Faculty of Sciences

{ Program in Biology }

The Department of Biological Sciences, established in 1977, offers undergraduates a practical knowledge of living matter on the cellular organism and population levels. Fundamental subjects, such as cell biology, genetics, physiology, microbiology, biochemistry, and ecology, are supplemented by a wide variety of elective courses. All these courses combined prepare students for future careers in teaching, research, and work in industry, agriculture and public health.

In addition, the Department offers an undergraduate biotechnology program as a minor. In this program, students learn basic and applied biotechnology techniques including techniques in molecular biology, bioinformatics, genetic engineering, enzyme and protein production, and industrial production of pharmaceutical products. This program is very beneficial as it prepares students to apply different biotechnology techniques in medicine, agriculture, immunology, pharmacy and other fields.

In addition to its undergraduate programs in biology and biotechnology, the Department offers a graduate program under the supervision of a highly qualified staff to offer the Masters Degree.

Department Vision

Provide undergraduate students with the essential requirements for a comprehensive undergraduate education in various biological disciplines to produce knowledgeable and competitive graduates who can advance to professional fields or graduate programs, or enter employment in the public and private sectors.

Department Mission

Provide an outstanding learning environment that integrates distinguished education and research and actively engages students in the biological sciences and prepares them for careers in research and teaching in modern biology and biotechnology.

Graduation Requirements

To earn a B.Sc. degree in biology, the student must successfully complete **126** credit hours. These include university compulsory courses as well as department compulsory and elective courses.

1. University compulsory courses 18 credit hours
2. Department compulsory courses 90 credit hours
3. Department elective courses 18 credit hours

General Program Intended Learning Outcomes

- Acquire fundamental and practical knowledge of biological sciences.
- Generate new ideas using fundamental knowledge in biological sciences.
- Communicate scientifically (orally and in writing) regarding concepts and arguments in biological sciences.
- Solve problems using scientific approach in their field of specialization.
- Work collaboratively as individuals and in teams.
- Apply high ethical standards in professional practice and social interactions for sustainable development.

Department compulsory courses

Course #	Course Title	Credits	Prerequisite
10201101	General Biology I	3	
10201102	General Biology II	3	10201101
10201107	General Biology I Lab.	1	10201101, or concurrent with 10201101
10201108	General Biology II Lab.	1	10201107; 10201102; or concurrent with 10201102
10211106	General Mathematics for Biology Students	3	
10221104	General Physics for Medical and Biology Students	3	
10221114	General Physics for Medical and Biology Students Lab	1	10221104 or concurrently
10231101	General Chemistry I	3	
10231102	General Chemistry II	3	10231101
10231107	General Chemistry I Lab.	1	
10231108	General Chemistry II Lab.	1	10231107
10231212	Analytical Chemistry	3	10231102 10231108
10231216	Practical Analytical Chemistry	1	10231212 or concurrently
10231233	Organic Chemistry	3	10231102 ;10231108
10231237	Practical Organic Chemistry	1	10231233
10201232	Genetics	3	10201102 ;10201108
10201311	Biochemistry	4	10231233
10201310	Biochemistry Lab.	0	10201311 or concurrently
10201341	Microbiology	4	10201102
10201340	Microbiology Lab.	0	10201341 or concurrently
10201423	Histology and Comparative Anatomy	4	10201321
10201424	Histology and Comparative Anatomy Lab.	0	10201423 or concurrently
10201372	Ecology	3	10201102 10201108
10201373	Ecology Lab.	0	10201372 or concurrently
10201352	Plant Anatomy and Physiology	3	10201254
10201353	Plant Anatomy and Physiology Lab.	0	10201352
10201362	Animal Physiology	3	10201264
10201365	Animal Physiology Lab.	0	10201362
10201254	Botany	4	10201102; 10201108
10201257	Botany Lab.	0	10201254 or concurrently
10201264	Zoology	4	10201102 10201108
10201260	Zoology Lab.	0	10201264 or concurrently

Course #	Course Title	Credits	Prerequisite
10201405	Developmental Biology	3	10201392; 10201264
10201400	Developmental Biology Lab.	0	10201405 or concurrently
10201496	Graduation Project	2	Department approval
10201321	Cell Biology	3	10201311
10216237	Biostatistics for Biology Students	2	
10206392	Molecular Biology	3	10201232; 10201321
10206410	Bioinformatics	2	10206392
10206411	Bioinformatics Lab.	0	10206410
10512182	Methods for Science Teaching	3	
10201492	Seminar	0	Department Approval
10201347	Immunology	3	10201341
10201348	Immunology Lab.	0	10201347
10201448	Practical Training	6	
Total		90	

Department elective courses

Course #	Course title	Credits	Prerequisite
10201364	Parasitology	3	10201102 ;10201108
10201366	Parasitology Lab.	0	10201364 or concurrently
10206346	Fermentation and Industry	3	10201341
10201344	Medical Microbiology	3	10201341
10201462	Endocrinology	3	10201362
10201442	Mycology	3	10201341
10201443	Mycology Lab.	0	10201442 or concurrently
10206490	Recombinant DNA Technology	3	10206393
10206488	Recombinant DNA Technology Lab.	0	10206490 or concurrently
10206323	Plant Cell Culture	3	10201321; 10201341
10206325	Plant Cell Culture Lab.	0	10206323 or concurrently
10201444	Virology	3	10206341
10201481	Special Topics	3	Department approval
10206413	Protein Purification	2	10201311
10201222	Microtechnique	3	10201102; 10201108
10201220	Microtechnique Lab.	0	10201222
10206324	Animal Cell Culture	2	10201321; 10201341
10206326	Animal Cell Culture Lab.	0	10206324
10201256	Plant Taxonomy	3	10201254
10201258	Plant Taxonomy Lab.	0	10201256
Total		18	

Course Descriptions

10201101 General Biology I

This course is a discussion of biological activity on the level of the cell, including cell structure, chemical constituents, architecture, material exchange with the environment, the role of the cell membrane, major energy generating biochemical pathways, cellular respiration, photosynthesis, control of cellular activities and basic concepts in genetics.

10201102 General Biology II

This course is a discussion of biological activity on the level of the organism, including structure and function of body parts, and responses of organisms to their biological and physical environments.

10201107 Practical General Biology I

This course provides students with scientific background and practical procedures for the various experiments on biological principles discussed in General Biology I.

10201108 Practical General Biology II

This course provides students with scientific background and practical procedures for the various experiments on biological principles discussed in General Biology II.

10201232 Genetics

Students study the principles of classical genetics and the molecular basis of inheritance in terms of structure, function and changes in genetic material in viruses, bacteria and higher organisms; transmission and expression of genetic material; recombinant DNA and bioengineering.

10201254 Botany

This course introduces students mainly to the dominant plants on our planet: the seed vascular non-flowering and flowering plants. General comparison of the vascular plants to the lower groups of the algae, fungi and non-vascular plants will be held in this course to understand the evolutionary features of the vascular plants. Plant development and important plants to human (economical, medicinal, food, and different phytogeography in Palestine) will be considered.

10201264 Zoology

This course is a survey of the animal kingdom with an emphasis on its history and organization. Particular attention is paid to special structures and mechanisms evolved by selected representatives of major phyla for solving problems of life in various environments.

10201311 - Biochemistry

This course covers fundamentals of biochemistry including structure and properties of bimolecular with special emphasis on proteins, enzymatic catalysis, membrane assembly and function and introduction to bioenergetics.

10201321 Cell Biology

Topics covered include structure and function of cells and organelles, including membrane structure and transport; bioenergenetics of mitochondria and chloroplasts; cell motility; DNA replication; protein synthesis and transport; mitosis and meioses. In addition, the course touches on various modern techniques used in cell biology.

10206323 Plant Cell Culture

This course covers the principles of plant cell, tissue and organ culturing techniques used to regenerate whole plants from different types of explants. Laboratory experience is gained in preparation of culture media supplemented with different plant growth regulators, and their influence on in vitro micropropagation of different plant species.

10206324 - Animal Cell Culture

This course illustrates the use of basic cell culture techniques for bioscience research. Students are introduced to cell cultivation methods, including proper use of a biological safety cabinet, sterile technique, cell enumeration and media preparation, primary cultures, cultivation of cell lines, detection of contamination, cryopreservation, transfection. The course ends with an introduction to bioassays and application of molecular techniques to in vitro situations.

10201341 Microbiology

This course covers morphology, physiology, classification, and cultivation of bacteriabio. This course focuses on biological (especially microbiological) systems by which materials and energy can be interconverted (e.g., waste products into useful chemicals or fuels, or antibiotic production). Manipulation of microorganisms capable of producing high value industrial substances is also discussed.

10201347 Immunology

This course aims at understanding the mechanisms of the immune system with special focus on antigen antibody structure and function, cells and

tissues of immune system, lymphocyte activation and specificity; effector mechanisms; complements, major histocompatibility complexes, B- and T-cell receptors. It also provides a background to the functions of innate and adaptive immunity (cellular and humoral), genetics of immune system, vaccines, autoimmunity, hypersensitivity, with an emphasis on some basic techniques used in immunology.

10201352 Plant Anatomy and Physiology

Plant anatomy and physiology is the study of plants' different function related to their anatomical features. This course teaches what plants do, and what chemical and physical factors cause plants to respond as they do in their environment. During this course, we will explore several important processes which allow plants to survive in their environment. Structure-function relationships will be emphasized, in addition to ecological implications of the physiological process under investigation.

10201256 Plant Taxonomy

Plant taxonomy is the science of plant classification. Systematics is the science of organisms' diversity. It entails the discovery, description and interpretation of biological diversity. Plant Taxonomy course is a systematic overview of the plant kingdom focusing on the classification and identification of unknown plant specimens. This course is designed to provide students with the basic understanding of the plant vegetative and reproductive terminology used in plant identification of the flowering plants. This course will provide students with working knowledge and common recognition of the most common flowering plant families of Palestine and neighboring regions.

10201362 Animal Physiology

This course is a study of functions of the major tissue types and organ systems of multicellular animals, with emphasis on human physiology in health and disease. The use of invertebrate and vertebrate animal models in research, and comparisons of functional adaptations in non-human systems will also be covered.

10201364 Parasitology

This course is designed to explore the various aspects of parasitology. Emphasis will be placed on the life cycles of major parasitic organisms attacking humans and animals.

10201372 Ecology

This course is an introduction to fundamentals of ecology and principles related to populations, communities and ecosystems. Particular emphasis is placed on the many dimensions of interdependence within ecosystems.

10206392 Molecular Biology

This course is a study of gene structure, function and control at the molecular level. Molecular techniques used to analyze nucleic acid and protein activity and diversity are also discussed.

10206393 Techniques in Molecular Biology

This laboratory course aims at applying molecular techniques to investigate a variety of biological questions. Techniques include cloning, DNA/Protein fingerprinting, RFLP, Blotting, PCR, and DNA sequencing.

10201405 - Developmental Biology

This course is a detailed survey of the processes of animal development, including fertilization, cleavage and organogenesis. Emphasis is placed on current techniques for studying development, such as recombinant DNA technology.

10206410 Bioinformatics

Bioinformatics is the science of storing, extracting, organizing, analyzing, and interpreting biological sequence data. The course is designed to introduce the most basic concepts and up-to-date developments, methods, and tools used in bioinformatics. Topics include bioinformatics databases, resources at NCBI and EBI, sequence and structure alignment, file formats, analysis of single DNA and protein sequences, BLAST, primer design, function predictions, phylogenetics, and protein structure prediction. Internet laboratory for teaching the databases and data mining tools will be considered.

10206412 Nanobiology

Nanobiology can be considered the intersection of biology and nanotechnology. Much of nanobiology involves using the tools and techniques of molecular biology to manipulate and analyze nucleic acids and proteins. This course introduces students to biological molecules and self-assembled biological nanostructures and nanomachines. Biological systems provide a rich range of examples of specialized chemical systems that are structured on the nanoscale, Nanofibres, microtubules, viruses, and ribosomes are examples of systems that can be studied from the perspective of nanoscience.

10206413 Protein Purification

This is a laboratory course in protein isolation and purification techniques.

10201222 Microtechnique

Students, in this course, will learn about the basic principles and techniques for the preparation of microscopic slides of animals, plants, and bacteria. In addition, they will also learn about tissue culture, using microtome, and microscopic photography and study microscopy (light and electron).

10201423 Histology and Comparative Anatomy

This course is a study of the basic types of tissues and organs at the microscopic level. Structure and associated functions are emphasized. The laboratory concentrates on the light microscopic study of tissues and offers students the opportunity to perform basic histological techniques.

10201442 Mycology

The aim of this course is to allow students to gain both knowledge about mycology as well as practical skills for handling the major fungal nutritional groups including mycorrhizal, saprotrofic and pathogenic fungi. The course addresses the following topics: growth physiology and nutrition, saprotrofic lifestyles, mycorrhizal fungi and biotrophic lifestyles, fungal diversity and phylogenetic species recognition, genetics and population genetics, fungal communities and interactions, and applied mycology including fungal biotechnology.

10201444 Virology

This course covers molecular/cell biology of viral structure, function, and evolution, with emphasis on pathological mechanisms of various human disorders.

10201462 Endocrinology

The course covers the endocrine system and its hormonal products, including the hormone producing cells, synthesis and modification of the hormones, release and transport of the hormones, hormone receptors and the mechanisms of hormone action, the effects of hormones on target cells, the effects of hormones on physiological processes as well as diseases caused by inappropriate hormone functions.

10201481 Special Topics

In this course, Department raise advanced topics in the field of Biology/ Biotechnology.

10206490 Recombinant DNA Technology

This course presents the fundamental aspects of techniques for DNA construction, cloning, and expression in host cells, with special emphasis on DNA cloning and expression vectors, restriction enzymes and ligases, gene cassette elements, gene isolation from genomic DNA, creation of genomic and CDNA libraries.

10201492 Seminar

In this seminar, students conduct studies and hold discussions on modern biological problems.

10201496 Graduation Project

This is a Department directed research in one field of biology.

10201448 Practical Training

The biology curriculum covers a wide range of courses on major areas in biological sciences. These courses are designed to help students who are interested in a career in education and research and have intentions to pursue graduate study. Training will be mainly in schools.

The Teaching Staff

Name	Academic Rank	University of Graduation
Ghaleb Odwan	Associate Prof.	Aristotle University of Thessaloniki, Greece.
Kamel Odwan	Associate Prof.	Middle East University, Turkey.
Raed Al-Kawni	Associate Prof.	University of Bari, Italy.
Sabri Mahmoud Nasir	Assistant Prof.	Ghent University, Belgium.
Nael Abu-Alhasan	Assistant Prof.	University of Glasgow, Scotland.
Awni Abu-Hijli	Assistant Prof.	Middle East University, Turkey.
Hani Al-Ahmad	Assistant Prof.	Weizmann Institute of Science, Israel.
Sami Ya'esh	Assistant Prof.	Durham University, Britain.
Salwa Khalaf	Assistant Prof.	Glasgow, Scotland.
Mu'tasim Al-Masri	Assistant Prof.	Aristotle University of Thessaloniki, Greece.
Ghadeer Omar	Assistant Prof.	University of Jordan, Jordan.
Ashraf Sawafta	Assistant Prof.	Paris 6, Paris
Sami Bdir	Instructor	Yarmouk University Jordan.
Nasir Jarrar	Lecturer	Yarmouk University Jordan.
Fatina Al-Hanbali	Instructor	University of Jordan, Jordan.
Lubna Abdallah	Instructor	Yarmouk University, Jordan.
Shoroq Ismaeil	Instructor	University of Bonn, Germany.

{ Program in Bio-technology }

The Department of Biological Sciences, established in 197, offers undergraduates a practical knowledge of living matter on the cellular organism and population levels. Fundamental subjects, such as cell biology, genetics, physiology, microbiology, biochemistry, and ecology, are supplemented by a wide variety of elective courses. All these courses combined prepare students for future careers in teaching, research, and work in industry, agriculture and public health.

In addition, the Department offers an undergraduate biotechnology program as a minor. In this program, students learn basic and applied biotechnology techniques including techniques in molecular biology, bioinformatics, genetic engineering, enzyme and protein production, and industrial production of pharmaceutical products. This program is very beneficial as it prepares students to apply different biotechnology techniques in medicine, agriculture, immunology, pharmacy and other fields.

In addition to its undergraduate programs in biology and biotechnology, the Department offers a graduate program.

Department Vision

Provide undergraduate students with the essential requirements for a comprehensive undergraduate education in various biological disciplines to produce knowledgeable and competitive graduates who can advance to professional fields or graduate programs, or enter employment in the public and private sectors. .

Department Mission

Provide an outstanding learning environment that integrates distinguished education and research and actively engages students in the biological sciences and prepares them for careers in research and teaching in modern biology and biotechnology.

Graduation Requirements

To earn a B.Sc. degree in biology, the student must successfully complete 126 credit hours. These include university compulsory courses as well as department compulsory and elective courses.

1. University compulsory courses 18 credit hours
2. Department compulsory courses 89 credit hours
3. Department elective courses 18 credit hours

General Program Intended Learning Outcomes

- Acquire fundamental and practical knowledge of biological sciences.
- Apply appropriate techniques in biological sciences.
- Generate new ideas using fundamental knowledge in biological sciences.
- Communicate scientifically (orally and in writing) regarding concepts and arguments in biological sciences.
- Solve problems using scientific approach in their field of specialization.
- Work collaboratively as individuals and in teams.
- Apply high ethical standards in professional practice and social interactions for sustainable development.

Department compulsory courses

Course #	Course title	Credits	Prerequisite
10201101	General Biology I	3	
10201102	General Biology II	3	10201101
10201107	General Biology I Lab.	1	10201101
10201108	General Biology II Lab.	1	10201107; 10231102 or concurrent
10211106	General Mathematics for Biology Students	3	
10221104	General Physics for Medical and Biology Students	3	
10221114	General Physics for Medical and Biology Students Lab	1	10221104 or concurrently
10231101	General Chemistry I	3	
10231102	General Chemistry II	3	10231101
10231107	General Chemistry I Lab.	1	10231101 or concurrent
10231108	General Chemistry II Lab.	1	10231107; 10231102 or concurrent with it
10231212	Analytical Chemistry	3	10231102 10231108
10231216	Practical Analytical Chemistry	1	10231212 or concurrently
10231233	Organic Chemistry	3	10231102 10231108
10231234	Practical Organic Chemistry	1	10231233
10201232	Genetics	3	10201102 10201108
10201311	Biochemistry	4	102312331
10201310	Biochemistry Lab.	0	10201311 or concurrently
10201341	Microbiology	4	10201102
10201340	Microbiology Lab.	0	10201341 or concurrently
10201423	Histology and Comparative Anatomy	4	10201321
10201424	Histology and Comparative Anatomy Lab.	0	10201423 or concurrently
10201372	Ecology	3	10201102 10201108
10201373	Ecology Lab.	0	10201372 or concurrently
10201352	Plant Anatomy and Physiology	3	10201254
10201353	Plant Anatomy and Physiology Lab.	0	10201352
10201362	Animal Physiology	3	10201264
10201365	Animal Physiology Lab.	0	10201362
10201254	Botany	4	10201102; 10201108
10201257	Botany Lab.	0	10201254 or concurrently
10201264	Zoology	4	10201102 10201108
10201260	Zoology Lab.	0	10201264 or concurrently
10201405	Developmental Biology	3	10201392; 10201264

Course #	Course title	Credits	Prerequisite
10201400	Developmental Biology Lab.	0	10201405 or concurrently
10201496	Graduation Project	2	Department approval
10201321	Cell Biology	3	10201311
10216237	Biostatistics for Biology Students	2	
10206392	Molecular Biology	3	10201232; 10201321
10206410	Bioinformatics	2	10206392
10206411	Bioinformatics Lab.	0	10206410
10512182	Methods for Science Teaching	3	
10201492	Seminar	0	Department Approval
10201347	Immunology	3	10201341
10201348	Immunology Lab.	0	10201347
10201446	Practical Training	6	
Total		90	

Department elective courses

Course #	Course title	Credits	Prerequisite
10201364	Parasitology	3	10201102 10201108
10201366	Parasitology Lab.	0	10201364 or concurrently
10206346	Fermentation and Industry	3	10201341
10201344	Medical Microbiology	3	10201341
10201462	Endocrinology	3	10201362
10201442	Mycology	3	10201341
10201443	Mycology Lab.	0	10201442 or concurrently
10206490	Recombinant DNA Technology	3	10206393
10206488	Recombinant DNA Technology Lab.	0	10206490 or concurrently
10206323	Plant Cell Culture	3	10201321; 10201341
10206325	Plant Cell Culture Lab.	0	10206323 or concurrently
10201444	Virology	3	10206341
10201481	Special Topics	3	Department approval
10206413	Protein Purification	2	10201311
10201222	Microtechnique	3	10201102; 10201108
10201220	Microtechnique Lab.	0	10201222 or concurrent
10206324	Animal Cell Culture	2	10201321; 10201341
10206326	Animal Cell Culture Lab.	0	10206324
10201256	Plant Taxonomy	3	10201254
10201258	Plant Taxonomy Lab.	0	10201256
Total		18	

Course Descriptions.

