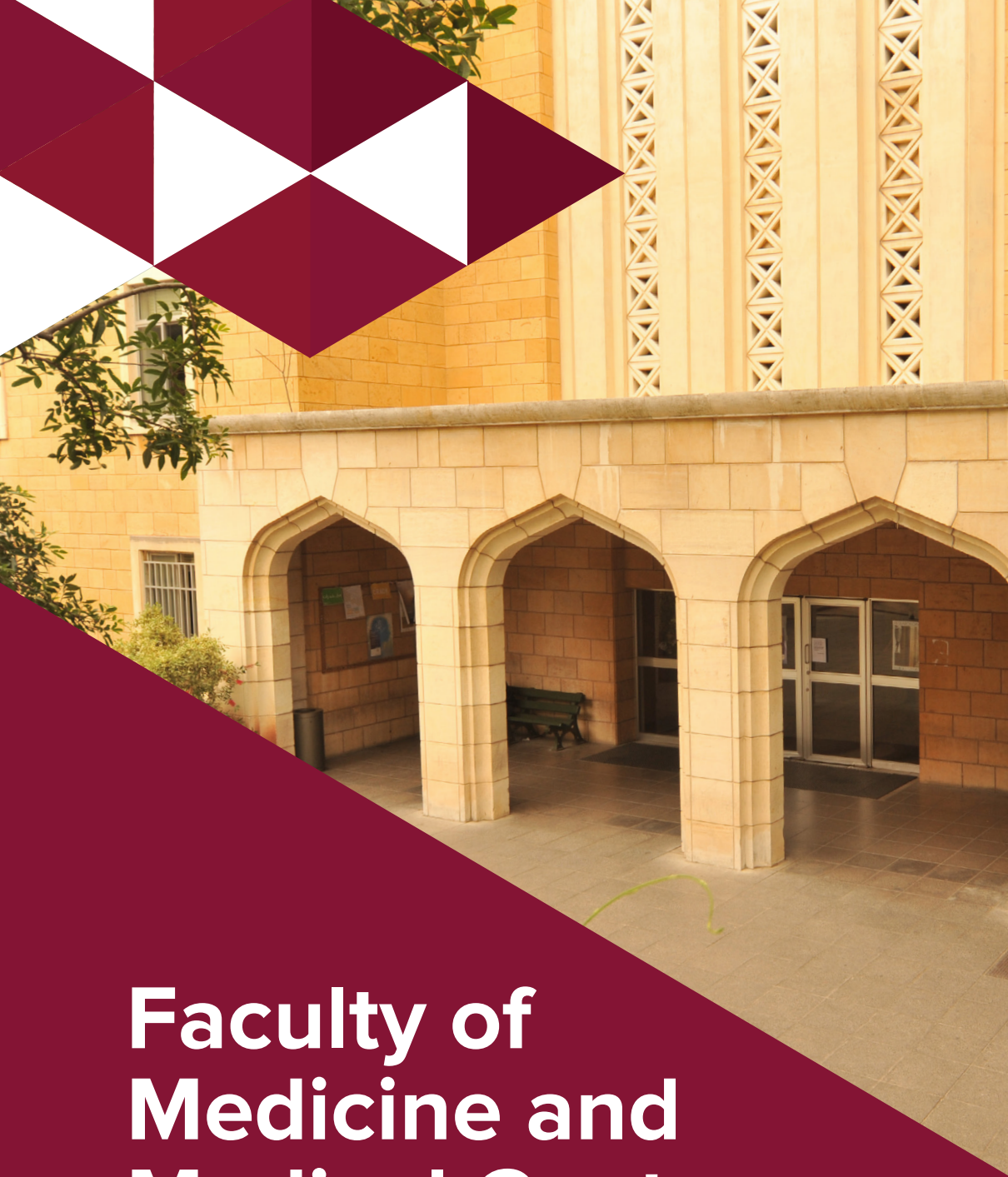

Faculty of Medicine and Medical Center (FM/AUBMC)

Fadlo R. Khuri	President of the University
Zaher Dawy	Provost
Raymond Sawaya	Vice President for Medical Affairs and the Raja N. Khuri Dean of Medicine
Joseph Otayek	Medical Center Director
Elie Akl	Associate Dean for Clinical Research
Samir Alam	Associate Vice President for Health Affairs
Kamal Badr	Executive Associate Dean for Medical Education
Assaad Eid	Associate Dean for Basic/Translational Research and Graduate Studies
Souha Kanj-Sharara	Associate Vice President for Global Affairs
Ramzi Sabra	Associate Dean for Educational Development
Hassan Solh	Executive Associate Vice President for Business and Finance
Fuad Ziyadeh	Executive Associate Dean for Faculty Affairs
Salah Zeineldine	Assistant Dean for Graduate Medical Education
Ali Taher	Associate Vice President for Communication and Creativity Services
Zeina Kanafani	Assistant Dean for Student Affairs
Umayya Musharrafiyeh	Director of Undergraduate Clinical Education
Nathalie Khoueiry Zgheib	Director of Undergraduate Pre-clerkship Education

Faculty Administrative Support

Mahmoud H. Harb	Medical Education Unit Coordinator
Rami Hawi	Instructional Designer and Assessment Specialist
Rania Jaber	Graduate Medical Education Manager
Hala Kaidbey	Research and Education Grants Manager
Houssam Khalil	Clinical Skills and Medical Simulation Officer
Khalil Kreidieh	FM Academic and Special Projects Coordinator
Nabil Mansour	Director of Operations
Ali Nabbouh	Graduate Student Officer
Reem Saad	Accreditation and Faculty Development Manager
Ruaa Saadeddine	Medical Student Affairs Coordinator
Miriam Saliba	Executive Officer

Historical Background

Since 1867, the founding date of the Faculty of Medicine, both the Faculty of Medicine and the Medical Center have continuously been providing services in the realms of medical education, training and health care to their immediate constituencies in Lebanon and the Middle East region. To date, the Faculty of Medicine has graduated 4,225 physicians, and there is a large postgraduate training program of over 280 residents in most of the departments. The Faculty of Medicine programs have been approved by and registered in the Education Department of the State of New York on a continual basis since 1867. In 1957 the faculty became an institutional member of the Association of American Medical Colleges. It enjoyed this status until 1988, when the new rules of the association precluded

membership of institutions outside the confines of the North American continent.

The AUB Medical Center has been accredited by the Joint Commission International (JCI) as of October 2007. Previously, the Medical Center was accredited by the US-based Joint Commission on Accreditation of Healthcare Organizations (JCAHO) from 1965 until 1983, when the civil war in Lebanon prevented review teams from continuing with their periodic site visits. The JCI is the international arm of the JCAHO. The National Board Examinations were administered to the faculty's undergraduate students for credit between 1966 and 1982. The faculty was a regional center for the administration of the examinations of the Educational Commission for Foreign Medical Graduates between 1959 and 1993. In addition, the faculty takes pride in having had very close links with prestigious American medical schools and centers including Columbia University from 1945 to 1955, Harvard School of Medicine from 1955 to 1965, and a formal affiliation with the Johns Hopkins School of Medicine from 1965 to 1975, which was supported by the Commonwealth Fund.

The Faculty of Medicine and the Medical Center have revived and established a number of links and affiliations with the following:

- Columbia University College of Physicians and Surgeons for student elective exchange (since 2002)
- University of George Washington School of Medicine in Washington, DC (as of September 8, 2004)
- Medical University of South Carolina (MUSC) (as of April 1, 2003) for an MD–PhD program that admits up to three medical students annually from AUB/FM
- Johns Hopkins University School of Medicine (as of May 10, 2004) for collaboration in research, education and the provision of medical services training
- University of Paris 7 Denis Diderot for cooperative cancer research (as of December 8, 2004)
- University of Poitiers (France) for cooperative neurosciences research (as of February 3, 2006)
- St. Jude Children's Research Hospital (as of April 19, 2000)
- Laval University in Quebec, Canada
- M.D. Anderson Cancer Center (as of June 6, 2007)
- Palermo University (as of April 23, 2007) for cooperation in research and higher education
- University of Montpellier (France) (as of August 3, 2007)

The Faculty of Medicine and the Medical Center (FM/AUBMC) are currently accredited by the following American-based accreditation bodies:

- The Middle States Commission on Higher Education
- The Joint Commission International (JCI) for hospital accreditation
- Accreditation of AUBMC by the Lebanese Ministry of Public Health
- Accreditation of the School of Nursing by the Commission on Collegiate Nursing Education (CCNE)
- Accreditation of the Nursing Services at AUBMC by the American Nurses Credentialing Center (ANCC)

- The College of American Pathologists (CAP)

In addition, the Faculty of Medicine, with its Medical Center, is a member of the following organizations:

- Alpha Omega Alpha (AOA) Gold Humanism Honor Society (GHHS) – AUB Faculty of Medicine was successful in establishing the AUB GHHS chapter in 2020 rendering it the first in the Arab Region to be accepted in the Gold Humanism Honor Society network. Honor Medical Society (The Faculty of Medicine is the only member of the AOA outside North America since 1958)
- The American Medical College Application Service
- The American College of Physicians/American Society of Internal Medicine
- The Association of Program Directors in Internal Medicine

The MD Program

The Faculty of Medicine offers a 4-year medical program leading to the MD degree, which follows the American model of medical education. Students can elect to pursue the regular track or the scholarship track; the latter allows them to pursue independent research during years 2, 3 and 4, for which they obtain a special certificate on graduation.

Mission

The mission of the Faculty of Medicine is to provide optimum, advanced, state-of-the-art, comprehensive, timely and cost-effective medical education for each student. The faculty aims to reach this objective by implementing innovative teaching techniques, and by recruiting and retaining outstanding faculty and students. The faculty also strives for improved student performance and career opportunities, as well as improved basic and clinical research, more effective patient management, and new and innovative medical approaches. The faculty focuses on enhancing the regional and global reputation of the AUB Medical Center (AUBMC) by encouraging the development of additional centers of excellence and developing more effective uses of physical resources and funds.

Vision

The vision of the Faculty of Medicine is to continuously upgrade the quality of education provided to its medical students and postgraduate physicians in the various medical and surgical subspecialties. This vision is implemented by the strong commitment of the faculty to educate young men and women to become excellent physicians with humane and high ethical standards as well as technical expertise. The faculty also aims at providing a better environment for personal growth and recognition for all its students by inspiring them to become leaders in their fields. The Faculty of Medicine will always endeavor to provide opportunities for its students to develop individual initiative, creative ability and professional leadership through participation in extracurricular seminars, discussion groups, research projects and student organizations.

The Scholarly Concentration Track in the MD Program

The Faculty of Medicine offers medical students the option of pursuing the Scholarly

Concentration Track towards the MD. This track allows students to link to a faculty member and pursue a scholarly project during years 2, 3 and 4 of the medical program. The time devoted to this track will be equivalent to a 3-credit course in year 2 and 12 weeks of elective clerkships during the 4th year. Additionally, students may elect to work on it during their free time within those 3 years. Completion of the scholarly project with a public presentation and a product of scholarship are requirements for graduation. The project may be in any of the following domains so long as it has some relevance to medicine and health: the basic biological and biomedical sciences; the clinical sciences; public health, epidemiology, community medicine and global health; the arts, humanities and social sciences (includes bioethics); engineering, architecture and the physical sciences; business administration and management; agricultural and nutritional sciences.

The MD-MBA Dual Degree Program

Students enrolled in the Faculty of Medicine MD program can choose to pursue a dual MD-MBA degree. This requires them to take one year off between the 3rd and 4th year of the MD program to pursue studies at the Olayan School of Business. At the end of the year (which includes fall, spring and summer semesters), the students will return to the Faculty of Medicine to complete their 4th year of the MD program, while they continue working on their 3-credit project for the MBA degree. Thus, the dual degrees will be completed in 5 years instead of 6 years if they were pursued separately. Students enrolled in this program will be considered as following the scholarly concentration track of the MD program, thus 3 4-week elective rotations in their 4th year of the MD program will double as 9 credits of elective courses for the MBA degree.

Admission Requirements: For the dual MD-MBA degree, the GMAT requirement and the work experience normally required for admission to the MBA program will be waived, whereby the MCAT would replace the GMAT, and the MD student's rotations during their MED III would be considered as equivalent to the required MBA work experience.

To be considered for admission, the MD student must be in good standing academically (no failed courses or clerkships) and professionally (no disciplinary action on record). A committee from representatives of both faculties shall interview and screen applicants and come up with admission recommendations. Each committee member has the option to separately review the file and interview the applicants to ensure their fit within the program. The decision of the committee shall be communicated to the student by the middle of the 3rd year in the MD program.

Admission

The Faculty of Medicine was established to give properly qualified candidates, particularly from Lebanon and the Near East, the opportunity for sound education in both the art and science of medicine. All applicants must hold a bachelor's degree and must have completed the premedical requirements as well as the Medical College Admission Test (MCAT). Applicants in their senior year expecting to graduate with a bachelor's degree in June are eligible to apply provided they have completed the premedical requirements and have taken the MCAT by the end of the first of their senior year. For applicants holding (or expecting) a bachelor's degree, consideration for acceptance is limited to students with a minimum cumulative GPA of 3.0 in each of the following: 1) all courses, 2) the required premedical core courses, and 3) major courses. For applicants from North American colleges, a minimum GPA of 3.3 is required. Applications from individuals holding (or expecting by June of the same year) a master's or a doctoral degree are encouraged. These applicants will be considered based upon their academic performance and their research productivity; in these cases, some of the premedical requirements may be waived depending on the field of study.

Interviews are granted to a selected group of applicants based on their MCAT scores and their academic achievement. Granting an interview does not necessarily imply that the applicant will be accepted. Students are accepted to medical school on the basis of their academic qualifications, their MCAT score and the results of their interviews. In addition, due consideration is given to the applicants' letters of recommendation from their teachers and mentors, their curriculum vitae, as well as their personal statements. Among the traits that the successful applicant will demonstrate are humanistic and ethical attitudes, good communication and interpersonal skills, emotional maturity, and personal integrity. Previous experience in research, community service and volunteer work are considered positive attributes.

The Faculty of Medicine at AUB does not discriminate on the basis of age, gender, nationality, ethnic origin or religion.

The minimal premedical requirements are summarized below:

A bachelor's degree in any field of study is required. Historically, the vast majority of applicants to the Faculty of Medicine have been holders of bachelor's degrees in biology or chemistry. In an effort to diversify the pool of applicants, graduates from other majors are strongly encouraged to apply as long as they complete the premedical core courses required for admission to the Faculty of Medicine. Students can take some of the premedical courses as electives in their respective majors.

Premedical core course requirements: Students who matriculated before fall 2024 should follow instructions published in previous catalogue(s).

Students who matriculated as of fall 2024 should follow the requirements listed below:

As of 2024-2025, the minimal course requirements for admission to the MD program at AUBFM will be as listed below (the courses in parentheses are AUB courses that fulfill the requirements), irrespective of the track followed in high school or the Lebanese Baccalaureate.

Biology: 7 credits: one course in general biology with laboratory (BIOL 201, 4 credits) and one course in biochemistry (BIOL 220, 3 credits).

Chemistry: 8 credits: 3 credits in general chemistry (CHEM 201, 3 credits); 5 credits in organic chemistry with lab (CHEM 208, 3 credits; CHEM 209, 2 credits). Biology and Chemistry majors will take CHEM 210, 211 and 212 to fulfill the requirements of organic chemistry.

Computer Science: 3 credits in introductory programming (CMPS 203, 3 credits).

English: 6 credits in academic English (ENGL 203 and 204).

Physics: 4 credits in a physics course for the life sciences with laboratory (PHYS 206 and 206L, 4 credits). Biology and Chemistry majors may take other courses as dictated by their majors in lieu of PHYS 206 (e.g. Biology majors will take PHYS 204, 204L, 205 and 205L and Chemistry majors will take PHYS 211 and PHYS 211L).

Psychology: 3 credits in general psychology (PSYC 201, 3 credits).

Sociology: 3 credits in general sociology (SOAN 201, 3 credits).

Humanities: 6 credits. Any two courses recognized by the university as fulfilling the "humanities" requirements may be taken, excluding some courses listed under point 2 below. At AUB, students are encouraged to consider minoring in the medical humanities. The following possibilities are recommended - but not mandatory - to fulfill the humanities requirements:

1. Any 2 CVSP/CHLA courses
2. One CVSP/CHLA course and one English or Arabic literature humanities course, excluding those listed below:
   a. ENGL 227: Introduction to Language
   b. ENGL 228: Phonetics
   c. ENGL 229: History of the English Language
   d. ENGL 233: Introduction to Translation
   e. ENGL 211/212: Survey of Arabic Grammar
   f. ENGL 213/214: Introductory Biblical Hebrew
   g. ENGL 215: Introductory Syriac
   h. ENGL 224: Arabic Stylistics and Metrics
   i. ENGL 227: Arabic Linguistics
   j. ENGL 228: Arabic Linguistics
3. One CVSP/CHLA and one philosophy course from the following:
   a. PHIL 210 Introduction to Ethics
   b. PHIL 214 Modern Philosophy
   c. PHIL 216 Political Philosophy
   d. PHIL 221 Philosophy of Mind
   e. PHIL 222 Philosophy of Science
   f. PHIL 224 Philosophy of Religion
   g. PHIL 225 History of Moral Philosophy
   h. PHIL 230 Philosophy of Plato

MCAT. A competitive score in the MCAT, which may be taken twice only, is required. If taken twice, the higher score is considered. The MCAT score must be available at the time the application is submitted. The MCAT has sections on the biological sciences, chemical and physical sciences, social, psychological and behavioral sciences, and critical analysis and reasoning skills. Students are encouraged to review the content of the MCAT and plan their studies accordingly.

Applicants expecting to receive a bachelor's degree after the deadline for application should be aware of the following:

- Applicants must be in their senior year.
- The cumulative GPA of 70 credits or more (at the time of application) should be equal to or higher than 3.0 for students from AUB or its equivalent for those from other universities. All required core courses must have been completed by the end of the fall term of the senior year with GPA of at least 3.0. The cumulative GPA in the major courses completed by the end of the fall term of the senior year must also be equal to or greater than 3.0.
- Admission to medical school is contingent upon completion of graduation requirements and obtaining the bachelor's degree, which should be achieved by the end of the spring term of the student's senior year.

Applicants expecting to receive a master's or doctoral degree after the deadline for application should be aware of the following:

- A minimum cumulative grade GPA of 3.3 or its equivalent is required.
- Admission to medical school is contingent upon completion of graduation requirements and obtaining the master's or doctoral degree, which should be achieved by the end of the spring term.

Conditional acceptance to the faculty is issued by the middle of April and is finalized upon completion of the requirements for the bachelor's, master's or doctoral degree.

Graduation Requirements

To be eligible for the degree of Doctor of Medicine, a student must satisfactorily complete the curriculum of the Faculty of Medicine and must be recommended by the Academic Committee. The degree may be granted with distinction to students who achieve, in years 1 and 2, a cumulative average ≥ 88%, and, in years 3 and 4, a grade of "Excellent" in at least 50 percent of the credits and a grade of "Pass" in no more than 20 percent of the credits in years 3 and 4, and who have no failures in any course or clerkship.

The Faculty of Medicine offers post-graduate training positions in the various academic departments at AUBMC to AUB and non-AUB medical graduates. However, these positions are limited and are granted on a highly competitive basis.

Dean's Honor List

To be placed on the dean's honor list, a student must be full-time and must not be repeating the year. The dean's honor list is those ranking in the top 15 percent of the class and is offered in years 3 and 4 of the medical program only.

Academic Rules and Regulations

See General University Academic Information on page 72.

Attendance

Regular attendance is required at lectures, laboratories, clerkships, examinations and other assigned duties. Credit is not given for work not performed. Students absent on account of illness or other valid reasons are requested to confer with course or clerkship coordinators or the Director of Student Affairs. The committees concerned will review prolonged or repeated absences and decide on the appropriate course of action.

Language Requirement

The language of instruction is English. However, students must have speaking knowledge of Arabic before entering the third year. This requirement may be waived by special vote of the Academic Committee.

Promotions and Deficiencies

In the first and second years, the performance of students is evaluated as either pass or fail based on absolute standards of grading, with no ranking. Numerical grades will be kept in the students' records for reference, and may be used for providing a descriptive account of student performance and for recommendation letters by the Dean's Office. Numerical grades may be used to decide on graduating students with distinction, granting of awards (e.g. Penrose Award, Alpha Omega Alpha Honor Medical Society) and if requested by students for scholarship or financial aid granting bodies that require them. In the third and

fourth years, absolute standards are used to determine the Pass-Fail margin. For those who pass, performance is evaluated as Excellent (E), Good (G), or Pass (P), based on normative grading. In this case, the distribution of grades in a class is as follows: the top 10-15 percent are granted an "E", the following 35-40 percent a "G", and the remaining 50 percent a "P". The evaluation of the student in each subject is based on his/her total performance and not solely on the results of examinations.

The student's performance is evaluated by appropriate class teaching committees, which make recommendations to the Academic Committee. The action of the Academic Committee is final. The class teaching committees and Academic Committee give due consideration to a general evaluation of fitness for a career in medicine. Only those students who, in the opinion of the committees, give promise of being a credit to themselves, the faculty and the medical profession are advanced.

To be promoted, a student must attain a grade of Pass or better in all courses or clerkships and must be recommended by the committees concerned. However, a student with a grade of Pass in all courses or clerkships may, at the discretion of the committees, be promoted on probation, be asked to do remedial work and pass the re-examinations in designated courses or clerkships or repeat the year.

In the first or second year, a student who fails less than 25 percent of the credits may be asked either to satisfactorily complete remedial work and/or pass re-examinations in the courses concerned in order to be promoted, repeat the year, or leave the program. A student who fails more than one re-examination will be asked either to repeat the year or leave the program. A student who fails only one re-examination may, at the discretion of the committees concerned, be allowed to take another and final re-examination for the same course. A student who fails this second re-examination will be asked either to repeat the year or leave the program.

A student in the first or second year who fails 25 percent or more of the credits may be asked either to repeat the year or leave the program.

At the discretion of the committees concerned, a student who is to repeat the first or second year may be allowed to repeat some of the courses, not all of them.

In order to pass a clerkship in the third or fourth year, a student must demonstrate competence in both clinical performance and knowledge of the discipline. Failure of either component is considered a failure of the clerkship.

In the third or fourth year, a student who fails less than 50 percent of clerkship and course hours may be asked to satisfactorily complete remedial work and/or pass re-examinations, repeat a clerkship, repeat the year or leave the program (refer to the section entitled Specific Guidelines for Clinical Clerkships for further information). A student who fails more than one re-examination, remedial work or repeated clerkship or course may be asked to either repeat the year or leave the program. A student who fails only one re-examination, remedial work or repeated clerkship may, at the discretion of the committees concerned, be allowed to have another attempt at passing them. A student who fails this second attempt will be asked either to repeat the year or leave the program.

A student in the third or fourth year who fails 50 percent or more of clerkship and course hours may be asked to either repeat the year or leave the program.

At the discretion of the committees concerned, a student who is to repeat the third or fourth year may be asked to repeat some of the clerkships/courses, not all of them, and to complete clerkships shorter than the original ones.

A student in the medical program may not fail more than one academic year. A student who

fails a second academic year will be asked to leave the program. A student who repeats a year and fails any course or clerkship may be asked to leave the program.

A student who is placed on probation cannot graduate unless probation has been removed.

Specific guidelines for clinical clerkships:

Decisions regarding failed clerkships or parts of clerkships are normally made at the end of the year, when the overall performance of the student is reviewed. Below are guidelines that describe potential courses of action, but the final decision is made by the Academic Committee based on an overall assessment of the student's performance and fitness for promotion or graduation. The following guidelines apply to students who fail less than 50% of clerkship hours in a year.

- In order to pass the clinical clerkships in years 3 and 4, students must demonstrate acquisition of adequate clinical performance and skills, as shown by performance evaluations, OSCE scores and other assessment measures defined by the specific clerkship, and an appropriate fund of knowledge as demonstrated primarily by a passing grade on the final written examination (usually an NBME examination). Failure of either component is considered a failure of the clerkship.
- If a student fails both the clinical performance and the final written examination of a clerkship, he/she will be required to repeat it in its entirety: the clinical components and the final written examination.
- If a student fails only the final examination of a clerkship, he/she will be required to repeat it. If the student fails a second time, he/she will be required to repeat the clerkship in its entirety: both the clinical components and the final written examination.
- If a student fails only the clinical performance component, he/she will be asked to repeat the clinical components of the rotation (totally or partly as determined by the department concerned). If the student fails the clinical component a second time, he/she will be required to repeat it in its entirety: both the clinical components and the final written examination.

Courses

Numbers Preceding Course Titles

Courses required for the Doctor of Medicine degree are numbered 200 to 299 as follows:

- 200 to 239 indicate courses given in first and second year medicine.
- 240 to 259 indicate courses given in third year medicine.
- 260 to 279 indicate courses given in fourth year medicine.
- 280 to 299 are reserved for clinical clerkships during the year of internship.

For the first and second years, odd numbers refer to first term courses and even numbers to second term courses. Year courses are indicated by a hyphen between the two numbers.

Graduate courses leading to the Master and Doctor of Philosophy degrees are numbered 300 to 399.

Regular medical courses approved for graduate work (MS and PhD programs) have two numbers.

Numbers preceded by the letters ID (Interdepartmental) or FM (Faculty of Medicine)

indicate integrated courses taught by two or more departments together.

Numbers Following Course Titles

The first number following the title of a course indicates the total number of lectures, conferences, and discussion hours given, except where otherwise stated.

The second number indicates the total laboratory or clinical practice hours, except where otherwise stated.

The third number indicates the number of term credit hours. Credit hours are used in conjunction with first and second year courses only.

Course Descriptions

All the following courses, except those listed as electives, are required of students working toward the degree of Doctor of Medicine. The electives designated may be chosen with the consent of the instructor. Detailed course descriptions are available under individual departments.

