Chemistry

The chemistry major aims to deepen students' appreciation for and understanding of the atomic and molecular nature of matter, which informs us about our universe and ourselves to conserve and enhance our world. The chemistry major offers three tracks to the bachelor's degree: a chemistry track, a biochemistry track, and a forensic science track. All programs provide coursework for students that help them develop the intellectual competence and technical skills necessary in their chosen careers.

Career Opportunities

A chemistry degree is excellent preparation for a wide variety of career goals, such as:

- Medicine (MD or DO)
- Dentistry
- Pharmacy
- Veterinary medicine
- Physician's Assistant (PA)
- Graduate school in chemistry or chemical engineering
- Industrial research careers
- Quality Assurance and Control
- Formulations chemistry
- Forensic science/criminal investigations
- Pharmaceutical, biological, chemical, or technical sales or support
- Patent and Intellectual Property Law
- Medical/Clinical laboratory science

See the Graduate section (http://catalog.mtmercy.edu/graduateprograms/) of this *Catalog* for more information on Graduate programs offered at Mount Mercy.

Major

Chemistry Track

Required:		
CH 111	General Chemistry I	4.5
CH 112	General Chemistry II	4.5
CH 211	Organic Chemistry I	4.5
CH 212	Organic Chemistry II	4.5
CH 251	Analytical Chemistry	4.5
CH 302	Biochemistry	4.5
CH 370	Physical Chemistry	4.5
MA 164	Calculus I	4
PH 151	Principles of Physics I	4
PH 152	Principles of Physics II	4
Select Two of the Following: *		**6-9**
CH 303	Biochemistry II	
CH 334	Instrumental Analysis	
CH 399	Special Topics in Chemistry	
Total Hours		**49.5-52.5**

* More electives will be added at a later date. Check with chemistry advisor for most up-to-date offerings.

Biochemistry Track

Required:		
CH 111	General Chemistry I	4.5
CH 112	General Chemistry II	4.5
CH 211	Organic Chemistry I	4.5
CH 212	Organic Chemistry II	4.5
CH 251	Analytical Chemistry	4.5
CH 302	Biochemistry	4.5
CH 303	Biochemistry II	3
MA 164	Calculus I	4
BI 125	Foundations of Biology & Scientific Inquiry I	3
BI 125L	Biostatistics and Scientific Investigation I	1.5
BI 126	Foundations of Biology & Scientific Inquiry II	4.5
BI 303	Genetics	4.5
Choose One of the Following: *		**3-5**
CH 334	Instrumental Analysis	
CH 370	Physical Chemistry	
CH 399	Special Topics in Chemistry	
BI 315	General Microbiology	
BI 370	Cell and Molecular Biology	
Total Hours		**50.5-52.5**

* More electives will be added at a later date. Check with chemistry advisor for most up-to-date offerings.

Forensic Science Track

Required:		
CH 111	General Chemistry I	4.5
CH 112	General Chemistry II	4.5
CH 211	Organic Chemistry I	4.5
CH 212	Organic Chemistry II	4.5
CH 251	Analytical Chemistry	4.5
CH 302	Biochemistry	4.5
CJ 101	Introduction To Criminal Justice	3
CJ 350	Trial Evidence	3
BI 273	Human Anatomy	4.5
Choose One Set:		**12.5-13.5**
Set A:		
BI 125	Foundations of Biology & Scientific Inquiry I	
BI 125L	Biostatistics and Scientific Investigation I	
BI 126	Foundations of Biology & Scientific Inquiry II	
BI 303	Genetics	
Set B:		
PH 151	Principles of Physics I	
PH 152	Principles of Physics II	
CH 370	Physical Chemistry	
CH 399	Special Topics in Chemistry	
Total Hours		**50-51**

Academic Requirements

A grade of C or above (C- does not count) in each required course for the major. To count toward the major, required chemistry courses must

have been taken within the last five (5) years. Alternatively a student may elect to take standard examinations for specific courses provided by the ACS Division of Chemical Education and pass with a minimum 60% of the total score.
Students planning to pursue teacher education should follow the program guidelines within the Education section (http://catalog.mtmercy.edu/curriculum/education/) of this *Catalog* and contact an advisor in the education division for assistance.

