

Engineering - General Information

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Historical Note

Engineering education at Manhattan College developed out of a science program in coordination with liberal arts. In 1892, civil engineering and electrical engineering were among four curricula leading to the Bachelor of Science degree. Although civil engineering has continued uninterrupted since, electrical engineering was suspended shortly after its introduction. It was re-established as a degree program in 1935. Programs in mechanical engineering, chemical engineering, environmental engineering and computer engineering were introduced in 1957, 1958, 1993, and 1998, respectively. The undergraduate program in environmental engineering was phased out in 2012. However, the master's degree programs in environmental engineering continue and undergraduate engineering students can minor in environmental engineering.

Vision and Mission Statements

The vision of the School of Engineering gives broad direction to long-term goals, i.e.:

The Manhattan College School of Engineering will be the school of choice for engineering education in the New York metropolitan region.

This means that the College will be the destination of choice when students apply to engineering schools. In order to realize this vision, every program in the school will develop curricula which attract and excite students while supporting the mission of the school.

The School of Engineering has developed the following mission statement with input from its stakeholders:

The mission of the Manhattan College School of Engineering is to prepare each student for a productive and rewarding career in engineering or a related profession.

This mission is congruent with the mission of the College. The curriculum supporting the school's mission instills the techniques and skills of engineering design through the study of basic and advanced engineering science. This foundation of techniques and skills is integrated with practice-oriented engineering design experience covering technical and non-technical aspects of engineering practice. Students earning a Manhattan College engineering degree are prepared to enter the world of professional practice and to continue their studies through the pursuit of post-baccalaureate education.

The strong foundation coupled with thorough preparation in an engineering discipline ensures that the student will have life-long access to rapidly developing new technologies and prepares each student to be a citizen, an advocate, and a leader in the complex world of the 21st century.

The mission of the School of Engineering is consistent with the Lasallian and Catholic heritage of Manhattan College. Graduates of its engineering programs are expected to meet high academic standards, reflect on moral and ethical considerations in all aspects of their lives, and appreciate the need for life-long learning in the fulfillment of professional goals. Part of the ethical considerations expected of all students is their observance of academic integrity. Students accept the Manhattan College Community Standards and Student Code of Conduct under which they will not engage in academic dishonesty – cheating, plagiarism, and/or fabrication – or in academic misconduct, nor tolerate it in others. As aspiring engineers, students are expected to be aware of engineering codes of professional conduct which also prohibit dishonesty and misuse of intellectual property.

Program Educational Objectives

The Bachelor of Science undergraduate engineering programs in the Manhattan College School of Engineering are individually accredited by the Engineering Accreditation Commission (EAC) of ABET, <http://www.abet.org> (<http://www.abet.org/>). (<http://www.abet.org>.) ABET states that Program Educational Objectives must be published and that these objectives are consistent with the institution's mission, needs of program stakeholders and other ABET criteria. Each program is required to develop, publish, and periodically review its objectives.

Although each program develops its own objectives, there are some general themes that are recognized across the programs. These themes can be grouped as:

- Leadership, achievement, and involvement in engineering and related professions
- Dedication to furthering the engineering profession through continuous self-improvement
- Ethical practices and moral character
- Commitment to engineering as a service-to-humanity profession

Graduates of the School of Engineering will be valued for their ethical practices and moral character, leadership and involvement in engineering and related professions, dedication to the profession through self-improvement, and recognition that engineering is a service to humanity.

Student Outcomes for The Engineering Programs

ABET states that programs must have documented Student Outcomes that prepare graduates to attain the Program Educational Objectives. These outcomes relate to the knowledge, skills, and behaviors that students acquire as they progress through the program. ABET requires each program to adopt a standard set of outcomes plus any additional outcomes that may be articulated by the program. The standard set of seven (7) outcomes, referred to as ABET Student Outcomes (1) through (7), is:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. an ability to communicate effectively with a range of audiences

4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

These standard (1) through (7) student outcomes have been adopted by the undergraduate engineering programs in chemical, civil, computer, electrical and mechanical.