Curricula

First Year		No. of Weeks	Lecture and Clinical Recitation	Laboratory or Clerkship Hrs.	Total Hrs.	Credits
IDTH 201	Cellular and Molecular Basis of Medicine	15	90	40	118	7
IDTH 202	Clinical Anatomy	15	38	110	148	6
IDTH 203	The Immune System in Health and Disease	8	37	28	75	3
IDTH 204	Basic Pathological Mechanisms	8	29	14	43	2
IDTH 205	Microbiology and Infectious Diseases	9	56	44	100	5
IDTH 210	Fundamentals of Medical Research	9	30	20	50	3
IDTH 211	The Blood	4	30	30	60	3
IDTH 225	The Liver and Gastrointestinal System	4	40	40	80	4
IDTH 229	The Skin	2	20	20	40	2
IDTH 213	Becoming a Doctor 1: Clinical Skills -I	45	20	80	100	4
IDTH 214	Becoming a Doctor 2: Physicians Patients and Society - I	16	16	16	32	2

IDTH 215	Becoming a Doctor 3: Global Health and Social Medicine	21	21	21	42	2
IDTH 216	Becoming a Doctor 4: Learning Communities	45	0	36	36	1
				Total	**924**	**44**

Second Year		**No. of Weeks**	**Lecture and Clinical Recitation**	**Laboratory or Clerkship Hrs.**	**Total Hrs.**	**Credits**
IDTH 226	The Cardiovascular System	4	40	40	80	4
IDTH 227	The Respiratory System	3	30	30	60	3
IDTH 228	The Kidneys and Urinary System	4	40	40	80	4
IDTH 212	Endocrinology and Reproduction	6	46	46	80	5
IDTH 230	Brain and Cognition	8	80	80	160	8
IDTH 231	Human Development and Psychopathology	4	40	40	80	4
IDTH 232	Research Design and Development	30	10	80	90	3
IDTH 233	Physicians Patients and Society-II	20	20	20	40	2
IDTH 234	Clinical Skills-II	30	20	50	70	3
IDTH 235	Learning Communities-II	30	0	30	30	1
IDTH 237	Introduction to Evidence Based Medicine	-	14	6	20	1
				Total	**790**	**38**

Third Year	**No. of Weeks**	**Lecture and Clinical Recitation**	**Laboratory or Clerkship Hrs.**	**Total Hrs.**	**Credits**
Clinical Conferences	46	240	–	240	–

INMD 246	Clinical Clerkship Internal Medicine	12	120	500	620	_
FMMD 242	Physicians, Patients and Society III	2	16	24	40	–
INMD 254	Infection Control	–	6	34	40	–
PSYT 252	Clinical Clerkship Psychiatry	4	25	180	205	–
OBGY 247	Clinical Clerkship Obstetrics and Gynecology	8	47	360	407	–
PEDT 246	Clinical Clerkship Pediatrics and Adolescent Medicine	8	35	360	395	–
SURG 246	Clinical Clerkship Surgery	8	45	360	405	–
FMMD 246	Clinical Clerkship Family Medicine	4	30	150	180	
PHRM 333	Clinical Pharmacology	1	16	–	16	–
				Total	**2568**	

Fourth Year		**No. of Weeks**	**Lecture and Clinical Recitation**	**Laboratory or Clerkship Hrs.**	**Total Hrs.**	**Credits**
Clinical Conferences		46	–	240	240	–
INMD 262	Clinical Clerkship Internal Medicine	8	–	360	360	_
NEUR 262	Clinical Clerkship Neurology	4	–	180	180	–
EMMD 262	Clinical Clerkship Emergency Medicine	5	–	230	230	–
PEDT 267	Clinical Clerkship Pediatrics and Adolescent Medicine	4	–	180	180	–
Elective in any department		16	–	720	720	–
IDTH 268	Clerkship in Preventive Medicine and Public Health	3	15	120	135	–
FMMD 262	Clinical Clerkship Family Medicine	4	30	150	180	–
IDTH 262	Capstone Course	1	10	40	45	
				Total	**2270**	

Interdepartmental Courses – Medical Program

First and Second Years

IDTH 201 Cellular and Molecular Basis of Medicine 90.40; 7 cr.
An interdisciplinary course that presents the cellular and molecular concepts and principles that underlie the normal structure and function of the human body. It covers cellular structure and function, including mechanisms and regulation of gene expression, protein synthesis, structure and function, signaling mechanisms, membrane transport, energy metabolism, contractility, and excitability, and the basic principles of drug action. Clinical examples and correlations are presented to illustrate the relevance of cellular and molecular function to medicine.

IDTH 202 Clinical Anatomy 38.110; 6 cr.
A regional dissection of the entire human body supplemented by embryology, clinical lectures and discussions. The student is also introduced to radiographic anatomy based on various imaging modalities in addition to computer-assisted instruction.

IDTH 203 The Immune System in Health and Disease 37.28; 3 cr.
A course that deals with the immune system's responses in states of normalcy and disease, from the molecular to the clinical level, and covers the pathophysiology, clinical manifestations, diagnosis and management of major rheumatologic diseases.

IDTH 204 Basic Pathological Mechanisms 29.14; 2 cr.
The course covers the basic pathological mechanisms of disease at the cellular and molecular levels, their microscopic, gross and clinical manifestation, and some pharmacological interventions that apply to them.

IDTH 205 Microbiology and Infectious Diseases 56.44; 5 cr.
The course provides the principles and concepts of basic and medical microbiology. Emphasis is placed on the basic properties, pathogenesis, preventive measures and laboratory diagnosis of bacteria, viruses, parasites and fungi, and the clinical outcome, management and treatment of patients infected by these etiologic agents.

IDTH 210 Fundamentals of Medical Research 40.10; 3 cr.
The course provides first year medical students with their first exposure to research methodology. Fundamental principles and concepts of evidence-based medicine, epidemiology and biostatistics are presented and discussed.

IDTH 211 The Blood 30.30; 3 cr.
An integrated course that covers the anatomy, histology, physiology, pathology, pathophysiology and pharmacology related to the blood and lymphatic systems. Concepts in social medicine and global health, preventive medicine, epidemiology and medical ethics are explored in relation to diseases of the blood.

IDTH 212 Endocrinology and Reproduction 46.36; 4 cr.
An integrated course that covers the anatomy, histology, physiology, pathology, pathophysiology and pharmacology related to the endocrine and reproductive systems. Concepts in social medicine and global health, preventive medicine, epidemiology and medical ethics are explored in relation to diseases of the endocrine and reproductive systems.

IDTH 213 Becoming a Doctor 1: Clinical Skills – I 20.80; 4 cr.
The course introduces students to the art of medicine: communication skills, history taking, physical examination and clinical reasoning. The course runs throughout the year and is closely integrated with the organ-system based courses being studied by the students to integrate clinical and basic science knowledge and skills.

IDTH 214 Becoming a Doctor 2: Physicians Patients and Society – I 19.19; 2 cr.
The course explores the place of medicine, illness, suffering and the human body in human culture expressed through art, literature and history of medicine, and through close encounters with patients.

IDTH 215 Becoming a Doctor 3: Global Health and Social Medicine 21.21; 2 cr.
The course introduces students to central issues in the practice of social medicine and global health and the connection between them. It examines how social forces become embodied as pathologies, how political, economic, and historic trends influence the distribution of disease among different populations, and how new trends in the organization of care affect the most vulnerable members of society.

IDTH 216 Becoming a Doctor 4: Learning Communities 0.36; 1 cr.
The course covers topics and issues important for the personal and professional development of students, with emphasis on reflection. Students are encouraged to make use of experiences for shared learning and to develop a sense of community and belonging, thus promoting well-being.

IDTH 225 The Liver and Gastrointestinal System 40.40; 4 cr.
An integrated course that covers the anatomy, histology, physiology, pathology, pathophysiology and pharmacology related to the liver and gastrointestinal tract. In addition, concepts in social medicine and global health, preventive medicine, epidemiology and medical ethics are explored in relation to diseases of this system.

IDTH 226 The Cardiovascular System 40.40; 4 cr.
An integrated course that covers the anatomy, histology, physiology, pathology, pathophysiology and pharmacology related to the cardiovascular system. In addition, concepts in social medicine and global health, preventive medicine, epidemiology and medical ethics are explored in relation to diseases of this system.

IDTH 227 The Respiratory System 40.40; 4 cr.
An integrated course that covers the anatomy, histology, physiology, pathology, pathophysiology and pharmacology related to the respiratory system. In addition, concepts in social medicine and global health, preventive medicine, epidemiology and medical ethics are explored in relation to diseases of this system.

IDTH 228 The Kidneys and Urinary System 40.40; 4 cr.
An integrated course that covers the anatomy, histology, physiology, pathology, pathophysiology and pharmacology related to the kidneys and urinary system. In addition, concepts in social medicine and global health, preventive medicine, epidemiology and medical ethics are explored in relation to diseases of this system.

IDTH 229 The Skin 20.20; 2 cr.
This course integrates the anatomy, histology, physiology, pathology, pathophysiology and pharmacology related to the skin. Basic concepts are presented in which students are expected to learn the scientific basis of the normal physiology and pathology of the skin and its appendages including hair and nails as well as mucosal surfaces. Mechanisms of

disease causation are illustrated with clinically relevant examples. Concepts in preventive medicine, epidemiology and medical ethics are explored in relation to diseases of the skin.

IDTH 230 Brain and Cognition 80.80; 8 cr.
This course is intended to provide preclinical medical students with an integrated approach to the structure and function of the nervous system. Basic principles of neuroanatomy, neurocytology, neuroembryology, neuroradiology, neurophysiology and neurology will be related to the function of the normal and diseased human nervous system, and the action of drugs. Concepts in social and preventive medicine, epidemiology and medical ethics are explored in relation to diseases of the nervous system.

IDTH 231 Human Development and Psychopathology 40.40; 4 cr.
This is a multidisciplinary course that integrates human development, psychopathological processes and their underlying neural circuitries along with basic and clinical psychopharmacology and relevant ethical, professional and public health issues. It teaches psychopathology through a lifespan approach and uses a variety of teaching/learning techniques such as didactics, team based learning, case studies and workshops.

IDTH 232 Research Design and Development 10.80; 3 cr.
The aim of the course is to provide the opportunity to learn and apply research methods to investigate a local health problem. It will provide a hands-on research experience, building on the basic knowledge and skills learned in the Fundamentals of Medical Research course in year 1. Students will learn the phases of the research process from conception to design to implementation. Through a combination of class sessions, meetings with research advisors and independent work, students, in groups, will identify a local health problem that is of particular interest to them, and will design and conduct a study relevant to it.

IDTH 233 Physicians Patients and Society – II 20.20; 2 cr.
This course explores medicine, illness and suffering as seen through the lens of bioethics, spirituality in medicine, palliative care and the nursing experience. It will bring together information related to the biophysical, psychological, humane, spiritual and social factors of illness - a holistic approach that focuses on the patient as a person.

IDTH 234 Clinical Skills – II 20.50; 3 cr.
This course is a continuation of IDTH 213 and further develops the student's communication skills, history taking, physical examination and clinical reasoning. It runs throughout the year and is closely aligned with the organ-system based courses being studied by the students in year 2 of medical school, to integrate clinical and basic science knowledge and skills.

IDTH 235 Learning Communities – II 0.30; 1 cr.
The course covers topics and issues important for the personal and professional development of students, with emphasis on reflection. Students are encouraged to make use of experiences for shared learning and to develop a sense of community and belonging, thus promoting well-being.

IDTH 237 Introduction to Evidence Based Medicine
This course runs longitudinally during the second year of medical school. The aims of this course are to train medical students in the skills of evidence-based medicine (EBM), which will enable them to be life-long independent learners and evidence-based practitioners. The students will explore how to generate clinical questions from case scenarios, how to efficiently and effectively search the literature for answers to their questions, and how to critically appraise articles of different designs.

Fourth Year

IDTH 268 Clerkship in Preventive Medicine and Public Health 15.120
In this clerkship, teams of senior medical students assess, critique and propose solutions to problems of public health or clinical significance. The students examine policy, organizational, social and individual challenges to these problems, addressing issues such as equity in health and setting public health programs, and identifying opportunities for change. Data collection and statistical analysis are secondary objectives.

IDTH 264 Capstone Course 10.70.
The two-week course aims to provide students with an opportunity to reflect on their undergraduate experience and the personal, social, emotional and practical issues of transition beyond medical school and graduate training or professional career. It deals with issues of ethics, law, insurance, social medicine, professionalism, life-long learning among many others.

Graduate Studies in Biomedical Sciences

The graduate program in Biomedical Sciences is designed to provide a multidisciplinary educational and training environment that will prepare students for independent research and teaching careers. It is centered in the Faculty of Medicine, where investigative collaborations among basic and clinical scientists are fostered. The program emphasizes concepts and state-of-the-art techniques of molecular and cellular medicine, and integrates students into the extensive and rapidly expanding translational research programs. Students may choose a discipline of study from the several research areas/programs offered by the Faculty of Medicine.

For general requirements about graduate study at AUB, refer to the Admissions section on page 29 of this catalogue.

MS Disciplines

Biochemistry	Refer to page 592
Human Morphology	Refer to page 586
Microbiology and Immunology	Refer to page 608
Pharmacology and Therapeutics	Refer to page 625
Physiology	Refer to page 588
Neurosciences (Interfaculty)	Refer to page 590
Biomedical Engineering (Interfaculty)	Refer to page 574
Scholar Health Research Program (SHARP) (Clinical)	Refer to page 635
Orthodontics (Clinical)	Refer to page 601

Admission to MS Programs

Admission as a regular student	Refer to page 40
Admission on probation	Refer to page 41

Course and Thesis Requirements

Students must complete a minimum of 21 credits of graduate course work with a minimum GPA of 3.3. Graduate students who intend to apply to the medical program should complete 21 credits of graduate courses, 10 credits of which are not integral to the structured medical curriculum. Medical students and medical graduates who wish to join the MD–MS program are required to complete a minimum of 10 credits of graduate courses not integral to the structured medical curriculum and earn a minimum GPA of 3.3. Those with a degree in dental or veterinary medicine are required to complete a minimum of 15 credits of graduate course work. In addition, all students must pass a comprehensive examination and complete a thesis project equivalent to 9 credits. The thesis must be presented and defended to the satisfaction of the examining committee.

Students following the non-thesis master's program are required to take a minimum of 30 graduate credit hours, 3 credits of which may be a project and should follow a course of study approved by the department/program and the concerned faculty Graduate Studies Committee.

PhD Program

Mission

The mission of the Doctoral Program in Biomedical Sciences (DBMS) is to provide excellent educational and research opportunities for students to develop into independent researchers and educators who will enrich the research and teaching output from Lebanon, the Middle East and beyond. The program will provide the students with the theoretical foundations and the special skills and attitudes that will allow them to develop their critical thinking and creative potential, conduct high caliber research in the biomedical sciences, contribute to the advancement of science, uphold the principles of intellectual honesty and become leaders in their chosen fields of study.

Program Objectives

Students are expected to:

- design and pursue pertinent research in biomedical science questions by devising and implementing a research plan to test a novel hypothesis,
- generate and analyze data critically, and utilize such analysis in devising, revising and/or refining a research plan,
- communicate findings, in both oral and written formats, through presentations at scientific meetings, publications in peer-reviewed journals and tutoring of junior students,
- demonstrate knowledge and integration of the fundamental principles of the various biomedical sciences,
- demonstrate theoretical and practical expertise in a specific field of research in the biomedical sciences,
- appreciate the complexity and volume of emerging new scientific information and its technical components, and be able to cope with it and manage one's learning efficiently and effectively,
- appreciate the importance of openness, teamwork and integrity in the advancement of knowledge through research.

PhD Disciplines

- Biochemistry and Molecular Genetics
- Biomedical Engineering
- Cell Biology of Cancer
- Microbiology and Immunology
- Neurosciences Program
- Nutrition (Interfaculty)
- Pharmacology and Toxicology
- Physiology

Academic Governance

Oversight of the DBMS Program occurs at three levels: at the PhD Program Committee level with faculty representation from the department and program of study and the coordinator of the PhD Program, at the Faculty of Medicine Dean's Office represented by the Faculty of Medicine Graduate Studies Committee and at the university level through the Board of Graduate Studies.

Admission Requirements

Admission to the program will be on a competitive basis. Students eligible for admission to the DBMS must have a sound academic record (GPA: 3.7 or its equivalent in the major field of study), a demonstrated, genuine interest in biomedical research and, preferably, research experience.

Minimum requirements for admission into the program are the following:

- Students with a BS degree or its equivalent in mathematics, biology, physics or chemistry in the Faculty of Arts and Sciences, as well as advanced courses in other medical science disciplines, and preferably with research experience, are eligible to apply (accelerated track PhD). Applicants with other degrees such as master's (MS), Medical Doctor (MD), Pharmacist (Pharm D or equivalent), Veterinarian Doctor (VMD), Dental Doctor (DMD, DDS), will also be considered for admission into the program (regular track PhD).
- Students should provide three letters of recommendation.
- General Graduate Record Examination (GRE), which is less than 5 years old, is required (applicant can use unofficial scores in the application and send the official copy after the application submission deadline). A total score of minimum 304 (equivalent to 1100 converted old GRE score) in the verbal and quantitative reasoning sections of the GRE test is required.
- Applicants to the graduate program, other than AUB graduates and graduates of colleges or universities recognized and located in North America, Great Britain, Australia and New Zealand, must meet the Readiness for University Studies in English (RUSE). Refer to catalogue section on Readiness for University Studies in English on page 38.
- Provide a personal statement (500 words maximum).

- Students should be interviewed by the PhD Committee members.
- Students should be recommended for admission by the PhD Committee.

FM accepts applications for the PhD program during fall.

Financial Support

The PhD program offers, on a competitive basis, substantial support which fully covers tuition and includes a monthly stipend and housing. In return, students are expected to help in teaching and in proctoring exams.

Program Requirements

50 credit hours of course work beyond the bachelor's program or 29 credit hours of course work beyond the master's program are required. To fulfill course requirements, 16 required core courses (34 credits), in addition to elective courses, are offered. A maximum of 21 credit hours may be transferred from the master's work if considered within the scope of the program. Students are expected to register for 24 credits of thesis.

Upon admission into the program, each student will be advised by the coordinator of the PhD program. After the first year, each student will have selected a thesis advisor who will design the set of elective courses to meet the student's research interests and career goals. Each student's course of study will be designed individually in light of the student's interests and career goals. All the duties of the coordinator of the PhD program will be transferred to the student's thesis advisor, who must be selected no later than the end of the first year for students entering into an MS program.

Core Courses

First Year		**Credits**	
BIOC 321	Nucleic Acids and Basic Genetics	1	Required
BIOC 322	Protein Biochemistry	1	Required
BIOC 323	Cellular Metabolism and Regulation	2	Required
PHYL 310	Cell Physiology and Biophysics	3	Required
BIOC 325	Receptor and Signal Transduction	2	Required
HUMR 305	Cell and Tissue Biology	3	Required
MBIM 320	Microbiology and Immunology	3	Required
BIOM 491	Laboratory Rotation	1	Required
HUMR 314	Seminar and Journal Club	1	Required
EDUC 401	Certificate in Teaching in Higher Education (C-THE)	0	Required
EDUC 402	Certificate in Teaching in Higher Education (C-THE) II	0	Required
HUMR 310A	Biomedical Research Techniques: Module A	1	Required
HUMR 310B	Biomedical Research Techniques: Module B	1	Required

HUMR 310C	Biomedical Research Techniques: Module C	1	Required
PHRM 315	Principles of Pharmacology	2	Required
BIOM 385	Research Ethics	1	Required

Second Year		**Credits**	
EPHD 310	Biostatistics	3	Required
IDTH 301	Introduction to Medical Science Literature Organ Physiology (Ph.D. candidates: can choose one of these as elective)	2	Required
PHYL 302	Cardiovascular Physiology	2	Required
IDTH 308A	Neuroanatomy	3	Elective
IDTH 308B	Neurophysiology	3	Elective
PHYL 300	Pulmonary – Renal	2	Elective
PHYL 304	GL – Endocrine – Reproductive	3	Elective

For other elective courses, refer to MS disciplines.

BIOC Courses	Refer to page 583
HUMR Courses	Refer to page 586
PHYL Courses	Refer to page 588
IDTH Courses	Refer to page 563
PHRM Courses	Refer to page 625
MBIM Courses	Refer to page 608

Course Descriptions

BIOM 375 Principles of Learning and Assessment 28.0; 2 cr.
This course provides students with the theoretical background and approaches to teaching science at the university level with emphasis on the nature of science and learner cognition. In addition, students are expected to apply principles and techniques of teaching and assessment of science in a teaching context. This is a core course for PhD students in Biomedical Sciences and is an elective for MS students. First term.

BIOM 385 Research Ethics 15.0; 1 cr.
This course introduces the fundamentals of responsible conduct of research, emphasizing the ethical practice of human research. The course recaps history of ethical principles and the development of research codes of conduct and ethical practices, familiarizes students with different kinds of ethical issues that they might come across throughout their careers and allows scholars to reflect critically about what it means to be an ethical and responsible researcher. Summer term.

BIOM 480 Qualifying Exam Part I: Comprehensive Exam 0 cr.
All students admitted to the PhD program must successfully complete a comprehensive

examination. The purpose of the comprehensive exam is to ascertain the student's knowledge in his/her field of specialization and related areas. The exam will cover major topics from within the concentration area and related fields.
Students who do not pass the comprehensive exam may, upon the recommendation of the thesis committee, take it for a second time in the following term. Failure on the second attempt will result in the student's discontinuation from the PhD program.

BIOM 481 Qualifying Exam Part II: Defense of Thesis Proposal 0 cr.
All students must successfully complete a qualifying examination, which is to be taken at least two terms prior to the final defense of the PhD thesis. The qualifying exam, administered by the thesis committee, is an oral exam in which the student presents his/her research proposal.
The objective of the oral exam is to determine whether the candidate's proposal and methodology are adequate for a PhD thesis. The candidate must show positive preliminary results and considerable promise of original research. It is the responsibility of the student to inform and update the thesis committee members about his/her research progress, especially during the period between the comprehensive and qualifying exams. Students who do not pass the qualifying exam are allowed to take it for a second time in the following term. Failure on the second attempt will result in the student's discontinuation from the graduate program.

BIOM 491 PhD Laboratory Rotations 0.30; 1 cr.
During the first year of study, PhD students in Biomedical Sciences must take a minimum of two laboratory rotations (1 credit each) in different faculty research laboratories within the Faculty of Medicine. Students may also enroll in the summer in a third elective laboratory rotation (1 credit). This course aims to familiarize students with potential thesis mentors and expose them to different research environments. Open to PhD students in Biomedical Sciences. First and second terms and summer.

BIOM 499 A/B/C/D/E PhD Thesis 24 cr.
In partial fulfillment of the requirements for the degree of Doctor of Philosophy, a student must submit a thesis (equivalent to 24 credit hours) that is expected to make a significant and original contribution to his/her field of research.

PhD Thesis Requirements

Thesis Committee

The PhD Thesis Committee should consist of at least five members. Two members should be from outside AUB, and the chair of the PhD Thesis Committee should be a faculty member holding the rank of a full professor and different from the thesis advisor. Refer to PhD Thesis Committee under General University Academic Information page 90.

Thesis Defense

After qualifying as a PhD candidate, the student will focus on the doctoral research with continued participation in seminars. The doctoral research, once completed, will be presented publicly and defended immediately after in front of the PhD Thesis Committee. Prior to the defense, all major revisions to the thesis must be completed. The decision of the committee will be by consensus. Refer to PhD Thesis Defense under General University Academic Information page 94.

Publication Requirements

PhD students should have published or have in press one journal publication and one abstract in an international conference related to their thesis topics.

Candidacy and Residency Requirements

All students admitted to the PhD program must successfully complete the qualifying exam part I (written) and qualifying exam part II (oral defense of thesis proposal).

To satisfy the minimum residency requirements for the PhD degree, all students must register and be in residence for at least three years beyond the completion of the master's degree. The requirements for the degree of Doctor of Philosophy must be completed within a period of 5 years after joining the PhD program. Extension beyond the 5-year period will require Graduate Council approval upon the recommendation of the faculty Graduate Studies Committee.

Graduation Requirements

To earn a PhD degree in Biomedical Sciences, a student must fulfill the following graduation requirements:

- attain a minimum cumulative GPA of 3.7 at the PhD level
- pass qualifying exams part I and II
- pass the PhD thesis defense
- satisfy the minimum residency requirements
- have a publication in a leading international journal, based on the PhD research
- have at least one accepted abstract in an international conference, based on the PhD research
- satisfy all pertinent AUB regulations

In addition to the AUB general requirements for graduate study, the Faculty of Medicine graduate study requirements and regulations are as follows:

- **Application and Notification of Acceptance**: For application submission deadlines and admissions decision notifications, refer to Application Procedures under Admissions section on page 38.
- **Acceptance**: Acceptance offers are issued in duplicates including category offered, registration period and date of start of classes. These dates are mentioned in the university calendar issued annually by the Office of the Registrar.
- Candidates must sign a copy of the above letter indicating acceptance and return it to the Office of Admissions on the due date. If acceptance letters are not signed and sent back by the set deadline, positions will be re-assigned to candidates on the waiting list.
- **Periods of Study**: The graduate program, once initiated, proceeds without interruption through the first term, the second term and the summer session.
- **Transfer Students**: See Transfer of Credits into a PhD Degree Program under General University Academic Information section on page 79.
- **Categories of Graduate Students**: The categories applicable at the university in

general are also applicable in the Faculty of Medicine with the following modifications: Students are given a regular graduate student status when they have a cumulative undergraduate GPA in the major field of study of at least 3.3 or its equivalent, and they are given a graduate on special status when they have a cumulative undergraduate GPA in the major field of study or an overall average of 3.0 or higher but lower than 3.3 or equivalent. Graduates on probation status are transferred to regular status upon achieving an overall GPA of at least 3.3 in 9 credits of graduate courses within two terms.

- **Visiting Graduate Students**: is a status applicable to students who pay a fee to attend a period of observer-ship in an ongoing research project.
- **Exchange students**: is a status applicable to students who participate in the graduate program in accordance with formal agreements between the Faculty of Medicine and other institutions.

In all instances, candidates must submit applications which are reviewed and acted upon by the Graduate Studies Committee.

Leave of Absence

See Leave of Absence under General University Academic Information section on page 74.

Interdepartmental Courses – Graduate Program

IDTH 301 Introduction to Medical Science Literature 16.32; 2 cr.
A multidisciplinary approach to the use of medical science publications. Open to beginning graduate students in the Faculty of Medicine.

IDTH 302 Methods 16.64; 3 cr.
Theory and practice of techniques used in various disciplines of medical sciences.

IDTH 303/304/305/306 Integrated Graduate Course I–IV 32.0; 2 cr. (each)
An integrated lecture seminar course introducing graduate students to the thinking in various medical science disciplines (required of all PhD students in the Faculty of Medicine). Four terms. One two–hour session a week each.

IDTH 307 Biomedical Electronics 32.16; 3 cr.
An introductory course in electricity and electronics as applied to biology and medicine. Alternate years.

IDTH 308A Neuroanatomy 31.27; 3 cr.
A course similar to the first part of 208, offered to graduate students, covering the normal structure of the human nervous system. See Department of Human Morphology. Three weeks.

IDTH 308B Neurophysiology 31.27; 3 cr.
A course similar to the second part of 208, offered to graduate students, covering the function of the human nervous system. See Department of Physiology. Three weeks.

IDTH 309 Biology of Nerve and Muscle 48.0; 3 cr.
A multi–disciplinary study of anatomy, physiology, biochemistry, pharmacology, and pathology of nerve and muscle. Alternate years.

IDTH 310 Basic Pathological Mechanisms 29.14; 2 cr.
The course covers the basic pathological mechanisms of disease at the cellular and molecular levels; their microscopic, gross and clinical manifestation; and some pharmacological interventions that apply to them.

IDTH 311 Foundations of Biomedical Science 90.40; 7 cr.
An interdisciplinary course that presents the cellular and molecular concepts and principles that underlie the normal structure and function of the human body. It covers cellular structure and function, including mechanisms and regulation of gene expression, protein synthesis, structure and function, signaling mechanisms, membrane transport, energy metabolism, contractility and excitability, and the basic principles of drug action.

IDTH 317 Perspectives in Medical Sciences 32.0; 2 cr.
A course of selected readings and seminars in the history, philosophy and methodology of medical and related sciences.

IDTH 319/320 Integrated Research Seminars 16.0; 1 cr. (each)
Participation of all PhD students and professors.

IDTH 330 Medical Pedagogy 3 cr.
A tutorial in teaching methods and practical experience under supervision. Open to PhD candidates only.

IDTH 333/334 Projects 2 cr. (each)
Two months half-time in a department other than the student's major occurring toward the end of the PhD candidate's residency.

Biomedical Engineering Graduate Program

Coordinator:	Dawy, Zaher (Electrical & Computer Engineering, MSFEA)
Co-coordinator:	Jaffa, Ayad (Biochemistry & Molecular Genetics, FM)
Coordinating Committee Members:	Amatoury, Jason (Biomedical Engineering, MSFEA) Daou, Arij (Biomedical Engineering, MSFEA) Darwiche, Nadine (Biochemistry & Molecular Genetics, FM) Khoueiry, Pierre (Biochemistry & Molecular Genetics, FM) Khraiche, Massoud (Biomedical Engineering, MSFEA) Kobeissy, Firas (Biochemistry & Molecular Genetics, FM) Mhanna, Rami (Biomedical Engineering, MSFEA) Oweis, Ghanem (Mechanical Engineering, MSFEA)

Background

The Biomedical Engineering Graduate Program (BMEP) is a joint MSFEA and FM interdisciplinary program that offers two degrees: Master of Science (MS) in Biomedical Engineering and Doctor of Philosophy (PhD) in Biomedical Engineering. The BMEP is housed in the MSFEA and administered by both MSFEA and FM via a Joint Program Coordinating Committee (JPCC).

