FACULTY OF SCIENCES

FACULTY LIST

OFFICERS OF THE FACULTY

Salem, Elie A.	President of the University
Bashour, Tali'	Vice President for Medical Studies
Karam, Nadim	Vice President for Health Affairs and Community Development
Nahas, George	Vice President for Planning and Educational Relations
Najjar, Michel	Vice President for Development and Public Affairs
Bahr, George	Dean
Moubayed, Walid	Dean of Admissions and Registration
Bashir, Sameera	Librarian

FACULTY STAFF

Nasr, Adele	Faculty Secretary
Bazzi, Samer	Laboratory Assistant
Bitar, Amine	Laboratory Assistant
Khoury (El), Takla	Laboratory Assistant
Mujaes, Nabil	Laboratory Assistant
Nini, Eddy	Laboratory Assistant
Zakhem, Michel	Laboratory Assistant

FACULTY MEMBERS

Abbas, Abdel-Wahed	Ph.D., Computer Science, Queen Mary College, University of London, UK
Abdel-Massih, Roula	Ph.D., Biochemistry, University of Glasgow, UK
Abdul-Aziz, Abdul-Rahman	Ph.D., Mathematics, University of Sydney, Australia
Abi-Salloum, Bachir	Ph.D., Animal Physiology, Hohenhein University, Germany
Achkar(El), Eliane	Ph.D., Molecular Genetics, Universite Paris VI, Pierre & Marie Curie, Paris, France
Alam-Eddine, Bassam	Ph.D., Organic Chemistry, University of Fribourg, Switzerland
Antoun, Sayed	Ph.D., Polymer Chemistry, University of Liège, Belgium
Attieh, Jihad	Ph.D., Plant Physiology & Biochemistry, Université de Montréal, Canada
Bahr, George	Ph.D., Immunology, University College, London, England
Barakeh, Bilal	Ph.D., Mathematics, Institut National Polytechnique de Lorraine, France
Chami, Riad	M.S., Computer Science, University of Technology, Sydney – Australia
Dabboussi, Fouad	Ph.D., Microbiology, Université de Lylle II, France

Dagher, Issam	Ph.D., Electrical Engineering, University of Central Florida, USA
Debs, Esperance	Ph.D., Food Microbiology, Université de Technologie de Compiègne, France
Debs (El), Hamid	Ph.D., Biomedical Engineering, Université de Technologie de Compiègne, France
Dib Nehme, Micheline	M.Sc., Mathematics, University of Texas-Arlington, USA
Echtay, Karim	Ph.D., Biochemistry, Ludwig Maximillians University, Munich, Germany
Ghanem, Noha	Ph.D., Medicinal Chemistry, University of Montpellier II, France
Ghorayeb, Sleiman	D.E.S.S., Computer Science, Nancy I & II University, France
Greije, Hanna	Ph.D., Applied Mathematics, Université Pierre et Marie Curie, France
Haddad, John	Ph.D., Molecular Pharmacology, Cell Physiology & Biochemistry, University of Dundee, UK
Hallak, Adel	Ph.D., Adaptive Control, Petersburg Technical University, Russia
Hanna, Robert	Emeritus Professor, Chemistry
Houalla, Rym	Ph.D., Microbiology, Edinburgh University, England
Jadayel, Roula	M.S., Mathematics, American University of Beirut, Lebanon
Jammal, Ghassan	Ph.D., Automated Control Systems, Czech Technical University, Czechoslovakia
Joumaa, Wissam	Ph.D., Muscular Physiopathology, Université de Nantes, France
Karam, Walid	M.S., Electrical Engineering, South Dakota State University, USA
Kassab, Rima	Ph.D., Organic Chemistry, Université Claude-Bernard, Lyon, France.
Masri, Rania	Ph.D., Forestry, North Carolina State University, USA
Melki, Antoine	Ph.D., Computer Science, University of Athens, Greece
Mokbel, Chafic	Ph.D., Computer Engineering, E.N.S.T. Paris, France
Nader, Manal	Ph.D., Biology and Aquaculture, Hokkaido University, Japan
Nakat (El), Hanna	Ph.D., Physical Chemistry, University of New South Wales, Australia
Nauffal, Diane	Ph.D., Education, University of Burmingham, U.K.
Nehme, Gaby	Ph.D., Material Sciences and Mechanical Engineering, University of Texas, USA

Obeid, Pierre	Ph.D., Chemistry, University of Patras, Greece
Rastikian, Karabet	Ph.D., Chemical Engineering, Université de Technologie de Compiègne, France
Saba, Riad	M.S., Electrical Engineering, Oklahoma State University, USA
Sbat, Mira	DEA, Mathematics, University of Saint Joseph, Lebanon
Shammas, Adballah	Ph.D., Soils and Water Chemistry, University of Wisconsin-Madison, USA
Tannous, Camille	M.S., Mechanical Enginneering, McNeese University, USA
Tannous, Tony	Ph.D., Science, University of Sydney, NSW, Australia
Tout, Hassan	Ph.D., Computer Science, University of Toulouse I-Toulouse, France
Yaacoub, Guitta	DEA, Plant Production, Lebanese University, Lebanon
Yammine, Paolo	Ph.D., Organic Chemistry, University of Paris XIII, France
Zakhem, Imad	M.S., Computer Engineering, National Technical University of Athens, Greece
Zaydan, Roula	Ph.D., Analytical Chemistry, University of Nantes, France

PROGRAMS OF STUDY

The Faculty of Sciences includes:

- The Department of Biology
- The Department of Chemistry
- The Department of Computer Science
- The Department of Environmental Sciences
- The Department of Mathematics
- The Department of Physics

The sequence of study proceeds from an education in both science fundamentals and humanities toward training designed to lead to the student's mastery of certain principles and arts central to science. The Faculty of Sciences offers the following degrees:

Major	Years	Degree	Status
Biology	3	BS	Offered
	3+1	Teaching Diploma	Offered
	3+2	MS	Offered
Chemistry	3	BS	Offered
	3+1	Teaching Diploma	Offered
	3+2	MS	Offered
Computer Science	3	BS	Offered
	3+1	Teaching Diploma	Offered
	3+2	MS	Offered
Computer Science (Information Systems)	3	BS	Offered
	3+2	MS	Offered
Environmental Sciences	3	BS	Offered
Mathematics	3	BS	Offered
	3+1	Teaching Diploma	Offered
Physics	3	BS	Offered
	3+1	Teaching Diploma	Offered

UNDERGRADUATE PROGRAM

1. ADMISSION REQUIREMENTS

Admission to the undergraduate program in the Faculty of Sciences is normally restricted to the first year. However, applicants from other accredited institutions may be considered with the approval of the Admissions Committee. In such cases, applications will be studied provided the following requirements are satisfied:

a- Enrollment quotas.
b- The applicant must have obtained a minimum average of 70 in at least 20 transferable credits, or must have successfully completed a whole year of study.
c- The applicant's Baccalaureate should qualify him/her for admission to the university.
d- The applicant must satisfy university admission requirements concerning English.
e- All transfers are subject to review by the Faculty Admissions Committee who evaluates the applicant's qualifications for academic success in scientific subjects.

2. ACADEMIC RULES AND REGULATIONS

Refer to Scholastic Standing, General Section, I

A. CHANGE OF MAJOR

To transfer from any other faculty of the University of Balamand to the Faculty of Sciences, the student must have a cumulative average of at least 70 to be eligible for consideration by the Faculty's Admissions Committee.

3. LABORATORY CHARGES

A. SUPPLIES

Each student taking laboratory subjects must furnish the necessary notebooks, blank forms, lab coat, and similar supplies at his/her expense. For regular students taking prescribed laboratory work no charge will be made for normal amounts of expendable material used in connection with the laboratory subject.

Expendable materials are those that are necessarily consumed or rendered unfit for further use by the normal conduct of a laboratory test. If an excessive amount of expendable material is required because of carelessness on the part of the student, the cost of the additional material will be charged to the student or group responsible.

B. DAMAGES

Students will be charged for damage to instruments caused by neglect. The amount of the charge will be the actual cost of repair, and if the damage results in total loss of the apparatus, adjustment will be made in light of the condition of the instruments. Where there is danger of costly damage, an instructor should be requested to check the equipment's set up. When a group does laboratory work, charges for breakage will be divided among the members of the group concerned. The amount of the charge will be stated immediately or as soon as it can be determined.

3. SUPPORT LABORATORIES

The laboratories that students will attend in support of the theoretical subjects include:

Biology Labs.
Chemistry Labs.
Database Lab.
Environmental Sciences Labs.
Internet Applications Lab: WEBLAB.
Multimedia Lab.
Networking Lab.
Parallel Programming Lab.
Telecommunications Lab.
UNIX Lab.
Video Conferencing and Computer Telephony Lab.
Statistics Lab.

GRADUATE PROGRAM

To earn a Master's degree, a student must successfully complete 30 credits of course work approved by the Department (of which up to six credits may be awarded for a research project).

1. ADMISSION REQUIREMENTS:

Applicants to the Master's degree program must hold a Bachelor's degree from a recognized institution of higher learning with an undergraduate average of at least 80 or its equivalent in the major courses of the field of study and in the last two years of undergraduate study as per Admission Information in Section I. The candidate's folder should contain the following documents:

a- An official application to join the graduate program.

b- Official transcripts from the universities attended during the last three years.

c- 3 letters of recommendation.

d- A personal statement.

e- Any other documentation requested by individual departments

Graduate acceptance is granted upon recommendation of the Faculty Graduate Committee after the application is reviewed.

The Faculty Graduate Committee may also admit students on probationary status to the graduate program after evaluation of the student file. A student admitted on probation must achieve an average of 80 or above in the major courses during the first semester of graduate study with a full-time load. A failing grade in any course is disqualifying. Failure to satisfy these requirements will result in automatic dismissal from the graduate program.

Students not admitted on probation due to insufficiently high undergraduate average scores may repeat some courses to improve their average and reapply for admission to the graduate program.

2. ACADEMIC RULES & REGULATIONS:

A. TIME LIMITATIONS:

With careful planning, full-time students should be able to complete the MS program in one calendar year. Part-time students can complete the MS degree in up to three years.

Course credits earned in the program of graduate study or accepted by transfer are valid for a maximum of six years, unless the Graduate Committee of the Faculty grants an extension. Students should petition the Graduate Committee in writing to request such exceptions.

B. TRANSFER CREDITS:

A maximum of 6 credits (two courses) obtained at an approved institution of higher learning may be accepted towards the degree, provided the credits consist of work taken at the graduate level. A grade of 80 or better is required for transfer courses to be accepted. The courses must not have been used as credit toward any other degree at UOB. Transfer credits will be granted for courses that are equivalent to a course offered at UOB.

C. PASSING GRADE:

The passing grade for all courses is 70.

D. FULL-TIME STATUS:

The semester load for full-time students is no less than 9 hours per semester. Students who are employed outside the university for more than 20 hours per week are not normally eligible for full-time status in the Faculty of Sciences.

E. GRADUATION REQUIREMENTS:

In order to graduate, students must achieve a cumulative average of 80 or above.

F. PROBATIONARY STATUS:

A student is placed on probation for any of the following reasons:

1- Having failed a course (grade less than 70).

2- Having a cumulative average less than 80.

G. DISMISSAL:

A graduate student may be dismissed from the program for any of the following reasons:

1- Failing 2 courses in one semester.

2- Failing to remove a probation or staying on probation for two consecutive semesters.

H. APPEAL:

A graduate student may petition the Dean concerning the application of any academic regulation. Petitions should be made only when a dispute cannot be resolved at the departmental level.

DEPARTMENT OF BIOLOGY

DESCRIPTION of BIOLOGY COURSES

The primary mandate of the Department of Biology is to provide excellence in teaching at the undergraduate and graduate levels. The Department offers a comprehensive program, which exposes students to the full range of biological sciences. Our undergraduate three-year curriculum introduces students to modern studies in general, molecular, cell, and environmental biology. It also emphasizes active, hands-on experience with modern technology. Small class sizes with an emphasis on laboratories and tutorials foster ongoing, productive interactions between students and faculty.

Graduates in Biology may go on to professional programs in medicine, medical sciences, biotechnology, or science education. They may also enter the workforce directly, as research assistants, data analysts and members of marketing teams in the pharmaceutical and health industries. Still others may choose to pursue graduate studies in biological sciences, with the aim of following a career in academia or industry.

The Department of Biology offers a Bachelor of Science Degree (B.Sc.) in Biology for students who have successfully undertaken a minimum of **96** credits of required courses provided that they satisfy all other graduation requirements set by the University.

Students must complete the following:

I. 41 credits of Major Courses:

Thirty credits (30 cr) constituted of the following courses: BIOL 201, BIOL 202, BIOL 203, BIOL 204, BIOL 207, BIOL 213, BIOL 214, BIOL 245, BIOL 246, BIOL 251, BIOL 261, BIOL 262, BIOL 283, BIOL 284.

Plus eleven credits (11 cr) selected from: BIOL 208, BIOL 221, BIOL 222, BIOL 223, BIOL 224, BIOL 225, BIOL 226, BIOL 227, BIOL 229, BIOL 230, BIOL 231, BIOL 232, BIOL 233, BIOL 241, BIOL 242, BIOL 243, BIOL 244, BIOL 247, BIOL 249, BIOL 263, BIOL 264, BIOL 265, BIOL 266, BIOL 271, BIOL 272, BIOL 285, BIOL 286, BIOL 287, BIOL 291, BIOL 292

II. 28 credits of Major-Required Courses:

CHEM 202, CHEM 203, CHEM 240*, CHEM 245, CSIS 273, MATH 203, MATH 242, MATH 272, PHYS 211, PHYS 212, PHYS 213, PHYS 214

***Premedical students must replace** CHEM 240 **with** CHEM 242 **&** CHEM 244**, which subsequently are counted in the Major Average.**

III. 18 credits of University-Required Courses:

ENGL 203, ENGL 204, CVSQ 201, CVSQ 202, CVSQ 203, CVSQ 204.

IV. 09 credits of Free Electives**

****A Premedical Student, having substituted CHEM 240 with CHEM 242 & CHEM 244 (6 cr), must also take CHEM 222 (Analytical Chemistry) as an elective. Such student may only choose ONE 3-credit course as a free elective.**

Minor in Biology

The minor in Biology allows students to gain valuable information in the field of biological sciences while completing their primary field of study. It also allows students to take advanced biology coursework related to the main discipline. The Faculty of Sciences offers a Minor in Biology for students who have successfully completed a minimum of **18** credits of biology courses as follows:

Course Code	Course Name	Value
BIOL 201	General Biology I	3 cr
BIOL 202	General Biology I Lab	1 cr
BIOL 203	General Biology II	3 cr
BIOL 204	General Biology II Lab	1 cr

Any three courses (9 credits) and one lab (1 credit) picked from the following list*:

BIOL 207	Ecology	3 cr
BIOL 213	Cell Biology	3 cr
BIOL 214	Cell Biology Lab	1 cr
BIOL 225	Animal Physiology	3 cr
BIOL 226	Animal Physiology Lab	1 cr
BIOL 229	Immunobiology	3 cr
BIOL 245	Plant Physiology	3 cr
BIOL 246	Plant Physiology Lab	1 cr
BIOL 251	Principles of Biochemistry	3 cr
BIOL 261	Microbiology	3 cr
BIOL 262	Microbiology Lab	1 cr
BIOL 263	Nutrition	3 cr
BIOL 264	Nutrition Lab	1 cr
BIOL 283	Genetics	3 cr
BIOL 284	Genetics Lab	1 cr
BIOL 285	Molecular Biology	3 cr
BIOL 286	Molecular Biology Lab	1 cr

* If carefully chosen, these courses may present a minor with a specific concentration.

Sample Course Distribution

First Year

Semester 1

Course Code	Course Title	Credit
BIOL 201	General Biology I	3
BIOL 202	General Biology I Lab	1
CHEM 202	Basic Chemistry	3
CHEM 203	Basic Chemistry Lab	1
CSIS 273	Personal Computing for Applied Sciences	3
ENGL 203	English Communication Skills III	3
MATH 203	Mathematics for Applied Sciences	3
		17

Semester 2

Course Code	Course Title	Credit
BIOL 203	General Biology II	3
BIOL 204	General Biology Lab. II	1
CHEM 240	Basic Organic Chemistry	3
ENGL 204	English Communication Skills IV	3
MATH 242	Statistics for Applied sciences	3
PHYS 211	Fundamentals of Physics I	3
PHYS 212	Fundamentals of Physics Lab. I	1
		17

Second Year

Semester 3

Course Code	Course Title	Credit
BIOL 283	Genetics	3
BIOL 284	Genetics Lab	1
CHEM 245	Organic Chemistry Lab. I	1
CVSQ 201	Early Formation of Civilization	3
PHYS 213	Fundamentals of Physics II	3
PHYS 214	Fundamentals of Physics Lab. II	1
	Free Elective	3
		15

Semester 4

Course Code	Course Title	Credit
BIOL 213	Cell Biology	3
BIOL 214	Cell Biology Lab	1
BIOL 251	Principles of Biochemistry	3
CVSQ 202	The Religious Experience	3
MATH 272	Differential Equations for Applied Sciences	3
	Major Elective	3
		—
		16

THIRD YEAR

Semester 5

Course Code	Course Title	Credit
BIOL 207	General Ecology	3
BIOL 261	Microbiology	3
BIOL 262	Microbiology Lab	1
CVSQ 203	Introduction to Modernity	3
	Major Elective	3
	Major Elective Lab	1
	Free Elective	3
		—
		17

Semester 6

Course Code	Course Title	Credit
BIOL 245	Plant Physiology	3
BIOL 246	Plant Physiology Lab	1
CVSQ 204	Contemporary Challenges in the Arab World	3
	Major Elective	3
	Major Elective Lab	1
	Free Elective	3
		—
		14

Electives in the Department of Biology

BIOL 208	GENERAL ECOLOGY LAB	1 Credit
BIOL 221	ZOOLOGY	3 Credits
BIOL 222	ZOOLOGY LAB	1 Credit
BIOL 223	COMPARATIVE VERTEBRATE ANATOMY	3 Credits
BIOL 224	COMPARATIVE VERTEBRATE ANATOMY LAB	1 Credit
BIOL 225	ANIMAL PHYSIOLOGY*	3 Credits
BIOL 226	ANIMAL PHYSIOLOGY LAB*	1 Credit
BIOL 227	NEUROPHYSIOLOGY	3 Credits
BIOL 229	IMMUNOBIOLOGY*	3 Credits
BIOL 230	IMMUNOBIOLOGY LAB	1 Credit
BIOL 231	DEVELOPMENTAL BIOLOGY	3 Credits
BIOL 232	DEVELOPMENTAL BIOLOGY LAB	1 Credit
BIOL 233	ENDOCRINOLOGY & REPRODUCTIVE BIOLOGY	3 Credits
BIOL 241	BOTANY	3 Credits
BIOL 242	BOTANY LAB	1 Credit
BIOL 243	PLANT ANATOMY	3 Credits
BIOL 244	PLANT ANATOMY LAB	1 Credit
BIOL 247	ECONOMIC PLANT BIOLOGY	3 Credits
BIOL 249	PLANT SECONDARY METABOLISM	3 Credits
BIOL 263	NUTRITION*	3 Credits
BIOL 264	NUTRITION LAB	1 Credit
BIOL 265	PARASITOLOGY & VIROLOGY	3 Credits
BIOL 266	PARASITOLOGY & VIROLOGY LAB	1 Credit
BIOL 271	PRINCIPLES OF SOIL SCIENCE	3 Credits
BIOL 272	PRINCIPLES OF SOIL SCIENCE LAB	1 Credit
BIOL 285	MOLECULAR BIOLOGY*	3 Credits
BIOL 286	MOLECULAR BIOLOGY LAB*	1 Credit
BIOL 287	BIOTECHNOLOGY & RECOMBINANT DNA	3 Credits
BIOL 291	SPECIAL TOPICS IN BIOLOGY	3 Credits
BIOL 292	SEMINARS IN BIOLOGY*	1 Credit

N.B. * Electives inBiology that are offered presently.