The educational objectives and outcomes of all the programs in the School of Engineering are consistent with the school's mission and the Lasallian and Catholic heritage of Manhattan College. In addition, the outcomes articulated by each program are consistent with the Manhattan College core competencies of:

- Effective Communication
- Critical Thinking
- Information Literacy
- Technology Literacy
- Quantitative Literacy
- Scientific Literacy
- Global Awareness
- Religious and Ethical Awareness
- Independent and Collaborative Work

Engineering Education

The foundation of the engineering curriculum includes:

1. The study of science representing the current state of human knowledge of the physical world and its behavior
2. The study of mathematics, the language and tool that engineers use to describe the physical world
3. Breadth of study in the humanities and social sciences, the basis for making ethical and moral engineering decisions
4. Development of the ability for independent learning and critical thinking
5. Development of skills in written, verbal, and graphical communication

In an age of revolutionary advances in science and technology, continual re-examination of trends in engineering becomes imperative. Accordingly, engineering faculty, in consultation with the Manhattan College Engineering board of advisors, a distinguished group of engineers and industrial leaders assembled from engineering-related

organizations, study and evaluate the concepts of engineering education and the school's programs. These studies re-emphasize the importance of humanities, mathematics and sciences as the foundation of engineering education. The engineering curriculum is, therefore, planned to provide the sound and broad education required in important branches of engineering.

Curricula

The engineering curricula have been designed with two premises in mind: one, that sound undergraduate engineering education must establish fundamental concepts at the expense of specialization; and two, that first-line engineering research, development or design requires post-collegiate specialization and advanced study through graduate work or industrial training, together with continuing self-development.

The engineering curricula are four-year programs and lead to the Bachelor of Science degree in one of the traditional branches of engineering: chemical engineering, civil engineering, computer engineering, electrical engineering, and mechanical engineering.

Each program provides opportunities for minor studies, focus areas, or concentrations within its discipline. Despite the apparent division of engineering study into these curricula, there is a core engineering curriculum designed to offer the fundamental education required for all engineering students.

All students must complete ENGL 110 First Year Composition . International students may be required to successfully complete ENGL 106 Introduction to Composition before enrolling in ENGL 110. Students graduating from a U.S. high school may be required to complete ENGL 106 before enrolling in ENGL 110. ENGL 106 will not count towards degree credit in any engineering program.

All students must complete RELS 110 The Nature and Experience of Religion and six additional credits in religious studies. The additional credits are selected from approved courses.

The curriculum for the first year is common to all undergraduate programs in engineering. In order to enable a student to test his or her interest in one of the major engineering disciplines, he or she takes designated courses from a specific discipline in the sophomore year. The curricula of the various engineering majors are detailed in the following section.

Each curriculum offers four areas of study:

1. General Education: Courses in this area comprise about one fifth of the entire curriculum and are conducted throughout the four years. These courses are intended to develop foundations for the fuller life of the student as a person. Courses in history, literature, philosophy, social sciences, business, education and religious studies blend with the scientific and technological growth of the student so that he or she may progress as a more complete person toward a satisfying professional life.

2. Mathematics and the Basic Sciences: Approximately one quarter of the entire curriculum provides a thorough grounding in mathematics, at least through differential equations, and the basic sciences of chemistry and physics. These subjects are essential to all engineering students as the foundation of the engineering sciences. All first-year

students are required to pass a mathematics readiness and aptitude examination prior to enrolling in MATH 185 Calculus I.

3. The Engineering Sciences: Fundamental concepts in engineering sciences provide a comprehensive foundation for all engineering disciplines. Topics such as statics, dynamics, electrical circuits, materials science, and thermodynamics integrate and build on principles introduced in mathematics, chemistry, and physics. Engineering science courses enable students to develop the competence to apply essential principles to synthesize and design engineering systems.