10201101 General Biology I

This course is a discussion of biological activity on the level of the cell, including cell structure, chemical constituents, architecture, material exchange with the environment, the role of the cell membrane, major energy generating biochemical pathways, cellular respiration, photosynthesis, control of cellular activities and basic concepts in genetics.

10201102- General Biology II

This course is a discussion of biological activity on the level of the organism, including structure and function of body parts, and responses of organisms to their biological and physical environments.

10201107 Practical General Biology I

This course provides students with scientific background and practical procedures for the various experiments on biological principles discussed in General Biology I 24101.

10201108- Practical General Biology II

This course provides students with scientific background and practical procedures for the various experiments on biological principles discussed in General Biology II 24102.

10201222 Micro Technique

Students, in this course, will learn about the basic principles and techniques for the preparation of microscopic slides of animals, plants, and bacteria. In addition, they will also learn about tissue culture, using microtome, and microscopic photography and study microscopy (light and electron).

10201232 Genetics

Students study the principles of classical genetics and the molecular basis of inheritance in terms of structure, function and changes in genetic material in viruses, bacteria and higher organisms; transmission and expression of genetic material; recombinant DNA and bioengineering.

10201255 Plant diversity

Plant diversity is the variety of plant life. The five kingdom classification system will be introduced in this course understanding the basics of this classification. This course will mainly introduce all photosynthetic organisms.

The non-flowering seeded vascular plants (Gymnosperms) and the flowering seeded vascular plants (Angiosperms) will be provided in more details in this course as they are the dominant plants on earth.

10201264 Zoology

This course is a survey of the animal kingdom with an emphasis on its history and organization. Particular attention is paid to special structures and mechanisms evolved by selected representatives of major phyla for solving problems of life in various environments.

10201311 Biochemistry

This course covers fundamentals of biochemistry including structure and properties of biomolecules with special emphasis on proteins, enzymatic catalysis, membrane assembly and function and introduction to bioenergetics.

10201321 Cell Biology

Topics covered include structure and function of cells and organelles, including membrane structure and transport; bioenergenetics of mitochondria and chloroplasts; cell motility; DNA replication; protein synthesis and transport; mitosis and meioses. In addition, the course touches on various modern techniques used in cell biology.

10206323 Plant Cell Culture

This course covers the principles of plant cell, tissue and organ culturing techniques used to regenerate whole plants from different types of explants. Laboratory experience is gained in preparation of culture media supplemented with different plant growth regulators, and their influence on in vitro micropropagation of different plant species.

10201341 Microbiology

This course covers morphology, physiology, classification, and cultivation of bacteria. This course focuses on biological (especially microbiological) systems by which materials and energy can be interconverted (e.g., waste products into useful chemicals or fuels, or antibiotic production). Manipulation of microorganisms capable of producing high value industrial substances is also discussed.

10206364 Fermentation and Industry

This course focuses on biological (especially microbiological) systems by which materials and energy can be interconvert (e.g., waste products into useful chemicals or fuels, or antibiotic production). Manipulation of microorganisms capable of producing high value industrial substances is also discussed.

10201347 Immunology

This course aims at understanding the mechanisms of the immune system with special focus on antigen antibody structure and function, cells and

tissues of immune system, lymphocyte activation and specificity; effectors mechanisms; complements, major histocompatibility complexes, B- and T-cell receptors. It also provides a background to the functions of innate and adaptive immunity (cellular and humoral), genetics of immune system, vaccines, autoimmunity, hypersensitivity, with an emphasis on some basic techniques used in immunology.

10201352 Plant Anatomy and Physiology

Plant anatomy and physiology is the study of plants' different function related to their anatomical features. This course teaches what plants do, and what chemical and physical factors cause plants to respond as they do in their environment. During this course, we will explore several important processes which allow plants to survive in their environment. Structure-function relationships will be emphasized, in addition to ecological implications of the physiological process under investigation.

10201362 Animal Physiology

This course is a study of functions of the major tissue types and organ systems of multicellular animals, with emphasis on human physiology in health and disease. The use of invertebrate and vertebrate animal models in research, and comparisons of functional adaptations in non-human systems will also be covered.

10201364 Parasitology

This course is designed to explore the various aspects of parasitology. Emphasis will be placed on the life cycles of major parasitic organisms attacking humans and animals.

10201372 Ecology

This course is an introduction to fundamentals of ecology and principles related to populations, communities and ecosystems. Particular emphasis is placed on the many dimensions of interdependence within ecosystems.

10206392 Molecular Biology

This course is a study of gene structure, function and control at the molecular level. Molecular techniques used to analyze nucleic acid and protein activity and diversity are also discussed.

10206393 Techniques in Molecular Biology

This laboratory course aims at applying molecular techniques to investigate a variety of biological questions. Techniques include cloning, DNA/Protein fingerprinting, RFLP, Blotting, PCR, and DNA sequencing.

10201405 Developmental Biology

This course is a detailed survey of the processes of animal development, including fertilization, cleavage and organogenesis. Emphasis is placed on current techniques for studying development, such as recombinant DNA technology.

10206410 Bioinformatics

Bioinformatics is the science of storing, extracting, organizing, analyzing, and interpreting biological sequence data. The course is designed to introduce the most basic concepts and up-to-date developments, methods, and tools used in bioinformatics. Topics include bioinformatics databases, resources at NCBI and EBI, sequence and structure alignment, file formats, analysis of single DNA and protein sequences, BLAST, primer design, function predictions, phylogenetics, and protein structure prediction. Internet laboratory for teaching the databases and data mining tools will be considered.

10206412 Nano-Biology

Nano-biology can be considered the intersection of biology and nanotechnology. Much of nano-biology involves using the tools and techniques of molecular biology to manipulate and analyze nucleic acids and proteins. This course Introduces students to biological molecules and self-assembled biological nanostructures and nano-machines. Biological systems provide a rich range of examples of specialized chemical systems that are structured on the nano-scale.

10206413 Protein Purification

This is a laboratory course in protein isolation and purification techniques.

10206421 Histology

This course is a study of the basic types of tissues and organs at the microscopic level. Structure and associated functions are emphasized. The laboratory concentrates on the light microscopic study of tissues.

10201442 Mycology

The aim of this course is to allow students to gain both knowledge about mycology as well as practical skills for handling the major fungal nutritional groups including mycorrhizal, saprotrofic and pathogenic fungi. The course addresses the following topics: growth physiology and nutrition, saprotrofic lifestyles, mycorrhizal fungi and biotrophic lifestyles, fungal diversity and phylogenetic species recognition, genetics and population genetics, fungal communities and interactions, and applied mycology including fungal biotechnology.

10201444 Virology

This course covers molecular/cell biology of viral structure, function, and evolution, with emphasis on pathological mechanisms of various human disorders.

10201481 Special Topics

In this course, Department raise advanced topics in the field of biology/ biotechnology.

10206490 Recombinant DNA Technology

This course presents the fundamental aspects of techniques for DNA construction, cloning, and expression in host cells, with special emphasis on DNA cloning and expression vectors, restriction enzymes and ligases, gene cassette elements, gene isolation from genomic DNA, creation of genomic and CDNA libraries.

10201492 Seminar

In this seminar, students conduct studies and hold discussions on modern biological problems.

10206497 Applied Biotechnology

An overview of the possibilities in which biotechnology may play an important role in producing vital compounds with medical applications, such as enzymes, hormones .Human gene therapy will be emphasized.

10206496 Graduation project

This is a Department directed research in one field of biology.

10206497 Biotechnology in Biological Control

This course covers recombinant DNA technology for engineering various organisms to be used for controlling plant and animal pest populations.

10201448 Practical Training

The biology curriculum covers a wide range of courses on major areas in biological sciences. These courses are designed to help students who are interested in a career in education and research and have intentions to pursue graduate study. Training will be mainly in schools.

The Teaching Staff

Name	Position	University of Graduation
Dr.Ghaleb Idwan	Full professor	Aristotle University-Greece
Dr. Kamel Idwan	Full professor	Middle east- Turkey
Dr. Raed Koni	Full professor	Bari-Italy
Dr.Sabri Nasser	Assistant Professor	Ghent- Belgium
Dr.Nael Abu-Alhassan	Assistant Professor	Glasgow-Scotland
Dr. Awni Abu-Hijleh	Assistant Professor	Middle east -Turkey
Dr.Hani Al-Ahmad	Assistant Professor	Wiseman science Institute-Occupied territories
Dr. Sami Yaeesh	Assistant Professor	Durham –Britain
Dr . Salwa Khalaf	Assistant Professor	Glasgow- Scotland
Dr . Mo'tasem Masri	Assistant Professor	Aristotle University- Greece
Dr . Ghadeer Omar	Assistant Professor	University Of Jordan –Jordan
Dr. Ashraf Sawafta	Assistant Professor	Marie Curie- Paris
Sami Bodair	Lecturer	Yarmouk -Jordan
Nasser Jarrar	Lecturer	Yarmouk –Jordan
Fatina Hanbali	Teaching assistant	University of Jordan
Lubna Abdallah	Teacher assistant	Yarmouk -Jordan
Shorouq Ismael	Teacher Assistant	Bonn - Germany

{Department of Mathematics}

The vision

To produce the most successful methods in teaching and creating knowledge in pure applied mathematics , as the department works really hard to maintain a refined level of theoretical education and research.

The mission

The department of mathematics aims at being a pioneer in the fields of education, academia, and research in order to develop the local community by way of providing it with high qualified graduates.

The objectives

1. To refine the students' scientific personalities so they are able to fully serve and improve their community.
2. To prepare distinguished graduates who are able to compete in professional life after graduation.
3. To support the graduate programs to obtain the masters' degree which is currently available, and the P.H.D this is to be available in the future.

The graduates of the Mathematics department are expected to be:

1. Capable of using logical and critical thinking skills.
2. In possession of problem solving skills within different levels of complication in Math which are related to life.
3. Qualified enough to be able to continue with their higher studies anywhere in the world.
4. Capable of using search engines in to get up- to- date mathematical data.
5. In possession of wide knowledge in algebra.
6. In possession of wide knowledge of mathematical analysis.
7. In possession of wide knowledge in the construction of mathematical models.
8. Knowledgeable in statistics.
9. Knowledgeable in teaching math in school curriculum.
10. In possession of wide knowledge in the area of numerical analysis and its computer applications.
11. Capable of using the different mathematical and statistical computer applications.
12. Capable of working efficiently in industrial and research institution.
13. Capable of working in financial fields such as accounting, taxes, and insurance.

Requirements to obtain a B.Sc. degree in mathematics

Students wishing to for a B.Sc. degree in mathematics should complete successfully 121 credit hours.

1. University compulsory requirements (18 credit hours)
2. Department compulsory requirements (84 credit hours)
3. Departmental elective requirements (21 credit hours)

A. Department compulsory courses (54 credit hours)

Course #	Course Title	Credits	Prerequisites
10211101	Calculus I	3	
10211102	Calculus II	3	10211101, 10211104
10221101	General Physics I	3	
10221107	General Physics I Lab	1	-
10221102	General Physics II	3	10221101
10231101	General Chemistry I	3	
10231107	General Chemistry I Lab	1	10231101, or concurrent 10231101
10211201	Calculus III	3	10211102
10211203	Principles of Differential Equations	3	10211201
10211211	Principles of Mathematics	3	10211101
10211212	Modern Analysis I	3	10211211
10211220	Programming for Mathematics	3	10211102
10216201	Methods of Statistics I	3	-
10211241	Linear Algebra I	3	10211201
10211242	Modern Algebra I	3	10211211
10211302	Partial Differential Equations I	3	10211203
10211311	Modern Analysis II	3	10211212
10211312	Complex Analysis I	3	10211212
10211321	Numerical Analysis I	3	10211241; 10211220
10211322	Linear Programming	3	10211241
10216302	Probability Theory I	3	10211201
10216304	Mathematical Statistics I	3	10216302
10211342	Modern Algebra II	3	10211242
10211343	Number Theory	3	10211211
10211361	Principles of General Topology	3	10211212
10211362	Modern Methods in Geometry	3	10211211
10211491	Seminar	1	Dept. approval
10211492	Practical Training	3	Or concurrent 10511492
10511292	Methods of Teaching Mathematics	3	-
10511492	Practical Education for Math Students	3	
	Total	84	

* Offered by the College of Educational Sciences.

This course plan applies to the students who are accepted for the mathematics program for the academic year 2013-2014 and after. Departmental elective courses (21 credit hours)

Students must take 27 credit hours from this section.

1. One 3- credit hour course offered by the College of Educational Sciences
2. Twenty- four credit hours selected from courses offered by the Department of Mathematics.

Course #	Course title	Credits	Prerequisites
10216202	Methods of Statistics II	3	10211230
10211301	Special Functions	3	10211203
10211303	Vector Analysis	3	10211201
10211314	Advanced Calculus	3	10211201
10211320	Software Packages for Mathematics	3	10211220; 10211241
10211323	Operations Research I	3	10211241
10211311	Sampling Methodology	3	10216202
10211351	Experimental Design and Variance Analysis		10211241, 10216202
10216303	Probability Theory II	3	10216302, 10211212
10216305	Mathematical Statistics II	3	10216304
10211341	Linear Algebra II	3	10211241
10211351	History of Mathematics	3	-
10211371	Methods of Applied Mathematics I	3	10211203
10211392	Methods of Applied Mathematics II	3	10211371
10211374	Applied Analysis	3	10211212
10211375	Integral Equations	3	10211371
10211403	Ordinary Differential Equations	3	10211203
10211414	Functional Analysis	3	10211361
10211421	Numerical Analysis II	3	10211321
10216371	Time Series Analysis	3	10216302
10216343	Applied Regression Analysis	3	10216202, 10211241
10211462	Differential Geometry	3	10211241
10211474	Combinatorics & Graph Theory	3	-
10211481	Special Topics I	3	-
10211482	Special Topics II	3	-
**10512138	Classroom Environmental Management	3	-

** Offered by the College of Educational Sciences (Choose one course: 72138 or 72254.

Course Descriptions

10211101 Calculus I

Topics covered in this course include analytic geometry, continuity, limits, definite and indefinite integration, applications of integration and differentiation.

10211102 Calculus 2

Definite integral and its properties, limited integration, integration of compensation, the space between two curves, volumes of revolution, ways of integration (integration by parts, integration of partial fractures, integration of trigonometric functions and integration with compensation trigonometric functions), integrals ailing, the length of the curve and the area of surfaces of revolution, final sequences and series, tests of convergent series, power series, Taylor series.

10211201 Calculus III

This course is a study of parametric equations and polar coordinates; vectors in R2 and R3 & surfaces; vector-valued functions; partial differentiation with applications; multiple integrals.

10211203 Principles of Differential Equations

Topics covered in this course include classifications and solutions of first-order ordinary differential equations with applications; higher-order and solutions; power series solutions; Laplace transforms; solutions of systems of linear differential equations.

10211211 Principles of Mathematics

In this course, students are introduced to logic and proofs; set theory, relations and functions; cardinality and examples on mathematical structures.

10211212 Modern Analysis I

Students in this course learn about properties of real numbers; open and closed sets; sequences; limits and continuity; differentiation; Riemann integral.

10211220 Programming for Mathematics

This course covers several topics: fundamentals of programming; algorithms, types of data and control statements, dimensions, functions and subroutines; some mathematical software with applications.

10216201 Methods of Statistics I

Topics covered in this course include: statistical data classifications; measure of central tendency and variability; probability concepts and rules; discrete and continuous random variables; probability distributions; the binomial and normal distributions; sampling distributions; point and interval estimations for one population mean; tests of hypotheses for one population mean.

10216202 Methods of Statistics II

This course deals with sampling distributions; confidence intervals; testing hypotheses for one and two population parameters; regression and correlation; testing hypotheses for regression line parameters; analysis of variance; chi-square test and non-parametric tests.

10211241 Linear Algebra I

Students in this course receive instruction on matrices, vectors and elementary row operations; operations on matrices; determinants and inverses of matrices; systems of linear equations and method of solutions; vector spaces, linear independence and basis; linear transformations, kernel and range; Eigen values and eigenvectors.

10211242 Modern Algebra I

This course is devoted to binary operations; groups, subgroups, finite groups, cyclic groups, symmetric groups, factor groups, normal subgroups; group homomorphism; Sylow theorems.

10211262 Principles of Geometry

This course introduces geometry: Hilbert's postulates, congruence, equivalence, similarities, circles, geometric transformations; space geometry: relations between lines, between lines and planes, between planes, theory of orthogonal projections; solid geometry: prisms, pyramids, cylinders, cones, sphere and related theorems.

10211301 Special Functions

Topics covered in this course include the Frobenious method for solving differential equations; special functions like Gamma and Beta functions; Legendre polynomials; Bessel functions; Hermite polynomials; Chebyshev, Laguerre and hyper geometric functions.

10211302 Partial Differential Equations I

In this course, students study the formation of a partial differential equation; methods of solutions of first order linear and nonlinear partial differential equations; methods of solutions of second order linear and nonlinear partial differential equations; Fourier series and transforms; wave equation, Laplace's equation, potential equation, equation of an infinite wire, and heat equation.

10211303 Vector Analysis

Topics taught in this course include vector algebra, vector products, vectors and scalar fields; the gradient, divergence and curl theorems; line, surface and volume integrals, related theorems; curvilinear coordinates.

10211311 Modern Analysis II

In this course, students are introduced to metric spaces; Riemann-Stetitges integral; functions of bounded variations; sequences and series of functions.

10211312 Complex Analysis I

Topics covered in this course include properties of complex numbers; complex functions, derivatives and Cauchy-Riemann equations; elementary functions and elementary transformations; complex integrals, residue theorem and improper integrals; power series.

10211314 Advanced Calculus

This course is a study of coordinate systems; functions of several variables, parametric representations of curves and surfaces, transformations of regions; derivatives and directional derivatives; implicit functions, Jacobians and related theorems; extreme; multiple integrals and related theorems.

10211320 Software Packages for Mathematics

This course is mainly concerned with mathematical modeling; using some software packages in mathematics and statistics; NETLIB, NAG, Derive, Mathematical, MATLAB, BLAS, Maple, MathCAD, SPSS, Minitab.

10211321 Numerical Analysis I

Topics covered in this course include numbers, Binary, Octal and Hexadecimal number systems; floating point arithmetic, errors, sources and types; solving nonlinear equations, direct and indirect methods in solving systems of linear equations, solving systems of nonlinear equations; approximation and interpolations, numerical integration.

10211322 Linear Programming

This course covers problem formulation; graphic solution; simplex method; duality theorem; linear sensitivity analysis and algebraic representation; transportation and assignment problems; network (PERT and CPM); game theory.

10211323 Operations Research I

This course is an introduction to operation research; inventory models, queuing models; game theory; Markov chains; case studies.

10211331 Sampling Methodology

Students in this course learn about simple random samples, estimation of means totals and proportions, estimation of the regression parameters,

stratified sampling, cluster sampling, systematic sampling and other sampling g methods.

10216351 Experimental Design and Variance Analysis

Topics covered in this course include random column design, Latin squares design, two-factor design, multi-factors comparative experiment, testing model accuracy in analysis of variance, insufficient sector model factor analysis, and multiple comparisons.

10216302 Probability Theory I

Students in this course are introduced to basic concepts of probability; discrete and continuous random variables; probability distributions; the binomial, geometric, negative binomial, uniform, gamma and normal probability distributions; examination of moment generating functions; probability distributions of functions of random variables.

10216303 Probability Theory II

This course is a review of some properties of random variables and probability distributions, multinomial distributions, distribution of order statistics, and moments and moment generating functions for some probability distributions. Limiting distributions, types of convergence and characteristic functions are also examined.

10216304 Mathematical Statistics I

This course provides an introduction to decision theory, risk and loss functions, unbiased estimation, efficient and maximum likelihood estimation, confidence intervals, testing statistical hypotheses, sufficient statistics, the Rao-Blackwell theorem and Rao-Cramir inequality.

