

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 objectives of the program are to:

- Expand students' understanding of the fundamentals and principles of chemical engineering;
- Expose students to contemporary advances in the areas of separation processes, alternative energy, water purification, pollution prevention, engineering management, cosmetic engineering, biopharmaceutical engineering, petroleum engineering, and advanced computer modeling and analysis skills;
- Provide opportunities for students to conduct fundamental and/or applied research, and to improve their oral and written communication skills.

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. Applicants with baccalaureate degrees from these programs will be considered for admission if they present satisfactory grades in Calculus I and II, Chemistry I and II, and Physics I. These students can expect to be admitted as non-matriculated and then matriculate when they have successfully completed the following undergraduate courses with a minimum grade point average of B (3.00) and no grade lower than C (2.00):

First Year

Fall	Credits	Spring	Credits
CHML 207: Process Calculations	3	CHML 208: Principles I (Fluids)	3
CHML 305: Principles II (Heat Transfer)	3	CHML 209 (Chemical Thermodynamics)	3
CHML 306: Separation Process Design I	3	CHML 316: Computer Simulations & Design	3
CHEM 319/323: Organic I Lecture/Lab ¹	5	CHML 321: Chemical Reaction Engineering	3
MATH 286: Differential Equations ^{1,2}	3		
	17		12

Total Credits: 29

Footnotes

- ¹ Required if not completed as part of student's undergraduate degree program.
- ² This course is offered fall, winter, spring, and summer sessions. It should be taken as early as possible in the program.

The order in which these courses are taken will be determined by the graduate director on a case-by-case basis. These courses will not satisfy any requirements for the Master of Science in Chemical Engineering degree. Students must complete prerequisite courses before they are permitted to register for graduate courses. Exceptions require the recommendation of the department chair and the approval of the dean of engineering.

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 petroleum 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 two semesters of research, and
2. present a written report/thesis at the end of the two semesters. All student presenting a thesis will need to follow procedures to archive a copy in the Manhattan College Library.

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

General Electives

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

CHMG 501	Adv Engineering Mathematics	3
CHMG 611	Environmental Impact Assess.	3
CHMG 708	Advanced Heat Transfer Applications	3
CHMG 710	Advanced Transport Phenomena	3
CHMG 727	Air Pollution Control Design	3
CHMG 739	Introduction to Design Project	3
CHMG 740	Design Project	3
CHMG 746	Advanced Chemical Processes for Water Purification	3
CHMG 747	Pollution Prevention	3

Cosmetic Engineering Electives

The Chemical Engineering Department offers a concentration in cosmetic engineering at the graduate level. The Cosmetic Engineering 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 petroleum engineering 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, biospearation 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, cosmetic engineering electives, biopharmaceutical engineering electives, and/or petroleum engineering electives (see the following).

Petroleum Engineering Electives

The Chemical Engineering Department offers a concentration in petroleum engineering at the graduate level. This concentration covers topics of interest to engineers in the refining, fuels, natural gas mining and processing, and petrochemical industries.

The focus is on the production of gaseous and liquid hydrocarbons, the physical chemistry of these hydrocarbon resources and the downstream processing to provide valuable chemical intermediates and products. In addition to the three required chemical engineering core courses, students must complete two additional petroleum core courses and two additional petroleum engineering electives for a total of 12 credits:

Required Courses

CHMG 748	Petroleum Refinery Processing I	3
CHMG 749	Natural Gas Processing I	3

Select two of the following three courses:		6
CHMG 754	Petroleum Refinery Processing II	3
CHMG 755	Natural Gas Processing II	3
CHMG 756	Oxidative Conversion of Shale Gas Components	3

Total Credits: 12

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