the theories and fundamentals related to the area of study as well as related areas.

1.2.2. Mutual influence between professional practice and its impacts on the environment.

1.2.3. Understand the legal and ethical principles of professional practice in the area of study specialization.

1.2.5. Know the basis of quality in professional practice in the area of specialization.

### 1.3. Intellectual skills

*By the end of the study program of graduate of MSc. must able to:*

1.3.1. Analyze and evaluate the information in the field of specialization.

1.3.2. Solve specialized problems in case of lack of information.

1.3.3. Link between different knowledge to solve professional problems.

1.3.4. Conduct a research study and / or write a methodology of a scientific investigation.

1.3.5. Risk assessment in professional practices in the area of interest.

1.3.6. Planning to improve performance in the field of interest.

1.3.7. Make the proper decision in diverse professional contexts.

**1.4. Professional skills**.

*By the end of the master's program graduate must be able to:*

1.4.1. Mastery of, modern professional basic skills in the area of specialization.

1.4.2. Write and evaluate of professional reports.

1.4.3. Assess the efficiency of methods and tools in the area of study or work area.

**1.5. General and transferable skills**.

*By the end of the master's program graduate must be able to:*

1.5.1. Communicate effectively to obtain required knowledge.

1.5.2. Use of information technology to serve the professional practice.

1.5.3. Develop rules and indicators for assessing the performance of others.

1.5.4. Work in a team, and leading team work in professional contexts.

## A. Program Specification

| Program Title | Master of Science Degree in Organic Chemistry |
|---|---|
| Award | Master of Science Degree in Chemistry |
| Parent Department | Chemistry Department |
| Teaching Institution | Faculty of Science – Tanta University |
| Awarding Institution | Tanta University |
| Coordinator | Prof. Mohamed A. EL-Borai |
| External Evaluator(s) | Prof. Magdi S. Farag<br>Faculty of Science –Cairo University |
| QAA Benchmarking Standards | National Academic Reference Standards (NARS) |
| Date of intake | Every year in September |
| Review Date | Internal Periodic Review, Summer 2013 |
| Date of Approval | September, 2014 |

### 1. Aims

**Aims**

It is aimed to extend students comprehension of key chemical concepts and to provide students with an in–depth understanding of specialized areas of organic Chemistry. In addition, the program aims to prepare students effectively to doctoral studies in chemical Sciences or to professional employment.

### 2. Intended Learning outcomes

***A. Knowledge and Understanding:***

By the end of the master's program graduate should be able to:

A1. Acquire in–depth knowledge in the field of interest.
A2. Illustrate his/ her contemporary professional practice in the field of specialty and describe its impact on the environment.
A3. Recognize the basics of the lab. quality assurance and its application in the field of interest.

A4. Explain the basis of ethical behavior in scientific research.

***B. Intellectual skills:***

They will also acquire the ability to:

B1. Formulate hypotheses, plan and execute laboratory investigation.

B2. Identify and analyze complex analytical problems.

B3. Apply subject knowledge and understanding to formulate chemical problems within a given frame.

B4. Analyse, synthesize and assimilate diverse information in a critical manner.

B5. Correctly document the scientific work, and comprehensively discuss the results and conclusions.

B6. Develop work, evaluate the outcomes and draw valid conclusions.

B7. Present logical solutions that display originality or creativity in industrial, health and environmental fields

***C. Professional and practical skills:***

C1. Apply the practical he acquired in various professional contexts.
C2. Reform and present precise results objectively.
C3. Develop the practical knowledge he gained in the professional work.

***D. General and transferable skills:***

D1. Provide responsible initiatives in his work.
D2. Communicate and exchange ideas effectively in his/field.
D3. Use several and different resources of reliable scientific information.
D4. Work within a team and manage the time properly.

## 3. Academic standards

The Academic Reference Standards (ARS) for M.Sc .program degree in organic chemistry as well as the attributes and capabilities of the graduates were based on the General Academic Reference Standards (ARS) for graduate studies published by the National Authority for Quality Assurance and Accreditation of Education (2009) for M.Sc. Degree. Specific reference standard for the M.Sc. in organic chemistry were approved by the Council of the Faculty of Science, Tanta University in 2014.

### 3.1. Graduate Attributes.

*The graduate of the of M.Sc ( -organic chemistry ) must be apple to:*

3.1.1. Apply the basic concepts of scientific research.
3.1.2. Apply the concepts of "analysis" and its use in the field of organic.
3.1.3. Construct related subjects and information to be applied professionally.
3.1.4. Show deep knowledge of the current problems in chemistry.
3.1.5. Solve problems using a range of formats and approaches.
3.1.6. Choose the appropriate technological techniques.
3.1.7. Communicate effectively and show a perfect professional leadership.
3.1.8. Make decisions regarding the professional activities.
3.1.9. Make use of the available facilities.
3.1.10. Recognize his/her role for society development.
3.1.11. Self–learning in both academic and professional areas.

### 3.2. Knowledge and understanding:

*By the end of the study program of graduate of M.Sc must able to:*
3.2.1. Know the theories and fundamentals related to the area of study as well as related areas.
3.2.2. Mutual influence between professional practice and its impacts on the environment.
3.2.3. Scientific developments in the area of specialization.
3.2.4. Understand the legal and ethical principles of professional practice in the area of study specialization.
3.2.5. Know the basis of quality in professional practice in the area of specialization.
3.2.6. Know the principles and ethics of scientific research

### 3.3. Intellectual skills

*By the end of the study program of graduate of M. Sc must able to:*
3.3.1. Analyze and evaluate the information in the field of specialization.
3.3.2. Solve specialized problems in case of lack of information.
3.3.3. Link between different knowledge to solve professional problems.
3.3.4. Conduct a research study and / or write a methodology of a scientific investigation.

3.3.5. Risk assessment in professional practices in the area of interest.
3.3.6. Planning to improve performance in the field of interest.
3.3.7. Make the proper decision in diverse professional contexts.

**3.4. Professional skills**.

*By the end of the master's program graduate must be able to:*

3.4.1. Mastery of, modern professional basic skills in the area of specialization.
3.4.2. Write and evaluate of professional reports.
3.4.3. Assess the efficiency of methods and tools in the area of study or work area.

**3.5. General and transferable skills**.

*By the end of the master's program graduate must be able to:*

3.5.1. Communicate effectively to obtain required knowledge.
3.5.2. Use of information technology to serve the professional practice.
3.5.3. Develop rules and indicators for assessing the performance of others.
3.5.4. Work in a team, and leading team work in professional contexts.

**4- Curriculum Structure and contents:**

4.a Program duration: One Year for completion of Course Work, and at least one Year for thesis Preparation (according to the regulation of the Faculty of Science).

4b. Program structure

.i- No. of hours per week: Lectures (6h/w), Computer science( 1h/w),Total (7h/w)
Exams. (writ. 7), Computer science (practical)

**M. 3.B Comparison of provision to external references:**

International Academic Standards

**4. Curriculum structure and contents:**

4.A Program duration One Year

4.B Program structure

4.B.1 Number of contact hours per Week: Lectures 6

4.B.2 Number of credit hours of other courses:(computer) Lectures 1 Lab. 1

**5. Program courses**

| **Year 1** | Course Title | Lec. | Prac. | Exer. | Program ILOs Covered |
|---|---|---|---|---|---|
| Code | Student must do the following modules: | Hours | | | |
| 1321 | Organic Chemistry 1 (Heterocyclic Compounds I, Heterocyclic Compounds II, Oxidation of Organic Compounds, Dyes) | 2 | - | - | KU, I, G |
| 1322 | Physical Organic Chemistry (Polymer Chemistry, Organic Spectroscopy, Physical Organic and Stereochemistry) | 2 | - | - | KU, I, G |
| 1323 | Physical Chemistry (Kinetics of Ion Exchange, Electrochemistry, Laser in Chemistry and Applied Spectroscopy) | 2 | - | - | KU, I, G |
| 1317 | Computer | 1 | 1 | - | KU, I, G |

## 6. Program admission requirements

Arrangements for admission are based on the national guidelines with no Faculty control on the number of newly enrolled students.

Candidates must satisfy the general admission requirements of the University, Faculty and chemistry Department and also hold B. Sc. in Chemistry

## 7. Regulations for progression and program completion

The Faculty has the following system to follow student's progression:

- The program includes one year of coursework, followed by a research project, i.e. the Master thesis, by laboratory investigation in a mentored environment.

- Assessment is held by the end of the first year, and student will be eligible only on attaining a “pass” degree (60%).

- The student who fails certain course at the first attempt will be eligible for only a “Pass” degree following only one re-set examination.

- The student can submit his thesis only after one year from the date of the Faculty Council approval on the thesis subject.

## 8. Evaluation of program intended learning outcomes

| Evaluator | Tool | Sample |
|---|---|---|
| 1. Senior students | applied | 20 |
| 2. Alumni | Applied | 20 |
| 3. Stakeholders(Employers) | applied | 20 |
| 4. External Evaluator(s)(External Examiner(s)) | applied | 1 |

## Matrix of ARS ILOs and M.Sc. Organic Chemistry Program ILOs

| ARS ILOs | Program intended learning outcomes ILOs | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | | Intellectual | | | | | | | Practical | | | | Transferable | | | |
| | A1 | A2 | A3 | A4 | | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | | D1 | D2 | D3 | D4 |
| **Knowledge and Understanding** | | | | | | | | | | | | | | | | | | | | |
| **1**. Know the theories and fundamentals related to the area of study as well as related areas. | √ | √ | | | | | | | | | | | | | | | | | | |
| **2.** Mutual influence between professional practice and its impacts on the environment. | √ | √ | | √ | | | | | | | | | | | | | | | | |
| **3.** Understand the legal and ethical principles of professional practice in the area of study specialization | | | √ | | | | | | | | | | | | | | | | | |
| **4.** Know the basis of quality in professional practice in the area of specialization. | √ | √ | √ | √ | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| **Intellectual Skills** | | | | | | | | | | | | | | | | | | | | |
| **1.** Analyze and evaluate the information in the field of specialization. | | | | | | √ | √ | | | | | | | | | | | | | |
| **2.** Solve specialized problems in case of lack of information. | | | | | | √ | √ | √ | | | | | | | | | | | | |
| **3.** Link between different knowledge to solve professional problems. | | | | | | √ | | √ | √ | | | | | | | | | | | |
| **4.** Conduct a research study and / or write a methodology of a scientific investigation. | | | | | | | √ | | √ | √ | | | | | | | | | | |
| **5.** Risk assessment in professional practices in the area of interest. | | | | | | √ | | | | √ | √ | | | | | | | | | |
| **6.** Planning to improve performance in the field of interest. | | | | | | √ | √ | | | | √ | | | | | | | | | |
| **7.** Make the proper decision in diverse professional contexts. | | | | | | | | | | √ | √ | | | | | | | | | |
| **Professional Skills** | | | | | | | | | | | | | | | | | | | | |
| **1.** Mastery of, modern professional basic | | | | | | | | | | | | | √ | √ | | | | | | |

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| skills in the area of specialization. | | | | | | | | | | | | | | | | | | | | |
| 2. Write and evaluate of professional reports. | | | | | | | | | | | | | | √ | √ | | | | | |
| 3. Assess the efficiency of methods and tools in the area of study or work area. | | | | | | | | | | | | | | √ | √ | | | | | |
| **General Skills** | | | | | | | | | | | | | | | | | | | | |
| **1**. Communicate effectively to obtain required knowledge. | | | | | | | | | | | | | | | | | √ | | | |
| **2**. Use of information technology to serve the professional practice. | | | | | | | | | | | | | | | | | √ | √ | | |
| **3.** Develop rules and indicators for assessing the performance of others. | | | | | | | | | | | | | | | | | √ | √ | | |
| **4.** Work in a team, and leading team work in professional contexts. | | | | | | | | | | | | | | | | | √ | | √ | √ |

ertify that all of the information required to deliver this program is contained in the above specification and will be implemented. All course specifications for this program are in place

**Master of Science Degree in organic Chemistry**

**Program's Matrix**

| Code | Courses | Knowledge and Understanding | | | | Intellectual Skills | | | | | Professional Skills | | | General Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | A1 | A2 | A3 | A4 | B1 | B2 | B3 | B4 | B5 | C1 | C2 | C3 | D1 | D2 | D3 | D4 |
| 1321 | Organic Chemistry l (Heterocyclic Compounds I, Heterocyclic Compounds II, Oxidation of Organic Compounds, Dyes | √ | √ | | √ | √ | √ | √ | | √ | | | | √ | √ | √ | √ |
| 1322 | Physical Organic Chemistry (Polymer Chemistry, Organic Spectroscopy, Physical Organic and Stereochemistry) | √ | √ | √ | | √ | √ | | √ | √ | √ | | | √ | √ | √ | √ |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1323 | Physical Chemistry (Kinetics of Ion Exchange, Electrochemistry, Laser in Chemistry and Applied Spectroscopy) | √ | | √ | √ | √ | √ | √ | | √ | | | | √ | √ | √ | √ |
| 1317 | Computer | √ | √ | √ | | | √ | | | √ | √ | √ | √ | | √ | | |
| | Thesis | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |

| Name | Signature | Date |
|---|---|---|
| *Program Coordinator:*<br>أ. د / محمد عبدالعزيز البرعى<br>Prof. Mohamed A. EL-Borai | ………………………… ……… | 9/201٤ |
| *Head of Quality Assurance Unit:*<br>Prof. Huda Kamal<br>(أ. د. هدى كمال) | ………………………… ……… | 9/201٤ |
| *Dean of the Faculty:*<br>Prof. Tarek A. Fayed<br>(أ. د. طارق فايد) | ………………………… ……… | 9/201٤ |

| | | |
|---|---|---|
| Course Title | **Organic Chemistry l (Heterocyclic Compounds I, Heterocyclic Compounds II, Oxidation of Organic Compounds, Dyes)** | |
| Course Code | **1321** | |
| Academic Year | **2014/2015** | |
| Coordinator | **Prof. Ahmed A. El-Barbary** | |
| Other Staff | **Prof. Mohamoud Fahmy, Prof.M. Fargaly, Prof. Fouad E. Abdel- Hay** | |
| Semesters | **Two Semesters** | |
| Pre-Requisite | **B.Sc. in Chemistry** | |
| Course Delivery | **Lecture** | **2h/week** |
| Parent Department | **Chemistry** | |
| Date of Approval | **September, 2014** | |

## 1. Aims

The aims of this course are to:

- Study the methods of synthesis and chemical behavior of some five membered heterocycles.
- Discuss the oxidation reactions of organic compounds with different oxidizing agents
- Discuss the different methods used for the synthesis of most six membered heterocyclic compounds.
- Teach students the chemistry of different classes of synthetic dyes used for dyeing and printing natural and synthetic fibers.

## 2. Intended Learning outcomes

### *A. Knowledge and understanding:*

By the end of this course the students should be able to demonstrate knowledge and understanding of:

A14. The basics of oxidation of organic compounds.

A15. The basics of reactions including carbenes, nitrines and similar compounds.

A16. The methods of preparation of new heterocyclic compounds containing six membered rings.

A17. Spectral methods of elucidation of the structure of these compounds and its reactivity.

A18. the chemistry of different classes of synthetic dyes used for dyeing and printing natural and synthetic fibers

### *B. Intellectual skills:*

By the end of this course the students should be able to:

B9. Explain the bases of oxidation of organic compounds.

B10. Recognize the basics of reactions including carbenes, nitrines and similar compounds.

B11. Solve problems related to the oxidation of organic compounds.

B12. Solve problems related to reactions including carbenes, nitrines, and similar compounds.

### *D. General and transferable skills:*

By the end of this course the students should be able to:

D11. Communicate effectively in written and oral.

D12. Use information technology and resources to collect and represent scientific data.

D13. Work effectively as a member of team and manage time.

