

MARS - MARINE SCIENCE (MARS)

MARS 102 Earth and Ocean Science

Credits 4. 3 Lecture Hours. 3 Lab Hours. Introduction to earth systems analysis, plate tectonic framework; earth and ocean structure and chemistry, ocean and atmospheric circulation; global carbon and hydrologic cycles; focus on earth systems interactions in the coastal zone; primary productivity and oceanic life; human modification and dependence on earth system components; climate change analysis.

MARS 210 Marine Geography

Credits 3. 3 Lecture Hours. Introduction to the physical and cultural patterns of the coastal zones of the world. Interrelationships between the physical forms and processes and the cultural patterns are used to analyze human use and abuse of the sea.

MARS 252 Introductory Marine Science Laboratory

Credit 1. 3 Lab Hours. Overview of the global ocean environment and the interrelated sub-disciplines; the important of the ocean for the earth's ecosystems and human impact on the ocean; field work and boat trip, water and benthic sediment collection and analysis; navigation chart work. **Prerequisite:** OCNG 251 or concurrent enrollment.

MARS 280 Coastal and Ocean Resources

Credits 3. 3 Lecture Hours. Coastal and Ocean Resources. Resources from the ocean including food, minerals, transportation and recreation. Methods of recovery and utilization of resources from the ocean, efficiency and cost effectiveness. Provides a foundation for understanding the wealth of resources available from the ocean and its margins, to include the impact of human activity on these resources.

MARS 281 Sophomore Seminar in Marine Sciences

Credit 1. 1 Lecture Hour. Compilation and discussions of literature pertaining to topics in marine sciences. Emphasis placed upon preparation and presentation of a written report. **Prerequisite:** Sophomore standing or approval of instructor.

MARS 285 Directed Studies

Credits 1 to 6. 1 to 6 Other Hours. Special topics and problems suited to analysis by individuals or small groups concerning special aspects of marine sciences. **Prerequisite:** Approval of department head.

MARS 289 Special Topics in Marine Sciences

Credits 1 to 4. 1 to 4 Lecture Hours. Study of selected topics in an identified area of marine sciences. **Prerequisite:** Approval of instructor.

MARS 303 Computing and Data Display

Credits 3. 2 Lecture Hours. 3 Lab Hours. Elements of programming and data display primarily through the MATLAB computing environment; includes an introduction to statistics and hypothesis testing with MATLAB. **Prerequisite:** Junior or senior classification or approval of instructor.

MARS 305 Environmental Micropaleontology

Credits 4. 3 Lecture Hours. 3 Lab Hours. Major animal, plant and protist microfossils groups, ecology, biostratigraphy, paleoenvironmental and paleoclimatic utility, primary preparation techniques, basic microscopy, research design and dissemination. Coastal foraminifera, thecamoebians and ostracods emphasized. Field trips required. **Prerequisites:** GEOL 101 and GEOL 102.

MARS 306 Coastal Sedimentary Geology

Credits 4. 3 Lecture Hours. 3 Lab Hours. A survey of modern coastal sedimentary systems, including principles of sedimentology and sediment analysis; laboratory includes a large group field projects; local field trips required. **Prerequisites:** GEOL 101 and GEOL 102.

MARS 310 Field Methods in Marine Sciences

Credits 3. 1 Lecture Hour. 6 Lab Hours. Techniques of documenting collected materials, the methods of reconnaissance and the mapping of traverses in the major coastal environments; sampling and recording techniques, interview procedures and the use of maps and remotely sensed imagery. **Prerequisites:** CHEM 120; PHYS 202, PHYS 208, or PHYS 207, and PHYS 217/ENGR 217; GEOL 101; GEOL 102.

MARS 325 Introduction to GIS for Marine Sciences

Credits 3. 2 Lecture Hours. 2 Lab Hours. Geographic Information Systems (GIS) are introduced for marine sciences and management. Basic use of software including creation of GIS models is covered. Creating, editing and querying GIS shape files is treated utilizing one of the standard GIS software packages such as ArcGis. **Prerequisite:** Junior or senior classification or approval of instructor.

