CHEMISTRY, MS

Program Description

The mission of the Master of Science program in Chemistry is to prepare students for technical careers, careers in chemical education at the secondary level or who aspire to enroll in a doctoral program. This program is designed to provide students with a quality experience that will help them grow as scholars and as professionals.

Student Learning Outcomes

Upon completion of their degree, students will:

- Possess a broad understanding of chemical concepts
- Possess enhanced knowledge of a specific area of chemistry, including relevant scientific literature, related to their thesis or professional paper
- Have the ability to accurately describe and assess chemistry related research both orally and in writing

For Additional Information

Website:
https://www.tamucc.edu/science/departments/physical-sciences/chemistry/graduate.php

Campus Address:
Center for Sciences Suite 130
Phone (361) 825-2681

Mailing Address:
Chemistry Program, Unit 5802
College of Science and Engineering
Texas A&M University-Corpus Christi
6300 Ocean Drive
Corpus Christi, Texas 78412-5802

Admission Requirements

Applicants must comply with university procedures for admission to the degree program. Incomplete applications will not be considered. Persons seeking admission to the MS Program in Chemistry should first contact the program faculty and identify a faculty member willing to serve as the graduate advisor. Applicants will not be admitted to the program without a graduate advisor. Persons seeking admission to the MS Program in Chemistry should consult the Admissions section of this catalog for university requirements for admission. In addition to the documents required by the Office of Recruitment and Admissions, applicants must submit GRE general test scores, an essay of at least 300 words describing their educational and career interests, goals, and challenges, and three letters of evaluation from persons knowledgeable about their potential for success in graduate studies. Applicants may optionally submit other relevant materials, e.g., copies of published works or reports of past scientific research. All materials submitted will be considered. Applicants who already hold an earned graduate degree from a regionally accredited university need not submit GRE scores. The applicant will be notified by letter of acceptance or rejection.

Students accepted to the degree program in chemistry are generally expected to enter the program with an undergraduate degree in chemistry. Students accepted to the degree program with insufficient background in chemistry will be required to take undergraduate or graduate prerequisite courses prescribed by their advisory committees. These courses may or may not apply towards the total required for completion of the master's degree.

Teaching assistant positions are available to graduate students admitted as degree-seeking students. Minimum qualifications and applications for assistantships may be found on the College of Graduate Studies website.

Program Requirements

Each student accepted to the Master of Science in Chemistry degree program must complete a minimum of 36 semester hours for the non-thesis "Professional" track and a minimum of 30 semester hours for the thesis track.

Students will choose between thesis and professional (non-thesis) options. Students following either option will be required to take a core of chemistry/chemistry-related courses to provide a broad background to the field, and to select elective courses in consultation with their advisory committee to provide in-depth education in a particular area of emphasis related to chemistry. A student will define an emphasis area for his or her graduate studies with assistance from the graduate advisor and advisory committee. The emphasis areas include the traditional areas of chemistry such as analytical chemistry, biochemistry, environmental chemistry, inorganic chemistry, materials chemistry, physical chemistry or theoretical chemistry; or the student may choose an MS degree in chemistry related to one of the other programs at TAMUCC such as Coastal and Marine System Science, Engineering, Marine Biology, Environmental Science, etc.

A graduate student who has met with his or her advisory committee, formulated a degree plan approved by the graduate committee, and has the plan on file is considered a degree candidate. A student must have advanced to degree candidacy by the end of the second full semester of graduate study following admission to the program. A student's advisory committee must approve any subsequent changes to the degree plan. A change from the thesis to the professional (non-thesis) option or vice versa requires that the student file a new degree plan as approved by the advisory committee.

All Chemistry MS students must successfully complete at least six semester hours per academic year to remain in the program.

All Chemistry MS students must enroll in CHEM 5303 Research in the Chemical Sciences (3 sch) during their first semester.

All Chemistry MS students must pass a final oral exam, to be administered by their advisory committee, during their last semester before graduation.

Thesis Track

The thesis option requires a thesis based upon original research supported by the scientific literature, and analyzed statistically when appropriate. The thesis master's degree will allow a person to pursue advanced graduate study, or to obtain employment in most areas requiring a detailed knowledge of a specific aspect of chemistry.