COURSE DESCRIPTIONS

BIOL 101 (previously BL 101) INTRODUCTION TO BIOLOGY I **3.0: 3 cr. E**

This course is an introduction to the basic concepts of Genetics and Evolution, for students undertaking the Freshman Program.

BIOL 102 INTRODUCTION TO BIOLOGY I LABORATORY **0.3: 1 cr. E**

A set of experiments that introduces students to the world of Biology, including use of the microscope, introduction to DNA isolation and manipulation, and the safe use of biology lab equipment.

BIOL 103 (previously BL 103) INTRODUCTION TO BIOLOGY II **3.0: 3 cr. E**

This course complements BIOL 101 and introduces the students to the basic concepts of Immunology and Metabolism.

BIOL 104 INTRODUCTION TO BIOLOGY II LABORATORY **0.3: 1 cr. E**

A set of experiments that introduces students to metabolism, including anatomy of the nervous system, neurophysiology, testing for glycaemia, blood cells, blood typing, and an introduction to immunological techniques.

BIOL 201 (previously BL 201) GENERAL BIOLOGY I **3.0: 3 cr. E**

Principles of biology, including the cellular basis of life; evolution; energy transfer through living organisms and introduction to Systematics.

BIOL 202 (previously BL 202) GENERAL BIOLOGY I LABORATORY **0.3: 1 cr. E**

Required laboratory includes techniques such as microscopy, biochemical analysis, and use of the scientific method.
Co-requisite: BIOL 201.

BIOL 203 (previously BL 203) GENERAL BIOLOGY II **3.0: 3 cr. E**

An introduction to the study of anatomy, physiology and classification of plants and animals, which includes structure/function relationships, reproduction, development and control systems.
Prerequisite: BIOL 201.

BIOL 204 (previously BL 204) GENERAL BIOLOGY II LABORATORY **0.3: 1 cr. E**

Laboratory includes cytology, histology, and dissection.
Co-requisite: BIOL 203.

BIOL 207 (previously BL 207) GENERAL ECOLOGY **3.0: 3 cr. E**

Origin and evolution of the biosphere, introduction to climates, ecosystems and biomes. A study of the interrelations of organisms and their environments. Principles of growth, regulation, distribution, structure and energetics of populations and communities are explored.
Prerequisite: BIOL 203.

BIOL 208 (previously BL 208) GENERAL ECOLOGY LABORATORY 0.3: 1 cr. E

Field and laboratory exercises illustrating concepts of general ecology.
Co-requisite: BIOL 207.

BIOL 213 (previously BL 213) CELL BIOLOGY 3.0: 3 cr. E

A general description of the structure and function of cellular organelles and cell components, with emphasis on the interactions between cells and their environment.
Prerequisite: BIOL 203.

BIOL 214 (previously BL 214) CELL BIOLOGY LABORATORY 0.3: 1 cr. E

Laboratory experiments include structure/function relationship in cell organelles. Introduction to basic techniques used in the field of cell biology.
Co-requisite: BIOL 213.

BIOL 221 (previously BL 221) ZOOLOGY 3.0: 3 cr. E

A general introduction to protists and animals without backbones. Emphasis placed on evolutionary and ecological relationships that make an understanding and appreciation of this diverse group of animals possible. A study of the vertebrates with regard to their systematics, ecology, and behavior.
Prerequisite: BIOL 203.

BIOL 222 (previously BL 222) ZOOLOGY LABORATORY 0.3: 1 cr. E

Exercises designed to introduce students to the 95 percent of all animals without a backbone. Identification of representative vertebrates through examination of specimens.
Co-requisite: BIOL 221.

BIOL 223 (previously BL 223) COMPARATIVE VERTEBRATE ANATOMY 3.0: 3 cr. E

A comparative study of the functional adaptations, which caused structural changes in different chordate animals based on specific examples.
Prerequisite: BIOL 203.

BIOL 224 (previously BL 224)
COMPARATIVE VERTEBRATE ANATOMY LABORATORY 0.3: 1 cr. E

A practical comparison of the anatomy of different vertebrates ranging from simplest forms to the most complex.
Co-requisite: BIOL 223.

BIOL 225 (previously BL 225) ANIMAL PHYSIOLOGY 3.0: 3 cr. E

A study of the functions of living things with emphasis on the chemical and physical properties of protoplasm, the conversion of energy and matter through cell respiration and synthesis, the transport of materials across membranes, cell excitability and contraction, and regulatory processes. A comparative study of physiological systems; nutrition, circulation, respiration, osmoregulation and excretion, nervous and endocrine coordination.
Prerequisite: BIOL 213.

BIOL 226 (previously BL 226) ANIMAL PHYSIOLOGY LABORATORY 0.3: 1 cr. E

Experimental investigation of various functions of cells by isolation and characterization of subcellular parts and examination of cellular processes such as membrane transport and cell excitability. Experimental examination of the various vertebrate organ systems and how different animals deal with physiological problems.
Co-requisite: BIOL 225.

BIOL 227 (previously BL 227) NEUROPHYSIOLOGY 3.0: 3 cr. E

An introduction to the nervous system with an organizational study of neural functions from molecular to organ level.
Prerequisite: BIOL 225.

BIOL 229 (previously BL 229) IMMUNOBIOLOGY 3.0: 3 cr. E

A general description of the immune system, its components, the different types of immune responses, the defense mechanisms; description of immunological techniques and immune diseases.
Prerequisite: BIOL 213.

BIOL 230 (previously BL 230) IMMUNOBIOLOGY LABORATORY 0.3: 1 cr. E

This course discusses subjects related to the mammalian immune system along with the application of various techniques used in the field of immunology such as Leukocyte count, Western blotting, immunoprecipitation, and ELISA.
Co-requisite: BIOL 229.

BIOL 231 (previously BL 231) DEVELOPMENTAL BIOLOGY 3.0: 3 cr. E

Description of the major events of the embryonic development in many organisms. Study of the molecular mechanisms that control this development.
Prerequisite: BIOL 203.

BIOL 232 (previously BL 232) DEVELOPMENTAL BIOLOGY LABORATORY 0.3: 1 cr. E

Thorough practical investigation of the different developmental stages in a number of animals belonging to different classes.
Co-requisite: BIOL 231.

BIOL 233 (previously BL 233) ENDOCRINOLOGY & REPRODUCTIVE BIOLOGY 3.0: 3 cr. E

This course deals with hormones, their structure, synthesis, secretion, role, and regulation. It deals also with related diseases and disorders.
Co-requisite: BIOL 213.

BIOL 241 (previously BL 241) BOTANY 3.0: 3 cr. E

An evolutionary survey of the plant kingdom: Classification, morphology and anatomy, adaptations for survival, and representative types and life cycles from the simplest to the most advanced groups.
Prerequisite: BIOL 203.

BIOL 242 (previously BL 242) BOTANY LABORATORY 0.3: 1 cr. E

Field and laboratory exercises to study plants ranging from the simplest to the most advanced groups. Identification of structural features of lower and higher plants.
Co-requisite: BIOL 241.

BIOL 243 (previously BL 243) PLANT ANATOMY 3.0: 3 cr. E

Origins, evolution and differentiation of plant tissues and organs with emphasis on the anatomy of vascular plants.
Prerequisite: BIOL 203.

BIOL 244 (previously BL 244) PLANT ANATOMY LABORATORY 0.3: 1 cr. E

Preparation and examination of different fixed plant tissues using light microscopy. Practical study of structure-function relationships.
Co-requisite: BIOL 243.

BIOL 245 (previously BL 245) PLANT PHYSIOLOGY 3.0: 3 cr. E

Selected aspects of the chemical and physical processes occurring in plants, including water relations and transpiration, photosynthesis, respiration, translocation of sugars, the assimilation of nitrogen and sulfur, mineral nutrition, growth and development, phytohormones and the metabolism of lipids and natural products.
Prerequisite: BIOL 203.

BIOL 246 (previously BL 246) PLANT PHYSIOLOGY LABORATORY 0.3: 1 cr. E

Introduction to experimental techniques used to study the biochemistry and physiology of plant growth.
Co-requisite: BIOL 245.

BIOL 247 (previously BL 247) ECONOMIC PLANT BIOLOGY 3.0: 3 cr. E

The importance of plants and their products in human life. Evolution and use of plant products in food and medicine with an overview of their potential use in biotechnology.
Prerequisite: BIOL 203.

BIOL 249 (previously BL 249) PLANT SECONDARY METABOLISM 3.0: 3 cr. E

In depth description of plant natural products, their nature, metabolism and role in plant interactions with other living organisms.
Prerequisite: BIOL 245.

BIOL 251 (previously BC 205) PRINCIPLES OF BIOCHEMISTRY 3.0: 3 cr. E

The course is designed to introduce the basic concepts of biochemistry. Coverage includes a thorough description of the biochemical framework: amino acids, proteins, enzymes, lipids, carbohydrates & nucleic acids. In addition, the course provides an overview of bioenergetics and metabolism of carbohydrates, lipids and amino acids.
Prerequisite: BIOL 203; Co-requisite CHEM 244 or CHEM 240.

BIOL 261 (previously BL 261) MICROBIOLOGY **3.0: 3 cr. E**

Structure and behavior of bacteria as well as selected fungi, algae, protozoa, and viruses; microbial genetics; microbial ecology and biotechnology; principles of immunity and disease.
Prerequisite: BIOL 203.

BIOL 262 (previously BL 262) MICROBIOLOGY LABORATORY **0.3: 1 cr. E**

Basic laboratory techniques for isolating, examining, and identifying bacteria, fungi, and viruses; elementary immunological techniques.
Co-requisite: BIOL 261.

BIOL 263 (previously BL 263) NUTRITION **3.0: 3 cr. E**

Study of basic human nutritional needs in energy, carbohydrates, fats, proteins, vitamins, and minerals with special emphasis on nutritional needs during various developmental stages in life (infant, adult, old age, and specific circumstances).
Prerequisite: BIOL 251.

BIOL 264 (previously BL 264) NUTRITION LABORATORY **0.3: 1 cr. E**

An investigation into the constituents of the major nutrients in the human diet. The laboratory includes testing of foods for composition and contamination.
Co-requisite: BIOL 263.

BIOL 265 (previously BL 265) PARASITOLOGY & VIROLOGY **3.0: 3 cr. E**

A general description of animal parasites: classification, morphology, life cycles and physiology.
Prerequisite: BIOL 261.

BIOL 266 (previously BL 266) PARASITOLOGY & VIROLOGY LABORATORY **0.3: 1 cr. E**

Practical application to the course material including diagnosis, identification of the most widespread types of parasites.
Co-requisite: BIOL 265.

BIOL 271 (previously BL 205) PRINCIPLES OF SOIL SCIENCE **3.0: 3 cr. E**

Introduction to soil science with an emphasis on soil genesis and development. Overview of the physical and mechanical characteristics. Plant, soil, water relations, microbial activities, and organic matter will be discussed.
Prerequisites: BIOL 203, CHEM 202.

BIOL 272 (previously BL 206) PRINCIPLES OF SOIL SCIENCE LABORATORY **0.3: 1 cr. E**

Examination of structure and texture of soils, determination of biological, physical and chemical characteristics of various soil samples.
Co-requisite: BIOL 271.

BIOL 283 (previously BL 283) GENETICS **3.0: 3 cr. E**

Organization, expression and evolution of hereditary elements in Prokaryotes and Eukaryotes; principles of the classical Mendelian Genetics and extension to population analysis; principles of molecular genetics: DNA structure and organization in chromosomes and genes, mutations and gene expression.
Prerequisite: BIOL 203.

BIOL 284 (previously BL 284) GENETICS LABORATORY **0.3: 1 cr. E**

Applications of genetic principles are reviewed through demonstrations, problem solving, and research. Experimental techniques employed in the study of genetics utilizing plants, animals, and microorganisms.
Co-requisite: BIOL 283.

BIOL 285 (previously BL 285) MOLECULAR BIOLOGY **3.0: 3 cr. E**

Molecular mechanisms involved in the expression of genetic information, the control of macromolecular synthesis, the aggregation of macromolecules into DNA-protein complexes, membranes, chromosomes and cell organelles, and an introduction to recombinant DNA technology.
Prerequisite: BIOL 283.

BIOL 286 (previously BL 286) MOLECULAR BIOLOGY LABORATORY **0.3: 1 cr. E**

Required laboratory includes an introduction to protein purification techniques, gene cloning, and recombinant DNA technology.
Co-requisite: BIOL 285.

BIOL 287 (previously BL 287) BIOTECHNOLOGY & RECOMBINANT DNA **3.0: 3 cr. E**

A course which deals with recombinant DNA technology and its uses in the various fields of Biology such as plant and animal amelioration, and bioremediation.
Prerequisite: BIOL 283.

BIOL 291 (previously BL 291) SPECIAL TOPICS IN BIOLOGY **3.0: 3 cr. E**

Course discussing various topics of Biology with special contemporary importance. Subjects may include advances in technical and theoretical knowledge as well as discussions of specific topics like cancer, cloning, theoretical biology, etc.
Prerequisite: BIOL 203.

BIOL 292 (previously BL 292) SEMINARS IN BIOLOGY **0.3: 1 cr. E**

Special course discussing topics of high interest presented by invited faculty or by students.
Prerequisite: Special permission from the Department.

CVSQ 201, 202, 203, 204

Refer to the Department of Cultural Studies.

CSIS 273

Refer to the Department of Computer Science.

MATH 203, 242, 272
Refer to the Department of Mathematics.

PHYS 211, 212, 213, 214
Refer to the Department of Physics.

GRADUATE PROGRAM IN BIOLOGY

The Department offers a two-year graduate program (30 credits) leading to the Master of Science (M.Sc.) degree in Biology and provides training in many areas with particular strengths in Biochemistry, Molecular Biology, Immunology, Microbiology and Experimental Plant Biology.

The emphasis in our program is on development of the intellectual and technical skills necessary for independent research. Formal course requirements (24 credits) are largely intended to fill gaps in the student's background and to bring him/her up to date with the most recent findings in the appropriate research areas. A primary component of the degree also is a thesis (6 credits) embodying the results of original research.

The Department's laboratory facilities are well equipped for graduate training and research in a wide variety of biological sciences. Our resources are further extended by association with other faculties, including the Faculty of Medicine and Medical Sciences and the Faculty of Health Sciences.

Admissions Requirements

Candidates for the graduate program must submit an application along with all the official documentation required. Applicants must have a B.Sc. in a discipline relevant to the proposed field of study with an overall average of 80 or its equivalent for undergraduate studies. The General Graduate Record Examinations (GRE) scores are required for the evaluation of the application (for more information on the GRE visit www.GRE.org). The Test of English as a Foreign Language (TOEFL) is required of students who have graduated from a non-English-language university.

Prospective graduate students should have adequate background knowledge in biochemistry, cell and molecular biology. Admission is based on an evaluation by the Department and on acceptance by a research director who can provide adequate academic guidance throughout the study period. Prospective graduate students are encouraged to contact staff members with whom they wish to study before applying for admission.

Applicants must also provide a statement of purpose outlining their research interests.

MASTER'S DEGREE IN BIOLOGY

Sample Distribution of Curriculum

SEMESTER I

BIOL 301	Techniques of Scientific Communication & Bioethics	3 cr
BIOL 303	Quantitative Analysis & Biostatistics	2 cr
BIOL 305	Enzymology & Metabolic Biochemistry	4 cr
		9 cr

SEMESTER II

BIOL 307	Advanced Molecular Biology	3 cr
BIOL 308	Techniques in Biological Research	3 cr
	Elective 1	3 cr
		9 cr

SEMESTER III

BIOL 391	Thesis	6 cr
	Elective 2	3 cr
		9 cr

SEMESTER IV

BIOL 391	Thesis (continued)	
	Elective 3	3 cr
		3 cr

Grand Total **30 credits**

Elective Courses:

BIOL 311	Advanced Cell Biology
BIOL 321	Advanced Topics in Cellular & Molecular Immunology
BIOL 323	Advanced Topics in Microbiology: Chronic Intracellular Infections & Pathogenesis
BIOL 341	Biochemistry & Physiology of Plants I: Growth & Development
BIOL 343	Biochemistry & Physiology of Plants II: Secondary Metabolism
BIOL 345	Biochemistry & Physiology of Plants III: Cell Wall
BIOL 381	Recent Advances in Biological Research

Electives may be chosen from the above list to provide an in-depth knowledge of a specific field of research. Presently, the Department offers two main research concentrations:

1. Experimental Plant Biology (Biochemistry and Molecular Biology)
2. Microbiology & Immunology.

Alternatively, up to 6 credits of elective courses may be chosen from outside the Department, with the consent of the supervisor, to complement the knowledge within a related field of research.

COURSE DESCRIPTIONS

BIOL 301 Techniques of Scientific Communication & Bioethics **3.0: 3 cr. E**

A graduate-level overview of techniques for platform, poster and written scientific presentations, as well as an understanding of the fundamentals of environmental and bioethics. After having successfully completed this course, students will be able to form and critique a logical argument, discuss the mission of making scientific presentations, dissect and summarize scientific papers, constructively critique scientific presentations, and draft a scientific proposal.

BIOL 303 Quantitative Analysis & Biostatistics **2.0: 2 cr. E**

This course provides students in the field of biological sciences and health care disciplines with the statistical tools and skills necessary to organize and summarize data in a meaningful way and to interpret and analyze data intelligently to reach sound decisions. There is an emphasis on computer applications for most of the statistical techniques covered in the course using SPSS as statistical software.

BIOL 305 Enzymology & Metabolic Biochemistry **4.0: 4 cr. E**

This is a lecture and discussion course designed for graduate students whose educational goals require more extensive exposure to biochemistry. The course provides detailed insights into the mechanisms of catalysis of various classes of enzymes including kinetic analysis, catalytic mechanisms, transition state stabilization and regulation of activity, strategies for active site characterization and regulatory properties. Cellular metabolism of carbohydrates, lipids, amino acids and nucleotides are also studied.

BIOL 307 Advanced Molecular Biology **3.0: 3 cr. E**

Advanced Molecular Biology is an advanced graduate lecture and discussion course. This course is based on critical reading and discussion of selected journal reviews and articles in Molecular Biology. The goals of the course are to (1) provide the student with an understanding of the biochemical processes fundamental to gene structure and function: DNA replication, transcription, translation, and regulation of gene expression; (2) explore the techniques and applications of recombinant DNA research, and to learn how this technology helped in elucidating the mechanisms of complex genetic control.

BIOL 308 Techniques in Biological Research **3.0: 3 cr. E**

This course covers specialized topics of current interest to graduate students in Biological Sciences with an emphasis on learning new research skills. Current laboratory techniques, literature searches, and hands-on practice of techniques are stressed. Laboratory with accompanying lectures give practical experience in the application of recombinant DNA technology, chromatography, microscopy and other basic and applied research. The aims of the course include improving practical skills in fundamental laboratory techniques in Biology.