The mission of the BMEP is to provide excellent education and promote innovative research enabling students to apply knowledge and approaches from the biomedical and clinical sciences in conjunction with design and quantitative principles, methods and tools from the engineering disciplines to address human health related challenges of high relevance to Lebanon, the Middle East and beyond. The program prepares its students to be leaders in their chosen areas of specialization committed to lifelong learning, critical thinking and intellectual integrity.

The curricula of the MS and PhD degrees are composed of core and elective courses balanced between biomedical sciences and engineering, and between fundamental and applied knowledge.

The curricula include the following three research focus areas:

- **Biomedical Systems**: This focus area includes research directions such as devices, instrumentation, biomechanics, biomaterials, drug delivery systems and tissue engineering.
- **Biomedical Cybernetics**: This focus area includes research directions such as biomedical and health informatics, computational biology, biomedical signal/image processing and biomedical systems engineering.
- **Cardiovascular and Pulmonary Engineering**: This focus area includes research directions such as fluid mechanics, modeling, simulation, imaging, devices, and implants related to both human cardiovascular and pulmonary systems.

A student may select his/her courses to satisfy the requirements of one of the three focus areas.

The MS and PhD degrees are open to students holding degrees from relevant fields of study including basic sciences, biomedical sciences, computer science, engineering, health sciences, and mathematics. Due to the interdisciplinary nature of the program, eight remedial undergraduate courses in sciences, math and engineering have been identified to cover the needed prerequisite knowledge; the remedial courses required by each admitted students are customized on a case-by-case basis depending on the student's undergraduate degree. Remedial undergraduate courses do not count as credit towards the MS or PhD degree completion. Grades on these remedial courses will appear on the transcript as Pass/Fail with a passing grade of (C+).

Required core courses (18 cr.)		**Credits**
BIOC 321	Nucleic Acids and Basic Genetics	1
BIOC 322	Protein Biochemistry	1
BMEN 600	Biomedical Engineering Applications	3
BMEN 601	Computational Modeling of Physiological Systems	3
BMEN 672	Hospital Lab Rotation	0
BMEN 673L	Biomedical Engineering Lab	1
EPHD 310	Basic Biostatistics	3
HUMR 310 (A, B, or C)	Biomedical Research Techniques	1
HUMR 314	Research Seminar	1
PHYL 346	Human Physiology	4

Restricted elective graduate courses: 6 credits restricted elective courses customized per focus area and required by both thesis and non-thesis options.

Restricted elective courses (6 cr.)		Credits	Systems	Cybernetics	Cardiovascular
BIOC 325	Receptors and Signal Transduction	2		X	
BIOC 326A	Bioinformatics Tools and Applications in Genomics	1		X	
BMEN 603	Tissue Engineering	3	X		X
BMEN 604	Engineering of Drug Delivery Systems	3	X		X
BMEN 605	Biomedical Imaging	3		X	X
BMEN 606	Nanobiosensors	3	X	X	
BMEN 607	Biomechanics	3	X		
BMEN 608	Biomaterials and Medical Devices	3	X		X
BMEN 609 or EECE 605	Computational Neuroscience or Neuromuscular Engineering	3	X	X	
BMEN 610	Micro and Nano Neural Interfaces	3	X		
BMEN 611	Computational Modeling in Biomechanics	3	X	X	X
EECE 601 or EECE 602	Biomedical Engineering I or Biomedical Engineering II	3	X	X	X
EECE 603	Biomedical Signal and Image Processing	3		X	X
EECE 633 or EECE 663 or EECE 667 or EECE 693	Data Mining or System Identification or Pattern Recognition or Neural Networks	3		X	
HUMR 305	Cell and Tissue Biology	3	X		
PHYL 302	Cardiovascular Physiology	2			R
PHYL 300A	Pulmonary Physiology	1			R

Free elective graduate courses for the non-thesis option: 6 credits additional elective courses. These courses should be taken from engineering and should be approved by the student's advisor and the coordinator of the joint program coordinating committee.

Master thesis for the thesis option: 6 credits master's thesis in biomedical engineering. The thesis requirements follow AUB's General University Academic Information as documented in the Graduate Catalogue.

PhD in Biomedical Engineering

Admission Requirements

The application procedures and admission requirements to the PhD program follow AUB's General University Academic Information as documented in the Graduate Catalogue. To be considered for admission, applicants must hold a bachelor's or master's degree in a relevant field of study from AUB or its equivalent, or from a recognized institution of higher learning.

Acceptance into the PhD program is determined by academic performance as well as an assessment of readiness, potential and ability to develop into independent researchers as judged by interviews by faculty members, a written statement, letters of recommendation, GRE scores, and other means of assessment such as publications and industrial experience.

Accepted students are eligible to receive scholarships that fully cover their tuition fees and provide a monthly stipend.

Degree Requirements

General requirements for master's degree holders: Based on AUB's guidelines, a minimum of 48 credit hours beyond those required for the master's degree, of which a minimum of 18 credit hours must be in graduate level course work and a minimum of 24 credit hours of thesis work, must be taken. Requirements also allow a maximum of 3 credit hours out of the 18 credits of coursework as tutorial course and include a 0-credit comprehensive examination preparation course and a 0-credit thesis proposal preparation course.

General requirements for bachelor's degree holders: Based on AUB's guidelines, a minimum of 78 credit hours beyond those required for the bachelor's degree, of which a minimum of 36 credit hours must be in graduate level coursework and a minimum of 30 credit hours of thesis work, must be taken. Requirements also allow a maximum of 6 credit hours out of the 36 credits of coursework as tutorial courses and include a 0-credit comprehensive examination preparation course and a 0-credit thesis proposal preparation course.

To earn a PhD degree in Biomedical Engineering, the student must complete the following requirements:

- Satisfy the course and research credit requirements
- Satisfy the residence requirement and all other pertinent AUB regulations
- Have at least one international refereed journal article based on the PhD thesis
- Have at least one refereed conference paper based on the PhD thesis
- Have a cumulative GPA of (3.7) or above
- Pass the comprehensive and oral qualifying examinations

- Successfully defend the PhD thesis

The following are the graduate level course requirements for students admitted with a bachelor's degree. The total number of credits is at least 36 credits divided among core, restricted elective and free elective courses. Students admitted with a master's degree can waive as many courses as possible without going below the minimum required 18 credits of coursework.

Core graduate courses: 21 credits of core courses from biomedical sciences and engineering.

Required core courses (21 cr.)		**Credits**
BIOC 321	Nucleic Acids and Basic Genetics	1
BIOC 322	Protein Biochemistry	1
BIOM 385	Research Ethics	1
BMEN 600	Biomedical Engineering Applications	3
BMEN 601	Computational Modeling of Physiological Systems	3
BMEN 671	PhD Lab Rotation	1 + 1
BMEN 672	Hospital Lab Rotation	0
BMEN 673L	Biomedical Engineering Lab	1
BMEN 675	Approved Experience	0
EPHD 310	Basic Biostatistics	3
HUMR 310 (A, B, or C)	Biomedical Research Techniques	1
HUMR 314	Research Seminar	1
PHYL 346	Human Physiology	4

Restricted elective graduate courses: 9 credits restricted elective courses customized per focus area.

Restricted elective courses (6 cr.)		**Credits**	**Systems**	**Cybernetics**	**Cardiovascular**
BIOC 325	Receptors and Signal Transduction	2		R	
BIOC 326A	Bioinformatics Tools and Applications in Genomics	1		R	
BMEN 603	Tissue Engineering	3	X		X
BMEN 604	Engineering of Drug Delivery Systems	3	X		X
BMEN 605	Biomedical Imaging	3		X	X
BMEN 606	Nanobiosensors	3	X	X	
BMEN 607	Biomechanics	3	X		

BMEN 608	Biomaterials and Medical Devices	3	X		X
BMEN 609 or EECE 605	Computational Neuroscience or Neuromuscular Engineering	3	X	X	
BMEN 610	Micro and Nano Neural Interfaces	3	X		
BMEN 611	Computational Modeling in Biomechanics	3	X	X	X
EECE 601 or EECE 602	Biomedical Engineering I or Biomedical Engineering II	3	X	X	X
EECE 603	Biomedical Signal and Image Processing	3		X	X
EECE 633 or EECE 663 or EECE 667 or EECE 693	Data Mining or System Identification or Pattern Recognition or Neural Networks	3		X	
HUMR 305	Cell and Tissue Biology	3	R		
PHYL 300A	Pulmonary Physiology	1			R
PHYL 302	Cardiovascular Physiology	2			R

Free elective graduate courses: 6 credits additional elective courses. These courses should be taken based on the student's specific area of research as approved by the student's advisor.

Course Descriptions

BMEN 600 Biomedical Engineering Applications 3 cr.

Biomedical engineering is an interdisciplinary domain which applies principles of engineering to find solutions for biological and health problems. Biomedical engineering aims to improve our fundamental understanding of biological processes and develop approaches for optimized therapeutic/diagnostic healthcare procedures. The field of biomedical engineering involves the development of materials to replace or enhance the operation of damaged or malfunctioning biological entities, development of diagnostic and therapeutic tools, modeling of biological systems, signal processing and bioinformatics. This course will introduce students to biomedical engineering and provide insight into the various applications in the biomedical engineering field. The course will be divided into modules, and each will be given by a specialist in a certain biomedical engineering area.

BMEN 601/MECH 635 Computational Modeling of Physiological Systems 3 cr.
This course focuses on the quantitative modeling of different physiological systems. It provides students with current concepts of the mathematical modeling, and different quantitative descriptions of cellular and organ physiology. At the subcellular/cellular level, we will examine mechanisms of regulation and homeostasis. At the system level, the course will cover basic aspects of anatomical and pathophysiological features of the nervous, neural, cardiovascular and respiratory systems. Several physiological processes are treated as case studies for increasing complexity in modeling dynamic systems. Prerequisite: MATH 202 and PHYL 346, or consent of instructor.

BMEN 602 Computational Modeling of Cardiovascular and Pulmonary Systems 3 cr.
The need for better understanding the mechanics and tools for computational modeling of cardiovascular and respiratory systems in healthy and diseased conditions is constantly increasing. This is a result of the enormous advances made in the science and engineering of both surgical and therapeutic medicine. This course covers the modeling and simulation of cardiovascular and respiratory systems. It will provide the students with a thorough understanding of the anatomy, physiology and mechanics of cardiovascular and respiratory systems as well as the computational tools for modeling and simulation of cardiac, circulatory and respiratory systems in healthy and diseased conditions.

BMEN 603/CHEN 675 Tissue Engineering 3 cr.
In a world of aging population, an ever-increasing demand for improvement of healthcare services and need for replacement organs and tissues are arising. The limited pool of donors together with the problem of donor organ rejection is a strong driver for engineering tissues and other body parts. Tissue engineering is an interdisciplinary field that uses cells, biomaterials, biochemical (e.g. growth factors) and physical (e.g. mechanical stimulation) signals, as well as their combination to generate tissue-like structures. The goal of tissue engineering is to provide biological substitutes that can maintain, restore or improve the function of damaged organs in the body. This course will introduce interested students to the new field of tissue engineering and provide insight into cutting edge applications in this area.

BMEN 604/CHEN 673 Engineering of Drug Delivery Systems 3 cr.
This course focuses on recent advances in the development of novel drug delivery systems. The fundamentals of drug delivery are discussed. Various strategies to tune and control the release of active agents for optimized therapeutic outcomes are explored. The course covers polymers and techniques used to produce drug nanoparticles, with specific examples of nanoparticle-based drug delivery systems. Prerequisites: CHEN 314 and CHEN 411, or consent of instructor.

BMEN 605 Biomedical Imaging 3 cr.
Biomedical imaging offers an unprecedented view into the structure and function of a living body, and as such plays an essential role in medical practice and research. This course will provide students with an overview of the key concepts underlying the primary diagnostic biomedical imaging modalities, including: ultrasound, x-ray, computed tomography, magnetic resonance and nuclear imaging. In particular, students will gain an understanding of the physical principles and theoretical bases governing the operation of each imaging modality, the technology that translates theory into practice, and the basic methods involved in image formation. Students will also learn the limitations of each imaging procedure, while being exposed to their vast applications in the clinic and research.

BMEN 606 Nanobiosensors 3 cr.
This course will provide a comprehensive analysis of the field of nanoengineering with a focus on biosensors including common modalities, basic theoretical considerations for sensor operation, physics of detection and applications in research and medical diagnostics. The course will cover the major types of electronic nanobiosensors for biological signal detection (potentiometric, amperometric, and mass based sensors) and their applications in the fields of neural engineering, DNA sequencing and cardiovascular early disease detection. The course will enable students to have a strong grasp of fundamentals of biosensor design, select sensors for various applications and evaluate new and emerging technologies. Prerequisites: EECE 210 (or equivalent) and BIOL 210 (or equivalent); or consent of instructor.

BMEN 607/MECH 633 Biomechanics 3 cr.
A course on the study of the biomechanical principles underlying the kinetics and kinematics of normal and abnormal human motion. Emphasis is placed on the interaction between biomechanical and physiologic factors (bone, joint, connective tissue, and muscle physiology and structure) in skeleto-motor function and the application of such in testing and practice in rehabilitation. The course is designed for engineering students with no previous anatomy/physiology. Prerequisites: CIVE 210, MECH 320 or CIVE 310; or consent of instructor.

BMEN 608/MECH 634 Biomaterial and Medical Devices 3 cr.
A course that examines the structure-property relationships for biomaterials and the medical applications of biomaterials and devices. The first part of the course focuses on the main classes of biomaterials, metal, ceramic, polymeric and composite implant materials, as well as on their interactions with the human body (biocompatibility). The second part of the course examines the various applications of biomaterials and devices in different tissue and organ systems such as orthopedic, cardiovascular, dermatologic and dental applications. Experts from the medical community will be invited to discuss the various applications. Prerequisite: MECH 340 or consent of instructor.

BMEN 609 Computational Neuroscience 3 cr.
The human brain, perhaps the most complex, sophisticated, and complicated learning system, controls virtually every aspect of our behavior. The central assumption of computational neuroscience is that the brain computes. What does that mean? Generally speaking, a computer is a dynamical system whose state variables encode information about the external world. In short, computation equals coding plus dynamics. Some neuroscientists study the way that information is encoded in neural activity and other dynamical variables of the brain. Others try to characterize how these dynamical variables evolve with time. The study of neural dynamics can be subdivided into two separate strands. One tradition, exemplified by the work of Hodgkin and Huxley, focuses on the biophysics of single neurons. The other focuses on the dynamics of networks, concerning itself with phenomena that emerge from the interactions between neurons. Therefore, computational neuroscience can be divided into three sub- specialties: neural coding, biophysics of neurons, and neural networks. This course will introduce engineers, physicists, computational scientists, mathematicians and other audiences to the neurosciences from the cellular level and the network level as seen from computational lenses. Prerequisite: BIOL 201 (or equivalent) and Math 202, or consent of instructor.

BMEN 610 Micro and Nano Neural Interfaces 3 cr.
Neural interfaces are micro and nano devices that form the connection between the biological neural tissue and the external electronic devices. These devices are designed for mapping, assisting, augmenting, or repairing neural pathways. The course will focus

on physical, chemical and neurophysiological principles of neural interfaces, theoretical and functional basis for their design, micro and nano fabrication techniques and applications in neural prosthesis for Brain Machine Interface. Topics covered in class will include: Neural Engineering, Brain Machine Interface, Microfabrication, Nanofabrication, Soft-lithography, Electrokinetics, Electrochemistry, Neural probes, Biocompatibility, Microelectrodes, NeuroMEMS (neuro microelectromechanical systems, BioMEMS (biomedical microelectromechanical systems).

BMEN 611 Computational Modeling in Biomechanics 3 cr.
This course provides students with a glimpse into the world of computational finite element modeling and simulation in biomechanics to investigate and solve biomedical problems. Students will take a journey through the processes involved in producing a computational finite element model in the biomedical field; starting at construction of model geometry, particularly from medical imaging data (CT/MRI), through to model creation, simulation and visualization using finite element analysis software (ANSYS Workbench). Students will also be exposed to a selection of experimental lab techniques in biomechanics and physiology to acquire data required for model development and validation. In pursuit of developing an appreciation for the areas covered, the course will incorporate a mix of theory, demonstrations, practice, real-world modeling applications and research seminars. In addition to skills gained in modeling and basic experimentation, the course will provide students with an opportunity to enhance vital skills in scientific writing and oral communication.

BMEN 671 PhD Lab Rotation 1 cr.
PhD students in Biomedical Engineering are required to take two laboratory rotations (1 credit each) in different faculty research laboratories within the MSFEA and/or FM. Students may also enroll in a third elective laboratory rotation. This aims to familiarize students with potential thesis mentors and expose them to different research environments.

BMEN 672 Hospital Lab Rotation 0 cr.
MS and PhD students in Biomedical Engineering are required to do a lab rotation in the Medical Engineering Department at AUB Medical Center (AUBMC). This aims to familiarize students with the typical activities and responsibilities of a biomedical engineer in a working environment and expose them to different equipment and tools.

BMEN 673L Biomedical Engineering Lab 1 cr.
This laboratory course aims to introduce students to the practical issues in the areas of biomedical instrumentation design and biological signal processing. A particular emphasis will be placed on signal transduction, electronic circuit design for recording and conditioning physiological signals. The lab will introduce hand-on laboratory experiments on biomedical sensors, analog signal amplifiers and filters, digital acquisition and transmission, and basic digital filtering. In addition, some experiments cover topics that demonstrate the various levels of complexity that characterize biological signals. Signal processing tools include spectral and cepstral analysis, de-noising and artifact removal, filter banks and wavelet decompositions, Hilbert transforms, and information-theoretic measures.

BMEN 675 Approved Experience 0 cr.
Approved Experience.

BMEN 796 Special Project in Biomedical Engineering 3 cr.
Special Project in Biomedical Engineering.

BMEN 797 Special Topics in Biomedical Engineering 1 cr.
Special Topics in Biomedical Engineering.

BMEN 798 Special Topics in Biomedical Engineering 3 cr.
Special Topics in Biomedical Engineering.

BMEN 799T MS Comprehensive Exam 0 cr.
Every term.

BMEN 799 MS Thesis 6 cr.
Every term. Prerequisite: BMEN 799T.

BMEN 980 Qualifying Exam Part I: Comprehensive Exam 0 cr.
Every term.

BMEN 981 Qualifying Exam Part II: Defense of Thesis Proposal 0 cr.
Every term. Prerequisite: BMEN 980.

BMEN 982 PhD Thesis 3 cr.

Every term. Taken while total required credit hours have been completed.

BMEN 983 PhD Thesis 6 cr.
Every term. Taken while total required credit hours have not been completed.

BMEN 984 PhD Thesis 9 cr.
Every term. Taken while total required credit hours have not been completed.

BMEN 985 PhD Thesis 12 cr.
Every term. Taken while total required credit hours have not been completed.

BMEN 986 PhD Thesis 0 cr.
Every term. Taken while total required credit hours have not been completed.

BMEN 987 PhD Thesis Defense 0 cr.
Every term. Prerequisite: BMEN 981.

BIOC 321 Nucleic Acids and Basic Genetics 15.0; 1 cr.
This course discusses the principles of nucleic acid structure and function in eukaryotes. It includes the information for basic genetics in terms of genome structure as well as the diversity of gene regulation. Required from MS and PhD students in biomedical Sciences. Requires consent of coordinator for other graduate disciplines. First term.

BIOC 322 Protein Biochemistry 10.10; 1 cr.
This course deals with the biochemistry of proteins including their basic units, different structures, folding process and protein-protein interactions. It focuses on how changes at the structural level modify function. The course also covers the principles of protein purification and sequencing, and introduces students to protein database, molecular modeling and systems biology. Required from MS and PhD students in biomedical sciences. Requires coordinator approval for other graduate disciplines. First term.

BIOC 325 Receptors and Signal Transduction 25.10; 2 cr.
This course covers classical pathways involved in receptor signaling and activation of downstream targets and the molecular mechanisms involved. It deals with the inter and intracellular communication, from the generation of signaling molecules through the cellular responses. Required from MS and PhD students in biomedical sciences. Requires consent of coordinator for other graduate disciplines. First term.

BIOC 326A Bioinformatics Tools and Applications in Genomics 1 cr.
This course will discuss the relationships among sequence, structure and function in biological networks, as well as advances in modeling of quantitative, functional and comprehensive genomics analyses. It will assess computational issues arising from high-throughput techniques recently introduced in biomedical sciences, and cover very recent developments in computational genomics, including genome structural variant discovery, epigenome analysis, cancer genomics and transcriptome analysis.

BIOM 385 Research Ethics 15.0; 1 cr.
This course introduces the fundamentals of responsible conduct of research, emphasizing the ethical practice of human research. The course recaps history of ethical principles, the development of research codes of conduct and ethical practices, familiarizes students with the different kinds of ethical issues that they might come across throughout their careers and allows scholars to reflect critically on what it means to be an ethical and responsible researcher. Summer term.

EECE 601 Biomedical Engineering I 3 cr.
This course includes an introduction to general instrumentation configuration and performance of instrumentation systems; types and characteristics of transducers; sources and characteristics of bioelectric signals; types and characteristics of electrodes; temperature regulation and measurement; cardiovascular system measurements and diagnostic equipment; blood instruments; patient care and monitoring; and electrical safety of medical equipment. Prerequisites: BIOL 210 or BIOL 202 or PHYL 246, and EECE 210; or PHYS 228 and PHYS 228L; or consent of instructor.

EECE 603 Biomedical Signal and Image Processing 3 cr.
Fundamentals of digital signal processing as implemented in biomedical applications. It provides a concise treatment of the tools utilized to describe deterministic and random signals as the basis of analyzing biological signals: data acquisition; imaging; denoising and filtering; feature extraction; modeling. The course is tightly coupled with a practical component through laboratory projects. Examples include the auditory system, speech generation, electrocardiogram, neuronal circuits and medical imaging. Students should have reasonable software skills in Matlab. Prerequisites: STAT 230 and EECE 340, or equivalent; or consent of instructor.

EECE 633 Data Mining 3 cr.
This course is an introduction to data mining. Data mining refers to knowledge discovery from huge amounts of data to find non-trivial conclusions. Topics will range from statistics to machine learning to database, with a focus on analysis of large data sets. The course will target at least one new data mining problem involving real data for which the students will have to find a solution. Prerequisite: EECE 330 or consent of instructor.

EECE 663 System Identification 3 cr.
This course introduces the basic mathematical tools to fit models into empirical input-output data. General time-series modeling and forecasting, such as stock prices, biological data and others. Topics include nonparametric identification methods: time and frequency response analysis; parametric identification: prediction error, least squares, linear unbiased estimation and maximum likelihood; convergence, consistency and asymptotic distribution of estimates; properties and practical modeling issues: bias distribution, experiment design and model validation.

EECE 667 Pattern Recognition 3 cr.
The course provides an overview of the algorithms used in machine learning. The course discusses modern concepts for model selection and parameter estimation, decision-making

and statistical learning. Special emphasis will be given to regression and classification for a supervised mode of learning. Students will be assigned typical machine learning problems to investigate as projects.

EECE 693 Neural Networks 3 cr.
The course provides a comprehensive foundation to artificial neural networks and machine leaning with applications to pattern recognition and data mining; learning processes: supervised and unsupervised, deterministic and statistical; clustering; single layer and multilayer perceptrons; least-mean-square, back propagation and Al-Alaoui algorithms; radial-basis function networks; committee machines; principal component analysis; self-organizing maps; and current topics of interest.

EPHD 310 Basic Biostatistics 2.2; 3 cr.
An introductory biostatistics course that covers basic concepts in statistical methods. The course demonstrates methods of exploring, organizing and presenting data. The course presents the foundation of statistical inference from estimation to confidence interval and testing of hypothesis. Applications include comparing population means or proportions via data obtained from paired or independent samples, one-way ANOVA. Also, it introduces simple linear regression, correlations, logistic regression and nonparametric methods for data analysis.

HUMR 305 Cell and Tissue Biology 30.33; 3 cr.
Consists of the first half of Basic Histology, HUMR 209, covering cells and tissues. Open to graduate students outside the department.
HUMR 310 (A, B, or C) Biomedical Research Techniques 1 cr.
A guided laboratory course in research methods used in cell biology and physiology. HUMR 310A covers Cell Biology Techniques; HUMR 310B covers Genomics and Proteomics; HUMR 310C covers Mouse Models and In Vivo Studies. Used in cell biology and physiology.

HUMR 314 Research Seminar 0.32; 1 cr.
Presentation and discussion of timely research topics designated by members of the department.

PHYL 302 Cardiovascular Physiology 31.6; 2 cr.
Presents the cardiovascular system with clear reference to pathophysiological and clinical events. Didactic lectures and seminar sessions define physiological concepts and emphasize structure-function relationships. Laboratory sessions familiarize the student with instrumentation and techniques in the cardiovascular field. Open to all graduate students in the department.

PHYL 346 Human Physiology for Paramedical and Undergraduate Students 48; 4 cr.
Outlines fundamental principles of human physiology and the mechanisms governing the function of different body organs. Prerequisites: BIOC 246 and BIOL 201 (or BIOL 210).

Department of Anatomy, Cell Biology and Physiological Sciences

Chairperson:	Eid, Assaad, A.
Emeritus Professor:	Bikhazi, Anwar
Professors:	Barada, Kassem; Bazarbachi, Ali; Eid, Assad, A.; El-Sabban, Marwan; Jurjus, Abdo; Mourad, Fadi; Nasr, Rihab; Saade, Nayef
Associate Professors:	Abou-Kheir, Wassim; Daoud, Georges;
Assistant Professors:	Eid, Stephanie; Hawi, Jihad; Obeid, Makram
Associates:	Husari, Ahmad; Kahhale, Joseph; Kfoury Kassouf, Hala; Oueidat, Doureid; Saad, William
Adjunct Professors	El Osta, Assam

The department offers three disciplines of study: Human Morphology, Physiology, and Neuroscience. Each discipline provides courses for medical, graduate, nursing, nutrition, paramedical, and undergraduate students.

The graduate program is comprehensive, leading to a master's degree (MS) or doctoral degree (PhD) in Biomedical Sciences with a focus on the aforementioned disciplines. Students with a BS degree or its equivalent in mathematics, biology, physics, or chemistry, along with advanced courses in physiology and other medical science disciplines, are eligible to apply. The department may require specific prerequisites in certain disciplines, such as biology and chemistry, as deemed necessary.

Anatomy and Cell Biology

Required courses for the discipline of Human Morphology include: PHYL 310 (3 cr.), HUMR 305 (3 cr.), HUMR 306 (3 cr.), HUMR 308 (3 cr.), HUMR 314 (1 cr.) and HUMR 310 (A&C, 2 cr.).

HUMR 244 Introduction to Human Biology 32.0; 2 cr.
An introductory course that meets the needs of a diverse group of students who are preparing for careers in allied health sciences, medical technologies, or other nonmedical careers like psychology or biomedical sciences. It introduces students to the very basic terms and concepts in anatomy, histology, and physiology. The course covers the basic biology of the cells, tissues, and organs of the human body.

HUMR 246 Human Morphology for Paramedical and Undergraduate Students 32.32; 3 cr.
An introduction to basic gross anatomy and histology. Offered to Nurses and other undergraduate students.

HUMR 248 Human Anatomy and Physiology 60.30; 5 cr.
A course that aims to provide a strong foundation for understanding the structural complexities of the human organism and the related physiological functions. The course, as conceived, will integrate structure and function and offer practical advantages in fine-tuning the balance between anatomy, histology, and physiology. Also, clinical correlations will be included for a vertical integration in addition to horizontal integration. Prerequisite: HUMR 244.

HUMR 305 Cell and Tissue Biology 30.33; 3 cr.
Consists of the first half of Basic Histology, HUMR 209, covering cells and tissues. Open to all graduate students.

HUMR 306 Organ Histology 28.36; 3 cr.
Consists of the second half of Basic Histology, HUMR 209, covering organs and systems. Open to graduate students. Prerequisite: HUMR 305 or equivalent.

HUMR 307 Gross Anatomy 24.198; 7 cr.
A regional dissection of the entire human body supplemented by embryology, clinical lectures and discussions. The student is also introduced to radiographic anatomy based on various imaging modalities, in addition to computer-assisted instruction. Open to all graduate students.