## 3. Contents

| | |
|---|---|
| Part-1 | **Heterocyclic Compounds I** (An hour / week) for one Semester |
| Lectures 1,2 | **ORGANO PHOSPHRUS COMPOUNDS**<br>A-Use of organophosphrous compounds as Insecticides, herbicides and fungicides. 1 Lawesson's Reagent **(** 2, 4- bis ( 4- methoxyphenyl) 1,3,2,4- Dithiadiphospha-2,4-disulphide **)**<br>B- Synthesis of Lawesson's Reagent<br>C- Reaction of Lawson's Reagent:<br>i- Reaction with nucleophiles ii- Water<br>iii- 1º and 2º alcohols iv- 1º and 2º amines<br>v- Carboxylic acids (mono and di- ) vi- Grinard Reagent |
| Lectures 3,4 | **Antiviral Agents**<br>i- Nucleosides, nucleotides and nucleic acids<br>(Purine - pyrimidine as bases ) and (ribose - Deoxy ribose as sugars )<br>ii- (adenosine - 5' – phosphate ), RNA<br>(ribonucleic acid ), DNA ( deoxy ribonucleic acids )<br>Different methods for synthesis and reactions with different reagents.<br>iii- synthesis of AZT ( 2' , 3' –dideoxy , 3' –azido –B –derythopenta furanose ) thymine iv- Synthesis of 2' , 3' –didoxy-3'-mercapto nucleoside. |
| Lectures 5,6 | **CHEMOTHERAPY**<br>1- Anti pyretics and their analgesis ( e.g. : Pyrazolones and their derivatives – salicylic acids; e.g. : antipyrine ( 2,3-dimethyl-2 phenylpyrazole-5-one)<br>2- ANTISTERILIZER AGENTS<br>a- Indole derivatives b- Vilismier reaction<br>1- ANTITUMERAGENTS ( e.g.-4-phenyl -2,aminothiazole )<br>2- ANTICOAGUELANT AGENTS<br>Thrombosis (benzopyran ) –Vasodialators (benzofuran)<br>3- ANTICOVULASNT AGENTS<br>Pyrrolidine derivatives – oxazolidine derivatves (e.g.: 2- nitrofurfural), reactions with (hydroxyl amine – epichlorohydrin – aminothiourea) |
| Lectures 7,8 | **1,3,4- OXADIAOLES and (1,3,4- Thiadiazole) derivatives**<br>Synthesis and reactions with different nuclophiles and electrophiles |
| Lectures 9,10 | **1,2,4- TRIAZOLES**<br>Synthesis and reactions with different nuclophiles and electrophiles |
| Lectures 11-14 | **HYDANTOINS**<br>i- Synthesis and reactions with different nuclophiles and electrophiles, Reactions of hydantoins (protonation, alkylation, N- acylation, condensation with aldehydes and ketones, reaction with nucleophiles, ammonlysis, diazonium salts, reducing agents and diazo-alkanes).<br>ii- 2- and 4- Thiohydantions<br>iii- 2- and 4- Dithiohydantions<br>1- Preparations: (thiourea and unsaturated acids, amino acids, from thiourea and bromoacetyl bromide) and others.<br>Reactions: (with dihalides, ammonolysis, desulfurisation) and others. |
| **Part-2** | **Oxidation of Organic Compounds** (An hour / week) for one Semester |
| Lectures 1,2 | (Oxidations of Alcohols to Aldehydes, Ketones or Carboxylic Acids) |

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|---|---|
| Lecture 3 | Addition of Oxygen at Carbon-Carbone Double bonds. |
| Lectures 4,5 | Cleavage of Carbon –Carbon Double bonds. |
| Lecture 6 | Selective Oxidative Cleavage at Other Functional Groups. |
| Lecture 7 | Oxidations of Ketones and Aldehydes. |
| Lectures 8,9 | Allylic Oxidation of Olefins |
| Lectures 10,11 | Oxidations at Unfunctionalized Carbon Atoms: |
| Lecture 12 | Carbenes structure ,synthesis and reactions |
| Lectures 13,14 | Nitrenes, Rearrangements of Electron-Deficient Intermediates, Fragmentations and Some Synthetically Useful Carbonium ion Reactions. |
| **Part-3** | **Heterocyclic Compounds II** (An hour/week) for one Semester |
| Lecture 1,2 | Synthesis and reaction of 2-and 4-pyrones |
| Lecture 3,4 | Synthesis of pyrylium salts and reactions |
| Lecture 5,6 | Benzopyrylium and benzopyrans |
| Lecture 7-9 | Diazines synthesis and reactions |
| Lecture 10-12 | Pyrazolones and its derivatives synthesis and reactions |
| Lectures 13,14 | Quinazolinones |
| **Part-**4 | **Dyes** (An hour/week) for one Semester |
| Lecture 1 | **Technical azo dyes for cellulosic fibers:** A- The chemistry of cellulosic fibers**.**<br>B- Direct dyes, Developed dyes, other after treated dyes, pre-metallized dyes and dyes with mixed chromophores.<br>C- Azoic dyes stabilized diazo compound, commercial ranges of azoic compound, Rapid fast colors, Rapidogen colors and neutral developing printing mixtures.<br>D- Sulphur dyes. |
| Lectures 2,3 | **Technical azo dyes for protein fibers:** A- Chemistry of wool and silk.<br>B- Dyes for wool (Levelling and milling acid dyes)<br>C- Metallised acid dyes (Chrome acid dyes) Dyes for silk. |
| Lecture 4 | **Technical azo dyes for synthetic fibers:**<br>A. Chemistry of Man-made fibres.<br>B. B- Disperse azo dyes and AQ dyes.<br>C. Reactive disperse azo dyes. |
| Lecture 5 | **Reactive dyes:**<br>A. Dyes for cellulosic fibers, reactive systems based on nucleophilic substitution, reactive systems based on nucleophilic addition and reactive systems based on the use of cross-linking agents.<br>B. Application of reactive dyes to cellulosic fibers<br>C- Reactive dyes for wool and for synthetic polyamides. |
| Lecture 6,7 | **Vat dyes:**<br>A. Indigo and thioindigo dyes<br>B. Anthraquinone dyes Carbocyclic dyes, five- and six-membered heterocyclic dyes and solubilized anthraquinone dyes.<br>C. Other vat dyes. |
| Lectures 8,9 | **Phthalocyanine pigments and dyes:**<br>A. Manufacture of Phthalocyanine pigments.<br>B. Metal-free Phthalocyanine**,** Phthalocyanine complex from metals other than copper.<br>C- Locyanine dyes for textile materials. |
| Lectures 10,11 | **Retention of dyes in the fiber:**<br>A. Dyes attached by processes leading to pigmentation of the fiber. |

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| | B. Dyes attached wholly or partly by chemical union with the fiber.<br>C. Cellulose-substantive dyes.<br>D- Disperse dyes. |
| Lectures 12-14 | **Fluorescent brighteners:**<br>A- Stibene derivatives.<br>B- Other chemical classes, heterocyclic vinylene derivatives, Diaryl C- pyrazolines, naphthalic imides, pyrene derivatives, cyclic sulphones, Miscellaneous chemical classes. |
| Weeks 15 | **Assessment** |

## 4. Teaching and Learning Methods

4.1. Theoretical lectures.

4.18. Library and net search for Assignments.

4.19. Seminars.

## 5. Student Assessment

| Assessment Method | Skills assessed* | Assessment Length | Weight |
|---|---|---|---|
| Written Examination | KU, I | 3 Hour Examination | 100% |

*KU: Knowledge and Understanding, I: Intellectual, P: Professional.

## 6. List of references

*Essential Books:*


1. 1. K.B. Wiberg (ed) "Oxidation in Organic Chemistry" Part A, Academic Press, New York, NY, 1965.
2. 
3. W. S. Trahanovsk (ed) " Oxidation in Organic Chemistry" Part B, Academic Press, New York, NY, 1973.
4. R.L. Augustine and D.J.T Treckers ( eds_ Ocidation, Vol .2, Marcel Dekker, New York, NY, 1971.
5. J. Griffiths (Academic Press), "Color and constitution of organic molecules".

*Recommended Books:*

6. The Chemistry of Synthetic Dyes by: K. Vankataraman, (Academic Press, New York).
7. Dyeing and Chemical Technology of Textile Fibers By: G.R. Trotman (Griffin, London).

- The structure and reactions of Heterocyclic Compounds,M,H,Palmar(1967),Edward Arnold,London.
- The chemistry of Heterocyclic compounds, R.M.Acheson(1967,2nd Edition),interscience publishers(New York)
- Acta Chemica Academiae Scientiarum Hungaricate.Tomus 91(1976)
- A.R.Katritzky. comprehensive Heterocyclic Compounds VI (1984).
- A.R.Katritzky. Advanced Heterocyclic compounds IV (1986)


## 7. Facilities required for teaching and learning

Teaching rooms equipped with white and blackboards, and data show.

**Organic Chemistry l (Heterocyclic Compounds I, Heterocyclic Compounds II, Oxidation of Organic Compounds, Dyes)(Course Code:- 1321)**

| Course contents | Course intended learning ILOS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and understanding | | | | | Intellectual | | | | practical | | | Transferable | | |
| | **A1** | **A2** | **A3** | **A4** | **A5** | **B1** | **B2** | **B3** | **B4** | **C1** | **C2** | **C3** | **D1** | **D2** | **D3** |
| **Part1: Heterocyclic Compounds I (An hour / week for one Semester)** | | | | | | | | | | | | | | | |
| **ORGANOPHOSPHRUS COMPOUNDS**<br>A-Use of organophosphrous compounds as Insecticides, herbicides and fungicides. 1 Lawesson's Reagent **(** 2, 4-bis ( 4- methoxyphenyl) 1,3,2,4-Dithiadiphospha-2,4-disulphide **)**<br>B- Synthesis of Lawesson's Reagent<br>C- Reaction of Lawesson's Reagent:<br>i- Reaction with nucleophiles<br>ii- Water<br>I iii- 1º and 2º alcohols<br>iv- 1º and 2º amines<br>v- Carboxylic acid (mono and di- )<br>vi- Grinard Reagent | | | ✓ | | | | | | | | | | ✓ | ✓ | ✓ |
| **Antiviral Agents**<br>i- Nucleosides, nucleotides and nucleic acids<br>(Purine - pyrimidine as bases ) and (ribose - Deoxy ribose as sugars )<br>ii- (adenosine - 5' – phosphate ), RNA<br>(ribonucleic acid ), DNA ( deoxy ribonucleic acids )<br>Different methods for synthesis and reactions with different reafents.<br>iii- synthesis of AZT ( 2' , 3' –dideoxy , 3' –azido –B –derythopenta furanose ) thymine<br>iv- Synthesis of 2' , 3' –didoxy-3'-mercapto nucleoside. | ✓ | | | | | | | | | | | | | ✓ | ✓ |

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| **CHEMOTHERAPY**<br>1- Anti pyretics and their analgesis ( e.g. : Pyrazolones and their derivatives – salicylic acids; e.g. : antipyrine ( 2,3-dimethyl-2 phenylpyrazole-5-one)<br>2- ANTISTERILIZER AGENTS<br>b- Indole derivatives b- Vilismier reaction<br>4- ANTITUMERAGENTS ( e.g.-4-phenyl -2 amino thiazole )<br>5- ANTICOAGUELANT AGENTS<br>Thrombosis (benzopyran ) –Vasodialators (benzofuran)<br>6- ANTICOVULASNT AGENTS<br>Pyrrolidine derivatives – oxazolidine derivatves (e.g.: 2- nitrofurfural), reactions with (hydroxyl amine – epichlorohydrin – aminothiourea) | | | ✓ | | | | | | | | | | | ✓ | ✓ |
| **1,3,4- OXADIAOLES and (1,3,4- Thiadiazole) derivatives**<br>Synthesis and reactions with different nuclophiles and electrophiles | | | ✓ | | | | | | | | | | ✓ | ✓ | |
| **1,2,4- TRIAZOLES**<br>Synthesis and reactions with different nuclophiles and electrophiles | | | ✓ | | | | | | | | | | ✓ | | ✓ |
| **HYDANTOINS**<br>i- Synthesis and reactions with different nuclophiles and electrophiles, Reactions of hydantoins (protonation, alkylation, N- acylation, condensation with aldehydes and krtones, reaction with nucleophiles, ammonlysis, diazoniumsalts, reducing agents and diazoalkanes).<br>ii- 2- and 4- Thiohydantions<br>iii- 2- and 4- Dithiohydantions<br>2- Preparations: (thiourea and unsaturated acids, amino acids, from thiourea and bromoacetyl bromide) and others.<br>Reactions: (with dihalides, ammonolysis, desulfurisation) and others. | | ✓ | | | | | | | | | | | | ✓ | ✓ |
| **Part 2: Oxidation of Organic Compounds (An hour / week for one Semester)** | | | | | | | | | | | | | | | |
| (Oxidations of Alcohols to Aldehdes, Ketones or Carboxylic Acids) | ✓ | | | | | ✓ | | ✓ | | | | | ✓ | ✓ | |
| Addition of Oxygen at Carbon-Carbone Double bonds. | ✓ | | | | | ✓ | | ✓ | | | | | | ✓ | ✓ |
| Cleavage of Carbon –Carbon Double bonds. | ✓ | | | | | ✓ | | ✓ | | | | | | | |
| Selective Oxidative Cleavage at Other Functional Groups. | ✓ | | | | | ✓ | | ✓ | | | | | | ✓ | ✓ |
| Oxidations of Ketones and Aldehydes. | | ✓ | | | | ✓ | | | | | | | ✓ | | |
| Allylic Oxidation of Olefins | ✓ | | | | | | | ✓ | | | | | | | |
| Oxidations at Unfunctionalized Carbon Atoms: | ✓ | | | | | ✓ | | | ✓ | | | | ✓ | | ✓ |
| Carbenes structure, synthesis and reactions | | ✓ | | | | | ✓ | | | | | | | | ✓ |
| Nitrenes , Rearrangements of Electron-Deficient Intermediates , Fragmentations and Some Synthetically Ueseful Carbonium ion Reactions. | | ✓ | | | | | ✓ | | ✓ | | | | | ✓ | |

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| **Part3: Heterocyclic Compounds II (An hour/week for one Semester)** | | | | | | | | | | | | | | | |
| Synthesis and reaction of 2-and 4-pyrones | ✓ | | | | | ✓ | | | | | | | ✓ | | |
| Synthesis of pyrylium salts and reactions | | | | | | | | ✓ | | | | | | ✓ | |
| Benzopyrylium and benzopyrans | | | | | | | | | | | | | | | |
| Diazines synthesis and reactions | | | | | | | | ✓ | | | | | ✓ | | |
| Pyrazolones and its derivatives synthesis and reactions | | | | | | | | | | | | | | | |
| Quinazolinones | | | | | | | | ✓ | | | | | | | ✓ |
| **Part 4 : Dyes (An hour/week for one Semester)** | | | | | | | | | | | | | | | |
| **Technical azo dyes for cellulosic fibers:** A- The chemistry of cellulosic fibers.<br>B- Direct dyes, Developed dyes, other after treated dyes, pre-metallised dyes and dyes with mixed chromophores.<br>C- Azoic dyes, stabilized diazo compound, commercial ranges of azoic compound, Rapid fast colors, Rapidogen colours and neutral developing printing mixtures.<br>D- Sulphur dyes. | | | | | ✓ | | | | | | | | ✓ | ✓ | |
| **Technical azo dyes for protein fibers:** A- Chemistry of wool and silk.<br>B- Dyes for wool (Levelling and milling acid dyes)<br>C- Metallised acid dyes (Chrome acid dyes) Dyes for silk. | | | | | ✓ | | | | | | | | | ✓ | |
| **Technical azo dyes for synthetic fibers:**<br>B. Chemistry of Man-made fibres.<br>B. B- Disperse azo dyes and AQ dyes.<br>C. Reactive disperse azo dyes. | | | | | ✓ | | | | | | | | ✓ | | |
| **Reactive dyes:**<br>C. Dyes for cellulosic fibers, reactive systems based on nucleophilic substitution, reactive systems based on nucleophilic addition and reactive systems based on the use of cross-linking agents.<br>D. Application of reactive dyes to cellulosic fibers<br>C- Reactive dyes for wool and for synthetic polyamides. | | | | | ✓ | | | | | | | | ✓ | ✓ | |
| **Vat dyes:**<br>A. Indigo and thioindigo dyes<br>B. Anthraquinone dyes Carbocyclic dyes, five- and six-membered heterocyclic dyes and solubilised anthraquinone dyes.<br>C. Other vat dyes. | | | | | ✓ | | | | | | | | | ✓ | |
| **Phthalocyanine pigments and dyes:**<br>C. Manufacture of Phthalocyanine pigments.<br>D. Metal-free Phthalocyanine, Phthalocyanine complex from metals other than copper. | | | | | ✓ | | | | | | | | ✓ | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C- Locyanine dyes for textile materials. | | | | | | | | | | | | | | | |
| **Retention of dyes in the fiber:**<br>D. Dyes attached by processes leading to pigmentation of the fiber.<br>E. Dyes attached wholly or partly by chemical union with the fiber.<br>F. Cellulose-substantive dyes.<br>D- Disperse dyes. | | | | | ✓ | | | | | | | | | | ✓ |
| **Fluorescent brighteners:**<br>A- Stibene derivatives.<br>B- Other chemical classes, heterocyclic vinylene derivatives, Diaryl C-pyrazolines, naphthalic imides, pyrene derivatives, cyclic sulphones, Miscellaneous chemical classes. | | | | | ✓ | | | | | | | | ✓ | | ✓ |

## Learning and Teaching Methods

| Learning Method | Course outcomes ILOs | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | | Intellectual Skills | | | | | Professional and Practical Skills | | | | | General and Transferable Skills | | | | |
| | A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | C1 | C2 | C3 | C4 | C5 | D1 | D2 | D3 | D4 | D5 |
| **Lecture** | √ | √ | | | | | √ | | | | | | | | | √ | √ | | | |
| **Discussion (Brain Storming)** | | | | | | | √ | | | | | | | | | √ | √ | | | |
| **Self-learning (Essay)** | √ | | | | | √ | | | | | | | | | | | | | | |
| **Field Trips** | | | | | | | | | | | | | | | | | | | | |
| **Practical** | | | | | | | | | | | | | | | | | | | | |

## Assessment Methods

| Assessment Methods | Course outcomes ILOs | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | | Intellectual Skills | | | | | Professional and Practical Skills | | | | | General and Transferable Skills | | | | |
| | A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | C1 | C2 | C3 | C4 | C5 | D1 | D2 | D3 | D4 | D5 |
| **Essay Question** | √ | √ | | | | | √ | | | | | | | | | √ | √ | | | |
| **MCQ** | √ | | | | | | | | | | | | | | | √ | | | | |
| **Student Activity** | | | | | | √ | √ | | | | | | | | | | | | | |
| **Practical** | | | | | | | | | | | | | | | | | | | | |

| | Course Coordinator | Head of Department |
|---|---|---|
| Name (Arabic) | أ. د / أحمد البربرى | أ. د / الرفاعى قناوي |
| Name | Prof. Ahmed A. El-Barbary | Prof. El-Refaie Kenawy |
| Signature | | |
| | 9/2014 | 9/2014 |

| | | |
|---|---|---|
| Course Title | **Physical Organic Chemistry (Polymer Chemistry, Organic Spectroscopy, Physical Organic and Stereochemistry)** | |
| Course Code | **1322** | |
| Academic Year | **2014/2015** | |
| Coordinator | **Prof. Mohamed EL-Borai** | |
| Other Staff | **Prof. Adel Selim , Prof. Mahmoud Taha, prof. El Refaie Kenawy** | |
| Semesters | **Two Semesters** | |
| Pre-Requisite | **B.Sc. in Chemistry** | |
| Course Delivery | **Lecture** | **2h/week** |
| Parent Department | **Chemistry** | |
| Date of Approval | **September, 2014** | |

## 1. Aims

The aims of this course are to:

- Identify the principles of composite materials types and classification.
- Demonstrate the basic principle of C.W. (continuous wave) NMR, pulse NMR technique
- Discuss in details the theory and applications of acids and bases in controlling organic reactions, and the principles and applications of phase-transfer and micellar catalysis.
- Explain the basics and theoretical principles of stereochemistry,
- 2. Intended Learning outcomes

### *A. Knowledge and understanding:*

By the end of this course the students should be able to:

A1. Recognize the basics of composite materials and the importance and formulations of rubber industry.

A2. Define the homo- and Hetero-nuclear-J-spectrum with law and high $\nu$ resolution and importance of spin echo-J-spectroscopy.

A3. Discuss the theories of acids and bases and applications in organic reactions and Explain the principles and applications of phase transfer and micellar catalysis, and the basics of stereochemistry.