10216305 Mathematical Statistics II

This course covers properties of point estimates, the exponential family of distributions, sufficiency and completeness, Bayesian estimation, most powerful test, sequential test, and estimation and testing hypotheses for linear models.

10211341 Linear Algebra II

Topics covered in this course include vector spaces; linear independence; direct product and direct sum of vector spaces; linear transformations, algebra of linear transformations; dual spaces; matrices; linear systems; Eigen values and eigenvectors; Hermite matrices; positive definite matrices.

10211342 Modern Algebra II

This course is devoted to the study of rings, ideals, division rings, factor rings; ring homo-morphisms; maximal ideals, principal ideal rings, principal ideal domains; polynomial rings, extension of fields.

10211343 Number Theory

This course is a study of divisibility and prime numbers; Chinese remainder theorem; congruence; Euler's theorem, Fermat's theorem, Wilson's theorem; linear congruence: congruent and non-congruent solutions; arithmetic functions; special numbers: perfect, deficient abundant and Mersenne numbers.

10211351 History of Mathematics

This course traces the mathematical development of this science; early numeral systems of Babylonians, Egyptians and Greek; the three problems of antiquities: duplicating a cube, quad rating of a circle and trisecting an angle; Alexandria 1st and 2nd schools, Hindu and Arab mathematics; European mathematics before and after the 17th century; analytic geometry and related concepts; development before calculus and transition to the 20th century.

10211361 Principles of General Topology

This course covers topological spaces, basis and sub-basis; functions and homomorphism; separation and countability axioms; connectedness and compactness; Hausdorff space, metric spaces and product spaces.

10211362 Modern Methods in Geometry

Topics covered in this course include Euclid's axioms; incidence geometry; Hilbert's postulates; absolute geometry; hyperbolic geometry; Riemann geometry; metric and non-metric geometric transformations.

10211371 Methods of Applied Mathematics I

This course reviews special functions including gamma, beta, watson and others, function errors, stirling's formula, trigonometric fourier series, laplace transforms and their applications in integral and partial equations, and differential variables.

10211373 Applied Mathematics

This course covers orthogonal functions; Fourier series and Fourier transform; discrete Fourier series and transform, Z-transform, minimization and least square method.

10211403 Ordinary Differential Equations

This course is concerned with solving ordinary differential equations using series; Laplace transform; existence theorem and applications; solving linear and nonlinear systems of ordinary differential equations; dynamical systems.

10211414 Functional Analysis

This course covers linear topological spaces, function spaces; weak topology; extension and separation theorems; open mappings; uniform bounded-ness; Banach and Hilbert spaces.

10211421 Numerical Analysis II

This course is a study of numerical methods for ordinary differential equations and systems; numerical methods for finding Eigen values and eigenvectors; numerical methods for solving nonlinear systems; and introduction to numerical methods for solving partial differential equations.

10216371 Time Series Analysis

This course highlights time series description, trends, periods, moving averages, filterization, Fourier analysis, models of stable series, self correlation, predictions, Jenkins-Box methods and spectrum analysis.

10216343 Applied Regression Analysis

Students in this course learn about simple linear regression, multiple regressions, estimation, and goodness, if fit tests, residual analysis, using matrices a regression, and factor rotation and applications.

10211462 Differential Geometry

Topics covered in this course include curves in planes and in space; curvature and torsion; theory of curves: intrinsic equations, involute curves and evolute curves; surfaces, simple surfaces and topological properties; tangent planes; first and second forms of a surface; asymptotes; intrinsic geometry, theory of surfaces; tensors and families of related curves.

10211474 Combinatorics and Graph Theory

This course focuses on graphs: simple graphs, directed graphs, components, connected components; blocks, cut-vertices, and bridges; Euler graphs; trees, planar and non-planar graphs; graph matrices and coloring.

10211481 Special Topics I

In this course some selected topics in pure and applied mathematics will be raised. These will be determined by the department and the course lecturer.

10211482 Special Topics 2

Like Special Topics I, this course will also raise some selected topics in pure and applied mathematics. These topics will be determined by the department and the course lecturer.

10211491 Seminar

This course is a study of the features of scientific thinking and its relation to scientific research. It also includes conducting a research on a mathematical topic- chosen from a range of topics approved by the department – and presenting it within seminars for discussion and evaluation.

10211492 Practical Training

In this course, students visit private and public schools to observe, prepare, and teach standard classes for primary and secondary level students, on the different mathematical topics. This course is taken in the graduation course, and requires students to observe and teach 100 classes.

10512138 Classroom Management

This course introduces the scientific bases of managing the classroom, and the roles which the teacher plays in there, focusing on the functional and practical aspects.

It also deals with the psychological bases on which a classroom is run, through looking into the different psychological theories which help both the teacher and the student achieve their goals , by way of providing the emotional and social atmosphere that encourages learning and delivering scientific expertise and directing them. This course also aims at making this field a practical science where theories are turned into classroom functions.

10511292 Methods of Teaching Math

This course begins with the identification of the general objectives of teaching mathematics and the objectives of teaching mathematics at key stage level and in secondary branches of the academic (scientific and literary), and vocational (industrial and commercial).

This course examines the themes the main stage of higher education (5-10), where students acquire the methods of teaching algebraic concepts and principles of solving equations, relations and associations, and the types of associations. Additionally, they learn how to teach the principles of probability, statistical representations, Euclidean geometry, how to demonstrate engineering subsidiary and trigonometry. This course also includes a description of recent trends in the teaching of mathematics using the technology of computers and calculators.

The course concludes on how to organize modules in the school calendar and how to prepare exams and evaluations.

10511492 Practical Training for Mathematics Students

In this course, students will have to:

- Research different steps to design lessons and how to integrate technology into lessons. The teacher will present footage of various teaching positions in mathematics to critique with students, and then each student prepares a lesson plan and applies them to fellow students and trainees under the supervision of the instructor and the students, thus clarifying the strengths and weaknesses in the lesson after the workload to be photographed on a tape in the laboratory.
- Research and report on teaching in basic and secondary schools, highlighting potential problems and finding solutions.
- Prepare and provide real classes in schools, for potential evaluation. The students will receive a teaching supervisor or teacher of mathematics in different schools who will support and evaluate the progress.

Department Staff:

Name	Position	University of Graduation
Mahmoud Al-Masri	Professor	University of North Carolina at Chapel Hill, USA. 1985
Naji Qatnani	Professor	Stuttgart University, Germany. 1996
Mohammad el-Amleh	Associate Professors	University of Alabama, USA. 1981
Fawaz Abu Diyak	Associate Professors	Michigan State University, East Lansing, USA. 1984
Abdullah Hakawati	Associate Professors	Lehigh University, USA. 1984
Ali Barakat	Associate Professors	North Carolina University, USA. 1989
Mohammad Najib Asaad	Assistant Professors	University of Munich, Germany. 1987
Subhi Riziyeh	Assistant Professors	Clarkson University, USA. 1989
Mohammad Abu Eideh	Assistant Professors	Nagpur University, India. 1989
Jaber Abu Jawkhah	Assistant Professors	Middle East Technical University, Turkey. 1990
Samir Matar	Assistant Professors	Bronell University, UK. 1991
Nihaya Awartani	Assistant Professors	AUW, USA. 1991
Anwar Saleh	Assistant Professors	Clarkson Bots ram University, NY. 1994
Muhammad Emran	Assistant Professors	Brigham Young University, UK. 1994
Muhammad Qabaha	Lecturers	Yarmouk University, Jordan. 1986
Amany Araman	Lecturers	Yarmouk University, Jordan. 2008
Adnan Al-Salqan	Lecturers	Ohio University, USA. 1985
Farhan Antari	Lecturers	An-Najah National Universit y, Nablus, Palestine. 2004
Basem Mostafa	Lecturers	King Fahd University, KSA. 2013
Abdul-Munem Kharrosheh	Lecturers	An-Najah National University, Nab lus, Palestine. 2007
Abdelrahman Eid	Lecturers	Yarmouk University, Jordan. 2013

Department of Physics

Vision of the Physics Department

Using the most successful methods of teaching and creating knowledge of the basic principles of theoretical and applied physics. To this end, the Department makes every effort towards maintaining a high standard of theoretical and practical education in physics. Moreover, the Department has a special interest in preparing undergraduate students for scientific research in physics. Its intention is to serve the country and society.

Mission of the Physics Department

Seeking to be a pioneer in the field of academic education and research, thus contributing to the development of Palestinian society by supplying it with highly-qualified graduates and building effective institutions that serve it well. The Department is home to diverse and highly-affiliated experiments and modern and specialized laboratories which are used to produce scientific and technical studies and applied research.

Objectives of the Physics Department

- Refining the student's scientific and laboratory skills to enable him/her to serve and develop his/her community.
- Turning out outstanding graduates who can compete in the field of research and work after graduation.
- Developing new specialties to fill the need in the work areas and multiplicity of public services.
- Supporting graduate programs: Master's and Doctoral.

Specifications of Physics Department graduates

Traits of An-Najah National University graduates apply to the Physics Department of graduates. In addition, the graduates of the Physics Department also have the following characteristics:

1. Ability to apply physics concepts in practical life.
2. A great deal of experience in using physics laboratory equipment correctly, which gives him/her the knowledge and experience to properly use many electronic and electrical appliances in non-physics areas.
3. Ability to work in groups and cooperate with others in all working environments
4. Good knowledge of public safety laws as a result of the application of safety laws in the laboratory during his/her studies.
5. Strong motivation to excel in any field of science and life in the community, in order to to keep abreast of modern scientific and technological developments and rally himself/ herself and the community around it.

Physics Department ILOs

1. Excellent understanding of theoretical and experimental physics concepts.
2. Excellent understanding of the mathematics used in physics.
3. Deep understanding of both classical and modern physics.
4. Basic understanding of electronics and circuit analysis.
5. Understanding of scientific research, and the ability to do it.
6. Ability to use online resources to obtain relevant scientific information.
7. Ability to connect physics and electronics concepts to modern technology.
8. Ability to use physics and electronic concepts to develop renewable energy resources.
9. Ability to apply electronics concepts in different fields in practical environments.
10. Ability to utilize computers in solving physics and electronics problems.
11. Awareness of the environment, through understanding of pollution sources: radiation, noise, chemical and biological.
12. Ability to use new scientific hardware.
13. Ability to identify the risk of misusing new and old hardware.
14. Expertise in public safety and awareness of its importance in life.
15. Ability to work as a team member.
16. Self–dependence and confidence in expressing himself and communicating with others.
17. Self-motivation to be a leader in his/her community, both scientifically and socially, and to keep up with technological advancement to benefit himself/herself and society.

Curriculum Plan of the Physics Department

The Department of Physics offers two undergraduate majors: (a) the physics major and (b) the physics major with a minor in electronics. After the completion of the first year, the student must apply in writing to the department chair about his/her wish to major in one of them.

A. Requirements for the B.Sc. degree in Physics:

The student must successfully complete 127 credits. This includes: University compulsory courses (18 credits), compulsory courses from the Faculty of Science (31credits), Department requirements (57 credits), elective courses (12 credits), compulsory and elective courses from the Faculty of Educational Sciences (6 credits), and practical training (3 credits).

University Compulsory Courses (18 credit hours)

Course #	Course title	Credit hours	Prerequisite
10032100	Remedial English	0	
11000101	Islamic Culture	3	
11000102	Arabic Language	3	
11000103	University English I	3	
11000322	University English II	3	1000103
11000105	Palestinian Studies	3	
11000117	Leadership and Communication Skills	1	
11000108	Community Service	1	
11000127	Introduction to Computer Science	1	
	Total	18	

Compulsory courses from Faculty of Science (31credits):

Course #	Course title	Credits	Classes	Lab	Prerequisite
10221101	General Physics I	3	3	-	----
10221107	General Physics Lab. I	1	-	2	10221101 or 10221105 or concurrently with 10221101
10221102	General Physics II	3	3	-	10221101
10221108	General Physics Lab. II	1	-	2	1) 10221102 or 10221106 or concurrently with 10221102 2) 10221107
10211101	Calculus I	3	3	-	----
10211102	Calculus II	3	3	-	10211101
10231101	General Chemistry I	3	3	-	----
10231102	General Chemistry II	3	3	-	10231101
10231107	General Chemistry Lab. I	1	-	2	10231101 or concurrently with 10231101
10201119	General Biology for Science Students	3	3	-	----
10201120	General Biology Lab. for Science Students	1	-	2	10201119 or concurrently with 10201119
10211201	Calculus III	3	3	-	10211102
10211203	Differential Equations	3	3	-	10211201
	Total	31			

Department compulsory courses (57 credits)

Course #	Course title	Credits	Classes	Lab	Prerequisite
10221103	General Physics III	3	3	-	10221101 or 10221105
10221213	Physics Lab I	1	-	3	10221108; 10221221 or concurrently with 10221221
10221221	Waves and Optics	3	3	-	10221103
10221231	Electronics I	3	3	-	10221102 or 10221106 or 10221111
10221233	Electronics Lab I	1	-	3	10221231
10221241	Thermodynamics and Statistical Physics	3	3	-	10221103; 10211201
10221242	Modern Physics I	3	3	-	10221103
10221253	Mathematical Physics I	3	3	-	10211203 or parallel with 10211203
10221301	Computers in Physics	3	3	-	10211203
10221313	Physics Lab II	2	-	4	10221213
10221351	Electricity and Magnetism I	3	3	-	10221253, 10211203
10221352	Classical Mechanics I	3	3	-	10211203, 10221253 or concurrently with10221253
10221353	Mathematical Physics II	3	3	-	10221353
10221354	Quantum Mechanics I	3	3	-	10221242; 10221253
10221371	Solid State Physics I	3	3	-	10221242
10221399	Scientific Research	3	3		10221354
10221413	Advanced Physics Lab.	2	-	5	10221313; 10221371
10221451	Electricity and Magnetism II	3	3	-	10221351
10221452	Classical Mechanics II	3	3	-	10221252; 10221353
10221454	Quantum Mechanics II	3	3	-	10221354
10221462	Nuclear and Particle Physics	3	3	-	10221354
	Total	57			

Department elective courses (12 credits)

The student is to take 12 credits from the courses listed in the following table, or he/she can chose a minimum of 6 credits from the same table, in addition to 6 credits, 300 level courses or above, either from the physics major-minor electronics courses, or from the Mathematics Department major courses.

Course #	Course title	Credits	Classes	Lab	Prerequisite
10221314	Practical Physics III	2	-	3	10221313
10221342	Modern Physics II	3	3	-	10221242; 10221354 or concurrently with 10221354
10221356	Theory of Relativity	3	3	-	10221242
10221361	Atomic and Molecular Physics	3	3	-	10221354
10221364	Principles of Laser	3	3	-	10221242; 10221221
10221373	Applied Geophysics	3	3		10221242
10221385	Renewable Energy	3	3	-	10221242
10221421	Acoustics	3	3	-	10221253
10221455	Statistical Mechanics	3	3	-	10221354
10221463	Particle Physics	3	3	-	10221454
10221464	Laser Spectroscopy	3	3	-	10221364
10221465	Spectroscopy	3	3	-	10221454
10221468	Astrophysics	3	3	-	10221354
10221471	Solid State Physics II	3	3		10221371
10221481	Special Topics I	3	3	-	10221354

Compulsory course from Faculty of Educational Sciences (3 credits)

Course #	Course title	Credits	Classes	Lab	Prerequisite
10512382	Methods of Science Teaching	3	3	-	----

Elective courses from Faculty of Educational Sciences (3 credit hours)

The student must choose a 3- credit hour course from the following list:

Course #	Course title	Credits	Classes	Lab	Prerequisite
10512238	Classroom Management	3	3	-	----
10512491	Practical Education for Science Students	3	3	-	----

Practical Training – 10221490 (3 credit compulsory course)

The student signs up for this course in the last semester of his/her study. The student must finish at least a 48-hour internship in a public or private institution relevant to his/her career path. The training period must be in the work place of one of the selected institutions. The choice of the institution must be approved by the University's Practical Training Center in consultation with the Physics Department. Following is a list of some of these public and private institutions.

- Palestinian Ministry of Education schools
- Elevator companies
- Electricity companies
- Power and energy companies
- Palestinian Energy and Natural Resources Authority (PENRA)
- Palestine Standards Institution (PSI)
- Cellular communication companies (JAWWAL and WATANIYA)
- Telecommunication Company (PALTEL)
- Car companies (electronic maintenance division)

A. Requirements for the B.Sc. degree in Physics with a minor in Electronics:

The student must successfully complete 127 credits. These include University compulsory courses (18 credits), compulsory courses from the Faculty of Sciences (31credits), Department compulsory courses (42 credits), Department compulsory physics/minor electronics courses (24 credits), Department elective physics/ minor electronics courses (3 credits), compulsory and elective courses from the Faculty of Educational Sciences (6 credits), and practical training (3 credits).

University Compulsory Courses (18 credit hours)

Course #	Course title	Credit hours	Prerequisite
10032100	Remedial English	0	
11000101	Islamic Culture	3	
11000102	Arabic Language	3	
11000103	University English I	3	
11000322	English IIUniversity	3	1000103
11000105	Palestinian Studies	3	
11000117	Leadership and Communication Skills	1	
11000108	Community Service	1	
11000127	Introduction to Computer Science	1	
	Total	18	

Compulsory courses from the Faculty of Sciences (31credits)

Course #	Course title	Credits	Classes	Lab	Prerequisite
10221101	General Physics I	3	3	-	----
10221107	General Physics Lab. I	1	-	2	10221101 or 10221105 or concurrently with 10221101
10221102	General Physics II	3	3	-	10221101
10221108	General Physics Lab. II	1	-	2	1) 10221102 or 10221106 or concurrently with 10221102 2) 10221107
10211101	Calculus I	3	3	-	----
10211102	Calculus II	3	3	-	10211101
10231101	General Chemistry I	3	3	-	----
10231102	General Chemistry II	3	3	-	10231101
10231107	General Chemistry Lab. I	1	-	2	10231101 or concurrently with 10231101
10201119	General Biology for Science Students	3	3	-	----
10201120	General Biology Lab. for Science Students	1	-	2	10201119 or concurrently with10201119
10211201	Calculus III	3	3	-	10211102
10211203	Differential Equations	3	3	-	10211201
	Total	31			

Department compulsory courses (42 credits)

Course #	Course title	Credits	Classes	Lab	Prerequisite
10221103	General Physics III	3	3	-	10221101 or 10221105
10221213	Physics Lab I	1	-	3	10221108; 10221221 or concurrently with 10221221
10221221	Waves and Optics	3	3	-	10221103
10221231	Electronics I	3	3	-	10221102 or 10221106 or 10221111
10221233	Electronics Lab I	1	-	3	10221231
10221241	Thermodynamics and Statistical Physics	3	3	-	10221103; 10211201
10221242	Modern Physics I	3	3	-	10221102 or 10221106
10221253	Mathematical Physics I	3	3	-	10211203
10221301	Computers in Physics	3	3	-	10211203
10221313	Physics Lab II	2	-	4	10221213
10221351	Electricity and Magnetism I	3	3	-	10221253, 10211203
10221352	Classical Mechanics I	3	3	-	10211203, 10221253 or concurrently with 10221253
10221354	Quantum Mechanics I	3	3	-	10221242; 10221253
10221371	Solid State Physics I	3	3	-	10221242
10221399	Scientific Research	3	3		10221354
10221413	Advanced Physics Lab.	2	-	5	10221313; 10221371
	Total	42			

Department compulsory physics/ minor electronics courses (24 credits)

Course #	Course title	Credits	Classes	Lab	Prerequisite
10226331	Solid State Electronics	3	3	-	10221231
10226341	Digital Electronics I	3	3	-	10221102
10226333	Digital Electronics I Lab.	1	-	3	10226341
10226351	Analog Electronic Circuits	3	3	-	10226331
10226343	Analog Electronics Lab.	1	-	3	10221233; 10226351
10226361	Electrical Instrumentation	2	2	-	10226331; 102 26341
10226441	Digital Electronics II	3	3	-	10226341
10226443	Digital Electronics II Lab.	1	-	3	10226333; 10226441
10226471	Communications	3	-	-	10221351; 10226351
10226481	Magnetic Devices	3	3	-	10226351; 10226331
10226491	Project in Electronics	1	1	1	10226333; 10226343, 10226441 or concurrently with 10226343; 10226441
	Total	24			

Department elective physics/ minor electronics courses (3 credits)

Student is to take 3 credit hours from the following course list

Course #	Course title	Credits	Classes	Lab	Prerequisite
10226472	Microwaves	3	3	-	10226471
10226482	Control Systems	3	3	-	10226471
10226483	Special Topics in Electronics	3	3	-	10226341
10226484	VLSI-Design	3	3	-	10226341

Compulsory courses from the Faculty of Educational Sciences (3 credits)

Course #	Course title	Credits	Classes	Lab	Prerequisite
10512382	Methods of Science Teaching	3	3	-	----

Elective courses from the Faculty of Educational Sciences (3 credit hours)

The student must choose 3 credit hours from the table below

Course #	Course title	Credits	Classes	Lab	Prerequisite
10512238	Classroom Management	3	3	-	----
10512491	Practical Education for Science Students	3	3	-	----

Practical Training – 10221490 (3 credit hour compulsory course)

The student signs up for this course in the last semester of study. The student must finish at least 48 hours of practical training in one of the public or private institutions that is relevant to his/her future career path. The training period must be in the work-place in one of the selected institutions. The choice of the institution must be approved by the University's Practical Training Center in consultation with the Physics Department. Following is a list of private and public institutions

- Palestinian Ministry of Education schools
- Elevator companies
- Electricity companies
- Power and energy companies
- Palestinian Energy and Natural Resources Authority (PENRA)
- Palestine Standards Institution (PSI)
- Cellular communication companies (JAWWAL and WATANIYA)
- Telecommunication companies (PALTEL)
- Car companies (electronic maintenance division)

Course Descriptions

10221101 General Physics I

This course covers the following topics: motion in one and more dimensions, the laws of motion with an application of Newton's laws, vector quantities, work and mechanical energy, linear momentum and collisions, and rotational dynamics.

