

Chemical Engineering

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Mission

The mission of the Master of Science (M.S.) degree in Chemical Engineering is to emphasize practice-oriented knowledge, detailed engineering analysis and design to prepare students for leadership roles in chemical engineering practice. In aid of this mission, the curriculum offers traditional graduate courses complimented by a diverse selection of elective courses taught by industry leaders through the New York Tri-State Area.

Objectives

The Program Educational Outcomes are:

- Students will apply advanced principles of chemical engineering to solve complex engineering problems;
- Students will design engineering solutions to issues and problems in one of the following concentration areas: cosmetic and consumer goods engineering, biopharmaceutical engineering, and sustainable materials engineering;
- Students will conduct fundamental and/or applied research, and improve their oral and written communication skills in the form of presentations, reports and technical memos, as appropriate to the audience.

Admission Requirements

Applicants must possess:

- A baccalaureate degree from a chemical engineering program accredited by the Engineering Accreditation Commission of ABET, Inc., or from a recognized foreign institution; or
- A baccalaureate degree in another area of engineering, chemistry, or closely-related field with satisfactory grades in Calculus I, II, and III (or equivalent), Chemistry I and II, Physics I, Differential Equations, Organic Chemistry I and Organic Chemistry Lab I. Applicants meeting these criteria will be considered for admission as matriculated but must complete the following undergraduate courses with a minimum grade point average of B (3.00) and no grade lower than C (2.00) before taking graduate courses:
 - CHML 480: Basic Principles of Thermal-Fluid Science (offered during Summer Session I)
 - CHML 485: Core Chemical Engineering Concepts (offered during Summer Session II)

- A baccalaureate degree in another area of engineering, chemistry, or closely-related field with satisfactory grades in Calculus I, II, or III (or equivalent), Chemistry I and II, Physics I but have not taken Differential Equations, Organic Chemistry I or Organic Chemistry Lab I. Applicants meeting these criteria will be considered for admission as non-matriculated but must complete the undergraduate courses listed below with a minimum grade point average of B (3.00) and no grade lower than C (2.00) before taking graduate courses. Upon completion of all but two courses, students can request a change of status to matriculated.

- CHML 480: Basic Principles of Thermal-Fluid Science (3 credits, offered during Summer Session I in an online synchronous delivery mode)
- CHML 485: Core Chemical Engineering Concepts (3 credits, offered during Summer Session II in an online synchronous delivery mode)
- MATH 285: Calculus III (3 credits, routinely offered in fall, spring, and summer sessions)
- MATH 286: Differential Equations (3 credits, routinely offered in fall, spring, and summer sessions)
- CHEM 319: Organic Chemistry I (3 credits, routinely offered in fall, spring, and summer sessions)
- CHEM 323: Organic Chemistry Laboratory I (2 credits, routinely offered in fall, spring, and summer sessions)

Note that Calculus III, Differential Equations, Organic Chemistry I and Organic Chemistry Laboratory I may be taken at another institution with approval of the Graduate Director.

Degree Requirements

All students must complete a minimum of 30 credit hours of graduate course work with a cumulative GPA of 3.0 or better. These hours include three core courses (nine credit hours) and seven additional courses (21 credit hours). The core courses are only offered once per year during the semesters specified below. The engineering electives may be chosen from any of the graduate chemical engineering courses offered within the school of engineering for which the prerequisites have been completed. The elective courses may also be used to complete either the cosmetic engineering, biopharmaceutical, or materials engineering concentrations offered by the department of chemical engineering.

Graduate courses from outside the department may be allowed on a case-by-case basis with approval from the Graduate Program Director.

Required Courses (three courses, 9 credits)

CHMG 713	Chemical Reactor Design (Fall)	3
CHMG 722	Elements of Transport Phenomena (Fall)	3
CHMG 707	Process Thermodynamics (Spring)	3
Total Credits		9

Additionally, students select a total of seven elective courses (21 credits) to complete the degree requirement.