Chemistry Minor

Required:		
CH 111	General Chemistry I	4.5
CH 112	General Chemistry II	4.5
CH 211	Organic Chemistry I	4.5
CH 212	Organic Chemistry II	4.5
CH 251	Analytical Chemistry	4.5
Choose One of the Following:		**4.5**
CH 302	Biochemistry	
CH 334	Instrumental Analysis	
CH 399	Special Topics in Chemistry	
Choose One of the Following:		**3**
MA 139	Pre-Calculus	
MA 164	Calculus I	
Total Hours		**30**

Academic Requirements

A grade of C or above (C- does not count) in each required course for the minor. To count toward the minor, required chemistry courses must have been taken within the last five (5) years. Alternatively a student may elect to take standard examinations for specific courses provided by the ACS Division of Chemical Education and pass with a minimum 60% of the total score.
Students planning to pursue teacher education should follow the program guidelines within the Education section (http://catalog.mtmercy.edu/curriculum/education/) of this *Catalog* and contact an advisor in the education division for assistance.
The following is the typical sequence of courses required for the major*:

Chemistry Track

Freshman

Fall	Hours	Winter	Hours	Spring	Hours
CH 111	4.5	Domain	3	CH 112	4.5
BI 125	3			Elective or Domain	3
BI 125L	1.5			Writing Competency	4
MA 164	4			CO 101	3
Portal	3				
	16		**3**		**14.5**

Sophomore

Fall	Hours	Winter	Hours	Spring	Hours
CH 211	4.5	Elective or Domain	3	CH 212	4.5
PH 151	4			PH 152	4
Domain	3			Domain	3
				Domain	3
	11.5		**3**		**14.5**

Junior

Fall	Hours	Winter	Hours	Spring	Hours
CH 302	4.5	Chemistry Elective or Domain	3	CH 251	4.5
CH 370	4.5			Chemistry Elective or Domain	3
Domain	3			Domain	3
Domain	3			Domain	3
	15		**3**		**13.5**

Senior

Fall	Hours	Winter	Hours	Spring	Hours
CH 370 (or Elective)	4.5	Domain or Chemistry Elective	3	Domain or Chemistry Elective	3
Elective or Chemistry Elective	3			Elective	2
Elective	3			Elective	3
Elective	3			Elective	3
				ME 450	1
	13.5		**3**		**12**

Total Hours: 122.5

Biochemistry Track

Freshman

Fall	Hours	Winter	Hours	Spring	Hours
CH 111	4.5	Domain	3	CH 112	4.5
BI 125	3			BI 126	4.5
BI 125L	1.5			Writing Competency	4
MA 164	4			CO 101	3
Portal	3				
	16		**3**		**16**

Sophomore

Fall	Hours	Winter	Hours	Spring	Hours
CH 211	4.5	Elective or Domain	3	CH 212	4.5
Elective	3			BI 303	4.5
Domain	3			Domain	3
Domain	2			Domain	3
	12.5		**3**		**15**

Junior

Fall	Hours	Winter	Hours	Spring	Hours
CH 302	4.5	CH 303	3	CH 251	4.5
Domain or Chemistry Elective	3			Chemistry Elective or Domain	3
Domain	3			Domain	3
Elective	3			Elective	3
	13.5		**3**		**13.5**

Senior

Fall	Hours	Winter	Hours	Spring	Hours
Chemistry Elective or Domain	3	CH 303 (or Elective)	3	Domain or Chemistry Elective	3
Domain	3			Domain	3
Elective	3			Elective	2
Elective	3			Elective	3
				ME 450	1
	12		**3**		**12**

Total Hours: 122.5

Forensic Science Track

Freshman

Fall	Hours	Winter	Hours	Spring	Hours
CH 111	4.5	Domain	3	CH 112	4.5
BI 125	3			BI 126	4.5
BI 125L	1.5			Writing Competency	4
Portal	3			CO 101	3
Math Competency	4				
	16		**3**		**16**

Sophomore

Fall	Hours	Winter	Hours	Spring	Hours
CH 211	4.5	Elective or Domain	3	CH 212	4.5
CJ 101	3			BI 303	4.5
PH 151 (B Track) or Elective / Domain	4			BI 273	4.5
Domain	3			PH 152	4
	14.5		**3**		**17.5**