10221102 General Physics II

This course is a study of the following topics: electric charges; forces and fields; electric potential and electric potential energy; electrical capacitance electric elements like capacitors, resistors, and conductors; electric current and direct-current circuits; magnetic fields; magnetic force; induction; and RC and RL circuits.

10221103 - General Physics III

This course deals with the following topics: fluids, simple harmonic motion,

sinusoidal waves, sound waves, heat thermodynamics laws, kinetic theory of gases, electromagnetic waves, geometrical optics and physical optics .

10221104 - General Physics for Medical and Life Sciences Students

This course, offered to non-physics majors, covers the following topics:

Part I: Introduction to physical concepts about mechanics, solids and fluids, heat and temperature, sound and hearing, electricity and magnetism, light and optics.

Part II: Physics concepts of some medical instruments:

lasers, x-ray, ultrasound, Magnetic resonance imaging (MRI), and heavy ions therapy.

10221105 - General Physics I for Educational Sciences Students

Offered to non-physics students, this course covers the following topics: kinematics (position, velocity, acceleration),vectors and scalars, dynamics, Newton's laws, friction, circular motion, work, energy, power, and momentum, rotational motion, simple harmonic motion, gravitation and Kepler's laws.

10221106 - General Physics II for Educational Sciences Students

This course is offered to non-physics students. It focuses on the following topics: charge and matter (electric current, electric potential), electric field, electric dipole, Millikan's experiment, electric flux of Gauss's law, electric potential, capacitors, capacitance, connection of capacitors, electric current and Ohm's law, magnetic field, Hall effects., galvanometer, cyclotron, velocity selector, mass spectrometer, electromagnetic induction and Faraday's law.

10221107 - General Physics Lab I

In this lab., experiments related to mechanics, mostly covered in General Physics I (10221101), are performed. These include measurements, vectors, acceleration on an inclined plane, the speed of sound in air, viscosity, Newton's second law, conservation of energy and momentum, rotational dynamics, simple harmonic motion, and Boyle's law.

10221108 - General Physics Lab. II

In this lab, experiments related to electricity and magnetism, mostly covered in General Physics II (10221102), are performed. These include experiments on electric field and equipotential surfaces, current, resistance, and Ohm's law, the CRO as voltmeter and frequency meter, Wheatstone bridge (DC and AC), capacitance (series, parallel and RC circuit), earth's magnetic field, resistance and temperature, Joule's constant, and refractive index of glass.

10221109 General Physics for Agriculture Students

This course is offered to non-physics students. Students learn about the following topics: vectors, motion in one and two dimensions; Newton's laws of motion; rotational motion; viscosity, heat and thermodynamics; elasticity and electricity.

10221110 General Physics Lab for Agriculture Students

This lab is offered to non-physics students. In this lab, experiments related to topics, mostly covered in General Physics for Agriculture Students (0221109), are performed. These include experiments on Vectors; Newton's laws; measurements; humidity; viscosity; density measurements; specific gravity; soil conductivity; electrochemical equivalent of Copper and specific heat.

10221111 General Physics for Information Technology (IT) Students

This course is offered to non-physics students; it covers the following topics:

classical mechanics; motion and Newton's Laws; circular motion and applications; energy transfer; linear and angular momentum; fluid mechanics, vibrations and wave motion; thermodynamics electricity and magnetism; Gauss's law, electric circuits, and sources of magnetic fields; light and lasers and microscopes.

10221112 General Physics Lab for Information Technology (IT) students

Offered to non-physics students, this lab covers experiments and topics mostly covered in General Physics for Computer Students (10221111). This includes experiments on:

CRO; Ohm's law potentiometer; Wheatstone bridge (AC and DC); capacitance and RC circuit; Joule's constant; acceleration and speed of sound; viscosity; Newton's 2nd law and simple harmonic motion; Boyle's law; and Archimedes' principle.

10221114 General Physics Lab for Medical and Life Sciences Students

This lab is offered to non-physics students. In this lab, experiments related to topics, mostly covered in Lab for Medical and Life Sciences (10221104), are performed. These includes experiments on Joule's constant; measurements; vectors; acceleration viscosity; Boyle's law ; Archimedes' principle; simple harmonic motion; the speed of sound; CRO; Ohm's law; capacitance and RC circuit refractive index.

10221115 General Physics Lab for Engineering Students

This lab is offered to non-physics students. In this lab, experiments related to topics mostly covered in General Physics I (10221101) and General Physics II (10221102) are conducted. These include experiments on CRO and Ohm's law potentiometer; Wheatstone bridge (AC and DC); capacitance and RC circuit; Joule's constant; acceleration and speed of sound; viscosity; Newton's 2nd law; simple harmonic motion; Boyle's law; and Archimedes' principle.

10221213 Physics Lab. I

In this lab, selected experiments in optics electricity, magnetism, thermodynamics and modern physics are introduced. Experiments to be conducted include e/m current balance; oscillation of a bar magnet in a uniform magnetic field; Doppler's effect; radioactive (β) rays; thermodynamics (Cu-Fe); thermocouple; prism spectrometer; diffraction grating; Newton's rings; Quincke's interference tube (path difference); photocell; lenses; DC ammeter and voltmeter construction.

10221221 Waves and Optics

This course includes the following topics: the dual nature of light ray optics, which includes reflection, refraction, lenses, and mirrors; the wave nature of light, which includes interference and diffraction; resolution optical instruments, such as the microscope, telescope, Michelson and Fabry-Perot interferometer; diffraction grating; polarization and holography.

10221231 Electronics I

This course has two parts: Part I is a review and analysis of methods for basic circuits; a review of Ohm's law; Kirchhoff's law, resistive circuits;

circuit analysis, such as thevoltage divider and current divider; node voltage analysis; mesh current analysis; source transformation; and Thévenin and Norton analysis. Part II is devoted to the basics of semiconducting electronic devices: the semiconductor fundamentals diode and its applications; special-purpose diodes like zener, varactor, LED, etc.; bipolar junction; transistor fundamentals and applications (switch and amplifier); transistor bias circuits: DC operating point; and voltage divider bias and other bias methods.

10221233 Electronics Lab. I

In this lab, students conduct experiments related to topics mostly covered in Electronics I (10222233). Experiments conducted include Kirchhoff's laws; Diode characteristics; Zener diode; diode circuits and applications; transistor characteristics; the transistor as an amplifier; and the transistor as a switch used in logic circuits.

10221241 Thermodynamics and Statistical Physics

This course covers several topics: different thermodynamic properties; processes in thermodynamics; equations of state, including the ideal gas equation; the first law of thermodynamics; work, internal energy, and heat flow equation, Carnot cycle; entropy and the second law of thermodynamics; thermodynamic potentials and statistical physics.

10221242 Modern Physics I

This course begins with an introduction to the theory of relativity; particle properties of waves; wave properties of particles; and atomic structure. It ends with an introduction to quantum mechanics and quantum theory of the hydrogen atom.

10221253 Mathematical Physics I

This course is devoted to the study of the following topics: a review of series complex numbers; linear algebra (matrices and determinants); vectors analysis; special functions (Beta, Gamma, etc.); series solution of differential equations; coordinate transformations with common special functions like Legendre, Hermite, Laguerre ,etc.

10221301 Computer in Physics

This course looks at algorithms and programming language (Fortran 90 or C). The duration for the above two topics must be at least 7 weeks (45% of course teaching hours). The course will introduce students to a wide selection of computer-powered mathematical tools for solving physics and mathematics problems. It will also introduce software packages (Mathematica, Maple), starting with a number of basics and applications: fundamental commands; real and complex algebra; trigonometry; linear algebra; differential equations; special functions; graphics in 2D and 3D and displaying and fitting data. Some physics applications to intermediate physics course will also be done.

10221313 Physics Lab. II

In this lab, selected experiments in optics and waves, atomic physics and modern physics are introduced. Experiments in this lab include Frank Hertz's experiment; electron diffraction; e/m (Thomson method); atomic spectra; photoelectric effect; microwave. Hysteresis; X-ray (atomic levels involved in cooper; kα and kβ emissions); velocity of sound in liquids as function of temperature; speed of light and Michelson interferometer; and e/k.

10221314 Physics Lab III

In this lab, selected experiments in different physics topics are introduced. These include the following experiments: Millikan's experiment; half-life and radioactive equilibrium with cobra 3; Rutherford experiment; X-ray fluorescence and Moseley's law; X-ray characteristic of molybdenum; Fabry-Perot interferometer; magnetic moment in the magnetic field; Coulomb's law with cobra 3; heat capacity of gas with cobra; vapor pressure of water at high temperature; Fresnel's equation and the theory of reflection.

10221342 Modern Physics II

This course is a study of many electron atoms and molecules. It also serves as an introduction to statistical mechanics, to solid state physics, nuclear structure, nuclear transformations and elementary particles.

10221351 Electricity and Magnetism I

In this course, students are introduced to electrostatics and relevant vector operations and theorems; special techniques in electrostatics and solving boundary-value problems; electrostatics in matter and relevant quantities needed; magnetostatics and methods to calculate magnetic fields and magnetic fields in matter.

10221352 Classical Mechanics I

This course deals with the following topics: coordinate systems; Newtonian mechanics in one dimension; damping oscillations; general motion of a particle in three dimensions; non-inertial reference frames; gravitation and central forces; Lagrange's and Hamilton's equations.

10221353 Mathematical Physics II

Topics taught in this course include calculus of variation; Fourier series and Fourier transforms; special functions: Bessel functions of complex variables; and Laplace transforms and an introduction to group theory.

10221354 Quantum Mechanics I

This course studies wave function and statistical interpretation; time-independent Schrödinger equation; stationary states; one-dimensional quantum systems; formalism- observables and Hermitian operators; quantum mechanics in three dimensions; hydrogen atom; angular momentum and spin.

10221356 Theory of Relativity

This course introduces students to relativistic kinematics; relativistic dynamics (collisions and conservation laws); Lorentz – Einstein transformations; relativity in measuring length and time; and relativity and electricity. It ends with an introduction to the general theory of relativity.

10221361 Atomic and Molecular Physics

This course focuses on hydrogen atoms, multi-electron atoms, the Zeeman effect, fundamental symmetries in atoms, the interaction of atoms with electromagnetic fields and radiations, laser spectroscopy and Bose-Einstein condensation.

10221364 Principles of Laser

This course examines the following topics: the nature of light and the meaning of laser; atom and molecules as a source of light; black body radiations; energy levels and electronic transitions; lasing processes (3-level and 4-level systems); Einstein's relations and population inversion; laser cavity and laser gain and threshed gain types of lasers and applications of lasers.

10221371 Solid State Physics I

This course covers several topics, such as crystal structure; reciprocal lattice and binding; Brillouin Zone Phonons; Fermi Gas and density of states and energy bands; and semiconductors

10221373 Applied Geophysics

This course is a review of the earth sciences, plate tectonics, and geological hazards. It also provides an introduction to geophysics, seismic exploration and geoelectrical methods.

10221385 Renewable Energy

Topics taught in this course include energy role in modern society; classical sources of energy; the environmental impact of fossil fuels; the importance of renewable energy sources; solar energy potentials; solar thermal; high temperature solar photovoltaics; passive and active techniques; wind energy potentials and techniques and geothermal energy.

10221399 Scientific Research

This course introduces students to technical scientific writing, techniques of citations, and writing scientific articles. In this course, the student must choose a project, with the help and approval of the instructor, and write a scientific paper on it. The student is expected to give an oral presentation on his/her project.

10221413 Advanced Physics Lab

In this lab, selected experiments in solid state physics, atomic and nuclear physics, electromagnetic and optics are introduced. These experiments include

the radioactivity hall effect; the Faraday effect; electron spin resonance; thermionic emission microwave attenuation; Zeeman effect resistivity versus temperature; four probe measurement for a semiconductor P-N junction; the Kerr effect; and magnetic susceptibility Compton scattering.

10221421 Acoustics

This course examines transverse waves in a string; longitudinal and transverse vibrations of rods and bars; vibration of membranes and plates; plane sound waves; reflections and transmission of plane sound waves at plane boundaries; spherical waves and radiation from a piston; architectural acoustics; noise in terms of its measurement and control; underwater sound and ultrasonic sound in liquids and solids.

10221451 Electricity and Magnetism II

Students in this course learn about electromagnetic induction and electromagnetic energy; Maxwell's equations in free space and in different media; the electromagnetic waves in vacuum, in matter and in closed regions; electromagnetic radiations and potential formalism.

10221452 Classical Mechanics II

This course introduces the following topics: Lagrange's and Hamilton's equations; dynamics of systems of particles; mechanics of rigid bodies: planar motion; motion of rigid bodies in three dimensions and dynamics of oscillating systems (small oscillations).

10221454 Quantum Mechanics II

This course is a study of identical particles with applications to atoms and solids; the theory of perturbation approximations with applications for the fine structure; the Zeeman Effect; other approximations as variational principle and WKB; time-dependent perturbation theory and applications and multiparticle quantum system.

10221455 Statistical Mechanics

Topics taught in this course include Maxwell- Boltzmann statistics; Bose-Einstein statistics; Fermi-Dirac statistics; statistical calculation of thermodynamic quantities and applications on statistical thermodynamics; thermodynamic laws; state of equilibrium; temperature and randomness and applications on statistical thermodynamics.

10221462 Nuclear and Particle Physics

This course examines the following topics: scattering theory; nuclear forces; nuclear models; alpha, beta, and gamma decays and applications; elementary particles; symmetries; standard model and fundamental forces.

10221464 Laser Spectroscopy

This course covers the following topics: spontaneous and stimulated emission; atomic spectrum; line broadening; nonlinear optical processes; two photon spectroscopy; saturation spectroscopy; Raman spectroscopy and applications in material science like medicine, environmental studies and industry.

10221465 Spectroscopy

This course is devoted to the energy spectrum; energy levels; excitation of atoms; electron spin resonance (ESR); nuclear magnetic resonance (NMR); IR spectrum and Raman spectrum; electronic vibrations and rotational spectra of diatomic molecules.

10221468 Astrophysics

This course highlights contents of the universe; matter, energy, dark matter and dark energy; channels of astronomical information; astronomical scales and measurements; stiller formation and evolution; universe of galaxies and life in the universe.

10221471 Solid State Physics II

This course is a study of the following topics: semiconductor crystals; Fermi surfaces; superconductivity magnetic materials and nano-materials dielectrics.

10221481 Special Topics

This course covers physics topics of interest to the instructor. The course instructor is expected to share his/her experiences in theoretical and/or experimental physics. This means that the course has no fixed description, as interests vary from one instructor to another. It is usually offered at the instructor's demand after seeking approval from the department.

10221490 Practical Training

The student registers for this course in the last semester of his/her study. The student must complete at least 48 hours of practical training in a public or private institution that is relevant to his/her future career. The training period has to be in the work place of one of the selected institutions. The choice of the institution must be approved by the university Practical Training Center in consultation with the Physics Department.

10226331 Solid State Electronics

Topics covered in this course include semiconductor materials, crystal lattices, growth of semiconductor crystals, energy bands and charge carriers in semiconductors, excess carriers, different junction types, fabrication and characteristics of p-n junctions, and different types of diodes: photodiodes, LED, varactor diodes, tunnel diodes.

10226333 Digital Electronics I Lab.

In this lab, hardware-oriented experiments that provide practical experience in the design, construction and checkout of components and IC for digital circuits, covered in Digital Electronics I (0226341), are introduced. These experiments include

logic gates (AND, OR, NAND, NOR, XOR, XNOR, NOT, Buffer); Boolean functions; half-adder and full-adder; half- subtractor and full- subtractor; decoder; multiplexer; design of a logic circuit to multiply; the BCD input by 5 and the output in BCD; encoder; one bit magnitude comparator; and project related to Digital Electronics I (0226341) which the student is expected to complete in the lab(in 2-3 weeks' time).

10226341 Digital Electronics I

This course is a study of numbers systems, codes, binary logic, IC-circuit, rules of Boolean algebra, logic gates, design of combinational logic circuits and analysis procedure and combinational logic with MSJ and LSI, ROM, and PLA.

10226343 Analog Electronics Lab.

In this lab, students perform experiments providing practical experience in the construction, design, and fault finding for analog circuits. Most experiments were covered in Analog Electronic Circuits (0226351), are introduced. Experiments include regulated power supply (voltage regulator); cascaded transistor amplifier; junction field transistor (JFET); collector-coupled multivibrator; sawtooth generator; the silicon- controlled rectifier (SCR); interface circuit by using SCR; the use of 555-timer TTL NOT gate & 2-input NAND gate operational amplifier (op amp); buffering to high current and high voltage digital to analog conversion

10226351 Analogue Electronic Circuits

This course introduces several electronic devices: FET and JFET; frequency response of RC and RL circuits; small signal amplifiers, power amplifiers; frequency response of amplifiers; thyristors; operational amplifiers and their applications; active filters; oscillators and voltage regulators.

10226361 Electrical Instrumentation

This course covers the following topics: analog measurements of electrical quantities; instrument transformers and other instruments; measurements of R, L, and CAC potentiometer magnetic measurements; digital measurements of electrical quantities and cathode ray oscilloscope sensors.

10226441 Digital Electronics II

In this course, students are taught about sequential logic circuits; registers; counters; memory unit; register transfer logic. ALU; accumulators and processor logic design.

10226443 Digital Electronics II Lab

In this lab, students perform hardware-oriented experiments that provide practical experience in the design, construction, and checkout of components and IC for digital sequential logic circuits; these topics were covered in Digital Electronics II (0226441). These include the following experiments: Programmable Logic Array (P.L.A.); clock pulse; flip flops; master slave flip flops; 4bit synchronous counter up/down synchronous counter up/down counter (4510); BCD to 7-segment decoder dual 4-stage; shift segister (using D-flip flop); sual 4-stage shift segister (using IC 4015); 5-stage Johnson counter arithmetic logic unit (A.L.U.) and accumulator.

10226471 Communications

This course introduces students to signals and signal classes, Fourier transform and linear system analysis, convolution, random signals, autocorrelation function, power spectral density, sampling, quantization, and signaling (encoding), Delta modulation and analog modulation schemes (AM, DSB-SC, SSB, FM, PM), pulse modulation schemes (PAM, PWM, PPM, PCM), digital modulation schemes (PSK, FSK, ASK), noise and noise classes, performance of analog and digital communication systems in presence of noise.

10226472 Microwaves

This course begins with an introduction to electromagnetic waves and then it moves to transmission lines and transmission line parameters, waveguides, scattering parameters, impedance and admittance matrix, ABCD Matrix, signal flow graph, Smith chart, and matching networks. The course caps with a study of microwave components (fitters, power dividers, couplers), T-junction, isolators, circulators and with an introduction to antenna.

