

# Chemical and Biomedical Engineering- Master of Science in Chemical and Biomedical Engineering

For information, contact:

Director of Graduate Studies

Department of Chemical, Paper and Biomedical Engineering

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<http://MiamiOH.edu/cec/academics/departments/cpb/academics/graduate-studies/>

## Introduction

The Master of Science in Chemical and Biomedical Engineering offers research (thesis) and course intensive (non-thesis) options. The mission of the program is to prepare students who wish to either pursue doctoral work in chemical or biomedical engineering or to seek research-related careers in industry. The departmental faculty have active research projects in the areas of solar cells, environmental, paper physics and chemistry, tissue engineering, biomaterials, molecular simulation, biomechanics, biophotonics, enzyme treatment, separation and electrochemistry.

## Research and Support Facilities

The department's equipment includes a highly instrumented papermaking machine, stock preparation equipment, complete paper testing laboratories, pulping digesters, process control laboratory, biochemical engineering laboratory, catalysis research laboratory, environmental laboratory, chemical engineering laboratory, molecular simulation, biomechanics, biomedical optical imaging and sensing laboratory, electrochemical laboratory, solar cell research laboratory and tissue engineering/biomaterials laboratory. Students also have access to equipment at the university's Electron Microscopy Facility and Nanotechnology Center.

## Admission Requirements

You must have an undergraduate education in a science or engineering field, and must provide:

1. Academic transcript of undergraduate performance,
2. Graduate Record Examination (GRE) scores (waived for combined BS/MS applicants),
3. Three letters of recommendation,
4. Written statement of purpose for seeking a master's degree in chemical and biomedical engineering from Miami University, and
5. Curriculum vitae (CV) or résumé.

## Combined Bachelor/Master's Program

Undergraduate students may apply to participate in the combined bachelors/master's program. This program allows you to pursue a master's degree in an accelerated manner while completing your bachelor's degree. It is a great opportunity to deepen your knowledge and research skills. Please contact the department for more information about the combined program.

## Program Requirements

### Option I - Research Intensive (thesis)

Students are required to complete a minimum of 33 semester hours, which is comprised of the following:

Code	Title	Credit Hours
CPB 517 or CPB 526	Biomedical Engineering Fundamentals of Tissue Engineering	3
CPB 515 or CPB 512 or CPB 514 or CPB 551	Chemical Kinetics and Reactor Design Chemical Engineering Thermodynamics Mass Transfer and Unit Operations Unit Operations Laboratory	2-4
CPB 600	Graduate Seminar <sup>1</sup>	3
CPB 611	Transport Phenomena in Engineering	3
CPB/MME 612	Engineering Analysis	3
CPB 700 or CPB 710	Research for Master's Thesis <sup>2</sup> Industrial Practicum	9-15

Students in the combined BS/MS program can double count up to 9 credit hours for thesis option

Electives <sup>2</sup>		8-10
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### Biomedical Engineering Electives

CPB 516	Biochemical Engineering
CPB 517	Biomedical Engineering
CPB 519	Biomaterials
CPB 523	Biomechanics
CPB 526	Fundamentals of Tissue Engineering
CPB 582	Process Control
CSE 556	Bioinformatic Principles
CSE 566	Bioinformatics Computing Skills
ECE 526	Biomedical Signal Analysis and Machine Learning
CSE 570	Special Topics in CSE (Computational Genomics (3))
CSE 616	Simulation of Physical Systems

### Chemical Engineering Electives

CPB 505	Industrial Environmental Control
CPB 512	Chemical Engineering Thermodynamics
CPB 514	Mass Transfer and Unit Operations
CPB 515	Chemical Kinetics and Reactor Design
CPB 516	Biochemical Engineering
CPB 541	Pollution Prevention in Environmental Management
CPB 551	Unit Operations Laboratory
CPB 542	Air Pollution Control
CPB 573	Chemical Process Design
CPB 582	Process Control
CPB 583	Chemical Process Safety

### Non-Engineering and Computing Electives

CHM 532	Fundamentals of Biochemistry
STA 504	Advanced Data Visualization
STA 672	Statistical Modeling and Study Design

GLG 532	X-ray Powder Diffraction and Clay Analysis
BIO 571	Molecular Physiology
BIO 581	Theory of Electron Microscopy
BIO 582	Scanning Electron Microscopy Laboratory
BIO 583	Transmission Electron Microscopy Laboratory
BIO 554	Endocrinology
<b>Total Credit Hours</b>	<b>33-39</b>

<sup>1</sup> Maximum 3.

<sup>2</sup> The remaining 8-10 credit hours of graduate course work are to be selected from the Biomedical Engineering, Chemical Engineering, or Non-Engineering and Computing electives with the approval of the program adviser.

The student must:

1. complete a total of 33 semester hours with at least 24 semester hours of graduate credit in biomedical and chemical engineering or related courses approved by the department. At least 12 credits must be earned at 600-level or above;
2. complete a research thesis (9 to 15 hours credit) or the analysis and solution of an industrial problem (9 to 15 hours credit); and
3. pass a final examination.

### Option II - Course Intensive (non-thesis)

Students are required to take a total of 34 credit hours, of which at least 30 semester hours must comprise of the following:

Code	Title	Credit Hours
CPB 517 or CPB 526	Biomedical Engineering Fundamentals of Tissue Engineering	3
CPB 515 or CPB 512 or CPB 514 or CPB 551	Chemical Kinetics and Reactor Design Chemical Engineering Thermodynamics Mass Transfer and Unit Operations Unit Operations Laboratory	2-4
CPB 600	Graduate Seminar <sup>1</sup>	3
CPB 611	Transport Phenomena in Engineering	3
CPB/MME 612	Engineering Analysis	3
CPB 704 or CPB 710	Non-Thesis Project Industrial Practicum	4-12
Electives <sup>2</sup>		14-16

Students in the combined BS/MS program can double count up to 6 credit hours for non-thesis option

**Total Credit Hours** **34-42**

<sup>1</sup> Maximum 3.

<sup>2</sup> The remaining 14-16 credits hours of graduate course work are to be selected from either the Biomedical Engineering, Chemical Engineering, or Non-Engineering and Computing electives listed under Option I with the approval of the program adviser.

The student must:

1. complete a total of 34 semester hours with at least 30 semester hours of graduate credit in chemical, paper and biomedical engineering or related courses approved by the department. At least 12 credits must be earned at 600-level or above;
2. register for at least 4 credit hours of CPB 704 or CPB 710 and complete a research project under the supervision of a faculty member. The student will write a comprehensive report and make a formal presentation, which will be evaluated by a team of three faculty. This will constitute the final exam for the student.