# BIOMEDICAL ENGINEERING, MASTER OF SCIENCE (M.S.) WITH A CONCENTRATION IN REHABILITATION ENGINEERING

## Program mission

The mission of the Master of Science in Biomedical Engineering program is to educate students to be significant contributors in health care and in research and development in biomedicine and bioengineering. The curriculum closely links technical fundamentals in science, engineering and the life sciences, together with the ability to function on multidisciplinary teams, to communicate effectively and to achieve the knowledge tools necessary for lifelong learning.

## Program goals

1. Provide students with a graduate education that prepares them for current and future challenges in biomedical engineering
2. Produce graduates who possess the necessary advanced analytical and technical skills in engineering and sciences – responds directly to the higher goals of fulfilling the needs of industry for effective, productive engineers and of providing economic development for the region, state and nation
3. Produce graduates who possess a facility with both written and oral communications – emanates from the requirement that engineers must be able to interact and share ideas with others in the work environment, and at a higher level, be capable of creative self-expression and leadership
4. Produce graduates who demonstrate creativity and innovation in solving technological problems – stems from the realization that new knowledge and new solutions to existing problems are necessary to meet the needs of our changing society and to advance the quality of human life

Graduates possess the ability to formulate, analyze and solve problems, analytically and/or experimentally, in the biomedical engineering industry, in the clinical setting or in biomedical research. Graduates can work effectively in teams to solve biomedical and/or clinical problems including the interconnection of engineering and clinical personnel toward the solution of problems of compelling clinical and biomedical interest and need, with particular reference to the biomedical engineering industry, in the clinical setting or in biomedical research. The career paths of BME graduates in these arenas would be enhanced as a result of these skills.

Student learning outcomes

### Biomedical engineering core outcomes

1. Apply advanced knowledge of mathematics, science or engineering: Graduates will demonstrate an ability to apply advanced knowledge of mathematics, science or engineering.
2. Communicate effectively: Graduates will demonstrate an ability to communicate effectively.
3. Identify, formulate and solve engineering problems: Graduates will demonstrate an ability to identify, formulate and solve engineering problems.

### Rehabilitation engineering concentration-specific outcome

1. Identify, formulate and solve problems in tissue engineering and regenerative medicine: Graduates will demonstrate an ability to identify, formulate and solve problems in tissue engineering and regenerative medicine.

## VCU Graduate Bulletin, VCU Graduate School and general academic policies and regulations for all graduate students in all graduate programs

The VCU Graduate Bulletin website documents the official admission and academic rules and regulations that govern graduate education for all graduate programs at the university. These policies are established by the graduate faculty of the university through their elected representatives to the University Graduate Council.

It is the responsibility of all graduate students, both on- and off-campus, to be familiar with the VCU Graduate Bulletin as well as the **Graduate School website** and academic regulations in individual school and department publications and on program websites. However, in all cases, the official policies and procedures of the University Graduate Council, as published on the VCU Graduate Bulletin and Graduate School websites, take precedence over individual program policies and guidelines.

**Visit the academic regulations section for additional information on academic regulations for graduate students.**

## Degree candidacy requirements

A graduate student admitted to a program or concentration requiring a final research project, work of art, thesis or dissertation, must qualify for continuing master's or doctoral status according to the degree candidacy requirements of the student's graduate program. Admission to degree candidacy, if applicable, is a formal statement by the graduate student's faculty regarding the student's academic achievements and the student's readiness to proceed to the final research phase of the degree program.

Graduate students and program directors should refer to the following degree candidacy policy as published in the VCU Graduate Bulletin for complete information and instructions.

**Visit the academic regulations section for additional information on degree candidacy requirements.**

## Graduation requirements

As graduate students approach the end of their academic programs and the final semester of matriculation, they must make formal application to graduate. No degrees will be conferred until the application to graduate has been finalized.

Graduate students and program directors should refer to the following graduation requirements as published in the Graduate Bulletin for a complete list of instructions and a graduation checklist.