BIOL 311 Advanced Cell Biology **3.0: 3 cr. E**

Advanced Cell Biology is designed for graduate students who need in-depth knowledge in the areas of cell and molecular biology and related fields. The course is based on the critical reading and discussion of selected journal reviews and articles in cell biology. It is a discussion-based course. The goals include learning basic principles in cell structure and function and developing analytical skills in experimental cell biology.

BIOL 321 Advanced Topics in Cellular & Molecular Immunology 3.0: 3 cr. E

The course addresses recent topics in the development, signaling and function of hematopoietic stem cells, innate immune cells, and lymphoid cells. In addition, the genetic, molecular, and cellular basis of atopy, autoimmunity and immunodeficiencies are exposed. By the end of the course, students would have acquired detailed knowledge of the mechanisms leading to the development of immune cells from hematopoietic stem cells, and of the activation, signaling, function, and regulation of innate immune cells (macrophages, dendritic cells, natural killer cells and natural T lymphocytes) as well as of adaptive immune cells and their subsets.

BIOL 323 Advanced Topics in Microbiology 3.0: 3 cr. E

The course provides an in-depth discussion of major intracellular bacteria and protozoa as well as 3 families of viruses, which commonly lead to chronic diseases. The pathogenesis and the immune evasion strategies used by these microbes are elucidated. By the end of the course, students would have acquired detailed description of key obligate and facultative intracellular bacteria (Mycobacteria, Listeria, Chlamidya, Brucella and Legionella), key intracellular protozoa (Plasmodium, Leishmania, Toxoplasma, and Trypanosoma) and key viral families (retroviruses, hepatitis viruses and herpes viruses) causing chronic diseases. The aspects of microbial growth, virulence, identification, and biological characteristics are elaborated. Disease epidemiology, pathology, diagnosis, treatment, and prevention are also discussed.

BIOL 341 Biochemistry & Physiology of Plants I: Growth & Development 3.0: 3 cr. E

This course focuses on developmental processes of plant growth from a structural and organismal approach. Biophysical and biochemical processes involved in plant growth are discussed: Synthesis, functions and mechanisms of action of phytohormones; endogenous rhythms: tropisms, circadian rhythms, and translocation. Exogenous signals (light and temperature) controlling plant development from seed germination to senescence are also covered. A student completing this course should have an understanding of the developmental processes of plant growth and how environmental factors affect plant growth and development.

BIOL 343 Biochemistry & Physiology of Plants II: Secondary Metabolism 3.0: 3 cr. E

This course constitutes a detailed survey of the field of natural products, which are referred to as ‘secondary metabolites’. The core focus will be on the structure and biosynthesis of the four main classes of plant secondary metabolites: polyketides, shikimate derivatives, isoprenoids and nitrogen-containing natural products. Synthesis and structure elucidation are covered only to the extent needed to understand how biosynthetic pathways are uncovered. The course will also touch on the various uses of secondary metabolites including medicinal use of plants, plant-insect interaction (chemical ecology), and the future of natural product research.

BIOL 345 Biochemistry & Physiology of Plants III: Cell Walls 3.0: 3 cr. E

This course provides information in areas of biochemistry unique to the plant cell wall. Its objective is to describe the complexity of cell wall structure, study its biosynthesis, and to relate cell wall structure with different aspects of the life of the plant. It includes a discussion of recent developments emphasizing understanding of the research approaches used to elucidate major processes in plant cell wall biosynthesis. Each chapter has a required list of scientific papers to help the students learn how to read and analyze scientific papers.

BIOL 381 Recent Advances in Biological Research **3.0: 3 cr. E**

The course is focused on an in-depth analysis of the literature through critical analysis of original research articles in a contemporary and highly specialized field of biological sciences. Journal papers and review articles will be analyzed in terms of background, hypothesis, use of experimental methods, and interpretation of results. The course is not limited to any specific topic and is intended to cover a wide range of subjects in biochemistry, genetics, microbiology, cell, molecular and developmental biology.

BIOL 391 Master's Thesis **6 cr.**

DEPARTMENT OF CHEMISTRY

BACHELOR'S DEGREE

The Faculty of Sciences offers a Bachelor Degree in Sciences (in Chemistry) for students who have successfully undertaken a minimum of 91 credits of required courses provided that they satisfy the standards set by the University and the Faculty. Students must complete the following:

1- 38 credits of Major Courses:

CHEM 202, CHEM 203, CHEM 222, CHEM 223, CHEM 224, CHEM 242, CHEM 244, CHEM 245, CHEM 246, CHEM 247, CHEM 260, CHEM 262, CHEM 263, CHEM 264, CHEM 270, CHEM 272.

2- 17 credits of Major Required Courses:

CSIS 273, MATH 203, MATH 272, PHYS 211, PHYS 212, PHYS 213, PHYS 214.

3- 18 credits of University Required Courses:

ENGL 203, ENGL 204, CVSQ 201, CVSQ 202, CVSQ 203, CVSQ 204.

4- 18 credits of Electives

Minor in Chemistry

The Faculty of Sciences offers a Minor in Chemistry for students who have successfully completed a minimum of 18 credits of chemistry courses as follows:

Course Code	Course Description	Credits
CHEM 202	Basic Chemistry	3cr
CHEM 203	Basic Chemistry Lab	1cr
CHEM 222	Analytical Chemistry I	3cr
CHEM 240	Basic Organic Chemistry	3cr
CHEM 245	Organic Chemistry Lab I	1cr
CHEM 260	Statistical Mechanics & Thermodynamics	3cr
CHEM 246	Applied Molecular Spectroscopy	3cr
And a selection of one laboratory course from		
CHEM 247	Organic Chemistry Lab II	1cr
CHEM 223	Analytical Chemistry Lab	1cr
CHEM 263	Physical Chemistry Lab	1cr

BACHELOR'S DEGREE

FIRST YEAR

Semester 1

Course Code	Course Title	Credit
CHEM 202	Basic Chemistry	3
CHEM 203	Basic Chemistry Lab	1
CSIS 273	Personal Computing for Applied Sciences	3
ENGL 203	English Communication Skills III	3
MATH 203	Mathematics for Applied Sciences	3
	Elective	3
		16

Semester 2

Course Code	Course Title	Credit
CHEM 222	Analytical Chemistry I	3
CHEM 242	Organic Chemistry I	3
ENGL 204	English Communication Skills IV	3
MATH 272	Differential Equations for Applied Sciences	3
PHYS 211	Fundamentals of Physics I	3
PHYS 212	Fundamentals of Physics I Lab	1
		16

SECOND YEAR

Semester 3

Course Code	Course Title	Credit
CHEM 245	Organic Chemistry Lab I	1
CHEM 244	Organic Chemistry II	3
CHEM 260	Statistical Mechanics and Thermodynamics	3
CVSQ 201	Early Formation of Civilization	3
PHYS 213	Fundamentals of Physics II	3
PHYS 214	Fundamentals of Physics II Lab	1
	Elective	3
		17

Semester 4

Course Code	Course Title	Credit
CHEM 224	Analytical Chemistry II	3
CHEM 246	Applied Molecular Spectroscopy	3
CHEM 247	Organic Chemistry Lab II	1
CHEM 262	Physical and Chemical Kinetics	3
CHEM 270	Inorganic Chemistry I	3
CVSQ 202	The Religious Experience: The Sacred	3
		16

THIRD YEAR

Semester 5

Course Code	Course Title	Credit
CHEM 223	Analytical Chemistry Lab	1
CHEM 264	Quantum Theory and Structure of Matter	3
CHEM 272	Inorganic Chemistry II	3
CVSQ 203	Introduction to Modernity	3
	Electives	6
		16

Semester 6

Course Code	Course Title	Credit
CHEM 263	Physical Chemistry Lab	1
CVSQ 204	Contemporary Challenges in the Arab World	3
	Electives	6
		10

CHIMESTRY ELECTIVE COURSES

I- With the Department

Course Code	Course Title	Credit
CHEM 280	Chemical Safety and Toxicology	3
CHEM 282	Food Chemistry	3
CHEM 284	Biogeochemistry	3
CHEM 286	Polymer Chemistry	3
CHEM 288	Methods of Analysis	3
CHEM 290	Industrial Chemistry	3
CHEM 298	Special Topics in Chemistry	3

II- Outside the Department

***Biochemistry
*** Biology
*** Computer Science
*** Environmental Sciences
*** Humanities
*** Mathematics
*** Physics

COURSE DESCRIPTIONS

CHEM 001 (previously CH 090) SOP CHEMISTRY 3.0: 3 cr. E

This is a Basic Chemistry course for students in the Special Orientation Program (SOP). SOP students normally study Chemistry in Arabic. It is the aim of this course to make the students familiar with the English terminology. Accordingly, the course reviews the topics usually taken at the Third Secondary Level such as: Atomic theory, Stoichiometry, Oxidation & Reduction, Ideal gas Laws, Quantum Chemistry, Chemical Equilibrium and an introduction to organic chemistry.

CHEM 100 (previously CH 100) INTRODUCTION TO CHEMISTRY I 3.0: 3 cr. E

Basic Chemistry Level I for Freshman students in the Scientific section. An elective for Freshman students in the Literary section. Accordingly, the course covers the following topics: Atomic theory of matter, types of reactions, concepts of acids and bases, molecular and ionic equations, oxidation-reduction reactions, calculations with chemical formulas and equations, stoichiometry, empirical gas laws, the ideal gas law, introduction to quantum chemistry.

CHEM 101 (previously CH 106)
INTRODUCTION TO CHEMISTRY I LABORATORY 0.3: 1 cr. E

The aim of this course is to introduce and familiarize Freshman students with the laboratory environment. Students will learn how to safely handle chemical reagents, glassware and basic apparatus by carrying out experiments such as precipitation, electrical conductivity of solutions, acid-base titration, melting point determination, distillation, etc.

CHEM 102 (previously CH 102) INTRODUCTION TO CHEMISTRY II 3.0: 3 cr. E

Basic Chemistry Level II for Freshman students in the Scientific section. Accordingly, the course covers the following topics: types of chemical bonds, electronegativity and polarity, rate of a chemical reaction, half life, chemical equilibrium, Le-Chaterlier's principle, Equilibrium in aqueous solutions (acids, bases, buffer), solubility, introduction to organic chemistry: hydrocarbons, hybridization, alkanes and cycloalkanes, alkenes, alkynes, aromatic hydrocarbons, reactions of hydrocarbons, organic compounds containing oxygen. Reaction of oxygen containing organic compounds, organic compounds containing nitrogen, and organic polymers.
Pre-requisite CHEM 100.

CHEM 103 INTRODUCTION TO CHEMISTRY II LABORATORY 0.3: 1 cr. E

In this laboratory course, Freshman students will carry out experiments such as precipitation, electrical conductivity of solutions, acid-base titration, melting point determination, distillation, etc.
Pre-requisite CHEM 101.

CHEM 110 INTRODUCTION TO FOOD CHEMISTRY AND NUTRITION 3.0: 3 cr. E

An introductory course for the exploration of the structure, properties, and chemical composition of food systems and the changes they undergo during processing and under storage. Basic food chemistry provides the student with knowledge of the three primary food constituents: carbohydrates, lipids and proteins and some of the main reactions between them. The Caloric concept of different food components is also discussed.

CHEM 150 INTRODUCTION TO THE SCIENCE OF COSMETICS 3.0: 3 cr. E

This is an enjoyable course for all students regardless of their educational formation or background. Cosmetics and toiletries are products of our every day life, ranging from the use of toothpastes, hair gels, deodorants, facial soaps, shampoos, hair conditioners and many others. Understanding how these products are made and how they work will unable you to decide which product to buy and which serves simply as a commercial tool. The student will also become familiar with basic perfume manufacturing process.

At the end of the course, each pupil will "manufacture" his/her own product they chose. The list includes shampoos, shaving creams, toothpastes, hand creams etc…

CHEM 200 (previously CH 208) GENERAL CHEMISTRY 3.0: 3 cr. E&F

This course of chemistry is designed primarily for first year students in various health-related programs as nursing, laboratory technology, medical assisting, dental assisting... Emphasis is placed on practical aspects of inorganic chemistry, organic chemistry and biochemistry. Theoretic topics will be given in three parts: Part I "inorganic chemistry" stresses relationships with the life processes that are the subject of part III "Biochemistry". Among theses related topics and processes-acids bases and electrolytes, solutions and redox reactions. Part II "organic chemistry" introduces the various classes of organic compounds. Part III "Biochemistry" deals with the chemical and molecular basis of life itself.

Students can not receive credits for both CHEM 200 and either of CHEM 202, or CHEM 204 or CHEM 206.

CHEM 202 (previously CH 202) BASIC CHEMISTRY 3.0: 3 cr. E

Origin of the atomic theory. Determination of atomic weights and molecular formulae. The mole concept. The chemical equation. Acid-base and oxidation-reduction concepts. Properties of gases and gas laws. Liquids and solutions. Types of solutions: ideal and non-ideal solutions. Chemical equilibrium. Ionic equilibrium in aqueous solutions. Solubility. Quantum theory of the atom. Electronic structure of atoms. The chemical bond: ionic and covalent bonds. Hybridization. The Valence-shell Electron-Pair Repulsion (VSEPR) Model.

Students can not receive credits for both CHEM 202 and either of CHEM 200, or CHEM 204 or CHEM 206.

CHEM 203 (previously CH 203) BASIC CHEMISTRY LABORATORY 0.3: 1 cr. E

The aim of this introductory laboratory course is to introduce the students to the basic techniques and equipment of common use in a chemistry lab. Co-requisite: CHEM 202, or 204, or 206.

CHEM 204 (previously CH 207) GENERAL APPLIED CHEMISTRY 3.0: 3 cr. E

This course is designed to give the students a basic knowledge of chemistry and chemical changes making them realize the importance of elements, components and mixture in everyday life. Also to show them how and why chemical reactions occur and the significance of such chemical changes in the fields of biology, medicine, industry, etc.

Students can not receive credits for both CHEM 204 and either of CHEM 200, or CHEM 202 or CHEM 206.

CHEM 206 (previously CH 213) CHEMICAL PRINCIPLES 3.0: 3 cr. E

This course is designed to cover the basic concepts in Chemistry that are of interest to students majoring in mechanical and Aeronautical Engineering. Students will especially learn about Electrochemistry, Chemical Thermodynamics in addition to chemical changes and their significance in industry.

Students can not receive credits for both CHEM 206 and either of CHEM 200, or CHEM 202 or CHEM 204.

CHEM 220 (previously CH 223) BASIC ANALYTICAL CHEMISTRY 2.0: 2 cr. E

A brief discussion of: Gravimetric Methods of Analysis. Titrimetric Methods of Analysis. Aqueous solution chemistry. Activities and Activity Coefficients. Equilibrium calculations. Precipitation Titration. Neutralisation Titration. Complex Acid-Base systems. Complex-Formation titration. Electrochemistry. Applications of Oxidation-reduction Titrations. Kinetics.
Students can not receive credits for both CHEM 220 and CHEM 222. Chemistry major students will not receive credits for CHEM 220.
Pre-requisite: CHEM 202.

CHEM 222 (previously CH 220) ANALYTICAL CHEMISTRY I 3.0: 3 cr. E

Errors in Chemical analysis. Statistical Evaluation of Analytical Data. Gravimetric Methods of Analysis. Titrimetric Methods of Analysis. Aqueous solution chemistry. Activities and Activity Coefficients. Equilibrium calculations. Precipitation Titration. Neutralization Titration. Complex Acid-Base systems. Complex-Formation titration. Electrochemistry. Applications of Oxidation-reduction Titrations. Kinetics. Students can not receive credits for both CHEM 220 and CHEM 222.
Pre-requisite: CHEM 202.

CHEM 223 (previously CH 221) ANALYTICAL CHEMISTRY LAB 0.3: 1 cr. E

The experiments are designed to familiarize the students with the manipulation of modern analytical instruments.
Pre-requisite: CHEM 203 & 222 (or 220).

CHEM 224 (previously CH 222) ANALYTICAL CHEMISTRY II 3.0: 3 cr. E

Potentiometric, Electrogravimetric and Coulorimetric Methods of Analysis. Voltametry. Introduction to Spectroscopic methods of Analysis. Instruments for Optical Spectroscopy. Molecular Absorption spectroscopy. Molecular Fluorescence Spectroscopy. Atomic Spectroscopy: UV & IR. Kinetic Methods of Analysis. Chromatography: Gas-Liquid and HPLC.
Pre-requisite: CHEM 222.

CHEM 240 (previously CH 248) BASIC ORGANIC CHEMISTRY 3.0: 3 cr. E

This course outlines the combined theories and fundamental concepts of organic chemistry, including structure, shape, IUPAC nomenclature, stereoisomerism, optical activity, absolute configuration and properties of the following groups: alkanes, alkenes, alkynes and aromatic hydrocarbons; compounds containing functional groups such as halogen, hydroxyl, carbonyl, carboxylic acids and amines. Emphasis is put on important synthesis methods and reagents, basic reaction mechanisms, important naturally-occurring and synthetic organic compounds, and physical methods used in structure determination.
Students cannot receive credit for both CHEM 240 and CHEM 242.
Students cannot receive credit for both CHEM 240 and CHEM 244.
Chemistry major students will not receive credits for CHEM 240.
Pre-requisite: CHEM 202.

CHEM 242 (previously CH 240) ORGANIC CHEMISTRY I **3.0: 3 cr. E**

Atomic and molecular orbitals; hybridization and bonding between two carbon atoms. Electronegativity and Resonance. Inductive effect. Stereochemistry: Optical and geometrical isomerism. Substitution, elimination and addition reaction. Properties of alkane, alkene and alkyne. Chemistry of the aromatic hydrocarbons.
Students cannot receive credit for both CHEM 240 and CHEM 242.
Pre-requisite: CHEM 202.

CHEM 244 (previously CH 242) ORGANIC CHEMISTRY II **3.0: 3 cr. E**

Study of the main functional groups: alcohol, phenols, ethers and epoxides, aldehydes and ketones, carboxylic acids and derivatives, amine and amides. Spectroscopy and structures. Carbanions. Aryl halides.
Students cannot receive credit for both CHEM 240 and CHEM 244.
Pre-requisite: CHEM 242.

CHEM 245 (previously CH 241) ORGANIC CHEMISTRY LAB I **0.3: 1 cr. E**

Experiments are intended to introduce students to basic techniques in organic chemistry, synthesis and extraction, chromatography and identification of functional groups.
Pre-requisite: CHEM 202, CHEM 203 & CHEM 242. Co-requisite: CHEM 244. or
Pre-requisite: CHEM 202 & CHEM 203. Co-requisite: CHEM 240.

CHEM 246 (previously CH 244) APPLIED MOLECULAR SPECTROSCOPY **3.0: 3 cr. E**

Principles and instrumentation of Ultraviolet, Visible, Infrared, Raman spectroscopy, Nuclear Magnetic Resonance spectroscopy and Mass Spectrometry. Analysis of IR, UV, NMR and mass spectra.
Pre-requisite: CHEM 244 or CHEM 240.

CHEM 247 (previously CH 243) ORGANIC CHEMISTRY LAB II **0.3: 1 cr. E**

Synthesis and structure determination of complex organic compounds. The aim of this course is to familiarize the students with advanced techniques used in organic chemistry laboratories.
Co-requisite: CHEM 245.