4. The Major: The fourth area of study is the major field which is described in the following sections.

The Major

Although significant specialization is postponed until after the bachelor's degree, basic programs in chemical, civil, computer, electrical, or mechanical engineering are offered as a major, comprising about one half of each curriculum. Each student is able to focus on one aspect of the engineering discipline in greater depth and to develop proficiency in engineering design.

The undergraduate programs in chemical engineering, civil engineering, computer engineering, electrical engineering, and mechanical engineering are accredited by the EAC of ABET, <http://www.abet.org/>. The Master of Engineering in Environmental Engineering program is also accredited by ABET.

Minor Studies

Engineering students have the opportunity to develop depth in an area other than the major by completing a minor.

Students may minor in many areas including air & space studies, biology, business, computer science, chemistry, economics, English, environmental studies, finance, political science, history, management, marketing, mathematics, modern foreign languages, peace studies, philosophy, physics, psychology, religious studies, urban affairs, and women and gender studies. In general, a minor requires 15 credits. Courses must be completed at Manhattan College.

Engineering students may also choose to minor in another engineering discipline. The minors are:

Chemical Engineering--

CHML 207 Process Calculations, CHML 208 Chemical Engineering Principles I, CHML 305 Chemical Engineering Principles II, CHML 306 Separation Process Design I, and CHML 321 Chemical Reaction Engineering.

Civil Engineering--

CIVL 302 Structural Analysis I, CIVL 309 Steel Design, CIVL 409 Reinforced Concrete Design, CEEN 303 Fluid Mechanics, and CIVL 310 Introductory Geomechanics.

Computer Engineering--

1. For all students except electrical engineering majors:

EECE 210 Software Engineering I, EECE 229 Introduction to Digital Systems and EECE 232 Computer System, Organization & Design, and two additional computer engineering courses approved by the ECE department chair.

2. For electrical engineering majors:

EECE 210 Software Engineering I and EECE 232 Computer System, Organization & Design, plus three elective computer engineering courses, of which at least two must be upper division or graduate, approved by the ECE department chair. These elective courses cannot be used to simultaneously satisfy the requirements for electrical engineering.

Electrical Engineering--

1. For all students except computer engineering majors:

EECE 201 Fundamentals of Electrical System Analysis I, EECE 203 Fundamentals of Electrical System Analysis II, and EECE 229 Introduction to Digital Systems Analysis II to Digital Systems, plus sequence a, b, or c as follows:

1. EECE 303 Signals and Systems I and EECE 304 Signals and Systems II , or
2. EECE 305 Electronic Systems I and EECE 306 Electronic Systems II, or
3. Two upper division courses in electrical engineering approved by the ECE department chair.

2. For computer engineering majors:

EECE 232 Computer System, Organization & Design, and EECE 321 Embedded Systems Design, plus three elective electrical engineering courses, of which at least two must be upper division or graduate level, approved by the department chair. These elective courses cannot be used to simultaneously satisfy the requirements for computer engineering.

Environmental Engineering--

The minor in environmental engineering is open to all engineering majors. Required course work includes ENGS 204 Environmental Engineering Principles I plus four courses from the following: CEEN 305 Energy & the Environment ENVL 406 Water and Wastewater Treatment Processes, ENVL 408 Environmental Engineering Design, ENVL 410 Hazardous Waste Design, ENVL 439 Environmental Engineering Projects, ENVL 505 Surface Water Quality Modeling and ENVL 507 Groundwater. Students interested in the environmental engineering minor should contact Dr. Robert Sharp.

Mechanical Engineering--

ENGS 205 Introductory Thermodynamics, ENGS 206 Statics, MECH 230 Introductory Solid Mechanics, MECH 318 Fluid Mechanics I, and MECH 325 Heat Transfer. This set of courses may be modified by the mechanical engineering department chair based upon the background of the student.

Students are responsible for any required prerequisites. Completion of the minor may qualify students for entry to the graduate program of the minor department. Except for

environmental engineering, students should contact the chair of the minor department for further information.