A4. Recognize the structure and properties of different optically active isomers as well as the importance and applications of different optically pure isomers. Explain the kinetic behavior of the formation of different types of copolymers.

A5. Explain the origin of nuclear over Houser effect, magnetic dipoles and dipole couple and interrelate of $^{13}C$ NMR spectra with protons, and postulate the mechanism of fragment formation and interpret of molecular ion region and isotopic contributions

### *B. Intellectual skills:*

By the end of this course the students should be able to:

B1. Design the structure of formulations for use in rubber industry, and recognize the relationship between the composite composition and the properties.

B2. Employ the theories of acids and bases in interpret catalysis of organic reactions, and draw the optically pure compounds by all methods and detect the absolute configuration of optically pure organic compounds.

B3. Analyze the HPLC-data to separate racemic mixtures either through diastereomers formation or using chiral columns, and evaluate the chemistry of different reagents using for asymmetric synthesis.

### *C. Professional and practical skills:*

By the end of this course the students should be able to:

C1. Conduct different applications of lasers in photochemical synthesis and the various aspects in which lasers differ from traditional light sources.

C2. Electro-synthesis of some organic compounds, perform industrial electrolysis processes: electroplating, anodization and electrometallurgy

C3. Conduct laboratory procedures to analyze materials using infrared analysis methods and Interpret data derived from laboratory observations and measurements concerning infrared measurements.

C10. Apply spectroscopy techniques in quality control and scientific research, Synthesis fibers and many plastics based on ion-exchange processes.

### *D. General and transferable skills:*

By the end of this course the students should be able to:

D1. Communicate effectively in written and oral manners.

D2. Use information technology and resources to collect and represent scientific data in different branches of chemistry.

D3. Work effectively as a member of team and manage time.

D14. Solve problems in industry and scientific research areas related to chemistry.

## 3. Contents

| | |
|---|---|
| **Part-1** | **Polymers Chemistry** (An hour/week) for one Semester |
| Lecture 1 | Definitions: a) Dispersed Phase Characteristics, b) Matrix Phase Characteristics. |
| Lecture 2 | Composites Classification: a) Organic-Inorganic Composites, b) Organic-Metal Composites, c) Inorganic-Metal Composites. |
| Lectures 3,4 | Organic-Inorganic Composites Types: a) Particle Reinforced Composites: Small, Large, b) Fiber Reinforced Composites: Continuous, Discontinuous, c) Structural Reinforced Composites: Laminar, Sandwich. |
| Lecture 5 | Rubber Industry: a) Compounding. |
| Lectures 6,7 | b) Elastomers: Natural Rubber, Styrene-Butadiene Rubber, Polybutadiene Rubber, Ethylene-Propylene Rubber, Chloroprene Rubber, Acrylonitrile-Butadiene Rubber, Isoprene-Isobutylene Rubber, Polyisoprene Rubber. |
| Lectures 8,9 | c) Additives: Curatives, Fillers and Reinforcing Agents, Softeners, Antidegradants, Tackifiers, Flame Retardants, Colorants, Blowing Agents. |
| Lectures 10,11 | Copolymerization: Kinetic Behavior: Random, Alternating, Block, Ideal Copolymers. |
| Lectures 12-14 | Blend copolymers. |
| **Part-2** | **Organic Spectroscopy** (An hour/week)for one Semester |
| Lecture 1 | Basic principle of C.W. NMR, simulating the sample, time frequency, practical implementations |
| Lecture 2 | Basic experimental methods, introduction, sample preparation choice of solvent, sample volume sample handling, nuclei other than proton $N^{15}$, $F^{19}$, $O^{17}$, $C^{13}$, $S^{33}$…etc |
| Lecture 3 | Basic principle description plus NMR technique, different of relaxation times. The NOE and internuclear distance. |
| Lecture 4 | Polarization transfer and spectrum INEPT intensity nuclear enhancement polarization technique DEPT (distortionless, enhancement polarization transfer) |
| Lecture 5 | Interpretation of $^{13}C$ NMR chemical shift related to peak assignment |
| Lecture 6 | New dimension in NMR $^{1}H$-$^{1}H$ connectivity coupling cosy experiment $^{1}H$-$^{13}C$ connectivity coupling APT $^{13}C$-$^{13}C$ connectivity coupling NOESY experiment |
| Lecture 7 | Spin echoes and J-spectroscopy, homonuclear J-spectrum and heteronuclear J-spectrum |
| Lecture 8 | Mass spectrometry instrumentation, determination of molecular ion region e.g. recognition of molecular ion peak, pathway fragmentation (daughter ion, fragmentation, rearrangement process. |

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| Lectures 9,10 | Isotopic labeling and their contribution in molecular ion peak and daughter ions meta stable peaks and their role. |
| Lectures 11,12 | High resolution mass spectrum types of mass spectra, including EI (electron impact) and chemical ionization (CI), mass spectra of some selected classes of chemical compounds modern techniques in mass spectrometry e.g. plasma desorption, accurate mass spectrometry |
| Lectures 13,14 | Problem; comprise of different examples e.g. UV-IR, $^{1}H$ NMR set, UV-IR, $^{1}H$ NMR and mass spectra, UV-IR, $^{1}H$ NMR, $^{13}C$ NMR and mass spectra problem with different difficulty levels including NMR range from 100-400 MHz and number of 2-D spectra. |
| **Part-3** | **Physical organic**(An hour/week) for one Semester |
| Lecture 1 | Bronsted Acids and Bases: Definitions; Strength of weak Bronsted Bases; Leveling Effect. |
| Lectures 2,3 | Acidity Functions: Hammett acidity function; other acidity scales; Bunnett and Olsen acidity function; Cox-Yates acidity function. |
| Lecture 4 | Strength of weak Bronsted acids: Thermodynamic acidity; Kinetic acidity. |
| Lecture 5 | Solution and gas-phase acidity; Acidity of carbon acids. |
| Lecture 6 | Application of acidity functions in mechanism studies. |
| Lecture 7 | Lewis Acids and Bases: Strength of Lewis Acids and Bases; Hard and Soft Acids and Bases (Pearson's Principle HSAB). |
| Lectures 8,9 | Catalysis: Acid-Base Catalysis; Specific and general Acid-Base Catalysis; Bronsted catalysis law and its applications. |
| Lectures 10,11 | Micellar Catalysis: Catalysis by non-covalent binding; Principles of micellar catalysis in aqueous solutions. Kinetic treatments of reactivities in micellar system (kinetic models for unimolecular and bimolecular reactions.) |
| Lectures 12,13 | Principles of Phase-Transfer Catalysis (PTC) Liquid/Liquid, Solid/Liquid and Triphase-Transfer Catalysis. |
| Lecture 14 | Tutorial (Applications and Questions on the whole course). |
| **Part-4** | **Stereochemistry** (An hour/week)for one Semester |
| Lectures 1,2 | Introduction (definitions, basics of stereochemistry) |
| Lectures 3,4 | Instrumentations of HPLC and the factors affecting its sensitivity. |
| Lecture 5 | Study the chemistry of racemic modification (preparation, properties and resolution). |
| Lecture 6 | Study the use of chiral stationary phase (CSP) and the three centers theory for chiral separation. |
| Lectures 7,8 | Study the chemistry of Mayer's asymmetric reagent for the synthesis of α-alkylated organic compounds. |
| Lecture 9 | Study the chemistry of Mayer's asymmetric reagent for the synthesis of β-alkylated organic compounds. |
| Lecture 10 | Study the chemistry of the asymmetric reagents which synthesized from optically pure camphor and its application for asymmetric synthesis of optically pure compounds. |
| Lectures 11,12 | Applications of the above asymmetric reagents for synthesis of some optically pure, biologically active compounds. |
| Lectures 13,14 | Study the chemistry of some stereoselective reducing reagent and its application for the synthesis of optically pure compounds. |
| Week 15 | **Assessment** |

## 4. Teaching and Learning Methods

4.1. Theoretical lectures.

4.20. Library and net search for Assignments.

4.21. Seminars.

## 5. Student Assessment

| Assessment Method | Skills assessed* | Assessment Length | Weight |
|---|---|---|---|
| Written Examination | KU, I | 3 Hour Examination | 100% |

*KU: Knowledge and Understanding, I: Intellectual, P: Professional.

## 6. List of references

*Essential Books:*


6- W. D. Callister, "**Materials Science and Engineering, An Introduction**". 3rd Edn John Wiley & Sons, Inc, New York, Chapter17, page 513-545, 1994.

7- J. S. Dick, "Compounding Materials for the Polymer Industries". Noyes Publications, New Jersey, Chapter 2, page 110-164, 1987.

8- Organic spectroscopy, An introduction, S.F. Dyke, A.J. Floyed, M. Sainsbury and R.S. Theobend, Penguis Press Books limited copy right (**1982**).

9- Spectroscopic Identification of Organic Compound Fourth edition, Robert M. Silverstein, clayton G. Bassler and Terence C. Morrill John Willey and Sons Inc. (**1988**).


*Recommended Books:*


10- Thomas H. Lowry and Kathleen S. Richardson "Mechanism and Theory in Organic Chemistry", Harper Collins Publishers, Third Edition. 1987.

11- Bernard Miller "Advanced Organic Chemistry, Reactions and Mechanisms", Pearson Education International, Second Edition, 2004.

12- T. W. G. Solomons and C. B. Fryhle; "Organic Chemistry", 8th Ed., John Wiley & Sons, 2004.

13- E. L. Eliel;"Stereochemistry of Carbon Compounds", Tata McGraw-Hill Publishing Comp.LTD, New Delhi, 1984.


## 7. Facilities required for teaching and learning

Teaching rooms equipped with white and blackboards, and data show.

## Learning and Teaching Methods

| Learning Methods | Course outcomes ILOs | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | | Intellectual Skills | | | | | Professional and Practical Skills | | | | | General and Transferable Skills | | | | |
| | A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | C1 | C2 | C3 | C4 | C5 | D1 | D2 | D3 | D4 | D5 |
| Lecture | √ | √ | | | | | √ | | | | | | | | | √ | √ | | | |
| Discussion (Brain Storming) | | | | | | | √ | | | | | | | | | √ | √ | | | |
| Self-learning (Essay) | √ | | | | | √ | | | | | | | | | | | | | | |
| Field Trips | | | | | | | | | | | | | | | | | | | | |
| Practical | | | | | | | | | | | | | | | | | | | | |

## Assessment Methods

| Assessment Methods | Course outcomes ILOs | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | | Intellectual Skills | | | | | Professional and Practical Skills | | | | | General and Transferable Skills | | | | |
| | A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | C1 | C2 | C3 | C4 | C5 | D1 | D2 | D3 | D4 | D5 |
| Essay Question | √ | √ | | | | | √ | | | | | | | | | √ | √ | | | |
| MCQ | √ | | | | | | | | | | | | | | | √ | | | | |
| Student Activity | | | | | | √ | √ | | | | | | | | | | | | | |
| Practical | | | | | | | | | | | | | | | | | | | | |

| | Course Coordinator | Head of Department |
|---|---|---|
| Name (Arabic) | أ. د / محمد عبدالعزيز البرعى | أ. د / الرفاعى قناوي |
| Name | Prof. Mohamed EL-Borai | Prof. El-Refaie Kenawy |
| Signature | | |
| | 9/2014 | 9/2014 |

| | | |
|---|---|---|
| Course Title | **Physical Chemistry (Kinetics of Ion Exchange, Electrochemistry, Laser in Chemistry and Applied Spectroscopy)** | |
| Course Code | **1323** | |
| Academic Year | **2014/2015** | |
| Coordinator | **Prof. Mohamad M. Ghoniem** | |
| Other Staff | **Prof. El-Zeiny M. Ebeid, Prof.Tarek A.Fayed and Prof. Ahmed B. Zaki** | |
| Semesters | **Two Semesters** | |
| Pre-Requisite | **B.Sc. in Chemistry** | |
| Course Delivery | **Lecture** | **2h/week** |
| Parent Department | **Chemistry** | |
| Date of Approval | **September, 2014** | |

## 1. Aims

The aims of this course are to:

- Deal with advanced techniques based on lasers with case studies in chemistry, biology and medical diagnosis. The course also highlights the unique applications of lasers in photochemical synthesis and the various aspects in which lasers differ from traditional light sources.
- Provide students with the basics and theoretical principles of near infrared spectroscopy. Students should know the differences this technique and that of medium infrared. The basic theories of infrared attenuated total reflection and optical fibers are also addressed. The application medium infrared, near infrared and optical fibers in biology, medicine, food, polymer industries, environmental science, Forensics and pharmaceutical are provided.
- Study the current-potential relationship for a slow or irreversible system and the electrode kinetics and dependence of current density on overvoltage (The Tafel equation) and explain each of activation overvoltage, resistance overvoltage, concentration overvoltage. Also it explains the hydrogen and oxygen overvoltage, the different theories of hydrogen overvoltage, the polarographic and voltammetric electrode processes, the electro-synthesis of some organic compounds, and the different applications in industrial electrolysis processes: electroplating, anodization and electrometallurgy
- Discuss the chemical theory of ion exchange, the ion- exchange techniques as well as kinetics and mechanisms of ion-exchange processes. Since its introduction early in the century, to industry, synthetic fibers as well as many plastics could not be produced free from defects without ion exchange treatment of their processing water. These are few of the many industrial applications of demineralization.

## 2. Intended Learning outcomes

### *A. Knowledge and Understanding:*

By the end of this course the students should be able to demonstrate knowledge and understanding of:

A1. Advanced techniques based on lasers with case studies in chemistry, biology and medical diagnosis.

A2. The current-potential relationship for slow and irreversible systems and the kinetics of electrode processes.

A3. The basics of near infrared and optical fibers techniques and theories behind each.

A4. The chemical theory of ion exchange and ion- exchange techniques as well as kinetics and mechanisms of ion-exchange processes.

A5. The importance and applications of such techniques in different areas.

***B. Intellectual skills:***

By the end of this course the students should be able to:

B1. Examine cases in chemistry, biology and medical diagnosis using advanced techniques based on lasers.

B2. Explain the theoretical bases related to infrared analysis techniques.

B3. Recognize the main differences between different infrared, medium and far infrared analysis techniques.

B4. Explain the theory of polarographic and voltammetric techniques.

B13. Evaluate and analyze data collected from the spectra and interrelate such data to the properties and structure of the investigated substances.

B14. Solve problems in industry and scientific research using such techniques.

***C. Professional and practical skills:***

By the end of this course the students should be able to:

C1. Interpret data derived from laboratory observations and measurements concerning infrared measurements.

C2. Apply spectroscopy techniques in quality control and scientific research.

***D. General and transferable skills:***

By the end of this course the students should be able to:

D1. Communicate effectively in written and oral manners.

D2. Use information technology and resources to collect and represent scientific data in different branches of chemistry.

D3. Work effectively as a member of team and manage time.

D4. Solve problems in industry and scientific research areas related to chemistry.

**3. Contents**

| | |
|---|---|
| **Part-1** | **Laser in Chemistry** (An hour/week) for one Semester |
| Lecture 1 | Electronic states (Multiplicity of states, Fluorescence and phosphorescence, Electronic states in molecular oxygen Singlet oxygen application in photodynamic therapy (PDT), Electronic states in solids. The exciton concept and Colour centers) |
| Lectures 2, 3 | Modes of deactivation of electronically-excited states (Internal and external photophysical deactivation pathways) Lifetime of electronically-excited states and Measurement of excited-state lifetimes |
| Lecture 4 | Time-resolved spectroscopy (Picosecond and Femtosecond Flash Photolysis, Femtosecond photochemical processes and Femtosecond primary dynamics of some anticancer drugs)) |
| Lecture 5 | Applications based on internal conversion and vibrational cascades (Salmonella detection by MUCAP reagent, Laser application in fingerprint detection, Thermal lensing technique, Laser welding of detached eye retina, DNA quantification using fluorescent stains and SYBR Green I (SG) and Pico green) |
| Lecture 6 | Applications based on molecular fluorescence (Excitation spectroscopy, Shpol'skii spectrum, Criminology and forensic science, Tire marks identification and Aflatoxin analysis) |
| Lecture 7 | Applications based on time-resolved spectroscopy (Diagnosis of tumors using nicotinamide adenosine dinucleotide NADH), Cell uptake of benz[a]pyrine carcinogen, Phenanthrene content in coal tar, Laser thermometry, Fluorescence lifetime imaging (FLIM) and FLIM in ion imaging) |

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| Lecture 8 | Fluorescence probes in biological systems (Fluoroimmunoassay (FIA) Fluorescent probes for labeling proteins, Determination of a female sex hormone by (FIA), Fluorescence-activated cell sorting (FACS) Intracellular Ca2+ indicator, Measurement of intravascular pH using distribution-probe method, Fluorescence in situ hybridization (FISH) |
| Lectures 9,10 | Nanomaterials and their applications (theoretical models, Semiconductor features, Intermittency, Model for blinking, Metallic features, Nanoparticles and nanorods - Applications on nanomaterials: Semiconductor nanocrystals as fluorescent probes in biological labeling, Drug delivery systems based on nanocrystals, Nanomaterials in DNA sequence, Magnetic nanoparticles , Contrast agents for MRI, Paramagnetic contrast agents. Immunoagglutination, Ultra sensitive bioassay using nanoparticles, Biomarkers. Biosensors, Gold nanoparticles in staining, Quantum well and quantum dot lasers |
| Lectures 11,12 | Applications based on energy transfer **(** Fluorosensors based on fluorescence quenching, Fluorescence quenching caused by humic acids, Energy transfer dye lasers (ETDL), Energy transfer in photochemical reactions, Probing the structure of a four-way DNA junction, Fluorescence resonance energy transfer (FRET) in enzyme kinetics, Drug –protein interaction, Gene expression measurement, Concentration depolarization**)** |
| Lectures 13-14 | Applications based on laser monochromaticity, coherence and mode **(**Raman Spectroscopy**:** Coherent anti-Stokes Raman spectroscopy (CARS), Some applications of Raman spectroscopy,<br>Group frequencies, Raman melting curves in biological systems, Raman spectroscopy in the study of membranes, Raman spectroscopy in oxygen carrier proteins, Raman LIDAR system, Surface-enhanced Raman scattering (SERS) |
| **Part-**2 | **Electrochemistry** (An hour/week) for one Semester |
| Lecture 1 | Electrode processes: Non-equilibrium electrode potentials, Ideal-current relationship, Current-potential relationship for a slow or irreversible system. |
| Lecture 2 | Electrode kinetics - Dependence of current density on overvoltage (The Tafel equation) |
| Lecture 3 | Electrolysis and overvoltage - Activation overvoltage – Resistance overvoltage - Concentration overvoltage - Overvoltage phenomena and their distinguishing features |
| Lecture 4 | Hydrogen and oxygen overvoltage - Decomposition potentials and overvoltage - Individual electrode overvoltage |
| Lecture 5 | Theories of hydrogen overvoltage - The Catalytic theory - The slow discharge theory - The electrochemical theory |
| Lecture 6 | The Exploitation of Electrode processes - Polarography and voltammetry - Types of working electrodes - Characteristics of diffusion-controlled polarographic waves. |
| Lecture 7 | Other types of polarographic waves - Pulse and differential pulse voltammetry |
| Lecture 8 | Cyclic voltammetry - Stripping voltammetry and some of its applications. |
| Lecture 9 | Electro-generated fenton reagent and its application for removal of pollutant from industrial waste water. |
| Lecture 10 | Electro-synthesis - Reductive elimination reactions Electro-synthesis - Reductive elimination reactions |
| Lecture 11 | Kolbe Hydrocarbon synthesis |
| Lecture 12 | Industrial electrolysis processes - Electroplating |
| Lecture 13 | Anodization |
| Lecture 14 | Electrometallurgy |
| **Part-**3 | **Ion exchange** (An hour/week) for one Semester |
| Lecture 1 | Introduction - Types of resins and their structures - Capacity of ion exchangers. |
| Lecture 2 | Ion-exchange techniques: Batch, fixed- bed, fluidized |

