Biomedical Engineering

Program Requirements
All master's students must successfully complete a total of 5.0 credits, which includes a 2.5 credit master's thesis. Courses must be selected with the approval of the student's supervisor.

M.A.Sc. Biomedical Engineering (5.0 credits)
Requirements:
1. 0.5 credit in:  
   BIOM 5010 [0.5] Introduction to Biomedical Engineering
2. 1.0 credit in BIOM (BMG) courses  
3. 1.0 credit in elective courses at either Carleton University or University of Ottawa with the approval of the OCIBME Director or Associate Director
4. 2.5 credits in:  
5. 0.0 credit in:  
   BIOM 5800 [0.0] Biomedical Engineering Seminar

Total Credits 5.0

M.A.Sc. Biomedical Engineering with Specialization in Data Science (5.0 credits)
Requirements:
1. 0.5 credit in:  
   BIOM 5010 [0.5] Introduction to Biomedical Engineering
2. 0.5 credit in:  
   DATA 5000 [0.5] Data Science Seminar
3. 1.0 credit in BIOM (BMG) courses  
4. 0.5 credit in elective courses taken either at Carleton University or University of Ottawa with the approval of the OCIBME Director or Associate Director
5. 2.5 credits in:  
6. 0.0 credit in:  
   BIOM 5800 [0.0] Biomedical Engineering Seminar

Total Credits 5.0

M.A.Sc. Biomedical Engineering with Specialization in Bioinformatics (5.0 credits)
Consult the Bioinformatics section for details regarding admission requirements to this program.
Requirements - by thesis (5.0 credits)
1. 0.5 credit in:  
   BIOM 5010 [0.5] Introduction to Biomedical Engineering
2. 1.0 credit in:  
   BIOL 5515 [0.5] Bioinformatics  
   BIOL 5517 [0.5] Bioinformatics Seminar
3. 1.0 credit in BIOM (BMG) courses  
4. 2.5 credits in:  
5. 0.0 credit in:  
   BIOM 5800 [0.0] Biomedical Engineering Seminar

Total Credits 5.0

M.Eng. Biomedical Engineering (5.0 credits)
Requirements - by coursework
1. 0.5 credit in:  
   BIOM 5010 [0.5] Introduction to Biomedical Engineering
2. 2.0 credits in BIOM (BMG) courses  
3. 2.5 credits in elective courses at either Carleton University or University of Ottawa with the approval of the OCIBME Director or Associate Director

Requirements - by project
1. 0.5 credit in:  
   BIOM 5010 [0.5] Introduction to Biomedical Engineering
2. 1.5 credits in BIOM (BMG) courses  
3. 1.5 credits in elective courses at either Carleton University or University of Ottawa with the approval of the OCIBME Director or Associate Director

M.Eng. Biomedical Engineering with Concentration in Clinical Engineering (5.0 credits)
Requirements:
1. 2.5 credits in:  
   BIOM 5010 [0.5] Introduction to Biomedical Engineering  
   BIOM 5100 [0.5] Biomedical Instrumentation  
   BIOM 5200 [0.5] Medical Image Processing  
   BIOM 5406 [0.5] Clinical Engineering  
   HLTH 5201 [0.5] Fundamentals of Policy I: Policy Analysis
2. 0.0 credit in:  
   BIOM 5800 [0.0] Biomedical Engineering Seminar
3. 1.5 credits in:  
   BIOM 5901 [1.5] Clinical Engineering Project
4. 1.0 credit in:  
   BIOM 5801 [1.0] Clinical Engineering Internship

Total Credits 5.0

M.Eng. Biomedical Engineering with Specialization in Data Science (5.0 credits)
Requirements - by coursework:
1. 0.5 credit in:  
   BIOM 5010 [0.5] Introduction to Biomedical Engineering
2. 0.5 credit in:  
   DATA 5000 [0.5] Data Science Seminar
3. 2.0 credits in BIOM (BMG) courses  

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4. 2.0 credits in elective courses at either Carleton University or University of Ottawa with the approval of the OCIBME Director or Associate Director
5. 0.0 credit in:
   BIOM 5800 [0.0] Biomedical Engineering Seminar

Total Credits 5.0

Note: for the course work Item 3 and Item 4 above, three 0.5-credit data science elective courses must be taken (three of BIOM 5400, BIOM 5405, COMP 5100, COMP 5101, COMP 5107, COMP 5108, COMP 5111, COMP 5112, COMP 5204, COMP 5209, COMP 5305, COMP 5306, COMP 5307, COMP 5308, COMP 5401, COMP 5703, COMP 5704, PHYS 5002, SYSC 5001, SYSC 5003, SYSC 5004, SYSC 5007, SYSC 5101, SYSC 5102, SYSC 5103, SYSC 5108, SYSC 5201, SYSC 5207, SYSC 5300, SYSC 5303, SYSC 5306, SYSC 5401, SYSC 5404, SYSC 5405, SYSC 5407, SYSC 5500, SYSC 5703, SYSC 5706)

