Graduate Studies in Biomedical Sciences

The graduate program in Biomedical Sciences is designed to provide a multidisciplinary educational and training environment that will prepare them 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 pages 33–46 of this catalogue.

MS Disciplines

- Biochemistry  
  Refer to page 391
- Human Morphology  
  Refer to page 385
- Microbiology and Immunology  
  Refer to page 399
- Pharmacology and Therapeutics  
  Refer to page 415
- Physiology  
  Refer to page 387
- Neurosciences (Interfaculty)  
  Refer to page 389

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 general average of 80. 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, with a minimum general average of 80. 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, three credits of which may be a project and should follow a course of study approved by the department/program and by the Faculty Graduate Studies Committee of the faculty.

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 into 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 the 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
- Cell Biology of Cancer
- Microbiology and Immunology
- Neurosciences Program
- Nutrition
- Pharmacology and Toxicology
- Physiology

Academic Governance

Oversight of the DBMS Program occurs at three different 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 Deans 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 (85% or its equivalent in the major field of study) and a demonstrated, genuine interest in biomedical research.

Minimum requirements for admission into the program are:

- Students with a BS degree or its equivalent, in mathematics, biology, physics and chemistry in the Faculty of Arts and Sciences, as well as advanced courses in other medical science disciplines, are eligible to apply (accelerated track PhD). Applicants with other degrees such as Masters (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). Provide three letters of recommendation.
- General Graduate Record Examination (GRE) less than 5 years old (applicant can use unofficial scores in the application and send the official copy after the application submission deadline). Total score of minimum 304 (equivalent to 1100 converted old GRE score) in the verbal and quantitative reasoning sections of the GRE test. Students from non-English-speaking countries must show proficiency in the English language (refer to catalogue section on English Language Proficiency Requirement page 37).
- Provide a personal statement (500 words maximum).
- Be interviewed by the PhD Committee members.
• Be recommended for admission by the PhD Committee.

Financial Support
The PhD program offers, on a selective 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
Fifty 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 adviser 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 adviser, who must be selected not later than the end of the first year for students entering with MS.

Core Courses

<table>
<thead>
<tr>
<th>First Year</th>
<th>Course Name</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Nucleic Acids and Basic Genetics</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Protein Biochemistry</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Cellular Metabolism and Regulation</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Cell Physiology and Biophysics</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Receptor and Signal Transduction</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Cell and Tissue Biology</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Biostatistics</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Laboratory Rotation</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Methods in Biomedical Sciences</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Principles of Pharmacology</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Research Ethics</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Seminar and Journal Club</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Cardiovascular Physiology</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Neuroanatomy</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Neurophysiology</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Pulmonary – Renal</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>GL – Endocrine – Reproductive</td>
<td>3</td>
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</tbody>
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* Students must choose at least one of these courses as elective.
<table>
<thead>
<tr>
<th>Second Year</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MBIM 309 or MBIM 310</td>
<td>3</td>
<td>Basic Microbiology or Basic Immunology</td>
</tr>
<tr>
<td>HUMR 314</td>
<td>1</td>
<td>Seminar and Journal Club</td>
</tr>
<tr>
<td>BIOM 375</td>
<td>2</td>
<td>Principles of Learning and Assessment</td>
</tr>
<tr>
<td>IDTH 301</td>
<td>1</td>
<td>Scientific Communication</td>
</tr>
</tbody>
</table>

| Elective | |
|----------| |
| Advanced Courses in Specialized Field of Studies | Variable number |

**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 course is a core course for PhD students in Biomedical Sciences and it is elective for MS students.  
First semester.

**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 about what it means to be an ethical and responsible researcher.  
Summer semester.

**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 semester. 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 semesters 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 semester. 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 to expose them to different research environments. Open to PhD students in Biomedical Sciences. First and second semesters and summer.

BIOM 499 PhD Thesis 24 cr.
A/B/C/D/E
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 where two members should be from outside AUB and the chair of the PhD Thesis Committee should be a full professor and different from the thesis adviser.

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 thesis committee. Prior to the defense, all major revisions to the thesis shall have been completed. The decision of the committee will be by consensus.

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 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 of 5 years period will require Graduate Council approval upon the recommendation by 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 average of 85 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, please refer to page 36 Admissions section Application Procedures. For Admissions Decision Notification, please refer to page 36 Admissions section Application Procedures.

• **Acceptance.** The letters of acceptance are sent in duplicate and contain the category of the position offered, the registration period set between August 12 and August 18, the date of the start of classes set at September 3, and a statement of acceptance or rejection of the position offered. Candidates must sign a copy of the above letter, indicating acceptance, and return it to the Office of Admissions no later than August 20. If acceptance letters are not signed and sent back by this 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 semester, the second semester, and the summer session.

• **Transfer Students.** Applicants who started a graduate program in other AUB faculties or at another recognized university can be accepted as transfer graduate students, subject to evaluation and approval of the departments and the Faculty of Medicine graduate committee. No more than a total of 6 credits of graduate course work from the previously covered program can be transferred. These courses are evaluated as satisfactory, are not assigned a numerical grade, and are not counted as part of the accrued average after the transfer.

• **Categories of Graduate Students.** The categories applicable at the University in general are also applicable in the Faculty of Medicine with the following modifications: **regular graduate student status**, applicable to students with a cumulative undergraduate average in the major field of study of at least 80 or its equivalent; **graduate on special status**, applicable to students with a cumulative undergraduate average in the major field of study or an overall average of 75 or higher but lower than 80 or equivalent. **Graduates on probation status** are transferred to regular status upon achieving an overall average of at least 80 in 9 credits of graduate courses within two semesters.

• **Visiting Graduate Students:** visiting students accepted for training, applicable to students who pay a fee; and exchange students, 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 committee.

**Leave of Absence**

All graduate students are expected to make steady and satisfactory progress toward the completion of degrees. Students who are not enrolled for a period of more than 12 months will be considered to have withdrawn from the program unless they apply for a leave of absence and secure approval of the department, Faculty/School Graduate Studies Committee, and Graduate Council.

The leave of absence application can be up to one year at a time. The maximum period of approved leave of absence is for two years. An approved leave of absence does not count towards maximum residency. Non-enrollment by the student for one semester without securing leave of absence will count towards maximum residency.

Students who seek to return without having secured leave of absence approval after nonenrollment period of 12 months must reapply and will be considered for readmission following regular AUB application/admission procedures. If re-admitted into the same graduate program then their earlier status as graduate student will count towards maximum residency. The Leave of Absence Application Form should normally be submitted to the respective department/faculty at least one month prior to beginning of the semester in which absence is planned.