Engineering students may obtain an Application for Minor form at the office of the Dean of Engineering. After the form is completed by the program chair offering the minor, the form should be returned to the office of the Dean of Engineering by the student. When all courses have been completed, the dean will notify the office of the Registrar. The courses leading to a minor in engineering are subject to change. Please verify the coursework required with the Assistant Dean of Engineering before starting a minor.

Transferring from a Community College

Students who complete a pre-engineering program will generally be permitted to transfer up to 50% of the credits required for a Bachelor of Science degree in an engineering degree program. Transfer credit will only be permitted for courses in which a grade of C (2.0) or higher has been earned. All transfer credits are reviewed by the Assistant Dean of Engineering

Students who graduate with an associate degree in a technology program will generally only be permitted to transfer 9 credits towards a Bachelor of Science engineering degree.

Engineering has transfer arrangements with several of the community colleges in the Tri-State area. Additional information can be obtained from the office of the Dean of Engineering at (718) 862-7281.

Graduate-Level Courses (5XX, 6XX, 7XX)

Undergraduate students in all engineering disciplines may be allowed to take graduate-level courses. Only those students who have a cumulative grade point average of at least a 3.00 may take the course for graduate credit with the approval of the department chair. Undergraduate students with a cumulative GPA of less than 3.00 will need the approval of the department chair to take the course for undergraduate credit. These courses will count for either undergraduate or graduate credit but not for both degree programs. Undergraduate students who enroll for undergraduate credit will be graded according to the standard undergraduate grading system, and the grade will be counted in the undergraduate grade point average. Tuition for the undergraduates in the graduate-level courses will be charged at the undergraduate rates provided the student does not exceed the total number of credits permitted for the academic year.

Seamless Master's Degree Program

Academically qualified undergraduate students may be invited to participate in a Seamless Master's Degree program in chemical, civil, computer, electrical, environmental, or mechanical engineering. Qualified students who enter Manhattan College with Advanced Placement and/or undergraduate college credit will generally be in a position to take graduate courses during their senior year at Manhattan College while completing the requirements for the Bachelor's degree. It may then be possible to obtain a Master's degree with only an additional year of study.

Undergraduate students who have earned a minimum of 3.20 cumulative GPA by the end of the first semester of their junior year are eligible to apply for the Seamless Master's Degree program upon the recommendation of a member of the engineering faculty.

Transfer students may be considered after completing courses at Manhattan College. All students participating in the Seamless Master's Degree program are required to submit an application for admission to that graduate program. The application must be submitted in the senior year through the Office of Admissions. The application is online. Students are required to complete the baccalaureate degree with a cumulative GPA of 3.00, or better, prior to continuing for the additional year of graduate study.

Students admitted into the seamless master's degree program may enroll in 500, 600, or 700 level courses while completing the requirements for the bachelor's degree. These courses will count for either undergraduate or graduate credit but not for both degree programs. Because some required graduate courses are offered on a two-year rotation, admitted students must meet with the chair of the major department prior to their senior year in order to select appropriate 500, 600, and 700-level courses to satisfy the master's degree requirements. There is no tuition increase for enrolling in graduate courses during the senior year provided the student does not exceed the total number of credits permitted for the academic year.

After completing the undergraduate degree requirements, financial support may be available from individual departments for the additional year of graduate study. This support typically includes research assistantships, graduate assistantships, academic scholarships and grants, and industrial fellowships.

Professional and Career Development

Internships

Experiential learning is invaluable to an undergraduate engineering student. Engineering students are encouraged to seek full-time positions in the summer, and manageable, part-time positions during the school year. Such jobs can enhance learning and develop complementary skills and personal growth. The engineering programs at Manhattan College do not offer academic credit for such internships. However, a student may take ENGS 401 Internship for Engineering Students, a tuition-free, zero credit course, which will be shown on the student's transcript thus demonstrating participation in this type of experiential learning. The School of Engineering encourages its students to investigate the benefits of internships.