Research Option

Students may replace two electives with a research project (CHMG 735) or thesis (CHMG 736). Students choosing the research project/thesis option are required to:

1. complete one or two semesters of research, and
2. present a written report/thesis upon completion of the project. All student presenting a thesis will need to follow procedures to archive a copy in the Manhattan University Library.

The program offers a number of general electives as well as electives specific to cosmetic, biopharmaceutical, or materials engineering concentrations.

General Electives

The general electives offered within the program vary from year to year, but typically include:

CHMG 708	Advanced Heat Transfer Applications	3
CHMG 710	Advanced Transport Phenomena	3
CHMG 727	Air Pollution Control Design	3
CHMG 746	Advanced Chemical Processes for Water Purification	3
ENGG 652	Project Management	3
ENGG 670	Pollution Prevention	3
ENGG 678	Sustainable Energy	3
ENGG 700	Creativity & Innovation	3

Consumer Products and Cosmetic Engineering Electives

The Chemical Engineering Department offers a concentration in consumer products and cosmetic engineering at the graduate level. This concentration, the only one of its kind in the nation, will prepare students for a variety of roles in the cosmetic and consumer product industries, including product formulation and development, process engineering, and research and development. Coursework will provide students specialized training in product formulation, polymers and emulsions, complex fluids, and regulatory issues relevant to cosmetic and consumer product industries. In addition to the three required chemical engineering core courses, students are required to complete at least four of the following cosmetic engineering electives for a total of 12 credits:

Required Courses:

CHMG 752	Advanced Processing Theory	3
CHMG 753	Advanced Processing Techniques	3
CHMG 758	Formulations I	3
CHMG 759	Formulations II	3
CHMG 760	Emulsion & Polymer Tech	3
CHMG 763	Industrial Regulations&Quality	3

Total Credits: 12

The remaining *nine* elective credits for the cosmetic engineering concentration can be chosen from the available general electives, cosmetic engineering electives, biopharmaceutical engineering electives, and/or engineering materials electives (see the following).

Biopharmaceutical Engineering Electives

The Chemical Engineering Department offers a concentration in biopharmaceutical engineering at the graduate level. The Biopharmaceutical Engineering concentration will prepare students for a variety of roles in the biopharmaceutical and biotechnology sectors, including discovery, development, formulation and production of pharmaceutical products and therapeutic agents. Coursework will provide students with specialized training in microbial and cell growth, polymers and emulsions, bioseparation processing, bioprocess design, formulation of pharmaceutical products, and regulatory issues relevant to the biopharmaceutical field. In addition to the three required chemical engineering core courses, students are required to complete at least four of the following biopharmaceutical engineering electives for a total of 12 credits:

Required Courses:

CHMG 759	Formulations II	3
CHMG 760	Emulsion & Polymer Tech	3
CHMG 761	Industrial Practice in Pharmaceutical Industry	3
CHMG 762	Manufacturing and Analysis of Pharmaceutical Products	3
CHMG 763	Industrial Regulations&Quality	3
CHMG 770	Bioseparations	3
CHMG 772	Bioreaction Engineering	3

Total Credits: 12

The remaining *nine* elective credits for the biopharmaceutical engineering concentration can be chosen from the available general electives, consumer products and cosmetic engineering electives, biopharmaceutical engineering electives, and/or engineering materials electives (see the following).

Principles and Processing of Novel Materials Electives

The Chemical Engineering Department offers a concentration in principles and processing of novel materials at the graduate level. This focus area covers topics of interest to engineers in the consumer products, semiconductor, and biomaterials industries. The focus is on the properties and production and of these materials including additive manufacturing, thin film deposition and biomaterials. In addition to the three required chemical engineering core courses, students must complete at least four of the following materials engineering electives for a total of 12 credits:

Required Courses

CHMG 760	Emulsion & Polymer Tech	3
CHMG 773	Synthesis & Deposition of Thin Films	3
CHMG 774	Additive Manufacturing: Technologies, Materials and Applications	3
CHMG 775	Production & Application of Biomaterials	3

Total Credits: 12

The remaining nine elective credits can be chosen from the general chemical engineering graduate electives, biopharmaceutical engineering electives, or consumer products and cosmetic engineering electives.