Requirements - by project:
1. 0.5 credit in:
   BIOM 5010 [0.5] Introduction to Biomedical Engineering
2. 0.5 credit in:
   DATA 5000 [0.5] Data Science Seminar
3. 1.5 credits in BIOM (BMG) courses
4. 1.0 credit in elective courses at either Carleton University or University of Ottawa with the approval of the OCIBME Director or Associate Director
5. 0.0 credit in:
   BIOM 5800 [0.0] Biomedical Engineering Seminar
6. 1.5 credit in:
   BIOM 5900 [1.5] Biomedical Engineering Project

Total Credits 5.0

Note: for the course work Item 3 and Item 4 above, three 0.5-credit data science elective courses must be taken (three of BIOM 5400, BIOM 5405, COMP 5100, COMP 5101, COMP 5107, COMP 5108, COMP 5111, COMP 5112, COMP 5204, COMP 5209, COMP 5305, COMP 5306, COMP 5307, COMP 5308, COMP 5401, COMP 5703, COMP 5704, PHYS 5002, SYSC 5001, SYSC 5003, SYSC 5004, SYSC 5007, SYSC 5101, SYSC 5102, SYSC 5103, SYSC 5108, SYSC 5201, SYSC 5207, SYSC 5300, SYSC 5303, SYSC 5306, SYSC 5401, SYSC 5404, SYSC 5405, SYSC 5407, SYSC 5500, SYSC 5703, SYSC 5706).

Notes:
- University of Ottawa course numbers are in parentheses.
- Course selection: only a selection of courses listed is given in a particular academic year. For information on courses offered in a given year please consult the Institute's web site (www.ocibme.ca).
- Given that the students admitted to this program are from different academic backgrounds, any elective course listed in this program can only be taken by qualified students who satisfy the prerequisites.

Ph.D. Biomedical Engineering (10.0 credits)

Requirements:
1. 0.5 credit in:
   BIOM 5010 [0.5] Introduction to Biomedical Engineering
2. 0.5 credit in BIOM (BMG) courses
3. 0.5 credit in elective courses at either Carleton University or University of Ottawa with the approval of the OCIBME Director or Associate Director
4. Completion of:
   BIOM 6800 [0.0] Biomedical Engineering PhD Seminar
5. Successful completion of the comprehensive examination before the end of the fourth term of registration
6. A written thesis proposal and oral examination to take place before the end of the sixth term of registration
7. 8.5 credits in:
   BIOM 6909 [8.5] Ph.D. Thesis

Total Credits 10.0

Regulations
See the General Regulations section of this Calendar.

Admission

M.A.Sc. Biomedical Engineering

The normal requirement for admission is a four-year bachelor's degree in engineering, science, computer science, or a related discipline, with an average of at least B+.

M.A.Sc. Biomedical Engineering Accelerated Pathway

The accelerated pathway in the M.A.Sc. Biomedical Engineering is a flexible and individualized plan of graduate study. Students in their final year of a Carleton B.Eng. degree with demonstrated academic excellence and aptitude for research may qualify for this option.

Students in their third-year of study in the B.Eng. degree should consult with both their Undergraduate Program Coordinator and the Associate Chair for Graduate Studies to determine if the accelerated pathway is appropriate for them and to confirm their selection of courses for their final year of undergraduate studies.

Accelerated Pathway Requirements

1. At least 0.5 credit in a BIOM courses (5000 level or higher) with a grade of B+ or higher.
2. Minimal overall CGPA of A-.

Students may receive advanced standing with transfer of credit of up to 1.0 credit which can reduce their time to completion.

Admission

M.Eng. Biomedical Engineering

The normal requirement for admission is a four-year bachelor's degree in engineering, science, computer science, biomedical sciences, health sciences, or a related discipline, with an average of at least B+. Applicants should note that simply meeting the minimum standards for admission will not guarantee admission to the program.
as there are only a limited number of positions available each year.

**Admission**

**Ph.D. Biomedical Engineering**

The normal requirement for admission into the Ph.D. program is a master's degree with thesis in engineering, science, computer science, or a related discipline, with an average of at least B+.

Students registered full-time in the M.A.Sc. in Biomedical Engineering program at Carleton University, who shows outstanding academic performance and demonstrates significant promise for advanced research, may be permitted to transfer into the doctoral program, without completing the master's program, upon recommendation of the student's home academic unit.