Engineering Service

Service to the broader community is a Lasallian heritage that is exemplified in the engineering professions. Engineers are educated to serve the public via their work as professional employees of or as volunteers for public and private organizations – whether in design, manufacturing, project implementation, construction planning, public speaking, or teaching. They are also taught to consider the consequences of their work with respect to ethics and to sustainability. Students engaged in engineering service activities may take ENGS 402 Service for Engineering Students, a tuition-free, zero academic credits course, which will be shown on the student's transcript thus demonstrating participation in a contribution to the community. The School of Engineering strongly encourages its students to investigate the benefits of service.

Professional Engineering Licensing

An important distinction for engineers is to become a licensed professional engineer. Receipt of the baccalaureate degree from an institution accredited by the EAC of ABET is one important step towards licensure. The requirements for licensure include a two part examination. Engineering students in good academic standing at Manhattan College may take the first part, the Fundamentals of Engineering (FE) examination, during their senior year. All engineering students are strongly encouraged to take and pass the FE examination. The examination is heavily based on mathematics, basic sciences, and the engineering sciences. The engineering curricula at Manhattan College prepare the student for the examination.

Fellowships and Professional Schools

Engineers have a variety of career options open to them within and beyond the engineering profession. Undergraduate engineers go on to complete advanced degrees in engineering and other disciplines and also pursue careers in teaching, business, law and medicine. Engineering students are encouraged to use the expertise and services of the Manhattan College Center for Graduate School and Fellowship Advisement (CGSFA). The CGSFA is focused on helping students understand undergraduate research experience in the context of graduate school, fellowships, and career pathways. CGSFA advisors will work with students to determine whether graduate school fits in with their own professional development plans.

Applying for Fellowships

The Center for Graduate School and Fellowship Advisement is committed to helping students understand the process of applying to very competitive national and international fellowships. The CGSFA guides students seeking fellowship opportunities well-suited to their personal and professional goals, crafting applications, developing research proposals and preparing for interviews. A faculty committee reviews student applications for fellowships requiring an institutional nomination.

Preparation for Law School

The Center for Graduate School and Fellowship Advisement works closely with the faculty Pre-law Advisor, the Center for Career Development, and Alumni Relations to provide advising, resources, and opportunities for students interested in pursuing law school. No single major at Manhattan College is a prerequisite for applying to law school, nor is there a pre-law major or minor. Students that do well in the application process have strong analytic and problem solving skills, critical reading skills, writing skills, communication skills, research skills, task management skills and a dedication to public service and promotion of justice, according to the American Bar Association. Students are also encouraged to join and actively participate in the St. Thomas More Law Society.

Pre-Health Advising and Preparation for Medicine and Dentistry

CGSFA works closely with the Health Professions Advisory Committee (HPAC), a body of faculty members, to give guidance and support to students interested in careers in medicine, dentistry and allied health fields. We are available to help students investigate

their career options in healthcare, and to discuss curricula, activities, internships, research, and application procedures in the health professions. We support candidates through all aspects of the application process, and we work to provide opportunities to prepare students to be competitive applicants to health professions schools.

Health Professions Advisory Committee

The Health Professions Advisory Committee is a group of faculty members who give guidance to students interested in preparing for careers in medicine, dentistry and allied fields. This committee helps students become aware of the course requirements and experiences essential for admission to professional schools. The committee advises students on the selection of programs of study that will give both background in the sciences and a broad liberal education to prepare them for effective participation in the human community. More detail and a list of minimum required courses for admissions to professional schools can be found in the undergraduate catalog section of Academic Resources.

Pre-Health Concentration

The Pre-Health Concentration (<http://catalog.manhattan.edu/undergraduate/science/prehealth/>) is recommended for students that wish to gain entrance to health professions schools, including medical school, dental school, veterinary school, optometry school, physician assistant programs and other health profession schools. While students are not required to be a part of the concentration in order to get a committee letter of evaluation from HPAC, students are strongly encouraged to consider enrollment in this concentration to be part of the competitive cohort that applies to health professions schools each year.

Academic Standing

Students are considered to be in good academic standing in the College when their Manhattan College cumulative (GPA) is 2.00. To be considered in good academic standing in the School of Engineering, a student must have a cumulative engineering GPA of at least 2.00 and the semester grade point average must be at least 2.00. Grade point averages are computed at the end of each semester or term.