10226481 Magnetic Instruments

This course includes the following topics: definitions and units; experimental methods; diamagnetism and paramagnetic; ferromagnetism and anti-ferromagnetism; ferrimagnetisms; soft magnetic materials; hard magnetic materials; magnetic materials for recording and computer; motors and transformers; Maglev train; electromagnetic stoves; hard disks; electromagnetic bomb and superconductor properties.

10226482 Control Systems

This course is a study of the mathematical models for control system components; transform and time domain methods for linear control systems; stability theory; Bode diagram; design specifications in time and frequency domains; compensation design in time and frequency domains; data systems and CAD control systems.

10226483 Special Topics in Electronics

This course covers topics of interest to the instructor. The instructor is expected to share his /her experiences in theoretical and/or experimental electronics with students. This means that the course has no fixed description, as interest varies from one instructor to another. It is usually offered by instructor demand after getting approval from the department.

10226484 VLSI Design

This course is devoted to the following topics: impacts and progress of IC-technology; implementation of electronic components; IC-fabrication; CVD – technique; ion-implantation technique; entire sequence of IC design; mask design; lithography; layout design and logic design; design rules and stick diagrams

10226491 Project in Electronics

In this course, the student is required to build an electronic device (analog or digital) selected with the course instructor's help. The student is also expected to deliver a written report and make a presentation on his/her project.

Faculty Members

Name	rank
Sami Jabir	Professor
Ghassan Saffarini	Professor
Isam Rashid	Professor
Mohammad Elsaid	Professor
Samir Ikhdair	Professor
Musa El-Hasan	Assistant Prof.
Sharif Musameh	Assoc. Prof.
Subhi Kamel	Assoc .Prof.
Muneer A'bboh	Assoc .Prof.
Mohammed Abu-Jafar	Assoc .Prof.
Khaled Ilawi	Assoc .Prof.
Iyad Saadeddin	Assoc .Prof.
Hussain 'Alayan	Assoc .Prof.
Zayd Qamhiyah	Assoc .Prof.
Hazem Abusara	Assoc .Prof.
Ribhic El-Haj Hamad	Lecturer
Sabri Ahmed EL-Tannah	Instructor
Diana Dahlia	Instructor
Mohamed Bahjat	Lab supervisor
Maher Rabah	Lab Technician
Same'eh Abdel Aziz	Lab Technician
Thurayya Tibi	Lab Technician
Nisreen Hamadneh	Computer Lab Technician

{ Department of Statistics }

Requirements to obtain a B.Sc. degree in Statistics

The Department of Statistics offers a single major in statistics. Students wishing to major in the field must complete successfully 123 credit hours:

1. University Compulsory Requirements (18 credit hours).
2. Department Compulsory Requirements (84) credit hours)
3. Departmental Elective Requirements (21 credit hours).

A. Departmental Compulsory Courses (84 credit hours)

Course #	Course Title	C. Hrs.	Prerequisites
10211101	Calculus I	3	
10211102	Calculus II	3	10211101
10221101	General Physics I	3	
10221107	General Physics I Lab	1	-
10221102	General Physics II	3	10221101
10231101	General Chemistry I	3	
10231107	General Chemistry I Lab	1	
10241101	General Biology I	3	
10211201	Calculus III	3	10211102
10211203	Principles of Differential Equations	3	10211201
10211211	Principles of Mathematics	3	10211102
10211212	Modern Analysis I	3	10211211
10211241	Linear Algebra I	3	10211201
10211321	Numerical Analysis I	3	10211241
10211322	Linear Programming	3	10211241
10216201	Methods of Statistics I	3	-
10216202	Methods of Statistics II	3	10216201or concurrent with 10211230
10216301	Statistical Applications Using Computer	3	10216202
10216302	Probability Theory I	3	10211201
10216304	Mathematical Statistics I	3	10216302
10216311	Sampling Methodology I	3	10216202
10216321	Operations Research	3	10211241
10216331	Stochastic Processes	3	10216302
10216343	Applied Regression Analysis		10216202+10211241
10216351	Experimental Design and ANOVA	3	10211241+ 10216202
10216352	Nonparametric Methods	3	10216202
10216399	Graduation Project	1	
10511292	Methods of Teaching Mathematics	3	-
10216492	Practical Training for Students of Mathematics	3	

II. Elective courses - Students may choose 21 credit hours from the following list:

Course #	Course Title	C. Hrs	Prerequisite
10216303	Probability Theory II	3	10216302+10211201
10216305	Mathematical Statistics II	3	10216304
10216322	Decision Theory	3	10216304
10216353	Categorical Data Analysis	3	10216202
10216361	Demographic Statistics		
10216371	Time Series Analysis	3	10216302
10216441	Multivariate Analysis	3	10216202,10211241
1016442	Sequential Analysis	3	10216304
10216481	Special Topics in Statistics	3	
10801150	Principles of Economics	3	-
10801319	Econometrics	3	10801113
10871121	Principles of Finance	3	-
10512138	Classroom Management	3	-
10513302	Evaluation in School	3	-

Course Descriptions

10216201 Methods of Statistics I

This course focuses on statistical data classification, measures of central tendency and variability, probability, concepts and rules, discrete and random variables and probability distributions, the binomial and normal distributions sampling distributions; point and interval estimate for population mean testing hypothesis for population mean; estimation; simple linear regression and correlation.

10216202 Methods of Statistics II

This course covers sampling distributions, confidence interval and testing hypothesis for single and two population parameters, regression and correlation, confidence interval and testing hypotheses for regression line parameters. Students also learn analysis of variable, chi-square tests and non-parametric tests.

10216301 Statistical Applications on Computer

The course mainly focuses on data evaluation and statistical tests using software packages.

10216302 Theory of Probability I

In this course, students receive instruction on axioms of probability, discrete and continuous random variables, probability distributions; binomial, geometric, negative binomial, uniform, exponential, gamma and normal. The course ends with an examination of moment generating functions and transformation distributions.

10216303 Theory of Probability II

This course begins with a review of properties of random variables and probability distributions as well as multinomial distribution. Then it moves to the study of distribution of order statistics, moments and moment generating function for some distributions. It also examines limiting distributions, types of convergences, in probability, in mean, in distribution, and characteristic function.

10216304 Mathematical Statistics I

Topics introduced in this course include decision theory, risk and loss function, unbiased estimation, efficiency, maximum likelihood estimation,

confidence intervals, composite hypotheses, and sequential tests. The course also introduces best test, sufficient statistics, Rao-Blackwell Theorm, and Rao-Cramir inequality.

10216305 Mathematical Statistics II

Students in this course learn about properties of point estimate, exponential family, sufficiency and completeness, Bayesian estimation, most powerful test, sequential test, estimation and testing hypotheses for linear models.

10216311 Methods of Sampling

Topics taught are simple random sample, mean estimations, totality, regression proportion estimations, stratified sampling, cluster sampling, systematic sampling, and other ways/methods of sampling.

STAT28321 Operations Research

Topics raised in this course are formulations of linear programming problems, graphic method, simplex method, sensitivity analysis, net flow problems and game theory.

STAT28322 Decision Theory

This course examines basic concepts in statistical decision theory and relationship with game theory, games in normal structures, optimal strategies and values, prediction, induction and Bayesian method.

10216331 Stochastic Processes

This course covers several topics: random process, examples on sample process, random walk, gamblers' destructive series, death and birth series, wait series, Markov discrete chain, classification of series cases, constant distributions, pure jumping process, Poisson process, Gaus process, and Weiner process.

10216343 Applied Regression Analysis

Topics covered in this course include simple linear regression, independent multi-variate regression, interpretation of results, estimations and consistency check, error and remainder analysis, using matrices in regression, factor rotation and real applications.

10216351 Experimental Design and Analysis of Variance

Students, in this course, are introduced to random column design, Latin squares, two-factor designs, multi-factor comparative experiments, testing model accuracy in analysis of variance, insufficiency sector model factor analysis, and multi-comparisons.

10216352 Non-Parametric Methods

This course introduces applications on non-parametric methods, testing and interval and point estimate, consistency tables, order, Kolomogrov and Sameironov statistics.

10216353 Categorical Data Analysis

This course gives an introduction to qualitative variables, two-variable tables, regression line equation (logistics), loglinear equation.

10216361 Demographic Statistics

This course covers population, numerated areas, population data, age structures, mortality rates, life tables and its structures, emigration and immigration, society structure and general census.

10216371 Time Series Analysis

Topics covered are description of time series, direction, constant rates, filterization, Fourier's analysis, and models of stable series, self-correlation, prediction, Jenkins-Box methods, and spectrum analysis.

10216399 Graduation Project

A student is assigned one specific topic to write about under the supervision of a department staffer. He/she is expected to submit a well-documented paper by the end of the term.

10216441 Multivariate Analysis

This course covers a number of topics: multivariate normal distribution, estimation of mean vector, co-variance matrix, and design of complete independent test of statistics, main components and correlation methods.

10216442 Sequential Analysis

This course introduces sequential tests for statistical hypotheses, function of sample size average, characteristic function for sequential tests, testing percentage of sequential probability and characteristic function.

10216481 Special Topics in Statistics

This course raises selected advanced topics in fields of statistics. Department and staffers determine the nature of these topics.

ECO53151 Principles of Economics

This course aims at acquainting students with basic principles in macroeconomics and microeconomics. Topics covered in this course include rules, and concepts pertinent to analysis of microeconomic units' behavior, concept of value, market mechanism and distribution theory. The course ends with a brief look at concepts pertinent to the Gross Domestic Product (G.D.P), and Gross National Income (G.N.I.) and ways of measuring them.

10871121 Principles of Finance

This course aims at introducing students to the value of money, the relationship between return and risk, financing foundations appropriate for companies, ways of studying and measuring risks, their types, profit policies followed by companies, cost of capital, and structure of optimal capital.

ECO10801319 Econometrics I

This course begins with an introduction to principles used in economics to examine quantitatively the degree of consistency between models and economic theories with the reality. The course surveys regression model foundations, mini-square method, estimates and their properties, analysis of variance, hypotheses testing, confidence intervals, general linear model, and curves. Students also learn about prediction through the use of the regression model.

10512138 Classroom Management

This course aims at introducing the principles of managing a classroom and the roles that a teacher plays in there, and specifically shedding the light on the applied aspects of teaching, as the way a classroom is handled indicates the success of the teacher in performing their tasks and responsibilities.

This course also aims looking into the psychological basis on which a classroom is managed, by way of investigating the different psychological theories to provide the both the students and the teacher with the social and emotional atmosphere that encourages learning and passing on experiences to assure an education where theories are transformed into reality.

10511292 Methods of Teaching Math

This course begins with introducing the general objectives of Mathematical training, then it moves on to introduce the objectives specific to the teaching math in both elementary and secondary levels. It also includes the methods of teaching the concepts and principals of Algebra, solving equations, relations, and conjugates in all their types.

This course also includes a description of the different approaches in teaching math using the computer and finally, the analysis of secondary level exams and how to make them.

10513302 Evaluation in School

This course introduces the students to scholastic evaluation; its objectives, methods, criteria and development. It also sorts out the different types of tests; how to make them and how to analyze them, and finally how to evaluate students on their academic achievements.

Department Staff:

Name	Academic Rank	University of Graduation
Dr. Ali Barakat	Associate Professor	North Carolina, USA
Dr. Mohammad Najib	Assistant Professor	University of Munich, Germany
Dr. Nihaya Awartani	Assistant Professor	American University, USA
Dr. Abdel-Rahim Barham	Assistant Professor	University of Carbondale, USA
Mohammad Qabaha	Instructor	Yarmouk University, Jordan
Amani Irman	Instructor	Yarmouk University, Jordan
Abdulraheem Eid	Instructor	Yarmouk University, Jordan

Department of Chemistry
Undergraduate Program in Pure Chemistry

The Department of Chemistry, founded in 1977, has four programmes in chemistry. These include a B.Sc. in Pure Chemistry, a B.Sc. in Applied Chemistry, and an M.Sc. and a Ph.D. in Chemistry.

Department Vision

The Department has a comprehensive and ambitious vision: to provide a distinguished teaching environment that enables graduates to undertake leadership in their future careers in private and public sectors. Graduates are equipped with a rich and diverse study plan that enables them to pursue their post-graduate study here and abroad. Based on excellence in teaching and research, the Department programmes have expanded horizontally (by providing two different study plans in Pure Chemistry and in Applied Chemistry) and vertically (by providing study plans leading to M.Sc. and Ph.D. degrees in Chemistry).

Department Mission

Since its establishment in 1977, the Department's mission, in accordance with that of the Faculty of Science, is helping Arab societies in general, and the Palestinian society in particular to reach sustainable economic and social development by providing them with quality graduates in chemistry at both undergraduate and graduate levels. To achieve this mission, the Department provides distinguished teaching and conducts research in pure and applied chemistry and advanced materials, while directly involving students.

B.Sc. Programme in Pure Chemistry

Programme Vision:

To provide qualified graduates able to pursue a career and achieve without obstacles or additional requirements for scholarships.

Programme Mission:

Prepare a generation of graduates able to contribute to building a society able to compete. Preparing a cadre of specialists in the field of chemistry to improve the community in the areas of education and scientific research, and solving problems facing scientific and industrial development plans in Palestine.

1) Student Enrolment in the Programme:

Students are directly enrolled in the programme based on their General Secondary School Certificate (TAWJIHI) on a competitive basis (equal opportunity policy adopted by An-Najah National University).

2) Graduation Requirements

To complete the B.Sc. degree in pure chemistry, the student must successfully com-

plete a total of 125 credit hours, with a cumulative GPA average 2/4 or higher, as follows:

University compulsory courses	18 credits
Programme compulsory courses	88 credits
Programme elective courses	19 credits

The graduation requirements are shown in the provided detailed study plan.

Objectives and Intended Learning Outcomes

General Programme Graduate ILOs:

Upon completing the B.Sc. study plan in chemistry the learner will be able to:

- Use scientific method to explain different natural phenomena critically and creatively
- Expand own knowledge independently
- Interact and communicate with people from same and other disciplines in a cooperative and benevolent manner.
- Implement and preserve professional ethics in different sectors, academic or professional.
- Successfully pursue graduate study in different areas of chemistry at different university systems with no need for prerequisites
- Undertake teaching duties in chemistry at all school system levels, including laboratory classes.
- Undertake teaching duties in other relevant disciplines (math, physics and biology) at preparatory school levels
- Undertake chemical research activities under direct supervision of other senior scientists
- Undertake university teaching assistance duties at university freshman level under supervision from other senior people.
- Undertake instrumental analytical duties in hospitals, environment and chemical industry laboratories after suitable extra orientation and training to meet specific activities
- Use library and online resources in chemical literature

Specific ILOs for different Programme courses:

Courses Attributes	Analytical Chemistry 10231211	Practical Analytical Chemistry 10231215	Organic Chemistry I 10231231	Organic Chemistry II 10231232	Practical Organic Chemistry I 10231235	Physical Chemistry I 10231241	Instrumental Analytical Chemistry 10231311
1- Gain general basics, principles and applications of chemistry.	X	X	X	X	X	X	X
2- Ability to recognise and solve problems related to chemistry.	X	X	X	X	X	X	X
3- Ability to perform accurate measurements using modern chemical instrumentation and techniques.		X			X		
4- Ability to interpret experimental results, perform calculations on these results, writing reports and draw reasonable conclusions.	X	X			X		
5- Gain knowledge and understanding of the issues of safety regulations in the use of chemicals in their laboratory work.		X			X		
6- Ability to use modern instrumentation and techniques and work in chemistry laboratories.							
7- the ability to make effective use of computers in chemistry applications using standard and chemistry specific software packages.							
8- Ability to make effective use of the library and other information resources in chemistry, including the primary literature, tabulated data, and secondary sources such as the internet.	X	X	X	X	X	X	X
9- Ability to communicate with scientists and non scientists		X					X
10- Gain knowledge of ethics and respect for others.							
11- Gain of a reasonable level of public education in the various aspects of life.							

Courses Attributes	Practical Instrumental Analysis 10231315	Inorganic Chemistry I 10231321	Inorganic Chemistry II 10231322	Practical Inorganic Chemistry 10231325	Organic Chemistry III 10231331	Practical Organic Chemistry II 10231335	Physical Chemistry II 10231341
1- Gain general basics, principles and applications of chemistry.	X	X	X	X	X	X	X
2- Ability to recognise and solve problems related to chemistry.	X	X	X	X	X	X	X
3- Ability to perform accurate measurements using modern chemical instrumentation and techniques.	X			X		X	
4- Ability to interpret experimental results, perform calculations on these results, writing reports and draw reasonable conclusions.	X			X		X	
5- Gain knowledge and understanding of the issues of safety regulations in the use of chemicals in their laboratory work.	X			X		X	
6- Ability to use modern instrumentation and techniques and work in chemistry laboratories.	X			X		X	
7- the ability to make effective use of computers in chemistry applications using standard and chemistry specific software packages.	X			X		X	
8- Ability to make effective use of the library and other information resources in chemistry, including the primary literature, tabulated data, and secondary sources such as the internet.	X	X	X	X	X	X	X
9- Ability to communicate with scientists and non-scientists	X			X		X	
10- Gain knowledge of ethics and respect for others.							
11- Gain of a reasonable level of public education in the various aspects of life.							

Courses Attributes	Physical Chemistry 3 10231342	Computational Chemistry 10231343	Practical Physical Chemistry I 10231345	Practical Physical chemistry II 10231346	Research Chemistry I 10231392	Identification & Analysis of Organic Compounds 10231432	Practical Training 10231475
1- Gain general basics, principles and applications of chemistry.	X		X	X	X	X	
2- Ability to recognise and solve problems related to chemistry.	X	X	X	X		X	
3- Ability to perform accurate measurements using modern chemical instrumentation and techniques.		X	X	X		X	
4- Ability to interpret experimental results, perform calculations on these results, writing reports and draw reasonable conclusions.		X	X	X	X	X	
5- Gain knowledge and understanding of the issues of safety regulations in the use of chemicals in their laboratory work.			X	X		X	
6- Ability to use modern instrumentation and techniques and work in chemistry laboratories.			X	X		X	
7- the ability to make effective use of computers in chemistry applications using standard and chemistry specific software packages.		X	X	X	X	X	
8- Ability to make effective use of the library and other information resources in chemistry, including the primary literature, tabulated data, and secondary sources such as the internet.	X		X	X	X	X	
9- Ability to communicate with scientists and non-scientists			X	X	X	X	X
10- Gain knowledge of ethics and respect for others.							X
11- Gain of a reasonable level of public education in the various aspects of life.							X

Courses Attributes	Biochemistry 10231332	Advanced Analytical Chemistry 10231411	Advanced Inorganic Chemistry 10231421	Advanced Organic Chemistry 10231431	Spectroscopy of Organic Compounds 10231434	Synthesis of Organic Compounds 10231435	Advanced Physical Chemistry 10231441
1- Gain general basics, principles and applications of chemistry.	X						
2- Ability to recognise and solve problems related to chemistry.	X	X	X	X	X	X	X
3- Ability to perform accurate measurements using modern chemical instrumentation and techniques.							
4- Ability to interpret experimental results, perform calculations on these results, writing reports and draw reasonable conclusions.							
5- Gain knowledge and understanding of the issues of safety regulations in the use of chemicals in their laboratory work.							
6- Ability to use modern instrumentation and techniques and work in chemistry laboratories.							
7- the ability to make effective use of computers in chemistry applications using standard and chemistry specific software packages.							
8- Ability to make effective use of the library and other information resources in chemistry, including the primary literature, tabulated data, and secondary sources such as the internet.	X	X	X	X	X	X	X
9- Ability to communicate with scientists and non-scientists		X	X	X	X	X	X
10- Gain knowledge of ethics and respect for others.							
11- Gain of a reasonable level of public education in the various aspects of life.	X						

Courses Attributes	Industrial Chemistry 10236461	Polymer Chemistry 10231464	Special Topics in Analytical chemistry 10231481	Special Topics in Inorganic chemistry 10231482	Special Topics in Organic chemistry 10231483	Special Topics in Physical chemistry 10231484	Research II 10231492
1- Gain general basics, principles and applications of chemistry.							
2- Ability to recognise and solve problems related to chemistry.	X	X	X	X	X	X	X
3- Ability to perform accurate measurements using modern chemical instrumentation and techniques.							X
4- Ability to interpret experimental results, perform calculations on these results, writing reports and draw reasonable conclusions.							X
5- Gain knowledge and understanding of the issues of safety regulations in the use of chemicals in their laboratory work.							X
6- Ability to use modern instrumentation and techniques and work in chemistry laboratories.							X
7- the ability to make effective use of computers in chemistry applications using standard and chemistry specific software packages.							X
8- Ability to make effective use of the library and other information resources in chemistry, including the primary literature, tabulated data, and secondary sources such as the internet.	X	X	X	X	X	X	X
9- Ability to communicate with scientists and non-scientists	X	X	X	X	X	X	X
10- Gain knowledge of ethics and respect for others.							
11- Gain of a reasonable level of public education in the various aspects of life.							