HUMR 308 Neuroanatomy 28.39; 3 cr.
The neuroanatomy component of Neuroscience, IDTH 208A. Open to all graduate students.

HUMR 309 Basic Histology 58.69; 6 cr.
A study of the cells, tissues and organs of the human body at the level of light and electron microscopes, utilizing traditional and advanced methodologies. Structure is related to function with some clinical application. Required of all medical students. Open to all graduate students in the department.

HUMR 310 Biomedical Research Techniques 28.46; 3 cr.
A guided laboratory course in research methods used in cell biology and physiology. Open to graduate students. The course is made of three modules that can all be selected or can be selected as one module per specialty as follows:

HUMR 310A Cell Biology Techniques 10.15; 1 cr.
Cell Biology Techniques.

HUMR 310B Genomics and Proteomics 10.15; 1 cr.
Genomics and Proteomics.

HUMR 310C Mouse Models and In Vivo Studies 8.16; 1 cr.
Mouse Models and In Vivo Studies.

HUMR 312 Anatomy Tutorial 0.64; 2 cr.
A guided literature review of special research topics.

HUMR 313 Directed Reading and Research 0.32-66; 2 cr.
Specific reading and research assignments under supervision of an advisor. At the discretion of the thesis supervisor.

HUMR 314/315 Research Seminar 0.32; 1 cr.; 3 cr.
Presentation and discussion of timely research topics designated by members of the department.

HUMR 346 Human Morphology for Graduate Students 48.32; 4 cr.
A course that includes the embryology component of HUMR 307, HUMR 246 and an experimental anatomy part.

HUMR 395A/B Comprehensive Exam 0 cr.
Prerequisite: Consent of advisor.

HUMR 399 A/B/C/D/E MS Thesis 9 cr.
Original research under faculty supervision leading to the MS degree.

HUMR 260 Elective in Human Morphology 0.180-360 cr.
An elective for Medicine III and IV in which the student can select one or more disciplines within the department including applied immunology, general surgical anatomy, radiographic anatomy, experimental neuroanatomy, neuromuscular disorders, techniques for study of cells and tissues and experimental neuropathology. One to two months.

Physiology

Required courses for the discipline in Physiology include PHYL 300 (2 cr.), PHYL 302 (2 cr.), PHYL 304 (3 cr.), PHYL 308 (3 cr.), PHYL 310 (3 cr.), HUMR 305 (3 cr.), HUMR 314 (1 cr.) and HUMR 310 (A&C, 2 cr.).

PHYL 246 Human Physiology for Paramedical and Undergraduate Students 48; 4 cr.
The course outlines fundamental principles of human physiology and the mechanisms governing the function of different body organs. Prerequisite: BIOL 201 or BIOL 210 or HUMR244 or HUMR 246.

PHYL 346 Human Physiology 48; 4 cr.
The course outlines fundamental principles of human physiology and the mechanisms governing the function of different body organs in the setting of a series of lectures and discussions. Prerequisite: BIOL 201 or BIOL 210.

PHYL 260 Elective in Physiology 0.180-360 cr.
The course covers one or more areas of physiology such as special physiologic techniques, general physiology, experimental gastroenterology, experimental neuroscience, and the physiology of cardiac and vascular smooth muscles. One to two months.

PHYL 300 Homeostasis 32.6; 2 cr.
The course studies the internal environment and its physiological regulation by two homeostatic organs: the lungs and the kidneys. Didactic lectures cover the physiology of the topic, treating internal environment, homeostasis and feedback mechanisms, the lung, the kidney and electrolytes. Open to all graduate students. The course consists of two modules:

PHYL 300A Pulmonary Physiology 10.15; 1 cr.
Pulmonary Physiology

PHYL 300B Renal Physiology 10.15; 1 cr.
Renal Physiology

PHYL 302 Cardiovascular Physiology 31.6; 2 cr.
The course presents the cardiovascular system with clear reference to pathophysiological and clinical events. Didactic lectures and seminar sessions define physiological concepts

and emphasize structure-function relationships. Laboratory sessions familiarize the student with instrumentation and techniques in the cardiovascular field. Open to all graduate students.

PHYL 304 Metabolism 32.12; 3 cr.
The course covers the physiology of the gastrointestinal tract, metabolism and its regulation by the endocrine system, and reproduction. This course consists of lectures, conferences and discussion sessions. Open to all graduate students.

PHYL 308 Neurophysiology 31.27; 3 cr.
The course reviews the physiology and various functions of the human nervous system. Open to all graduate students.

PHYL 310 General Physiology: Cellular Mechanisms 32.16; 3 cr.
A course on aspects of membrane transport processes across symmetrical and asymmetrical cell membranes, electrophysiology, membrane potentials, action potentials in excitable cells, synaptic transmissions and excitation-contraction coupling in muscles. Open to all graduate students.

PHYL 311-312 Advanced Physiology 0.48; 2 cr.
A guided study (experimental and theoretical) of the literature of major topics in physiology, alongside the different research topics being conducted in the department. This course is conducted as a seminar, and it acts as a Virtual Laboratory Rotation. Open to all graduate students.

PHYL 313-314 Physical Methods in Physiological Research 0.64; 2 cr.
A guided laboratory course of the physical methods used in the major branches of physiology.

PHYL 390 Directed Reading and Research 0.32-66; 2 cr.
Assignments based on the research interests of the graduate student and the advisor, aimed at formulating an original research project.

PHYL 391-392 Projects in Physiology 0.64; 2 cr.
A guided study (theoretical and experimental) of different research topics performed at AUB-FM. This course will introduce you to diverse fields of study and it will cover research topics on cancer, stem cells, pain, cardiovascular diseases, diabetes, neuroscience, development and others. In addition, you will learn about the tools and methods that are employed in each specific field and topic. This course is primarily intended for Master and PhD candidates in the Faculty of Medicine but may also be applicable to candidates within the biomedical (basic and clinical) research field in other faculties. This course is designed to offer students, through various components of lectures, presentations, discussions, assignments and literature analysis, a broad overview of the latest research discoveries, their potential applications and results interpretation. This course will act as a virtual rotation for Master and PhD candidates. Open to all graduate students.

PHYL 395A/B Comprehensive Exam 0 cr.
Prerequisite: Consent of advisor.

PHYL 399 A/B/C/D/E MS Thesis 9 cr.
Original research under staff supervision, leading to the MS degree.

Neuroscience

Required courses for the discipline in Neuroscience include PHYL 310 (3 cr.), PHYL 308 (3 cr.), HUMR 305 (3 cr.), HUMR 308 (3 cr.), HUMR 310 (A&C, 2 cr.) and HUMR 314 (1 cr.).

IDTH 208 Basic Neuroscience 6 cr.
See Interdepartmental Teaching.

HUMR 308 Neuroanatomy 28.39; 3 cr.
The neuroanatomy component of Neuroscience, IDTH 208. Open to all graduate students.

PHYL 308 Neurophysiology 31.27; 3 cr.
Similar to PHYL 208 and IDTH 308B. Open to all graduate students.

HUMR 261/PHYL 261 Elective in Basic Neuroscience 0.180-360 cr.
The objective of this elective is to involve students in a basic research project as part of the on-going studies in the neuroscience research laboratories of the department. Open to Medicine III and IV students, graduate students in the combined MS-MD program and visiting medical students.

IDTH 395A/B Comprehensive Exam 0 cr.
Prerequisite: Consent of advisor.

Department of Anesthesiology

Chairperson:	Aouad-Maroun, Marie
Professor Emeritus:	Muallem, Musa
Professors:	Aouad-Maroun, Marie; Jabbour-Khoury, Samar; Khatib, Mohammad; Siddik-Sayyid, Sahar
Associate Professors:	Kaddoum, Roland; Taha, Samar; Zeeni, Carine
Assistant Professors:	Dabbous, Aliya; Karam, Cynthia; Nauphal, Maud; Rizk, Marwan;
Instructors:	Abou Nafeh, Nancy; Khalili, Amro; Rouphael; Christian; Msheik, Fatima
Clinical Associates:	Louis, Faek; Sarkis, Sarine

The Department of Anesthesiology offers a clinical clerkship to third-year medical students. At the graduate level, it offers a four-year residency program and a one-year clinical fellowship in cardiovascular anesthesia.

ANES 247 Clinical Clerkship

A clinical clerkship offered to third year medical students, consisting of instructive lectures given by attending on practical aspects of anesthesiology and pain, as well as cardiopulmonary resuscitation training. Also, the clerkship includes simulation sessions on airway control, intravenous line insertion, as well as general anesthetic management of different diseases. In addition, it offers training opportunities on preoperative assessment in the PAU, different types of anesthesia in the operating room, and pain management in the acute postoperative period.

ANES 268 Elective in the Subspecialties of Anesthesia

Residents focus on all aspects of anesthesiology, such as general anesthesia, regional anesthesia, ICU rotations and pain management. They are exposed to difficult airway management, vascular access, as well as invasive monitoring. They learn the different subspecialties of Anesthesia including Cardiac, Pediatric, Neuro, Obstetric, Regional Anesthesia, Pain Management, Non-Operating Room Anesthesia and Perioperative Medicine. Residents also attend the didactic lectures of the department.

Department of Biochemistry and Molecular Genetics

Chairperson (Interim):	Usta, Julnar
Professors:	Darwiche, Nadine; Jaffa, Ayad; Usta, Julnar
Professors Joint appointee:	Boustany, Rose-Mary; Dbaibo, Ghassan; Kurban Mazen; Refaat, Marwan; Ziyadeh, Fuad
Associate Professors:	Yazbek, Souha
Associates:	Karam, Pascale, El- Khoury Riyad
Adjunct Professors:	Echtay, Karim; Kobeissy, Firas; Nemer, Georges; Slim, Rima

The Department of Biochemistry and Molecular Genetics offers undergraduate courses to students in Allied Health Science Programs enrolled in the: Medical Laboratory Sciences Degree at the Faculty of Public Health and Nursing students at the Hariri School of Nursing.

It also offers courses to medical students and to graduate students in the graduate program leading to a master's degree (MSc) in Biomedical Sciences, MSc Biochemistry and a doctoral degree (PhD) in Biomedical Sciences or Biomedical Engineering.

The requirements for admission to the graduate program are a BS with prerequisites in chemistry and biology courses or a BS degree from a university and an academic record with a cumulative GPA of 3.3 and above. Students should have a background in chemistry, biology, or a related medical science degree. Students will spend a minimum of two years in the graduate program during which they must complete 21 credits of graduate courses, pass a comprehensive exam (BIOC 395 A/B), and submit a thesis (9 credits, BIOC 399 A/B/C/D/E) based on independent research. The 21 credits of graduate courses include a total of 14 credits of required core courses and 7 credits of elective courses.

Required MS courses in Biomedical Sciences track Biochemistry include: BIOC 302 (1 cr.); BIOC 305 (1cr.); BIOC 321 (1 cr.); BIOC 322 (1 cr.), BIOC 323 (2 cr.), BIOC 325 (2 cr.); BIOC 326-A/B (2 cr.); BIOC 330 (2 cr.) and IDTH 301 (2cr.).

Required PhD courses in Biomedical Sciences are listed on page 566 of the Graduate Catalogue.

Undergraduate Courses

The Department of Biochemistry and Molecular Genetics offers undergraduate courses to students in Allied Health Science Programs enrolled in the: Medical Laboratory Sciences Degree at the Faculty of Public Health and Nursing students at the Hariri School of Nursing.

It also offers graduate level courses to medical students and to graduate students in the graduate program leading to a master's degree (MS) in Biomedical Sciences, MSc Biochemistry and a doctoral degree (PhD) in Biomedical Sciences or Biomedical Engineering.

The requirements for admission to the graduate program are a BA with prerequisites in chemistry and biology courses or a BS degree from a university and an academic record with a cumulative GPA of 3.3 and above. Students should have a background in chemistry, biology, or a related medical science degree. Students will spend a minimum of two years

in the graduate program during which they must complete 21 credits of graduate courses, pass a comprehensive exam (BIOC 395 A/B), and submit a thesis (9 credits, BIOC 399 A/B/C/D/E) based on independent research. The 21 credits of graduate courses include a total of 14 credits of required core courses and 7 credits of elective courses.

Required MS courses in Biomedical Sciences track Biochemistry include: BIOC 302 (1 cr.); BIOC 305 (1cr.); BIOC 321 (1 cr.); BIOC 322 (1 cr.), BIOC 323 (2 cr.), BIOC 325 (2 cr.); BIOC 326-A/B (2 cr.); BIOC 330 (2 cr.) and IDTH 301 (2cr.).

Required PhD courses in Biomedical Sciences are listed on page 558 of the Graduate Catalogue.

Course Descriptions

BIOC 246 Biochemistry for Nursing 60.0; 4 cr.
A course that is tailored to nursing students. It provides students with brief and general information in chemistry and functional groups of carbon compounds that are required to understand biochemistry. The course discusses the main biochemical pathways in the cell, alluding to related disorders. It is composed of three units: (a) general chemistry (b) organic chemistry and (c) biochemistry. Offered to BS Nursing students. First semester.

BIOC 255 Biochemistry for MLSP 45.0; 3 cr.
The course is an introductory biochemistry course offered to undergraduate students in the Medical Lab Technology Program and related fields. A course that provides an overview of structure, function, and cellular metabolism of biological micro/ macro molecules. The course elaborates on the normal and abnormal metabolism highlighting their clinical relevance correlating basic information to disease situation. Second semester.

Graduate Courses

Courses in the graduate program are open to all graduate students enrolled in the various Biomedical Sciences programs in the various departments and in Biomedical Engineering as well as to science major graduates, such as Biology, Chemistry or related sciences upon the consent of the coordinator.

Required Courses

BIOC 305 a, b, c Biochemistry Research Seminars 0.30; 1 cr.
A required course that spreads over three terms. During their residency in the master's program, graduate students will register for: BIOC 305 a (0 cr.) during the second term of their first year; BIOC 305 b (0 cr.) during the first term of their second year; and BIOC 305 c (1 cr.), following their completion of a and b, during the second term of their second year. Each of BIOC 305 a, b, c will emphasize one or two biochemical or genetic themes. Students will be asked to present published research or literature reviews on a specific topic as advised by the different coordinators. Required from MS Biochemistry students.

BIOC 321 Nucleic Acids and Basic Genetics 15.0; 1 cr.
This course discusses the principles of nucleic acids structure and function in eukaryotes. It includes the information for basic genetics in terms of genome structure as well as the diversity of gene regulation. Required from MS and PhD students in Biomedical Sciences. Requires consent of coordinator for other graduate disciplines. First term.

BIOC 322 Protein and Enzyme Biochemistry 14.6; 1 cr.
This course deals with the biochemistry of proteins in general and enzymes in specific. It

discusses protein structures, folding process, and protein-protein interactions. It focuses on how changes at the structural level modify function. The course also elaborates on catalytic proteins, enzymes, differentiating Michaelis Menten from allosteric enzymes, estimating kinetic parameters, and emphasizing their regulation. Required from MS and PhD students in Biomedical Sciences and Biomedical Engineering. Requires coordinator approval for other graduate disciplines. First semester.

BIOC 323 Cellular Metabolism and Regulation 25.10; 2 cr.
The course provides a coherent account of structural and metabolic biochemistry. It emphasizes basic concepts of dynamic state and regulatory mechanisms that allow conflicting pathways and reactions to occur while maintaining homeostasis at the organ and inter-organ levels. Required from MS and PhD students in Biomedical Sciences. Requires coordinator approval for other graduate disciplines. Second semester.

BIOC 325 Receptors and Signal Transduction 25.10; 2 cr.
This course covers classical pathways involved in receptor signaling and activation of downstream targets and the molecular mechanisms involved. It deals with inter and intracellular communication, from the generation of signaling molecules through the cellular responses. Required from MS and PhD students in Biomedical Sciences. Requires consent of coordinator for other graduate disciplines. First term.

BIOC 326 A, B Bioinformatics Tools and Applications in Genomics 32.0; 2 cr.
This two-module course (1 credit/module) introduces students to the new field of Next Generation Sequencing (NGS). It covers different NGS applications involved in basic research and precision medicine. Students will learn about modern methods, concepts and techniques that are widely used in the field. The hands-on sessions will allow students to acquire basics of bioinformatics and genomics data analysis using state of the art tools and methods. Cases from the literature on genetics, cancer genomics and diseases in general will be discussed. Open to all graduate students from FM, FAS, FHS, FAFS and FEA. Both modules are required for the students of the Biochemistry and Molecular Genetics Department. Required. Prerequisite: Consent of coordinator. Second term.

BIOC 326A Bioinformatics Tools and Applications in Genomics: A focus on the Basics of Next Generation Sequencing 1 cr.
Bioinformatics Tools and Applications in Genomics: A focus on the Basics of Next Generation Sequencing.

BIOC 326B Bioinformatics Tools and Applications in Genomics: Next Generation Sequencing analysis for functional genomics and precision medicine: 1 cr.
Bioinformatics Tools and Applications in Genomics: Next Generation Sequencing analysis for functional genomics and precision medicine.

BIOC 330 Human Genetics and Genomics 32.0; 2 cr.
This course discusses the genetics and molecular basis of heredity and inherited traits, how genome organization affects the phenotype and the consequences of deregulation on traits and phenotypes including diseases and human evolution. It will introduce the animal models used in genetics research. The course will also discuss key genomic technologies, advances in prognostic and diagnostic genetic tests. It will review methods in determining heritability of traits and diseases by studying the larger population and teach how gene identification can help identify targets for therapeutics intervention and gene therapy. Required. Prerequisite: Consent of coordinator. Open to MS and PhD students in Biomedical Sciences. Requires coordinator approval for other graduate disciplines. Second semester.

BIOC 395A/B Comprehensive Exam 0 cr.
Prerequisites: Completion of 18- 21 credits with a GPA of 3.3 and consent of advisor.

BIOC 399 A/B/C/D/E MS Thesis 9 cr.
A 9 credit-hour course in which students conduct original research under faculty supervision. Faculty research focus includes: molecular mechanisms of inflammation, vascular biology, congenital heart problems, metabolism, metabolic disorders, mitochondrial toxicology, phenotype-genotype studies, Wilson's disease, diabetes and its complications (microvascular and macrovascular), atherosclerosis, sphingolipid metabolism, genetics of autism, dermatological disorder, cancer, cell death, herbal medicine, natural product remedies, liver injury, inflammation, traumatic brain injury causes and mechanisms, proteomics, bioinformatics.

Elective Courses

BIOC 302 Genetic Pathways in Organogenesis 15.0; 1 cr.
A course that aims at drawing all the pathways involved in early organogenesis in mammals. The students will be exposed to all the techniques that helped in understanding these pathways. Detailed mechanisms governing cell differentiation and tissue-specific gene regulation will be explained for select organs. Genetic networks involving genes encoding growth factors and transcription factors will be exposed and contrasted between the different organs. Examples of Mendelian inherited disorders caused by mutations in these genes will be discussed at the end. Required. Prerequisites: BIOC 321 and BIOC 322, or consent of the coordinator. Second term.

BIOC 303 a, b Molecular Biology of Cancer a) 15.0; 1 cr.; b) 30.0; 2 cr.
A 2-module course composed of BIOC 303 a (1 cr.) and BIOC 303 b (2 cr.) that is open to MSc. and or Ph.D.

BIOC 303 a: A course that deals with the regulatory mechanisms of tumor cell growth and cancer formation at the cellular, molecular, genetic and epigenetic levels. This course includes a discussion of recent developments in the intra and/or inter-cellular mechanisms involved in cellular proliferation, cell death and resistance to cancer therapeutics. The 1-credit elective course is open to all graduate students in basic Biomedical Sciences, Biomedical Engineering and Biology. Second term.
BIOC 303 b: A course that deals with more advanced topics in tumor biology, such as invasion and metastasis, cancer stem cells and animal models. The 2-credit elective course is recommended for graduate students whose research interest can benefit from a thorough knowledge of tumor biology. BIOC 303 is a prerequisite for BIOC 303 b. Students can register for both BIOC 303 a and BIOC 303 b. Second term.

BIOC 306 Mediators in Vascular Biology and Inflammation 32.0; 2 cr.
An elective course that deals with the different mediators of vascular biology and inflammation at the molecular and cellular levels. The major cell and mediator components of blood vessels and inflammation and their signaling pathways will be studied. Different inflammation and vascular–related diseases will be presented and discussed. The course will offer opportunities to analyze the recent scientific findings inflammation and vascular systems. Elective. Open to graduate students in basic Biomedical Sciences and Biology, and to medical doctors. Second semester.

BIOC 310 Molecular Basis of Genetic and Metabolic Disorders 16.32; 2 cr.
A course that deals with the molecular basis of genetic and metabolic disorders. This course presents a detailed overview of the molecular basis of known genetic diseases. Students also learn the methods used to map chromosomal aberrations or DNA mutations implicated in congenital diseases. A PhD elective course. Open to all graduates in Biomedical Sciences or related fields of study. Prerequisites: BIOC 321 and BIOC 322, or a background in biology. Second term; alternating years.

BIOC 314 Mitochondria: Genetics, Protein and Disease 15.0; 1 cr.
A course that provides a clear understanding of the biochemistry, molecular genetics and bioenergetics of the mitochondria (mt). It emphasizes the role of the mitochondrial dysfunction (mt-DNA mutations, environmental toxins) in the pathogenesis of mitochondrial diseases. Elective course open to all graduate students in basic Biomedical Sciences and Biology. Second term or summer; alternating years.

BIOC 316 Bioinformatics 0.30; 1 cr.
A course that introduces students to the latest bioinformatics literature. The format is a journal club in which recent journal articles are circulated and discussed. Guest lecturers are invited to present research related to the field. Students are also given an orientation on software currently available in the Computational Science and Bioinformatics Lab. Elective. Open to both basic Biomedical Sciences as well as Arts and Sciences graduate students. Prerequisites: Consent of instructor and graduate standing.

BIOC 317 (a-j) Special Topics in Biochemistry and Genetics 15.0; 1 cr.
A series of special elective courses (a-i), 1 credit each, which will emphasize the basic concepts and introduce recent developments in the fields of (a) Proteomics; (b) Metabolomics; (c) Genomics; (d) Lipidomics; (e) Enzymology; (f) Apoptosis; (g) Biochemistry of Inflammation; (h) Biochemical Toxicology; (i) Congenital Heart Problems; (j) Grant and Proposal Writing; (K) Forensic Biomedical Sciences part-1; (L) Forensic Biomedical Sciences part-2. Courses are open to medical doctors who would like to update their knowledge and to MSc/PhD graduates in biomedical and /or related fields. Elective. Prerequisite: Consent of coordinator. First/second /summer term.

BIOC 327 Precision Genomics: Cancer and Diabetes 15.0; 1 cr.
A 1-cr elective course that will explore the genetic and genomic alterations in diseases including cancer, and diabetes. It will review how genetics and genomics are currently being used in prediction of drug response, medical decisions, practices and applications. In addition, it will address the challenges faced when implementing genomics into the clinic setting, while addressing the ethical considerations. Elective. Prerequisite: Consent of coordinator. Open to Biomedical Science Graduates: MS, PhD as well as Medical students. Requires coordinator approval for other graduate disciplines. First semester.

Department of Dentofacial Medicine

Chairperson:	Ghafari, Joseph
Professors:	Barakat, Nabil (Adjunct Clinical); Geha, Hassem (Adjunct Clinical); Ghafari, Joseph (Tenured); Sabri, Roy (Adjunct Clinical)
Associate Professors:	Haddad, Ramzi; Macari, Anthony; Makary, Christian Pierre (Adjunct Clinical); Saadeh, Maria (Adjunct Clinical)
Assistant Professor:	Zeno, Kinan
Instructors:	Abou Chebel, Naji (Clinical); Ammoury, Makram (Adjunct Clinical); Chalala, Chimene (Adjunct Clinical)
Clinical Associates:	Abou Jaoude, Nadim; Abou Obeid, Fares; Afeiche, Nada; Anhoury, Patrick; Bou Assi, Samar; Chedid, Nada; El Chekie, Michelle; Feghali, Roland; Ghogassian, Saro; Hanna, Antoine; Itani, Mohammad; Kassab, Ammar; Kamel, Nadine; Karam, Ingrid; Metni, Hoda; Rezk-Lega, Felipe; Tabet, Kristel

The Department of Dentofacial Medicine offers post graduate residency training to dental graduates. The specialty program lasts 36 months and is designed to carry clinical activities in a scholarly environment where basic science and clinical orthodontics are integrated. A major part of the postdoctoral program consists of clinical education and training with a spectrum of treatment ranging from childhood to adulthood, including patients who require orthognathic surgery. In addition, residents are enrolled in the Master of Science (MS) in Orthodontics program. The completion of a research project and defense of a corresponding thesis, related to clinical or basic sciences, is a requirement toward certification. Under specific conditions related mainly to the research thesis PGY II and PGY III residents are allowed to spend a period of one month per year in approved US programs under appropriate conditions of attendance in the program.

Program and Curriculum

The curriculum leading to the degree of Master of MS in Orthodontics and a residency certificate is structured after the scientist-practitioner model with dual emphasis on the scientist and practitioner aspects of the profession. The program covers, in addition to achieving competence in clinical practice, two essential requirements (also stipulated for accreditation by the American Dental Association's Commission on Dental Accreditation) which are the following:

- The inclusion of core credits of basic science courses (e.g. somatic, craniofacial growth and development biomechanics of tooth movement, research design and statistics)
- The conduct of original research and the corresponding successful defense of a written thesis

The degree is pursued concurrently with the clinical specialty training, which is also subject to defined requirements for clinical certification.

Basic knowledge courses include material on growth and development of the craniofacial complex and body, anatomy, anthropology, imaging of the head, scientific method, biostatistics, dental materials and biomechanics.

Daily seminars and classes are scheduled in a planned sequence over the three years and cover the basic topics as well as those related to orthodontics and other specialties necessary for multidisciplinary treatment, such as periodontics, restorative and cosmetic dentistry, minor oral and orthognathic surgery, temporomandibular dysfunction and pediatric dentistry.

Technical clinical courses and actual treatment requirements are non-credit activities commensurate with the AUBMC residency requirements. The clinical sessions include treatment delivery in the dentofacial clinic, encompassing specific requirements for the correction of malocclusions in children, adolescents, and adults, as well as discussions of treatment planning, treatment progress and case reports. Practice is based on scientific evidence interpreted to the individual conditions of each patient.

The degree is awarded after successful completion of both didactic coursework and research (thesis defense).

Admission

Admission is offered on a highly selective basis only to students who have shown distinct academic ability and success on the entrance examination. The applications to the Residency and MS in Orthodontics are separate. The application process follows the conditions currently used at AUB and AUBMC for the MS degrees and the Residency. Final acceptance in the MS program will be through the Graduate Committee (MS requirements) and the Graduate Medical Education Committee (Residency), then through the institutional process.

The specific prerequisites for acceptance in the MS program include, in addition to the AUBMC general conditions for admission in an MS program, the following:

- Only applicants possessing the doctoral degree in Dental Medicine or its equivalent (Dental Surgery, Dentistry) from a recognized institution in Lebanon or abroad are accepted. The course requirements are designed to build upon the basic biological sciences common to those required for the dental doctoral degree.
- A cumulative average in dental school of at least 3.3 or its equivalent is required if ascertained by a school using a different grading system. The candidate may be accepted on probation if the grades are between B and B+.
- The candidate must pass the entrance examination that includes practical (wire bending), written exam, and oral exams. This balanced and comprehensive examination helps evaluate the candidate's critical and scientific approach to dentistry in general and orthodontics in particular.
- Evidence of proficiency in English is required by passing the English Language Proficiency Requirement or its equivalent as required by AUB. (refer to the requirements listed in the Graduate Studies section of the AUB graduate catalogue).
- Applicants will also be interviewed.

Courses and Credits

The total number of credits required for the proposed MS in Orthodontics is 30. The Graduate Studies Committee may waive a maximum of 6 credits of graduate course work taken as part of the candidate's dental graduate studies upon the proposal of the Orthodontic Admissions Committee. Accordingly, a total of 24 credits including the 9 research thesis credits represent the minimal requirement. Elective courses are offered as part of the MS courses within the scope of potential research topics from clinical to interdisciplinary research. Didactic courses make up nearly a third of the curriculum. They include lectures, seminars, literature review sessions, journal club, research presentations and case discussions.

