MARINE AND ATMOSPHERIC CHEMISTRY

- Dept. Code: MAC

Degree Program
The program covers the chemistry of the atmosphere and oceans, including geochemical, photochemical and biochemical processes. Undergraduate training should be in chemistry, physics, biology and mathematics; also useful may be courses in geology, biochemistry, oceanography and meteorology.

New students are evaluated for their knowledge of chemistry; deficiencies are corrected by directed study and/or course work and must be remedied within one year. New students can be admitted to the M.A. or the M.S. program, or directly into the PhD program, even without a prior M.S. degree.

Students are assigned a faculty advisor when they are accepted into MAC, and before the end of the second year they form a supervisory committee. The advisor and committee discuss with the student a course of study and research for the student. Students without an MS degree take a written comprehensive examination after course work is complete. The comprehensive exam tests the basic knowledge of marine and atmospheric science, and is based on course material taken by the student. After passing the comprehensive exam, the student prepares a dissertation research proposal which usually includes an abstract, background material, hypothesis and/or list of objectives, methods, preliminary data, and bibliography. The dissertation research proposal needs to be approved by the advisor and supervisory committee. Ph.D. students also take a written qualifying exam. The qualifying examination is set by the advisor and supervisory committee and is taken after their approval of the dissertation proposal. The qualifying exam tests the student's knowledge of the chosen research topic. An oral examination may be required after the written examination. Students who twice fail the qualifying examination will receive an MS if they present and successfully defend a written thesis. For all students, the seminar (MAC 770) is taken twice for credit hour. However, each student must give one seminar per year and they must attend seminars regularly.

Courses
MAC 603. Principles of Marine and Atmospheric Chemistry. 3 Credit Hours.
Introduction to the chemical aspects of the sea and atmosphere chemical composition, physico-chemical properties and relationships, methodology of study, fundamental aspects of marine and atmospheric chemistry.
Components: LEC.
Grading: GRD.
Typically Offered: Fall.

MAC 610. Biogeochemical Exploration of the Major Ocean Basins. 3 Credit Hours.
This course will have students explore the basic hydrography and biochemistry of the major ocean basins through use of several publicly available global ocean data sets. Each ocean basin will be assessed for biogeochemical features that are unique to that system. By the end of the course, students will have the skills necessary to investigate and interpret marine biogeochemical processes throughout the global ocean.
Components: LEC.
Grading: GRD.
Typically Offered: Fall.

MAC 660. Tropospheric Chemistry I. 3 Credit Hours.
Process-Oriented lower atmospheric chemistry. Topics include photochemical oxidant formation, nighttime chemistry, air-sea exchange, cloud droplet and aerosol reactions, physical properties of aerosols, and transport properties of the troposphere.
Components: LEC.
Grading: GRD.
Typically Offered: Spring.

MAC 684. Special Topics. 1-4 Credit Hours.
Lectures, research projects or directed readings in special topics of Marine and Atmospheric Chemistry.
Components: LEC.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

MAC 705. Chemical Oceanography. 3 Credit Hours.
Course consists of lecture and discussions with renowned experts in the major disciplinary foci and topical issues dominating the field of Chemical Oceanography. Topics include the chemistry and biogeochemical processes of the carbon cycle, ocean tracers, photochemistry, and specific marine environments (geothermal vents, anoxic waters, sediments, air/seas interface).
Components: LEC.
Grading: GRD.
Typically Offered: Spring.

MAC 720. Marine Physical Chemistry. 3 Credit Hours.
Physical-chemical principles applied to the marine environment, based on thermodynamics and the study of rate processes.
Components: LEC.
Grading: GRD.
Typically Offered: Spring.