Pure Chemistry Plan

Type of Courses	Credit Hours	
University Compulsory Courses	18	
Specialization Compulsory Courses	88	
Specialization Elective Courses	16	
Specialization Electives from Another Faculty	3	
Total Credit Hours	125	

University Compulsory Courses (18 Credits)

Course Code	Course's Title	Credit Hours	Prerequisites
10032100	Remedial English	0	
11000103	English Language I	3	
11000322	English Language II	3	1) 1000103
11000101	Islamic Culture	3	
11000117	Leadership and Communication Skills	1	
11000105	Palestinian Studies	3	
11000108	Society Service	1	
11000102	Arabic Language	3	
11000127	Introduction to Computer Science	1	

Specialization Compulsory Courses (88 Credits)

Course Code	Course's Title	Credit Hours	Prerequisites
10201101	General Biology (1)	3	
10201102	General Biology (2)	3	1) 10201101
10201107	General Biology (1) Lab	1 or concurrent with it	1) 10201101
10201108	General Biology (2) Lab	1 2) 10201102 or concurrent with it	1) 10201107
10211101	Calculus I	3	
10211102	Calculus II	3	1) 10211101
10211201	Calculus III	3	1) 10211102
10211203	Differential Equations	3	1) 10211201
10221101	General Physics I	3	
10221102	General Physics II	3	1) 10221101
10221107	General Physics (1) Lab	1 or concurrent with it 2) 10221105	1) 10221101
10221108	General Physics (2) Lab	1 or concurrent with it 2) 10221107 or 10221109	1) 10221102
10231101	General Chemistry (1)	3	

10231102	General Chemistry (2)	3	1) 10231101
10231107	General Chemistry (1) Lab	1 or concurrent with it	1) 10231101
10231108	General Chemistry (2) Lab	1 2) 10231102 or concurrent with it	1) 10231107
10231211	Analytical Chemistry	3 2) 10231108	1) 10231102
10231215	Practical Analytical Chemistry	1 or concurrent with it 2) 10231108	1) 10231211
10231231	Organic Chemistry I	3 2) 10231108	1) 10231102
10231232	Organic Chemistry II	3	1) 10231231
10231235	Practical Organic Chemistry I	2 or concurrent with it 2) 10231108	1) 10231231
10231241	Physical Chemistry I	3 or concurrent with it 2) 10231102	1) 10211201
10231311	Instrumental Analytical Chemistry	3	1) 10231211
10231315	Practical Instrumental Analysis	1 2) 10231311 or concurrent with it	1) 10231215
10231321	Inorganic Chemistry I	3 or concurrent with it	1) 10231241
10231322	Inorganic Chemistry II	3	1) 10231321
10231325	Practical Inorganic Chemistry	2 or concurrent with it 2) 10231321	1) 10231322
10231331	Organic Chemistry III	3	1) 10231232
10231335	Practical Organic Chemistry II	2 or concurrent with it 2) 10231235	1) 10231331
10231341	Physical Chemistry II	3	1) 10231241
10231342	Physical Chemistry III	3 or concurrent with it 2) 10231341	1) 10211203
10231345	Practical Physical Chemistry I	1 2) 10231215	1) 10231241
10231346	Practical Physical Chemistry II	1 2) 10231341	1) 10231345
10231392	Research Chemistry I	3	60 hours or more completed
10231432	Identification & Analysis of Organic Compounds	3 2) 10231331	1) 10231335
10231475	Practical Training	3	85 hours or more completed
10512182	Methods of Science Teaching	3	

Specialization Elective Courses (16 Hours)			
Course Code	Course's Title	Credit Hours	Prerequisites
10231332	Biochemistry	4 2) 10231235	1) 10231232
10231343	Computational Chemistry	3 or concurrent with it	1) 10231342
10231411	Advanced Analytical Chemistry	3	1) 10231311
10231421	Advanced Inorganic Chemistry	3	1) 10231322
10231431	Advanced Organic Chemistry	3 or concurrent with it	1) 10231331
10231434	Spectroscopy of Organic Compounds	3	1) 10231331
10231435	Synthesis of Organic Compounds	2 2) 10231335	1) 10231331
10231441	Advanced Physical Chemistry	3	1) 10231241
10231464	Polymer Chemistry	3 or concurrent with it 2) 10231232	1) 10231331
10231481	Special Topics in Analytical Chemistry	3	1) 10231311
10231482	Special Topics in Inorganic Chemistry	3	1) 10231322
10231483	Special Topics in Organic Chemistry	3	1) 10231331
10231484	Special Topics in Physical Chemistry	3	1) 10231341
10231492	Research II	3	1) 10231392
10236461	Industrial Chemistry	3 2) 10231241	1) 10231232

Elective Courses from Faculty of Educational Science (3 Hours)			
Course Code	Course's Title	Credit Hours	Prerequisites
10512138	Classroom Management	3	
10512491	Practical Education for Science Students	3	

Course Description

10231101 General Chemistry I

A compulsory 3-lecture course that is mainly designed to give students a knowledge of the most important chemical principles such as atomic structure and periodic table, mass relationships in chemical reactions, reactions in aqueous solutions, gases, thermo chemistry, quantum theory and the electronic structure of atoms, periodic relationships among the atoms, basic concepts of chemical bonding, molecular geometry and hybridization of atomic orbitals.

10231102 General Chemistry II

A compulsory 3-lecture course that is a continuation of General Chemistry (I). It is designed to introduce some basic chemical facts and theories about solutions, kinetics, dynamic equilibrium, thermodynamics, electrochemistry and nuclear chemistry.

10231107 General Chemistry I lab

A compulsory practical course, designed to introduce the students to various experimental practices used in general chemistry, such as accurate weighing, performing basic chemical methods such as filtration, titration and gravimetric analysis, make simple metathesis and redox reactions, calorimetry experiments and calculations.

10231108 General Chemistry II lab

A compulsory practical course that is a continuation for skills gained in Chemistry 10231107 course. The student is expected to use what he/she learned in new techniques such as the synthesis and analysis of aspirin, molar mass of a solid from freezing point depression phenomena, experimental determination of the reaction rate law. The course involves other topics such as: reaction kinetics, chemical equilibrium, aqueous solutions and pH concept, bleach analysis, thermodynamics and electrochemistry.

10231211 Analytical Chemistry

A compulsory 3-lecture course that deals with the classical quantitative methods of chemical analysis. These include gravimetric and titrimetric methods of analysis. The course also includes topics in statistics and data analysis that are important in analytical chemistry.

10231215 Practical Analytical Chemistry

A compulsory laboratory course that involves experiments related to classical chemical analysis. It provides basic information about safety rules, tools of analytical chemistry, statistics for data treatment, and practice to various gravimetric and volumetric methods of analysis.

10231231 Organic Chemistry I

A compulsory 3-hour lectures, course that starts with an introduction to hybridization, covalent and hydrogen bonds; and dipole of bonds and molecules. Then rigorously treats the chemical structures, chemical properties and physical properties of open chain hydrocarbons such as alkanes, alkenes and alkynes. Structure and properties of alkyl halides and alcohols including syntheses, properties, mechanisms and stereochemistry are also involved.

10231232 Organic Chemistry II

A compulsory 3-lecture course that involves the basics of organic spectroscopy such as nuclear magnetic spectroscopy (NMR), infra-red spectroscopy (IR), ultra-violet spectroscopy (UV) and mass spectroscopy (MS), and the use of these spectroscopic techniques in the identification of organic compounds. This course, also, deals with structures, shapes, preparations and reactions of ethers, phenols and conjugated unsaturated compounds. Structures, properties and reactions of aromatic compounds, including different substitution reactions, are also involved.

1031235 Practical Organic Chemistry I

A compulsory practical, divided into four hour lab work periods weekly. The course includes some experiments which give the student practice in basic laboratory techniques such as determination of physical properties (melting point and boiling point) and methods of separation (extraction, distillation and steam distillation) and purification (crystallization and chromatography). This course also involves chemical reactions such as elimination, addition and substitution.

10231241 Physical Chemistry I

A compulsory 3-lecture course that covers the properties of gases, kinetic theory of gases, laws of thermodynamics, the transformation of pure substance , phase diagrams, two and three component systems , simple mixtures and applications, the activities of solutions and ions.

10231311 Instrumental Analytical Chemistry

A compulsory 3-lecture course that deals with the principles and applications of instrumental chemical analysis. Attention is devoted to the theoretical basis of each type of instrument, its optimal area of application, its sensitivity, its precision, and its limitations. The topics of this course include: Oxidation-reduction theory, Potentiometry, Electogravimetry and Coulometry, Coductometry and spectrometry.

10231315 Practical Instrumental Analysis

A compulsory course that covers basic instrumental methods used in quantitative chemical analysis, such as: polarimetry, refractometry, pH - titrations, potentiometry, conductometry, electrogravimetry, coulometry and spectrometry.

10231321 Inorganic Chemistry I

A compulsory 3-lecture course that involves fundamentals of inorganic chemistry. The course starts with semi-quantitative quantum theory and its application to atomic structure. Periodic properties, molecular shapes & chemical bonding theories (Valence Shell Electron Pair Repulsion Theory, Valence Bond Theory and Molecular Orbital Theory) are rigorously treated. Molecular Symmetry, acid/base chemistry and solid state chemistry are also rigorously involved.

10231322 Inorganic Chemistry II

A compulsory 3-lecture course that is mainly devoted to the chemistry of transition elements. The course starts with descriptive chemistry of the elements, and then rigorously deals with application of bonding theories (VBT, CFT and LFT) in coordination compounds including their physical & chemical properties, structures and synthesis. Reactivity (and mechanisms) of coordination compounds is treated in depth with special focus on coordination numbers 4, 5 and 6. Using LFT in understanding electronic absorption spectra of coordination compounds is involved using Orgel diagrams and Tanabe Sugano diagrams.

10231325 Practical Inorganic Chemistry

A compulsory course involves four practical hour laboratory work per week. It consists of a set of experiments related to inorganic chemistry. The experiments include main-group elements, transition-metal elements and their coordination compounds. Synthesis, characterization techniques and reactivity are rigorously treated. Different types of isomerism are also included.

10231331 Organic Chemistry III

A compulsory, 3 hour lectures, course study some organic groups that were not studded in 102 31231 and 10231232 above such as carboxylic acids and their derivatives, aldehydes, ketones, amines, heterocyclic compounds and reactions of carbanions. The course includes methods of preparations, mechanisms of reactions and physical & chemical properties of these compounds.

10231332 Biochemistry

This course covers fundamentals of biochemistry including structure and properties of biomolecules with special emphasis on proteins, enzymatic catalysis, membrane assembly and function and introduction to bioenergetics.

10231335 Practical Organic Chemistry II

It is a compulsory practical, one lecture and divided into 4 hours lab work periods, course study electrophilic aromatic substitution reactions and some basic preparative practical reactions such as Grignard reaction, Sandmyer reaction, Friedel-Craft reactions and functional group protection reactions. This course also involves condensation reactions, oxidation reactions and elemental analysis.

10231341 Physical Chemistry II

A compulsory 3-lecture course that is a continuation of 10231241. The following topics are covered: Chemical equilibria and it applications, electrochemistry, kinetic molecular theory of liquids and gases, conductivity and movement of ions, rates of chemical reactions and its applications, mechanisms of complex reactions, photochemical and photophysical reactions, collision theory, transition state theory, diffusion of gases, in addition to catalysis and surface chemistry.

10231342 Physical Chemistry III

A compulsory 3-lecture course that explains the main principles of classical mechanics, explaining the different postulates and theorems of quantum mechanics. Exact solutions of Shrodinger equation for some systems are involved like particle in a box, harmonic oscillator and the hydrogen atom.

10231343 Computational Chemistry

An elective 2- lecture and one lab work per week course that involves fundamentals of computational chemistry. The course introduces the student to basic concepts of programming and techniques to solve problems using high level languages. The course shows how computers can be used to solve chemical problems, such as quantum theory, spectroscopy, thermodynamics and other areas.

10231345 Practical Physical Chemistry I

A laboratory course that involves a set of experiments related to solubility and activity coefficient, heat of solution, equilibrium constant and distribution coefficient, phase diagram of partially miscible liquids, two-component system of simple eutectic type, three component system, phase diagram of two components that deviates negatively from Raoult's law, density and viscosity, vaporization, refractometry, bomb calorimetry and partial molar volume.

10231346 Practical Physical Chemistry II

A laboratory course that involves experiments using the following techniques in studying the kinetics of chemical reactions: conductivity, spectrophotometry, volume change at constant temperature and pressure, polarimetry, back titration, sampling methods, and experiments related to electrolytic conductance, effect of ionic strength on rate and adsorption from solution.

10231392 Research Chemistry (I)

A compulsory course (lecture and practical) that discusses the principles and rules used in chemical literature and abstracts. The course also aims to teach students the use of computers in chemistry, relevant software programs, the Internet & its utilization in searching for articles, periodicals, and properties

of chemical compounds. The course stresses upon the ethics of profession for practicing chemists in all aspects taking into account protecting the environment, respect for human life, respect for copyright and intellectual & creativity property rights.

10231411 Advanced Analytical Chemistry

An elective 3-lecture course that deals with the modern methods commonly used in analytical chemistry. This includes elucidation of basic principles behind various techniques that are used currently for performing chemical analysis, such as; Chromatography, Atomic Spectroscopy, Molecular Luminescence and Thermal methods.

10231421 Advanced Inorganic Chemistry

An elective 3-lecture course that involves advanced topics in inorganic chemistry. Organometallic chemistry and catalysis, solid state chemistry and molecular spectroscopy are included. Modern applications of inorganic solid compounds are also involved, such as: liquid ionics, energy storage devices (ion insertion batteries and electrochemical capacitors) and liquid crystal-based devices are also included.

10231431 Advanced Organic Chemistry

An elective 3-lecture course that studies advanced organic chemistry subjects such as aryl halides, α,β-unsaturated carbonyl compounds, orbital symmetry, heterocyclic compounds and neighboring group effect.

10231432 Identification and Analysis of Organic compounds

A compulsory course that consists of 2- lectures and one (4 hours) lab work period per week. The course includes the basic qualitative analysis of identification of pure organic compounds and separation of mixtures and the identification of their components by their functional groups and preparation of derivatives. The practical part contains the identification of three pure unknowns and the separation and identification of at least one or two component mixtures. The lecture involves general instructions and guidance, and a review for the organic chemistry and theoretical identification including spectroscopy.

10231434 Spectroscopy of Organic Compounds

An elective, 3 lectures, course studying the basic theories of different spectroscopic techniques and identification of organic compounds by these techniques; such as 1H and 13C nuclear magnetic resonance, mass, infra-red and ultra-violet spectroscopy.

10231435 Synthesis of Organic Compounds

An elective practical course that consists of two periods per week (4 hours each). This course deals with multi-step syntheses methods, planning for these methods and protecting groups.

10231441 Advanced Physical Chemistry

An elective 3-lecture course that involves advanced topics in physical chemistry and includes the law of corresponding states, compressibility factors, liquefaction of gases, chemical potential, Amagat's law and the ideal gas solution, chemical equilibria in gaseous systems. Equations of state, partial molar Gibb's function, free energy function, fugacity, excess functions, ideal dilute solution, distillation behavior of two components, retrograde condensation and other advanced topics.

10231464 Polymer Chemistry

An elective 3-lecture course which encompasses an introduction to learn the nature of polymers, their methods of synthesis with an account on each polymerization process, examples of the important polymers in industrial applications (such as elastomers, plastics, and fibers) & their physical properties with emphasis upon the relationship between structure and property so as to include a comparison between stereoregular polymers & other types of polymers.

10231475 Practical Training

In collaboration with Practical Training Center at the University. Each pure chemistry student is required to spend 320 working hours (or 40 Days) of practical training in schools, the chemical industry and/or public sectors that involve chemical activities in Palestine and abroad. The student should submit a detailed report to the Department after concluding the training. Moreover, the student should be prepared to give oral presentation about the training activities.

Practical training can go in tandem with other semester study (no more than 9 credit hours) or in summer (with no other courses).

10231481, 10231482, 10231483 and 10231484:

(Special Topics) Elective 3 lecture courses, in analytical, inorganic, organic and physical chemistry respectively. Each course involves an in depth study of a selected number of special topics where students heavily participate in a learner-centered approach, and show independent learning skills.

10231492 Research Chemistry (II)

This "12" hours a week course is a research proposal and under the supervision of one of the faculty members. The course aims to prepare students to rely on themselves in the future and conduct activities of scientific research and acquire the necessary skills to do so.

10236461 Industrial Chemistry

A compulsory 3-lecture course which includes an introduction to the technology of chemical industries to gain knowledge of some chemical

reactors, important industrial equipment, unit processes & operations used for production & purification and their design in various fields, namely, petrochemicals, plastics, detergents, dyestuffs, drugs, and agrochemicals and others. The course emphasizes the common technological foundations without going into specialized details.

Staff

Full Professor		
Name	University of graduate	Graduation Year
Dr. Hikmat Hilal	University of Manchester, UK.	1980
Dr. Bassem Shraydeh	University of Wales, UK.	1980
Dr. Maher An-Natsheh	University of Manchester, UK.	1983
Dr. Mohammed Subu'	University of Florida, USA.	1984
Dr. Ismail Warad	Tuebingen University/Germany	2003

Associate Professor		
Name	University of graduate	Graduation Year
Dr. Foad Mahmoud	University of Sussex, UK.	1979
Dr. Nidal Zatar	University of Kent, UK.	1983
Dr. Mohammed Al- Noori	University of New York, Buffalo, N.Y., USA.	1983
Dr. Waheed Jondi	University of Manchester, UK.	1990
Dr. Shehdeh Jodeh	Wayn State University ,USA.	1991
Dr. Othman Hamed	Loyolla University , USA.	1996

Assistant Professor		
Name	University of graduate	Graduation Year
Dr. Nizar Mattar	University of Bradford, UK.	1983
Dr. Mohammed Suleiman Shtaya	Georg-August-Univesrsitate Goettingen, Germany.	2003
Dr. Samar Al-Shakhshir	University of Oklahoma, USA.	1995
Dr. Ibrahim Abu Shqair	An-Najah N. University, Nablus, Palestine.	2006
Dr. Ahed Zyoud	An-Najah N. University, Nablus, Palestine.	2009
Dr. Ahmad Abu Obeid	An-Najah N. University, Nablus, Palestine.	2010
Dr. Maather Sawalha	The University of Texas at El Paso (UTEP), USA.	2006

Lecturer		
Name	University of graduate	Graduation Year
Kamel Abdel Hadi	Southern Illinois University at Carbondale, USA.	1986
Nisreen al-Masri	University of the Pacific, USA.	1988
Randa Arafat	An-Najah N. University, Nablus, Palestine	1997
Nuha A. Shawareb	An-Najah National University, Nablus, Palestine.	2009
Amani Zu'bi	An-Najah N. University, Nablus, Palestine	2003

Teaching Assistant		
Name	University of graduate	Graduation Year
Omair Nabulsi	An-Najah National University, Nablus, Palestine.	1993
Ashraf Salman	An-Najah National University, Nablus, Palestine.	1996
Nafez Dweikat	An-Najah National University, Nablus, Palestine.	1998
Ameed Amereh	An-Najah N. University, Nablus, Palestine	2007
Mohammad Al masry	An-Najah N. University, Nablus, Palestine	2007
Mohammad Alqraini		0
Ruba Mahmoud Awayes	An-Najah N. University, Nablus, Palestine	2007
Tarek Dridy	An-Najah N. University, Nablus, Palestine	2009
Motasem Jamon	An-Najah N. University, Nablus, Palestine	2011

Department of Chemistry
Undergraduate in Applied Chemistry

The Department of Chemistry, founded in 1977, has four programmes in chemistry. These include a B.Sc. in Pure Chemistry, a B.Sc. in Applied Chemistry, and a M.Sc. and a Ph.D. in Chemistry.