CHEM 260 (previously CH 260)
STATISTICAL MECHANICS AND THERMODYNAMICS **3.0: 3 cr. E**

The properties of gases. The First Law of thermodynamics: concepts and machinery. The Second Law of thermodynamics: concepts and machinery. Change of state. Equilibrium electrochemistry. Pre-requisite: CHEM 202.

CHEM 262 (previously CH 262) PHYSICAL AND CHEMICAL KINETICS **3.0: 3 cr. E**

The kinetic theory of gases. Ion transport and molecular diffusion. Rates of chemical reactions. Kinetics of complex reactions. Molecular reaction dynamics. Processes at solid surfaces. Dynamic electrochemistry.
Pre-requisite: CHEM 202.

CHEM 263 (previously CH 263) PHYSICAL CHEMISTRY LAB **0.3: 1 cr. E**

Kinetic properties of reacting systems. Rate of a reaction. Application of electronic spectroscopy to vibrational, rotational and electronic properties of simple molecules.
Pre-requisite: CHEM 203, CHEM 260 & Co-requisite: CHEM 262 or CHEM 264.

CHEM 264 (previously CH 261)
QUANTUM THEORY AND STRUCTURE OF MATTER **3.0: 3 cr. E**

Quantum theory: introduction, principles, techniques and applications. Atomic structure and atomic spectra. Molecular structure. Rotational and vibrational spectra. Electronic transitions. Magnetic resonance. Diffraction techniques. Statistical thermodynamics. Electrical and magnetic properties of molecules.
Pre-requisite: CHEM 202.

CHEM 270 (previously CH 280) INORGANIC CHEMISTRY I **3.0: 3 cr. E**

Bohr's nuclear model of the atom. Waves mechanics and the Shr?dinger equation. Energy levels and Lines spectra. Chemical bonds. Acids and bases in inorganic reactions. Study of some regular types of elements.
Pre-requisite: CHEM 202.

CHEM 272 (previously CH 281) INORGANIC CHEMISTRY II **3.0: 3 cr. E**

Theory of chemical bonds in coordination compounds; isomerism and stability. Organometallic Chemistry, Review of experimental techniques used in structure determination.
Pre-requisite: CHEM 202

CHEM 273 (previously CH 282) INORGANIC CHEMISTRY LAB **0.3: 1 cr. E**

Preparation of some inorganic compounds and study of their properties.
Pre-requisite: CHEM 270, Co-requisite: CHEM 272

CHEM 280 (previously CH 292) CHEMICAL SAFETY AND TOXICOLOGY **3.0: 3 cr. E**

This course provides an outline of the toxicological, occupational hygiene and environmental aspects of chemical hazards and exposures. Metals, solvents, toxic and irritant gases, pesticides, carcinogens, hazardous wastes and dioxins will also be discussed.

CHEM 282 (previously CH 290) FOOD CHEMISTRY **3.0: 3 cr. E**

Chemical composition of food; their physical and sensory properties. Preservation of food.

CHEM 284 (previously CH 291) BIOGEOCHEMISTRY **3.0: 3 cr. E**

An interdisciplinary science course encompassing chemical reactions in the atmosphere, oceans, soil and sediment, and living organisms. It is a study about effects exerted by living systems on quality of the environment, impact on the global system, and the link existing between the atmosphere, the ocean and land.

CHEM 286 (previously CH 293) POLYMER CHEMISTRY **3.0: 3 cr. E**

Basics of polymer chemistry. Importance of polymers to our life. Stoichiometry of flexible chain molecules. Some microscopic features of bulk polymers. Methods for molecular characterization of polymers. Step and chain polymerization reactions-mechanisms and kinetics. Investigation onto co-polymerization strategy. Different polymerization methods.

CHEM 288 (previously CH 294) METHODS OF ANALYSIS **2.3: 3 cr. E**

This course is a combination of class and laboratory work; theory and application. It dwells on the principles of chemistry underlying the various methods and procedures. It prepares students for professional career in human and animal nutrition, industry and environmental sciences, as they learn how to collect, treat, store and digest samples, and how to run elemental analysis on the digest. It is designed to allow each student to obtain "hands-on" experience with the primary instrumentation available to chemists working in academia, industry, and government research.

CHEM 290 (previously CH 296) INDUSTRIAL CHEMISTRY **3.0: 3 cr. E**

Topics include different applications of organic and inorganic materials: glass, cement, ceramics, detergents, adhesives, fibers, biomaterials, electrical and electronic applications.

CHEM 298 (previously CH 297) SPECIAL TOPICS IN CHEMISTRY **3.0: 3 cr. E**

CVSQ 201, 202, 203, 204

Refer to the Cultural Studies Department.

CSIS 273

Refer to Department of Computer Science.

MATH 203, 272

Refer to Department of Mathematics.

PHYS 211, 212, 213, 214

Refer to Department of Physics.

MASTER'S DEGREE IN CHEMISTRY

The Department of Chemistry offers a Master's Degree in Sciences for students who have successfully completed a minimum of thirty credits **(30 cr)** of required courses provided that they satisfy the standards set by the University and the Faculty. The credits are distributed as follows:

I- Core Courses

The core courses provide advanced knowledge in each of the main fields of Chemistry; analytical, inorganic, organic and physical Chemistry. These courses, a total of four, are obligatory and add up to twelve credits **(12 cr)**. The course codes and course names are listed below:

CHEM 300	Advanced Analytical Chemistry	3 credits
CHEM 302	Advanced Organic Chemistry	3 credits
CHEM 304	Advanced Physical Chemistry	3 credits
CHEM 306	Advanced Inorganic Chemistry	3 credits

II- Elective Courses

MSc students are requested to choose four elective courses that constitute a total of twelve credits **(12 cr)**. Such courses are selected from the set of electives mentioned below to suit the area of specialty that each student is pursuing in the Master's degree.

III- Master's Thesis (CH 390)

Upon enrollment in the Master's Program, each student will be assigned an advisor(s) to help plan and supervise the Master's thesis. The thesis accounts for six credits **(6 cr)** and is done with possible collaboration with other local or foreign universities. Students will officially register for CHEM 390 at the last year of the Master's Program, however, throughout the two years of the program, research group seminars will be held including discussion, oral presentation, problem solving and reading of current literature pertinent to research interests. (Upon a recommendation from the curriculum committee in the Department, a student may substitute CHEM 390 by a 3 cr course and a 3 cr Master's project **(CHEM 391)**).

1. A Master's thesis represents the experimental or theoretical research studies that are anticipated to be completed within one academic year. However, if needed, this period can be extended for another year.
2. A Master's project represents the experimental or theoretical research studies that are anticipated to be completed within one semester. However, if needed, this period can be extended for another semester.

FOURTH YEAR

Semester 7

Course Code	Course Title	Credit
CHEM 300	Advanced Analytical Chemistry	3
CHEM 302	Advanced Organic Chemistry	3
	Elective I	3
		9

Semester 8

Course Code	Course Title	Credit
CHEM 304	Advanced Physical Chemistry	3
CHEM 306	Advanced Inorganic Chemistry	3
	Elective II	3
		9

FIFTH YEAR

Semester 9

Course Code	Course Title	Credit
Elective III		3
CHEM 390	Master's Thesis	6
		9

Semester 10

Course Code	Course Title	Credit
CHEM 390	Master's Thesis	continue
	Elective IV	3
		3

COURSE DESCRIPTIONS

CHEM 300 (previously CH 300) ADVANCED ANALYTICAL CHEMISTRY 3.0: 3 cr. E

The course focuses on major separation techniques employed in chemistry, and illustrates the methodology applied for treating analytical data. Key issues will be covered in the areas of chromatography, extraction, electrochemical analysis and chemometrics. Optimization and qualification of several analytical tools will be also discussed.

CHEM 302 (previously CH 302) ADVANCED ORGANIC CHEMISTRY 3.0: 3 cr. E

Pinacol, Tiffeneau–Demjanov, Favorskii, Wolff, Curtius, Hofmann, Beckmann, Wittig, Benzylic, Schmidt, Sigmatropic rearrangement, Cope, Claisen, Allylic reactions, Fragmentation

CHEM 304 (previously CH 304) ADVANCED PHYSICAL CHEMISTRY 3.0: 3 cr. E

The course is intended to provide the physical fundamentals of mass spectrometry (MS), nuclear magnetic resonance (NMR), X-ray diffraction (XRD) and interface chemistry. In-depth knowledge of these instruments, the interpretation of spectra and the applications (of such instruments) in different areas will be also revealed.

CHEM 306 (previously CH 306) ADVANCED INORGANIC CHEMISTRY 3.0: 3 cr. E

Reactions and descriptive chemistry of transition metal, organo-metallic and main group compounds. Chemistry of some of the less common elements, with correlations among structural, thermodynamic, kinetic, and chemical properties.

CHEM 320 (previously CH 320) ADVANCED POLYMER CHEMISTRY 3.0: 3 cr. E

New controlled polymerization methods for the synthesis of well defined materials. Some specialty polymers for future technologies (isomers, liquid crystals, active surfaces). Properties of common polymers in bulk. Crystallitic and amorphous polymers. Morphology. Mechanical, thermal and chemical properties. Polymer mixtures and composites. Soft polymer materials. Degradation and stabilizing of polymers.

CHEM 322 (previously CH 322) ADVANCED ORGANIC SYNTHESIS 3.0: 3 cr. E

Heterocyclic compounds, Organo-metallic compounds in Organic synthesis, Homogenous and Heterogeneous Catalysis, Protection of functional groups, Enols and Enones: Michael and Robinson reactions.

CHEM 324 (previously CH 324) PHYSICAL ORGANIC CHEMISTRY 3.0: 3 cr. E

Physical fundamentals of organic chemistry; thermodynamics, kinetics, molecular orbital theory, theory of concerted reactions, isotope effects, aromaticity, linear free energy relationships, acidity functions, photo-and free-radical chemistry.

CHEM 326 (previously CH 326) NUCLEAR CHEMISTRY 3.0: 3 cr. E

Properties of nucleons and nuclei, nucleus models, radioactivity, nuclear reactions, nuclear fission, nuclear reactors, detection and measurement of activity, applications of radioactivity, elements of radiation chemistry

CHEM 328 (previously CH 328) SURFACE CHEMISTRY AND CATALYSIS 3.0: 3 cr. E

The structure of surfaces. Thermodynamics, dynamics and electrical properties of surfaces. The surface chemical bond. Catalysis by surfaces.

CHEM 330 (previously CH 330) ELECTROCHEMISTRY 3.0: 3 cr. E

Principles of electrochemistry and their relation to the newer Electro-Analytical methods. Electrochemistry applied to heterogeneous and homogeneous processes, with emphasis on cyclic voltammetry and AC polarography. Use of the Laplace transforms and infinite different methods. Students explore the kinetics and thermodynamics of fast reactions by computer stimulation of electrochemical data.

CHEM 332 (previously CH 332)
Lab-on-a-chip: A Revolution in Chemical and Biological Sciences 3.0: 3 cr. E

State-of-the-art technology. Miniaturization of analytical techniques and instrumentation. Theory and applications. Downsizing Chemistry by introducing microchips. Benefits of miniaturization. Types of microchips, basic concepts and novel components used to construct the microchips as well as their applications. Micro-fluidics. Miniaturized total-analysis systems (?-TAS). DNA Micro-array Technology and its benefits

CHEM 334 (previously CH 334)
BIOCHEMICAL TECHNIQUES AND INSTRUMENTATION 3.0: 3 cr. E

Theory and practice of advanced biochemical techniques. Topics may include buffer and reagent preparation, protein assay, protein purification, electrophoresis, enzyme kinetics, DNA isolation, and molecular visualization and modeling.

CHEM 336 CHEMISTRY AND BIOCHEMISTRY OF MACROMOLECULES 3.0: 3 cr. E

The course covers the basic concepts of molecular biology intended for discussion on the application of molecular techniques in the analysis and understanding of macromolecules (DNA, RNA, Proteins) as well as their diagnosis

CHEM 338 SUPRAMOLECULAR CHEMISTRY 3.0: 3 cr. E

Starting from the basics, this course introduces the concepts as well as the historical development of supramolecular chemistry and its applications. The course will focus on the bottom up approach to prepare self-assembled nanomaterials by non-covalent interactions, which are employed in life chemistry as well as in potential industrial uses. The course also covers the most useful synthetic strategies to build such complex systems and the most practical techniques needed by supramolecular chemists.

CHEM 340 LIQUID CRYSTALS AND THEIR APPLICATIONS 3.0: 3 cr. E

Liquid crystals combine the material properties of solids with the flow properties of liquids. They have provided new photonic applications from which the flat-panel liquid crystal displays technology (LCDs). In this course, the fundamentals of liquid crystals science are introduced and explained revealing the different phases that can be generated and the different molecular architectures that affect liquid crystalline properties. The course also spotlights the various applications of the liquid crystalline materials (displays, memory devices, switches, lasers).

CHEM 342 MOLECULAR MODELING **3.0: 3 cr. E**

Molecular Modeling implies the use of methods of calculation (mechanic or semi-empirical) allowing the chemists to determine the chart of the geometry or the configuration of the atoms in a molecule and to evaluate some physical properties.

CHEM 344 SURFACE ANALYSIS: PRINCIPLES, INSTRUMENTATIONS, AND TECHNIQUES **3.0: 3 cr. E**

This course provides the chemist with the chief tools used to analyze surfaces, and thin films. The focus will be subjected towards the principles, instrumentations and applications of such techniques based on electronic, ionic, and X-ray sources. Furthermore, microscopic methods, such as, scanning tunneling microscopy (STM), and atomic force microscopy (AFM) will be discussed.

CHEM 380 (previously CH 350) Advanced Topics in Chemistry **3.0: 3 cr. E**

CHEM 390 (previously CH 390) Master's Thesis **6cr. E**

CHEM 391 (previously CH 391) Master's Project **3cr. E**

DEPARTMENT OF COMPUTER SCIENCE

The Department of Computer Science provides a fundamental education to prepare students for positions in industry, government, education, or commerce, or to pursue graduate study. It offers two specializations, Computer Science and Information Systems. The degrees offered are:

* BS in Computer Science
* BS in Computer Science with Teaching Diploma
* MS in Computer Science, with 2 options:
  - Pure Computer Science
  - Networking and Communications.
* BS in Information Systems
* MS in Information Systems

BACHELOR'S DEGREE in COMPUTER SCIENCE

Program Features

The goals of the curriculum of the BS in Computer Science is to prepare students to meet immediate demands in solving computational problems, based on sufficient understanding of basic principles and concepts in computer science.

Career Opportunities

The work of the BS holder may involve the design of software for computer systems, the analysis and design of algorithms or the use of computers for various applications.

BACHELOR OF SCIENCE in INFORMATION SYSTEMS

Program Features

The Bachelor's Degree in Computer Information Systems combines mastery of management processes and a thorough knowledge of Information Technology, offered in a dynamic framework, a multidisciplinary approach and state-of-the-art laboratories.

Career Opportunities

Information Technology is used practically in all fields of administration, from small businesses to large corporations and from governmental and non-governmental organizations to private institutions, such as hospitals, schools, universities, etc.

MASTER'S DEGREE in COMPUTER SCIENCE (PURE)

Program Features

The main goal of this program is to equipp the students with up-to-date theories and knowledge in the field of Computer Science. Students enrolled in this program are prepared for research by being oriented towards the development of software following the hotest techniques and technologies.

Career Prospects

Holders of the Master's Degree in Computer Science are mainly candidate for post-graduate studies. In the meantime, due to their robust formation, they can excel in any professional career.

MASTER'S DEGREE in COMPUTER NETWORKING and COMMUNICATIONS

Program Features

This is a 30-credit, 3-semester graduate degree, including a final project, suitable for BS holders in either Computer Science or related Engineering disciplines. The program offers rich theoretical content applied in state-of-the-art laboratories.

Career Prospects

Career opportunities for holders of the Master's Degree in Networking & Communications are widely available in institutions such as governmental and non-governmental organizations, local authorities, universities and cultural institutions as well as in banks, financial, industrial and commercial companies.

MASTER'S DEGREE in INFORMATION SYSTEMS

Program Features

The primary goal of the program is meet the increasing demand for knowledgeable personnel who possess a balanced combination of technical and managerial skills. The interdisciplinarity of the program and its integration of the different fields help reducing the training needed by the graduates.

Career Prospects

Graduates of this program are expected to fill a growing demand for professional IT managers who have the technical knowledge, business acumen, and management skills to deliver IT solutions in a rapidly changing business environment.

BACHELOR'S DEGREE in COMPUTER SCIENCE

FIRST YEAR

Semester 1

Course Code	Course Title	Credit
CSIS 200	Introduction to Computers & Programming	4
ENGL 203	English Communication Skills III	3
MATH 200	Calculus I	4
MATH 212	Discrete Mathematics	3
PHYS 221	Physics I	3
		17

Semester 2

Name of Course		Credit
CSIS 210	Computer Organization & Assembly Language	3
CSIS 202	Data Structure	3
CSIS 280	Introduction to the Theory of Computation	3
ELEN 201	Instrumentation Lab	1
ENGL 204	English Communication Skills IV	3
Electives	(from the dept.)	3
		16

SECOND YEAR

Semester 3

Name of Course		Credit
CVSQ 201	The Formation of Civilization	3
CSIS 270	Database	3
CSIS 204	Object Oriented Programming	3
CSIS 211	Introduction to Logic Circuits	3
CSIS 222	Principles of Computer Networking and Communication	3
		15

Semester 4

Name of Course		Credit
ACCT 201	Introduction to Accounting	3
CVSQ 202	The Religious Experience: The Sacred	3
CSIS 220	Systems Programming	3
CSIS 231	Internet and Java Programming	3
CSIS 212	Digital Lab	1
MATH 240	Probability and Statistics	4
		17

{Four-Weeks Training}

THIRD YEAR

Semester 5

Name of Course		Credit
CVSQ 203	Introduction to Modernity	3
CSIS 250	Computer Graphics	3
CSIS 276	System Analysis and Design	3
MATH 230	Numerical Analysis	3
Electives (1)		3
		15

Semester 6

Name of Course		Credit
CVSQ 204	The Arab World	3
CSIS 221	Operating Systems	3
CSIS 260	Introduction to Artificial Intelligence	3
CSIS 290	Undergraduate Project	1
Electives (2)		6
		16

MAJOR COURSES:

The following are major courses:

CSIS 200, CSIS 210, CSIS 202, CSIS 270, CSIS 280, CSIS 220, CSIS 211, CSIS 212, CSIS 221 , CSIS 250, CSIS 204, CSIS 260 CSIS 290, CSIS 276, CSIS 231, CSIS 222, MATH 200, MATH 212 , MATH 240 and MATH 230.

ELECTIVE COURSES

At least one elective course should be within the department.

