

# Pharmaceutical Engineering, MS (Boston)

The Master of Science in Pharmaceutical Engineering is offered jointly by Northeastern University's College of Engineering and Bouvé College of Health Sciences. The program prepares students with a fundamental understanding of pharmaceutical sciences and principles of engineering to develop the depth needed for advanced study of pharmaceutical engineering.

This program is generally pursued by students with a Bachelor of Science in Chemical Engineering or closely allied fields in engineering, sciences, or mathematics. The program was designed in collaboration with the Department of Pharmaceutical Sciences to develop the depth needed for advanced study of pharmaceutical engineering. Students wishing to pursue the master's degree with undergraduate educational backgrounds other than engineering are required to demonstrate completion of mathematics coursework through differential equations or the equivalent to be admitted. Prior completion of at least one semester of organic chemistry or the equivalent is also required, and some prior exposure to concepts in biochemistry and molecular biology is helpful. Students are advised to work closely with their advisors and instructors to determine the electives that would meet their career goals.

## Part-Time Students

Part-time students may progress according to their plans and time constraints but within the seven-year time limit.

Master of Science students wishing to change their status from part time to full time must notify the chemical engineering department and make a formal petition to the Graduate School of Engineering. Refer to the regulations of the Graduate School of Engineering for further information on academic administrative policies.

## Program Requirements

Complete all courses and requirements listed below unless otherwise indicated.

### Core Requirements

Code	Title	Hours
CHME 6390	Professional Development and Communication Essentials (Complete this course twice.) <sup>1</sup>	0
CHME 7600	Pharmaceutical Engineering I	4
CHME 7601	Pharmaceutical Engineering II	4
CHME 7602	Pharmaceutical Engineering Laboratory	2
PHSC 5100	Concepts in Pharmaceutical Science	2
PHSC 5102	Concepts in Pharmaceutical Science 2	2
PHSC 7010	Pharmaceutical Sciences Laboratory	4

<sup>1</sup> To be completed each of the first two semesters in the program.

### Restricted Elective Courses

Code	Title	Hours
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At least 4 semester hours of elective coursework is required from CHME, and at least 2 semester hours of elective coursework is required from PHSC and PMST. These semester hours could come from any elective group, as appropriate.

#### Regulatory

Complete 3–4 semester hours from the following: 3-4

BIOE 5250	Regulatory and Quality Aspects of Medical Device Design
BIOT 5340	Introduction to Biotherapeutic Approvals
BIOT 5500	Concepts in Regulatory Science
BIOT 6320	Design and Development of Biopharmaceuticals
RGA 6002	Introduction to Regulatory Compliance and Practice

#### Quality/Statistics

Complete 4 semester hours from the following: 4

CHME 5185	Design of Experiments and Ethical Research (DOEER)
CHME 6320	Numerical and Statistical Methods for Chemical Engineering
CHME 6410	Chemical Engineering Research Methods
IE 6200	Engineering Probability and Statistics
IE 7280	Statistical Methods in Engineering
IE 7285	Statistical Quality Control

PHSC 6214	Experimental Design and Biostatistics
<b>Depth Electives</b>	
Complete 6–7 semester hours from the following:	
BIOE 5115	Dynamical Systems in Biological Engineering
BIOE 5411	Applied Molecular Bioengineering
BIOE 5510	Bioengineering Products/Technology Commercialization
BIOE 5860	Engineering Approaches to Precision Medicine I
BIOT 5330	Drug Safety and Immunogenicity
BIOT 6300	Pharmaceutical Microbiology
BIOT 6340	Sterile Manufacturing Operations
CHME 5160	Drug Delivery: Engineering Analysis
CHME 5179	Complex Fluids and Everyday Materials
CHME 5185	Design of Experiments and Ethical Research (DOEER)
CHME 5510	Fundamentals in Process Safety Engineering
CHME 5515	Process Safety Engineering for Biotechnology and Pharmaceutical Industries
CHME 5631 or BIOE 5820	Biomaterials Principles and Applications Biomaterials
CHME 5632	Advanced Topics in Biomaterials
CHME 5683	Introduction to Polymer Science
CHME 7330	Chemical Engineering Thermodynamics
CHME 7350	Transport Phenomena
PHSC 5300	Pharmaceutical Biochemistry
PHSC 5310	Cellular Physiology
PHSC 5500	Repurposing Drugs for Cancer Immunotherapies
PHSC 5555	Pharmaceutical Toxicology
PHSC 5560	Nanotoxicity
PMST 6250	Advanced Physical Pharmacy
PMST 6252	Pharmacokinetics and Drug Metabolism
PMST 6254	Advanced Drug Delivery Systems

### Optional Co-op Experience

Code	Title	Hours
Complete the following (students must complete ENCP 6100 to qualify for co-op experience):		
ENCP 6100	Introduction to Cooperative Education	1
ENCP 6964	Co-op Work Experience	0
or ENCP 6954	Co-op Work Experience - Half-Time	
or ENCP 6955	Co-op Work Experience Abroad - Half-Time	
or ENCP 6965	Co-op Work Experience Abroad	

### Program Credit/GPA Requirements

32 total semester hours required (33 with optional co-op)

Minimum 3.000 GPA required