Typically, the core courses and related course work will be completed within the first two years of the program. The clinical specialty training will span over the three years of study. Most of the research will take place in years two and three, with a major focus on the research project and thesis defense in the third year. The degree will not be awarded no earlier than three years after matriculation in the program.

Clinical Curriculum

The clinical component encompasses a spectrum of treatments ranging from childhood to adulthood, including management of patients who require orthognathic surgery and those with craniofacial anomalies (e.g. cleft lip/palate). Trainees will be exposed to a variety of disorders and training experiences. Each resident will have a range of problems to treat that cover a full scope of malocclusions and craniofacial anomalies, as well as a spectrum of treatment approaches and mechanics, including orthognathic surgery of skeletal dysplasias. Supervised clinical activities are supplemented with classroom activities (seminars, case presentations, literature review).

Research

The research project may be clinical or basic. Each student will have the opportunity to develop strong research skills and conduct an original study fulfilling rigorous scientific norms. Students will register for courses in clinical and basic research methods (relative to applicable research) and elective basic medical and health sciences that are needed for the conduct of the specific project. The residents will be initiated into the formulation of research hypotheses, research design, and statistical analyses that should provide them with the skills required to complete theses of publishable quality.

Collaborative projects between AUB faculties foster the concept of inter-professional cooperation, bringing together medical/dental disciplines with not only public health (most natural alliance) and business (e.g. medical management, third party pay and insurance development), but also engineering (e.g. biomedical engineering developments) and education (e.g. education policy, higher education management). Participation of mentors from other faculties/departments is based on mutual interests between the specialties and actual professors from both sides.

Faculty

All faculty members in the program are full-time or part-time associated faculty. Depending on the courses and instruction they provide, their role is either in the basic studies, the clinical program or both. Credentials of the teaching faculty are distinguished including clinicians with certification from highly recognized orthodontic programs, including the AUB program, and American or European specialty boards.

Course Descriptions

The Department of Dentofacial Medicine offers postgraduate courses to dentists specializing in Orthodontics at the American University of Beirut Medical Center/Faculty of Medicine. The courses required for the MS in Orthodontics are listed below. They do not include elective courses listed in the catalogue of graduate FM, FHS and other AUB faculties.

ODFO 301 Craniofacial Growth and Development 48; 3 cr.
This course focuses on basic growth concepts and mechanisms (including underlying biological and cellular growth events), the main craniofacial components (cranial base, maxilla and mandible, and their interrelationships at different stages of growth), the tissues involved in facial growth (bone, cartilage, muscle and teeth), the relationship between main somatic and facial growth, and the development of growth deformities. Lectures, seminars, review of key articles and presentations by residents of selected assignments.

ODFO 302 Craniofacial Imaging, Craniofacial Imaging I, Principles and applications of advanced radiology, Craniofacial Imaging II, Cephalometric method and science 48.0; 3 cr. 8.0; 0.5 cr. 30; 1.9 cr.
This multifaceted series includes lectures and laboratory applications through assignments to impart knowledge on correspondence of cephalometric radiographs to anatomy, assessment of craniofacial growth and maxillofacial orthopedic treatment, visualization of orthodontic/orthognathic surgical treatment, simulation of growth and treatment outcome. Lectures, seminars, review of key articles and presentations by residents of selected assignments.

Craniofacial Imaging III Applications of 3D Imaging in Orthodontics 10.0; 0.6 cr.
This advanced knowledge series encompasses current and developing methods utilizing 3D technology related to: diagnosis and treatment planning of specific conditions (e.g. impacted canines, orthodontic- surgical treatment, airway assessment, placement of mini-implants); biologic boundaries of tooth movement; use of CBCT in orthodontic research (e.g. volume assessment of palate and chin); assessment of treatment changes upon 3D cephalometric and palatal rugae superimpositions; modelling and prediction of tooth movement, including the utilization of finite element analysis. Lectures, seminars, review of key articles and presentations by residents of selected assignments.

ODFO 303 Biology and Mechanics of Tooth Movement and Properties of Wire 48; 3 cr.
Biological responses to and physical principles of tooth movement. Lectures, seminars, review of key articles and presentations by residents of selected assignments.

ODFO 304 Research Science: Method, Design and Conduct 26.12; 2 cr.
A guided laboratory course in methods used as aids in morphologic research. Lectures, seminars, review of key articles and presentations by residents of selected assignments.

ODFO 305A/ODFO 305B General and Maxillofacial Medicine Issues in dentistry and medicine. 16; 1 cr.
Lecture series by invited speakers from various medical and dental fields pertinent to the science of orthodontics and medical/dental care (e.g. nose anatomy and physiology, pediatric Otorhinolaryngology, head and neck pathology, genetics principles, counseling and prenatal diagnosis, sleep apnea, practical concepts on general anesthesia, pharmacology, and pain management).

ODFO 306 Journal Club 1 cr.
Weekly

ODFO 307 Craniofacial Seminar 1 cr.
Monthly over 3 years.

ODFO 395 Comprehensive Exam 0 cr.
Comprehensive Exam

ODFO 399 MS Thesis 9 cr.
Original research under staff supervision leading to the MS degree.

ODOC 3800/ODOC 3900 Clinical Clerkship 0 cr.
The course includes pretreatment (record taking, diagnosis and treatment planning) and treatment (morning and afternoon sessions in the Dentofacial Clinic). Modules. Daily.

ODOC 3000 Courses in Orthodontics 0 cr.
Exposure to orthodontics and its allied fields. Daily.

ODFO 301S Community Service Project 0 cr.
Development of, or involvement in, project that benefit the community.

Residency and Master of Science in Clinical Orthodontics

Orthodontics Postgraduate Courses

Core Courses (ODFO)		Year	Credit Hrs.
Craniofacial Biology and Imaging			
ODFO 301	Craniofacial Growth and Development	1	3 cr.
ODFO 301A	Craniofacial Development		
ODFO 301B	Somatic Growth		
ODFO 301C	Development of the Dentition		
ODFO 301D	Facial Musculature in Orthodontics		
ODFO 302	Craniofacial Imaging		
ODFO 302A	Craniofacial Imaging I: Basics of Radiographic Imaging	1	0.5 cr.
ODFO 302B	Craniofacial Imaging II: Cephalometrics	1	1.9 cr.
ODFO 302C	Applications of 3D Imaging in Orthodontics	1	0.6 cr.
ODFO 303A	Biology of Tooth Movement		
ODFO 303B	Mechanics of Tooth Movement		
ODFO 303C	Properties of Wires		

General and Maxillofacial Medicine			
ODFO 305	General and Maxillofacial Medicine – Issues in Dentistry and Medicine	1/2/3	
ODFO 305A	Comparative mammal anatomy (2), nose anatomy and physiology (2), pediatric Otorhinolaryngology (2), overview of head and neck anatomy pathology and treatment (4), speech pathology (2), sleep apnea (4)		1 cr.
ODFO 305B	Genetics principles, counseling and prenatal diagnosis (2); practical concepts on general anesthesia (3), pharmacology (3), pain management (4), overview of adolescent medicine (2), jurisprudence and patient privacy (2)		1 cr.
Scientific Methods and Reviews			
ODFO 304	Research Science: Method, Design and Conduct Scientific Method and Research Design	1	2 cr.
ODFO 306	Journal Club	2/1	1 cr.
Craniofacial Anomalies			
ODFO 307	Craniofacial Seminar	1/2/3	1 cr.
Elective Courses			
Credits in the existing AUB FM/FHS/other faculties graduate programs, if deemed relevant to the field of individual research and upon recommendation by the research adviser.			2 to 6 cr.
ODFO 399	Thesis	3	9 cr.

Department of Dermatology

Chairperson:	Kibbi, Abdul-Ghani
Professors:	Abbas, Ossama; Kibbi, Abdul-Ghani; Kurban, Mazen; Rubeiz, Nelly; Zaynoun, Shukrallah (Clinical)
Assistant Professors:	Abou Rahal, Jihane; Saade, Dana
Clinical Associates:	Abd-el-Baki, Jasmin; El-Saad-Debahy, Nada; Muallem, Maya; Salman, Salah

The Department of Dermatology offers a course, "The Skin" (IDTH 229) to Medicine I students. Elective and selective clerkships are also available for Medicine IV students, interns and house staff, as well as for foreign medical students and graduates. A three-year residency training program in dermatology, accredited by the Arab Board of Health Specializations and its Scientific Council of Dermatology and Venereology, is offered to MD graduates following a one-year internship. The goal of the training program is to produce fully competent dermatologists capable of providing a broad spectrum of quality care to patients. Residents in training are involved in daily general and specialty clinics, including phototherapy, dermatologic surgery, skin oncology, hair and nail and connective tissue clinics.

An equivalent tuition fee-based residency training program is also open to foreign medical graduates. For more information regarding qualifying examination and prerequisite criteria, please follow the link to the "Admission to GME Programs" page at http://website.aub.edu.lb/fm/gme/adm_info/Pages/Adm_info.aspx

IDTH 229 The Skin

This course introduces first year medical students to basic skin physiology and pathology and is designed in accordance with the Impact Curriculum. Basic concepts are presented in which students are expected to learn the scientific basis of the normal physiology and pathology of the skin and its appendages, including hair and nails as well as mucosal surfaces. Mechanisms of disease causation are illustrated with clinically relevant examples.

DERM 267 Elective in Dermatology 9.90-180.

Students participate in the morning clinics (general dermatology) and afternoon clinics (including hair and nail and Genodermatoses clinics), as well as seminars, conferences, journal club and assignments of audio-visual teaching material. Students can participate in on-going clinical research programs. At the end of the four-week rotation, a final examination is offered to students. This course is offered to AUB and Non-AUB students. Four weeks.

DERM 277 Selective in Dermatology 9.90-180.

Dermatology is the study of skin in health and disease. The goal of this selective is to share with fourth year medical students our enthusiasm for the subject of dermatology and to administer a well-organized, informative and focused course. During this rotation, the essentials of morphology, diagnosis and management will be underscored. By the end of the course, students are expected to acquire basic clinical dermatology and to work up and manage patients with skin, hair, nail and mucous membrane disorders. A final exam is offered at the end of the year for all students. This course is offered only to fourth year medical students enrolled in AUB. Four weeks.

DERM 287 House Staff 9.131-262.
Same as DERM 267; offered to straight and rotating interns and residents of other departments on an elective basis. One month.

Weekly Conferences

Journal club, journal club for electives, grand rounds/case discussion, basic science seminar, clinical slides/differential diagnosis, genodermatoses lecture series, dermatopathology conferences, Bolognia book review, dermoscopy seminar, laser lecture series and dermatologic surgery conference.

Monthly Conferences

Consultation review, attending staff lecture, research meeting, and basic science journal club. For further details, visit the Department of Dermatology website at
https://www.aub.edu.lb/fm/Dermatology/Pages/default.aspx

Department of Diagnostic Radiology

Interim Chairperson:	Berjawi, Ghina
Professors:	Haddad, Maurice; Hourany-Rizk, Roula; Hourani, Mukbil; Berjawi, Ghina; Khoury, Nabil
Associate Professor:	Haidar, Mohamad
Assistant Professors:	Abi Ghanem, Alain; Moukaddam, Hicham; Mourany, Bassem; Muallem Nadim; Nassar, Lara
Instructors:	Khouzami, Riad; Natout, Mustafa; Tamer, Christel
Adjunct:	Al-Kutoubi, Aghiad; Bou Ayache, Jad; Lutfi, Shukri; Salah, Fatima; Sawan, Peter
Clinical Associates:	Abi Fakher-Saab, Faysal; Chebli, Hala; Hobeika, Carla; Geara, Aline; Mehanna, Mayssoun; Nader, Reine; Ngheiui, Ziad

The Department of Diagnostic Radiology offers elective clerkships to medical students, electives to interns and residents, and a five-year residency training program.

DGRG 268 Elective in Diagnostic Radiology 0.180
Open to fourth year medical students within and outside AUB who would like to consolidate their knowledge in radiology. This elective involves attending lectures specifically designed for medical students, read-out sessions with residents & faculty and scientific activities in the department. 4 weeks.

DGRG 287 Student Internship 0.262-1048
Open to all interns and residents. This internship involves attending tutorial and read out sessions and scientific activities in the department. Duration 1-2 months. 1 month (Non-radiology interns & residents). 2 months (AUB future radiology residents).

Weekly Conferences

The Department of Diagnostic Radiology organizes teaching activities divided into 13 organ-based blocks: General Radiology, Emergency Radiology, Ultrasound, Breast, Gastrointestinal Radiology, Genitourinary Radiology, Neuro Radiology, Vascular Intervention Radiology, Musculoskeletal Radiology, Pediatric Radiology, Nuclear Medicine, Cardiothoracic Radiology and Cardiac Imaging.

Department of Emergency Medicine

Chairperson:	Hitti, Eveline
Professors:	Kazzi, Amin; Hitti, Eveline; El Sayed, Mazen
Associate Professors:	Abou Dagher, Gilbert; Mufarrij, Afif; Bou Chebl, Ralph
Adjunct Associate Professors:	Kazzi, Ziad; Hamam, Mohamad; Harmouche, Elie; Sawaya, Rasha Dorothy
Assistant Professor:	El Zahran, Tharwat
Instructors:	Faris, Nagham (Clinical); El Helou, Rachelle (Clinical); Skoury, Assaad (Clinical)
Clinical Associates:	Alameddine, Kawsar; Anka, Mariam; Chalhoub, Sana; El Mais, Amro; Ghanem, Mario; Ghalayini, Nisrine; Farah, Karim; Fares, Sobhi; Hoballah, Hassan; Hakim, Michel; Helbawi, Ali; Ismail, Ali; Itani, Ziad; Kanso, Mohamad; Kreidieh, Ibrahim; Laham, Sami; Maatouk, Ali; Ozoor, Khodor; Rammal, Abdallah; Romani, Diala; Tabaja, Ali; Traboulsy, Sarah; Lakkis, Farah; Moukhaiber, Jihane; Abdul Nabi, Sarah; Bou Assi, Joseph; Samoity, Lidia; Abou Daher, Ghadi; Saab, Aed

The Department of Emergency Medicine (EM) at AUBMC is one of the busiest Emergency Departments (ED) in Lebanon seeing 5-year-average annual volume of 54000 patient visits. ED physicians, nurses and ancillary staff are highly experienced and trained in emergency medical care and provide timely, high-quality care to patients with acute illnesses or injuries. The ED has full-time, round-the-clock, attending level physician coverage by physicians trained in the treatment of all acute care illnesses from medical and surgical cases to pediatric and obstetrics acute care.

Educational Programs

In June 2012, the Department of Emergency Medicine established its first properly supervised EM training program in Lebanon. The program is a four-year curriculum with five categorical positions. All core faculty are emergency medicine trained physicians. Trainees are exposed to the spectrum of acute care illnesses in adult and pediatric patients and have structured, didactic sessions and hands-on workshops. In addition to a robust clinical experience, the program offers integrated research and administrative rotations that are meant to develop skills required to become leaders in the field. In the fall of 2015, the program earned its ACGME-I accreditation, and thus became the first Emergency Medicine Graduate Education Program in the country and one of a few in the region to receive this prestigious certification.

EMMD 262 Clinical Clerkship in Emergency Medicine
A clinical clerkship in which fourth year medical students will learn and work in the AUBMC

Emergency Department (ED). Students will play an active role in the ongoing care of the ED patient and will be responsible for the initial evaluation of assigned patients. They will obtain a thorough history and perform a focused physical exam, formulate a differential diagnosis, suggest diagnostic workup and treatment plan, and determine a disposition for each of their assigned patients under the direction of senior residents and faculty. They will be required to complete a total of five weeks of clinical rotation during which they are expected to be present for up to 17 shifts and to attend and contribute to the educational sessions taking place in the department. Students will acquire important procedural skills by being exposed to and encouraged to participate in the supervised performance of a wide variety of procedures in the ED. The weekly clerkship conference series runs over four weeks and includes a wide variety of topics and workshops that are pertinent to EM practice. Students will sit for the NBME examination for Emergency Medicine at the end of their fourth medical year.

Department of Experimental Pathology, Immunology and Microbiology

Chairperson:	Matar, Ghassan
Professors:	Khoury, Samia; Matar, Ghassan; Sayegh, Mohamed
Associate Professors:	El Hajj, Hiba; Rahal, Elias; Shirinian, Margret; Zaraket, Hassan
Assistant Professors:	Abou Fayad, Antoine; Al-Awar, Ghassan; Massaad, Michel; Bilen, Melhem; Esber, Saba

The Department of Experimental Pathology, Immunology and Microbiology offers courses to medical laboratory sciences (MLSP) students as well as to nursing, medical and graduate students. It offers a graduate program (discipline of Microbiology and Immunology) leading to a master's degree (MS) or doctoral degree (PhD) in Biomedical Sciences.
The requirements for admission to the graduate program are stated on page 29 of this catalogue.

IDTH 203 The Immune System in Health and Disease 37.28; 3 cr.
See Interdepartmental Courses.

IDTH 205 Microbiology and Infectious Diseases 37.28; 5 cr.
See Interdepartmental Courses.

MBIM 223 Parasitology for MLSP Students 39.39; 4 cr.
A course of diagnostic parasitology. Second term.

MBIM 237 Microbiology and Immunology for Nursing Degree Students 32.64; 3 cr.
A course on the fundamental aspects of medical microbiology and immunology for nursing students. Second term.

MBIM 260 Elective in Infectious Diseases for Medicine III and IV 0.180
A course on basic evaluation, diagnosis and management of infectious diseases. One month.

MBIM 261 Elective in Immunology for Medicine III and IV 0.180
A course that is an introduction to immunological research and its application to clinical practice. One month.

MBIM 310 Basic and Medical Immunology 32.32; 1 cr.
A course on innate and adaptive immune mechanisms, infection and immunity, vaccination, immune mechanisms in diseases and tissue injury and therapeutic immunology. Second term.

MBIM 311 Basic and Medical Bacteriology 32.32; 3 cr.
A course on the characteristics and classification of medically important bacteria, diseases caused by bacteria, anti-bacterial agents, susceptibility testing, prophylaxis and therapy. Second term.

MBIM 312 Basic and Medical Parasitology-Mycology 16.32; 2 cr.
A course on the characteristics of medically important parasites and fungi, diseases caused by parasites and fungi, anti-parasitic and anti-fungal agents, prophylaxis and therapy. Second term.

MBIM 313 Basic and Medical Virology 16.32; 2 cr.
A course on the characteristics and classification of medically important viruses, diseases caused by viruses, anti-viral agents, prophylaxis and therapy. Second term.

MBIM 314 Tutorial in Immunology 32.0; 2 cr.
Tutorial in Immunology.

MBIM 315 Tutorial in Bacteriology 32.0; 2 cr.
Tutorial in Bacteriology.

MBIM 316 Tutorial in Virology 32.0; 2 cr.
Tutorial in Virology.

MBIM 317 Tutorial in Parasitology-Mycology 32.0; 2 cr.
Tutorial in Parasitology-Mycology.

MBIM 318 Fruit Flies: Experimental Model Organism 1 cr.
A course designed to introduce graduate students to a variety of topics and techniques including the latest approaches for studying human diseases using Drosophila melanogaster as a model system. The course also includes hands-on laboratory sessions.

MBIM 319 Natural Products as Anti-Infective Agents 1 cr.
The course will cover screening methods, biosynthesis, and mode of action of novel anti-infective, in addition to early pharmacokinetics and pharmacodynamics properties. Second term. Prerequisite course: BIOC322.

MBIM 320 Microbiology and Immunology 3 cr.
A course on the fundamental aspects of basic and medical microbiology and immunology offered to non-Microbiology & Immunology graduate students at the MS and PhD levels. First term.

MBIM 326 Applied and Advanced Basic and Medical Immunology 32.64; 1 cr.
A treatise on advances in immunological diseases, their molecular mechanisms and their laboratory diagnosis. Second term. Alternate years.

MBIM 327 Advanced Basic, molecular and Medical Bacteriology 32.64; 1 cr.
A treatise on advances in the epidemiology, pathogenesis, immune response, diagnosis and prevention of bacterial infections, with particular emphasis on bacterial genetics and antimicrobial resistance. Second term. Alternate years.

MBIM 328 Applied and Advanced Basic, molecular and Medical Parasitology 32.64; 1 cr
A treatise on advances in the epidemiology, pathogenesis, immune response, diagnosis and prevention of parasitic infections. Second term. Alternate years.

MBIM 329 Applied and Advanced Basic, molecular and Medical Virology 32.64; 1 cr.
A treatise on advances in the epidemiology, pathogenesis, immune response, diagnosis and prevention of viral infections. Second term. Alternate years.

MBIM 330 Molecular Microbiology 32.64; 3 cr.
A course on molecular applications on the identification of infectious agents. Second term. Alternate years.

MBIM 331 Infection Control 16.0; 1 cr.
A treatise on the prevention of infections in the laboratory. Second term.

MBIM 390 Seminar 0.32; 1 cr.
Annually

MBIM 394 Journal Club 0 cr.
Annually

MBIM 395A/B Comprehensive Exam 0 cr.
Prerequisite: Consent of advisor.

MBIM 399 A/B/C/D/E MS Thesis 9 cr.
MS Thesis

Department of Family Medicine

Interim Chair:	Musharrafieh, Umayya
Professors:	Antoun, Jumana; Musharrafieh, Umayya; Saab, Bassem; Usta, Jinan
Associate Professors:	Mufarrij, Afif; Romani, Maya; Sakr, Carine
Assistant Professors:	Assaf, Georges; Khater, Beatrice; Rahme-Ballan, Diana; Osman, Mona; Shararah, Nabil; Zahran, Tharwat
Instructors:	Khaddaj, Wajdi; Khattar, Joe; Lakissian, Zavi; Makarem, Nisrine; Moukheiber, Sami; Razzouk, Jibrayil
Clinical Associates:	Alayan, Nour; Badr, Samia; Chalhoub, Wissam; El Ashkar, Khalil; Ghanem, Mario; Hleis, Sani; Lakkis, Najla; Maalouf, Grace; Makhlouf-Akel, Madeleine; Malek, Elie; Rahimi, Rose Maria; Sarkis Habib Ishak, Hala; Zeidan, Randa

The Department of Family Medicine offers a clinical clerkship and specialty electives to fourth year medical students. It also offers a postgraduate training program to physicians at the end of which they are eligible to sit for the Arab Board of Family Medicine.

Residency Program

The Department of Family Medicine offers a three-year training program. Residents who like to sit for the Arab Board will have an extra year. The goal of training is to produce competent, community-oriented family physicians capable of providing high-quality care to their patients. The program consists of rotations in the different clinical departments of the Faculty of Medicine, as well as ambulatory primary health care experience in the Family Medicine Clinics, emergency services at AUBMC, and satellite centers. All residents are required to sit for the In-training Examination of the American Board of Family Medicine during the first three years.

FMMD 262 Clinical Clerkship 0.180.
The purpose of this clerkship is to expose medical students to the principles and practice of family medicine, caring for people of all ages in their communities through a patient-centered and team-based approach emphasizing the bio-psychosocial model. It upgrades the medical students' knowledge of common problems and their skills in the application of preventive medicine in a community oriented primary care setting. Students see patients under supervision in the Family Medicine Clinics and other satellite clinics in the community. They also conduct site visits to community-based health programs to gain exposure to the various resources available in the community. Offered to fourth year students. They attend special lectures and workshops tailored to their needs, including MSK lectures, topics related to integrative medicine and will get a certificate in Lifestyle Medicine Coaching. One block; 4 weeks.

FMMD 267 Elective 0.180.
An elective in family medicine which can be tailored to the needs of the resident/ student and their program requirements including introduction to integrative health and wellness.

Teaching Activities

The department holds topic conferences, core content lectures, journal clubs, morning reports, research forums, patients from our practice, practice management, guest lectures, and workshops.

Family Medicine Added Qualifications Fellowships

The Department of Family Medicine has established three new fellowships. “The Primary Care Sports Medicine Fellowship”, “The Occupational and Environmental Medicine Fellowship”, and “Geriatric Medicine fellowship”.

- The Primary Care Sports Medicine Fellowship offers a 1-year integrated academic and clinical program. It prepares the primary care physician to deliver evidence based, safe and quality musculoskeletal care. Applicants should have completed a residency training in Family Medicine, Internal Medicine, Pediatrics or Emergency Medicine.
- The Occupational and Environmental Medicine Fellowship offers a 2-year integrated academic and clinical program. It trains the physicians to be proficient in all aspects of the practice of Occupational and Environmental Medicine. Completion of the program leads to certification in Occupational and Environmental Medicine and a master’s degree in public health. Applicants should have completed a residency training in Family Medicine or Internal Medicine.
- The Geriatric Medicine fellowship offers a 2-year integrated academic and clinical program. Training occurs in different settings, in hospital, clinics, and nursing home. Fellows also receive training in palliative care. Applicants should have completed a residency training in Family Medicine or Internal Medicine.

University Health Services (UHS)

The Department of Family Medicine is responsible for providing comprehensive primary care services to the AUB community including students, faculty, staff and their dependents at the Family Medicine Clinics and Advancing Research Enabling Communities Center AREC (Bekaa) rural clinic.

Employee Health

The Department offers Employee Health services to the University including the Medical Center.

Faculty Development

The Department provides faculty development courses to primary care physicians from Lebanon and the region. Subjects covered include Integrative Health, Evidence Based Practice, Health Information Systems, Communication Skills, Primary Care Centers Practice Management, Employee Health and Travel Medicine.

Satellite Clinics

The Department of Family Medicine assists various Non-Governmental Organizations (NGOs), governmental and private organizations in managing their primary care clinics. It is currently sending residents to different community-based NGO clinics.

Department of Internal Medicine

Interim Chair:	Abu-Alfa, Ali
Professor Emeritus:	Cortas, Nadim (Dean Emeritus); Berbari, Adel (Professor Emeritus)
Professors:	Abu-Alfa, Ali; Akl, Elie; Alam, Samir; Arnaout, Samir; Badr, Kamal; Barada, Kassem; Bazarbachi, Ali; Bou Khalil, Pierre; Dakik, Habib; El-Hajj Fuleihan, Ghada; El-Saghir, Naji; Ghazzal, Ziyad; Husari, Ahmad; Kanj-Sharara, Souha; Khuri, Fadlo; Mallat, Samir; Mourad, Fadi; Nasrallah, Mona; Refaat, Marwan; Salti, Ibrahim; Sawaya, Jaber (Clinical); Shaib, Yasser; Shamseddine, Ali; Sharara, Ala'; Soweid, Assaad; Taher, Ali; Tamim, Hani; Tfayli, Arafat; Uthman, Imad; Ziyadeh, Fuad
Associate Professors:	Abi-Saleh, Bernard; Arabi, Asma; Assi, Hazem; Bassil, Nazem; Bouakl, Imad; Daniel, Fady; Daouk, Majida; El Cheikh, Jean; Hajjar, Ramzi; Kanafani, Zeina; Khoury, Maurice; Medawar, Walid; Rebeiz, Abdallah; Salem, Ziad; Sawaya, Fadi; Tabbarah, Zuhayr (Clinical); Temraz, Sally; Zeineldine, Salah
Assistant Professors:	Abou Dalle, Iman; Al-Awar, Ghassan; Chakhtoura, Marlene; Choucair, Mahmoud; El Bejjani, Martine; Gharzuddine, Walid; Kanj, Nadim; Masri, Abdul-Fattah (Clinical); Merashli, Mira; Rizk, Nesrine; Tanios, Bassem; Zakhem, Aline
Instructors:	Bou Fakhreddine, Hisham; El Asmar, Noel; Farah, Pamela; Kreidieh, Firas; Moukadem, Hiba; Moukalled, Nour
Adjunct Faculty members:	Mohty, Mohamad (Adjunct Professor); Sayegh, Mohamed Hassan (Adjunct Professor); Mukherji, Deborah (Adjunct Clinical Associate Professor); Bizri, Abdul Rahman (Adjunct Clinical Assistant Professor); Ghusn, Husam (Adjunct Clinical Assistant Professor); Karam; Sabine (Adjunct Clinical Assistant Professor)
Clinical Associates:	Abboud, Diana; Alkawam, Lamees; Allaw, Fatima; Amhaz, Ghid; Baydoun, Omaya; El-Imad, Zuhayr; Farah, Karim; Farran, Abbas; Harb, Wissam; Hilal, Nadeen; Issa, Zeinab; Mohamad, Rayan; Othman, Mahmoud; Rayshouni, Hamza; Rhayem, Caline; Saleh, Munzer; Sukkariyeh, Ismail

The Department of Internal Medicine offers courses, clinical clerkships and specialty electives to medical students. It also offers clinical post-graduate training to MD graduates including residency and subspecialty fellowships. The Residency Program offers two tracks, which are a 1-year training (Preliminary Track) and a 3-year training (Categorical Track).