BACHELOR'S DEGREE IN COMPUTER SCIENCE

(OPTION INFORMATION SYSTEMS)

FIRST YEAR

Semester 1

Course Code	Course Title	Credit
ACCT 201	Introduction to Accounting	3
CSIS 200	Introduction to Computer & Programming	4
ENGL 203	English Communication Skills III	3
MATH 201	Mathematics for Computation	4

Semester 2

Name of Course		Credit
CSIS 202	Data Structure	3
CSIS 274	End User Computing	3
ECON 211	Microeconomics	3
ENGL 204	English Communication Skills IV	3
MATH 240	Probability and Statistics	4

SECOND YEAR

Semester 3

Name of Course		Credit
MGMT 220	Principles of Management	3
CVSQ 201	The East & Ancient Greece	3
CSIS 270	Database	3
CSIS 204	Object Oriented Programming	3
CSIS 222	Principle of Computer Networking and Communications	3
Electives (1)		3

Semester 4

Name of Course		Credit
MRKT 220	Principles of Marketing	3
CVSQ 202	Cultures & Christianity	3
CSIS 231	Internet & Java Programming	3
CSIS 271	Database technologies	3
ECON 212	Macroeconomics	3

THIRD YEAR

Semester 5

Name of Course		Credit
FINE 220	Managerial Finance	3
CVSQ 203	Arab-Muslim Civilization	3
CSIS 276	Systems Analysis and Design	3
MATH 261	Operations Research	3
Electives (1)		3

Semester 6

Name of Course		Credit
BUSN 230	Strategic Management	3
CVSQ 204	History of Modern & Contemporary Thought	3
CSIS 290	Undergraduate Project	1
CSIS 277	Information Systems Management	3
CSIS 232	Electronic Commerce	3
Electives (1)		3

MAJOR COURSES:

The following are major courses:

ACCT 201, FINE 220 , MGMT 220, MRKT 220, CSIS 277, BUSN 230, CSIS 200, CSIS 202, CSIS 270, CSIS 274, CSIS 271, CSIS 204, CSIS 290, CSIS 276, CSIS 222, CSIS 231, CSIS 232, ECON 211, ECON 212, MATH 201, MATH 240, MATH 261

MASTER'S DEGREE IN COMPUTER SCIENCE

PROGRAM FEATURES

This is a 30-credit graduate program leading to a Master's degree. The program is open for BS holders in either Computer Science, Information Systems, or related Engineering disciplines.

The program offers:

Rich theoretical content

The curriculum includes the study of computer systems, computer communications, computer networks, and distributed and parallel systems. It emphasizes the ability to design systems and evaluate their performance at all levels of operation and to identify the key parameters of global systems behavior.

State-of-the-art laboratories

The data processing and transmission methods of various systems will be explored in detail. This necessarily involves a working knowledge of all modes of systems design and operation. Laboratories equipped with the latest technologies offer continuous hands-on experience in all systems.

Professional Certification

The degree may be supplemented with any professional certificate thus improving the career prospects of the degree holder in the local, regional and international job markets.

Three tracks are offered: General, Computer Networking and Communications and Information Systems.

I - MASTER'S DEGREE IN COMPUTER SCIENCE (PURE)

Course Requirements

Semester 1

Course Code	Course Title	Credit
CSIS 370	Distributed Database Systems	3
CSIS 300	Theory of Algorithms	3
CSIS 353	Computer Simulation	3
Elective Course		3

Semester 2

Course Code	Course Title	Credit
CSIS 361	Advanced Artificial Intelligence	3
CSIS 351	Advanced Computer Graphics	3
CSIS 320	Advanced Operating Systems	3
Elective course		3
CSIS 391	Graduate Thesis or Two Elective Courses	6

Summer Training

8 weeks of field experience in networking companies

Elective Courses

Course Code	Course Title	Credit
CSIS 360	Expert Systems	3
CSIS 371	Software Testing, Verification & Validation	3
CSIS 380	Advanced Theory of Computations	3
CSIS 362	Neural Networks	3
CSIS 352	Computer Vision	3
CSIS 350	Digital Image Processing	3
CSIS 312	Advanced Computer Architecture	3
CSIS 321	Computer Networks: Architecture & Protocol	3

(or any course with advisor's consent)

II - MASTER'S DEGREE IN COMPUTER SCIENCE
(OPTION COMPUTER NETWORKING and COMMUNICATIONS)

Course Requirements

Semester 1

Course Code	Course Title	Credit
CSIS 321	Computer Networks: Architecture & Protocols	3
CSIS 325	Data Communication	3
CSIS 374	Advanced Data Base Applications	3

Semester 2

Course Code	Course Title	Credit
CSIS 320	Advanced Operating Systems	3
CSIS 327	Network Programming	3
CSIS 390	Final Project	3
Elective		3

Summer Training

Eight (8) weeks of field experience in networking companies

Semester 3

Course Code	Course Title	Credit
CSIS 329	Network Management & Security	3
CSIS 326	Telecommunication protocols	3
Elective		3
CSIS 390	Final Project-continued	

Elective Courses

Course Code	Course Title	Credit
CSIS 370	Distributed Databases systems	3
CSIS 350	Digital Image Processing	3
CSIS 362	Neural Networks	3
CSIS 332	Parallel Programming	3
CSIS 363	Optimizations Theory and Stochastic Processes	3
CSIS 364	Natural Language & Speech Processing	3
CSIS 310	Real-Time Computations	3

(or any course with advisor's consent)

III - MASTER'S DEGREE IN COMPUTER SCIENCE (OPTION INFORMATION SYSTEMS)

Course Requirements

Semester 1

Course Code	Course Title	Credit
CSIS 321	Computer Networks: Architecture and Protocols	3
CSIS 374	Advanced Database Applications	3
MATH 340	Multivariate Statistics	3

Semester 2

Course Code	Course Title	Credit
CSIS 373	Information Systems Policy	3
BUSN 322	Game Theory	3
CSIS 390	Final Project	3
Elective		3

Summer Training

Eight (8) weeks of field experience in networking companies

Semester 3

Course Code	Course Title	Credit
ISYS 330	Enterprise Systems	3
CSIS 363	Optimization Theory and Stochastic Processes	3
Elective		3
CSIS 390	Final Project (continued)	

Elective Courses

Course Code	Course Title	Credit
CSIS 310	Real-time Computations	3
CSIS 371	Software Testing, Verification & Validation	3
CSIS 353	Computer Simulation	3
CSIS 370	Distributed Database systems	3
CSIS 375	Software Engineering	3

(or any course with advisor's consent)

COURSE DESCRIPTIONS

CSIS 200 (previously CSC 101)
INTRODUCTION TO COMPUTERS & PROGRAMMING 3.3: 4 cr. E

Informal specifications of programs, program development as a problem solving activity, development of algorithms and implementations, practical programming experience through a conventional programming language: C. The course also provides a very basic understanding of computer systems and the overall software development process.

CSIS 201 (previously CSC 104) PROGRAMMING METHODOLOGY 3.0: 3 cr. E

This course introduces the improvements that can be made over the naive methods usually given in introductory programming courses. It treats structured problem solving, data abstraction, software engineering principles, and the comparative analysis of algorithms as fundamental tools of program design. Several case studies are worked out in detail to demonstrate how a variety of tools are used together to build complete programs.
Prerequisite: CSIS 200.

CSIS 202 (previously CSC 201) DATA STRUCTURE 3.0: 3 cr. E

This course enables students to understand and apply knowledge of a wide range of data structures via abstract specifications. Students should be able to identify alternative implementations of abstract data types (stacks, queues, lists, trees, graphs, and related algorithms). They should be able to consider the use of these data structures in the construction of programs, including criteria for selecting between alternatives. They should also be able to identify and apply techniques for analyzing the effects of such alternatives.
Prerequisite: CSIS 200.

CSIS 203 (previously CSC 207) FUNCTIONAL PROGRAMMING 3.0: 3 cr. E

Programming with functions, top-down decomposition and stepwise refinement, higher-order functions, referential transparency, Lazy evaluation. The application language is LISP.
Prerequisite: CSIS 200.

CSIS 204 (previously CSC 306) OBJECT-ORIENTED PROGRAMMING 3.0: 3 cr. E

This is an advanced programming course. It covers the programming paradigms with examples, and the transition between modular programming and object-oriented programming. The course also covers data categorization and subdivision into classes and discusses inheritance of operations from one class to another. The language used is C++.
Prerequisite: CSIS 202.

CSIS 205 (previously CSC 316)
FORMAL SPECIFICATION & VERIFICATION OF PROGRAMS 3.0: 3 cr. E

Mathematical and logical backgrounds, program specifications, program derivation, theories and tools for program derivation, proofs of correctness.
Prerequisite: CSIS 202.

CSIS 206 PROGRAMMING FOR ENGINEERING **3.0: 3 cr. E**

Informal specifications of programs, program development as a problem solving activity, development of algorithms and implementations, practical programming experience through a conventional programming language: C.

CSIS 210 (previously CSC 102)
COMPUTER ORGANIZATION & ASSEMBLY LANGUAGE **3.0: 3 cr. E**

An introduction to computer organization and assembly programming covering the general structure of a microprocessor-based computer with detailed description of the data, address, and control buses used on the 8086 microprocessor. It also covers the assembly process and the instruction set of the 8086. In addition, it discusses I/ O and memory management.
Prerequisite: CSIS 200.

CSIS 211 (previously CSC 230) INTRODUCTION TO LOGIC CIRCUITS **3.0: 3 cr. E**

It covers sequential circuit analysis and design; registers; counter and memory system and design. This course is given to computer science students.

CSIS 212 (previously CSC 231) DIGITAL LAB **0.3: 1 cr. E**

This laboratory provides an introduction to analysis and design of digital circuits and systems; combinational logic; sequential logic and MSI circuits.
Prerequisite: CSIS 211.

CSIS 213 (previously CSC 314) COMPILER DESIGN & CONSTRUCTION **3.0: 3 cr. E**

Overview of compilers including component functions and classification. Symbol table construction and operations; lexical analysis, parsers, code generation, and error handling. Intermediate code generation and compiler generators.
Prerequisite: CSIS 202, CSIS 280.

CSIS 214 (previously CSC 320) COMPUTER ARCHITECTURE **3.0: 3 cr. E**

A quantitative approach to the study of computer architecture with emphasis on the basics of the RISC processors. Instructions set principles, pipelining, and principles of memory-hierarchy design, I/O, and storage systems.
Prerequisite: CSIS 210.

CSIS 220 (previously CSC 205) SYSTEMS PROGRAMMING **3.0: 3 cr. E**

The UNIX operating system is introduced as a programming environment. Topics include: the C language and libraries, history and overview of the UNIX operating system, the file structure, the shell, graphical user interfaces, the vi editor, programming the Bourne, the C and the Korn shell, UNIX utility programs, and UNIX networking.

CSIS 221 (previously CSC 302) OPERATING SYSTEMS 3.0: 3 cr. E

This course is a comprehensive survey of operating systems principles. Topics covered include: process description and control, threads, process and disk scheduling, file and memory and I/O management, concurrency, networking and distributed processing, security.
Prerequisite: CSIS 220 (or Advisor's Permission).

CSIS 222 (CSIS 322 Comp. Eng.) (previously CSC 319) (previously CSC 427) PRINCIPLES OF COMPUTER NETWORKING AND COMMUNICATION 3.0: 3 cr. E

Networks and Open Systems Intercommunication (OSI) reference model. Standards organizations. Functionality, principal entities of protocol in physical link, network, transport, and session of applications layer.
Prerequisite: CSIS 202

CSIS 230 (previously CSC 318) INTRODUCTION TO CONCURRENT AND DISTRIBUTED PROCESSING 3.0: 3 cr. E

Design and analysis of concurrent programs with emphasis on those used for parallel and distributed processing. Mutual exclusion and deadlock detection. Communication and synchronization. Computational models: shared memory and message passing.
Prerequisite: CSIS 220.

CSIS 231 (previously CSC 325) INTERNET AND JAVA PROGRAMMING 3.0: 3 cr. E

This course covers the foundations of Internet Technology. It gives students the ability to master Internet fundamentals: HTTP protocol, mail, news, HTML, CGI, and, mainly, JAVA [Applets, Applications, AWT, JDBC, RMI..]. Beside the theoretical basis, the course gives the students the ability to manage these different technologies. Lab sessions permit students to implement and maintain web, mail, and news servers and to develop Java Applets and applications.
Prerequisite: CSIS 204.

CSIS 232 (previously CSC 340) ELECTRONIC COMMERCE 3.0: 3 cr. E

The use of multimedia and the web for commercial applications is a vital opportunity. The course highlights the major areas of applications by selecting and analyzing real life examples. Students manipulate and design web pages using standard software packages. A term project is required. Prerequisite: CSIS 270.

CSIS 240 (previously CSC 312) SEMANTICS OF PROGRAMMING LANGUAGES 3.0: 3 cr. E

Methods of defining programming language semantics: axiomatic, denotational, and operational semantics.
Prerequisite: CSIS 202.

CSIS 250 (previously CSC 303) COMPUTER GRAPHICS 3.0: 3 cr. E

An introduction to computer graphics. The PHIGS and GKS graphics standards; Geometrical transformation in 2D and 3D; Viewing in 3D; Projection; Representing curves and surfaces; Visible surface determination; Advanced modeling techniques (factual models, spline, Bezier); Color theory, realism, and rendering; Elimination and shading.
Prerequisite: CSIS 202, MATH 200, MATH 212.

CSIS 251 (previously CSC 327) COMPUTER GRAPHICS DESIGN I 3.0: 3 cr. E

The student learns how to produce different kinds of illustrations and posters using computer software: advertising art, technical drawing, book illustration, and map production. Topics covered include: drawing, transformations, layers, color palette, 3D drawing, perspective, light, rendering, and texture. (Some projects will involve the use of OPENGL). Software used to design projects is: Corel Draw, Illustrator, 3D max and Freehand.

CSIS 252 (previously CSC 328) COMPUTER GRAPHICS DESIGN II 3.0: 3 cr. E

This course shows how professional artists use computer software (such as Photoshop or Painter) to manipulate, edit, and enhance scanned images to create a variety of special effects using artistic filters (such as KAI's power tools plug-in filter). Topics covered include: image editing, image enhancement, layers, construction of color palette, image mode (RGB, CMY,) light effects, transparency, mask, brushes, texture, and morphing.

CSIS 253 (previously CSC 329) COMPUTER GRAPHICS DESIGN III 3.0: 3 cr. E

This course permits students to acquire a good knowledge of multimedia technologies. The student learns through practical projects to edit and produce video clip with sound and animation. Topics include video morphing (dynamic imaging). The student studies the programming language LINGO for Macromedia Director to make their projects truly interactive. (Adobe Premiere will be available for these projects
Prerequisites: CSIS 251/252.

CSIS 260 (previously CSC 307)
INTRODUCTION TO ARTIFICIAL INTELLIGENCE 3.0: 3 cr. E

Overview of methods used in Artificial Intelligence selected from knowledge representation, search techniques, theorem proving, expert systems, and natural language understanding.

CSIS 270 (previously CSC 202) DATABASES 3.0: 3 cr. E

Data, DBMS architecture, schema and sub-schema, levels of data representation, database system life cycles. Relations within database architecture. Decomposition, normalization, hierarchy, and network. Data description language (DDL). Data manipulation language (DML); query languages and query optimization in centralization systems. Database security, integrity, and concurrence.
Prerequisite: CSIS 202.

CSIS 271 (previously CSC 222) DATABASE TECHNOLOGIES 3.0: 3 cr. E

The course is designed as a second undergraduate course in databases. It is intended to cover both theory and application issues. Emphasis is placed on implementation more than design. Topics included: Database servers, transaction definition and properties, concurrency control, buffer management, reliability, query optimization, distributed architectures, and interoperability.
Prerequisite: CSIS 270.

CSIS 272 (previously CSC 223) DATABASE SYSTEMS MANAGEMENT 3.0: 3 cr. E

The course is an advanced one in database technologies and a continuation of the course dealing with database design. Topics included are: Storage and file structure, indexing and hashing, query processing, transaction concept, concurrency control, and recovery systems. Opened only for seniors.
Prerequisite: CSIS 270.

CSIS 273 (previously CSC 140)
PERSONAL COMPUTING FOR APPLIED SCIENCES **3.0: 3 cr. E**

This course helps the student become a power user of several software packages used in daily problem solving. Topics covered include: personal productivity tools, statistical software for data analysis, database querying and Internet use. The course employs a combination of lecture-based delivery of material and experimental hands-on problem solving workshops.

CSIS 274 (previously CSC 240) END USER COMPUTING **3.0: 3 cr. E**

This course helps the student become a power user of several software packages used in business problem solving. Topics covered include: personal productivity tools, what-if analysis, business charting and graphing, Internet browsing, and web page creation and maintenance. The course employs a combination of lecture-based delivery of material and experimental hands-on problem solving workshops.

CSIS 275 (previously CSC 304) COMPUTER-AIDED SOFTWARE ENGINEERING **3.0: 3 cr. E**

Software planning, software fundamentals, software designs and methods, software design tools, programming languages and coding, software quality assurance and testing, software maintenance, real-time software development.
Prerequisite: CSIS 202.

CSIS 276 (previously CSC 313) SYSTEMS ANALYSIS & DESIGN **3.0: 3 cr. E**

Analysis concepts (fact-finding, interview, feasibility study, user requirements, structured system analysis, documentation). Design concepts (design of I/O, file specification, database, algorithms, software and hardware specifications). Project management. Practical applications. Schedule and cost.
Prerequisite: CSIS 270.

CSIS 277 (previously CSC 321) INFORMATION SYSTEMS MANAGEMENT **3.0: 3 cr. E**

The course is an advanced study in information systems requiring a solid background in systems analysis and design, and information technology. Professional issues are treated at both theoretical and practical levels. Topics covered: the managerial functions, the role of information, its sources and pricing, project management, IT sourcing, TQM in information systems management, IT role in organizational change. Project management.
Prerequisite: CSIS 276.

CSIS 280 (previously CSC 204)
INTRODUCTION TO THE THEORY OF COMPUTATION **3.0: 3 cr. E**

This introduces the basics of the theory of computation. Topics covered include: automata theory and formal languages, computability by Turing machines and recursive functions, computational complexity, and mathematical logic.
Prerequisite: CSIS 200.

CSIS 290 (previously CSC 310) UNDERGRADUATE PROJECT **1 cr. E**

Experimental projects by individuals or small teams.
Prerequisite: CSIS 202.

CSIS 300 (previously CSC 413) THEORY OF ALGORITHMS 3.0: 3 cr. E

Advanced design and analysis of efficient computer algorithms and data structures, lower-bound techniques, semi-numerical algorithms, and fast Fourrier transforms. Dynamic programming; linear programming. parallel and distributed algorithms.

CSIS 310 (previously CSC 403) REAL-TIME COMPUTATIONS 3.0: 3 cr. E

Software design in real-time systems, software design methods, verification and validation of real-time systems, real-time structured analysis and design, applications of real-time systems, steps for applying real-time systems, design of interactive and distributed systems with real-time methods. Parallel computations.

CSIS 311 (previously CSC 414) ADVANCED COMPILER CONSTRUCTION 3.0: 3 cr. E

Advanced topics in the design and implementation of programming language translators. Data flow analysis and optimization, code generation and register allocation, attribute grammars and their evaluation, translation within programming environments, and the implementation of advanced language features.
Prerequisite: CSIS 213.

CSIS 312 (previously CSC 417) ADVANCED COMPUTER ARCHITECTURE 3.0: 3 cr. E

A quantitative study of RISC architecture. Advanced pipelining and instruction-level parallelism (ILP): hazards detection, and solutions such as using dynamic scheduling, dynamics hardware, prediction and compiler support for exploring ILP. Memory-hierarchy design: cache issues and virtual memory. Multiprocessors.

CSIS 320 (previously CSC 412) ADVANCED OPERATING SYSTEMS 3.0: 3 cr. E

This course explores both advanced topics and in-depth design and analysis of operating systems concepts. Advanced topics may include security and access control, object and capability-based systems, multiprocessor support, and fault-tolerant systems, transaction processing systems, and distributed operating systems. Laboratory sessions include programming and modification of operating systems components.