Code	Title	Hours
Core Courses		
CHEM 5303	Research in the Chemical Sciences [1]	3
CHEM 5317	Advanced Instrumental Analysis	3
Thesis Track		

CHEM 5392	Thesis Proposal	3
CHEM 5394	Thesis Submission	3
CHEM 5993	Thesis Research [2]	6
Prescribed Elective Courses		
Select 12 hours from the following: [3]		12
CHEM 5307	Advanced Inorganic Chemistry	
CHEM 5321	Molecular Ecology	
CHEM 5322	Supramolecular Chemistry	
CHEM 5340	Advanced Environmental Chemistry	
CHEM 5341	Advanced Organic Chemistry	
CHEM 5352	Computational Chemistry	
CHEM 5362	Chemical Oceanography	
CHEM 5369	Advanced Molecular Spectroscopy	
CHEM 5375	Stable Isotope Biogeochemistry	
CHEM 5421	Aquatic Chemistry	
CHEM 5490	Advanced Topics	
CHEM 5993	Thesis Research [2]	
Total Hours		**30**

1

CHEM 5303 Research in the Chemical Sciences (3 sch) must be taken the first semester by all Chemistry MS students.

2

Students are required to take CHEM 5993 Thesis Research (1-9 sch) for at least 6 semester hours of credit. CHEM 5993 Thesis Research (1-9 sch) can be taken for a variable number of credit hours (1-9) per semester.

3

Additional courses from relevant fields (e.g. Biomedical Science, Coastal and Marine Systems Science, Environmental Science, etc.) may be substituted with committee approval.

Professional Track - Non-Thesis

The professional option allows students to take required and elective graduate courses to further explore sub-disciplines of chemistry and identify a project that will help them advance their career or better compete for leadership opportunities. The project would be appropriate (for example) to partner with local chemical industries to help develop solutions to applied problems arising during their operations, or for local educators to further their chemistry experience. Non-thesis students must complete a professional research project with a written final report and seminar.

Code	Title	Hours
Core Courses		
CHEM 5303	Research in the Chemical Sciences [1]	3
CHEM 5317	Advanced Instrumental Analysis	3
Professional Track		
CHEM 5369	Advanced Molecular Spectroscopy	3
CHEM 5397	Directed Research [2]	3
Prescribed Elective Courses		
Select 24 hours from the following: [3]		24
CHEM 5307	Advanced Inorganic Chemistry	
CHEM 5321	Molecular Ecology	
CHEM 5322	Supramolecular Chemistry	
CHEM 5340	Advanced Environmental Chemistry	
CHEM 5341	Advanced Organic Chemistry	
CHEM 5352	Computational Chemistry	
CHEM 5361	Organic Geochemistry	
CHEM 5362	Chemical Oceanography	
CHEM 5375	Stable Isotope Biogeochemistry	
CHEM 5397	Directed Research [2]	
CHEM 5421	Aquatic Chemistry	
CHEM 5490	Advanced Topics	
Total Hours		**36**

1

CHEM 5303 Research in the Chemical Sciences (3 sch) must be taken the first semester by all Chemistry MS students.

2

Students are required to take CHEM 5397 Directed Research (3 sch) for up to six hours. At least three hours of CHEM 5397 Directed Research (3 sch) may be counted toward the requirements of the Professional track with approval from the program coordinator.

3

Additional courses from relevant fields (e.g. Biomedical Science, Coastal and Marine Systems Science, Environmental Science, etc.) may be substituted with committee approval.

Information About the Thesis or Professional Paper

Thesis and Professional Paper Format and Style

The thesis or professional paper must be prepared in a standard format and style dictated by the advisory committee and College of Graduate Studies. The format and style requirements will specify paper size, paper quality, margins, pagination, etc.

Upon approval by a student's advisory committee, a copy of the thesis will be sent to the Office of the Dean of the College of Science and Engineering. At the time of successful completion of the oral exam, committee members will sign the thesis and return it to the Dean of the College of Science and Engineering for final approval and signature. All submitted copies of the thesis must be bound in prescribed buckram. The student must pay the fee for this service. Thesis formatting and submission requirements have changed. Please visit the following link for further information: http://gradcollege.tamucc.edu/current_students/dissertation_thesis.html.

Grades for Thesis or Directed Research Courses

The following courses are eligible for awarding a permanent mark of "In Progress" (IP) if the work is not completed by the end of the semester in which a student has enrolled in the course: CHEM 5392 Thesis Proposal (3 sch), CHEM 5394 Thesis Submission (3 sch) and CHEM 5397 Directed Research (3 sch). University rules stipulate that the student must register for the same course in the subsequent semester, paying the appropriate tuition and fees, to receive a letter grade for the course.