The Fellowship training following the residency period is offered in these subspecialties: cardiology, endocrinology, gastroenterology, hematology-oncology. Nephrology and hypertension, infectious diseases, pulmonary, critical care and sleep medicine, and rheumatology.

INMD 246 Clinical Clerkship in Internal Medicine 120.540
A clinical clerkship during which third year medical students spend two months on the ward and one month in the outpatient department (OPD). On the ward, students work up and follow patients under the supervision of senior residents and faculty. They are responsible for taking the history, performing the physical examination, following laboratory work and writing supervised notes in the charts on assigned hospital patients. Throughout their rotations students are required to attend clinical conferences, and to prepare and participate in clinical discussions.

INMD 254 Infection Control 6.34; 1 cr.
A course given to Med III students to increase their awareness and expertise in infection control as it relates to the protection of patients as well as the health-care worker from iatrogenic infection. The course aims to ensure that students understand their responsibility in infection control and apply scientifically acceptable infection control principles. This course is given as an online presentation followed by a series of questions. Students should also pass a written examination.

INMD 262 Clinical Clerkship in Internal Medicine 0.540
A clinical clerkship in which fourth year medical students work in their capacity as junior interns (sub-internship) on the medical floors of the hospital. They are responsible for admission work-up of patients, and their follow-up under the supervision of the attending physician and team resident. They are also required to attend clinical conferences, present at the student report activity, and prepare and participate in clinical discussions.

INMD 267 Elective in Internal Medicine Subspecialties 0.180-360.
An elective is offered to fourth year medical students in one or more of the subspecialties of internal medicine, including cardiology, endocrinology, gastroenterology, general medicine and geriatrics, hematology-oncology, nephrology and hypertension, infectious diseases, pulmonary medicine and critical care, and rheumatology.

Department of Neurology

Chairperson:	Atweh, Samir
Professors:	Atweh, Samir; Beydoun, Ahmad; Khoury, Samia; Sawaya, Raja
Associate Professor:	Nasreddine, Wassim
Assistant Professors:	El Ayoubi, Nabil; El Halabi, Tarek
Clinical Instructor:	Doumiati, Hassan
Clinical Associate:	Makki, Ashraf
Adjunct Associate Professor:	Chemali, Zeina; Salameh, Johnny

The Department of Neurology, established in July 2011, offers clinical clerkships and electives to MED IV students. The department also participates in teaching preclinical students the Basic Neuroscience course. The department offers a 4-year post-graduate residency training program in Clinical Neurology as well as post-residency fellowships in Epilepsy, Neuromuscular Diseases and Multiple Sclerosis. Residents sit for the RITE examination offered by the American Academy of Neurology.

NEUR 262 MED IV Clinical Clerkship in Neurology 90.90
MED IV students rotate for 2 weeks on the inpatient neurological service and the neurological intensive care, and 2 weeks on the Neurology consult service and the Emergency room. They have daily attending teaching rounds and lectures, as well as attending daily neurology clinics and neurology grand rounds.

NEUR 267 Elective in Neurology 0.180
Elective rotations are offered to MED IV medical students and house staff where they rotate for 4 weeks on the consult service and outpatient clinics. They attend daily rounds, lectures and weekly grand rounds.

IDTH 230 Brain and Cognition Course 80.80
This course is intended to provide preclinical medical students with an integrated approach to the structure and function of the nervous system. Basic principles of neuroanatomy, neurocytology, neuroembryology, neuroradiology, neurophysiology and neurology will be related to the function of the normal and diseased human nervous system, and the action of drugs. Concepts in social and preventive medicine, epidemiology and medical ethics are explored in relation to diseases of the nervous system.

Weekly Conferences

The Department of Neurology organizes general neurology conferences including Neurology Grand Round, Mortality and Morbidity conferences, Core Curriculum Lectures, Neuroscience Reading Club, Journal Club, as well as a weekly Multiple Sclerosis (MS) conference.

Department of Obstetrics and Gynecology

Chairperson:	Nassar, Anwar
Professors:	Bazi, Toni; Ghazeeri, Ghina; Hannoun, Antoine; Karam, Karam: Khalil, Ali (Clinical); Nassar, Anwar; Usta, Ihab
Associate Professor:	Chamsy, Dina
Assistant Professors:	Abdallah, Reem; Adra, Abdallah; Aswad, Naji (Clinical); El Khoury, Nabil; Hobeika, Elie
Clinical Associates:	Atallah, Sandrine; El Kak, Faysal; Malas, Salah; Yared; Georges

The Department of Obstetrics and Gynecology offers clinical clerkships and specialty electives to medical students. It also offers clinical postgraduate training to MD graduates. The residency program is a four-year specialty training in obstetrics and gynecology. A minimum of four categorical postgraduate year 1 (PGY1) students are accepted yearly. All residents sit for a yearly examination of the Council for Resident Education in Obstetrics and Gynecology administered by the American College of Obstetrics and Gynecology. The Program is ACGME-I accredited and is recognized by the Arab Board of Medical Specialties. The Department of Obstetrics and Gynecology has initiated a 2-year fellowship program in Reproductive Endocrinology and Infertility as of June 2014. One fellow is accepted every year.

OBGY 247 Clinical Clerkship 47-360.
A clerkship is offered to third year medical students consisting of seminars in normal and abnormal obstetrics and gynecology, weekly grand rounds, monthly special grand rounds, and a clinical clerkship divided into delivery suite, gynecological service and outpatient clinics. Other activities include specialty clinics in reproductive endocrinology and infertility, family planning, gynecologic oncology, maternal fetal medicine and urogynecology. Eight weeks.

OBGY 248 Elective in Obstetrics and Gynecology 0.180-360.
Exposure to selected general obstetrics and gynecology or subspecialties in the field, offered to third- and fourth-year medical students. Two to four weeks.

Educational Activities

- **Daily:** Morning Reports with the attending of the week
- **Weekly:** Case Discussion with attending of the week, Chart Review Conference, Grand Round, Chairman's Round, Resident Education Conference, Core Curriculum Lecture, and Journal Club.
- **Monthly:** Joint Perinatal Neonatal Conference, Joint Radiology OB/GYN Conference. Special Grand Round with International speakers, and Ultrasound Course Lecture.

Department of Otorhinolaryngology and Head and Neck Surgery

Interim Chairperson:	Zaytoun, George
Professors:	Fuleihan, Nabil (Adjunct Clinical); Hadi, Usamah (Clinical); Hamdan, Abdul Latif; Zaytoun, George
Assistant Professors:	Alam, Elie; Barazi, Randa; Korban, Zeina; Mourad, Marc; Natout, Mohammad Ali (Clinical)
Clinical Associate:	Kasty, Maher

The Department of Otorhinolaryngology—Head and Neck Surgery offers clinical postgraduate resident training to MD graduates. It also offers clinical clerkships to medical students and specialty electives to interns and residents.

The residency program consists of five years with a gradual escalation in the clinical and surgical responsibilities of each resident. During the internship year, residents spend nine months rotating in relevant general surgical specialties, radiology, and emergency medicine and three months in the Otorhinolaryngology service. The acquired general surgical skills during this year act as a foundation for their future development as surgeons in Otorhinolaryngology—Head and Neck Surgery.

During the next four years of training, residents are exposed to all subspecialties in Otorhinolaryngology—Head and Neck Surgery, namely Otology, Rhinology, Laryngology, Head and Neck Surgery, Pediatric Otorhinolaryngology, and Facial Plastic and Reconstructive Surgery. In each subspecialty, residents learn the clinical and surgical principles required for the diagnosis and medical and surgical management of various diseases. The corresponding faculty members give a series of courses covering the updates of each subspecialty. A temporal bone surgical dissection course is also given yearly. For interdisciplinary exposure, faculties from other departments and services are often invited as speakers. Residents also contribute and learn from the monthly activities of the department, which include the Grand Rounds, Tumor Board, Mortality and Morbidity, Pathology conferences, Radiology conferences, and Journal Clubs. To ensure a busy clinical load, residents rotate in affiliated hospitals with diverse exposure to different areas of the country. These include Clemenceau Medical Center and Bikhazi Hospital. Residents sit for an In-service examination on a yearly basis to assess their written fund of knowledge and clinical competencies. The written in-service exam is acknowledged by the American Board of Otorhinolaryngology and is the same test administered to all US resident trainees.

The PGY4 training program includes at least two months of electives spent in an approved program in the United States of America. The rationale behind this elective is to broaden the medical perspective and provide a wider exposure for residents before graduating. Residents are also encouraged to present research projects at international meetings and are often sent for courses in Europe, the US, and other countries. The PGY4 year also includes three months of protected research time, during which residents are expected to design and complete a research project.

Course Descriptions

ORLG 267 Clinical Clerkship 11.120.
Mornings in the Outpatient Department (OPD), two to three mornings in the operating rooms and the rest of the time in the hospital. Three weeks in the department.

ORLG 268 Elective in Otorhinolaryngology 0.180.
Exposure to Otorhinolaryngology and its allied fields. One month.

ORLG 287 Internship 0.262.
Work divided between Outpatient Department (OPD), operating rooms and hospital. Elective. One month.

Research is also an integral part of the resident training program. All residents contribute to multiple research projects either in terms of literature review, study design or data collection, analysis, and manuscript writing. As a requirement for graduation, each resident is expected to design, execute, and publish a full original research project.
Administrative responsibilities are also allocated to residents throughout their training as part of their development. The aim is to provide physicians, who might assume future managerial tasks and positions, with added value to their clinical practice.
For more information, please contact our Residency Program Coordinator, Ms. Ruba Abed El Karim (email: ra305@aub.edu.lb)

Following are the monthly activities of the department:

- **First Monday**: Journal Club and Mortality Morbidity
- **Second Monday**: Grand Round
- **Third Monday**: Interesting Cases
- **Fourth Monday**: Grand Round

Department of Ophthalmology

Chairperson:	Noureddin, Baha'
Professors:	Awwad, Shady; Bashshur, Ziad; Mansour, Ahmad (Clinical); Noureddin, Baha'; Salti, Haytham
Associate Professors:	Haddad, Christiane; Hamam, Rola; Jabbur, Nada (Adjunct); Ma'luf, Riad (Clinical)
Assistant Professors:	Alameddine, Ramzi; Bou Ghannam, Alaa; Farah, Nadim (Clinical); Haddad, Randa; Jurdi Kheir, Wajiha; Saade, Joanna
Clinical Associates:	Allam, Souha; Massoud, Vicky; Shahin, Hasan; Younis, Mohammad

The Department of Ophthalmology offers clinical clerkships/selectives and specialty electives to medical students. It also offers clinical postgraduate training to MD graduates, including internship, residency and fellowship programs. The internship program is a one or two month rotation offered to categorical interns in other disciplines or to family medicine residents. The residency program is an ACGME-I accredited three-year specialty training in ophthalmology, including rotations in cornea, glaucoma, oculoplastics, pediatrics, neuro-ophthalmology, vitreo-retinal, intra-ocular / refractive surgery, and ocular oncology/ pathology. The residency training in ophthalmology is recognized by the International Council of Ophthalmology (ICO). The primary part of the Royal College of Ophthalmologists examination can be taken at the beginning of the second year of residency, while the final part can be taken any time after that. The same recognition is also granted by the Arab Board of Ophthalmology under similar terms. Two fellowships are offered: a one-year medical retina fellowship, which is a 12-month training with clinical exposure to pathologies of the posterior segment from diabetic retinopathy to age-related macular degeneration, also comprising all posterior uveitic conditions. The second one is a cornea/refractive fellowship with exposure to all the classic and most recent cornea and refractive lasers, procedures, and pathologies.

Finally, the department offers a Pre-Residency Research Fellowship. Twelve months are spent in actively contributing to and running the ongoing clinical research projects in the department.

OPHT 267 Clinical Clerkship Offered as a Selective 0.120.
Clinical training and seminars. Students are clinically required to master the use of the direct ophthalmoscope and identify optic nerve abnormalities through the pupillary light reflex, identifying problems which need referral for ophthalmic assessment. Offered to fourth year medical students. Four weeks.

OPHT 268 Elective in Ophthalmology 0.180.
Exposure to Ophthalmology. (Same as OPHT 267). Students and interns are required to get acquainted with use of the different diagnostic ophthalmic tests. Open to interns and fourth year medical students. One month.

OPHT 287 Internship 0.262-524.
An elective in the Outpatient Department (OPD), hospital wards and seminars. Same as OPHT 268. One to two months.

Department of Pathology and Laboratory Medicine

Chairperson:	Zaatari, Ghazi
Professors:	Araj, George; Daher-Karam, Rose; Kfoury-Kassouf, Hala; Mahfouz, Rami (Tenure); Salem-Shabb, Nina; Tawil, Ayman; Zaatari, Ghazi (Tenure)
Associate Professors:	Kfoury-Baz, Elizabeth; Chakhachiro, Zaher; El-Khoury, Riyad
Assistant Professors:	Fakhreddin, Najla; Assaf, Nada
Instructors:	Jurdi, Nawaf; Aoun, Jessica; Sinno, Sara
Clinical Associate:	Abadjian, Gerard

The Department of Pathology and Laboratory Medicine offers courses to medical students and undergraduate courses to students in the Medical Laboratory Sciences program (Faculty of Health Sciences). The department also offers four-year residency training programs in Pathology and Laboratory Medicine.

Clinico-Pathology Conferences

Med III, IV, and staff in collaboration with the departments of Surgery, Internal Medicine, Pediatrics, Obstetrics and Gynecology, Diagnostic Radiology, and Otolaryngology-Head and Neck Surgery.

Courses Offered for Medical Laboratory Sciences Students

IDTH 204 Basic Pathological Mechanisms 29.14; 2 cr.
This course covers the basic and general pathological mechanisms of disease processes at the clinical, gross, cellular, and molecular levels. The course includes the topics of cellular adaptation to injury, cell death, acute and chronic inflammation, anti- inflammatory drugs, healing/repair and fibrosis, hemodynamic disorders, neoplasia, hereditary and clinical genetics, cancer chemotherapy and radiotherapy, and toxicology. The material covered in this course provides the foundations for the comprehensive organ system-based modules that are covered throughout the first two years of medical school (IDTH 203, 205, 211, 212, 225, 226, 227, 228, 229 and 230). These modules integrate clinical and pathologic aspects of multiple disease entities and are taught collaboratively between pathologists and colleagues from clinical departments.

IDTH 221/222 Introduction to Medicine
See Department of Internal Medicine.

PATH 260 Elective in Pathology 0.180.
This one-month elective is open to Med IV students. The purpose of this elective is to

expose students to the general principles of surgical pathology and cytopathology. During this rotation, the student will participate in the daily teaching activities of the department, learn basic dissection skills at the grossing bench, and learn histologic features of common pathologic processes during multi-headed microscope sign-out sessions. Additionally, the student is required to make a presentation on a topic of interest and is encouraged to participate in an investigative research project with a faculty member.

LABM 262 Elective in Laboratory Medicine 0.180-360.
A clerkship offered to Med IV students. This clerkship consists of daily practical training, supplemented by lectures and seminars to cover the disciplines of clinical chemistry, clinical microbiology and immunology, clinical hematology, blood banking and transfusion medicine, molecular diagnostics and cytogenetics. This elective is available in these various disciplines of laboratory medicine and may be adjusted according to the interest of the candidate. During the rotation, the student is required to make a presentation on a topic of interest and is encouraged to participate in an investigative research project with a faculty member. One to two months.

LABM 287 Internship 0.180-360.
Same as LABM 262. Offered to rotating interns. One to two months.

LABM 201/202 Clinical Chemistry I and II 2.0; 3 cr.
Clinical Chemistry courses I and II are designed to acquaint students with fundamentals of clinical chemistry, including basic physiological and biochemical processes, instrumentation, principles of analytical procedures, and methods used for reliable determination of clinical analytes. Correlation of laboratory results with clinical manifestation is also an integral part of these courses. These courses cover all aspects of routine clinical chemistry such as carbohydrates, electrolytes, acid-base balance, blood gases, nitrogen metabolites, proteins, enzymes, lipids and lipoproteins, calcium metabolism and liver function. LABM 202 also covers some advanced clinical chemistry topics like hormones, therapeutic drug monitoring, toxicology; and specialized techniques like chromatography (HPLC, GC/MS and so on).

LABM 210 Cytology and Histological Techniques 24.16; 2 cr.
A course that includes a series of lectures, demonstrations and hands-on training on cell biology, a review of normal histology of various human organs, examples of pathological changes, lectures and hands-on training on techniques of tissue handling, preparation, staining and studying of sections and smears for cytological material. Department of Anatomy, Cell Biology and Physiological Sciences.

LABM 220 Clinical Chemistry and Endocrinology 0.128; 4 cr.
Practical experience in Clinical Chemistry that includes two parts. The applied manual procedures give students a thorough understanding of test principles and basic laboratory preparations and measurements. The clinical laboratory rotation covers all areas from specimen handling to an overview of automated clinical chemistry analyzers and other specialized areas like electrophoresis and amino acid analysis as well as patient test management. Six weeks.

LABM 230 Clinical Hematology and Phlebotomy 0.128; 4 cr.
Practical experience in clinical hematology and phlebotomy. This course covers technical aspects of diagnosis of hematological disorders including peripheral blood smears and bone marrow aspirates examination. In addition, laboratory testing for coagulopathies work-up is exposed in a variety of tests monitoring that take hemostatic characteristics of a case in consideration. Six weeks.

LABM 231 Clinical Laboratory Quality Systems 1 cr.
This course is intended to give Medical Laboratory Sciences students a thorough understanding of the quality systems used for implementation of total quality management in the clinical laboratories. The course covers all the basic elements and tools required to implement the quality system essentials across all phases of the laboratory workflow: preanalytical, analytical, postanalytical. In addition, it will include focused lectures related to quality and safety standards required in specialized areas such as blood bank, clinical microbiology and molecular diagnostics. Practical examples from the laboratory setting will be part and parcel of the lectures to help students relate theory to practice.

LABM 233 Genetics and Molecular Biology 2.0; 2 cr.
This course is an introduction to human genetics, comprising the structure and function of DNA and the classification of genetic disorders, as well as the application of laboratory genetic testing in the clinical differential diagnosis of a variety of disorders. Diagnostic techniques in human genetics (cytogenetics, biochemical and molecular) will be covered and their applications in pathology, oncology, immunology and microbiology will be reviewed. In addition, there will be learning of performing polymerase chain reaction (PCR) technique, real-time PCR, Sanger sequencing, and Next Generation Sequencing.

LABM 235 Medical Mycology 1.0; 1 cr.
A course that covers the different types of fungi, yeasts (e.g. Candida, Cryptococcus) and molds (e.g. dermatophytes, saprophytes, dimorphic). This course discusses their disease spectrum, mode of infection, growth requirements, and culture and non-culture methods of identification and diagnosis as well as antifungal drugs and susceptibility testing.

LABM 240 Clinical Microbiology 0.128; 4 cr.
Practical experience in clinical microbiology- conventional, automated, and non-culture rapid testing. The diagnostic methods encompass aerobic and anaerobic bacteria, mycobacteria, fungi, media preparation, quality control, specimen management, microbial identification, antimicrobial susceptibility testing and interpretation of findings. Six weeks.

LABM 250 Clinical Parasitology and Urinalysis 0.64; 2 cr.
Practical experience covering conventional and automated approaches in clinical microscopy pertaining to parasitology, urinalysis, spermogram, occult blood, calprotectin lactoferrin, Sudan III fat in stool, RBC morphology, and use of different types of microscopic methods for diagnosing particulate material in synovial fluid and other body fluids. Prerequisite: MBIM 223. Three weeks.

LABM 260 Serology 0.64; 2 cr.
Practical experience in clinical immunology and various automated and manual serodiagnostic techniques used for the diagnosis of infectious and non-infectious diseases. Three weeks.

LABM 270 Blood Banking 0.64; 2 cr.
This course introduces students to the various aspects of modern Blood Banking and Transfusion Medicine. Students will learn the theoretical and practical laboratory aspects of Blood Banking including: ABO, Rh and other blood group systems; handling donor and patient samples; infectious screening; and collection/preparation of blood/ blood components for transfusion administration. The course also covers adverse transfusion reactions, hemolytic disease of the newborn and fetus, as well as advanced Blood Bank procedures and quality management. Prerequisite: MLS 207. Three weeks.

LABM 280 Cytogenetics, Molecular Diagnostics and Histotechniques 0.64; 2 cr.
Practical experience in cytogenetics, molecular diagnostics and histotechniques. Prerequisite: LABM 210. Three weeks.

Department of Pediatrics and Adolescent Medicine

Chairperson:	Abboud, Miguel
Professors:	Abboud, Miguel; Badr, Lina (Adjunct); Bitar, Fadi; Boustany, Rose-Mary; Dbaibo, Ghassan; El Solh, Hassan; Mikati, Mohamad (Adjunct); Mroueh, Salman; Muwakkit, Samar; Nabulsi-Khalil, Mona; Yunis, Khalid
Associate Professors:	Arabi, Mariam (Clinical); Bulbul, Ziad; Charafeddine, Lama; Hanna-Wakim, Rima; Karam, Pascale; Majdalani, Marianne; Musallam, Salim (Clinical); Sinno, Durriyah; Tfayli, Hala; Yazbeck, Nadine
Assistant Professors:	Aoun, Bilal; Maalouf Faouzi; Munla, Nabil (Clinical); Obeid, Makram
Instructors:	Bechara, Elie; Borghol, Rafah; El Taoum, Katia; Haddad, Laith; Hneine; Mona; Ismail, Ali; Moukheiber; Jihane; Noun, Dolly
Clinical Associates:	Abdelnabi, Reem; Abi Nassif, Tania; Alamin, Farah; Al Ali, Razan; Al Araj, Alia; Charafeddine, Fatme; Habanjar, Dima; Khalifeh, Simone; Khafaja, Sarah; Nasrallah, Mona; Sanjad, Sami; Shamseddine, Fadi; Tannoury, Theresia; Yazbek, Soha; Youssef, Nour

The Department of Pediatrics and Adolescent Medicine offers clerkships to medical students. The clerkships concentrate on those aspects of children and adolescent healthcare that are important to any physician, including the management of healthy and sick children; peculiarities of disease in infancy, childhood and adolescence; and nutrition growth and development. These clerkships also concentrate on the importance of combining preventive with curative medicine. Graduate training is offered to physicians leading to specialization (residency) in pediatrics over a three-year period.

PEDT 246 Clinical Clerkship 35.360.
Daily assignments in the Outpatient Department (OPD) (general Pediatrics and subspecialty clinic) for 6 weeks and a 2-week inpatient rotation in the normal nursery and Neonatal Intensive Care Unit. Offered to third year students. Two months.

PEDT 267 Clinical Clerkship 0.360.
A clerkship consisting of daily assignments in the inpatient general Pediatric ward for 2 weeks and in the Children Cancer Center for 2 weeks. Offered to fourth year students. One month.

PEDT 268 Elective in Pediatrics 0.180-360.
Clinical electives are open to fourth year medical students. Laboratory research electives are open to students at all levels. Exposure of students to laboratory research in neurogenetics, molecular biology, infectious diseases, and basic cardiology; or to a special area of clinical pediatrics of the student's choice, including pediatric cardiology, neurology,

hematology-oncology, infectious diseases, pediatric critical care and neonatal intensive care. One to two months.

PEDT 287 Internship 0.786.
A two- to three-month rotation each in the hospital wards, ambulatory services or newborn nursery.

PEDT 288 Straight Internship 0.2882.
Interns spend 11 months in the Department of Pediatrics and Adolescent Medicine at the hospital (PL-1) and in affiliated hospitals.

Weekly Conferences

Ward rounds (daily), radiology conferences, journal clubs, pediatric grand rounds, morbidity and mortality conferences, core curriculum lectures and specialty conferences (adolescent medicine morbidity review, hematology/oncology, neonatology, infectious diseases, critical care and pediatric cardiology).

Department of Pharmacology and Toxicology

Chairperson:	Sabra, Ramzi
Professors:	Sabra, Ramzi; Khoueiry Zgheib, Nathalie
Professor Emeritus:	Cortas, Nadim; Simaan, Joseph
Associate Professosr:	El-Najjar, Nahed; Zouein, Fouad
Associate:	Puzanian, Houry

The field of pharmacology embraces knowledge of the history, sources, physical and chemical properties, compounding, biochemical and physiological effects, mechanisms of action, absorption, distribution, biotransformation, excretion, and therapeutic and other uses of drugs. The Department of Pharmacology and Toxicology offers mainly graduate courses for students in the medical, biomedical and nursing fields. Only one undergraduate course is available, specifically designed for students pursuing a BS in Nursing.

Graduate courses include those offered to medical students, graduate students in the biomedical sciences pursuing either a MS or PhD, degree, and graduate students in the MS in Nursing program. With the complete integration of the preclinical years in the medical program, pharmacology teaching occurs throughout the first two years of medical training within integrated, mostly organ-system based, courses. In addition, sessions in clinical pharmacology are offered during the third year of medical school as a separate 1-credit course.

The MS graduate program in the department (in the discipline of Pharmacology and Therapeutics) consists of a minimum of two years of didactic and research training leading to the degree of Master of Science. Students who wish to enroll must have a BS and must have taken undergraduate courses in biology, chemistry (including organic chemistry) and physics. Required courses within the program include courses within the disciplines of biochemistry, physiology and cell biology, and the PHRM 300 course (see below) for a total of 21 credits, followed by a thesis (PHRM 399).

The PhD in Pharmacology and Toxicology is offered within the PhD program in biomedical sciences (refer to Faculty of Medicine and Medical Center – PhD Program in this catalogue).

PHRM 240 Pharmacology and Therapeutics 48.0; 3 cr.
A presentation of the chemistry, pharmacological effects, and therapeutic usefulness and toxicity of drugs. Designed to meet the requirements of the BS in nursing.

PHRM 300 Pharmacology and Toxicology 7 cr.
A general course dealing with the chemistry, general properties, pharmacological effects on the various systems, therapeutic usefulness and toxicity of drugs. A separate section deals with toxicology. Offered to graduate students.

PHRM 307/308 Tutorial in Pharmacology 0.96; 3 cr. (each)
An introduction to research.

PHRM 309/310 Pharmacology Seminar 0.32; 1 cr. (each)
Pharmacology Seminar

PHRM 314 Advanced Pharmacology and Therapeutics 48.0; 3 cr.
The course covers the basic pharmacology of various drug classes and emphasizes clinical practice perspectives. Designed to meet the requirements of the MS degree in nursing. Prerequisites: PHRM 240 (or its equivalent) and NURS 504.

PHRM 260 Elective in Pharmacology 0.180-360
An introduction to biochemical and physiological methods in use in pharmacology, offered to 4th year medical students as an elective clerkship. One to two months.

PHRM 315 Principles of Pharmacology 19.21; 2 cr.
A course that covers the basic principles of drug action including pharmacokinetics, pharmacodynamics, pharmacogenetics, drug resistance, tolerance and toxicity, and pharmacovigilance; it explores mechanisms of action of major drug classes.