CSIS 321 (previously CSC 426)
COMPUTER NETWORKS: ARCHITECTURE & PROTOCOL 3.0: 3 cr. E

Design of protocols for error recovery, reliable delivery, routing, and congestion control. Store-and-forward networks, satellite networks, local-area networks, and locally distributed systems. Case studies of networks, protocols, and protocol families. Emphasis on software design issues in computer communication.

CSIS 323 (previously CSC 428) TELECOMMUNICATION PROTOCOLS 3.0: 3 cr. E

This course is directed towards the protocols used for signaling in the telecommunication networks and uses the GSM network as an example. It aims to make the students familiar with the principal signaling protocols implemented in the general telecommunication networks. The main signaling protocols covered are ISDN, SS7, ATM and WAP.
Prerequisite: CSIS 325 Data communication or advisor’s permission.

CSIS 324 (previously CSC 436) TELECOMMUNICATION SYSTEM PRINCIPLES 3.0: 3 cr. E

This course with its integrated lab gives Computer Science students the understanding of both analog and digital communication principles in general and their direct applications on networking devices and systems. Different signaling, coding, and transmission methods will be demonstrated in the lab.

CSIS 325 (previously CSC 446) DATA COMMUNICATION 3.0: 3 cr. E

Data Communications networks and protocols are discussed in this course. Topics will cover X.25, ISDN and broadband ISDN, Frame Relay, ATM and DSL networks and protocols as well as the integration of those networks into the telecommunication networks like PSTN, ISDN, and GSM.

CSIS 326 (previously CSC 528) TELECOMMUNICATION PROTOCOLS 3.0: 3 cr. E

This course is directed towards the protocols used for signaling in the telecommunication networks and uses the GSM network as an example. It aims to make the students familiar with the principal signaling protocols implemented in the general telecommunication networks. The main signaling protocols covered are ISDN, SS7, ATM and WAP.
Prerequisite: CSIS 325 Data communication or advisor's permission.

CSIS 327 (previously CSC 538) NETWORK PROGRAMMING 3.0: 3 cr. E

This course gives the students a fundamental knowledge and hands-on exercise of the UNIX networking software design and client/server applications development. Topics include the TCP/IP model, UNIX model, communication protocols, Berkeley sockets, Unix transport layer interface (TCP & UDP), client and server software design, introduction to Remote Procedure Calls, and network applications development.

CSIS 329 (previously CSC 556) NETWORK MANAGEMENT & SECURITY 3.0: 3 cr. E

This course is an introduction to network management and security. Topics include TMN concepts such as what is TMN, different TMN architectures, interfaces and reference points, as well as management protocols used in TMN such as ACSE, CMISE, SNMPv1, SNMPv2, and SNMPv3. Topics related to computer security will be also covered like encryption, digital signatures, s-http, ssl, Kerberos, and firewall.

CSIS 332 (previously CSC 454) PARALLEL PROGRAMMING 3.0: 3 cr. E

This course examines how to program parallel processing systems. Various parallel algorithms are presented to demonstrate different techniques for mapping tasks onto parallel machines. Parallel architectures to be considered are: SIMD (synchronous), MIMD (asynchronous), and mixed-mode (SIMD/MIMD hybrid). Emphasis will be on MPI parallel programming language.

CSIS 350 (previously CSC 409) DIGITAL IMAGE PROCESSING 3.0: 3 cr. E

Image acquisition and storage. Imaging geometry: transformations and camera models. Image transforms: Fourrier transform FT and FFT. Image enhancement: in frequency domain and spatial domain (filtering). Image restoration. Image compression. Image segmentation.

CSIS 351 (previously CSC 411) ADVANCED COMPUTER GRAPHICS 3.0: 3 cr. E

Morphing. 3D graphics. Bezier and B-Spline modeling surfaces. Hidden surface elimination algorithms (Painter algorithm, Robert algorithm, Z-buffer algorithm). Color theory, illumination, and shading models. Rendering. texture. Introduction to ray tracing. Virtual Reality.

CSIS 352 (previously CSC 418) COMPUTER VISION 3.0: 3 cr. E

Introducing fundamental techniques for low-level and high-level computer vision. Examining image formation, early processing, boundary detection, image segmentation, texture analysis, shape from shading, photometric stereo, motion analysis via optic flow, object modeling, shape description, and object recognition. Models of human vision, subjective contours, visual illusions, apparent motion, mental rotations, and cyclopean vision.

CSIS 353 (previously CSC 420) COMPUTER SIMULATION 3.0: 3 cr. E

Introduction to simulation and examples. General principles and programming languages. Statistical models in simulation. Queuing models. Random number generation. Input modeling. Input data analysis Verification and validation of simulation models. Output analysis for a single model. Alternative system designs. Virtual reality.

CSIS 360 (previously CSC 401) EXPERT SYSTEMS 3.0: 3 cr. E

Symbolic computation. Knowledge representation formalisms. Associative nets and frame systems. Logic and inference. Automated reasoning. Heuristics. Representing Uncertainty. Quantitative models of plausible inference. Knowledge acquisition.

CSIS 361 (previously CSC 410) ADVANCED ARTIFICIAL INTELLIGENCE 3.0: 3 cr. E

Foundational issues in the construction of intelligent machines. The first half of the course covers forms of inductive inference, including machine learning, Bayesian networks, speech perception, machine vision, discussion of simulated annealing and genetic algorithms as optimization techniques for inductive inference. The second half covers deductive inference including reasoning from constraints, automated theorem proving, syntax and semantics of natural language, and the relationship between language and reasoning.

CSIS 362 (previously CSC 415) NEURAL NETWORKS 3.0: 3 cr. E

Neural dynamics: architecture and signals, activation model, unsurprised learning, surprised learning, architectures and equilibrium. The Hopfield model and recurrent networks. The self- organizing map. Adaptive resonance theory.

CSIS 363 (previously CSC 460)
OPTIMIZATION THEORY AND STOCHASTIC PROCESSES 3.0: 3 cr. E

This course covers various methods in optimizations: Deterministic models, probabilistic models, and non-linear models. It discusses the concept of stochastic theory, Queuing systems, and markov processes.

CSIS 364 (previously CSC 461) NATURAL LANGUAGE & SPEECH PROCESSING 3.0: 3 cr. E

This course is an introduction to computational linguistics and Speech. It requires the ability to program and assumes the student is familiar with basic computer science terminology. We will be covering traditional foundations of computational linguistics areas such as finite-state methods, context-free and extended context-free models of syntax, parsing, and semantic interpretation; basics of more recent corpus-based and stochastic methods such as n-gram models, hidden Markov models, probabilistic grammars, and statistical methods for word sense disambiguation; traditional foundations of Speech Processing, computational phonology, models of pronunciation and spelling, text to speech and speech recognition; and some selection of application areas from among such topics as information retrieval, machine translation, computational psycholinguistics, and computational lexicography. Concepts taught in class will be reinforced in practice by hands-on programming assignments.

CSIS 370 (previously CSC 402) DISTRIBUTED DATABASE SYSTEMS 3.0: 3 cr. E

This course discusses the concept of distributed databases and handles data distribution, distributed query optimization and transaction concurrency control. It also deals with recovery, integrity, and security in distributed databases. In addition, it covers the concepts of next generation databases such as object-oriented databases, expert, and multimedia systems.

CSIS 371 (previously CSC 406)
SOFTWARE TESTING, VERIFICATION & VALIDATION 3.0: 3 cr. E

Software quality and diversity. Specification and design. Unit testing, including testing and its relationships to specifications, structural testing, error-oriented testing and analysis, and managerial aspects of unit testing and analysis. Verification and validation, including objectives, theoretical limitations, integration and systems testing, regression testing, simulation and prototyping, requirements tracing, proof of correctness, code reviews, and planning for verifications and validation. Formal verification methods including Hoare logic, weakest preconditions and others.

CSIS 372 (previously CSC 408) DATA-FLOW ARCHITECTURE & LANGUAGES 3.0: 3 cr. E

The data-flow model as a basis for the design of parallel systems. Static and dynamic data-flow graphs. Implicit parallel programming using functional languages and their extensions. Higher-order functions, non-strictness, polymorphism. Nondeterministic programming and resource managers. Operational semantics and term rewriting systems. Optimizations and static analysis. Compiling into data flow graphs. Cryptography and computer security: design and use of cryptographic systems and cryptanalyitic attacks; a history of cryptographic systems and the mathematics behind them; shift register sequences; random number generators: DES, public systems, and theft applications.

CSIS 373 (previously CSC 421) INFORMATION SYSTEMS POLICIES 3.0: 3 cr. E

The course is intended to provide a layout of the IS policies foundation and the major areas they address. The course covers the process of starting, writing and maintaining the policies. Topics include: determination of policy needs, physical security, authentication and network, Internet, Email, viruses, encryption, software development, and acceptable use policies.

CSIS 374 (previously CSC 422) ADVANCED DATABASE APPLICATIONS 3.0: 3 cr. E

This course handles the different aspects of data warehousing and data mining, data warehouse building, the difference between data warehouses and OLTP systems, the business requirements to build a data warehouse, information analysis: OLAP and ROLAP, star schema design and its variants.

CSIS 375 (previously CSC 458) SOFTWARE ENGINEERING 3.0: 3 cr. E

The objective of this course is to provide a well-engineered software development process from software requirements and specification towards software delivery through system modeling, requirement specification, software design, software validation, and programming techniques and tools. Project planning and scheduling as well as software quality assurance for software development will be also discussed.

CSIS 380 (previously CSC 407) ADVANCED THEORY OF COMPUTATION 3.0: 3 cr. E

Computational complexity, abstract complexity, NP and PSPACE completeness, polynomial hierarchy, cryptography, Kolgomorov complexity, parallel algorithms, and random algorithms.

CSIS 390 (previously CSC 550) FINAL PROJECT **3 cr**

CSIS 391 (previously CSC 430) GRADUATE THESIS **6 cr**

ACCT 201, BUSN 230, BUSN 322, ECON 211, ECON 212, FINE 220, ISYS 330
Refer to the Faculty of Business and Management.

CVSQ 201, 202, 203, 204
Refer to the Cultural Studies program.

ELEN 201
Refer to Department of Electrical Engineering.

ENGL 203, 204
Refer to Department of English Language and Literature.

MATH 200, 212, 201, 240, 230, 261, 340
Refer to Department of Mathematics.

PHYS 221
Refer to Department of Physics.

DEPARTMENT OF ENVIRONMENTAL SCIENCES

The Environmental Science Department trains students to understand the scientific basis of the environmental crisis, as well as the social, political and economic factors that determine effective solutions. Students examine the interactions between humans, social systems and environmental damage across the globe, and the ways to redesign human systems to become sustainable. The Bachelor of Science in Environmental Science provides breadth in the physical and life sciences and depth in a chosen area of scientific concentration, either aquatic resources or land resources management, and consequently offers a holistic and grounded perspective of environmental issues and resource management. Students can also choose the medical school track, and thus offer themselves the opportunity to either pursue a medical degree or another vocation within their area of interest. Initiated in the proper research and scientific approaches, students then have the option of becoming scientists, managers, planners, decision makers, community activists, or pursuing graduate studies.

BACHELOR'S DEGREE

FIRST YEAR

Semester 1

Course Code	Course Title	Credit
BIOL 201	General Biology I	3
BIOL 202	General Biology I Lab	1
CHEM 202	Basic Chemistry	3
CHEM 203	Basic Chemistry Lab	1
CSIS 273	Personal Computing for Applied Sciences	3
ENGL 203	English Communication Skills III	3
MATH 203	Mathematics for Applied Sciences	3
		17

Semester 2

Course Code	Course Title	Credit
BIOL 203	General Biology II	3
BIOL 204	General Biology II Lab	1
CVSQ 201	Early Formation of Civilization	3
ENGL 204	English Communication Skills IV	3
MATH 272	Differential Equations for Applied Sciences	3
PHYS 211	Fundamentals of Physics I	3
PHYS 212	Fundamentals of Physics I Lab	1
		17

SECOND YEAR

Semester 3

Course Code	Course Title	Credit
BIOL 207	General Ecology	3
BIOL 225	Animal Physiology	3
BIOL 226	Animal Physiology Lab	1
CHEM 222	Analytical Chemistry I	3
CVSQ 202	The Religious Experience: the Sacred	3
EVSC 201	Environmental Sciences: Creating a Sustainable Future	3
		16

Semester 4

Course Code	Course Title	Credit
CHEM 240	Basic Organic Chemistry	3
CHEM 245	Organic Chemistry Lab I	1
EVSC 207	Coastal Zone Management	3
EVSC 233	Pollution Sources and Transport in Ecosystems	3
MATH 242	Statistics for Applied Sciences	3
	Electives *	3
		16

Summer

Course Code	Course Title	Credit
EVSC 211	Project Residency	3

THIRD YEAR

Semester 5

Course Code	Course Title	Credit
BIOL 251	Biochemistry	3
CVSQ 203	Introduction to Modernity	3
EVSC 237	Ecotourism Planning and Development	3
EVSC 239	Environmental Economics and Development	3
	Electives*	3
		17

Semester 6

Course Code	Course Title	Credit
CVSQ 204	Contemporary Challenges in the Arab World	3
EVSC 235	Environmental Communication Approaches	3
EVSC 241	Natural Resources Planning and Policy	3
EVSC 243	Special Topics for Environmental Sciences	3
	Electives*	3
		14

ENVIRONMENTAL SCIENCES ELECTIVE COURSES

I- Within the Department

IA- Aquatic Resources Concentration

Course Code	Course Title	Credit
EVSC 221	Assessment and Management of Fish Populations	3
EVSC 222	Assessment and Management of Fish Populations Lab	1
EVSC 245	Marine Ecosystems	3
EVSC 247	Environmental Risk Perception	3

IB- LAND Resources Concentration

Course Code	Course Title	Credit
EVSC 213	Restoration and Reclamation Ecology	3
EVSC 219	Wildlife Resources Management	3
EVSC 247	Environmental Risk Perception	3

IC- Additional Electives

Course Code	Course Title	Credit
EVSC 209	Introduction to Aquaculture	3
EVSC 249	Writing for Environmental Professionals	2
EVSC 251	Protected Areas Management and Planning	3

II- Pre-Med Track

Course Code	Course Title	Credit
CHEM 242®	Organic Chemistry I	3
CHEM 244®	Organic Chemistry II	3
PHYS 213	Fundamentals of Physics II	3
PHYS 214	Fundamentals of Physics II Lab	1

® Replace CHEM 240 (refer to department of Chemistry)

III- Outside the Department

*** Biology
*** Chemistry
*** Computer Science
*** Humanities
*** Mathematics
*** Physics

DESCRIPTION OF ENVIRONMENTAL SCIENCES COURSES

The Basic Sciences Program offers a Bachelor Degree in Sciences (in Environmental Sciences) for students who have successfully undertaken a minimum of **98** credits of required courses provided that they satisfy the standards set by the University and the Faculty. Students must complete the following:

1- 41 credits of Major Courses:

BIOL 201, BIOL 203, BIOL 207, CHEM 202, CHEM 222, EVSC 201, EVSC 207, EVSC 211, EVSC 233, EVSC 235, EVSC 237, EVSC 239, EVSC 241, EVSC 243.

2- 30 credits of Major Required Courses:

BIOL 251, BIOL 202, BIOL 204, BIOL 225, BIOL 226, CHEM 203, CHEM 245, CHEM240. CSIS 273, MATH 203, MATH 242, MATH 272, PHYS 211, PHYS 212.

3- 18 credits of University Required Courses:

ENGL 203, ENGL 204, CVSQ 201, CVSQ 202, CVSQ 203, CVSQ 204

4- 09 credits of Electives.

COURSE DESCRIPTIONS

EVSC 100 (previously ENV 100)
INTRODUCTION TO ENVIRONMENTAL SCIENCE 2.0: 2 cr. E

This course will introduce the principles of basic-science and technology involved in processes of environmental change, pollution and protection of natural resources, and their implications to economic and human systems.

EVSC 200 (previously ENV 200)
INTRODUCTION TO ENVIRONMENTAL STUDIES 3.1: 1 cr. E

The course introduces the student to the natural environment as it relates to people's lives. Aspects of the natural environment such as relationships between living and non living elements are discussed. The course also looks into environmental degradation and causes of pollution as well as ways to control them. The course will expose students to practical knowledge on environmental conversation which they will use in their daily lives as the course emphasizes the role of individuals in this area. (For Arts and Social Sciences students only).

EVSC 201 (previously ENV 201) ENVIRONMENTAL SCIENCE:
CREATING A SUSTAINABLE FUTURE 3.0: 3 cr. E

This course introduces students to the root causes of the environmental crisis, explains how to critically analyze all of the issues and competing viewpoints, provides in depth case studies and the latest statistics and scientific findings within the field. It examines the interactions between humans, social systems, and environmental damage across the globe, emphasizes the need for fundamental changes in human systems and shows how systems can be redesigned to be sustainable.

EVSC 207 (previously ENV 207) COASTAL ZONE MANAGEMENT 3.0: 3 cr. E

Introduces the student to a wide range of coastal environments including studies on rocky and sandy beaches. The course mixes theory and practice of coastal planning and management and demonstrates the importance of combining abstract and technical elements to achieve the best outcome for the coastal zone. Case studies will show examples of sound practice and differences in approaches around the world as well as the linkage between scales of coastal planning.

EVSC 209 (previously ENV 209)
INTRODUCTION TO AQUACULTURE 3.0: 3 cr. E

Introduction to the history of Aquaculture and its importance. Covers the fundamentals of engineering, nutrition, husbandry, diseases of cultured fishes and management of fish farms.

EVSC 211 (previously ENV 211) PROJECT RESIDENCY 3.0: 3 cr. E

This course provides students with practical experience through their participation in on-going projects at organizations or institutions working in the fields of environment and development. Students are required to complete their residency over a period of two months under the supervision of a Faculty member.

EVSC 213 (previously ENV 213)
RESTORATION AND RECLAMATION ECOLOGY 3.0: 3 cr. E

Theory and case studies of disturbances, restoration and reclamation; character and processes of ecological systems; types of natural systems; types of disturbance and their impact; restoration and reclamation strategies for forests, deserts, watersheds, riparian zones, streams and rivers.

EVSC 219 (previously ENV 219) WILDLIFE RESOURCES MANAGEMENT 3.0: 3 cr. E

A study of the ecological principles governing wild animal populations and their habitats, and the relationship of these principles to management programs and decisions. This course will introduce management techniques that can be used at the different levels of wildlife management: field, regional, national, international.

EVSC 221 (previously ENV 221) ASSESSMENT AND MANAGEMENT OF FISH POPULATIONS 2.0: 2 cr. E

Introduction to theory and methods for estimating vital statistics of fish populations. Use of computers and statistical software to describe, analyze, and model attributes of fish populations. Applied aquatic and fish ecology related to fisheries. Role of planning in fisheries management. Application of management tools and assessment of their efficacy.

EVSC 222 (previously ENV 222) ASSESSMENT AND MANAGEMENT OF FISH POPULATIONS LABORATORY 0.3: 1 cr. E

Laboratory sessions include giving the students hands on experience with different fishing techniques, tagging studies and fish population sampling. Involves ½ day field trips out at sea. Co-requisite: EVSC 221.

EVSC 233 (previously ENV 233)
POLLUTION SOURCES AND TRANSPORT IN ECOSYSTEMS 3.0: 3 cr. E

This course introduces students to the different sources of pollutions and their means of transport in air, soil and water. Toxic action and fate of environmental pollutants, pollution control, ecotoxicological impact and standard testing methods will be covered.