**Visit the academic regulations section for additional information on graduation requirements.**

Apply online today. (https://www.vcu.edu/admissions/apply/graduate/)

## Admission requirements

| Degree: | Semester(s) of entry: | Deadline dates: | Test requirements: |
|---|---|---|---|
| M.S. | Fall | Jun 1 | English proficiency test as required by international admissions |
| | Spring | Dec 1 | English proficiency test as required by international admissions |

In addition to the general admission requirements of the VCU Graduate School (https://bulletin.vcu.edu/graduate/study/admission-graduate-study/admission-requirements/), biomedical engineering has the following admission criteria for all entering graduate students:

1. Statement of intent: Applicants must state their reasons for pursuing an M.S. in Biomedical Engineering with a concentration in rehabilitation engineering at VCU.
2. Letters of recommendation: Two letters of recommendation from instructors or professional references in the applicant's intended field of study are required for the thesis option. Letters should address the applicant's academic and professional abilities and preparation for graduate study. One or more letters may be waived upon request to the graduate program director. Letters of recommendation are not required for the non-thesis option.

Biomedical engineering may accept credit hours for transfer into the M.S. program if the original grades for such courses are B or higher (or equivalent).

Acceptance of an applicant is based upon the recommendation of the admissions committee with approval of the department chair and the associate dean for graduate studies.

## Degree requirements

In addition to the VCU Graduate School graduation requirements (https://bulletin.vcu.edu/academic-regs/grad/graduation-info/), students must meet the following requirements.

This program is nominally a two-year program leading to the M.S. in Biomedical Engineering with a concentration in rehabilitation engineering. The program offers a thesis or non-thesis option and can be tailored to meet the individual student's academic goals and research interests. Eighteen to 24 months of full-time study are usually necessary to complete the requirements for the thesis option. The non-thesis option generally requires 12 months of full-time study or up to four years of part-time study. A time limit of six calendar years, beginning at the time of first registration, is placed on work to be credited toward the master's degree. Generally, a maximum of six credit hours of approved graduate course work required for a master's degree may be transferred from another program at VCU or an outside institution and applied toward the degree.

The following are the minimum credit hour requirements for the proposed graduate degree program options:

**M.S. thesis option** – minimum 30 credit hours including 16 credit hours in concentration courses, eight credit hours in technical electives (engineering, science or related areas) and six credit hours in directed research **EGRB 697**

**M.S. non-thesis option** – minimum 30 credit hours including 16 credit hours in core courses and 14 credit hours in technical electives (engineering, science or approved courses)

## Curriculum requirements

**Thesis option**

| Course | Title | Hours |
|---|---|---|
| **Required graduate-level coursework** | | |
| Engineering or other relevant graduate course work (including a minimum of 6 credit hours from 500-level or higher courses in EGRE, ENGR, EGRB, EGMN, CMSC, CLSE) approved by the advisory committee: This component allows the student to take courses in either engineering or science with approval of the student's adviser. | | 8 |
| **Concentration component** | | |
| EGRB 520 | Assistive Technology | 3 |
| EGRB 521 | Human Factors Engineering | 3 |
| EGRB 523 | Rehabilitation Engineering and Prostheses | 3 |
| EGRB 603 | Biomedical Signal Processing | 3 |
| OCCT 591 | Neuroscience Applications to Occupational Therapy | 4 |
| **Directed research** | | |
| EGRB 697 | Directed Research in Biomedical Engineering | 6 |
| **Total Hours** | | **30** |

**The minimum number of graduate credit hours required for this degree is 30.**

**Non-thesis option**

| Course | Title | Hours |
|---|---|---|
| **Required graduate-level coursework** | | |
| Engineering or other relevant graduate course work (including a minimum of 9 credit hours from 500-level or higher courses in EGRE, ENGR, EGRB, EGMN, CMSC, CLSE) approved by the adviser. This component allows the student to take courses in either engineering or science with approval of the student's adviser. | | 14 |
| **Concentration component** | | |
| EGRB 520 | Assistive Technology | 3 |
| EGRB 521 | Human Factors Engineering | 3 |
| EGRB 523 | Rehabilitation Engineering and Prostheses | 3 |
| EGRB 603 | Biomedical Signal Processing | 3 |
| OCCT 591 | Neuroscience Applications to Occupational Therapy | 4 |
| **Total Hours** | | **30** |

**The minimum number of graduate credit hours required for this degree is 30.**

**Contact**

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**Program website:** egr.vcu.edu/future-students/graduate/graduate-degrees/rehabilitation-engineering-masters/ (https://egr.vcu.edu/future-students/graduate/graduate-degrees/rehabilitation-engineering-masters/)