PHRM 333 Clinical Pharmacology 16; 1 cr.
This course is offered to third year medical students. It covers rational prescribing and prescription writing in outpatients and special populations. The goal is to prepare medical students for the practice of safe and effective pharmacotherapy.

PHRM 395 A/B Comprehensive Exam 0 cr.
Prerequisite: Consent of advisor.

PHRM 399 A/B/C/D/E MS Thesis 9 cr.
MS Thesis

Department of Psychiatry

Chairperson:	Maalouf, Fadi
Professors:	Khoury, Brigitte; Maalouf, Fadi
Associate Professors:	Akoury Dirani, Leyla; Talih, Farid
Assistant Professors:	Barakat, Marc; Baroud, Evelyne; Bizri, Maya; El Hayek, Samer (Adjunct); Ghossoub, Elias; Khoury, Rita; Shamseddeen, Wael
Instructors:	Ayna, Dinah; Dandan, Nadia Tina
Clinical Associates:	Bazzi, Zeinab; Farhoud, Leila; Haddad, Ramzi; Ismail, Ghina

The Department of Psychiatry offers a course to Med II students and a clinical clerkship to Med III students, a post-graduate residency training program in Psychiatry as well as clinical electives to interns and residents.

PSYT 227 Human Development and Psychopathology 32.36; 3 cr.
This course covers psychopathology through a lifespan approach. It specifically covers social, emotional and cognitive aspects of human development in addition to the psychopathology of major psychiatric disorders (neurodevelopmental, mood, anxiety, psychosis and substance use disorders, etc.). It also introduces pharmacological and non-pharmacological approaches to the management of patients. A variety of teaching/learning techniques are implemented including didactics and team-based learning.

PSYT 252 Clinical Clerkship in Psychiatry 0.180.
A clinical clerkship in which third year medical students spend one month working on psychiatric patients and attending morning rounds on an inpatient psychiatric service where they are supervised by an attending psychiatrist. Students also attend psychiatry clinics in the outpatient department where they see new and old cases. The rotation also includes seminars dealing with psychopathology, case presentations and discussions, interview techniques and basic psychotherapy, as well as psychopharmacology. One month.

Clinical Psychology Training Program

The AUBMC Department of Psychiatry offers a Clinical Psychology Training Program leading to a certificate of training in clinical psychology. Students are admitted only if they intend to complete the two academic year program.

During the first year, students follow adult and child and adolescent training. They are expected to master the diagnosis and treatment plan process. They are also initiated into individual and group psychotherapies. Note that the first year could be considered as practicum courses within the master's degree program.

The second year can be offered at a post-MA training level. Students choose one of two tracks which include an adult or a child and adolescent track. At the end of the second year, they are expected to develop the expertise to carry out comprehensive clinical diagnoses and treatment plans and to conduct psychotherapy.

Application Process

Second year master's level Clinical Psychology students enrolled in Lebanese universities or abroad are eligible to apply provided they have taken the prerequisite courses at the graduate level. Students in doctorate programs may also apply for the training. Other requirements are a GPA of 3.3 or above and a proficiency in Arabic and English languages.

Applications should be submitted to the Department of Psychiatry and addressed to Mrs. Nibal Safah at ns54@aub.edu.lb. After an initial screening and verification of credentials, selected applicants will be interviewed. The first-year course requirements for students with a master's degree or a doctorate degree in Psychology may be waived if supported by available transcripts.

Application Material

The following are required to be submitted when applying:

- An updated CV
- Copies of transcripts of grades for undergraduate and graduate courses
- A statement of purpose indicating your interest in the program, past achievements and experiences, your goals from the programs and your future career plans. Other relevant issues can also be included
- One photo
- Copy of passport or Lebanese ID

Application: From January 6, 2025, till April 30, 2025

Prerequisite Courses

- Graduate course in Psychopathology
- Graduate course in Psychotherapy Theories
- Graduate course in Developmental Psychology (for those who are interested in the child track)
- Graduate course in Psychological Testing and Assessment

English Requirement

Applicants to the graduate program, other than AUB graduates and graduates of colleges or universities recognized and located in North America, Great Britain, Australia and New Zealand, must meet the Readiness for University Studies in English (RUSE). For more information, refer to page 38.

The program consists of 4 courses (one per term) taken in sequence.

The courses are as follows:

1st year:

PSYT 300 Clinical Psychology Practicum I: 4.0 cr.
Immersion and Observation
The clinical training in this course includes observation of patient interviews, and participation in clinical interviews conducted in a group format, assessment, and treatment of patients from different age groups (adult, adolescents, and children) and backgrounds

and with a variety of presenting problems. Trainees will also be able to practice clinical interviewing and diagnoses with patients they will see. Clinical training will be under the direct supervision of qualified clinical academic faculty.

PSYT 301 Clinical Psychology Practicum II: 4.0 cr.
Diagnosis and Treatment Plan
The second course of the clinical training will involve direct patient contact for trainees who will be assigned a certain load of patients. They will formulate a diagnosis and establish a treatment plan based on the patient's needs. They will learn to practice in a bio-psychosocial model of treatment. Advanced clinical training will be under the direct supervision of qualified clinical academic faculty.

2nd year:

PSYT 302 Clinical Psychology Practicum III: 6.0 cr.
Psychotherapy I
During this course, trainees will carry their own load of individual patients, which they will follow in weekly psychotherapy sessions. They will be trained in Cognitive Behavioral therapy and Psychodynamic therapy. They will also be introduced to in-patient care. Introduction and training in group therapy is possible at this level with psychology interns being co-moderators within groups. Advanced clinical training will be under the direct supervision of qualified clinical academic faculty.

PSYT 303 Clinical Psychology Practicum IV: 6.0 cr.
Psychotherapy II
During this course, trainees will carry their own load of individual adult or child patients, which they will follow in weekly psychotherapy sessions. They will also be participating in in-patient care of patients admitted to the Psychiatry unit as well as conducting psychological assessment and testing whenever needed. Advanced clinical training will be under the direct supervision of qualified clinical academic faculty.

Department of Radiation Oncology

Interim Chairperson:	Eid, Toufic
Professor:	Issa, Philip (Emeritus)
Associate Professor:	Youssef, Bassem
Assistant Professors:	Ayoub, Zeina; Bodgi, Larry; Eid, Toufic; Hilal, Lara; Jalbout, Wassim; Shahine, Bilal

RADO 260 Introduction to Radiation Oncology 0.180
An elective clerkship that introduces the student to the basic principles, techniques and application of radiation oncology. One month.

RADO 287 Internship 0.262-1.048
An elective in radiotherapy. Open to interns. One to four months.

RADO 288 Residency Training in Radiation Oncology
Open to interns after graduation and one year internship in any clinical specialty. The program extends over four years with short elective rotations in pathology, medical oncology, radiology, pediatric oncology and research.

RADO 290 Clinical Training in Medical Physics
Short intensive course open to medical physicists who need to acquire skills in modern radiotherapy physics and clinical training on modern equipment.

RADO 291 Medical Physics to Medical Residents
Medical physics courses open to Medical Radiation Oncology residents to prepare them for their Radiation Oncology exam/certification.

RADO 292 Medical Physics Residency Training in Radiation Oncology (Program under construction)
Open to Medical Physics program graduates. The program extends over two years and includes didactic as well as clinical training.

Department of Surgery

Chairperson:	Hoballah, Jamal
Professors Emeriti:	Khalil, Ismail
Professors:	Al-Halees, Zohair (Adjunct Clinical); Abi Saad, Georges; Atiyeh, Beshara (Clinical); Bulbul, Mohamad (Clinical); Haddad, Fady; Haidar, Rachid; Hoballah, Jamal; Khalifeh, Mohammad; Khauli, Raja; Khoury, Ghattas (Clinical); Najjar, Marwan; Obeid, Mounir; Saghieh, Said; Sawaya, Raymond; Skaf, Ghassan (Adjunct)
Associate Professors:	Abbas, Jaber (Clinical); Akel, Samir (Clinical); Bakhach, Josephzz Deeba, Samer (Clinical); El Hajj, Albert; Haddad, Raja (Clinical); Ibrahim, Amir; Nasr, Rami; Sagherian, Bernard; Sfeir, Pierre; Sfeir, Roger (Clinical)
Assistant Professors:	Bachir, Bassel; Baddoura, Omar (Clinical); Darwish, Hussein; Doughan, Samer (Clinical); El Lakis, Mustapha; Hussein, Maher (Clinical); Kreidieh, Ibrahim (Clinical); Lakkis, Suheil (Clinical); Sbaity, Iman; Sidani, Mustafa (Clinical); Sunna', Tarek (Adjunct); Tayim, Ahmad; Wazzan, Wassim (Clinical); Zaghal, Ahmad
Instructors:	Abiad, Firass (Adjunct); Amine, Ali; Nasser Eddine, Mohamad, Nassereldine, Rakan
Clinical Associates:	Abdelnoor, John; Attieh, Christian; Bazi, Tony; Bitar, Elias; Chahine, Fadl; Daher, Ronald; Harakeh, Ayman; Hushaymi, Ibrahim; Jassar, Yehya; Msheik, Mayyas; Murr, Chadi; Rahhal, Salim, Sakr, Ghazi; Sayyed, Khaled

The Department of Surgery offers courses, graduate clerkships, and specialty electives to medical students. It also offers post-graduate training to MD graduates including residency and subspecialty fellowships.

Post-Graduate Training

The Department of Surgery offers two tracks of residency training which include a one-year of internship in preliminary track required for any further specialization and a categorical track for residency training in General Surgery, Neurosurgery, Orthopedic Surgery, Plastic Surgery and Urology. Trainees are selected during or after their last year of medical school.

The training programs in the categorical track consist of a five-year training program in general surgery, a seven-year training program in neurosurgery, including two prerequisite years of general surgery, a six-year training program in orthopedic surgery, and urology, including prerequisite one year in general surgery and a second year of other surgical and non-surgical rotations, and a seven-year training program in plastic surgery including three prerequisite years in general surgery.

All residency programs are structured to conform to the requirements of the Lebanese Order of Physicians, Arab Board of Surgery, and the Accreditation Council for Graduate Medical Education-International (ACGME-I).

All the surgical residents in the General Surgery training and rotations participate in the didactic curriculum established by the Surgical Council on Resident Education (SCORE).

All junior surgical residents are enrolled in the ACS Fundamentals of Surgery Curriculum. In addition, an elaborate skills lab curriculum including basic and advanced open and laparoscopic skills is provided.

All first year categorical residents are required to join the institutional Fellowship and Residency Research Program (FRRP) and to carry out one research project throughout their residency or fellowship period.

All residents are required to take and maintain their BLS and ACLS certification offered at AUBMC. They are also required to take the Advanced Trauma Life Support (ATLS) course, which is currently offered by AUB and the American College of Surgeons-Lebanon Chapter. All senior general surgery and urology residents are required to get FLS certification offered at the AUBMC-Department of Surgery that is an approved international FLS test center.

All surgical residents shall have memberships in societies or associations pertinent to their specialty of training which are the Resident and Associate Society of the American College of Surgeons (RAS-ACS) for all General Surgery, Neurosurgery and Plastic Surgery, the American Academy of Orthopedic Surgeons (AAOS) for Orthopedic Surgery, the American Society of Plastic Surgery (ASPS) Education Network (EdNet) for Plastic Surgery residents, and the American Urological Association (AUA) for Urology residents.

Starting February 2011, the General Surgical residents were allowed to sit for the annual International American Board of Surgery In-training Exam (I-ABSITE). The General Surgery Residency program was accredited by the Royal College of Surgeons in Ireland (RCSI), and general surgery residents will be eligible to sit for the RCSI after they fulfill the needed requirements. All our residency programs (General Surgery, Neurosurgery, Orthopedic Surgery, Plastic Surgery and Urology) are accredited by the ACGME-I.

As of 2013, General Surgery graduates became eligible to sit for the European Board of General Surgery Certification exam.

The Department of Surgery also offers the following fellowships: a two-year fellowship training program in Trauma and Surgical Critical Care, a one-year fellowship training program in Surgical Critical Care, a two-year fellowship training program in Vascular Surgery, and a two-year Complex general surgery oncology fellowship training program.

SURG 246 Clinical Clerkship 44.540.

The third year surgery clerkship at AUBMC is an 8-week rotation consisting of 6 weeks on a core general surgical service (2 weeks on each General Surgery team, Team A, Team B, and Team C), and 2 weeks on subspecialty surgical services (orthopedic surgery, neurosurgery, urologic surgery, or plastic surgery). The goal of the surgery clerkship is to introduce the student to the principles of caring for the surgical patient. This goal is accomplished by allowing the student to participate in the care of patients at the various stages of evaluation and treatment by the surgical faculty and their teams. These stages include, but are not limited to, the preoperative office or clinic visit, inpatient admission, operative procedures, and inpatient and outpatient recovery.

The clerkship is structured on the principle that learning is an active process, which can be accomplished only by the student. The role of the faculty and House staff is to provide

guidance, motivation, and stimulate their interest in surgical pathology. The third year clerkship educational experience is supplemented by a core curriculum set of lectures/ clinical case discussions covering all the basic topics in general surgery and the surgical specialties, as well as multiple problem-based learning sessions designed by various faculty members. In addition, students participate in weekly teaching rounds with the Attending on-call in the pertinent rotation, as well as a weekly clinical case discussion with the Chairman. Students are required to attend all educational activities held in the department.

SURG 268 Elective in Surgery 0.180-360.
AUB fourth year students may elect to rotate through one or more of the following disciplines: general and pediatric surgery, neurosurgery, orthopedic surgery, plastic surgery, and urology. Non-AUB third and fourth year medical students may elect to rotate through one or more of the following disciplines: general (including pediatric surgery, cardiovascular surgery), neurosurgery, orthopedic surgery, plastic surgery and urology, depending on availability of spots. Non-AUB students act as observers only, for a period of one to two months. Knowledge of English is necessary. No elective will be offered in the months of July and August.

SURG 269 Selective in Surgery 0.180-360.
This selective is offered to fourth year AUB medical students only in General and Plastic Surgery. The program can accommodate up to two selective candidates at any point in time. Students rotating as selective will be evaluated on their efforts and participation during ward rounds and in the operating room. Students are expected to demonstrate appropriate bedside clinical presentations, diagnostic evaluation and the ability to develop and implement a management plan. Students are also expected to demonstrate ability in basic surgical skills such as suturing and knot tying. The faculty and the chief resident of the service will evaluate the individual student and will summarize the overall performance. In addition, students are offered a written MCQ exam at the end of the rotation. No selective will be offered in the months of July and August.

SURG 288 Straight Internship 0.2882.
The surgical interns are post-graduate first year trainees, selected by the Department of Surgery during or after their last year of medical school: previous academic performance, research experience, personal motivation, career goals and potential to achieve a successful academic and clinical career in surgery are evaluated during the selection process. The interns function as an integral part of the resident staff. Workup and general care of patients are the major responsibilities of the interns. They perform surgical procedures under supervision and actively participate in the various bedside rounds and educational conferences of the department. The interns rotate in General Surgery specialty teams and through other subspecialty services as per training requirements.

Conferences

A Departmental Grand Round is held once a month. Each division has its own weekly conference and teaching activities. Bedside teaching rounds are held at least once or twice a week. The trend is more toward bedside teaching rather than didactic teaching. A quality improvement conference is held biweekly in most divisions. Didactic teaching conferences are held each Tuesday and Thursday at 6:45 am to cover the surgical curriculum, pathology and journal club reviews.

Pathology and Journal Club Reviews

Special lectures are delivered as the occasions arise, especially with visiting professorship lectures. Journal clubs are held monthly in all specialties.

Affiliations

Currently there are several affiliations with the Department of Surgery based on agreements of cooperation:

- Makassed Hospital (since March 4, 1982)
- Rafic Hariri University Hospital (since June 9, 2005 for urology, since July 2017 for Plastic Surgery)
- Mount Lebanon Hospital (since August 2010)
- Najjar Hospital (since February 2010)
- Bikhazi Hospital (2015)
- King's College Hospital England (since 2014 for Transplant Rotation)
- General Hospital of Athens "G. GENNIMATAS" (since 2016; for Plastic Surgery)

Additional affiliations are being explored.

Introduction to Radiobiology: Introducing short course to Radiation Oncology residents, addressing biological principles of radiation oncology. Over a period of two months.

Weekly Conferences

Multidisciplinary Tumor Board: GU MDT, GI MDT, Breast MDT, Thoracic MDT, Head and Neck MDT, GYN MDT, Malignant Hematology/BMT, Rare tumors MDT. In addition to the Multidisciplinary radiation oncology case reviews and Journal Clubs. The department participates in the teaching activities of the oncology section of the Department of the Internal Medicine.

Joint Programs

Scholars in Health Research Program (SHARP)

Director:	El Hajj Fuleihan, Ghada
Diploma Director:	Tamim, Hani
Executive Committee:	Tamim, Hani; Nabulsi, Mona; Huda; Sibai, Abla; Zeina Kanafani

Background

The Scholars in HeAlth Research Program is a joint FM and FHS graduate program that consists of a 12-credit summer diploma, a 12-credit two-semester diploma, as well as a 35-credit master's degree. The summer diploma, two-semester diploma, and the MS degree are open to graduates of health fields. Social scientists and humanities graduates interested in Non-Communicable Diseases (NCD) can also enroll in the program, provided they fulfill admission and selection criteria and have the necessary background to follow the course curriculum. Credits earned for the SHARP summer diploma and two-semester diploma can be credited towards the Master of Science in Health Research requirements. These credits can also be credited in full or partly towards other post-graduate degrees at FM, FHS, FAFS, or HSON and possibly at other institutions.

SHARP provides graduates with the required foundation to pursue a career in clinical and translational research. Although focused on NCD, a major cause of mortality and morbidity in the region, the garnered skills are applicable to other areas of clinical research. The Program helps create and sustain a cadre of highly trained researchers who conduct patient-oriented and population-oriented studies on NCD. It also equips trainees with management and leadership skills needed to become "change agents" and lead research groups, academic departments or other health care settings. Management and leadership courses are offered in collaboration with faculty at the Olayan School of Business.

Mission

The Mission of the Scholars in HeAlth Research Program (SHARP) at the American University of Beirut (AUB) is "To provide superior didactic education complemented with state-of-the-art interactive and practical training in health research, with a focus on Non-Communicable Diseases research. It is intended for physicians and other health care professionals, to improve and advance the health care agenda for Non-Communicable Diseases in Lebanon and the region."

SHARP Diploma Curriculum

The SHARP diploma is a 12-credit module that provides the essential foundations in quantitative methods and fundamental skills to conduct research. The core disciplines covered include epidemiology, biostatistics, research ethics and library sciences/informatics. These are complemented with a practical hands-on training course in the analysis and reporting of large health-related datasets in NCD. The SHARP diploma is offered as an intensive summer program and as a two-semester online program.

SHARP Master of Science in Health Research

Admission to the Program

The application deadline for the summer diploma is in March, and the acceptance is in April of each academic year calendar. The application deadline for the two-semester diploma is in March, and the acceptance is in May of each academic year calendar. The application deadline for the MS degree in Health Research is in June, and the deadline for acceptance is in July of each academic year calendar. The SHARP diploma (either summer or two-semester) is a prerequisite for the SHARP MS program, and the performance in the diploma is evaluated to ensure the candidate is suitable for continuing on the MS path. Students should apply to the MS program by early June and are accepted upon successful completion of the diploma program (minimum GPA 3.3). While the 2-year program is approved for all, the 1-year program is approved by the Lebanese Ministry of Education for medical doctors only. For more details, please refer to the Admissions section of the AUB graduate catalogue, page 29.

Criteria for Admission

All applicants to the SHARP summer diploma and two-semester diploma and the Master of Science in Health Research must satisfy the criteria established at AUB for enrollment into a master's degree program, namely the Readiness for University Studies in English (RUSE) (see page 38 of this catalogue) and a minimum degree of BS with a minimum GPA of 3.3 or its equivalent.

In addition, applicants should express/demonstrate commitment to a career in NCD research in the statement of purpose submitted along with their application.

Applications for the summer program are reviewed by the SHARP executive committee.

Applications for the MS program are reviewed by the joint FM/FHS Graduate Studies Committee.

The Application Process

An applicant is considered for admission to the SHARP summer diploma and two-semester diploma and the MS program if s/he meets the following minimum admission requirements:

- an undergraduate cumulative GPA of at least 3.3 (or standardized equivalent from other institutions of higher learning) leading to a bachelor's degree or its equivalent from recognized institutions of higher learning
- at least two letters of recommendation
- a statement of purpose (500-word limit) indicating the purpose for applying to the program and specifying the applicant's research interests and/or practical experience

Applicants to any graduate program, other than AUB graduates and graduates of recognized colleges or universities in North America, Great Britain, Australia and New Zealand must demonstrate proficiency in the English language. See Admissions section in this catalogue, page 29.

Graduation Requirements

See General University Academic Information in this catalogue, page 95.

Incompletes

See General University Academic Information in this catalogue, page 78.

Probation

See General University Academic Information in this catalogue, page 80.

Program Outline

The 35-credit master's degree requirements can be completed over one full-time year (available to Doctor of Medicine graduates only) or two part-time years. The total number of allowed credits per term is 16 unless otherwise approved by the joint FM/FHS Graduate Studies Committee. The degree consists of the 12-credit diploma in addition to 15 credits in required courses, 2 credits of electives and 6 credits for the thesis. The thesis is a mentored research project culminating in the completion of a project revolving around Non-Communicable Diseases. In compliance with AUB requirements, scholars must also sit for a 0-credit comprehensive exam (Pass/Fail) during their last term.

Program Delivery

The 35-credit program is divided as indicated below:

- **Summer diploma and two-semester diploma:** The 12-credit diploma, taken as either an intensive diploma in the summer, or an online two-semester diploma, consists of five courses: Biostatistics (4 cr.), Principles of Epidemiology (4 cr.), Introduction to Research Ethics and Responsible Conduct of Research (1.5 cr.), Analysis and Reporting of Large Clinical Datasets (2 cr.) and Library Science/Informatics (0.5 cr.). These courses consist of didactic lectures, faculty-facilitated discussion groups, laboratory sessions and group projects. The courses in epidemiology and biostatistics are held in conjunction with the Faculty of Health Sciences (FHS), while the Introduction to Research Ethics and Responsible Conduct of Research is held in conjunction with the Salim El-Hoss Bioethics and Professionalism Program (SHBPP).
- **Courses:** Students are required to take a total of 15 credits in required courses, 2 credits of elective courses.
- **Thesis:** Each student is required to select a clinical research project and identify advisor(s) from among the Faculty of Medicine (FM) and Faculty of Health & Science (FHS) engaged in clinical research. Mentors and projects are approved by the joint FM/FHS Graduate Studies Committee (GSC). For those pursuing the 2-year track, the research project typically begins in the Spring term of the student's first year and culminates in a thesis document and oral thesis defense delivered before the end of the second academic year. For those choosing the 1-year track, the process begins early in the Fall term and ends in the Spring term of the same academic year. All projects are supervised by a thesis committee.

Comprehensive Examination

Each student is expected to pass a 0-credit comprehensive examination course after completion of all required courses. If a student does not pass the comprehensive exam, s/he is allowed to take it a second time in the following term as per AUB regulations. The Comprehensive Examination has a Pass (P) or Fail (F) format, and timing of the examination is set by the program.

Tracks

Master of Science: 1-Year Program

12 credit diploma	Course Title	Faculty	Credits
Principles of Epidemiology/Design and Analysis of Epidemiological Studies	SHRP 300/320	SHARP	4 credits
Basic Biostatistics	SHRP 310	SHARP	4 credits
Introduction to Research Ethics and Responsible Conduct of Research	SHRP 315	SHARP	1.5 credits
Analysis and Reporting of Large Clinical Datasets	SHRP 330	SHARP	2 credits
Library Science / Informatics	SHRP 325	SHARP	0.5 credits
Fall – 13 credits	**Course Title**	**Faculty**	**Credits**
Design and Analysis of Clinical Trials	EPHD 321	FHS	2 credits
Clinical Trial Protocol	SHRP 321A	SHARP	2 credits
Leadership and Behavior in Organizations	MNGT 306	OSB	3 credits
Thesis	SHRP 400	SHARP	6 credits
Spring – 10 credits	**Course Title**	**Faculty**	**Credits**
Systematic Review and Meta-Analysis	EPHD 328	FHS	3 credits
Public Health Policy and Advocacy	PBHL 304	FHS	3 credits
Comprehensive Examination	SHRP 395A	-	0 credits
Elective	-	-	2 credits
Advances in NCD Research	SHRP 340	SHARP	2 credits
Thesis	SHRP 400A	SHARP	0 credits

Master of Science: 2-Year Program

12 credit diploma	Course Title	Faculty	Credits
Principles of Epidemiology/Design and Analysis of Epidemiological Studies	SHRP 300/320	SHARP	4 credits
Basic Biostatistics	SHRP 310	SHARP	4 credits
Introduction to Research Ethics and Responsible Conduct of Research	SHRP 315	SHARP	1.5 credits
Analysis and Reporting of Large Clinical Datasets	SHRP 330	SHARP	2 credits
Library Science / Informatics	SHRP 325	SHARP	0.5 credits
Fall I – 4 credits	**Course Title**	**Faculty**	**Credits**
Design and Analysis of Clinical Trials	EPHD 321	FHS	2 credits
Clinical Trial Protocol	SHRP 321A	SHARP	2 credits
Spring I – 9 credits	**Course Title**	**Faculty**	**Credits**
Systematic Review and Meta-Analysis	EPHD 328	FHS	3 credits
Thesis	SHRP 400	SHARP	6 credits

Fall II – 5 credits	**Course Title**	**Faculty**	**Credits**
Leadership and Behavior in Organizations	MNGT 306	OSB	3 credits
Thesis	SHRP 400A	SHARP	0 credits
Elective	-	-	2 credits
Spring II – 5 credits	**Course Title**	**Faculty**	**Credits**
Public Health Policy and Advocacy	PBHL 304	FHS	3 credits
Advances in NCD Research	SHRP 340	SHARP	2 credits
Thesis	SHRP 400B	SHARP	0 credits
Comprehensive Examination	SHRP 395A/B	-	0 credits

Course Descriptions

Required Courses

SHRP 300 Principles of Epidemiology 2 cr.
A course in principles, concepts and application of epidemiology tools relevant to public health and clinical practice. The course covers basic principles of epidemiology related to disease occurrence, distribution and determinants. Topics include rubrics of epidemiology, morbidity and mortality measures, sources of data, epidemiologic study (cross-sectional, case-control, cohort studies and clinical trials), casual inference and causation in epidemiology. The course consists of lectures, assigned readings and complementary practical sessions. Equivalent to EPHD 300.

SHRP 320 Design and Analysis of Epidemiological Studies 2 cr.
The course covers in detail methodological issues related to study design and conduct, data analysis, interpretation of results and inference in epidemiological research. Problems of exposure and disease definitions, information and selection biases, confounding and effect modification are considered. Students are required to critique and discuss epidemiological studies and to lead in the write-up of a research study protocol for design and conduct of an epidemiologic study. Equivalent to EPHD 320. Equivalence to be discussed with FHS on a case-by-case basis and as needed.

SHRP 310 Basic Biostatistics 4 cr.
This course is an introduction to basic statistical techniques applied to health sciences and related fields. The objectives are twofold: descriptive statistics, which encompass techniques for organizing and summarizing data, and inferential statistics, from estimation to confidence interval and testing of hypotheses. Applications include probability distribution, comparing population means (t-tests) or proportions (X2 squares) for data obtained from paired or independent samples, significance testing, sample size calculation and power, stratified and matched analyses, and one-way ANOVA. Also, it introduces simple linear regression, correlations, logistic regression and nonparametric methods for data analysis. Focus will be on problems that are commonly encountered in health services and biomedical research. Equivalent to EPHD 310.

SHRP 315 Introduction to Research Ethics and RCR 1.5 cr.
This course introduces students to the fundamentals of responsible conduct of research, emphasizing the ethical practice of human and animal research. The course recaps the history of ethical principles and the development of research codes of conduct and ethical practices, familiarizes investigators and faculty members with the different kinds of ethical

issues that they might come across throughout their careers, and allows scholars to reflect critically about what it means to be an ethical and responsible researcher. In RE & RCR, students will attend lectures, participate in discussions, analyze actual case studies and watch Audio-visual material. Most importantly, they will know how to conduct and assess research from an ethical standpoint.