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| | bed and continuous bed techniques. |
| Lectures 3,4 | Ion exchange in columns (fixed bed) : breakthrough curves-determination of bed capacity from breakthrough curves – calculation of zone height – factors affecting the ion – exchange zone. |
| Lectures 5,6 | Sorption of solutes: sorption isotherms and distribution coefficients. |
| Lectures 7,8 | Sorption of strong electrolytes: Donnan potential and its thermodynamic treatment. |
| Lectures 9,10 | Ion-exchange equilibria: Ion-exchange isotherm and separation factor – selectivity and selectivity coefficients. |
| Lectures 11,12 | Kinetics of ion exchange: mechanisms of ion exchange- The rate determining step in the ion exchange process. |
| Lectures 13,14 | Applications using ion-exchange resins: water treatment – ion exchangers as catalysts. |
| **Part-**4 | **Applied spectroscopy** (An hour/week) for one Semester |
| Lecture 1 | Medium and near infrared spectroscopy (Theory, origin of infrared spectrum, the harmonic oscillation, the inharmonic oscillation, summary of absorption of bonds in organic molecules, organic compounds identification using infrared spectroscopy |
| Lectures 2, 3 | Infrared spectroscopy in clinical and diagnostic analysis, Introduction, infrared spectroscopy of biological fluids, calibration methods and serum analysis. |
| Lecture 4 | Analysis of dairy products<br>Preparation and structural characterization of O-Acetyl agarose with low degree of substitution*Pharmaceutical Application*, characterization of normal and malignant human colonic tissues. |
| Lecture 5 | Evaluation of glycogen levels in human carcinoma tissues.<br>Detection and identification of bacteria in a juice and fatty acids and analysis of Iberian pig fat. |
| Lecture 6 | The near-infrared spectra of solid sucrose, lactose and xylitol in the first C-H overtone region, analysis of polymer laminates<br>characterization of nylon polymer and infrared analysis for gaseous emissions |
| Lecture 7 | The analysis of natural oils, determination of moisture content in freeze-dried materials, application to aluminum forgings and polymorph analysis |
| Lectures 8, 9 | Application in cosmetic products for skin and hair, analysis of suspect explosive component, analysis of petroleum hydrocarbons, Oil, and Grease content and solid state characterization and Infrared therapy |
| Lectures 10, 11 | Attenuated total reflectance infrared (ATR-IR) spectroscopy<br>Theory of ATR-IR spectroscopy - Applications<br>1. Determination of protein concentration in raw milk.<br>2. Analysis of automotive fluids.<br>3. Determination the contamination in paper production.<br>4. Solid and liquid state characterization. |
| Lectures 12, 13 | Fiber optics in molecular spectroscopy, Introduction, |

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| | Description of optical fibers, internal reflection consideration core-cladding, evanescent wave, fiber throughput, selecting fibers, sampling configuration |
| Lecture 14 | Applications of fiber optics in medicine, drug Analysis, water analysis in the near-IR, gas analysis in the near-IR and lamination monitoring in the Medium-IR. |
| Weeks 15 | **Assessment** |

**4. Teaching and Learning Methods**

4.1. Theoretical lectures.

4.22. Library and net search for Assignments.

4.23. Seminars.

**5. Student Assessment**

| Assessment Method | Skills assessed* | Assessment Length | Weight |
|---|---|---|---|
| Written Examination | KU, I | 3 Hour Examination | 100% |

*KU: Knowledge and Understanding, I: Intellectual, P: Professional.

**6. List of references**


*Essential Books:*

11. E. M. Ebeid and S. M. AlHazmy " Photophysical and Laser-Based Techniques in Chemistry, Biology and Medicine"BookSurge,LLC(2006).
12. F. G .Helfferich, Ion exchange, McGraw- Hill Book Co., Inc. New York, 1962.
13. L. Liberti and F. G. Helfferich, Mass transfer and kinetics of ion exchange, Martinus Nijhoff Publishers Boston, NATO ASI series, 1983.
14. Allen J. Bard and Larry R. Faulkner "Electrochemical Methods. Fundamentals and Applications", John Wiley & Sons, New York 1980.

*Recommended Books:*

15. Instrumental Methods in Electrochemistry" ,John Wiley & Sons, New York 1985.
16. Philip H. Rieger “Electrochemistry", Prentice- Hall International , Inc., New Jersey 1987.
17. D.R. Crow " Principles and Application of Electrochemistry", Chapman & Hall, 1988
18. Pharmaceutical and Medical Applications of Near-lnfrared Spectroscopy Emil W. Ciurczak and James K. Drennen Ill, 2002 by Marcel Dekker, Inc.
19. You should regularly visit the web site as it has several important resources, including spread sheet examples, tutorials, simulations and animations


**7. Facilities required for teaching and learning**

Teaching rooms equipped with white and blackboards, and data show.

| **Course contents** | Course intended learning ILOS | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and understanding | | | | | Intellectual | | | | | | **Practical** | | Transferable | | | |
| | **A1** | **A2** | **A3** | **A4** | **A5** | **B1** | **B2** | **B3** | **B4** | **B5** | **B6** | **C1** | **C2** | **D1** | **D2** | **D3** | **D4** |
| **Part1 :- Laser in Chemistry (An hour/week for one Semester)** | | | | | | | | | | | | | | | | | |
| Electronic states (Multiplicity of states, Fluorescence and phosphorescence, Electronic states in molecular oxygen Singlet oxygen application in photodynamic therapy (PDT), Electronic states in solids. The exciton concept and Colour centers) | ✓ | | | | | ✓ | | | | | | ✓ | | ✓ | | | |
| Modes of deactivation of electronically-excited states (Internal and external photophysical deactivation pathways) Lifetime of electronically-excited states and Measurement of excited-state lifetimes | ✓ | | | | | ✓ | | | | | | | | ✓ | | ✓ | |
| Time-resolved spectroscopy (Picosecond and Femtosecond Flash Photolysis, Femtosecond photochemical processes and Femtosecond primary dynamics of some anticancer drugs)) | ✓ | | | | | ✓ | | | | | | | ✓ | | ✓ | ✓ | ✓ |
| Applications based on internal conversion and vibrational cascades (Salmonella detection by MUCAP reagent, Laser application in fingerprint detection, Thermal lensing technique, Laser welding of detached eye retina, DNA quantification using fluorescent stains and SYBR Green I (SG) and Pico green) | ✓ | | | | ✓ | ✓ | | | | | | | | ✓ | | | |
| Applications based on molecular fluorescence (Excitation spectroscopy, Shpol'skii spectrum, Criminology and forensic science, Tire marks identification and Aflatoxin analysis) | ✓ | | | | ✓ | ✓ | | | | | | | | | | ✓ | |
| Applications based on time-resolved spectroscopy (Diagnosis of tumors using nicotinamide adenosine dinucleotide NADH), Cell uptake of benz[a]pyrine carcinogen, Phenanthrene content in coal tar, Laser thermometry, Fluorescence lifetime imaging (FLIM) and FLIM in ion imaging) | ✓ | | | | ✓ | ✓ | | | | | | | ✓ | ✓ | | | |
| Fluorescence probes in biological systems (Fluoroimmunoassay (FIA) Fluorescent probes for labeling proteins, Determination of a | ✓ | | | | ✓ | ✓ | | | | | | ✓ | | | | ✓ | ✓ |

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| female sex hormone by (FIA), Fluorescence-activated cell sorting (FACS) Intracellular $Ca^{2+}$ indicator, Measurement of intravascular pH using distribution-probe method, Fluorescence in situ hybridization (FISH) | | | | | | | | | | | | | | | | | |
| Nanomaterials and their applications (theoretical models, Semiconductor features, Intermittency, Model for blinking, Metallic features, Nanoparticles and nanorods - Applications on nanomaterials: Semiconductor nanocrystals as fluorescent probes in biological labeling, Drug delivery systems based on nanocrystals, Nanomaterials in DNA sequence, Magnetic nanoparticles , Contrast agents for MRI, Paramagnetic contrast agents. Immunoagglutination, Ultra sensitive bioassay using nanoparticles, Biomarkers. Biosensors, Gold nanoparticles in staining, Quantum well and quantum dot lasers | ✓ | | | | ✓ | ✓ | | | | | | | ✓ | ✓ | ✓ | | |
| Applications based on energy transfer **(** Fluorosensors based on fluorescence quenching, Fluorescence quenching caused by humic acids, Energy transfer dye lasers (ETDL), Energy transfer in photochemical reactions, Probing the structure of a four-way DNA junction, Fluorescence resonance energy transfer (FRET) in enzyme kinetics, Drug –protein interaction, Gene expression measurement, Concentration depolarization**)** | ✓ | | | | ✓ | ✓ | | | | | | | | | | ✓ | ✓ |
| Applications based on laser monochromaticity, coherence and mode **(**Raman Spectroscopy**:** Coherent anti-Stokes Raman spectroscopy (CARS), Some applications of Raman spectroscopy, Group frequencies, Raman melting curves in biological systems, Raman spectroscopy in the study of membranes, Raman spectroscopy in oxygen carrier proteins, Raman LIDAR system, Surface-enhanced Raman scattering (SERS) | ✓ | | | | ✓ | ✓ | | | | | | | | ✓ | | ✓ | |
| **Part 2:-Electrochemistry (An hour/week for one Semester)** | | | | | | | | | | | | | | ✓ | | | |
| Electrode processes: Non-equilibrium electrode potentials, Ideal-current relationship, Current-potential relationship for a slow or | | ✓ | | | | | | | | | | | | | | ✓ | |

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| irreversible system. | | | | | | | | | | | | | | | | | |
| Electrode kinetics - Dependence of current density on overvoltage (The Tafel equation) | | ✓ | | | | | | | | | | | | | | | ✓ |
| Electrolysis and overvoltage - Activation overvoltage – Resistance overvoltage - Concentration overvoltage - Overvoltage phenomena and their distinguishing features | | ✓ | | | | | | | | | | | | ✓ | | ✓ | |
| Hydrogen and oxygen overvoltage - Decomposition potentials and overvoltage - Individual electrode overvoltage | | ✓ | | | | | | | | | | | | | ✓ | | ✓ |
| Theories of hydrogen overvoltage - The Catalytic theory - The slow discharge theory - The electrochemical theory | | ✓ | | | | | | | | | | | | ✓ | | | |
| The Exploitation of Electrode processes - Polarography and voltammetry - Types of working electrodes - Characteristics of diffusion-controlled polarographic waves. | | ✓ | | | | | | | | | | | | ✓ | | | ✓ |
| Other types of polarographic waves - Pulse and differential pulse voltammetry | | ✓ | | | ✓ | | | | ✓ | | | | | | | ✓ | |
| Cyclic voltammetry - Stripping voltammetry and some of its applications. | | ✓ | | | ✓ | | | | ✓ | | | | | ✓ | | | |
| Electro-generated fenton reagent and its application for removal of pollutant from industrial waste water. | | ✓ | | | ✓ | | | | ✓ | | | | | | ✓ | | ✓ |
| Electro-synthesis - Reductive elimination reactions Electro-synthesis - Reductive elimination reactions | | ✓ | | | | | | | ✓ | | | | | ✓ | | | |
| Kolbe Hydrocarbon synthesis | | ✓ | | | ✓ | | | | ✓ | | | | | | | ✓ | |
| Industrial electrolysis processes - Electroplating | | ✓ | | | | | | | ✓ | | | | | ✓ | | | |
| Anodization | | ✓ | | | | | | | ✓ | | | | | | | | ✓ |
| Electrometallurgy | | ✓ | | | ✓ | | | | | | | | | | ✓ | | |
| **Part 3 :-Ion exchange (An hour/week for one Semester)** | | | | | | | | | | | | | | | | | |
| Introduction - Types of resins and their structures - Capacity of ion exchangers. | | | | ✓ | | | | | | | | | | | | | ✓ |
| Ion-exchange techniques: Batch, fixed- bed, fluidized bed and continuous bed techniques. | | | | ✓ | | | | | | | | | | | ✓ | | ✓ |
| Ion exchange in columns (fixed bed): breakthrough curves- | | | | ✓ | | | | | | | | | | | | ✓ | |

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| determination of bed capacity from breakthrough curves – calculation of zone height – factors affecting the ion – exchange zone. | | | | | | | | | | | | | | | | | |
| Sorption of solutes: sorption isotherms and distribution coefficients. | | | | ✓ | | | | | | | | | | ✓ | | | |
| Sorption of strong electrolytes: Donnan potential and its thermodynamic treatment. | | | | ✓ | | | | | | | | | | | | ✓ | ✓ |
| Ion-exchange equilibria: Ion-exchange isotherm and separation factor – selectivity and selectivity coefficients. | | | | ✓ | | | | | | | | | | ✓ | | ✓ | |
| Kinetics of ion exchange: mechanisms of ion exchange-The rate determining step in the ion exchange process. | | | | ✓ | | | | | | | | | | | | | ✓ |
| Applications using ion-exchange resins: water treatment – ion exchangers as catalysts. | | | | ✓ | | | | | | | | | | ✓ | | | |
| **Part 4:- Applied spectroscopy (An hour/week for one Semester)** | | | | | | | | | | | | | | | | | |
| Medium and near infrared spectroscopy (Theory, origin of infrared spectrum, the harmonic oscillation, the inharmonic oscillation, summary of absorption of bonds in organic molecules, organic compounds identification using infrared spectroscopy | | | ✓ | | | | ✓ | | | | | | | ✓ | | ✓ | |
| Infrared spectroscopy in clinical and diagnostic analysis, Introduction, infrared spectroscopy of biological fluids, calibration methods and serum analysis. | | | ✓ | | | | ✓ | | | | | | | | ✓ | | |
| Analysis of dairy products<br>Preparation and structural characterization of O-Acetyl agarose with low degree of substitution*Pharmaceutical Application*, characterization of normal and malignant human colonic tissues. | | | ✓ | | | | ✓ | | | | | | | ✓ | | | ✓ |
| Evaluation of glycogen levels in human carcinoma tissues.<br>Detection and identification of bacteria in a juice and fatty acids and analysis of Iberian pig fat. | | | ✓ | | | | | | | | | | | ✓ | | ✓ | |
| The near-infrared spectra of solid sucrose, lactose and xylitol in the first C-H overtone region, analysis of polymer laminates characterization of nylon polymer and infrared analysis for gaseous emissions | | | ✓ | | | | | ✓ | | | | | | ✓ | | | ✓ |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| The analysis of natural oils, determination of moisture content in freeze-dried materials, application to aluminum forgings and polymorph analysis | | | ✓ | | | | | ✓ | | | | | | | ✓ | ✓ | |
| Application in cosmetic products for skin and hair, analysis of suspect explosive component, analysis of petroleum hydrocarbons, Oil, and Grease content and solid state characterization and Infrared therapy | | | ✓ | | | | | ✓ | | | | | | ✓ | | | ✓ |
| Attenuated total reflectance infrared (ATR-IR) spectroscopy<br>Theory of ATR-IR spectroscopy - Applications<br>Determination of protein concentration in raw milk.<br>Analysis of automotive fluids.<br>Determination the contamination in paper production.<br>Solid and liquid state characterization. | | | ✓ | | | | | ✓ | | | | | | | ✓ | | |
| Fiber optics in molecular spectroscopy, Introduction, Description of optical fibers, internal reflection consideration core-cladding, evanescent wave, fiber throughput, selecting fibers, sampling configuration | | | ✓ | | | | | ✓ | | | | | | | ✓ | | ✓ |
| Applications of fiber optics in medicine, drug Analysis, water analysis in the near-IR, gas analysis in the near-IR and lamination monitoring in the Medium-IR. | | | ✓ | | | | | ✓ | | | | | | | ✓ | | ✓ |
| **Assessment** | | | | | | | | | | | | | | | | | |

**Learning and Teaching Methods**

| **Learning Method** | **Course outcomes ILOs** | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Knowledge and Understanding** | | | | | **Intellectual Skills** | | | | | **Professional and Practical Skills** | | | | | **General and Transferable Skills** | | | | |
| | **A1** | **A2** | **A3** | **A4** | **A5** | **B1** | **B2** | **B3** | **B4** | **B5** | **C1** | **C2** | **C3** | **C4** | **C5** | **D1** | **D2** | **D3** | **D4** | **D5** |
| **Lecture** | √ | √ | | | | | √ | | | | | | | | | √ | √ | | | |
| **Discussion (Brain Storming)** | | | | | | | √ | | | | | | | | | √ | √ | | | |
| **Self-learning** | √ | | | | | √ | | | | | | | | | | | | | | |

| Learning Method | Course outcomes ILOs | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | | Intellectual Skills | | | | | Professional and Practical Skills | | | | | General and Transferable Skills | | | | |
| | A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | C1 | C2 | C3 | C4 | C5 | D1 | D2 | D3 | D4 | D5 |
| (Essay) | | | | | | | | | | | | | | | | | | | | |
| Field Trips | | | | | | | | | | | | | | | | | | | | |
| Practical | | | | | | | | | | | | | | | | | | | | |

**Assessment Methods**

| Assessment Methods | Course outcomes ILOs | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | | Intellectual Skills | | | | | Professional and Practical Skills | | | | | General and Transferable Skills | | | | |
| | A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | C1 | C2 | C3 | C4 | C5 | D1 | D2 | D3 | D4 | D5 |
| Essay Question | √ | √ | | | | | √ | | | | | | | | | √ | √ | | | |
| MCQ | √ | | | | | | | | | | | | | | | √ | | | | |
| Student Activity | | | | | | √ | √ | | | | | | | | | | | | | |
| Practical | | | | | | | | | | | | | | | | | | | | |

| | Course Coordinator | Head of Department |
|---|---|---|
| Name (Arabic) | أ. د / محمد المتولى غنيم | أ. د / الرفاعى قناوي |
| Name | Prof. Mohamad M. Ghoniem | Prof. El-Refaee Kenawy |
| Signature | | |
| | 9/2014 | 9/2014 |

| | | |
|---|---|---|
| Course Title | **Computer** | |
| Course Code | 1317 | |
| Academic Year | **2014/2015** | |
| Coordinator | **Prof. Mahmoud Kamel** | |
| Other Staff | **Prof. Mahamed El-Awady, Mohmed Ghoneim, Prof. Qadry Zakaria, Prof Saad Abo elenen** | |
| Semesters | **Two Semesters** | |
| Pre-Requisite | **B.Sc.** | |
| Course Delivery | **Lecture** | **1h/week** |
| | **Practical** | **1h/week** |
| Parent Department | **Computer Centre** | |
| Date of Approval | **September, 2014** | |

**1. Aims**

This course will enable students to acquire a range of transferable skills that are important for post graduate M. Sc. students to:

- Develop their capability for information retrieval and presentation, and proficiency in the use of IT effectively in the context of their studies.
- Underpin academic work throughout postgraduate studies.
- Provide opportunities to develop skills required for team working, oral presentation of scientific material, and career choices.

