

BIOENGINEERING GRADUATE PROGRAM

BIOENGINEERING MASTER'S PROGRAM

The Bioengineering Master's Program of the University of Puerto Rico – Mayagüez (UPRM) trains students in bioengineering by integrating the skills and competences of engineering, computational sciences, natural sciences, and medicine, while establishing an entrepreneurial culture within the students to focus on product-oriented research and development for future commercialization. Another program objective is to prepare graduates that are aware of the ethical and social responsibilities associated to the solution of technical problems in bioengineering.

The bioengineering program focuses on computational bioengineering and biomedical engineering research. It draws on internal areas of emphasis in order to guide students in their curriculum and maintain a flexible structure that is adaptable to technological evolutions.

Students graduating from the master's degrees will possess the following qualifications:

- In-depth knowledge in a specific area of bioengineering.
- Breadth of knowledge in the core areas of bioengineering and supporting disciplines.
- Ability to formulate a complex bioengineering problem and outline viable solution by integrating and applying basic principles of biology and engineering/physical sciences.
- Ability to work in a multidisciplinary environment.
- Ability to effectively communicate technical and scientific findings.
- Awareness of ethical and social issues.
- Entrepreneurial consciousness.

Two master's degrees are offered, which correspond to Plans I, II and III, as described in Certification 09-09 of the University of Puerto Rico-Mayagüez's Academic Senate.

Master's of Science (Plan I - Thesis). This program consists of a total of 31 credit-hours: nine credit-hours in bioengineering core courses, six credit-hours in bioengineering courses, six credit-hours in courses outside of bioengineering, three credit-hours in elective courses, six credit-hours in master's thesis, and one credit-hour in graduate seminar.

Master's of Engineering (Plan II - Project). This program consists of a total of 31 credit-hours: nine credit-hours in bioengineering core courses, six credit-hours in bioengineering courses, six credit-hours in courses outside of bioengineering, three credit-hours in elective courses, six credit-hours in engineering project, and one credit-hour in graduate seminar.

Master's of Engineering (Plan III). This program consists of a total of 31 credit-hours: nine credit hours in bioengineering core courses, twelve credit-hours in bioengineering courses, six credit-hours in courses outside of bioengineering, three credit-hours in elective courses, and one credit-hour in graduate seminar.

The degrees conferred will be Master of Science in Bioengineering to students that complete Plan I (thesis) and Master of Engineering in Bioengineering to students that complete Plan II (project) or Plan III (courses-only). The program's graduate committee will consider transfers from the doctoral program in bioengineering into the master's program, with previous recommendation from the student's thesis committee and from the program's executive director.

Admission Requirements

General requirements for admission into graduate programs at the University of Puerto Rico-Mayagüez are established in Certification 09-09 of the University of Puerto Rico-Mayagüez's Academic Senate. In addition, the Bioengineering Master's Program requires that applicants possess:

- A baccalaureate degree in engineering with a minimum grade point average (GPA) of **3.20** on a scale of **4.00**, from an accredited institution of higher learning. Depending on the applicant's academic background, admission may be granted with deficiency courses. Applicants will be encouraged, but not required, to have approved undergraduate courses in human anatomy and physiology, human cellular and molecular biology, or both.
- A baccalaureate degree in physics, chemistry, biology or related areas with a minimum grade point average (GPA) of **3.20** on a scale of **4.00**, from an accredited institution of higher learning, and with a mathematical background at the level of differential equations. Depending on the applicant's academic background, admission may be granted with deficiency courses. Applicants will be encouraged, but not required, to have approved undergraduate courses in human anatomy and physiology, human cellular and molecular biology, or both.

- International students for whom English is not the first language are required to submit a Test of English as a Foreign Language (TOEFL) exam score.

Graduation Requirements

The general academic requirements for conferring the Master's of Science or Master's of Engineering degrees are established in Certification 09-09 of the University of Puerto Rico-Mayagüez's Academic Senate. Specific requirements for each degree in the graduate program in bioengineering are described below.