SHRP 325 Library Science/Informatics 0.5 cr.
This introductory course spans five 1.5 hours sessions, and focuses on effective and efficient searching skills of the various medical and health-related resources. It also includes an introduction to the evidence-based practice concept and where and how to locate such documents, in addition on how to design a high sensitive search strategy for systematic reviews. Delivery of this course is through a mixture of live demonstration, hands-on exercises, and solving clinical scenarios. Offered only in Summer.

SHRP 330 Analysis and Reporting of Large Clinical Datasets I 2 cr.
This course will put into practice the statistical analysis and other computing skills introduced to scholars in EPHD 300/SHARP 300, EPHD 310/SHARP 310 and SHARP 325. The training format is a mixture of demonstrations, hands-on exercises and clinical scenarios. The course will simulate previously executed/published analyses on previously collected de-identified health research datasets. Scholars will go through the entire process experience of data handling, hypothesis-driven analysis design and culminate in the execution of statistical analysis (modeling) and presentation of results. In addition, this course will use existing datasets to familiarize scholars with commonly used health data analysis methods including survival analysis methodology and Cox regression multivariate modeling of survival data, and finally introduce propensity score approaches for risk-adjustment.

SHRP 340 Advances in Non-Communicable Diseases Research 2 cr.
The course examines a number of selected non-communicable diseases (NCD) given their morbidity and mortality burden at the local and regional level. Expert guest speakers are invited to discuss the public health importance of the topic; its burden; epidemiology (prevalence, patterns, determinants); theoretical and practical methodological challenges and opportunities in the conduct of epidemiologic studies; most recent findings in NCD research conducted in Lebanon and the region; and strategies for the prevention and control of NCDs. The course is an opportunity for students to be acquainted with researchers in Lebanon active in the field and to appreciate the scope and findings of the NCD studies conducted in Lebanon and the region. Students are expected to lead on a scoping review of a selected research question. Offered in Spring every 2 years.

EPHD 321 Design and Analysis of Clinical Trials 2 cr.
A course that focuses on issues in the design and organization of randomized controlled clinical trials: ethical and legal issues, patient selection, recruitment, masking and randomization, endpoint definition, protocol development and statistical analysis.

SHRP 321A Clinical Trial Protocol 2 cr.
This is a 2-credit course designed to complement EPHD 321 (Design and Analysis of Clinical Trials). It is structured around the development of a clinical trial protocol based on principles/concepts covered in parallel in EHPD 321. The course systematically covers all standard key items needed to describe a clinical trial protocol using the 33 items checklist of the 2013 SPIRIT (Standard Protocol Items: Recommendations for Intervention Trials) document. These items include detailed content description for: administrative information, protocol registration, participants, interventions, outcomes, assignment of interventions, data collection, data management, data analysis, monitoring, data sharing,

ethics and dissemination. Weekly assignments are designed to guide students in the production of a clinical trial protocol, covering sequential items of the SPIRIT checklist. The final paper consists of a fully developed protocol to implement a clinical trial that is suitable for submission for competitive funding and for publication in a peer- reviewed journal. Students will also give a PowerPoint presentation at the end of the course describing the protocol developed prior to submission of their final paper.

EPHD 328 Systematic Review and Meta-Analysis 3 cr.
The course is structured around the steps of executing a systematic review of trials of interventions: specifying the PICO question, searching for potentially relevant articles, selecting eligible studies, abstracting data, assessing risk of bias, conducting a meta-analysis, grading the quality of evidence and interpreting results. Weekly assignments are designed to guide students in the production of a systematic review. The final paper consists of a report of the systematic review suitable for publishing in a peer-reviewed journal. The course examines advances in Non-Communicable Disease (NCD) research and risk factors with special focus on methodological challenges and opportunities.

MNGT 306 Leadership and Behavior in Organizations 3 cr.
This course sets the base for proper understanding and micro-level analysis of the role of individual and group behavior in organizations. It is designed as two independent modules. Module I concerns organizational behavior while Module II concerns leadership. The course will serve as an introduction to behavioral aspects of the modern workplace, including such processes as leadership, communication, motivation, conflict resolution and team building, and the influence that the environment has on such behavioral patterns. The course will help students assimilate the different roles people play in an organization irrespective of their departmental positions or functional affiliations, and recognize the interactions inherent among people, structures and environments. Particular attention is accorded to leadership as a focal point of group processes and a critical ingredient in successful organizational endeavors and transformations. Through this course students will analyze, evaluate and apply management and organizational behavior concepts, approaches and tools to both novel business problems and situations and to managerial decision-making situations.

PBHL 304 Public Health Policy and Advocacy 3 cr.
This course introduces students to the relevant concepts and approaches in public health policy and advocacy. It will provide students with a basic understanding of the public health policymaking process as well as the basic elements of advocacy. The aim is to make MPH students informed of the complex nature about public health policy development, be critical consumers of health policy research and evidence, and analytical of the influence of various actors on the policy. Students will learn the stages of the policy process (i.e., agenda setting, policy development, policy implementation and policy evaluation). The field draws upon numerous disciplines. As such, course readings will be drawn from political science, sociology, biomedical sciences and policy studies. Students will also cover the basic elements of an advocacy process, including defining the issue, understanding the audiences and crafting advocacy strategies. Case studies, class discussions, and guest speakers will provide tangible examples of public health policy and advocacy processes at the national, regional and international levels. Ethics and equity considerations will be included in discussions related to concepts and application.

SHRP 395A Comprehensive Examination 0 cr.
Each student is expected to pass a comprehensive examination after completion of all required courses. Examinations may be written, oral or both. Timing of the examination is set by the program.

SHRP 400 Research Thesis 6 cr.
This is a 6-credit master's research course generally completed over two-three terms or more, after the SHARP required summer certificate program. The thesis research track for the SHARP MS degree program will be flexible provided its primary focus is related to NCD. The focus would be clinical trial based, or pertaining to NCD related outcomes or clinical epidemiology, or to the formulation of a health policy related to NCD. A meta-analysis is allowed as a thesis topic pending approval of the joint FM/FHS GSC. A passing grade on the comprehensive exam is also required and it will be followed by a thesis defense and document submission as required by AUB academic guidelines.

Electives

SHARP MS students are allowed a total of 2 credits of electives that can be taken either as established offered courses at any of the following faculties: FM, FHS, OSB, FAFS and HSON (including those listed below), or as tutorials (credits) and seminars (1 credit), provided they are post-graduate courses and are approved by the SHARP Director.

EPHD 324 Special Topics in Biostatistics 1-3 cr.
A course that covers selected topics in biostatistics of special interest to researchers and trainees in epidemiology and population health. Prerequisite: EPHD 310 or consent of instructor.

EPHD 312 Analysis of Continuous Data 3 cr.
A course that deals with concepts and methods for the analysis of continuous outcomes. The main focus is on multiple linear regression. Analytical means to control for confounding and effect modification while maximizing precision is explored. The methods of regression diagnostics are explained. Basic theory is considered; however, the emphasis is on application. Applications of the statistical techniques are carried out using the statistical package SPSS. Prerequisite: EPHD 310 or consent of instructor.

EPHD 313 Analysis of Categorical Data 3 cr.
A course that covers univariate and multivariate statistical techniques for categorical data. Topics include distributions; measures of association and inference for categorical data; log-linear models for multi-contingency tables; and logistic regression for binary, polytomous and ordinal responses. In addition, the concept of maximum likelihood estimation is introduced. Applications of the statistical techniques are carried out using the statistical package STATA. Prerequisite: EPHD 310 or consent of instructor.

HPCH 334 Qualitative Health Research 3 cr.
A course in which students advance their qualitative social research methodology and methods for public health research. Students revisit the underlying paradigms and use of qualitative methodology. Throughout this course, students refine their interviewing skills, train on how to manage qualitative data, apply systematic data analysis and produce a rigorous account of qualitative research findings through practical applications in Arabic and English. Prerequisite: PBHL 310 and PBHL 312 or (PHNU 300 & NFSC 307 & NFSC 301).

HMPD 300 Health Care Systems 3 cr.
This course deals with all the main components, resources and functions of health care systems. It is designed for graduate students to identify organizational and health system problems and apply systems thinking in resolving them. The course also introduces graduate students to the policy making and analysis of health system issues with particular focus on Lebanon and the Middle East region.

PBHL 310 Research Design 3 cr.
This course discusses principles of research design and the methods used in both quantitative and qualitative social research methodologies. Topics include formulation of research questions, literature review, sampling issues, methods of data collection and analysis. Practical ethical issues are also discussed.

HMPD 314 Project Management 2 cr.
A course that exposes students to current project management trends, best practices, and strategies that can aid in better management of projects and programs in health care settings.

SHRP 333 Longitudinal correlated measures 1 cr.
This course builds on the basic biostatistics course by developing regression models to analyze studies that involve correlated outcome data. Correlated outcomes occur in many study designs ranging from classic longitudinal follow-up studies to hierarchical designs where patient level outcomes are influenced by their physician and their health clinic. The correlation may adversely or beneficially affect the power of the study, leading to the need to estimate and adjust for the degree of correlation during analysis, as well as to adjust sample size calculations during the design of the study. Thirteen lectures will cover relevant topics including the concept of correlation, its impact on study design, the specific forms a correlation matrix can assume, and a detailed investigation of modeling longitudinal outcome data. Alternative methods for fitting correlated data including generalized estimating equations, random effects models, and fixed effects models, will be covered.

BIOM 375 Principles of Learning and Assessment 2 cr.
This course provides students with the theoretical background and approaches to teaching science at the university level with emphasis on the nature of science and learner cognition. In addition, students are expected to apply principles and techniques of teaching and assessment of science in a teaching context. Course offered to PhD students in Biomedical Sciences.

SHRP 345 Survival Analysis 1 cr.
This course provides students with the theoretical background and approaches to teaching science at the university level with emphasis on the nature of science and learner cognition. In addition, students are expected to apply principles and techniques of teaching and assessment of science in a teaching context. Course offered to PhD students in Biomedical Sciences.

SHRP 329A Guideline Development and Adaptation 1 cr.
This course provides students with the theoretical background and approaches to teaching science at the university level with emphasis on the nature of science and learner cognition. In addition, students are expected to apply principles and techniques of teaching and assessment of science in a teaching context. Course offered to PhD students in Biomedical Sciences.

SHRP 332 Applied Survival Analysis 1 cr.
This course introduces students to many of the basic principles of human behavior that effective managers apply when managing individuals and groups in organizations. These include individual differences in abilities and attitudes, perception, attribution and bias, motivation, group dynamics including teams and communication, power and politics, organizational culture, and organizational structure and design. Particular attention is given

to the psychological aspects of the employment relationship. Leadership is also highlighted as a crucial underpinning of group processes and as a decisive factor in organizational success, with the tone of leadership having important implications for HRM success.

SHRP 360 Introduction to Data Science 2 cr.
This introductory course will initiate trainees to the main concepts of the Data Science lifecycle, and to machine learning (ML) tools, their algorithms, to mine big data. During the 20 lectures students will learn: To develop an understanding of the data that one will use and how it was collected through significant exploration (exploration and understanding); To munge, wrangle, and manipulate data in order to get an informative, manageable data set; To explore the statistical relationships between the variables in the data, and generate hypotheses and intuition about the data prediction based on statistical learning tools such as regression, machine learning tools including classification and clustering, as well as deep learning techniques; To give the data back in a compelling form and structure, through visualization, stories, and interpretable summaries. The course will therefore allow students to understand the basics behind ML, their potential, as well as their limitations, and to learn data-driven protocols for assessing the quality of data sets. Students will use ML tools to develop and validate predictive models, in order to predict, diagnose, and design interventions to improve pre-defined outcomes. This will include health outcomes in population or cohort settings in general, and as they relate to NCDs in particular. Students will use trustworthy pre- selected large public data sets of relevance to NCDs including data sets on pollution, cancer and cardiovascular diseases, and learn how to pose and answer predictive questions around those data sets. The Data Science tools acquired by the trainees will culminate in a course project where they will apply knowledge and skills acquired on large (big) data sets on air pollution as well as on NCDs with a focus on cardiovascular diseases and cancer.

MS in Public Health Nutrition

The Master of Science in Public Health Nutrition is a new graduate program offered jointly by the Faculty of Agricultural and Food Sciences (FAFS) and the Faculty of Health Sciences (FHS) at AUB. Students may pursue the Master of Science in Public Health Nutrition in either a thesis or a non-thesis track. The successful completion of the degree will require 40 credit hours for both tracks. Credits must be earned within the Faculty of Agricultural and Food Sciences and the Faculty of Health Sciences.

For the non-thesis track, 38 credits out of the required 40 credits should be earned as core program courses, including a culminating experience and a practicum. Two credits must be acquired as one or two elective courses either earned within or at both faculties.

For the thesis track, students must complete a total of 34 credits as core courses and must work on a 6-credit thesis under the supervision of a thesis advisor and thesis committee and defend their thesis as per AUB graduate program policies.

The credit requirements for both the thesis and non-thesis track options are tabulated below.

Credit requirements for both the thesis and non-thesis options for the Master of Science in Public Health Nutrition

		Non-Thesis Track Credits	Thesis Track Credits
Year 1			
NFSC 301	Statistical Methods for Nutrition and Food Sciences	3	3
NFSC 306A	Community Nutrition	2	2
NFSC 307	Nutritional Epidemiology	3	3
PHNU 300	Fundamentals of Public Health Nutrition	3	3
PBHL 303	Design and Evaluation of Public Health Programs	3	3
PBHL 304	Public Health Policy and Advocacy	3	3
PBHL 306A	Workshop Series: Library and Literature Search Skills	0	0
PBHL 306B	Workshop Series: Proposal Writing and Literature Synthesis for Public Health Research and Practice	0	0
PHNU 304	Nutrition in Emergencies	2	2
HPCH 331	Theories in Health Promotion	2	2
HPCH 334	Qualitative Research in Health Promotion	3	3
Total year credits		**24**	**24**
Year 2			
HPCH 333	Social Marketing in Health Promotion	2	2
FSEC 310	Food and Nutrition Security	3	3
PHNU 301	Nutrition in the Life Cycle	3	3
PHNU 302	Nutrition-related Chronic Disease	3	3
PHNU 390	Practicum	2	0
PHNU 391	Integrative Learning Experience	3	0
	Elective	1	0
PHNU 396	Comprehensive Exam	0	0
PHNU 399	Thesis	0	6
Total year credits		**17**	**17**
Total credits		**41**	**41**

Core Courses (Thesis)

NFSC 301 Statistical Methods for Nutrition and Food Science 2.3; 3 cr.
This is an intermediate level course of statistics. Topics include introduction to designs in Nutrition and Food Science research; critical appraisal of literature; methods of describing data; statistical inference for means and proportions; linear and logistic regression, and an introduction to multiple regression. Prerequisites: STAT 210 or EDUC 227 and CMPS 209 or equivalent undergraduate course in statistics. Offered Fall and Spring.

NFSC 306A Community Nutrition 2.0; 2 cr.
In this course, students will be trained on the role of nutrition in improving the health and wellbeing of communities and will be equipped with skills required to conduct community-based assessment, as well as plan, implement, and evaluate community nutrition programs

and policies. The course combines theory and practice where students will discuss, analyze, and experiment with the theories of behavioral change and will apply the principles of nutrition education when tackling specific nutritional problems. Students will be provided with experiential learning opportunities to assess the health and nutrition needs of specific population groups. In addition, this course will give students the opportunity to plan, implement, and evaluate small-scale nutrition interventions to improve the health and well-being of individuals within select communities. Offered Spring.

NFSC 307 Nutritional Epidemiology 3.0; 3 cr.
This course deals with the design, conduct, analysis, and interpretation of epidemiologic studies related to nutrition, particularly the relationship between nutritional status, diet and disease. Prerequisites: STAT 210 or EDUC 227 and CMPS 209 or equivalent undergraduate course in statistics. Offered Fall.

PHNU 300 Fundamentals of Public Health Nutrition 3 cr.
This course introduces students to the field of public health nutrition, covering the fundamental pillars of the field; nutrition status and needs, assessments and planning, monitoring, and evaluating nutrition interventions. Students will be exposed to the theories and conceptual frameworks behind addressing nutrition-related health issues at a population level. Offered Fall.

HPCH 331 Theories in Health Promotion 2.0; 2 cr.
This course focuses on theories utilized to understand health determinants and outcomes and to promote individual and population health. Students will critically examine perspectives from health promotion and other social science disciplines through theoretical readings and empirical case studies. They will also discuss the merits and challenges of using theory to analyze health and to intervene at multiple levels from the individual to the structural levels. Prerequisite: PBHL 312 or (PHNU 300 and NFSC 307). Offered Spring.

HPCH 334 Qualitative Health Research 2 cr.
A course in which students advance their qualitative social research methodology and methods for public health research. Students revisit the underlying paradigms and use of qualitative methodology. Throughout this course, students refine their interviewing skills, train on how to manage qualitative data, apply systematic data analysis and produce a rigorous account of qualitative research findings through practical applications in Arabic and English. Prerequisites: PBHL 310 and PBHL 312 or (PHNU 300 & NFSC 307 & NFSC 301).

PHNU 301 Nutrition in the Life Cycle 3.0; 3 cr.
This course covers the nutritional needs of individuals in different stages of the life cycle, with a focus on maternal and child nutrition and nutrition in the elderly. Offered Fall.

PHNU 302 Nutrition-related Chronic Disease 3.0; 3 cr.
This course covers the epidemiology, etiology, and the medical and nutritional management of chronic diseases whose etiologies are nutrition-related. Offered Fall.

HPCH 333 Social Marketing in Health Promotion 2.0; 2 cr.
In this course, students will learn the theoretical underpinnings of social marketing, a framework used to develop strategies aimed to address social and public health issues and to design effective, sustainable, and ethically sound public health campaigns. As a service-learning course, students apply concepts acquired into the development of a social marketing plan for a local community partner organization, responding to selected public health issues. This course is offered in blended learning format and is based on a combination of different modes of delivery (online and face-to-face) and diverse models

of teaching and learning styles, providing students with an interactive and meaningful learning environment. Prerequisites: HPCH 331 and PBHL 303. Offered Fall.

FSEC 310 Nutrition Security: Assessment and Intervention Strategies 3.0; 3 cr.
This course introduces students to basic principles of nutrition security, community nutrition, and nutritional ecology; and highlights the role that nutrition plays in improving the health and wellbeing of communities. The course aims to equip students with the knowledge and skills required to conduct population-based nutrition research, assess the nutrition needs of a population, to plan, implement and evaluate community nutrition programs and policies based on evidence-based practice and taking into consideration cultural, social, and contextual dimensions. Offered Spring.

PHNU 304 Nutrition in Emergencies 2.0; 2 cr.
This course covers evidence-based community nutrition interventions in emergency situations that place vulnerable populations at risk of food insecurity and consequent malnutrition. Offered Summer.

PBHL 303 Design and Evaluation of Public Health Programs 2.2; 3 cr.
This course introduces students to the concepts and methods of public health program design and evaluation. Students will develop skills for assessing population needs for the development of health programs. The course then covers public health program design, including developing measurable objectives, identifying evidence-based intervention strategies, and planning for program implementation. Students will learn to select appropriate methods for impact and process evaluation of health programs. Prerequisites: PBHL 310 (waived for PHNU students) and PBHL 312 or (PHNU 300 & NFSC 307 & NFSC 301 & HPCH 334 (concurrently)). Offered Spring.

PBHL 304 Public Health Policy and Advocacy 3.0; 3 cr.
This course introduces students to the relevant concepts and approaches in public health policy and advocacy. It will provide students with a basic understanding of the public health policymaking process as well as the basic elements of advocacy. The aim is to make MPH students informed of the complex nature about public health policy development, be critical consumers of health policy research and evidence, and analytical of the influence of various actors on the policy process. Students will learn the stages of the policy process (i.e., agenda setting, policy development, policy implementation and policy evaluation). The field draws upon numerous disciplines. As such, course readings will be drawn from political science, sociology, biomedical sciences and policy studies. Students will also cover the basic elements of an advocacy process, including defining the issue, understanding the audiences and crafting advocacy strategies. Case studies, class discussions, and guest speakers will provide tangible examples of public health policy and advocacy processes at the national, regional and international levels. Ethics and equity considerations will be included in discussions related to concepts and application. Offered Spring.

PHNU 396 Comprehensive Exam 0 cr.
Comprehensive Exam

PHNU 399 MS Thesis 6 cr.
MS Thesis

Core Courses (Non-Thesis)

NFSC 301 Statistical Methods for Nutrition and Food Sciences 2.3; 3 cr.
This is an intermediate level course of statistics. Topics include introduction to designs in

Nutrition and Food Science research; critical appraisal of literature; methods of describing data; statistical inference for means and proportions; linear and logistic regression, and an introduction to multiple regression. Prerequisites: STAT 210 or EDUC 227 and CMPS 209 or equivalent undergraduate course in statistics. Offered Fall and Spring.

NFSC 306A Community Nutrition 2.0; 2 cr.
In this course, students will be trained on the role of nutrition in improving the health and wellbeing of communities and will be equipped with skills required to conduct community-based assessment, as well as plan, implement, and evaluate community nutrition programs and policies. The course combines theory and practice where students will discuss, analyze, and experiment with the theories of behavioral change and will apply the principles of nutrition education when tackling specific nutritional problems. Students will be provided with experiential learning opportunities to assess the health and nutrition needs of specific population groups. In addition, this course will give students the opportunity to plan, implement, and evaluate small-scale nutrition interventions to improve the health and well-being of individuals within select communities. Offered Spring.

NFSC 307 Nutritional Epidemiology 3.0; 3 cr.
This course deals with the design, conduct, analysis, and interpretation of epidemiologic studies related to nutrition, particularly the relationship between nutritional status, diet and disease. Prerequisites: STAT 210 or EDUC 227 and CMPS 209 or equivalent undergraduate course in statistics. Offered Fall.

PHNU 300 Fundamentals of Public Health Nutrition 3 cr.
This course introduces students to the field of public health nutrition, covering the fundamental pillars of the field; nutrition status and needs assessments and planning, monitoring, and evaluating nutrition interventions. Students will be exposed to the theories and conceptual frameworks behind addressing nutrition-related health issues at a population level. Offered Fall.

HPCH 331 Theories in Health Promotion 2.0; 2 cr.
This course focuses on theories utilized to understand health determinants and outcomes and to promote individual and population health. Students will critically examine perspectives from health promotion and other social science disciplines through theoretical readings and empirical case studies. They will also discuss the merits and challenges of using theory to analyze health and to intervene at multiple levels from the individual to the structural levels. Prerequisites: PBHL 312 or (PHNU 300 and NFSC 307). Offered Spring.

HPCH 334 Qualitative Health Research 3 cr.
A course in which students advance their qualitative social research methodology and methods for public health research. Students revisit the underlying paradigms and use of qualitative methodology. Throughout this course, students refine their interviewing skills, train on how to manage qualitative data, apply systematic data analysis and produce a rigorous account of qualitative research findings through practical applications in Arabic and English. Prerequisites: PBHL 310 and PBHL 312 or (PHNU 300 & NFSC 307 & NFSC 301).

PHNU 301 Nutrition in the Life Cycle 3.0; 3 cr.
This course covers the nutritional needs of individuals in different stages of the life cycle, with a focus on maternal and child nutrition and nutrition in the elderly. Offered Fall.

PHNU 302 Nutrition-related Chronic Disease 3.0; 3 cr.
This course covers the epidemiology, etiology, and the medical and nutritional management of chronic diseases whose etiologies are nutrition-related. Offered Fall.

HPCH 333 Social Marketing in Health Promotion 2.0; 2 cr.
In this course, students will learn the theoretical underpinnings of social marketing, a framework used to develop strategies aimed to address social and public health issues and to design effective, sustainable, and ethically sound public health campaigns. As a service-learning course, students apply concepts acquired into the development of a social marketing plan for a local community partner organization, responding to selected public health issues. This course is offered in blended learning format and is based on a combination of different modes of delivery (online and face-to-face) and diverse models of teaching and learning styles, providing students with an interactive and meaningful learning environment. Prerequisites: HPCH 331 and PBHL 303. Offered Fall.

FSEC 310 Nutrition Security: Assessment and Intervention Strategies 3.0; 3 cr.
This course introduces students to basic principles of nutrition security, community nutrition, and nutritional ecology; and highlights the role that nutrition plays in improving the health and wellbeing of communities. The course aims to equip students with the knowledge and skills required to conduct population-based nutrition research, assess the nutrition needs of a population, to plan, implement and evaluate community nutrition programs and policies based on evidence-based practice and taking into consideration cultural, social, and contextual dimensions. Offered Spring.

PHNU 304 Nutrition in Emergencies 2.0; 2 cr.
This course covers evidence-based community nutrition interventions in emergency situations that place vulnerable populations at risk of food insecurity and consequent malnutrition. Offered Summer.

PBHL 303 Design and Evaluation of Public Health Programs 2.2; 3 cr.
This course introduces students to the concepts and methods of public health program design and evaluation. Students will develop skills for assessing population needs for the development of health programs. The course then covers public health program design, including developing measurable objectives, identifying evidence-based intervention strategies, and planning for program implementation. Students will learn to select appropriate methods for impact and process evaluation of health programs. Prerequisites: PBHL 310 (waived for PHNU students) and PBHL 312 or (PHNU 300 & NFSC 307 & NFSC 301 & HPCH 334 (concurrently)) Offered Spring.

PBHL 304 Public Health Policy and Advocacy 3.0; 3 cr.
This course introduces students to the relevant concepts and approaches in public health policy and advocacy. It will provide students with a basic understanding of the public health policymaking process as well as the basic elements of advocacy. The aim is to make MPH student informed of the complex nature of public health policy development, be critical consumers of health policy research and evidence, and analytical of the influence of various actors on the policy process. Students will learn the stages of the policy process (i.e., agenda setting, policy development, policy implementation and policy evaluation). The field draws upon numerous disciplines. As such, course readings will be drawn from political science, sociology, biomedical sciences and policy studies. Students will also cover the basic elements of an advocacy process, including defining the issue, understanding the audiences and crafting advocacy strategies. Case studies, class discussions, and guest speakers will provide tangible examples of public health policy and advocacy processes at the national, regional and international levels. Offered Spring.

PHNU 390 Practicum 2.0; 2 cr.
The practicum is considered an essential part of the curriculum of students. Students gain practical experience working with organizations engaged in developing, implementing and /or evaluating community-based public health nutrition programs. This experience may be purely research-based for students aiming for more academic careers. Offered Spring.

PHNU 391 Integrative Learning Experience 3.0; 3 cr.
This course will allow students to apply knowledge and skills acquired throughout their graduate courses. Through this course, students will develop an understanding of how to conduct a community-based project or a research project beginning with the conception of ideas and concluding with depicting written results and discussing them, along with proper citations and procedures. Part I offered Fall and Part II offered spring.

PHNU 396 Comprehensive Exam 0 cr.
Comprehensive Exam.

List of Elective Courses

HPCH 301 Health Communication 2.0; 2 cr.
Health communication is an area of study that examines how human and mediated communication can influence the outcomes of health-care and health promotion efforts. This core MPH course introduces the students to the basic concepts of health communication and its scholarship, including the focal areas of health literacy and patient-provider communication, social marketing, health campaigns, risk communication, crisis communication, and health advocacy. In the course, students will discuss the ways communicating about health is influenced by individual, social, and societal factors. The course will provide students with tools to critically evaluate existing health campaigns and to outline strategies to effectively communicate with different audiences about health-related topics. They will also design culturally appropriate, evidence-based health messages, designed for specific publics. Through this course, students will also learn how to effectively communicate scientific information with different audiences (e.g., general population, experts, the media), appropriately choosing oral and written materials and communication channels.

NFSC 395 Graduate Seminar in Nutrition and Food Science 1.0; 1 cr.
Offered Fall and Spring.