***A. Knowledge and understanding:***

Upon successful completion of this course the students should be able to:

A8. Demonstrate knowledge and understanding of the use of IT in the context of their postgraduate studies.

A9. Know the diverse media and hardware and software that help to benefit of the IT in the context of the postgraduate studies.

A10. Carry out necessary graphical, statistical and frequency analyses of different types of data.

A11. Create powerful presentation using sophisticated software packages.

A12. Make use of different internet resources.

A13. Solve scientific problems using computer programming.

A14. Make use of different photo enhancing and manipulation techniques.

***B. Intellectual skills:***

They should also acquire the ability to:

B3. Integrate different application programs to develop effective information analysis and presentation.

***C. Professional and practical skills:***

C1. Use a number of computer packages to present information.

***D. General and transferable skills:***

D3. Use the internet/electronic resources to obtain subject specific information, and to develop lifelong learning skills that can be applied to suitable research problems.

**3. Contents**

Lectures 1-5 — **Assignment 1** : **information technology**

Types and generations of computers

Hardware and Software computer structure

Types and development of operating systems

Working with windows
File and folder manipulations

Lectures 6-12 **Assignment2** : **Using PowerPoint program**
Working with PowerPoint program
Insert slides and animations
Different methods of slide editing
Insert tables ,charts, video, pictures, hyperlinks ,web pages and different objects
Design a real and powerful presentation with different acquired skills

Lecture 13-18 **Assignment 3** : **Using Access program**
Working with Access program
Define data and information
Creating data base tables , sorting and filtering records and fields
Creating different types of queries to extract useful information
Creating forms for data entries and calculations
Creating and printing final reports

Lecture 19-23 **Assignment 4: Using the Internet**
Define different types of protocols and network
Different levels of internet connections
Email and methods of file transfer
Use of internet capabilities and searching engines
Life search on the internet for some real information

Lecture 24-28 **Assignment 5**: Programming using Visual Basic 6
Different types of computer languages
Concept of visual programming language
Working with visual basic language
Steps necessary for creating a project with visual basic
Solving real problems using a visual basic computer language

**4. Teaching and Learning Methods**
- Lectures
- Practical classes
- Assignments

The course is delivered through lectures, practical sessions and assignments. Team working skills are developed on a week-long laboratory exercises and the students present and defend their findings in a public seminar.

**5. Student Assessment**

| Assessment Method | Skills assessed* | Assessment Length | Schedule | Proportion |
|---|---|---|---|---|
| Written Examination | KU, I | 1 Hour Examination | Term Final | 60% |
| Practical Examination | KU, I | 1 Hour Examination t | Term Final | 30% |
| Semester work | P, T | Continuous Assessment | | 10% |

*KU: Knowledge and Understanding, I: Intellectual, P: Professional, T: Transferable

**6. List of references**

*Course notes:*

- Notes given to students at each section describe the tasks to be completed, therefore no particular book(s) recommended.

**7. Facilities required for teaching and learning**

- Projectors; Video and Overhead
- LCD screens and writing Boards
- Commercial computer scientific software packages.

Course Contents – Course ILOs Matrix

**Course code: 1317 Chemistry, course title: Computer**

| **Course Contents** | | **Course outcomes ILOs** | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **Knowledge and Understanding** | | | | | | | | | | **Intellectual** | | | | | **Practical** | | | | | **Transferable** | | |
| | | **A1** | **A2** | **A3** | **A4** | **A5** | **A6** | **A7** | **A8** | **A9** | **A10** | **B1** | **B2** | **B3** | **B4** | **B5** | **C1** | **C2** | **C3** | **C4** | **C5** | **D1** | **D2** | **D3** |
| **Week #1-2** | | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| **Week #3-4** | | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| **Week #5-6** | | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| **Week #7-8** | | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| **Week #9-10** | | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| **Week #11-12** | | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| **Week #13-14** | | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| **Week #14-15** | | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| **Week #16-17** | | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| **Week #18-19** | | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| **Week #20-21** | | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |

| Course Contents | | Course outcomes ILOs | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Knowledge and Understanding | | | | | | | | | | Intellectual | | | | | Practical | | | | | Transferable | | |
| | | A1 | A2 | A3 | A4 | A5 | A6 | A7 | A8 | A9 | A10 | B1 | B2 | B3 | B4 | B5 | C1 | C2 | C3 | C4 | C5 | D1 | D2 | D3 |
| Week #22-23 | | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #24-25 | | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #26-27 | | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #28 | | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |

| | Course Coordinator | Head of Department |
|---|---|---|
| Name | Prof. Mahmoud M. Kamel | **Prof. El-Sayed T. Rizk** |
| Name (Arabic) | أ.د.محمود مصطفى كامل | أ.د. السيد طه رزق |
| Signature | | |
| Date | 9/2014 | 9/2014 |

# Master Science of Biochemistry

## **A c a d e m i c  S t a n d a r d s for the M.Sc. of Bio-Chemistry**

The Academic Reference Standards (ARS) for M.Sc. program degree in Biochemistry as well as the attributes and capabilities of the graduates were based on the General Academic Reference Standards (ARS) for graduate studies published by the National Authority for Quality Assurance and Accreditation of Education (20١٤) for M.Sc. Degree. Specific reference standard for the M.Sc. in Biochemistry were approved by the Council of the Faculty of Science, Tanta University in ٢٠١٤

**1.1. Graduate Attributes.**

*The graduate of the M.Sc. (non-organic chemistry) must be able to:*

1.1.1. Apply the basic concepts of scientific research.

1.1.2. Apply the concepts of "analysis" and its use in the field of Biochemistry.

1.1.3. Construct related subjects and information to be applied professionally.

1.1.4. Show deep knowledge of the current problems in Biochemistry.

1.1.5. Solve problems using a range of formats and approaches.

1.1.6. Choose the appropriate technological techniques.

1.1.7. Communicate effectively and show a perfect professional leadership.

1.1.8. Make decisions regarding the professional activities.

1.1.9. Make use of the available facilities.

1.1.10. Recognize his/her role for society development.

1.1.11. Self–learning in both academic and professional areas.

**1.2. Knowledge and understanding**:

*By the end of the MSC program the graduate must able to:*

1.2.1. Know the theories and fundamentals related to the area of study as well as related areas.

1.2.2. Mutual influence between professional practice and its impacts on the environment.

1.2.3. Scientific developments in the area of specialization.

1.2.4. Understand the legal and ethical principles of professional practice in the area of study specialization.

1.2.5. Know the basis of quality control in professional practice in the area of specialization.

1.2.6. Know the principles and ethics of scientific research

**1.3. Intellectual skills**

*By the end of the Master program the graduate must able to:*

1.3.1. Analyze and evaluate the information in the field of specialization.

1.3.2. Solve specialized problems in case of lack of information.

1.3.3. Link between different knowledge to solve professional problems.

1.3.4. Conduct a research study and / or write a methodology of a scientific investigation.

1.3.5. Assess the risk in professional practices in the area of interest.

1.3.6. Planning to improve performance in the field of interest.

1.3.7. Make the proper decision in diverse professional contexts.

**1.4. Professional skills**.

*By the end of the master program the graduate must be able to:*

1.4.1. Master modern professional basic skills in the area of specialization.

1.4.2. Write and evaluate professional reports.

1.4.3. Assess the efficiency of methods and tools in the area of study or work area.

**1.5. General and transferable skills**.

*By the end of the master program the graduate must be able to:*

1.5.1. Communicate effectively to obtain required knowledge.

1.5.2. Use of information technology to serve the professional practice.

1.5.3. Develop rules and indicators for assessing the performance of others.

1.5.4. Work in a team and leading a team work in professional contexts.

## A. Program Specification

| | |
|---|---|
| Program Title | **M Sc. Biochemistry** |
| Award | **Master of Science Degree in Biochemistry** |
| Parent Department | **Chemistry Department; Biochemistry Division** |
| Teaching Institution | **Faculty of Science – Tanta University** |
| Awarding Institution | **Tanta University** |
| Coordinator | **Prof. Tarek Mostafa Mohamed** |
| External evaluator(s) | **Prof. Amro Y. Esmat**<br>**Faculty of Science- Ein Shams University** |
| QAA Benchmarking Standards | **National Academic Reference Standards (NARS)** |
| Other Reference Points | **Egyptian Code of Assessment** |
| Date of intake | **Every year in September** |
| Review Date | **Internal Periodic Review, Summer 2014** |
| Date of Approval | **September , 2014** |

### 1. Program Aims

It aims at extending students comprehension of key biochemical concepts and to provide students with an in–depth understanding of specialized areas of biochemistry. In addition, the program aims at preparing students effectively to doctoral studies in biochemistry.

### .2. Intended Learning outcomes

#### *A. Knowledge and understanding:*

*By the end of the Master program the graduate should be able to:*

A1. Acquire in–depth knowledge in the field of interest.
A2. Indicate contemporary professional practice in the field of specialty and describe its impact on the environment.
A3. Know the basics of the lab. Quality assurance and its application in the field of interest.
A.4 Recognize the basis of ethical behavior in scientific research.

#### *B. Intellectual skills:*

By the end of the Master program the graduate should be able to:

B1. Evaluate the knowledge and information in his field.
B2. Assess and predict the knowledge and information to solve problems in his specialty.
B3. Specify research study and conclude the methodology of scientific problems.
B4. Assess risks in his/her job and make the appropriate precautions.

#### *C. Professional and practical skills:*

C1. Apply the practical skills he acquired in various professional contexts.
C2. Reform and present precise results objectively.
C3. Develop the practical knowledge he gained in the professional work.

#### *D. General and transferrable skills:*

D1. Provide responsible initiatives in his work.

D2. Communicate and exchange ideas effectively in his/her field.
D3. Use several and different resources of reliable scientific information.
D4. Work within a team and manage the time effectively.

## 3. Academic standards

The Academic Reference Standards for M.Sc. program degree in Biochemistry as well as the attributes and capabilities of the graduates were based on the General Academic Reference Standards (ARS) for graduate studies published by the National Authority for Quality Assurance and Accreditation of Education (20١٤) for M.Sc. Degree. Specific reference standard for the M.Sc. in Biochemistry were approved by the Council of the Faculty of Science, Tanta University in ٢٠١٤/٢٠١٥ .

### 3.1. Graduate Attributes.

*The graduate of the M.Sc. (non-organic chemistry) must be able to:*
3.1.1. Apply the basic concepts of scientific research.
3.1.2. Apply the concepts of "analysis" and its use in the field of Biochemistry.
3.1.3. Construct related subjects and information to be applied professionally.
3.1.4. Show deep knowledge of the current problems in Biochemistry.
3.1.5. Solve problems using a range of formats and approaches.
3.1.6. Choose the appropriate technological techniques.
3.1.7. Communicate effectively and show a perfect professional leadership.
3.1.8. Make decisions regarding the professional activities.
3.1.9. Make use of the available facilities.
3.1.10. Recognize his/her role for society development.
3.1.11. Self–learning in both academic and professional areas.

### 3.2. Knowledge and understanding:

*By the end of the MSC program the graduate must able to:*
3.2.1. Know the theories and fundamentals related to the area of study as well as related areas.
3.2.2. Mutual influence between professional practice and its impacts on the environment.
3.2.3. Scientific developments in the area of specialization.
3.2.4. Understand the legal and ethical principles of professional practice in the area of study specialization.
3.2.5. Know the basis of quality control in professional practice in the area of specialization.
3.2.6. Know the principles and ethics of scientific research

### 3.3. Intellectual skills

*By the end of the Master program the graduate must able to:*
3.3.1. Analyze and evaluate the information in the field of specialization.
3.3.2. Solve specialized problems in case of lack of information.
3.3.3. Link between different knowledge to solve professional problems.
3.3.4. Conduct a research study and / or write a methodology of a scientific investigation.
3.3.5. Assess the risk in professional practices in the area of interest.
3.3.6. Planning to improve performance in the field of interest.
3.3.7. Make the proper decision in diverse professional contexts.

### 3.4. Professional skills.

*By the end of the master program the graduate must be able to:*
3.4.1. Master modern professional basic skills in the area of specialization.
3.4.2. Write and evaluate professional reports.
3.4.3. Assess the efficiency of methods and tools in the area of study or work area.

### 3.5. General and transferable skills.

*By the end of the master program the graduate must be able to:*

3.5.1. Communicate effectively to obtain required knowledge.
3.5.2. Use of information technology to serve the professional practice.
3.5.3. Develop rules and indicators for assessing the performance of others.
3.5.4. Work in a team and leading a team work in professional contexts.

**4- Curriculum Structure and contents**

4.a- Program duration: One Year for completion of Course Work, and at least one Year for thesis Preparation (according to the regulation of the Faculty of Science).

**4. Curriculum Structure and contents:**

4.A Program duration — One Year

4.B Program structure

4.B.1 Number of contact hours — per Week: Lectures 6

4.B.2 Number of credit hours of other courses:(computer) — Lectures 1 Lab. 1

**5. Program courses**

| Year 1 | Course Title | Lec. | Prac. | Exer. | Program ILOs Covered |
|---|---|---|---|---|---|
| Code | Student must study the following modules: | Hours | | | |
| 1331 | Carbohydrate, lipid and proteins(Protein metabolism, Biological oxidation, Molecular and Radiobiology) | 2 | - | - | |
| 1332 | Enzymes, Metabolism(Enzymes, Metabolism, Toxicology and Cancer Biology) | 2 | - | - | |
| 1333 | Vitamins, Hormones and Nutrition (Hormones, Natural product, Nutrition and Immunology) | 2 | - | - | |
| | Computer | 1 | 1 | - | |

## 6. Program admission requirements

Arrangements for admission are based on the national guidelines with no Faculty control on the number of newly enrolled students.

Candidates must satisfy the general admission requirements of the University, Faculty in biochemistry and also hold one of the following:

- General Certificate of BSc Education in Biochemistry

## 7. Regulations for progression and program completion

The Faculty has the following system to follow student's progression through the program in which they are enrolled.

- To progress from pre Master, the student needs to pass in all course units.
- Student who fails in the final examination at the first attempt will be eligible only for a “Pass” degree following any rest examinations.
- □ Student who progressed in pre-master will make a thesis in biochemistry including a practical research within 5 years later or canceled the pre-master.