Students are expected to make adequate progress towards fulfilling their degree requirements every term. Adequate progress is described in the annually published *School of Engineering Advising Manual*. Students who are not making adequate progress are subject to academic sanctions.

Each of the engineering undergraduate programs has selected two different courses defined as **gateway courses**. These are essential courses in the different programs and the ability to successfully complete the courses in a timely manner is mandatory. Examples of gateway courses are ENGS 206 Statics for the civil engineering and mechanical engineering programs and CHML 207 Process Calculations for the chemical engineering program. A list of the gateway courses is published in the annual *School of Engineering Advising Manual*. A student will be allowed a maximum of three (3) attempts to take and pass, with a grade of C (2.00) or better, each of the gateway courses in the student's program. After three unsuccessful attempts to pass a gateway course with a C (2.00) or higher, the student will be subject to dismissal from the engineering program (but not Manhattan College), as determined by the department chair and the dean.

A letter of **academic warning** is typically issued to each student earning a grade of D or F in any given term, even if the student is still in good academic standing in engineering. Letters of academic warning in two consecutive terms, while the student is still in good academic standing in engineering, will result in a meeting with the Assistant Dean or the Dean of Engineering. The letter of academic warning clearly spells out the danger to an academic program from receiving unacceptable grades.

A letter of **academic probation** is typically issued to each student failing to remain in good academic standing in engineering. Also, a letter of academic probation is typically issued to students receiving multiple unsatisfactory grades (especially grades of F) even though the student may be in good academic standing. Freshman failing to remain in good academic standing after their first term may be placed on academic probation. Students on probation are required to take a reduced course load of 12 credits for the following term and may be restricted from participating in Manhattan College activities. Students may remove themselves from academic probation by achieving a grade point average of 2.0 by the end of the following regular term. Failing to achieve good academic standing while on probation can lead to an academic contract or, in extreme cases, dismissal.

An **academic contract** is typically issued to students failing to achieve good academic standing in engineering while on academic probation. A letter of academic contract is also typically issued to a student if the most recent term grade point average falls below 1.0 even if the student was not on probation the previous term. A student may not be on academic contract for two consecutive terms without authorization of the Dean of Engineering. A student who does not successfully complete an academic contract is subject to suspension or dismissal.

Students are subject to **suspension** when they fail to satisfy the conditions of the academic contract or fail to achieve good academic standing while on probation. In these situations, a judgment is made by the dean that the student's studies should be interrupted for a designated time period, usually six months or one year, before reinstatement would be considered. Suspended students must present evidence of their ability to continue their studies successfully when applying for such reinstatement into the school of engineering. Upon return, suspended students are subject to an academic contract for their first term back.

Dismissal is a permanent separation from Manhattan College, not just the School of Engineering. A letter of dismissal from the college may be issued to each student failing to satisfy the conditions of the academic contract or failing to achieve good academic standing while on probation. A student may also be dismissed from the college when earning failing grades in all courses attempted in any one term.

Generally, a student not in good academic standing may not enroll in more than four courses or for more than 14 credits, whichever is less. Exceptions to this limitation require the written permission of the Assistant Dean or the Dean of Engineering.

Engineering students must earn a grade of C (2.0) or higher in:

CHEM 101	General Chemistry I	3
CHEM 103	General Chemistry Laboratory I	1
CHEM 102	General Chemistry II	3
CHEM 104	General Chemistry Laboratory II	1

MATH 185	Calculus I	3
MATH 186	Calculus II	3
MATH 285	Calculus III	3
PHYS 101	Physics I	3
PHYS 102	Physics II	3

as required by the program of study, before enrolling in any 300 level engineering courses. A grade of C (2.0) or higher is required in MATH 286 Differential Equations prior to taking any 400 level engineering courses.

In addition, the following program-specific courses are also included in those which are allowed no more than three grades less than a C (i.e., no grades of C-, D+, or D).