For thesis students, the student's graduate committee must sign the completed Thesis Proposal before the student is awarded a letter grade for CHEM 5392 Thesis Proposal (3 sch). If the proposal is not signed and on file in the College of Science and Engineering (Dean's Office) by the end of the semester, a permanent mark of IP will be awarded. The student will also receive a permanent mark of IP for each semester of CHEM 5394 Thesis Submission (3 sch) until the student has defended the thesis

and the graduate committee has approved and signed the final thesis manuscript. At that time the student's graduate advisor will award a letter grade which reflects the overall quality of the thesis defense and the manuscript itself. Students who receive marks of IP must continuously enroll for CHEM 5392 Thesis Proposal (3 sch) or CHEM 5394 Thesis Submission (3 sch) until they earn a letter grade.

For non-thesis students, the student must have successfully defended the professional project, the student's graduate committee must have accepted the professional paper, and a final copy must be on file in the College of Science and Engineering (Dean's Office) by the end of the semester before the student is awarded a letter grade for CHEM 5397 Directed Research (3 sch). The letter grade will reflect the overall quality of the professional project research and the final professional paper. Otherwise the student will receive a permanent mark of IP and must sign up again for CHEM 5397 Directed Research (3 sch) in a subsequent semester to receive a letter grade for this work.

Final Oral Exam

Each student must pass a final oral exam during the last semester before graduation, to be administered by the student's advisory committee. The oral exam will cover topics related to

1. all graduate coursework undertaken for the chemistry program,
2. a student's emphasis area (including the thesis or directed research project), and
3. broad concepts of chemistry, including a familiarity with the literature and appropriate professional societies.

The student is responsible for scheduling the exam with the faculty involved. A student who fails the final oral exam may repeat it once, but only after an interval of four months or more. If a student fails the second oral examination, the student will be terminated from the program.

Graduate Coursework

General prerequisite for 5000- and 6000-level courses: graduate standing. Senior undergraduates in their last semester or summer session of undergraduate work may take graduate-level courses provided that they have a cumulative grade point average of 3.0 or better, and that written approval is obtained from the Dean of the college in which the work is offered. Weekly lecture and laboratory hours associated with each course are designated by (lecture:lab) following the semester hours. The indicated laboratory hours are laboratory instructional time. In most cases, additional laboratory time will be required to complete assigned work.

Courses

CHEM 5302 Current Trends in Chemistry
3 Semester Credit Hours (3 Lecture Hours)
The study and discussion of current topics and research efforts in chemistry. The course is intended to provide teachers with background and understanding that will enrich their classroom presentations in the chemistry curriculum. May be repeated for credit when topics vary. Offered on sufficient demand.

CHEM 5303 Research in the Chemical Sciences
3 Semester Credit Hours (3 Lecture Hours)
Studies and analysis of pertinent literature. May be repeated for credit, but credit may count only once towards the degree plan.

CHEM 5307 Advanced Inorganic Chemistry
3 Semester Credit Hours (3 Lecture Hours)
Chemistry 5307, 3 credit course, provides a detailed perspective to Inorganic chemistry. Specifically, the detailed descriptions of metals, their properties as well as applications, radioactive materials, organometallic chemistry, as well as bioinorganic chemistry. It will also introduce students to the world of solid-state chemistry and nanotechnology. The prerequisite is CHEM 1412. This course includes lectures, scientific paper reading and writing capabilities. No laboratory associated with this course.
Prerequisite: CHEM 1412.

CHEM 5317 Advanced Instrumental Analysis
3 Semester Credit Hours (3 Lecture Hours)
Advanced study of instrumental methods of analysis: spectroscopy, chromatography, and electrochemical methods.
Prerequisite: CHEM 3418.

CHEM 5321 Molecular Ecology
3 Semester Credit Hours (3 Lecture Hours)
A laboratory intensive graduate course that emphasizes the use of biochemical and molecular techniques to address ecological questions. Field sampling, sample preparation, biochemical and molecular genetic assays, statistical analysis and computer-based modeling techniques are used in a project-based approach to assess population genetic diversity, structure and migration rates in a key ecosystem species. Such estimates are of increasing concern for conservation and habitat management.