EVSC 235 (previously ENV 235)
ENVIRONMENTAL COMMUNICATION APPROACHES 3.0: 3 cr. E

This course is based on cooperative learning activities. Students will learn how to organize environmental workshops and will get introduced to the theories and skills of alternative dispute resolution approaches, citizen participation strategies, public participation structures and dynamics, public policy decision making and implementation, risk communication, leadership styles and small group dynamics.

EVSC 237 (previously ENV 237)
ECO-TOURISM PLANNING AND DEVELOPMENT 3.0: 3 cr. E

Study of the basic concepts of nature based tourism planning and its contribution to community development. The course emphasizes the negative and positive economic, social, and environmental impacts of nature based tourism.

EVSC 239 (previously ENV 239)
ENVIRONMENTAL ECONOMICS AND DEVELOPMENT 3.0: 3 cr. E

Application of economic and social science principles and techniques to production and consumption of natural resources. Benefit-cost analysis. National and regional impact analysis. Social impact assessment.

EVSC 241 (previously ENV 241)
NATURAL RESOURCES PLANNING AND POLICY 3.0: 3 cr. E

Scientific, environmental, social and institutional factors affecting planning and policy making. The course focuses on ecosystem-based planning and policy issues through development of a multiple-use plan. Sources and use of environmental data are discussed and illustrated. General overview of environmental laws on the national scale will be attempted.

EVSC 243 (previously ENV 243)
SPECIAL TOPICS FOR ENVIRONMENTAL SCIENCES 3.0: 3 cr. E

Introduces students to the new topics in the environmental sciences. Sessions will include exposure to environmental impact assessment methodologies, GIS systems, remote sensing and modeling and their applications to the environmental sciences and decision making. An overview of Lebanese environmental laws, policies and legal processes will also be covered.

EVSC 245 (previously ENV 245) MARINE ECOSYSTEMS
3.0: 3 cr. E

The course will present a broad overview of the field of marine biology. It will introduce the student to the marine environment, the physical forces governing marine organisms, the different marine ecosystems, the diversity of marine life and techniques of investigation of marine systems.

EVSC 247 (previously ENV 247) ENVIRONMENTAL RISK PERCEPTION 3.0: 3 cr. E

Concepts, problems, and research related to the assessment and management of environmental hazards. Current psychological, sociological and cultural theories in risk perception, communication and policy. Emphasis will be placed on the interplay between science, politics, law, cultural values and public opinion.

EVSC 249 (previously ENV 249)
WRITING FOR ENVIRONMENTAL PROFESSIONALS 2.0: 2 cr. E

This is an introduction to principles and practice of writing skills required of environmental professionals. Students will develop proficiency in determining the purpose of a document, analyzing the audience; selecting, developing and organizing the information in an appropriate design; and writing clearly, precisely, and effectively.

EVSC 251 (previously ENV 251)
PROTECTED AREAS MANAGEMENT AND PLANNING 3.0: 3 cr. E

Principles and methods of management of protected areas. Current principles and practices relevant to the planning of protected areas and recreational environments in wild settings. Includes the integration of biological and sociological criteria in the management of protected areas and recreational environments.

BIOL 201, 202, 203, 204, 207, 225, 226, 251
Refer to Department of Biology.

CHEM 202, 203, 222, 240, 245
Refer to Department of Chemistry.

CVSQ 201, 202, 203, 204
Refer to the Cultural Studies Department.

CSIS 273
Refer to Department of Computer Science.

ENGL 203, 204
Refer to Department of English Language and Literature.

MATH 203, 242, 272
Refer to Department of Mathematics.

PHYS 211, 212
Refer to Department of Physics.

Minor in Environmental Sciences

Develop an Environmental Science minor available for all Faculties Responding to requests from faculty and students at the University for an opportunity to take environmental science courses and have these courses be recognized in some format, the Environmental Science Department suggests the development of an Environmental Science Minor that would be made available to all Faculties at the University. This minor would potentially increase the number of students taking environmental science courses and enrich the educational experience of the UOB students by offering them the opportunity to focus on a growing national and international issue. Students would need to take a minimum of 15 credits to obtain a minor in environmental science. Students would take the 4 mandatory courses, and then choose between any of the remaining EVSC courses for the remaining course. (Please refer to Table 2 for the courses to obtain a minor.)

Environmental Science Courses	**Credit**	**Mandatory**	**Electives**
EVSC 201: Creating a Sustainable Future	**3**	**X**	
EVSC 207: Coastal Zone Management	**3**	**X**	
EVSC 209: Introduction to Aquaculture	3		X
EVSC 211: Project Residency	3		X
EVSC 213: Restoration and Reclamation Ecology	3		X
EVSC 219: Wildlife Resources Management	3		X
EVSC 221: Assessment and Management of Fish Populations	2		X
EVSC 233: Pollution Sources and Transport in Ecosystems	**3**	**X**	
EVSC 235: Environmental Communication Approaches	3		X
EVSC 237: Ecotourism Planning and Development	3		X
EVSC 239: Environmental Economics and Development	3		X
EVSC 241: Natural Resources Planning and Policy	**3**	**X**	
EVSC 243: Special Topics for Environmental Sciences	3		X
EVSC 245: Marine Ecosystems	3		X
EVSC 247: Environmental Risk Perception	3		X
EVSC 249: Writing for Environmental Professionals	2		X
EVSC 251: Protected Areas Management and Planning	3		X

DEPARTMENT OF MATHEMATICS

BACHELOR'S DEGREE IN APPLIED MATHEMATICS

(Actuarial Sciences Option)

FIRST YEAR

Semester 1:

Name of Course		Credit
CSIS 200	Introduction to Computers & Programming	4
ENGL 203	English Communication Skills III	3
MATH 200	Calculus I	4
MATH 210	Algebra I	3
PHYS 201	General Physics I	3
		17

Semester 2:

Name of Course		Credit
ENGL 204	English Communication Skills IV	3
MATH 202	Calculus II	4
MATH 211	Linear Algebra I	3
MATH 240	Probability & Statistics	4
PHYS 202	General Physics II	3
		17

SECOND YEAR

Semester 3:

Name of Course		Credit
CVSQ 201	The East & Ancient Greece	3
MATH 270	Differential Equations	3
MATH 204	Real Analysis I	3
MATH 241	Statistics I	3
MATH 213	Linear Algebra II	3
		15

Semester 4:

Name of Course		Credit
CVSQ 202	The Religious Experience: The Sacred	3
MATH 230	Numerical Analysis I	3
MATH 261	Operations Research	3
MATH 273	Integral Equations I	3
MATH 274	Calculus of Variation	3
MATH 271	Partial Differential Equations	3
		18

THIRD YEAR

Semester 5:

Name of Course		Credit
MATH 250	Life Contingencies I	3
CVSQ 203	Introduction to Modernity	3
MATH 207	Complex Analysis	3
MATH 243	Statistics II	3
Elective*		3
		15

Semester 6:

Name of Course		Credit
MATH 254	Risk & Reserves in Casualty Insurance	3
CVSQ 204	Arab World	3
MATH 262	Math for Financial Analysis	3
MATH 330	Numerical Analysis II	3
Electives**		6
		18

Electives *:

Name of Course		Credit
MATH 251	Organizational Communication Theory	3
MATH 252	Life Contingencies II	3
MATH 264	Game Theory & Decision Analysis	3

Electives** :

Name of Course		Credit
MATH 253	Human Relations in the Organization	3
MATH 255	Methods for Ratemaking	3
MATH 256	Estimation of Actuarial Methods	3
CSIS 250	Computer Graphics	3
MATH 265	Integer & Combinatorial Optimization	3
MATH 340	Multivariate Statistics	3

BACHELOR'S DEGREE IN MATHEMATICS

FIRST YEAR

Semester 1:

Name of Course		Credit
CSIS 200	Introduction to Computers & Programming	4
ENGL 203	English Communications Skills III	3
MATH 200	Calculus I	4
MATH 210	Algebra I	3
PHYS 201	General Physics I	3
		17

Semester 2:

Name of Course		Credit
ENGL 204	English Communication Skills IV	3
MATH 202	Calculus II	4
MATH 211	Linear Algebra I	3
MATH 240	Probability & Statistics	4
PHYS 202	General Physics II	3
		17

SECOND YEAR

Semester 3:

Name of Course		Credit
CVSQ 201	The Formation of Civilization	3
MATH 270	Differential Equations	3
MATH 204	Real Analysis I	3
MATH 241	Statistics I	3
MATH 213	Linear Algebra II	3
		15

Semester 4:

Name of Course		Credit
CVSQ 202	The Religious Experience: The Sacred	3
MATH 230	Numerical Analysis I	3
MATH 261	Operations Research	3
MATH 273	Integral Equations I	3
MATH 274	Calculus of Variation	3
MATH 271	Partial Differential Equations	3
		18

THIRD YEAR

Semester 5:

Name of Course		Credit
CVSQ 203	Introduction to Modernity	3
MATH 205	General Topology	3
MATH 207	Complex Analysis	3
MATH 208	Real Analysis II	3
Elective*		3
		15

Semester 6:

Name of Course		Credit
CVSQ 204	Arab World	3
MATH 214	Algebra II	3
MATH 209	Differential Geometry	3
MATH 330	Numerical Analysis II	3
Electives		6
		18

Electives:

Name of Course		Credit
CSIS 202	Data Structure	3
CSIS 280	Introduction to the Theory of Computation	3
CSIS 220	Systems Programming	3
CSIS 250	Computer Graphics	3
CSIS 260	Artificial Intelligence	3
MATH 243	Statistics II	3
MATH 221	Number Theory	3
PHYS 232	Thermal and Statistical Physics	3

Minor in Mathematics

The Faculty of Sciences offers a Minor in Mathematics for students who have successfully completed a minimum of 18 credits of Mathematics courses as follows:

Course Code	Course Description	Credits
MATH 203	Mathematics for Applied Sciences	3 cr
MATH 211	Linear Algebra I	3 cr
MATH 242	Statistics for Applied Sciences	3 cr
MATH 272	Differential Equations for Applied Sciences	3 cr
MATH 230	Numerical Analysis I	3 cr
MATH 261	Operations Research	3 cr

NB MATH 203 may be substituted by MATH 200
MATH 242 may be substituted by MATH 240
MATH 272 may be substituted by MATH 270

COURSE DESCRIPTIONS

MATH 111 (previously MT 011) INTRODUCTION TO CALCULUS I 3.0: 3 cr. E

The course introduces the basic trigonometric functions and their inverses. It discusses the basic ideas of functions including limits, continuity, derivatives, variations, and symmetry of functions leading to the graphs of polynomial and rational functions. The course then introduces indefinite integrals, the rules for antiderivatives and the substitution method before definite integrals and their application to areas are discussed. The course ends by introducing vectors within a three dimensional coordinate system and by defining sets of points such as planes and lines in space.

MATH 112 (previously MT 012) INTRODUCTION TO CALCULUS II 3.0: 3 cr. E

This course has been organized to present the calculus of logarithmic and exponential functions. Separable variable, linear first and second order differential equations follow. Basic operations in complex numbers are covered in detail, Combinatory analysis that involves combinations and permutations follows. Topics in analytical geometry such as angles between lines and planes and the orthogonal projection of a point on a plane are presented.
Prerequisite: MATH 111.

MATH 113 (previously MT 013) INTRODUCTION TO CALCULUS III 4.0: 4 cr. E

The basic ideas concerning sequences of numbers and their limits are covered in the first part of the course. Algebraic manipulation and substitution integration techniques are carried a step further by introducing powerful techniques as integration by parts and the integration of rational and inverse trigonometric functions. The concept of probability is then introduced. Basic operations in complex numbers are developed to cover applications to Demoivre's and Euler's formulas and solutions to differential and second order complex equations. At the end of the course a detailed analytic geometry of conic sections is presented.
Prerequisite: MATH 111.

MATH 200 (previously MT 106) CALCULUS I 4.0: 4 cr. E

Techniques of Integration. Applications of definite integral. Infinite series. First Order Differential Equations. Polar coordinates. Functions of several variables: Limits and Continuity, Partial derivatives, Chain rule. Multiple integrals.

MATH 201 (previously MT 116) MATHEMATICS FOR COMPUTATION 4.0: 4 cr. E

This course includes topics from algebra, linear algebra, and calculus. It contains: Bases and number representation. Computer representation for Real and Integer numbers. Laws of logic. Set and relation. Functions. Induction and recursion. Boolean algebra. Matrix algebra. Solution of linear systems. Power series. Function of several variables.

MATH 202 (previously MT 107) CALCULUS II 4.0: 4 cr. E

Multi-variable Functions. Multiple Integral. Cylindrical and Spherical coordinates. Line Integrals. Circulation and Flux. Fourier Analysis. Laplace Transform.
Prerequisite: MATH 200.

MATH 203 (previously MT 117) MATHEMATICS FOR APPLIED SCIENCES 3.0: 3 cr. E

Infinite series. Polar coordinates. Function of several variables. Partial derivatives, Chain rule. Multiple integrals with applications.

MATH 204 (previously MT 205) REAL ANALYSIS I 3.0: 3 cr. E

Metric spaces. Completeness, compactness, uniform limit, and uniform continuity. Real value functions on a compact metric space, application of contraction mappings to calculus, differential equations, and numerical analysis.
Prerequisite: MATH 200.

MATH 205 (previously MT 210) GENERAL TOPOLOGY 3.0: 3 cr. E

Basic point set topology. Includes set theory, well ordering, and metrization.
Prerequisite: MATH 200.

MATH 206 (previously MT 222) ENGINEERING TOPICS IN MATHEMATICS 3.0: 3 cr. E

This is a remedial course that covers: Multiple Integral. Vector Fields. Fourier Analysis. Laplace Transform. Power series solutions of ODE. Partial Differential Equations. Numerical Algorithms, Finite difference calculus, interpolation and extrapolation, roots of equations, numerical solution of simultaneous linear algebraic equations, least-squares approximation, numerical integration, numerical solution of ordinary differential equations.
Prerequisite: MATH 200.

MATH 207 (previously MT 301) COMPLEX ANALYSIS 3.0: 3 cr. E

Cauchy integral theorem, Taylor series, residues, evaluation of integrals by means of residues, conformal mapping, application to two-dimensional fluid flow, Riemann mapping theorem.
Prerequisite: MATH 200.

MATH 208 (previously MT 310) REAL ANALYSIS II 3.0: 3 cr. E

Lesbegue theory of measure and integration, convergence theorem, differentiation, norms on a vector space.
Prerequisite: MATH 204.

MATH 209 (previously MT 312) DIFFERENTIAL GEOMETRY 3.0: 3 cr. E

Curves in space, regular surfaces, tensors, the geometry of the Gauss map, normal curvature, the geometry of surface, Gauss Bonnet theory. Prerequisite: MATH 202.

MATH 210 (previously MT 108) ALGEBRA I 3.0: 3 cr. E

Elements of mathematical logic, theory of sets, relations, functions and applications, construction of numeric sets: N,Z,Q,R, and C, internal law of composition and elementary algebraic structures like, groups, rings and Boolean Algebra.

MATH 211 (previously MT 109) LINEAR ALGEBRA I
3.0: 3 cr. E

Linear Systems. Matrix Operations. Echelon Form. Vector spaces. Linear Transformations. Determinants. Eigenvalues and Eigenvectors.

MATH 212 (previously MT 115) DISCRETE MATHEMATICS 3.0: 3 cr. E

This course teaches students how to think mathematically by covering the topics of computer representation for numbers, symbolic logic, sets, functions, induction recursion, Boolean algebra, and graph theory. The course also presents the fundamentals and techniques of linear algebra, providing the students with the tools to analyze matrices and determinants for solving systems of linear equations and giving them a solid knowledge on linear transformations.

MATH 213 (previously MT 212) LINEAR ALGEBRA II 3.0: 3 cr. E

Introduction to numerical methods of linear algebra, Gauss elimination, Gauss scidel and Jacobi method. Approximating Eigenvalues by the power methods. Applications to approximations problems and quadratic form. Complex vector spaces.
Prerequisite: MATH 211.

MATH 214 (previously MT 309) ALGEBRA II 3.0: 3 cr. E

Groups, rings, ideals, isomorphism theorems. Field of fractions, polynomial rings, factorial rings, quotient rings.
Prerequisite: MATH 210.

MATH 221 (previously MT 315) NUMBER THEORY 3.0: 3 cr. E

Divisibility, arithmetic functions, Chinese remainder theorem, Mobeus inversion, quadratic forms, Euler phi functions, Fermat theorem.

MATH 230 (previously MT 203) NUMERICAL ANALYSIS I 3.0: 3 cr. E

Analysis and implementation of current numerical methods: number representation and round-off errors; difference equations; interpolation of polynomials; solution of non-linear equations; functions approximation; numerical differentiation and integration; numerical solution of differential equations; solution of systems of linear equations.
Prerequisite: CSIS 200, MATH 200/ 211 (or MATH 212).

MATH 231 (previously MT 404) NUMERICAL ANALYSIS II 3.0: 3 cr. E

Solution of linear algebraic equations. The matrix value problem. Introduction to the solution of initial and boundary value problem in ordinary differential equations. Introduction to the numerical solution of partial differential equations.
Prerequisite: MATH 230.

MATH 240 (previously MT 201) PROBABILITY & STATISTICS 4.0: 4 cr. E

Introduction to descriptive statistics. Probability. Random variables and probability distribution. Mathematical expectation. Discrete probability distributions: Uniform, Binomial and Multinomial, Hyper-geometric, Negative Binomial, Geometric and Poisson distributions. Continuous probability distribution: Normal distribution, Gamma and exponential distributions, Chi squared distribution. Sampling theory, estimation theory, confidence interval, hypothesis tests and significations, test t (student), test F(Fisher) and X2 test.
Prerequisite: MATH 200.

MATH 241 (previously MT 207) STATISTICS I **3.0: 3 cr. E**

Sampling theory, estimation theory, confidence interval, hypothesis tests and significations, test t (student), test F(Fisher) and c2 test , linear regressions, , least square applications, Multiple regressions, correlation.

MATH 242 (previously MT 215) STATISTICS FOR APPLIED SCIENCES **3.0: 3 cr. E**

This course introduces students to statistical inferences and applications. Topics covered include: Sampling theory, estimation theory, confidence interval, hypothesis tests and significations, test t (student), test F(Fisher) and c2 test, linear regressions, least square applications, Multiple regressions, correlation. This course is not to be offered for Mathematics students.
Prerequisite: MATH 203.

MATH 243 (previously MT 302) STATISTICS II **3.0: 3 cr. E**

Analysis of variance. Regression Analysis.
Prerequisite: MATH 241.

MATH 246 PROBABILITY FOR ENGINEERS **3.0: 3 cr. E**

Introduction to descriptive statistics. Probability. Random variables and probability distribution. Mathematical expectation. Discrete probability distributions: Uniform, Binomial and Multinomial, Hyper-geometric, Negative Binomial, Geometric and Poisson distributions. Continuous probability distribution: Normal distribution, Gamma and exponential distributions , Chi squared distribution.
Prerequisite: MATH 200.

MATH 250 (previously ASC 301) LIFE CONTINGENCIES I **3.0: 3 cr. E**

The mortality table, life annuities, pensions, life insurance premiums, reserves, cash value, loss premiums, dividends.
Prerequisite: MATH 211.