**Matrix of ARS ILOs and M.Sc. Biochemistry Program ILOs**

| ARS ILOs | Program intended learning outcomes ILOs | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | | Intellectual | | | | | | | Practical | | | | Transferable | | | |
| | A1 | A2 | A3 | A4 | | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | | D1 | D2 | D3 | D4 |
| **Knowledge and Understanding** | | | | | | | | | | | | | | | | | | | | |
| **1**. Know the theories and fundamentals related to the area of study as well as related areas. | √ | √ | | | | | | | | | | | | | | | | | | |
| **2.** Mutual influence between professional practice and its impacts on the environment. | √ | | √ | √ | | | | | | | | | | | | | | | | |
| **3.** Understand the legal and ethical principles of professional practice in the area of study specialization | | | √ | | | | | | | | | | | | | | | | | |
| **4.** Know the basis of quality in professional practice in the area of specialization. | √ | | √ | √ | | | | | | | | | | | | | | | | |
| **Intellectual Skills** | | | | | | | | | | | | | | | | | | | | |
| **1.** Analyze and evaluate the information in the field of specialization. | | | | | | √ | √ | | | | | | | | | | | | | |
| **2.** Solve specialized problems in case of lack of information. | | | | | | √ | √ | √ | | | | | | | | | | | | |
| **3.** Link between different knowledge to solve professional problems. | | | | | | √ | | √ | √ | | | | | | | | | | | |
| **4.** Conduct a research study and / or write a methodology of a scientific investigation. | | | | | | | √ | | √ | √ | | | | | | | | | | |
| **5.** Risk assessment in professional practices in the area of interest. | | | | | | √ | | | | √ | √ | | | | | | | | | |
| **6.** Planning to improve performance in the field of interest. | | | | | | √ | √ | | | | √ | | | | | | | | | |
| **7.** Make the proper decision in diverse professional contexts. | | | | | | | | | | √ | √ | | | | | | | | | |
| **Professional Skills** | | | | | | | | | | | | | | | | | | | | |
| **1.** Mastery of, modern professional basic skills in the area of specialization. | | | | | | | | | | | | | √ | √ | | | | | | |
| 2. Write and evaluate of professional reports. | | | | | | | | | | | | | | √ | √ | | | | | |
| 3. Assess the efficiency of methods and tools in the area of study or work area. | | | | | | | | | | | | | | √ | √ | | | | | |

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **General Skills** | | | | | | | | | | | | | | | | | | | | |
| **1**. Communicate effectively to obtain required knowledge. | | | | | | | | | | | | | | | | | √ | | | |
| **2**. Use of information technology to serve the professional practice. | | | | | | | | | | | | | | | | | √ | √ | | |
| **3.** Develop rules and indicators for assessing the performance of others. | | | | | | | | | | | | | | | | | √ | √ | | |
| **4.** Work in a team, and leading team work in professional contexts. | | | | | | | | | | | | | | | | | √ | | √ | √ |

We certify that all of the information required to deliver this program is contained in the above specification and will be implemented. All course specifications for this program are in place

M.Sc. program In Biochemistry

Program’s Matrix

| | Courses | **Knowledge and Understanding** | | | | | **Intellectual Skills** | | | | **Professional Skills** | | | | **General Skills** | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 | B4 | | | | | D1 | D2 | D3 | D4 |
| 1331 | Carbohydrate, lipid and proteins(Protein metabolism, Biological oxidation, Molecular and Radiobiology) | √ | √ | | √ | | √ | | √ | | | | | | √ | | √ | √ |
| 1332 | Enzymes, Metabolism(Enzymes, Metabolism, Toxicology and Cancer Biology ) | √ | √ | √ | | | | √ | | √ | | | | | | √ | | √ |
| 1333 | Vitamins, Hormones and Nutrition (Hormones, Natural product, Nutrition and Immunology) | | √ | | √ | | √ | | | √ | | | | | √ | √ | | |
| 1317 | Computer | √ | | √ | √ | | √ | | | √ | | | | | | | √ | √ |
| | Thesis | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |

**Learning and Teaching Methods**

| **Learning Method** | **Course outcomes ILOs** | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Knowledge and Understanding** | | | | | **Intellectual Skills** | | | | | **Professional and Practical Skills** | | | | | **General and Transferable Skills** | | | | |
| | **A1** | **A2** | **A3** | **A4** | | **B1** | **B2** | **B3** | **B4** | | **C1** | **C2** | **C3** | | | **D1** | **D2** | **D3** | **D4** | |
| **Lecture** | √ | √ | | | | √ | | | √ | | √ | | √ | | | √ | √ | √ | √ | |
| **Discussion (Brain Storming)** | | √ | | √ | | | √ | √ | √ | | | √ | √ | | | √ | √ | √ | √ | |
| **Self-learning (Essay)** | √ | | √ | √ | | √ | | √ | | | √ | √ | | | | √ | √ | √ | √ | |
| **Field Trips** | | | | | | | | | | | | | | | | | | | | |
| **Practical** | | | | | | | | | | | √ | √ | √ | | | | | | | |

## Assessment Methods

| Assessment Methods | Course outcomes ILOs | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | | Intellectual Skills | | | | | Professional and Practical Skills | | | | | General and Transferable Skills | | | | |
| | A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | C1 | C2 | C3 | C4 | C5 | D1 | D2 | D3 | D4 | |
| **Essay Question** | √ | √ | | √ | | | √ | | √ | | √ | √ | | | | | | | | |
| **MCQ** | √ | | √ | √ | | | | | √ | | | | √ | | | | | | | |
| **Student Activity** | | | | | | √ | √ | | | | √ | √ | | | | √ | √ | √ | √ | |
| **Practical** | | | | | | | | | | | √ | √ | √ | | | | | | | |

| Date | Signature | Name |
|---|---|---|
| 9/2014 | ……………………………… | *Program Coordinator:*<br>**Prof. Mohamed Y. El sheikh**<br>**(أ. د. محمد يسري الشيخ)** |
| 9/2014 | ……………………………… | *Head of Quality Assurance Unit:*<br>Prof. Hoda K. Elsayed<br>**(أ. د./ هدى كمال السيد)** |
| 9/2014 | ……………………………… | *Dean of the Faculty:*<br>Prof. Tarek A. Fayed<br>**(أ. د./ طارق فايد)** |

| | | |
|---|---|---|
| Course Title | **Carbohydrate, lipid and proteins (Protein metabolism, Biological oxidation, Molecular and Radiobiology)** | |
| Course Code | **1331** | |
| Academic Year | **2014/2015** | |
| Coordinator | **Prof. Dr. Ehab M. Mohamed** | |
| Other Staff | **Prof. Tarek El-namer and Dr. Afrah Salama** | |
| Semesters | **Two Semesters** | |
| Pre-Requisite | **B.Sc. in Biochemistry** | |
| Course Delivery | **Lecture** | **2h/week** |
| Parent Department | **Chemistry** | |
| Date of Approval | **September, 201٤** | |

## 1. Aims

This course provide student with:
1.1 Understand energy released and consumed in living organism
1.2 The concepts, theories of biosynthesis and degradation of protein and nucleic acids
1.3 Provide the capability for information of radiation hazardous

## 2. Intended Learning outcomes

### *A. Knowledge and understanding:*

A1. . Demonstrate the principles of proteins and molecular biology.
A2. Recognize the types of radiation and type of hazardous
A3. Describe the gene expression
A4. Explain the biological oxidation and energy released and consumed
A5. Acquire the protein metabolism

### *B. Intellectual skills:*

The students will acquire the ability;

B1. Demonstrate the probable mechanism of different proteins metabolism and abnormal metabolism

B2. Distinguish the radiation to metabolism.

B3 illustrate the oxidation reduction reaction in living organism

B4. Design the DNA manipulation

### *C. Professional and practical skills:*

C1. Plan and conduct various forms of research and projects involving sustained independent enquiry.
C2. Interpret primary and secondary sources of information.

### *D. General and transferable skills:*

D1. Give oral presentation.
D2. Use electronic resources to obtain interpretation.
D3. Self and continuous learning.

## 2. Contents:

| | | |
|---|---|---|
| **Part- 1** | **Protein metabolism** (An hour/week for one Semester) |
| Lecture 1 | Introduction of amino acid and protein metabolism |
| Lecture 2 | Amino acid catabolism and anabolism |
| Lecture 3 | Albinism and phenylketonuria |
| Lecture 4 | Alkaptonuria, Parkinson's disease |
| Lecture 5 | Sulfur containing amino acids |
| Lecture 6 | Hypermethionemia and Hypercystinuria |
| Lecture 7 | Cystathoninuria and histidinuria |
| Lecture 8 | disease of propionate and methyl malonate |
| Lecture 9 | Disease of ornithine |
| Lecture 10 | Folic acid deficiency and metabolism |
| Lecture 11 | Glutathion structure and function |
| Lecture 12 | Transferase function in detoxification reactions |
| Lecture 13 | Transferase function in detoxification reactions |
| Lecture 14 | Revision |
| **Part- 2** | **Biological oxidation**(An hour/week for one Semester) |
| Lecture 1 | Energy-yielding and energy-requiring reactions. |
| Lecture 2 | Oxidation-reduction reactions. |
| Lecture 3 | ATP as an energy carrier. |
| Lecture 4 | Activation energy. |
| Lecture 5 | Electron transport chain. |
| Lecture 6 | Electron transport chain (Cont'd). |
| Lecture 7 | Oxidative phosphorylation (chemiosmotic hypothesis). |
| Lecture 8 | Oxidative phosphorylation (membrane transport systems). |
| Lecture 9 | Inherited defects in oxidative phosphorylation. |
| Lecture 10 | Free radicals and their role in diseases. |
| Lecture 11 | The antioxidant system. |
| Lecture 12 | The antioxidant system (Cont'd). |
| Lecture 13 | Antioxidants as important markers of diseases. |
| Lecture 14 | Revision |
| **Part- 3** | **Molecular Biology** (An hour/week for one Semester) |
| Lecture 1 | Replication and post replication modification |
| Lecture 2 | Transcription and post transcription modification of transcripts |
| Lecture 3 | Genes and gene operons |
| Lecture 4 | Structural motifs of DNA binding domain |

| | |
|---|---|
| Lecture 5 | The regulation of gene expression |
| Lecture 6 | Regulation of transcription |
| Lecture 7 | Protein-nucleic acid interaction |
| Lecture 8 | Role of the DNA conformation in protein-DNA interaction |
| Lecture 9 | Repressors and transcriptional activators |
| Lecture 10 | The principle of transcription regulation |
| Lecture 11 | Regulation by binding of effector molecules |
| Lecture 12 | Regulation of genes by modification of initiation factors |
| Lecture 13 | Principles of technical aspects of molecular biology |
| Lecture 14 | Role of phosphorylation in gene regulation |
| **Part- 4** | **Radiobiology** (An hour/week for one Semester) |
| Lecture 1 | The various types sources of radiation |
| Lecture 2 | Radiation quantities and their units, as used in the assessment of radiation levels |
| Lecture 3 | The interactions of radiation particles with molecules in tissue. |
| Lecture 4 | The physic-chemical events that follow an ionizing event, including their spatial distribution and the time scale |
| Lecture 5 | The physic-chemical events that follow an ionizing event, including their spatial distribution and the time scale |
| Lecture 6 | The biological impact of these events on living tissue at the molecular water, protein, lipids and enzyme. |
| Lecture 7 | the biological impact of these events on living tissue at the molecular DNA, RNA, membrane, chromosome, cellular, organs and whole animal. |
| Lecture 8 | Radiobiological outcome, when presented with the conditions of irradiation(e.g. type, energy, dose, dose rate, oxygen level and drugs) |
| Lecture 9 | The applications of radiation to the research laboratory and to medicine |
| Lecture 10 | The applications of radiation to the research laboratory and to medicine |
| Lecture 11 | To become aware of safety precautions when using ionizing radiation. |
| Lecture 12 | Tracer technique and its applications in biology and medicine |
| Lecture 13 | Tracer technique and its applications in biology and medicine |
| Lecture 14 | Revision |

## 4. Teaching and Learning Methods

4.1 Theoretical Lecture
4.2 Library and net search
4.3 Assignments.

## 5. Student Assessment

| Assessment Method | Skills assessed* | Assessment Length | Weight |
|---|---|---|---|
| Written Examination | KU, I | 3 Hour Examination | 100% |

*KU: Knowledge and Understanding, I: Intellectual, P: Professional.

## 6. List of references

*Essential Books:*

- Genetics: A molecular approach, Peter J. Russell, 2nd edition, Pearson Education Inc., Benjamin Cummings, San Francisco, CA 94111, USA, 2006.

*Recommended Books:*

- Text Book of Biochemistry. Devli, TM. Fifth edition. Willy Liss . 2008

## 7. Facilities required for teaching and learning

Overhead projector, data show well equipped teaching classes by himself

## Course Matrix

| | Courses | Knowledge and Understanding | | | | | Intellectual Skills | | | | Professional Skills | | General Skills | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Protein Metabolism** | A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 | B4 | C1 | C2 | D1 | D2 | D3 |
| 1 | Introduction of amino acid and protein metabolism | √ | | | | √ | √ | | | | | | | √ | √ |
| 2 | Amino acid catabolism and anabolism | √ | | | | √ | √ | | | | | | √ | | √ |
| 3 | Albinism and phenylketonuria | √ | | | | √ | √ | | | | | | √ | √ | |
| 4 | Alkaptonuria, Parkinson’s disease | | | | | √ | √ | | | | | √ | | | √ |
| 5 | Sulfur containing amino acids | | | | | √ | √ | | | | | √ | √ | √ | |
| 6 | Hypermethionemia and Hypercystinuria | | | | | √ | √ | | | | | √ | √ | | |
| 7 | Cystathoninuria and histidinuria | | | | | √ | √ | | | | | | | √ | √ |
| 8 | disease of propionate and methyl malonate | | | | | √ | √ | | | | | | | √ | |
| 9 | Disease of ornithine | | | | | √ | √ | | | | √ | | √ | | √ |
| 10 | Folic acid deficiency and metabolism | | | | | √ | √ | | | | √ | | √ | √ | √ |
| 11 | Glutathion structure and function | | | | | √ | √ | | | | √ | | | √ | √ |
| 12 | Transferase function in detoxification reactions | | | | | √ | √ | | | | √ | | √ | √ | |
| 13 | Transferase function in detoxification reactions | | | | | √ | √ | | | | √ | | √ | | √ |
| 14 | Revision | | | | | √ | √ | | | | | | √ | √ | √ |
| | **Biological oxidation** | | | | | | | | | | | | | | |
| 1 | Energy-yielding and energy-requiring reactions. | | | | √ | | | | √ | | | | √ | | √ |
| 2 | Oxidation-reduction reactions. | | | | √ | | | | √ | | | | | √ | √ |
| 3 | ATP as an energy carrier. | | | | √ | | | | √ | | | | | | √ |
| 4 | Activation energy. | | | | √ | | | | √ | | | | √ | | √ |
| 5 | Electron transport chain. | | | | √ | | | | √ | | | | √ | √ | √ |
| 6 | Electron transport chain (Cont'd). | | | | √ | | | | √ | | | | √ | | |
| 7 | Oxidative phosphorylation (chemiosmotic hypothesis). | | | | √ | | | | √ | | | | √ | √ | √ |
| 8 | Oxidative phosphorylation (membrane transport systems). | | | | √ | | | | √ | | √ | | | | √ |
| 9 | Inherited defects in oxidative phosphorylation. | | | | √ | | | | √ | | √ | | √ | | |
| 10 | Free radicals and their role in diseases. | | | | √ | | | | √ | | √ | | √ | √ | |
| 11 | The antioxidant system. | | | | √ | | | | √ | | √ | | √ | | √ |
| 12 | The antioxidant system (Cont'd). | | | | √ | | | | √ | | | √ | √ | | √ |
| 13 | Antioxidants as important markers of diseases. | | | | √ | | | | √ | | | √ | √ | | √ |
| 14 | Revision | | | | √ | | | | √ | | | | √ | | √ |
| | **Molecular Biology** | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Replication and post replication modification | √ | | | | | | | | √ | √ | | √ | | √ |
| 2 | Transcription and post transcription modification of transcripts | √ | | | | | | | | √ | √ | | √ | √ | |
| 3 | Genes and gene operons | √ | | | | | | | | √ | √ | | | | √ |
| 4 | Structural motifs of DNA binding domain | √ | | | | | | | | √ | √ | | √ | | √ |
| 5 | The regulation of gene expression | | | √ | | | | | | √ | | √ | √ | √ | √ |
| 6 | Regulation of transcription | | | √ | | | | | | √ | | √ | √ | | |
| 7 | Protein-nucleic acid interaction | | | √ | | | | | | √ | | √ | √ | √ | √ |
| 8 | Role of the DNA conformation in protein-DNA interaction | | | √ | | | | | | √ | | √ | | | √ |
| 9 | Repressors and transcriptional activators | | | √ | | | | | | √ | | | √ | | |
| 10 | The principle of transcription regulation | | | √ | | | | | | √ | | | √ | √ | |
| 11 | Regulation by binding of effector molecules | | | √ | | | | | | √ | | | √ | √ | |
| 12 | Regulation of genes by modification of initiation factors | | | √ | | | | | | √ | | | √ | √ | √ |
| 13 | Principles of technical aspects of molecular biology | | | √ | | | | | | √ | | | | √ | √ |
| 14 | Role of phosphorylation in gene regulation | | | √ | | | | | | √ | | | √ | | √ |
| | **Radiobiology** | | | | | | | | | | | | | | |
| 1 | The various types sources of radiation | | √ | | | | | √ | | | | | | √ | √ |
| 2 | Radiation quantities and their units, as used in the assessment of radiation levels | | √ | | | | | √ | | | | | √ | | √ |
| 3 | The interactions of radiation particles with molecules in tissue. | | √ | | | | | √ | | | | √ | √ | √ | |
| 4 | The physic-chemical events that follow an ionizing event, including their spatial distribution and the time scale | | √ | | | | | √ | | | | √ | √ | √ | √ |
| 5 | The physic-chemical events that follow an ionizing event, including their spatial distribution and the time scale | | √ | | | | | √ | | | | | √ | √ | |
| 6 | The biological impact of these events on living tissue at the molecular water, protein, lipids and enzyme. | | √ | | | | | √ | | | | | | √ | √ |
| 7 | the biological impact of these events on living tissue at the molecular DNA, RNA, membrane, chromosome, cellular, organs and whole animal. | | √ | | | | | √ | | | √ | | √ | | √ |
| 8 | Radiobiological outcome, when presented with the conditions of irradiation(e.g. type, energy, dose, dose rate, oxygen level and drugs) | | √ | | | | | √ | | | √ | | √ | √ | √ |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 9 | The applications of radiation to the research laboratory and to medicine | | √ | | | | | √ | | | √ | | √ | √ | √ |
| 10 | The applications of radiation to the research laboratory and to medicine | | √ | | | | | √ | | | √ | | √ | √ | |
| 11 | To become aware of safety precautions when using ionizing radiation. | | √ | | | | | √ | | | | | √ | | |
| 12 | Tracer technique and its applications in biology and medicine | √ | | | | | √ | | | | | | √ | √ | √ |
| 13 | Tracer technique and its applications in biology and medicine | √ | | | | | √ | | | | | | √ | √ | √ |
| 14 | Revision | √ | | | | | √ | | | | | | √ | | √ |

**Learning and Teaching Methods**

| Learning Method | Course outcomes ILOs | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | | Intellectual Skills | | | | | Professional and Practical Skills | | | | | General and Transferable Skills | | | | |
| | A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 | B4 | | C1 | C2 | | | | D1 | D2 | D3 | | |
| Lecture | √ | √ | | | √ | | √ | | √ | | √ | √ | | | | √ | √ | √ | | |
| Discussion (Brain Storming) | | √ | | | √ | √ | | √ | √ | | | | | | | √ | √ | √ | | |
| Self-learning (Essay) | √ | | √ | √ | √ | √ | | √ | | | √ | √ | | | | √ | √ | √ | | |
| Field Trips | | | | | | | | | | | | | | | | | | | | |
| Practical | | | | | | | | | | | √ | √ | | | | | | | | |

**Assessment Methods**

| Assessment Methods | Course outcomes ILOs | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | | Intellectual Skills | | | | | Professional and Practical Skills | | | | | General and Transferable Skills | | | | |
| | A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 | B4 | | C1 | C2 | | | | D1 | D2 | D3 | | |
| Essay Question | √ | √ | √ | √ | | | √ | √ | √ | | √ | √ | | | | | | | | |
| MCQ | √ | √ | | | √ | √ | | √ | √ | | | | | | | | | | | |
| Student Activity | | | | | | | √ | √ | | | √ | √ | | | | √ | √ | √ | | |
| Practical | | | | | | | | | | | √ | √ | | | | | | | | |

**Course Coordinator** **Head of Department**

Name (Arabic) أ.د. إيهاب مصطفى محمد أ. د / الرفاعي صبحي قناوي

Name Prof. Ehab Mostafa Mohamed Prof. El-Refaie Kenawy

Signature ……………………………………… ………………………………………

9/2014 9/2014

| | | |
|---|---|---|
| Course Title | **Enzymes and Metabolism (Enzymes, Metabolism, Toxicology and Cancer Biology)** | |
| Course Code | **1332** | |
| Academic Year | **2014/2015** | |
| Coordinator | **Prof Tarek M. Mohamed** | |
| Other Staff | **Prof. Sherif salem; Dr. Afrah Salama** | |
| Semesters | **Two Semesters** | |
| Pre-Requisite | **B.Sc. in Biochemistry** | |
| Course Delivery | **Lecture** | **2h/week** |
| Parent Department | **Chemistry** | |
| Date of Approval | **September, 2014** | |

**1. Aims:**

The aims of this course are to:

1.1 The concept of Enzymes and Metabolism.

1.2 Understand the relation toxic compound to the metabolism

1.3 Provide the mechanism of cancer and related to the metabolism

2. Intended Learning outcomes

***A. Knowledge and understanding:***

A1. Recognize theories and concepts of enzymes and metabolism

A2. Indicate the enzyme kinetics.