CHEM 5322 Supramolecular Chemistry
3 Semester Credit Hours (3 Lecture Hours)
The course introduces advanced topics covering the areas synthetic molecular receptors, host-guest chemistry, biochemical self-assembly, crystal engineering and molecular templation. Supramolecular chemistry has been called "chemistry beyond the molecule" focusing on intermolecular interactions and forces leading to the formation complexes and superstructures in solution and in the solid-state. The material takes a classical approach to chemical pedagogy that instills the excitement of modern research areas in the chemical sciences. The course is designed at an advanced level for graduate students.
Prerequisite: CHEM 3412.

CHEM 5340 Advanced Environmental Chemistry
3 Semester Credit Hours (3 Lecture Hours)
Advanced study of the impact of chemistry on the environment. Topics will include the chemistry of the natural environment and the modifications to that environment brought about by human activities. Includes readings in current literature and research on an environmental issue.

CHEM 5341 Advanced Organic Chemistry
3 Semester Credit Hours (3 Lecture Hours)
The course introduces advanced topics covering the areas of molecular structure and thermodynamics as well as reactivity, kinetics, and mechanisms of organic molecular architectures and ensembles. The material takes a classical approach to chemical pedagogy that instills the excitement of modern research areas in the chemical sciences. The course is designed at an advanced level for graduate students.
Prerequisite: CHEM 3412.

CHEM 5352 Computational Chemistry
3 Semester Credit Hours (3 Lecture Hours)
The course will include the investigation of the uses and outcomes of computational chemistry, including both classical (non-quantum) simulations of molecular systems and quantum mechanical modeling of molecules. Emphasis will be on constructing an appropriate molecular model, performing the appropriate calculation, and interpreting the results of the calculation.

CHEM 5361 Organic Geochemistry
3 Semester Credit Hours (3 Lecture Hours)
An introduction to the properties and cycling of natural organic materials will be presented to benefit graduate students studying marine systems. The course is designed to follow the geologic cycle of organic matter, from production in living organisms to burial in sediments and preservation in the depositional record. Specific topics include factors controlling preservation in sediments, methanogenesis, diagnetic alterations of organic compounds, fossil fuel production and degradation, life in the deep biosphere, biomarkers for ancient life, and isotopic variations in the sedimentary record.

CHEM 5362 Chemical Oceanography
3 Semester Credit Hours (3 Lecture Hours)
This course will cover both chemical processes in the oceanic environment and how biology, geology and physics affect the chemistry. Topics include air-sea interactions, water column chemistry, and reactions in sedimentary environments. Students are expected to participate in the teaching process through their involvement in small groups, class discussions, and modeling/simulation exercises.
Prerequisite: CHEM 1311 and 1312.

CHEM 5369 Advanced Molecular Spectroscopy
3 Semester Credit Hours (3 Lecture Hours)
The course is taught at the graduate level with the curriculum focusing on the advanced spectroscopic methods of molecular structure determination. The course aims to present foundational theoretical concepts of different molecular spectroscopy techniques including nuclear magnetic resonance, infrared, ultraviolet-visible, and mass spectroscopies and how these techniques are used to interpret spectra of unknown and structurally complex molecular analytes. This includes modes of absorption and emission, qualitative and quantitative uses and potential problems and limitations. The course has been designed for students who have completed organic chemistry II lecture and laboratory during their undergraduate career.

CHEM 5375 Stable Isotope Biogeochemistry
3 Semester Credit Hours (3 Lecture Hours)
This course teaches stable isotope systematics of five common light elements - carbon, nitrogen, hydrogen, oxygen and sulfur in biological, geological, and systems. Course material includes basic principles, analytical methods, thermodynamic and kinetic fractionations, and applications of stable isotope analyses in a wide range of natural systems. This course is recommended to graduate students in chemistry, geology, biological sciences, and coastal and marine system science.
Prerequisite: CHEM 1412.

CHEM 5392 Thesis Proposal
3 Semester Credit Hours
Review of the literature on a thesis topic. Completion of a written research proposal including proposed experimental design.

CHEM 5393 Thesis Research
3 Semester Credit Hours (3 Lecture Hours)
THESIS RESEARCH Chemistry Thesis Track students only. Collection and organization of research data. To receive a qualitative grade, the student must present a first draft of the thesis manuscript to the thesis advisor. If the semester ends before the advisor receives the first draft, an “In Progress” is recorded and the course must be repeated.
Prerequisite: CHEM 5392.