Junior

Fall	Hours	Winter	Hours	Spring	Hours
CH 302	4.5	Domain or Elective	3	CH 251	4.5
CH 370 (Track B) or Elective	4.5			CH 399 (Track B) or Elective	3
Domain	3			Elective or Domain	3
				Elective or Domain	3
	12		**3**		**13.5**

Senior

Fall	Hours	Winter	Hours	Spring	Hours
CH 370 (Track B) or Elective	4.5	Elective or Domain	3	CJ 350	3
Domain	3			CH 399 (Track B) or Elective	3
Elective	1.5			Domain	3
Elective	3			Domain	3
				ME 450	1
	12		**3**		**13**

Total Hours: 126.5

Note: Elective courses could be used for a second major, a minor, a course of interest, internship or study abroad experience.
Note: See the Curriculum section *(*http://catalog.mtmercy.edu/curriculum/#corecurriculumtext*) for more information on Portal, Competency, Domain, and Capstone courses.*

*Disclaimer

The course offerings, requirements, and policies of Mount Mercy University are under continual examination and revision. This *Catalog* presents the offerings, requirements, and policies in effect at the time of publication and in no way guarantees that the offerings, requirements, and policies will not change.
This plan of study represents a typical sequence of courses required for this major. It may not be applicable to every student. Students should contact a department faculty member to be sure of appropriate course sequence.

Courses

CH 100 Discovering Chemistry Laboratory: 1 semester hour
Students will perform a variety of chemistry and/or physics laboratory experiments. Students will be able to define problems clearly, analyze data properly and draw appropriate conclusions. Based on their laboratory experiments, the students will then be able to construct inquiry-based laboratory exercises using appropriate resources. This course fulfills the requirement of the Natural World domain for transfer students who have not taken a laboratory based natural science course before transferring to Mount Mercy. This course is also for education majors who need additional credit hours for their endorsement areas. This course can be crosslisted with PH 100.

CH 101 Chemistry in the Kitchen: 4 semester hours
This course is designed to teach students a basic understanding of chemistry using food science. The course is for non-science majors. Major topics covered in this class include: the scientific method, chemicals and food, atomic structure and food molecules, chemical measurements and calculations, thermodynamics and energy, common chemical reactions, kinetics, acid-base chemistry, and nutrients. This course fulfills the Natural World Domain requirement for non-major students.

CH 110 Introduction to Chemistry: 3 semester hours
This course is intended to provide an overview of fundamental concepts in chemistry, including: atomic and molecular structure, the nature of chemical bonding, chemical reactions, and stoichiometry, nomenclature, basic knowledge of thermodynamics and equilibrium, acids/bases, basic organic chemical nomenclature and reactivity. This course meets the needs of students not planning to take chemistry courses beyond CH 113. Students with minimal mathematical skills can use CH 110 as a preparatory course for CH 111 General Chemistry I. Three hours of lecture per week. Typically offered each fall and spring semester.

CH 111 General Chemistry I: 4.5 semester hours
This course is an introduction to the field of chemistry, providing an understanding of the structures of atoms, molecules and ions and their interactions, and a foundation for the further study of chemistry. Three lectures and one three-hour lab weekly. Prerequisite: A Mathematics Pre-Algebra and Elementary Algebra Enhanced ACT subscore of 16 or higher; or a Mathematics score of 16 or higher on the former ACT; or completion of MA 008 with a grade of C or higher.

CH 112 General Chemistry II: 4.5 semester hours
This course is a continuation of CH 111. Topics covered are: chemical kinetics; equilibrium and thermodynamics; acids and bases; electrochemistry; survey of metals, nonmetals, and transition metals; complexes; nuclear chemistry. Three lectures and one three-hour lab weekly. Prerequisite: CH 111.

CH 211 Organic Chemistry I: 4.5 semester hours
This course is an introduction to organic chemistry; an integrated presentation with emphasis on the theoretical aspects and mechanisms of reactions. Detailed discussion of alkanes, alkenes, alkynes, and stereochemistry. Three lectures and an additional three-hour lab meet weekly. Prerequisite: CH 111, CH 112.