Total Credit-Hour Requirement

Students entering the **Master's of Science (Plan I - Thesis)** program are required to approve a minimum of thirty-one (31) credit-hours distributed in the following manner:

- 9 credit-hours in core courses
 - Principles of Biomedical Engineering (INME 6065)
 - Principles of Computational Bioengineering (BING 6004)
 - Molecular and Cellular Biology for Engineers (BING 6002)
- 6 credit-hours in bioengineering courses
- 6 credit-hours in courses outside of bioengineering
- 3 credit-hours in elective courses (either in bioengineering or outside)
- 1 credit-hour in graduate seminar (BING 8998)
 - The topics covered in the seminar will include:
 - Scientific issues
 - Social and ethical issues
 - Entrepreneurship
- 6 credit-hours in master's thesis (BING 6999)

Students entering the **Masters of Engineering (Plan II - Project)** program are required to approve a minimum of thirty-one (31) credit-hours distributed in the following manner:

- 9 credit-hours in core courses
 - Principles of Biomedical Engineering (INME6065)
 - Principles of Computational Bioengineering (BING 6004)
 - Molecular and Cellular Biology for Engineers (BING 6002)
- 6 credit-hours in bioengineering courses
- 6 credit-hours in courses outside of bioengineering

- 3 credit-hours in elective courses (either in bioengineering or outside)
- 1 credit-hour in seminar (BING 8998)
 - The topics covered in the seminar will include:
 - Scientific issues
 - Social and ethical issues
 - Entrepreneurship
- 6 credit-hours in engineering project (BING 6998)

Students entering the **Master's of Engineering (Plan III – Courses Only)** program are required to approve a minimum of thirty-seven (37) credit-hours distributed in the following manner:

- 9 credit-hours in core courses
 - Principles of Biomedical Engineering (INME6065)
 - Principles of Computational Bioengineering (BING 6004)
 - Molecular and Cellular Biology for Engineers (BING 6002)
- 12 credit-hours in bioengineering courses
- 6 credit-hours in courses outside of bioengineering
- 3 credit-hours in elective courses (either in bioengineering or outside)
- 1 credit-hour in seminar (BING 8998)
 - The topics covered in the seminar will include:
 - Scientific issues
 - Social and ethical issues
 - Entrepreneurship

Students will prepare a plan of study before the second month of their second semester of studies, and under the guidance of the student's graduate committee. The plan of study will be prepared taking into consideration: the student's academic and research interests, suitability of courses to prepare students for their research or project work, and academic offer. No more than 9 credit-hours of advanced undergraduate level courses can be used to complete degree requirements.

Minimum Academic Index Requirements

In order to complete the master's degree, each student must approve the required minimum credit-hours with a GPA of 3.0 or higher. Students enrolled in the graduate program may repeat a course with an earned

grade of C or lower only once. Courses with a final grade of A or B cannot be repeated.

Maximum Number of Transfer Credits Allowed

Graduate courses taken at UPRM to fulfill requirements of another program may be utilized to fulfill the requirements of the bioengineering program. Courses taken at other institutions of higher learning may be utilized to fulfill master's program requirements, but are subject to residency requirements as specified in Certification 09-09 of the University of Puerto Rico-Mayagüez's Academic Senate. These norms stipulate that 60% of the courses in a student's plan of study must have been taken at UPRM. The program's graduate committee will determine which courses could be transferred. All transfer courses must be approved with a minimum grade of B. Under no conditions may thesis credits be transferred.

Residency

The "Norms that Regulate Graduate Studies at UPRM" stipulate the residency requirements as follows:

"Residency requirements at the Master's level: a minimum of two semesters of study at UPRM and having completed sixty (60) percent of the course work for the program at UPRM."

Graduate Seminar

Master's students will be required to register for the Graduate Seminar in Bioengineering course for the duration of their studies and will be awarded one credit-hour the end of their last semester of studies. Besides scientific and technical topics, the graduate seminar will also cover topics related to entrepreneurship, intellectual property, and social and ethical issues related to the field of bioengineering.

Master's Thesis or Project (Plan I and Plan II only)

Master's students enrolled in **Plan I (Master of Science degree)** are required to conduct a research project in bioengineering. Students are required to submit a thesis proposal for the approval of the student's graduate committee, complete the proposed research work, prepare a thesis and orally defend the thesis.

Master's students enrolled in **Plan II (Master of Engineering degree)** are required to develop an engineering project in bioengineering. Students are required to submit a project proposal for the approval

of the student's graduate committee, complete the project, prepare a written project report, and orally defend this project.

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