Department Vision

The Department has a comprehensive and ambitious vision: to provide a distinguished teaching environment that enables graduates to undertake leadership in their future careers in private and public sectors. Graduates are equipped with a rich and diverse study plan that enables them to pursue their post-graduate study here and abroad. Based on excellence in teaching and research, the Department programmes have expanded horizontally (by providing two different study plans in Pure Chemistry and in Applied Chemistry) and vertically (by providing study plans leading to M.Sc. and Ph.D. degrees in Chemistry).

Department Mission

Since its establishment in 1977, the Department's mission, in accordance with that of the Faculty of Science, is helping Arab societies in general, and the Palestinian society in particular to reach sustainable economic and social development by providing them with quality graduates in chemistry at both undergraduate and graduate levels. To achieve this mission, the Department provides distinguished teaching and conducts research in pure and applied chemistry and advanced materials, while directly involving students.

B. Sc. Programme in Applied Chemistry:

Programme Vision:

In line with the University policy to adopt distinct disciplines to meet the needs of the local labour market, and in light of the significant shortage of qualified cadres in the field of chemistry and their applications in various industries (food, medicines, polymers, leather, detergents, etc.), An-Najah provides an 'Applied' chemistry programme. This programme addresses this shortage and the resulting level of quality of industrial products. It also raises the level of performance and efficiency of related industrial enterprises.

Programme Mission:

The programme aims at providing Palestinian society with necessary specialised scientific competencies to serve the society and its development plans, programmes, education, industry and conducting applied academic research. It also contributes to the dissemination of a scientific culture to provide technical services in the field of chemistry for both the public and private sectors.

Study Plan

Student Enrollment in the Programme:

Students are directly enrolled in the programme based on their General Secondary School Certificate (Tawjihi) on a competitive basis (equal opportunity policy adopted by An-Najah National University).

Graduation Requirements

To complete the B.Sc. degree in Applied Chemistry, the student must successfully complete a total of 124 credit hours, with a cumulative GPA average 2/4 or higher, as follows:

University compulsory courses	18 credit hours
Programme compulsory courses	85 credit hours
Programme elective courses	21 credit hours

The graduation requirements are shown in the provided detailed study plan.

General Programme Graduate ILOs:

Upon completing the B.Sc. study plan in chemistry the student will be able to:

- Use scientific method to explain different natural phenomena critically and creatively.
- Expand own knowledge independently.
- Interact & communicate with people from same and other disciplines in a cooperative and benevolent manner.
- Implement & preserve professional ethics in different sectors, academic or professional.
- Successfully pursue graduate study in different areas of chemistry at different university systems with minimal prerequisites.
- Undertake teaching duties in chemistry at all school system levels, including laboratory classes.
- Undertake teaching duties in other relevant disciplines (physics and biology) at preparatory school levels.
- Undertake chemical research activities under direct supervision of other senior scientists.
- Undertake university teaching assistance duties at university first-year level under supervision from other senior chemists.
- Undertake professional duties in hospitals, environment and chemical industry laboratories after suitable extra orientation and training to perform specific activities.
- Use library & online resources in chemical literature.
- Start own small/medium venture/enterprise in chemical industry.

Specific ILOs for Different Programme Courses:

Courses Attributes	Analytical Chemistry 10231211	Practical Analytical Chemistry 10231215	Organic chemistry I 10231231	Organic Chemistry II 10231232	Practical Organic chemistry I 10231235	Physical Chemistry I 10231241	Instrumental Analysis 10231311
1- Gain general basics, principles and applications of chemistry.	X	X	X	X	X	X	X
2- Ability to recognise and solve problems related to chemistry.	X	X	X	X	X	X	X
3- Ability to perform accurate measurements using modern chemical instrumentation and techniques.		X			X		
4- Ability to interpret experimental results, perform calculations on these results, writing reports and draw reasonable conclusions.	X	X			X		
5- Gain knowledge and understanding of the issues of safety regulations in the use of chemicals in their laboratory work.		X			X		
6- Ability to use modern instrumentation and techniques and work in chemistry laboratories.							
7- The ability to make effective use of computers in chemistry applications using standard and chemistry specific software packages.							
8- Ability to make effective use of the library and other information resources in chemistry, including the primary literature, tabulated data, and secondary sources such as the internet.	X	X	X	X	X	X	X
9- Ability to communicate with scientists and non-scientists		X					X
10- Gain knowledge of ethics and respect for others.							
11- Gain of a reasonable level of public education in the various aspects of life.							X

Courses Attributes	Practical Instrumental Analysis 10231315	Inorganic Chemis-try I 10231321	Inorganic Chemistry II 10231322	Practical Inorganic Chemistry 10231325	Organic Chemistry III 10231331	Practical Organic Chemistry II 10221335	Physical Chemistry II 10231341
1- Gain general basics, principles and applications of chemistry.	X	X	X	X	X	X	X
2- Ability to recognise and solve problems related to chemistry.	X	X	X	X	X	X	X
3- Ability to perform accurate measurements using modern chemical instrumentation and techniques.	X			X		X	
4- Ability to interpret experimental results, perform calculations on these results, writing reports and draw reasonable conclusions.	X			X		X	
5- Gain knowledge and understanding of the issues of safety regulations in the use of chemicals in their laboratory work.	X			X		X	
6- Ability to use modern instrumentation and techniques and work in chemistry laboratories.	X			X		X	
7- The ability to make effective use of computers in chemistry applications using standard and chemistry specific software packages.	X			X		X	
8- Ability to make effective use of the library and other information resources in chemistry, including the primary literature, tabulated data, and secondary sources such as the internet.	X	X	X	X	X	X	X
9- Ability to communicate with scientists and non-scientists	X			X		X	
10- Gain knowledge of ethics and respect for others.							
11- Gain of a reasonable level of public education in the various aspects of life.	X	X	X	X	X	X	

Courses Attributes	Practical Physical Chemistry I 10231345	Practical Physical Chemistry II 10231346	Research Chemistry I 10231392	Identification & Analysis of Organic Compounds 10231432	Industrial Plant Economics & Production Management 10236302	Chemical Processes Lab. 10236365
1- Gain general basics, principles and applications of chemistry.	X	X	X	X		
2- Ability to recognise and solve problems related to chemistry.	X	X		X	X	X
3- Ability to perform accurate measurements using modern chemical instrumentation and techniques.	X	X		X		X
4- Ability to interpret experimental results, perform calculations on these results, writing reports and draw reasonable conclusions.	X	X	X	X		X
5- Gain knowledge and understanding of the issues of safety regulations in the use of chemicals in their laboratory work.	X	X		X		X
6- Ability to use modern instrumentation and techniques and work in chemistry laboratories.	X	X		X		
7- The ability to make effective use of computers in chemistry applications using standard and chemistry specific software packages.	X	X	X	X		
8- Ability to make effective use of the library and other information resources in chemistry, including the primary literature, tabulated data, and secondary sources such as the internet.	X	X	X	X	X	X
9- Ability to communicate with scientists and non-scientists	X	X	X	X	X	X
10- Gain knowledge of ethics and respect for others.					X	X
11- Gain of a reasonable level of public education in the various aspects of life.					X	X

Courses Attributes	Practical Training 10236476	Chemical Pollution & Industrial Safety 10236312	Environ-mental Chemistry 10236313	Biochem-istry 10231332	Petrochemicals & Organic Chemis-try Technology 10236334	Advanced Analytical Chemistry 10231411	Food Industry 10236413
1- Gain general basics, principles and applications of chemistry.							
2- Ability to recognise and solve problems related to chemistry.	X	X	X	X	X	X	X
3- Ability to perform accurate measurements using modern chemical instrumentation and techniques.	X		X				X
4- Ability to interpret experimental results, perform calculations on these results, writing reports and draw reasonable conclusions.							X
5- Gain knowledge and understanding of the issues of safety regulations in the use of chemicals in their laboratory work.	X		X				X
6- Ability to use modern instrumentation and techniques and work in chemistry laboratories.			X				X
7- The ability to make effective use of computers in chemistry applications using standard and chemistry specific software packages.	X						
8- Ability to make effective use of the library and other information resources in chemistry, including the primary literature, tabulated data, and secondary sources such as the internet.	X	X	X	X	X	X	X
9- Ability to communicate with scientists and non-scientists	X	X			X	X	X
10- Gain knowledge of ethics and respect for others.	X				X		X
11- Gain of a reasonable level of public education in the various aspects of life.	X	X	X	X			X

Courses Attributes	Industrial Inorganic Chemistry 10236423	Industrial Chemistry 10236461	Polymer Chemistry 10231464	Applied Chemical Catalysis 10236465	Polymer Technology 10236467	Industrial Pharmacy 10236468	Material Science 10236469
1- Gain general basics, principles and applications of chemistry.					X		
2- Ability to recognise and solve problems related to chemistry.	X	X	X	X	X	X	X
3- Ability to perform accurate measurements using modern chemical instrumentation and techniques.							
4- Ability to interpret experimental results, perform calculations on these results, writing reports and draw reasonable conclusions.						X	
5- Gain knowledge and understanding of the issues of safety regulations in the use of chemicals in their laboratory work.	X					X	
6- Ability to use modern instrumentation and techniques and work in chemistry laboratories.						X	X
7- The ability to make effective use of computers in chemistry applications using standard and chemistry specific software packages.					X		X
8- Ability to make effective use of the library and other information resources in chemistry, including the primary literature, tabulated data, and secondary sources such as the internet.	X	X	X	X	X	X	X
9- Ability to communicate with scientists and non-scientists	X	X	X	X	X		X
10- Gain knowledge of ethics and respect for others.					X		
11- Gain of a reasonable level of public education in the various aspects of life.					X		

Courses Attributes	Food Microbiology 10236472	Special Topics in Applied Chemistry 10236485	Special Topics in Industrial Chemistry 10236486	Natural Phytochemistry 10236493	Practical Natural Phytochemistry 10236494
1- Gain general basics, principles and applications of chemistry.				X	
2- Ability to recognise and solve problems related to chemistry.	X	X	X	X	
3- Ability to perform accurate measurements using modern chemical instrumentation and techniques.	X				X
4- Ability to interpret experimental results, perform calculations on these results, writing reports and draw reasonable conclusions.	X				X
5- Gain knowledge and understanding of the issues of safety regulations in the use of chemicals in their laboratory work.	X			X	X
6- Ability to use modern instrumentation and techniques and work in chemistry laboratories.	X				X
7- The ability to make effective use of computers in chemistry applications using standard and chemistry specific software packages.					X
8- Ability to make effective use of the library and other information resources in chemistry, including the primary literature, tabulated data, and secondary sources such as the internet.	X	X	X	X	X
9- Ability to communicate with scientists and non-scientists	X	X	X		
10- Gain knowledge of ethics and respect for others.	X			X	X
11- Gain of a reasonable level of public education in the various aspects of life.	X			X	X

Applied Chemistry plan

Type of Courses	Credit Hours	
University Compulsory Courses	18	
Specialization Compulsory Courses	85	
Specialization Elective Courses	18	
Specialization Electives from Another Faculty	3	
Total Credit Hours	124	

University Compulsory Courses (18 Credits)

Course Code	Course's Title	Credit Hours	Prerequisites
10032100	Remedial English	0	
11000103	English Language I	3	
11000322	English Language II	3	1) 1000103
11000101	Islamic Culture	3	
11000117	Leadership and Communication Skills	1	
11000105	Palestinian Studies	3	
11000108	Society Service	1	
11000102	Arabic Language	3	
11000127	Introduction to Computer Science	1	

Specialization Compulsory Courses (85 Credits)

Course Code	Course's Title	Credit Hours	Prerequisites
10201101	General Biology (1)	3	
10211101	Calculus I	3	
10211102	Calculus II	3	1) 10211101
10211201	Calculus III	3	1) 10211102
10221101	General Physics I	3	
10221102	General Physics II	3	1) 10221101
10221107	General Physics (1) Lab	1 or concurrent with 10221101 or 10221105	1) 10221101
10221108	General Physics (2) Lab	1 or concurrent with it 2) 10221107 or 10221109	1) 10221102
10231101	General Chemistry (1)	3	
10231102	General Chemistry (2)	3	1) 10231101
10231107	General Chemistry (1) Lab	1 or concurrent with it	1) 10231101
10231108	General Chemistry (2) Lab	1 2) 10231102 or concurrent with it	1) 10231107

10231211	Analytical Chemistry	3 2) 10231108	1) 10231102
10231215	Practical Analytical Chemistry	1 or concurrent with it 2) 10231108	1) 10231211
10231231	Organic Chemistry I	3 2) 10231108	1) 10231102
10231232	Organic Chemistry II	3	1) 10231231
10231235	Practical Organic Chemistry I	2 or concurrent with it 2) 10231108	1) 10231231
10231241	Physical Chemistry I	3 or concurrent with it 2) 10231102	1) 10211201
10231311	Instrumental Analytical Chemistry	3	1) 10231211
10231315	Practical Instrumental Analysis	1 2) 10231311 or concurrent with it	1) 10231215
10231321	Inorganic Chemistry I	3 or concurrent with it	1) 10231241
10231322	Inorganic Chemistry II	3	1) 10231321
10231325	Practical Inorganic Chemistry	2 or concurrent with it 2) 10231321	1) 10231322
10231331	Organic Chemistry III	3	1) 10231232
10231335	Practical Organic Chemistry II	2 or concurrent with it 2) 10231235	1) 10231331
10231341	Physical Chemistry II	3	1) 10231241
10231345	Practical Physical Chemistry I	1 2) 10231215	1) 10231241
10231346	Practical Physical Chemistry II	1 2) 10231341	1) 10231345
10231392	Research Chemistry I	3	60 hours or more completed
10231432	Identification & Analysis of Organic Compounds	3 2) 10231331	1) 10231335
10236476	Practical Training	3	85 hours or more completed
10236302	Industrial Plant Economics & Production Management	3	1) 10231102
10236365	Chemical Processes Laboratory	2 2) 10231235	1) 10231215
10236461	Industrial Chemistry	3 2) 10231241	1) 10231232
10512182	Methods of Science Teaching	3	

Specialization Elective Courses (18 Hours)

Course Code	Course's Title	Credit Hours	Prerequisites
10231332	Biochemistry	4 2) 10231235	1) 10231232
10231411	Advanced Analytical Chemistry	3	1) 10231311
10231464	Polymer Chemistry	3 or concurrent with it 2) 10231232	1) 10231331
10236312	Chemical Pollution & Industrial Safety	3	1) 10231211
10236313	Environmental Chemistry	3	1) 10231211

10236334	Petrochemicals & Organic Chemical Technology	3	1) 10231331
10236413	Food Industry Chemistry	2	1) 10231311
10236423	Industrial Inorganic Chemistry	3	1) 10231321
10236465	Applied Chemical Catalysis	3 2) 10231232	1) 10231322
10236467	Polymer Technology	3	1) 10231464
10236468	Industrial Pharmacy	3 2) 10231461	1) 10231241
10236469	Material Science	3	1) 10231322
10236472	Food Microbiology	3	
10236485	Special Topics in Applied Chemistry	3 or concurrent with it 2) 10231341 3) 10231322	1) 10231331
10236486	Special Topics in Industrial Chemistry	3	1) 10236461
10236493	Natural Phytochemistry	3	1) 10231232
10236494	Practical Natural Phytochemistry	1 with 10231493	Concurrent

Elective Courses from Faculty of Educational Science (3 Hours)

Course Code	Course's Title	Credit Hours	Prerequisites
10512138	Classroom Management	3	
10512491	Practical Education for Science Students	3	

Course Description

10231101 General Chemistry I

A compulsory 3-lecture course that is mainly designed to give students a knowledge of the most important chemical principles such as atomic structure and periodic table, mass relationships in chemical reactions, reactions in aqueous solutions, gases, thermo chemistry, quantum theory and the electronic structure of atoms, periodic relationships among the atoms, basic concepts of chemical bonding, molecular geometry and hybridization of atomic orbitals.

10231102 General Chemistry II

A compulsory 3-lecture course that is a continuation of General Chemistry (I). It is designed to introduce some basic chemical facts and theories about solutions, kinetics, dynamic equilibrium, thermodynamics, electrochemistry and nuclear chemistry.

10231107 General Chemistry I lab

A compulsory practical course, designed to introduce the students to various experimental practices used in general chemistry, such as accurate weighing, performing basic chemical methods such as filtration, titration and gravimetric analysis, make simple metathesis and redox reactions, calorimetry experiments and calculations.

10231108 General Chemistry II lab

A compulsory practical course that is a continuation for skills gained in Chemistry 10231107 course. The student is expected to use what he/she learned in new techniques such as the synthesis and analysis of aspirin, molar mass of a solid from freezing point depression phenomena, experimental determination of the reaction rate law. The course involves other topics such as: reaction kinetics, chemical equilibrium, aqueous solutions and pH concept, bleach analysis, thermodynamics and electrochemistry.

10231211 Analytical Chemistry

A compulsory 3-lecture course that deals with the classical quantitative methods of chemical analysis. These include gravimetric and titrimetric methods of analysis. The course also includes topics in statistics and data analysis that are important in analytical chemistry.

10231215 Practical Analytical Chemistry

A compulsory laboratory course that involves experiments related to classical chemical analysis. It provides basic information about safety rules, tools of analytical chemistry, statistics for data treatment, and practice to various gravimetric and volumetric methods of analysis.

10231231 Organic Chemistry I

A compulsory 3-hour lectures, course that starts with an introduction to hybridization, covalent and hydrogen bonds; and dipole of bonds and molecules. Then rigorously treats the chemical structures, chemical properties and physical properties of open chain hydrocarbons such as alkanes, alkenes and alkynes. Structure and properties of alkyl halides and alcohols including syntheses, properties, mechanisms and stereochemistry are also involved.

10231232 Organic Chemistry II

A compulsory 3-lecture course that involves the basics of organic spectroscopy such as nuclear magnetic spectroscopy (NMR), infra-red spectroscopy (IR), ultra-violet spectroscopy (UV) and mass spectroscopy (MS), and the use of these spectroscopic techniques in the identification of organic compounds. This course, also, deals with structures, shapes, preparations and reactions of ethers, phenols and conjugated unsaturated compounds. Structures, properties and reactions of aromatic compounds, including different substitution reactions, are also involved.

1031235 Practical Organic Chemistry I

A compulsory practical, divided into four hour lab work periods weekly. The course includes some experiments which give the student practice in basic laboratory techniques such as determination of physical properties (melting point and boiling point) and methods of separation (extraction, distillation and steam distillation) and purification (crystallization and chromatography). This course also involves chemical reactions such as elimination, addition and substitution.

10231241 Physical Chemistry I

A compulsory 3-lecture course that covers the properties of gases, kinetic theory of gases, laws of thermodynamics, the transformation of pure substance, phase diagrams, two and three component systems , simple mixtures and applications, the activities of solutions and ions.

10231311 Instrumental Analytical Chemistry

A compulsory 3-lecture course that deals with the principles and applications of instrumental chemical analysis. Attention is devoted to the theoretical basis of each type of instrument, its optimal area of application, its sensitivity, its precision, and its limitations. The topics of this course include: Oxidation-reduction theory, Potentiometry, Electogravimetry and Coulometry, Coductometry and spectrometry.

10231315 Practical Instrumental Analysis

A compulsory course that covers basic instrumental methods used in quantitative chemical analysis, such as: polarimetry, refractometry, pH - titrations, potentiometry, conductometry, electrogravimetry, coulometry and spectrometry.

10231321 Inorganic Chemistry I

A compulsory 3-lecture course that involves fundamentals of inorganic chemistry. The course starts with semiquantitative quantum theory and its application to atomic structure. Periodic properties, molecular shapes & chemical bonding theories (Valence Shell Electron Pair Repulsion Theory, Valence Bond Theory and Molecular Orbital Theory) are rigorously treated. Molecular Symmetry, acid/base chemistry and solid state chemistry are also rigorously involved.

10231322 Inorganic Chemistry II

A compulsory 3-lecture course that is mainly devoted to the chemistry of transition elements. The course starts with descriptive chemistry of the elements, and then rigorously deals with application of bonding theories (VBT, CFT and LFT) in coordination compounds including their physical & chemical properties, structures and synthesis. Reactivity (and mechanisms) of coordination compounds is treated in depth with special focus on coordination numbers 4, 5 and 6. Using LFT in understanding electronic absorption spectra of coordination compounds is involved using Orgel diagrams and Tanabe Sugano diagrams.

10231325 Practical Inorganic Chemistry

A compulsory course involves four practical hour laboratory work per week. It consists of a set of experiments related to inorganic chemistry. The experiments include main-group elements, transition-metal elements and their coordination compounds. Synthesis, characterization techniques and reactivity are rigorously treated. Different types of isomerism are also included.