A3. Describe the basis of metabolic reactions.

A4. Indicate the mechanism of cancer and related to the metabolism

A5. Recognize the toxic compound to the metabolism

***B. Intellectual skills:***

The students will acquire the ability:

B1. Demonstrate the enzyme mechanisms, enzyme kinetics

B2. Interpret the problems of cancer to the metabolism

B3. Illustrate the relation between enzymes and metabolism.

B4. Illustrate the effect of toxic compound to the metabolism.

***C. Professional and practical skills:***

C1. Plan and conduct various forms of research for essays and projects involving sustained independent enquiry.

C2. Access and interpret primary and secondary sources of information.

***D. General and transferable skills:***

D1. Give oral presentation.

D2. Use electronic resources to obtain metabolic interpretation

D3. Self- and continuous learning.

## 3. Contents

| | |
|---|---|
| **Part- 1** | **Enzyme** (One hours/week for one Semester) |
| Lecture 1 | Introduction, |
| Lecture 2 | The mechanism of enzyme action |
| Lecture 3 | Relation between thermodynamics and enzyme mechanism |
| Lecture 4 | Transient state theory |
| Lecture 5 | Some examples of Enzyme mechanisms |
| Lecture 6 | Some examples of Enzyme mechanisms |
| Lecture 7 | Clinical correlation of enzyme action |
| Lecture 8 | Clinical correlation of enzyme action |
| Lecture 9 | Enzyme inhibition |
| Lecture 10 | Enzyme regulation |
| Lecture 11 | RNA and some antibodies as enzymes |
| Lecture 12 | Application of enzyme |
| Lecture 13 | Enzyme immobilization and it kinetics |
| Lecture 14 | Revision |
| **Part- 2** | **Metabolism** (One hour/week for one Semester) |
| Lecture 1 | Introduction to Metabolisn |
| Lecture 2 | Regulation of Glycolitic pathway |
| Lecture 3 | Regulation of carbohydrate anabolism |
| Lecture 4 | Clinical correlation of carbohydrate metabolism |
| Lecture 5 | Metabolism of some sugar |
| Lecture 6 | Abnormal sugar metabolism |
| Lecture 7 | Lipid catabolism |
| Lecture 8 | Energy producing from fatty acid catabolism |
| Lecture 9 | Lipid anabolism |
| Lecture 10 | Cholesterol synthesis |
| Lecture 11 | Prostaglandins |
| Lecture 12 | Carbohydrate and lipids in fed state |
| Lecture 13 | Carbohydrate and lipids in Starved state |
| Lecture 14 | Revision |
| **Part- 3** | **Toxicology** (An hour/week for one Semester) |

| | |
|---|---|
| Lecture 1 | Principles of toxicology |
| Lecture 2 | Types of toxins |
| Lecture 3 | Pharmatokinetics in Toxicology |
| Lecture 4 | Teratogenesis |
| Lecture 5 | carcinogenesis mutagenesis and Ames test |
| Lecture 6 | Biotransformation of xenobiotics |
| Lecture 7 | Biotransformation of xenobiotics |
| Lecture 8 | cytochrome P450 mechanism |
| Lecture 9 | Toxic response |
| Lecture 10 | Genetics of Toxicology |
| Lecture 11 | Clinical Pathology of Toxicology |
| Lecture 12 | Metal Toxicity |
| Lecture 13 | Pesticides |
| Lecture 14 | Revision |
| **Part- 4** | **Cancer Biology** (One hour/week for one Semester) |
| Lecture 1 | What is cancer?<br>Evidence suggests that cancer is a genetic disease at the cellular level.<br>Cell cycle. |
| Lecture 2 | Oncogenes<br>Growth factors, receptor and nonreceptor protein-tyrosine and protein serine/threonine kinases. |
| Lecture 3 | Membrane-associated G proteins, nuclear transcription factors. |
| Lecture 4 | The retinoblastoma gene and protein.<br>Mutations in the RB pathway and cancer. |
| Lecture 5 | The p53 pathway.<br>Mutation in p53 pathway and cancer. |
| Lecture 6 | Telomeres, telomerase and cancer.<br>Apoptosis and cancer. |
| Lecture 7 | Retroviruses and cancer<br>DNA tumor viruses. |
| Lecture 8 | Metastasis. |
| Lecture 9 | Evidence for a role of epigenetics in carcinogenesis. |
| Lecture 10 | Chemicals and radiation as carcinogens.<br>Nutrients, hormones and gene interactions. |
| Lecture 11 | Tumor markers<br>Definition, methods of evaluating tumor markers, PSA as marker of prostate |

cancer.

Lecture 12 Tumor markers
CA 15-3, CA 549 as markers of breast cancer.
CA 125, CA 19.9, CEA, AFP, hCG, NSE.

Lecture 13 Cancer therapeutic strategies.
Cancer vaccines.

Lecture 14 Revision

**4. Teaching and Learning Methods**

4.1 Theoretical Lecture.
4.2 Library and net search
4.3 Assignments.

**5. Student Assessment**

| Assessment Method | Skills assessed* | Assessment Length | Weight |
|---|---|---|---|
| Written Examination | KU, I | 3 Hour Examination | 100% |

*KU: Knowledge and Understanding, I: Intellectual, P: Professional.

**6. List of references**

*Essential Books:*

- Nelson, D. L. and Cox, M. M. (2000) Lehninger-Principle of biochemistry 3rd ed. New York. Worth Pub

*Recommended Books:*

- Genetics: A molecular approach, Peter J. Russell, 2nd edition, Pearson Education Inc., Benjamin Cummings, San Francisco, CA 94111, USA, 2006. The basic science of oncology, Ian F. Tannock, Richard P. Hill, 3rd edition,
- McGraw-Hill, Health Professions Divisions, New York, USA, 1998.

**7. Facilities required for teaching and learning**

Over head projector well equipped teaching classes

## Course Matrix

| | Courses | Knowledge and Understanding | | | | | Intellectual Skills | | | | Professional Skills | | General Skills | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Enzyme** | A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 | B4 | C1 | C2 | D1 | D2 | D3 |
| 1 | Introduction, | √ | | | | | √ | | | | | | √ | √ | √ |
| 2 | The mechanism of enzyme action | √ | | | | | √ | | | | | | √ | √ | |
| 3 | Relation between thermodynamics and enzyme mechanism | | √ | | | | √ | | | | | | √ | | |
| 4 | Transient state theory | | √ | | | | √ | | | | √ | | √ | √ | √ |
| 5 | Some examples of Enzyme mechanisms | | √ | | | | √ | | | | √ | | | √ | √ |
| 6 | Some examples of Enzyme mechanisms | √ | | | | | √ | | | | √ | | | | √ |
| 7 | Clinical correlation of enzyme action | √ | | | | | | √ | | | √ | | √ | | |
| 8 | Clinical correlation of enzyme action | √ | | | | | | √ | | | √ | | | √ | √ |
| 9 | Enzyme inhibition | √ | | | | | √ | | | | √ | | √ | √ | √ |
| 10 | Enzyme regulation | √ | | | | | | √ | | | | √ | √ | | √ |
| 11 | RNA and some antibodies as enzymes | √ | | | | | √ | | | | | √ | √ | √ | |
| 12 | Application of enzyme | √ | | | | | √ | | | | | √ | | √ | √ |
| 13 | Enzyme immobilization and it kinetics | √ | | | | | √ | | | | | | √ | | √ |
| 14 | Revision | √ | | | | | | | | | | | √ | √ | √ |
| | **Metabolism** | | | | | | | | | | | | | | |
| 1 | Introduction to Metabolism | √ | | | | | | | √ | | | | √ | | √ |
| 2 | Regulation of Glycolitic pathway | √ | | | | | | | √ | | | | √ | √ | |
| 3 | Regulation of carbohydrate anabolism | √ | | | | | | | √ | | | | | √ | √ |
| 4 | Clinical correlation of carbohydrate metabolism | | | √ | | | | | √ | | | | √ | √ | √ |
| 5 | Metabolism of some sugar | √ | | | | | | | √ | | | | √ | √ | |
| 6 | Abnormal sugar metabolism | | | √ | | | | | √ | | | | √ | √ | √ |
| 7 | Lipid catabolism | | | √ | | | | | √ | | | | √ | √ | √ |
| 8 | Energy producing from fatty acid catabolism | | | √ | | | | | √ | | | | | | √ |
| 9 | Lipid anabolism | √ | | | | | | | √ | | | | | √ | √ |
| 10 | Cholesterol synthesis | √ | | √ | | | | | √ | | | | √ | | √ |
| 11 | Prostaglandins | | | √ | | | | | √ | | | | √ | √ | |
| 12 | Carbohydrate and lipids in fed state | | | √ | | | | | √ | | | | √ | √ | √ |
| 13 | Carbohydrate and lipids in Starved state | √ | | | | | | | √ | | | | | | √ |
| 14 | Revision | √ | | | | | | | √ | | | | √ | √ | √ |
| | **Toxicology** | | | | | | | | | | | | | | |
| 1 | Principles of toxicology | | | | √ | | | | | √ | | | √ | | |
| 2 | Types of toxins | | | | √ | | | | | √ | | | | √ | √ |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 | Pharmatokinetics in Toxicology | | | | √ | | | | | √ | | | | | √ |
| 4 | Teratogenesis | | | | √ | | | | | √ | | | √ | √ | √ |
| 5 | carcinogenesis mutagenesis and Ames test | | | | √ | | | | | √ | | | √ | √ | √ |
| 6 | Biotransformation of xenobiotics | | | | √ | | | | | √ | √ | | √ | | |
| 7 | Biotransformation of xenobiotics | | | | √ | | | | | √ | √ | | √ | | √ |
| 8 | cytochrome P450 mechanism | | | | √ | | | | | √ | √ | | | | √ |
| 9 | Toxic response | | | | √ | | | | | √ | √ | | √ | √ | √ |
| 10 | Genetics of Toxicology | | | | √ | | | | | √ | | | | √ | √ |
| 11 | Clinical Pathology of Toxicology | | | | √ | | | | | √ | | | √ | √ | |
| 12 | Metal Toxicity | | | | √ | | | | | √ | | | √ | | √ |
| 13 | Pesticides | | | | √ | | | | | √ | | | | | |
| 14 | Revision | | | | √ | | | | | √ | | | | | |
| | **Cancer Biology** | | | | | | | | | | | | | | |
| 1 | What is cancer? Evidence suggests that cancer is a genetic disease at the cellular level. Cell cycle. | | | | √ | | | √ | | | | | | | √ |
| 2 | Oncogenes<br>Growth factors, receptor and nonreceptor protein-tyrosine and protein serine/threonine kinases. | | | | √ | | | √ | | | | | √ | | √ |
| 3 | Membrane-associated G proteins, nuclear transcription factors. | | | | √ | | | √ | | | | | √ | √ | √ |
| 4 | The retinoblastoma gene and protein.<br>Mutations in the RB pathway and cancer. | | | | √ | | | √ | | | | | √ | √ | √ |
| 5 | The p53 pathway.<br>Mutation in p53 pathway and cancer. | | | | √ | | | √ | | | | | √ | | √ |
| 6 | Telomeres, telomerase and cancer.<br>Apoptosis and cancer. | | | | √ | | | √ | | | | √ | √ | √ | |
| 7 | Retroviruses and cancer<br>DNA tumor viruses. | | | | √ | | | √ | | | | √ | √ | √ | √ |
| 8 | Metastasis. | | | | √ | | | √ | | | | √ | √ | √ | √ |
| 9 | Evidence for a role of epigenetics in carcinogenesis. | | | | √ | | | √ | | | | √ | √ | √ | |
| 10 | Chemicals and radiation as carcinogens.<br>Nutrients, hormones and gene interactions. | | | | √ | | | √ | | | | √ | √ | √ | |
| 11 | Tumor markers Definition, methods of evaluating tumor markers, PSA as marker of prostate cancer. | | | | √ | | | √ | | | | | √ | | |
| 12 | Tumor markers<br>CA 15-3, CA 549 as markers of breast cancer. CA 125, CA 19.9, | | | | √ | | | √ | | | | | √ | √ | √ |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CEA, AFP, hCG, NSE. | | | | | | | | | | | | | | |
| 13 | Cancer therapeutic strategies. Cancer vaccines. | | | | √ | | | √ | | | | | | √ | √ |
| 14 | Review | | | | | | | √ | | | | | √ | √ | |

### Learning and Teaching Methods

| Learning Method | Course outcomes ILOs | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | | Intellectual Skills | | | | | Professional and Practical Skills | | | | | General and Transferable Skills | | | | |
| | A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 | B4 | | C1 | C2 | | | | D1 | D2 | D3 | | |
| Lecture | √ | √ | | | √ | | √ | √ | √ | | √ | √ | | | | √ | √ | √ | | |
| Discussion (Brain Storming) | | √ | | √ | | √ | | | √ | | √ | √ | | | | √ | √ | √ | | |
| Self-learning (Essay) | √ | | √ | √ | | √ | √ | √ | | | √ | √ | | | | √ | √ | √ | | |
| Field Trips | | | | | | | | | | | | | | | | | | | | |
| Practical | | | | | | | | | | | √ | √ | | | | | | | | |

### Assessment Methods

| Assessment Methods | Course outcomes ILOs | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | | Intellectual Skills | | | | | Professional and Practical Skills | | | | | General and Transferable Skills | | | | |
| | A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 | B4 | | C1 | C2 | | | | D1 | D2 | D3 | | |
| Essay Question | √ | √ | √ | | | | √ | √ | √ | | √ | | | | | | | | | |
| MCQ | √ | | | | √ | √ | √ | | √ | | √ | | | | | | | | | |
| Student Activity | | | √ | | | | | √ | √ | | √ | √ | | | | √ | √ | √ | | |
| Practical | | | | | | | | | | | √ | √ | | | | | | | | |

| | Course Coordinator | Head of Department |
|---|---|---|
| Name (Arabic) | أ.د. طارق مصطفى محمد | أ. د / الرفاعي صبحي قناوي |
| Name | Prof. Tarek Mostafa Mohamed | Prof. El-Refaie Kenawy |
| Signature | …………………………… | …………………………… |
| | 9/2014 | 9/2014 |

| | | |
|---|---|---|
| Course Title | **Vitamins, Hormones and Nutrition (Hormones, Natural product, Nutrition and Immunology)** | |
| Course Code | **1333** | |
| Academic Year | **201٤/201٥** | |
| Coordinator | **Prof. Ehab M. Mohamed** | |
| Other Staff | **Prof. Ahmed Safan , Prof. Mohamed Labib, Prof. Tarek M. Ali** | |
| Semesters | **Two Semesters** | |
| Pre-Requisite | **B.Sc. in Biochemistry** | |
| Course Delivery | **Lecture** | **2h/week** |
| Parent Department | **Chemistry** | |
| Date of Approval | **September, 201٤** | |

### 1. Aims:

The aim of this course is to provide the student with knowledge of theories and concepts of Natural product, Hormones, Nutrition and Immunology

### 2. Intended Learning outcomes

***A. Knowledge and understanding:***

By the end of this course the students will be able to:

A1. Recognize the integration, control of reproduction, normal body function through endocrine signaling.

A2. Indicate the types of natural products and their mechanisms

A3. Describe the endocrine systems and Mechanism the hormone action.

A4. Identify the role of antibiotics and complement in host defense.

A5. Recognize the prevention and early diagnosis of immune diseases

***B. Intellectual skills:***

The students will acquire the ability;

B1. Evaluate the role of all leukocytes in host defense and Assess the knowledge and understanding of endocrine systems

B2. Apply their knowledge and understanding in integration cell signaling and Immunological

B3. Specify the types of healthy nutrients

B4. Distinguish the relation between natural product with nutrition and disease

***C. Professional and practical skills:***

C1. Plan and conduct various forms of research for essays and projects involving sustained independent enquiry.

C2. Access and interpret primary and secondary sources of information.

***D. General and transferable skills:***

D1. Give oral presentation.

D2. Use electronic resources to obtain interpretation

D3. Self- and continuous learning.