CHEM 5394 Thesis Submission
3 Semester Credit Hours
Thesis defense and completion of the thesis manuscript including acceptance of the final copy by the advisory committee. May be repeated; no more than three hours may be taken per semester.

CHEM 5397 Directed Research
3 Semester Credit Hours
Chemistry Professional Track students only. Collection, organization and submission of research data. To receive a qualitative grade, the student must successfully defend the professional project, the student's graduate committee must accept the professional paper, and a final copy must be on file in the Dean's Office. If the semester ends before these are accomplished, an "In Progress" is recorded and the course must be repeated.

CHEM 5417 Advanced Environmental Chemistry
4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)
Advanced study of the impact of chemistry on the environment. Topics will include the chemistry of the natural environment and the modifications to that environment brought about by human activities. Includes readings in current literature and research on an environmental issue. Includes a laboratory component.
Prerequisite: CHEM 1412.
Co-requisite: SMTE 0093.

CHEM 5421 Aquatic Chemistry
4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)
A study of the chemistry of natural and polluted waters. Topics include chemical kinetic and equilibrium principles as applied to natural and polluted waters, and the ecotoxicological aspects of aquatic chemistry. In addition, critical readings in current literature and research on environmental issues will be discussed. Includes a laboratory component.
Co-requisite: SMTE 0093.

CHEM 5431 Environmental Instrumental Analysis
4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)
A presentation of standard instrumental tools and instrumental methods used for the characterization of environmental pollutants and their distribution in the environment. Includes a laboratory component.

CHEM 5490 Advanced Topics
1-4 Semester Credit Hours (1 Lecture Hour, 1-3 Lab Hours)
Subject materials variable. Advanced topics including current literature research. May be repeated for credit when topics are sufficiently different.

CHEM 5596 Directed Independent Study
1-5 Semester Credit Hours
Study in areas of current interest. (A total of six hours of Directed Independent Study may be counted toward the MS degree.)

CHEM 5940 Project Research
1-9 Semester Credit Hours (3 Lecture Hours)
Student research on a project of interest. This variable credit hour course may be repeated in different semesters. Student may count up to six hours of CHEM 5940 toward the Chemistry Thesis Track or Professional Track with approval from the program coordinator.

CHEM 5993 Thesis Research
1-9 Semester Credit Hours
Chemistry Thesis Track students only. Collection, organization, and analysis of research data.

CHEM 6321 Molecular Ecology
3 Semester Credit Hours (3 Lecture Hours)
A laboratory intensive graduate course that emphasizes the use of biochemical and molecular techniques to address ecological questions. Field sampling, sample preparation, biochemical and molecular genetic assays, statistical analysis and computer-based modeling techniques are used in a project-based approach to assess population genetic diversity, structure and migration rates in a key ecosystem species. Such estimates are of increasing concern for conservation and habitat management. Offered on sufficient demand.

CHEM 6362 Chemical Oceanography
3 Semester Credit Hours (3 Lecture Hours)
This course will cover both chemical processes in the oceanic environment and how biology, geology and physics affect the chemistry. Topics include air-sea interactions, water column chemistry, and reactions in sedimentary environments. Students are expected to participate in the teaching process through their involvement in small groups, class discussions, and modeling/simulation exercises. Offered on sufficient demand.
Prerequisite: CHEM 1411 and 1412.

CHEM 6375 Stable Isotope Biogeochemistry
3 Semester Credit Hours (3 Lecture Hours)
This course teaches stable isotope systematics of five common light elements - carbon, nitrogen, hydrogen, oxygen and sulfur in biological, geological, and systems. Course material includes basic principles, analytical methods, thermodynamic and kinetic fractionations, and applications of stable isotope analyses in a wide range of natural systems. This course is recommended to graduate students in chemistry, geology, biological sciences, and coastal and marine system science.
Prerequisite: CHEM 1412.

CHEM 6417 Advanced Environmental Chemistry
4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)
Advanced study of the impact of chemistry on the environment. Topics will include the chemistry of the natural environment and the modifications to that environment brought about by human activities. Includes readings in current literature and research on an environmental issue. Includes a laboratory component.
Prerequisite: CHEM 1412.

CHEM 6421 Aquatic Chemistry
4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)
A study of the chemistry of natural and polluted waters. Topics include chemical kinetic and equilibrium principles as applied to natural and polluted waters, and the ecotoxicological aspects of aquatic chemistry. In addition, critical readings in current literature and research on environmental issues will be discussed. Includes a laboratory component