CH 212 Organic Chemistry II: 4.5 semester hours
This course is a continuation of CH 211. Functional groups discussed in detail. The course will provide an introduction to absorption spectroscopy and qualitative identification of organic compounds; aromatic and heterocyclic compounds; macromolecules. Three lectures and one additional three-hour lab meet weekly. Prerequisite: CH 111, CH 112, CH 211.

CH 251 Analytical Chemistry: 4.5 semester hours
Theory and application of basic methods in quantitative analysis: titrimetric, gravimetric, chromatographic, potentiometric, and spectrophotometric determinations. Three lectures and one additional four-hour lab meet weekly. Prerequisites: CH 111, CH 112, MA 142 or MA 164.

CH 302 Biochemistry: 4.5 semester hours
This course focuses on the study of life at the molecular level. The course examines the structure and function of key biological macromolecules (proteins, nucleic acids, lipids and carbohydrates), enzymes (kinetics, catalytic and regulatory strategies), central metabolic pathways and their regulation (cellular respiration, gluconeogenesis, glycogen, fatty acid and lipids), cell membranes and signal-transduction pathways. The laboratory portion emphasizes techniques used to study and analyze proteins. Three hours of lecture and one four-hour laboratory per week. Prerequisites: CH 111, CH 112, CH 211, CH 212, BI 125 and BI 125L. (Offered fall semester).

CH 303 Biochemistry II: 3 semester hours
A continuation of CH 302. Topics include the metabolism of amino acids, proteins, and nucleotides, membrane lipids and steroids; the integration of metabolism; exploring sensory systems, immune systems, and drug development. Prerequisites: CH 111, CH 112, CH 211, CH 212, CH 302. (Offered winter term in even years).

CH 334 Instrumental Analysis: 4.5 semester hours
The course teaches the underlying principles and practical aspects of using modern instruments in chemical analysis. Students will understand the chemistry relevant to sampling, sample preparation, and the chemical processes occurring in each instrument - such as electron transfer, electron emission, light scattering and absorption, gas and liquid phase equilibria. Prerequisites: CH 111, CH 112, CH 211, CH 212, CH 251.

CH 370 Physical Chemistry: 4.5 semester hours
An introduction to physical chemistry. Topics covered include thermodynamics, kinetics, quantum chemistry, molecular structure and spectroscopy. Three hours of lecture and one three-hour laboratory weekly. Prerequisites: CH 111, CH 112, CH 211, CH 212, CH 251, MA 164.

CH 399 Special Topics in Chemistry: 3 semester hours
Chemistry is a dynamic subject and this course is designed to present topics that may not have sufficient, sustained demand to be a regular course offering. The course is intended to provide an in-depth, advanced study of topics that are chosen with attention to student interest and faculty availability. This course may be repeated if topic is different. Prerequisite: CH 211 and permission of instructor.

CH 450 Chemistry Internship: 6 semester hours
This is a directed educational experience in employment situations under joint sponsorship by a faculty member and an employer. Students enrolled in this course will work with a community partner and are expected to perform duties as assigned by the community partner, who functions as the student's on-site supervisor. Internships are anticipated to mimic the employee-employer relationship and conform to standards prevalent at the community partner. Each credit hour of internship should correlate to approximately 40 hours of internship activities (activities are mainly determined by the specific job or projects assigned by the community partner). Students are required to: (1) Keep a journal during their internship reflecting on their experiences, new skills learned, etc. Due dates for the journal entries will be determined by the facu1ty instructor. (2) Meet (this may be done electronically, e.g. Facetime or Skype video conference) with the MMU instructor at least three times during the semester: at the beginning, near mid-term, and at the end of the semester (before the end of finals week), and (3) Complete an evaluation of the internship experience. Prerequisite: a successful application must be made in writing to a supervising chemistry instructor in the semester prior to the internship.

CH 451 Chemistry Research: 6 semester hours
This course provides a research opportunity for undergraduate students, which may include an introduction to relevant background material, technical instruction, identification of a meaningful project, data collection, analysis and dissemination. Projects and topics are determined by the faculty member in charge of the course and may relate to his/her research interests, or the interests of a student. This course will be offered based on faculty availability and student demand. Students may register for 1-6 credits per semester (1 semester credit= 40 project hours); students may repeat this course. Prerequisite: approval by advising instructor.