10231331 Organic Chemistry III

A compulsory, 3 hour lectures, course study some organic groups that were not studded in 102 31231 and 10231232 above such as carboxylic acids and their derivatives, aldehydes, ketones, amines, heterocyclic compounds and reactions of carbanions. The course includes methods of preparations, mechanisms of reactions and physical & chemical properties of these compounds.

10231332 Biochemistry

This course covers fundamentals of biochemistry including structure and properties of biomolecules with special emphasis on proteins, enzymatic catalysis, membrane assembly and function and introduction to bioenergetics.

10231335 Practical Organic Chemistry II

It is a compulsory practical, one lecture and divided into 4 hours lab work periods, course study electrophilic aromatic substitution reactions and some basic preparative practical reactions such as Grignard reaction, Sandmyer reaction, Friedel-Craft reactions and functional group protection reactions. This course also involves condensation reactions, oxidation reactions and elemental analysis.

10231341 Physical Chemistry II

A compulsory 3-lecture course that is a continuation of 1023124. The following topics are covered: Chemical equilibria and it applications, electrochemistry, kinetic molecular theory of liquids and gases, conductivity and movement of ions, rates of chemical reactions and its applications, mechanisms of complex reactions, photochemical and photophysical reactions, collision theory, transition state theory, diffusion of gases, in addition to catalysis and surface chemistry .

10231345 Practical Physical Chemistry I

A laboratory course that involves a set of experiments related to solubility and activity coefficient , heat of solution, equilibrium constant and distribution coefficient , phase diagram of partially miscible liquids, two-component system of simple eutectic type , three component system, phase diagram of two components that deviates negatively from Raoult's law, density and viscosity, heat of vaporization, refractometry, bomb calorimetry, and partial molar volume .

10231346 Practical Physical Chemistry II

A laboratory course that involves experiments using the following techniques in studying the kinetics of chemical reactions: conductivity, spectrophotometry, volume change at constant temperature and pressure, polarimetry, back titration , sampling methods , and experiments related to electrolytic conductance , effect of ionic strength on rate and adsorption from solution .

10231392 Research Chemistry (I)

A compulsory course (lecture and practical) that discusses the principles and rules used in chemical literature and abstracts. The course also aims to teach students the uses of computers in chemistry, relevant software programs, the Internet & its utilization in searching for articles, periodicals, and properties of chemical compounds. The course stresses upon the ethics of profession for practicing chemists in all aspects taking into account protecting the environment, respect for human life, respect for copyright and intellectual & creativity property rights.

10231411 Advanced Analytical Chemistry

An elective 3-lecture course that deals with the modern methods commonly used in analytical chemistry. This includes elucidation of basic principles behind various techniques that are used currently for performing chemical analysis, such as; Chromatography, Atomic Spectroscopy, Molecular Luminescence and Thermal methods.

10231432 Identification and Analysis of Organic compounds

A compulsory course that consists of 2- lectures and one (4 hours) lab period per week, the course includes the basic qualitative analysis of identification of pure organic compounds and separation of mixtures and the identification of their components by the identification of the functional groups and preparation of derivatives. The practical part contains the identification of three pure unknowns and the separation and identification of at least one two component mixture. The lecture part involves general instructions and a guidance of the course, and a review for the organic chemistry and theoretical identification including spectroscopy.

10231441 Advanced Physical Chemistry

An elective 3-lecture course that involves advanced topics in physical chemistry and includes the law of corresponding states , compressibility factors , liquefaction of gases , chemical potential, Amagat's law and the ideal gas solution , chemical equilibria in gaseous systems. Equations of state, partial molar Gibb's function, free energy function , fugacity, excess functions, ideal dilute solution, distillation behavior of two components , retrograde condensation and other advanced topics.

10231464 Polymer Chemistry

An elective 3-lecture course which encompasses an introduction to the nature of polymers, their methods of synthesis with an account on each polymerization process, examples of the important polymers in industrial applications (such as elastomers, plastics, and fibers) & their physical properties with emphasis upon the relationship between structure and property so as to include a comparison between stereoregular polymers & other types of polymers.

10236302 Industrial Plant Economics and Production Management

An elective 3-lecture course that includes consumer demand, production, cost, market structures and factors. It also includes introduction to operation management, product design, process analysis, facility layout, forecasting, operations scheduling, quality management and cost studies.

10236312 Chemical Pollution and Industrial Safety

An elective 3-lecture course that is concerned with types of chemical & radiating pollutants in water & air and their sources, methods of pollution-monitoring, methods of water purification, safety in laboratories, hazardous chemicals & their fate.

10236313 Environmental Chemistry

An elective 3-lecture course deals with the fundamental principles of chemistry and using them to understand the source, fate, and reactivity of compounds in natural and polluted environments. Emphasis will be placed on the environmental implications of energy utilization and on the chemistry of the atmosphere, hydrosphere, and lithosphere. Environmental issues that will be discussed include climate change, air pollution, stratospheric ozone depletion, pollution and treatment of water sources, and the utilization of insecticides and herbicides.

10236334 Petrochemicals and Organic Chemistry Technology

This is a three credit hours elective course for students of Applied Chemistry. This course deals with major processes in Petrochemical Industry, such as synthesis of ethylene and co-products, ethylene derivatives, propylene derivatives, butadiene and butanes, benzene, toluene and xylenes production, and their derivatives, steam reforming and related processes, and some miscellaneous processes and products.

10236365 Chemical Processes Laboratory

A compulsory laboratory course which includes study and small-scale production of industrially important materials (soap, industrial detergents, shampoo, creams, soft drinks, jam, cheese, and aromatic oils) besides quality tests for these products & others (such as vegetable oil & milk).

10236413 Food Industry Chemistry

An elective 3-lecture course that covers raw materials, major food industries, methods followed in producing foodstuff, storage and manufacturing food, additives, such as flavoring, preservatives, coloring and sweetening materials. In addition, the course focuses on food analysis by using modern techniques.

10236423 Industrial Inorganic Chemistry

An elective 3-lecture course deals with industrial operations used in the production of acids (such as sulfuric acid), ammonia, soda, phosphate compounds, industrial gases, glass, ceramics, salts of alkalis and other important chemicals.

10236461 Industrial Chemistry

A compulsory 3-lecture course which includes an introduction to the technology of chemical industries to gain knowledge of some chemical reactors, important industrial equipment, unit processes & operations used for production & purification and their design in various fields, namely, petrochemicals, plastics, detergents, dyestuffs, drugs, and agrochemicals and others. The course emphasizes the common technological foundations without going into specialized details.

10236465 Applied Chemical Catalysis

An elective 3-lecture course that introduces applied chemistry students to different aspects of chemical catalysis, including theory and applications. The course covers different types of homogeneous, heterogeneous and hybrid types of catalysis. Catalysis by molecular organometallic compounds and zeolites is involved together with surface catalysis by metals and metal oxides. Photocatalysis is also included. Applications of catalysis in organic reactions such as hydrogenation, reforming, carbonylation, isomerization, and other processes are included. Environmental applications of catalysis, such as cleanup processes by solar light are also included.

10236467 Polymer Technology

An elective 3-lecture course which deals with industrial methods of producing & forming polymers such as moulding, blowing, calendering, casting, extrusion, foaming, coloring, and filling with additives.

10236468 Industrial Pharmacy

This is an elective 3-lecture course deals with the basic principles of pharmaceutical manufacturing operations and machinery. In this course students are acquainted with the basic requirements of the current Good Manufacturing Practices (cGMP), basic operations in the manufacturing of the different pharmaceutical dosage forms, quality control procedures and equipments used. The course describes basic design and various divisions and departments of an industrial plant, cGMP requirements, equipments and dealing with various problems encountered during the development of various dosage forms from the research and development (R&D) stage to final approval.

10236469 Material Science

An elective 3-lecture course that involves the principles of structure and bonding together with physical characteristics of materials utilized in societal daily life. Properties of materials related to atomic, molecular and crystalline structure are targeted. Metals, ceramics, semiconductors, nano-materials and conjugated polymers are involved. Materials manufacturing and characterization techniques with AFM, SEM, XRD and others are involved.

10236472 Food Microbiology

An elective 3-lecture course that involves food preservation, spoilage, poisoning and modern concepts in quality assurance. The aim is to understand the factors governing microbial changes in foods. Problem solving in the food industry is emphasized. Laboratory work of this course includes taking samples and knowing the microbes in the food like fruits, vegetables, dairy and meals. Knowing the types of microbes in food is the most important in analysis.

10236476 Practical Training

The applied chemistry student, through coordination with the Practical Training Centre at An-Najah National University, is required to spend 320 working hours or 40 days of training (8 hours/day) in chemical & allied industries or relevant centres or laboratories. After completion of training, the student must write a report and/or give a presentation of his work.

Practical training can go in tandem with other semester study (no more than 9 credit hours) or in summer (with no other courses).

10236485 Special Topics in Applied Chemistry

An elective 3-lecture course that covers different advanced topics in applied chemistry.

10236486 Special Topics in Industrial Chemistry

An elective 3-lecture theoretical course that covers different advanced topics in industrial chemistry.

10236493 Natural Phytochemistry

This course focuses on the classification of medicinal plants, ways of identifying their chemical constituents, methods of separation. The course involves also a study of the physico-chemical properties of the natural pure compounds, methods of structure determination (MS, NMR, IR, and UV).

10236494 Practical Natural Phytochemistry

This experimental course involves a study of natural chemical groups such as fluorides, glycosides, volatile and fixed oils, ways of their identification and evaluation according to accredited pharmaceutical rules.

Staff

Full Professor		
Name	University of graduate	Graduation Year
Dr. Hikmat Hilal	University of Manchester, UK.	1980
Dr. Bassem Shraydeh	University of Wales, UK.	1980
Dr. Maher An-Natsheh	University of Manchester, UK.	1983
Dr. Mohammed Subu'	University of Florida, USA.	1984
Dr. Ismail Warad	Tuebingen University/Germany	2003

Associate Professor		
Name	University of graduate	Graduation Year
Dr. Foad Mahmoud	University of Sussex, UK.	1979
Dr. Nidal Zatar	University of Kent, UK.	1983
Dr. Mohammed Al- Noori	University of New York, Buffalo, N.Y., USA.	1983
Dr. Waheed Jondi	University of Manchester, UK.	1990
Dr. Shehdeh Jodeh	Wayn State University, USA.	1991
Dr. Othman Hamed	Loyolla University, USA.	1996

Assistant Professor		
Name	University of graduate	Graduation Year
Dr. Nizar Mattar	University of Bradford, UK.	1983
Dr. Mohammed Suleiman Shtaya	Georg-August-Univesrsitate Goettingen, Germany.	2003
Dr. Samar Al-Shakhshir	University of Oklahoma, USA.	1995
Dr. Ibrahim Abu Shqair	An-Najah N. University, Nablus, Palestine.	2006
Dr. Ahed Zyoud	An-Najah N. University, Nablus, Palestine.	2009
Dr. Ahmad Abu Obeid	An-Najah N. University, Nablus, Palestine.	2010
Dr. Maather Sawalha	The University of Texas at El Paso (UTEP), USA.	2006

Lecturer		
Name	University of graduate	Graduation Year
Kamel Abdel Hadi	Southern Illinois University at Carbondale, USA.	1986
Nisreen al-Masri	University of the Pacific, USA.	1988
Randa Arafat	An-Najah N. University, Nablus, Palestine	1997
Nuha A. Shawareb	An-Najah National University, Nablus, Palestine.	2009
Amani Zu'bi	An-Najah N. University, Nablus, Palestine	2003

Teaching Assistant		
Name	University of graduate	Graduation Year
Omair Nabulsi	An-Najah National University, Nablus, Palestine.	1993
Ashraf Salman	An-Najah National University, Nablus, Palestine.	1996
Nafez Dweikat	An-Najah National University, Nablus, Palestine.	1998
Ameed Amereh	An-Najah N. University, Nablus, Palestine	2007
Mohammad Al masry	An-Najah N. University, Nablus, Palestine	2007
Mohammad Alqraini		0
Ruba Mahmoud Awayes	An-Najah N. University, Nablus, Palestine	2007
Tarek Dridy	An-Najah N. University, Nablus, Palestine	2009
Motasem Jamon	An-Najah N. University, Nablus, Palestine	2011

Courses Offered by Chemistry Department for Other Faculties

Course Code	Course's Title	Credit Hours	Prerequisites	Faculty
10231103	General Chemistry for Veterinary Medicine	3		Veterinary Medicine
10231104	General Chemistry Lab for Veterinary Medicine	1	1) 10231103 or concurrent with it	Veterinary Medicine
10231114	General Chemistry for Health Science	3		Health Sciences
10231115	General Chemistry Lab for Health Science	1	1) 10231114 or concurrent with it	Health Sciences
10231212	Analytical Chemistry for Biological Science	3	1) 10231102 2) 10231108	Biological Science
10231213	Analytical Chemistry for Health Science	3	1) 10231114 2) 10231115	Health Sciences
10231214	Analytical Chemistry Lab for Health Science	1	1) 10231213 or concurrent with it 2) 10231115	Health Sciences
10231216	Analytical Chemistry Lab for Biological Science	1	1) 10231212 or concurrent with it 2) 10231108	Biological Science
10231233	Organic Chemistry for Biological Science	3	1) 10231102 2) 10231108	Biological Science
10231234	Organic Chemistry for Veterinary Medicine	3	1) 10231102 or 10231103 2) 10231108 or 10231104	Veterinary Medicine
10231236	Organic Chemistry for Health Science (I)	3	1) 10231114 2) 10231115	Health Sciences
10231237	Organic Chemistry Lab for Biological Science	1	1) 10231233 or concurrent with it	Biological Science
10231238	Organic Chemistry Lab for Veterinary Medicine	2	1) 10231234 or concurrent with it	Veterinary Medicine
10231239	Organic Chemistry Lab for Health Science (I)	1	1) 10231236 or concurrent with it	Health Sciences
10231313	Instrumental Analytical Chemistry	3	1) 10231213	Health Science
10231314	Instrumental Analysis Lab.	1	1) 10231214 2) 10231313 or concurrent with it	Health Sciences
10231330	Organic Chemistry (II) for Health Science (II)	3	1) 10231236	Health Sciences
10231334	Organic Chemistry Lab (II) for Health Science (II)	1	1) 10231238 2) 10231330 or concurrent with it	Health Sciences

Course Description

10231103 General Chemistry for Veterinary Medicine

A compulsory 3-lecture course that is mainly designed to give students a knowledge of the most important chemical principles, such as atomic structure and the periodic table, mass relationships in chemical reactions, reactions in aqueous solutions, gases, thermo chemistry, basic chemical facts and theories about solutions, kinetics, dynamic equilibrium, thermodynamics and electrochemistry.

10231104 General Chemistry Lab for Veterinary Medicine.

A compulsory practical course, designed to introduce the students to various experimental practices used in general chemistry, such as accurate weighing, performing basic chemical methods such as filtration, titration and gravimetric analysis, make simple metathesis and redox reactions, calorimetry experiments and calculations, kinetics, equilibrium experiments and using pH- meter.

10231114 General Chemistry for Health Science

A compulsory 3-lecture course that is mainly designed to give students a knowledge of the most important chemical principles such as atomic structure and the periodic table, mass relationships in chemical reactions, reactions in aqueous solutions, gases, thermo chemistry, basic chemical facts and theories about solutions, kinetics, dynamic equilibrium, thermodynamics and electrochemistry.

10231115 General Chemistry Lab for Health Science

A compulsory practical course, designed to introduce the students to various experimental practices used in general chemistry, such as accurate weighing, performing basic chemical methods such as filtration, titration and gravimetric analysis, make simple metathesis and redox reactions, calorimetry experiments and calculations, kinetics, equilibrium experiments and using pH- meter.

10231212 Analytical Chemistry for Biological Science

A compulsory 3-lecture course that involves some classical and modern methods of analysis, such as: Gravimetry, Titrimetry, and Spectrometry. The course also includes topics in statistics and data analysis that are important in analytical chemistry.

10231213 Analytical Chemistry for Health Science

A compulsory 3-lecture course that involves some classical and modern methods of analysis, such as: Gravimetry, Titrimetry, and Spectrometry. The course also includes topics in statistics and data analysis that are important in analytical chemistry.

10231214 Analytical Chemistry Lab for Health Science

A compulsory laboratory course that involves experiments related to classical chemical analysis. It provides basic information about safety rules, tools of analytical chemistry, statistics for data treatment, and practice to various gravimetric and volumetric methods of analysis.

10231216 Analytical Chemistry Lab for Biological Science

A compulsory laboratory course that involves experiments related to classical chemical analysis. It provides basic information about safety rules, tools of analytical chemistry, statistics for data treatment, and practice to various gravimetric and volumetric methods of analysis.

10231233 Organic Chemistry for Biological Science

A compulsory 3-lecture course that starts with an introduction to organic chemistry then rigorously deals with physical and chemical properties, structure, naming and methods of syntheses of some organic compounds such as alkanes, alkenes, alkynes and aromatics. The course also involves physical and chemical properties of some basic functional groups such as alcohols, amines, carboxylic acids and their derivatives; and phenols together with basic stereochemistry.

10231234 Organic Chemistry for Veterinary Medicine

A compulsory 3-lecture course that starts with an introduction to organic chemistry then rigorously deals with physical and chemical properties, structure, naming and methods of syntheses of some organic compounds such as alkanes, alkenes, alkynes and aromatics. The course also involves physical and chemical properties of some basic functional groups such as alcohols, amines, carboxylic acids and their derivatives; and phenols together with basic stereochemistry.

10231236 Organic Chemistry for Health Science (I)

A compulsory 3-lecture course that starts with an introduction to organic chemistry then rigorously deals with physical and chemical properties, structure, naming and methods of syntheses of some organic compounds such as alkanes, alkenes, alkynes and aromatics. The course also involves physical and chemical properties of some basic functional groups such as alcohols, amines, carboxylic acids and their derivatives; and phenols together with basic stereochemistry.

10231237 Organic Chemistry Lab for Biological Science

A compulsory practical, divided into four hour lab periods weekly. The course includes some experiments which give the student practice in basic laboratory techniques such as determination of physical properties (melting point and boiling point) and methods of separation (extraction, distillation and steam distillation) and purification (crystallization and chromatography). This course also involves some chemical reactions such as elimination, addition and substitution.

10231238 Organic Chemistry Lab for Veterinary Medicine

A compulsory practical, divided into four hour lab periods weekly. The course includes some experiments which give the student practice in basic laboratory techniques such as determination of physical properties (melting point and boiling point) and methods of separation (extraction, distillation and steam distillation) and purification (crystallization and chromatography). This course also involves some chemical reactions such as elimination, addition and substitution.

10231239 Organic Chemistry Lab for Health Science (I)

A compulsory practical, divided into four hour lab periods weekly. The course includes some experiments which give the student practice in basic laboratory techniques such as determination of physical properties (melting point and boiling point) and methods of separation (extraction, distillation and steam distillation) and purification (crystallization and chromatography). This course also involves some chemical reactions such as elimination, addition and substitution.

10231313 Instrumental Analytical Chemistry

Instrumental analysis course which will explain the theory of operation, instrumental design, methodology, and applications of instrumental techniques of spectroscopic methods including infrared, UV/VIS, MS, and chromatographic methods including gas, liquid, and thin layer chromatography and some potentiometric and coulometric methods of analysis.

10231314 Instrumental Analysis Lab

A compulsory course involves three practical hour laboratory work per week. It covers basic instrumental methods used in quantitative chemical analysis, such as: polarimetry, refractometry, pH - titrations, potentiometry, conductometry, electrogravimetry, coulometry and spectrometry.

10231330 Organic Chemistry (II) for Health Science (II)

A compulsory, 3 hour lectures. The course is a continuation to organic chemistry (I) 0231236 and is designed to study the importance of organic pharmaceutical compounds. Topics to be covered are, α-β unsaturated carbonyl compounds; heterocyclic compounds and their nomenclature,

chemical properties and their importance in pharmaceuticals; chemistry of lipids and carbohydrates is also covered.

10231334 Organic Chemistry Lab (II) for Health Science (II)

It is a compulsory practical, one lecture and 4 hour lab periods, course study electrophilic aromatic substitution reactions and some basic preparative practical reactions such as Grignard reaction, Sandmyer reaction, Friedel-Craft reactions and functional group protection reactions. This course also involves condensation reactions, oxidation reactions and elemental analysis.