MAC 725. Marine Biochemical Cycles. 3 Credit Hours.
Course discusses the roles of bacteria in the transformation of compounds in the marine environment, their functions in the carbon, nitrogen, sulfur, and phosphorus cycles, and transformation of metals. Bacterial activities in the deep-sea environment and their involvement in corrosion and fouling is also discussed.
Components: LEC.
Grading: GRD.
Typically Offered: Spring.
MAC 750. Reaction Kinetics and Molecular Dynamics. 3 Credit Hours.
Theories and experimental techniques for studying kinetics in the
gas-phase, association, unimolecular and bimolecular reactions,
chain reactions, flames, statistical theories, potential energy surfaces,
collision dynamics, kinetics in solution and the solid-state, experimental
methods, diffusion-controlled processes, transition state theory, thermal
decomposition, and nucleation are discussed.
Components: LEC.
Grading: GRD.
Typically Offered: Spring.

MAC 761. Tropospheric Chemistry II. 3 Credit Hours.
Chemical and physical properties of tropospheric aerosols. Topics
include properties of aerosols, dynamics of single aerosol particles,
thermodynamics of aerosols, nucleation theory, aerosol growth,
heterogeneous processes, dynamics of aerosol populations, and radiative
properties of atmospheric aerosols.
Components: LEC.
Grading: GRD.
Typically Offered: Fall.

MAC 762. Environmental Photochemistry. 3 Credit Hours.
Introduction to the principles of photochemistry and their application to
understanding sunlight initiated processes in the region of the ocean-
atmosphere interface. Organic and inorganic photochemical reactions
and subsequent thermal reactions in solution, gas, and solid media are
discussed.
Components: LEC.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

MAC 767. Marine Trace Element Geochemistry. 3 Credit Hours.
Components: LEC.
Grading: GRD.
Typically Offered: Spring.

MAC 770. Seminar in Marine and Atmospheric Chemistry. 1.00 Credit
Hour.
Oral presentation of research and special topics by students, faculty, and
visiting scientists.
Components: SEM.
Grading: GRD.
Typically Offered: Fall & Spring.

MAC 781. Special Topics in Marine and Atmospheric Chemistry. 1-4
Credit Hours.
Lectures, research projects or direct readings in special topics of marine
and atmospheric chemistry.
Components: LEC.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

MAC 805. Special Report. 1-6 Credit Hours.
Supervised project for students pursuing the Master of Arts degree
in Marine Studies. Consists of a paper, researched, and written on a
topic approved by the student’s advisory committee, and presented as a
seminar to the student’s division. Six credits are required for graduation.
Components: THI.
Grading: GRD.
Typically Offered: Fall, Spring, & Summer.

MAC 810. Master’s Thesis. 1-6 Credit Hours.
The student working on his/her master’s thesis enrolls for credit, in most
departments not to exceed six, as determined by his/her advisor. Credit is
not awarded until the thesis has been accepted.
Components: THI.
Grading: SUS.
Typically Offered: Fall, Spring, & Summer.

MAC 820. Research in Residence. 1 Credit Hour.
Used to establish research in residence for the thesis for the master’s
degree after the student has enrolled for the permissible cumulative total
in MAC 710 (usually six credits). Credit not granted. May be regarded as
full time residence.
Components: THI.
Grading: GRD.
Typically Offered: Fall, Spring, & Summer.

MAC 830. Doctoral Dissertation. 1-12 Credit Hours.
Required of all candidates for the Ph.D. The student will enroll for credit
as determined by his/her advisor but not for less than a total of 12. Not
more than 12 hours of MAC 730 may be taken in a regular semester, nor
more than six in a summer session. Where a student has passed his/her
(a) qualifying examinations, and (b) is engaged in an assistantship, he/she
may still take the maximum allowable credit stated above.
Components: THI.
Grading: SUS.
Typically Offered: Fall, Spring, & Summer.

MAC 850. Research in Residence. 1 Credit Hour.
Used to establish research in residence for the Ph.D., after the student
has been enrolled for the permissible cumulative total in appropriate
doctoral research. Credit not granted. May be regarded as full-time
residence as determined by the Dean of the Graduate School.
Components: THI.
Grading: SUS.
Typically Offered: Fall, Spring, & Summer.