CHEM 309	Physical Chemistry I	3
CHEM 310	Physical Chemistry II	3
CHEM 319	Organic Chemistry I	3
CHEM 320	Organic Chemistry II	3
CHEM 323	Organic Chemistry Laboratory I	2
PHYS 201	Wave Theory of Light and Matter	3

A student is permitted no more than three grades below a C (2.0) in engineering courses. If a student earns less than a C (2.0) in more than three engineering courses, the student must repeat one or more of the courses with a grade of C (2.0) or higher. The course(s) to be repeated will be determined in consultation with and approval of the Assistant Dean of Engineering.

In addition, all CMPT and MATH courses required for any engineering program and any mathematics and science elective courses are also included in this requirement. Additional courses may be added during the period of this catalog so students are advised to contact the chair of their department or the Assistant Dean of Engineering to determine if they will need to repeat a course in which they earn a grade of C- (1.67) or lower.

General Education Requirements For Engineering Majors

A graduate of the School of Engineering is expected to be technically competent in the chosen program of study and also prepared as a citizen, an advocate, and a leader in the complex world of the 21st century. A broader education beyond science, technology, engineering, and mathematics (STEM) courses is expected of the modern engineering graduate. STEM courses must be augmented and balanced by courses from other disciplines such as English, foreign languages, history, religious studies, communication, sociology, education, political science, business, and economics.

The EAC of ABET requires that engineering program curricula offer a professional component which must include "a general education component that complements the technical content of the curriculum and is consistent with the program and institution objectives." In order to meet ABET requirements and institutional objectives, students graduating from an engineering program at Manhattan College must successfully complete the following general education requirements:

- ENGL 110 First Year Composition 3 credits (required of all students)
- RELS 110 The Nature and Experience of Religion 3 credits (required of all students)
- Religious Studies - Additional 6 credits with students selecting one course from Elective Group A (Catholic Studies) and one course from Elective Group B (Global Studies and Contemporary Issues)
- Humanities, Social Sciences or other approved courses – 12 to 15 credits (depending on engineering program) from subject areas such as modern foreign languages (200 Level or higher), religious studies (beyond the 9 credits described above), fine arts, history, philosophy, English, political science, economics, psychology, sociology, business and education.

A list of acceptable courses can be found in the annually updated *School of Engineering Advising Manual*. Additional restrictions may be applied and final acceptance of all courses meeting the general education requirements are subject to approval by the Office of the Dean of Engineering.

Guidance Program

The guidance and advisory program for students in engineering follows the pattern established for the entire college. First-year students are advised by the Assistant Dean in the office of the Dean of Engineering. The chairs or designated faculty members of engineering departments act as advisors to upper division students. Those students may also receive guidance and advice through the office of the Dean of Engineering. The phone number for the office of the Dean of Engineering is (718) 862-7281.

Departmental faculty members are available to advise junior and senior students with respect to career opportunities in their major, as well as the program of study.

Student Societies

Student chapters of several national engineering societies have been established at Manhattan College to assist the student in becoming familiar with the engineering profession: American Institute of Chemical Engineers, American Society of Civil Engineers, American Society of Mechanical Engineers, and Institute of Electrical and Electronics Engineers.

Other organizations of special interest to engineering students include: American Chemical Society; Society of Hispanic Professional Engineers; Society of Women Engineers; American Society of Heating, Refrigeration, Air Conditioning Engineers; The New York Water Environment Association; and the Society of Automotive Engineers. Chapters of Tau Beta Pi (Engineering), Omega Chi Epsilon (Chemical Engineering), Chi Epsilon (Civil Engineering), Eta Kappa Nu (Electrical Engineering), and Pi Tau Sigma (Mechanical Engineering) honor societies have been chartered at Manhattan College to recognize students who excel in scholarship and leadership. Membership in these national honor societies is open to juniors and seniors.

Certification For Graduation

The Dean of the School of Engineering must certify that a student has satisfied all requirements for his or her program of study prior to graduation. The dean may approve program modifications, if necessary, to meet program requirements.