MATH 251 (previously ASC 302)
ORGANIZATIONAL COMMUNICATION THEORY **3.0: 3 cr. E**

Communication theory and its applications in an organizational setting, including written and interpersonal communication.

MATH 252 (previously ASC 303) LIFE CONTINGENCIES II **3.0: 3 cr. E**

The measurement of mortality, life annuities, life insurance, net annual premiums, net level premium reserves, special topics, population theory.
Prerequisite: MATH 243.

MATH 253 (previously ASC 304) HUMAN RELATIONS IN THE ORGANIZATION **3.0: 3 cr. E**

An examination of the theories and applications of managing human relations and the dynamics of interaction within organizations.

MATH 254 (previously ASC 305) RISK & RESERVES IN CASUALTY INSURANCE 3.0: 3 cr. E

The economics of insurance, utility functions, utility and insurance, compound distribution of aggregate claims, premiums, loss and expense reserves, loss reserving methods, known claims, IBNR claims, all incurred claims.
Prerequisite: MATH 243.

MATH 255 (previously ASC 306) METHODS FOR RATEMAKING 3.0: 3 cr. E

Full and partial credibility, Bayesian credibility, empirical Bayes credibility, claims frequency and claims severity, aggregate claim distributions, modeling loss distributions, application of distributional models, principles of ratemaking, data for ratemaking.
Prerequisite: MATH 243.

MATH 256 (previously ASC 307) ESTIMATION OF ACTUARIAL METHODS 3.0: 3 cr. E

Measures of mortality and morbidity, fitting parametric survival distribution, mortality assumptions, individual record formula, practical aspects of mortality table construction.
Prerequisite: MATH 243 and MATH 250.

MATH 261 (previously MT 204) OPERATIONS RESEARCH 3.0: 3 cr. E

Formulation. Standard forms of LP problems. Graphical solution. Algebraic solution. Simplex method. Dual-simplex method. Sensitivity analysis. Transportation and assignment problems. Integer programming: some examples and solution methods.

MATH 262 (previously MT 305) MATH FOR FINANCIAL ANALYSIS 3.0: 3 cr. E

This course includes topics such as fractional exponents and radicals, simple interest, compound interest and compound amount, compound discount and present value, simple annuities, effective annual rate of interest, amortization and equity, and sinking funds.

MATH 263 (previously MT 306)
COMPUTATIONAL METHODS FOR NON-LINEAR SYSTEMS 3.0: 3 cr. E

Analysis and computer applications of modern methods for solving non-linear algebraic systems and non-linear constrained optimization problems.

MATH 264 (previously MT 307) GAME THEORY & DECISION ANALYSIS 3.0: 3 cr. E

Matrix games, relation to linear programming; non-zero sum games, decision trees, models for groups decisions, utility theory.
Prerequisite: MATH 261.

MATH 265 (previously MT 308)
INTEGER & COMBINATORIAL OPTIMIZATION 3.0: 3 cr. E

Modeling and solving optimization problems with discrete components, graphs and networks; network flow problems; minimum spanning trees; basic polyhedral theory; the Knaspack problem; the plant location problem; the set packing problem; computational complexity; branch and bound; cutting planes, Lagrangian relaxation, and Bender's decomposition.
Prerequisite: MATH 261.

MATH 266 (previously MT 316) ECONOMETRICS **3.0: 3 cr. E**

Multiple regression, time series, contingency tables analysis.
Prerequisite: MATH 243.

MATH 267 (previously MT 317) LINEAR PROGRAMMING **3.0: 3 cr. E**

Formulation of technical problems; simplex method; transportation problems; duality theory and applications.
Prerequisite: MATH 261.

MATH 270 (previously MT 202) DIFFERENTIAL EQUATIONS **3.0: 3 cr. E**

This course covers the Ordinary Differential Equations (ODE) and the partial differential equations(PDE). In Part I includes the second order linear differential equations, the higher order, and series solutions. In Part II the course illustrates the importance of partial differential equations in science and engineering and discusses the solution of parabolic, hyperbolic, and elliptic type problems.
Prerequisite: MATH 200.

MATH 271 (previously MT 211) PARTIAL DIFFERENTIAL EQUATIONS **3.0: 3 cr. E**

Mathematical formulations and solution of partial differential equations of Mathematical-Physics. The mathematical techniques developed are the Fourrier transform, Fourrier series, complex variables, and the Laplace transform. Other topics include first-order hyperbolic systems, Gauchy-Kowalewski theorem, potential theory, Dirichlet and Newman problems, integral equations, and elliptic equations.
Prerequisite: MATH 270.

MATH 272 (previously MT 217)
DIFFERENTIAL EQUATIONS FOR APPLIED SCIENCES **3.0: 3 cr. E**

This course covers first and higher order differential equations. Topics include seperable and exact first order equations. Bernoulli and Euler-Cauchy equations. Undetermined coefficient, variation of parameters and power series solutions of higher order linear equations. Introduction to linear systems of equations.
Prerequisite: MATH 203.

MATH 273 (previously MT 208) INTEGRAL EQUATIONS I **3.0: 3 cr. E**

Relation to differential equations. Fredholm, Hilbert-Schmidt, and Volterra type equations; special devices and approximation method.

MATH 274 (previously MT 209) CALCULUS OF VARIATIONS **3.0: 3 cr. E**

This course covers topics such as the variation of a functional, the variational derivative, invariance of Euler's equation, variational problems in parametric form, the Weierstrass - Erdmann conditions, the canonical form of Euler's equations, the Legendre transformation, the Hamilton - Jacobi equation, the second variation of a functional, the field of a functional, and Hilbert's Invariant, and variational problems involving multiple integrals.
Prerequisite: MATH 200.

MATH 340 (previously MT 305) MULTIVARIATE STATISTICS **3.0: 3 cr. E**

Multiple regression; Factor analysis; Principal components analysis (hierarchical cluster and k-means). Application with SPSS software. Prerequisite: MATH 243.

CVSQ 201, 202, 203, 204
Refer to Cultural Studies Program

CSIS 200, 202, 280, 220, 250, 260
Refer to Department of Computer Science.

ENGL 203, 204
Refer to Department of English Language and Literature.

PHYS 201, 202, 232
Refer to Department of Physics.

DEPARTMENT OF PHYSICS

BACHELOR'S DEGREE

FIRST YEAR

Semester 1

Name of Course		Credit
CSIS 200	Introduction to Computers & Programming	4
ENGL 203	English Communication Skills III	3
MATH 200	Calculus I	4
MATH 210	Algebra I	3
PHYS 201	General Physics I	3
		17

Semester 2

Name of Course		Credit
ENGL 204	English Communication Skills IV	3
MATH 202	Calculus II	4
MATH 211	Linear Algebra I	3
PHYS 202	General Physics II	3
ELEN 221	Circuit Analysis	3
ELEN 201	Electrical Instrumentation Lab	1
		17

SECOND YEAR

Semester 3

Name of Course		Credit
MATH 270	Differential Equations	3
CHEM 202	Basic Chemistry	3
PHYS 222	Electricity & Electromagnetism	3
CSIS 211	Introduction to Logic Circuits	3
PHYS 203	General Physics Lab	1
CVSQ 201	The Formation of Civilization	3
		16

Semester 4

Name of Course		Credit
CHEM 222	Analytical Chemistry I	3
CHEM 203	Basic Chemistry Lab	1
PHYS 223	Electricity Lab	1
PHYS 241	Physical Optics	3
PHYS 245	Modern Physics I	3
CVSQ 202	The Religious Experience: The Sacred	3
CSIS 212	Digital Lab	1
		15

THIRD YEAR

Semester 5

Name of Course		Credit
PHYS 281	Modern Physics II	3
PHYS 232	Thermal & Statistical Physics	3
ELEN 231	Electronics I	3
CVSQ 203	Introduction To Modernity	3
PHYS 251	Introduction to Solid State Physics	3
Elective		3
		18

Semester 6

Name of Course		Credit
ELEN 332	Electronics II	3
ELEN 304	Electronics Lab	1
CVSQ 204	The Arab World	3
PHYS 247	Experiments in Modern Physics	1
Electives		9
		17

List of Electives

Name of Course		Credit
PHYS 216	Theoretical Mechanics	3
PHYS 291	Computational Physics	3
PHYS 283	Nuclear Physics	3
MECH 243	Fluid Mechanics	3
CSIS 250	Computer graphics	3
PHYS 265	Astrophysics	3
PHYS 282	Atomic & Molecular Physics	3
PHYS 248	Quantum Mechanics	3
MECH 321	Heat Transfer	3
PHYS 227	Electromagnetic Wave Theory	3

Minor in Physics

The Faculty of Sciences offers a Minor in Physics for students who have successfully completed a minimum of 17 credits of Physics courses as follows:

Course Code	Course Description	Credits
PHYS 211	Fundamentals of Physics I	(3cr)
PHYS 212	Fundamentals of Physics I Laboratory	(1cr)
PHYS 213	Fundamentals of Physics II	(3cr)
PHYS 214	Fundamentals of Physics II Laboratory	(1cr)
PHYS 222	Electricity & Electromagnetism	(3cr)
PHYS 241	Physical Optics	(3cr)
+ one of the following courses:		
PHYS 232	Thermal & Statistical Physics	(3cr)
PHYS 245	Modern Physics I	(3cr)
PHYS 251	Introduction to Solid State Physics	(3cr)
PHYS 281	Modern Physics II	(3cr)

COURSE DESCRIPTIONS

PHYS 100 (previously PS 011) INTRODUCTION TO PHYSICS I 3.0: 3 cr. E

Physical quantities, standards and units. Vectors and scalars. Velocity and acceleration. Motion in one, two and three dimensions. Newton's laws, falling bodies, uniform circular motion. Work and energy, power, Kinetic energy theorem. Conservation of total energy. Rectilinear sinusoidal motion, angular sinusoidal motion. Linear and angular momentum collisions. Gravitation.

PHYS 102 (previously PS 012) INTRODUCTION TO PHYSICS II 3.0: 3 cr. E

Fluids, statics, pressure, Pascal's principle and Archimede's Principle. Wave motion, interference of waves. Sound waves. Temperature, Kinetic theory, Brownian motion. Thermodynamics, first and second law. Alternating current, R-L-C circuits, power in A/C circuits. Light nature and propagation, reflection and refraction at plane surfaces. Spherical mirrors, interference of light. Diffraction, polarization, photoelectric effect, X-rays.

PHYS 201 (previously PS 103) GENERAL PHYSICS I 3.0: 3 cr. E

Elements of vector calculus, position, velocity, and acceleration. Motion in one, two, and three dimensions. Dynamics of point particles, Newton's laws, gravitation, concept of force, concept of field, falling bodies. projectile motion, non-uniform circular motion. Work, energy, and power. Kinetic energy, conservation of total energy. Linear momentum and collision. The center of mass; Rotation, angular momentum and its conservation. Torque work and energy in rotational motion. Elements of hydrostatics and hydrodynamics.

PHYS 202 (previously PS 104) GENERAL PHYSICS II 3.0: 3 cr. E

Oscillatory motion. Simple harmonic motion. The pendulum. Damped oscillation. Wave motion, sound waves, superposition of waves, standing waves. First and second laws of thermodynamics. The nature of light, the laws of geometric optics, interference of light waves, diffraction polarization.
Prerequisite: PHYS 201.

PHYS 203 (previously PS 204) GENERAL PHYSICS LAB 0.3: 1 cr. E

This lab provides firsthand knowledge of physical principles and experimental methods through the handling of various types of apparatus designed to demonstrate the meaning and applications of these principles. In this lab, the student performs different types of fundamental physical experiments:

a- Mechanics: motions, laws of collisions, free fall, torsion.
b- Optics: laws of lenses and optical instruments, interference diffraction.
c- The vibrations of strings and the velocity of sound using Kundt's tube.

Prerequisites: PHYS 201/202.

PHYS 211 (previously PS 200) FUNDAMENTALS OF PHYSICS I 3.0: 3 cr. E

The course introduces some of the basic fundamentals of physics, including: kinematics of a particle, relative motion analysis, Newton's laws of motion, work, energy, center of mass, linear impulse and momentum, collision, torque, equilibrium, elasticity, gravity, properties of fluids, simple harmonic motion, transverse and longitudinal waves, resonance, sound waves, Doppler effect, thermal expansion, first and second laws of thermodynamics, entropy.
Prerequisite: MATH 203.

PHYS 212 (previously PS 201) FUNDAMENTALS OF PHYSICS I LABORATORY 0.3: 1 cr. E

This laboratory introduces students to the types of basic apparatus used in physics. Experiments are designed to demonstrate the meaning and applications of the physical concepts included in the "Fundamental of Physics I" course.
Co-requisite: PHYS 211.

PHYS 213 (previously PS 202) FUNDAMENTALS OF PHYSICS II 3.0: 3 cr. E

The course introduces some of the basic fundamentals of physics, including: electric charge, Coulomb's law, electrostatic force, electric field, electric potential, Gauss' Law, capacitors, capacitance, electric current, resistance, Ohm's law, power, emf, internal resistance, magnetic field, magnetic force, magnetic materials, alternating current, rms voltage and current, polarization, reflection, refraction, mirrors, thin lenses, interference, diffraction, photoelectric effect, blackbody radiation, Hydrogen atom, fluorescence, atomic and mass numbers, isotopes, alpha, beta and gamma decays, nuclear fission, nuclear fusion.
Prerequisite: MATH 203.

PHYS 214 (previously PS 205) FUNDAMENTALS OF PHYSICS II LABORATORY 0.3: 1 cr. E

This laboratory introduces students to the types of basic apparatus used in physics. Experiments are designed to demonstrate the meaning and applications of the physical concepts included in the "Fundamental of Physics II" course.
Co-requisite: PHYS 213.

PHYS 221 (previously PS 101) PHYSICS I 3.0: 3 cr. E

Fundamental of Electricity Introduction to electricity study of charges, electric forces, electric field and electric flux. potential and potential difference. Study of the fundamentals of direct current including ohm's law, kirchoff's laws and circuit analysis techniques. emphasis on circuit analysis of resistive networks and dc measurements. includes steady state analysis of, inductance, and capacitance. Alternating current study of the fundamentals of alternating current including series and parallel ac circuits, phasors, capacitive and inductive networks, transformers, and resonance. Electronic devices. A study of diodes, bipolar, mos semiconductor devices, including analysis of static characteristics

PHYS 222 (previously PS 203) ELECTRICITY & ELECTROMAGNETISM 3.0: 3 cr. E

Charge and matter. Electric fields. Gauss's law, electric potential, capacitors, dielectrics, dc circuits, magnetic field, Biot-Savart law, Faraday's law, Ampere's law, inductors, Paramagnetism, ac circuits, Maxwell's equations, and electromagnetic waves.
Prerequisite: PHYS 221.

PHYS 223 (previously PS 206) ELECTRICITY LAB 0.3: 1 cr. E

PHYS 225 (previously PS 102) BASIC ELECTRONICS 3.0: 3 cr. E

Electrical circuits. Semiconductors diode. Transistors and integrated circuits. Field-effect transistors (FET): JFET. MOSFET, transfer characteristics. Signal processing circuits: Waveshaping circuits. Digital electronic circuits: DTL, HTL, TTL, RTL, DCTL, ECL. Small signal models.
Prerequisite: PHYS 221.

PHYS 231 (previously PS 105) THERMODYNAMICS **3.0: 3 cr. E**

Basic concepts and definitions. Properties of pure substance. Heat. Work. First law of thermodynamics. Second law of thermodynamics. Entropy. Reversibility and Irreversibility. Power and refrigeration cycles.

PHYS 232 (previously PS 302) THERMAL AND STATISTICAL PHYSICS **3.0: 3 cr. E**

The laws of thermodynamics, elementary probability theory, kinetics theory of gases and Brownian motion, equilibrium, statistical mechanics of ideal systems: statistical origins of heat, temperature, and entropy are stressed. Equilibrium between phases.
Prerequisite: PHYS 231.

PHYS 241 (previously PS 207) PHYSICAL OPTICS **3.0: 3 cr. E**

Optical instruments, electromagnetic waves, interference, diffraction, polarization, lasers, holography, Fourier transform optics, and non-linear optics.
Prerequisite: PHYS 202.

PHYS 245 (previously PS 208) MODERN PHYSICS I **3.0: 3 cr. E**

Elements of special relativity. Black body radiation, atomic spectra, Bohr Model. Basic principles of quantum theory, the Schroedinger equation. One-dimensional problem, orbital angular momentum. The harmonic oscillator. The hydrogen atom.

PHYS 247 (previously PS 304) EXPERIMENTS IN MODERN PHYSICS **0.3: 1 cr. E**

Measurement of c, e, e/m, h/e, G, g; contemporary experiments in microwave and optical diffraction and interference; optical fibers; temperature-dependent properties of conductors.

PHYS 251 (previously PS 303) INTRODUCTION TO SOLID STATE PHYSICS **3.0: 3 cr. E**

Lattices, reciprocal lattice and diffraction; thermal and elastic properties; cohesive energy of solids; electrons in metals; semiconductors; superconductivity; magnetism.
Co-requisite: PHYS 281.

PHYS 281 (previously PS 301) MODERN PHYSICS II **3.0: 3 cr. E**

General formalism of spin and addition of angular momenta. Elements of atomic and molecular physics. Radioactivity and nuclear physics. Nuclear reactions. Elementary particles. Solid state physics. Astrophysics.
Prerequisite: PHYS 213.

CHEM 202, 203, 222

Refer to Department of Chemistry.

CVSQ 201, 202, 203, 204

Refer to Cultural Studies Program.

CSIS 200, 211, 212

Refer to Department of Computer Science.

ELEN 201, 221, 231, 332, 304
Refer to Department of Electrical Engineering.

MATH 200, 202, 210, 211, 270
Refer to Department of Mathematics.

MECH 243
Refer to Department of Mechanical Engineering.

TEACHING DIPLOMA IN APPLIED SCIENCES:

This degree is offered to students having a BS degree in applied sciences: Mathematics, Biology, Chemistry, Environmental Sciences or Computer Science and are planning to become teachers of intermediate or high school levels.

The diploma involves the following courses (27 Credits):

EDUC 213	Fundamentals of Education: History and Methods	3 cr.
EDUC 216	Test and Measurement	3 cr.
EDUC 220	Educational Psychology	3 cr.
EDUC 227	Sociology of Education	3 cr.
EDUC 250A	Assisted Learning	3 cr.
PSYC 214	Adolescence Development	3 cr.
PRAC 201	Practicum I	3 cr.
PRAC 202	Practicum II	3 cr.

And in addition , one specialized course (3 Credits) of the following :

EDUC 251 Teaching Mathematics in the Elementary School
EDUC 264 Teaching Applied Sciences in the Elementary School
EDUC 280 Teaching of Computer

For course descriptions, refer to “Sciences de l’education” Department.

PREMEDICAL REQUIRED COURSES

The Premedical Program is offered to students who intend to enter the Faculty of Medicine & Medical Sciences and gives them the opportunity to apply for the Medical College Admission Test (MCAT) after successfully taking a minimum of **34 credits** distributed as follows:

Biology	a minimum of 8 credits: normally BIOL 201, 202, 203, 204
Chemistry	a minimum of 12 credits, including 7 credits of Organic Chemistry: normally CHEM 202, 203, 222 (or 220), 242, 244, 245
Humanities and Social Sciences	a total of 6 credits
Physics	a minimum of 8 credits: normally PHYS 211, 212, 213, 214

NB: English communication skills are required but not credited.