## 3. Contents

| | |
|---|---|
| **Part- 1** | **Hormones** (An hour /week for one Semester) |
| Lecture 1 | General mechanisms of hormone action<br>Growth hormone (synthesis and structure, the GH receptor, physiologic and biomedical actions, pathophysiology). |
| Lecture 2 | Prolactin (synthesis and structure, the prolactin receptor, |
| Lecture 3 | physiologic and biomedical actions, pathophysiology),<br>chorionic somatomammotropin. |
| Lecture 4 | Thyroid-stimulating hormone, luteinizing hormone. |
| Lecture 5 | Follicle-stimulating hormone, chorionic gonadotropin. |
| Lecture 6 | Vasopressin, oxytocin. |
| Lecture 7 | The pro-opiomelanocortin peptide family (ACTH, LPH, MSH). |
| Lecture 8 | The pro-opiomelanocortin peptide family (ACTH, LPH, MSH) (Cont'd). |
| Lecture 9 | Thyroid hormones |
| Lecture 10 | Thyroid hormones (Cont'd). |
| Lecture 11 | Internalization of Receptors. |
| Lecture 12 | Intracellular action: Protein kinase. |
| Lecture 13 | Insulin and glucagon. |
| Lecture 14 | Revision |
| **Part- 2** | **Natural products** (An hour /week for one Semester) |
| Lecture 1 | The Chemistry of antibiotics |
| Lecture 2 | The role of isopencillin N-synthase |
| Lecture 3 | Heteropolysaccharides |
| Lecture 4 | Mucoplysacchrides |
| Lecture 5 | Aldobiuronic acid of pneumococcus |
| Lecture 6 | Thiamine |
| Lecture 7 | Glycerolipids |
| Lecture 8 | Flavonoids |
| Lecture 9 | Methods of extraction of flavonoids |
| Lecture 10 | Synthesis of oligoribonucleotide |
| Lecture 11 | Surfactant |
| Lecture 12 | Custom surface of fragment of nucleic acid |
| Lecture 13 | Biosynthesis and function of cAMP |
| Lecture 14 | Revision |
| **Part- 3** | **Nutrition** (An hour /week for one Semester) |
| Lecture 1 | Introduction of Digestion and absorption |
| Lecture 2 | Clinical correlation of Digestion and absorption |
| Lecture 3 | Energy metabolism |
| Lecture 4 | Composition of micronutrient in diet |

| | |
|---|---|
| Lecture 5 | Clinical correlation of diet requirements |
| Lecture 6 | Dietary fat |
| Lecture 7 | Fibers |
| Lecture 8 | Nutrients and antioxidant |
| Lecture 9 | Metabolic adaptation |
| Lecture 10 | Micronutrients |
| Lecture 11 | Trace minerals |
| Lecture 12 | Assessment of nutritional state in clinical practice |
| Lecture 13 | Nutritional of the elderly |
| Lecture 14 | Revision |
| **Part- 4** | **Immunology** (An hour /week for one Semester) |
| Lecture 1 | Introduction to immunology |
| Lecture 2 | Immunological cell system |
| Lecture 3 | Antigen Antibodies interaction |
| Lecture 4 | Triggering of immune response |
| Lecture 5 | Primary Organs of immune response |
| Lecture 6 | 2ry organs of immune response |
| Lecture 7 | Type I and II of Hypersensitivity |
| Lecture 8 | Type III and IV of Hypersensitivity |
| Lecture 9 | Autoimmunity |
| Lecture 10 | AIDS and defense mechanisms |
| Lecture 11 | Transplantation mechanisms |
| Lecture 12 | Transplantation mechanism |
| Lecture 13 | Immunological application |
| Lecture 14 | Revision |

## 4. Teaching and Learning Methods

4.1 Theoretical Lecture
4.2 Practical classes.
4.3 Library and net search
4.4 Assignments.

## 5. Student Assessment

| Assessment Method | Skills assessed* | Assessment Length | Weight |
|---|---|---|---|
| Written Examination | KU, I | 3 Hour Examination | 100% |

*KU: Knowledge and Understanding, I: Intellectual, P: Professional.

## 6. List of references

*Essential Books:*

- Harper's Biochemistry, Robert K. Murray, Daryl K. Granner, Peter A. Mayes, and Victor W. Rodwell, Appleton & Lange, twenty five edition, 2000.
- Text Book of Biochemistry. Devli, TM. Fifth edition. Willy Liss . 2008

*Recommended Books:*

- Benjammini, E and Leskowitz (2006). Immunology a short course 4th ed. Willy-liss pub
- Abbas, A. K., Lichtman, A. H. and Pober, J. S. (2008). Cellular Molecular Immunology. 3rd ed. W. B. Saunders comp.

## 7. Facilities required for teaching and learning

Over-head projector, well equipped teaching classes himself

Course Matrix

| | Courses | Knowledge and Understanding | | | | | Intellectual Skills | | | | Professional Skills | | General Skills | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Hormone** | A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 | B4 | C1 | C2 | D1 | D2 | D3 |
| 1 | General mechanisms of hormone action<br>Growth hormone (synthesis and structure, the GH receptor, physiologic and biomedical actions, pathophysiology). | √ | | | | | | √ | | | | | | √ | √ |
| 2 | Prolactin (synthesis and structure, the prolactin receptor, | | √ | | | | | √ | | | | | √ | | |
| 3 | physiologic and biomedical actions, pathophysiology), chorionic somatomammotropin. | √ | | | | | | √ | | | | | √ | √ | √ |
| 4 | Thyroid-stimulating hormone, luteinizing hormone. | √ | | | | | | √ | | | | | | | √ |
| 5 | Follicle-stimulating hormone, chorionic gonadotropin. | √ | | | | | | √ | | | √ | | √ | √ | √ |
| 6 | Vasopressin, oxytocin. | √ | | | | | | √ | | | √ | | √ | | √ |
| 7 | The pro-opiomelanocortin peptide family (ACTH, LPH, MSH). | √ | | | | | | √ | | | √ | | | √ | √ |
| 8 | The pro-opiomelanocortin peptide family (ACTH, LPH, MSH) (Cont'd). | √ | | | | | | √ | | | √ | | √ | √ | √ |
| 9 | Thyroid hormones | √ | | | | | | √ | | | √ | | √ | | √ |
| 10 | Thyroid hormones (Cont'd). | √ | | | | | | √ | | | | | | | √ |
| 11 | Hormones that regulate calcium metabolism. | | √ | | | | | √ | | | | | √ | √ | |
| 12 | Hormones that regulate calcium metabolism (Cont'd). | | √ | | | | | √ | | | | | √ | √ | √ |
| 13 | Insulin and glucagon. | √ | | | | | | √ | | | | | | √ | √ |
| 14 | Revision | √ | | | | | | √ | | | | | √ | | |
| | **Natural product** | | | | | | | | | | | | | | |
| 1 | The Chemistry of antibiotics | | √ | | | | | | | √ | | | √ | | √ |
| 2 | The role of isopencillin N-synthase | | √ | | | | | | | √ | | | √ | √ | √ |
| 3 | Heteropolysaccharides | | √ | | | | | | | √ | | | √ | | |
| 4 | Mucoplysacchrides | | √ | | | | | | | √ | | | | | √ |
| 5 | Aldobiuronic acid of pneumococcus | | √ | | | | | | | √ | | | | √ | √ |
| 6 | Thiamine | | √ | | | | | | | √ | | | √ | √ | |
| 7 | Glycerolipids | | √ | | | | | | | √ | | √ | √ | √ | √ |
| 8 | Flavonoids | | √ | | | | | | | √ | | √ | √ | √ | √ |
| 9 | Methods of extraction of flavonoids | | √ | | | | | | | √ | | √ | √ | | √ |
| 10 | Synthesis of oligoribonucleotide | | √ | | | | | | | √ | | √ | √ | √ | |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 11 | Surfactant | √ | √ | | | | | | | √ | | | √ | √ | √ |
| 12 | Custom surface of fragment of nucleic acid | √ | | | | | | | | √ | | | | | √ |
| 13 | Biosynthesis and function of cAMP | √ | | | | | | | | √ | | | | √ | √ |
| 14 | Revision | | | | | | | | | | | | √ | | |
| | **Nutrition** | | | | | | | | | | | | | | |
| 1 | Introduction of Digestion and absorption | √ | | | | | | | √ | | | | √ | | √ |
| 2 | Clinical correlation of Digestion and absorption | √ | | | | | | | √ | | | | √ | √ | √ |
| 3 | Energy metabolism | √ | | | | | | | √ | | | | √ | | |
| 4 | Composition of micronutrient in diet | | √ | | | | | | | √ | | | | | √ |
| 5 | Clinical correlation of diet requirements | | √ | | | | | | | √ | | √ | | √ | √ |
| 6 | Dietary fat | | √ | | | | | | | √ | | √ | √ | √ | |
| 7 | Fibres | | √ | | | | | | √ | | | √ | √ | √ | √ |
| 8 | Nutrients and antioxidant | √ | | | | | | | √ | | | √ | √ | √ | √ |
| 9 | Metabolic adaptation | √ | | | | | | | √ | | | √ | √ | | √ |
| 10 | Micronutrients | √ | | | | | | | √ | | | | √ | √ | |
| 11 | Trace minerals | √ | | | | | | | √ | | | | √ | √ | √ |
| 12 | Assessment of nutritional state in clinical practice | √ | | | | | | | √ | | | | | | √ |
| 13 | Nutritional of the elderly | √ | | | | | | | √ | | | | | √ | √ |
| 14 | Revision | √ | | | | | | | √ | | | | √ | | |
| | **Immunology** | | | | | | | | | | | | | | |
| 1 | Introduction to immunology | | | | √ | | √ | | | | √ | | | | |
| 2 | Immunological cell system | | | | √ | | √ | | | | √ | | | | |
| 3 | Antigen Antibodies interaction | | | | √ | | √ | | | | √ | | | √ | |
| 4 | Triggering of immune response | | | | √ | | √ | | | | √ | | | √ | |
| 5 | Primary Organs of immune response | | | | √ | | √ | | | | √ | | | √ | |
| 6 | 2ry organs of immune response | | | | | √ | | √ | | | √ | | | √ | |
| 7 | Type I and II of Hypersensitivity | | | | | √ | | √ | | | | √ | √ | | |
| 8 | Type III and IV of Hypersensitivity | | | | | √ | | √ | | | | √ | √ | | |
| 9 | Autoimmunity | | | | | √ | | √ | | | | √ | √ | | |
| 10 | AIDS and defence mechanisms | | | | | √ | | √ | | | | √ | √ | | |
| 11 | Transplantation mechanisms | | | | | √ | | √ | | | | √ | √ | | |
| 12 | Transplantation mechanism | | | | | √ | | √ | | | | √ | √ | | |
| 13 | Immunological application | | | | | √ | | √ | | | | √ | | | |
| 14 | Revision | | | | | √ | | √ | | | | | | | |

## Learning and Teaching Methods

| Learning Method | Course outcomes ILOs | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | | Intellectual Skills | | | | | Professional and Practical Skills | | | | | General and Transferable Skills | | | | |
| | A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 | B4 | | C1 | C2 | | | | D1 | D2 | D3 | | |
| Lecture | √ | √ | | √ | √ | √ | √ | | | | √ | √ | | | | √ | √ | √ | | |
| Discussion (Brain Storming) | | √ | | | √ | √ | | | √ | | √ | √ | | | | √ | √ | √ | | |
| Self-learning (Essay) | √ | | √ | √ | √ | √ | √ | √ | | | √ | √ | | | | √ | √ | √ | | |
| Field Trips | | | | | | | | | | | | | | | | | | | | |
| Practical | | | | | | | | | | | √ | √ | | | | | | | | |

## Assessment Methods

| Assessment Methods | Course outcomes ILOs | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Knowledge and Understanding | | | | | Intellectual Skills | | | | | Professional and Practical Skills | | | | | General and Transferable Skills | | | | |
| | A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 | B4 | | C1 | C2 | | | | D1 | D2 | D3 | | |
| Essay Question | √ | √ | √ | | √ | √ | √ | √ | √ | | √ | √ | | | | | | | | |
| MCQ | √ | | | | √ | √ | √ | | | | √ | | | | | | | | | |
| Student Activity | | √ | √ | | | | | √ | √ | | √ | √ | | | | √ | √ | √ | | |
| Practical | | | | | | | | | | | √ | √ | | | | | | | | |

| | Course Coordinator | Head of Department |
|---|---|---|
| Name (Arabic) | أ.د/ ايهاب مصطفى محمد | أ. د / الرفاعي صبحي قناوي |
| Name | Prof.Ehab M. Mohamed | Prof. El-Refaie Kenawy |
| Signature | …………………………… | ………………………………… |
| | 9/2014 | 9/2014 |

| Course Title | **Computer** | |
|---|---|---|
| Course Code | 1317 | |
| Academic Year | **201٤/201٥** | |
| Coordinator | **Prof. Mahmoud Kamel** | |
| Other Staff | **Prof. Mahamed El-Awady, Mohmed Ghoneim, Prof. Qadry Zakaria, Prof Mahmoud Kamel, Prof Saad Abo elenen** | |
| Semesters | **Two Semesters** | |
| Pre-Requisite | **B.Sc.** | |
| Course Delivery | **Lecture** | **1h/week** |
| | **Practical** | **1h/week** |
| Parent Department | **Computer Centre** | |
| Date of Approval | **September, 201٤** | |

**1. Aims**

This course will enable students to acquire a range of transferable skills that are important for post graduate M. Sc. students to:

- Develop their capability for information retrieval and presentation, and proficiency in the use of IT effectively in the context of their studies.
- Underpin academic work throughout postgraduate studies.
- Provide opportunities to develop skills required for team working, oral presentation of scientific material, and career choices.

***A. Knowledge and Understanding:***

Upon successful completion of this course the students should be able to:

A15. Demonstrate knowledge and understanding of the use of IT in the context of their postgraduate studies.

A16. Know the diverse media and hardware and software that help to benefit of the IT in the context of the postgraduate studies.

A17. Carry out necessary graphical, statistical and frequency analyses of different types of data.

A18. Create powerful presentation using sophisticated software packages.

A19. Make use of different internet resources.

A20. Solve scientific problems using computer programming.

A21. Make use of different photo enhancing and manipulation techniques.

***B. Intellectual skills:***

They should also acquire the ability to:

B4. Integrate different application programs to develop effective information analysis and presentation.

***C. Professional and practical skills:***

C1. Use a number of computer packages to present information.

***D. General and transferable skills:***

D4. Use the internet/electronic resources to obtain subject specific information, and to develop lifelong learning skills that can be applied to suitable research problems.

**3. Contents**

Lectures 1-5 **Assignment 1** : **Information technology**

Types and generations of computers

Hardware and Software computer structure
Types and development of operating systems
Working with windows
File and folder manipulations

Lectures 6-12 **Assignment 2** : **Using PowerPoint program**
Working with PowerPoint program
Insert slides and animations
Different methods of slide editing
Insert tables ,charts, video, pictures, hyperlinks ,web pages and different objects
Design a real and powerful presentation with different acquired skills

Lecture 13-18 **Assignment 3** : **Using Access program**
Working with Access program
Define data and information
Creating data base tables , sorting and filtering records and fields
Creating different types of queries to extract useful information
Creating forms for data entries and calculations
Creating and printing final reports

Lecture 19-23 **Assignment 4: Using the Internet**
Define different types of protocols and network
Different levels of internet connections
Email and methods of file transfer
Use of internet capabilities and searching engines
Life search on the internet for some real information

Lecture 24-28 **Assignment 5**: Programming using Visual Basic 6
Different types of computer languages
Concept of visual programming language
Working with visual basic language
Steps necessary for creating a project with visual basic
Solving real problems using a visual basic computer language

**4. Teaching and Learning Methods**

- Lectures
- Practical classes
- Assignments

The course is delivered through lectures, practical sessions and assignments. Team working skills are developed on a week-long laboratory exercises and the students present and defend their findings in a public seminar.

**5. Student Assessment**

| **Assessment Method** | **Skills assessed*** | **Assessment Length** | **Schedule** | **Proportion** |
|---|---|---|---|---|
| Written Examination | KU, I | 1 Hour Examination | Term Final | 60% |

| | | | | |
|---|---|---|---|---|
| Practical Examination | KU, I | 1 Hour Examination t | Term Final | 30% |
| Semester work | P, T | Continuous Assessment | | 10% |

*KU: Knowledge and Understanding, I: Intellectual, P: Professional, T: Transferable

**6. List of references**

*Course notes:*

- Notes given to students at each section describe the tasks to be completed, therefore no particular book(s) recommended.

**7. Facilities required for teaching and learning**

- Projectors; Video and Overhead
- LCD screens and writing Boards
- Commercial computer scientific software packages.

Course Contents – Course ILOs Matrix

**Course code: 1317 Chemistry, course title: Computer**

| Course Contents | | Course outcomes ILOs | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Knowledge and Understanding | | | | | | | | | | Intellectual | | | | | Practical | | | | | Transferable | | |
| | | A1 | A2 | A3 | A4 | A5 | A6 | A7 | A8 | A9 | A10 | B1 | B2 | B3 | B4 | B5 | C1 | C2 | C3 | C4 | C5 | D1 | D2 | D3 |
| Week #1-2 | | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #3-4 | | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #5-6 | | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #7-8 | | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #9-10 | | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #11-12 | | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #13-14 | | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #14-15 | | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #16-17 | | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #18- | | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |

| Course Contents | | Course outcomes ILOs | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Knowledge and Understanding | | | | | | | | | | Intellectual | | | | | Practical | | | | | Transferable | | |
| | | A1 | A2 | A3 | A4 | A5 | A6 | A7 | A8 | A9 | A10 | B1 | B2 | B3 | B4 | B5 | C1 | C2 | C3 | C4 | C5 | D1 | D2 | D3 |
| 19 | | | | | | | | | | | | | | | | | | | | | | | | |
| Week #20-21 | | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #22-23 | | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #24-25 | | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #26-27 | | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |
| Week #28 | | ☒ | ☒ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☒ | ☒ | ☐ | ☐ | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | ☐ | ☐ |

| | Course Coordinator | Head of Department |
|---|---|---|
| Name | Prof. Mahmoud M. Kamel | **Prof. El-Sayed T. Rizk** |
| Name (Arabic) | أ.د.محمود مصطفى كامل | أ.د. السيد طه رزق |
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