MARS 330 Petroleum Geology

Credits 3. 3 Lecture Hours. Origin, migration and accumulation of petroleum; reservoir rock, traps, accumulation and conditions, and subsurface methods. **Prerequisites:** GEOL 101 and GEOL 102.

MARS 336 Integrated Marine Geohazards Assessment

Credits 3. 3 Lecture Hours. Implications of past failures and ongoing significance to operational safety and the environment of offshore operations; integration of geology, geophysics, and geotechnical and soil properties; exploration of integrated marine site investigation and its support to the delivery of the energy transition. **Prerequisite:** GEOL 101 and GEOL 102, or MARS 102.

MARS 340 Global Biogeochemical Cycles

Credits 3. 3 Lecture Hours. Biological, chemical, geological, and physical processes that influence the cycling of major bioactive elements on the surface of the Earth. **Prerequisite:** CHEM 120; GEOL 101 and GEOL 102, or MARS 102.

MARS 342 Ancient Sea Monsters

Credits 3. 3 Lecture Hours. Examination of prehistoric marine reptile groups including ichthyosaurs, piosaurs, plesiosaurs, and mosasaurs; fundamental principles of vertebrate paleontology, evolution, and extinction; evaluation of the geological history of these sea reptile groups with the origins and history of the Western Interior Sea. **Prerequisites:** MARS 102 or approval of instructor.

MARS 350 Advanced Computer Applications

Credits 2. 1 Lecture Hour. 2 Lab Hours. Data manipulation, merging, selection, filtering and querying in Microsoft Office primarily using large real data sets. Introduction to GIS, MatLab and other software relevant to science and/or business applications. Discussion of algorithm development in structured and object oriented programming languages.

MARS 361 Marine Biochemistry Laboratory

Credit 1. 3 Lab Hours. Selected methods used to characterize, purify, identify and isolate biomolecules. The laboratory is designed to complement the MARS 360 lecture. **Prerequisite:** MARS 360 or concurrent enrollment.

MARS 365 Integrated Marine Sciences Laboratory

Credits 3. 1 Lecture Hour. 6 Lab Hours. Integrated lectures, field and laboratory exercises for data collection and analysis of physical, chemical, biological and geological measurements in ocean, coastal and estuarine environments. **Prerequisites:** MATH 142 or 152, PHYS 202 or PHYS 208, OCNG 251, MARS 252, CHEM 102 and CHEM 112, BIOL 112 and GEOL 101 and GEOL 102, junior or senior classification or approval of instructor.

MARS 370/GEOG 370 Coastal Processes

Credits 3. 3 Lecture Hours. Introduction to the coastal system, waves and wave dominated coasts, shoreline morphodynamics, tidal and lake coasts, long term coastal development, sea level changes, subtidal and beach ecosystems, coastal dunes and wetlands, structures and organizations, coastal management and coastal hazards. **Cross Listing:** GEOG 370/MARS 370.

MARS 408 Estuarine and Coastal Hydrodynamics

Credits 3. 3 Lecture Hours. Physical processes in estuarine and coastal environments in various time scales: turbulent, tidal and residual (subtidal); study of salts, suspended solids, nutrients and heat affected by water movement; physical, biogeochemical processes and mass transport. **Prerequisites:** MATH 251, PHYS 218, junior or senior classification or approval of instructor.

MARS 410 Physical Oceanography

Credits 3. 2 Lecture Hours. 3 Lab Hours. Elements of the physics of the ocean; descriptive aspects and theoretical explanations of circulation, characteristic structure and waves. **Prerequisites:** MATH 152, MATH 150, or MATH 148; PHYS 207 and PHYS 217/ENGR 217, or PHYS 202 or ENGR 217/PHYS 217; junior or senior classification or approval of instructor.

MARS 412 Remote Field Investigations in Marine Sciences

Credits 1 to 6. 1 to 6 Lecture Hours. An overview of marine sciences in remote locations varying by instructor and selected topics; lectures on recent scientific papers, methods and concepts related to field area; individual projects; data collection; data analysis and presentation. **Prerequisite:** Junior or senior classification or approval of instructor.

MARS 415 Remote Sensing Technology

Credits 3. 3 Lecture Hours. An introduction to the uses of remote sensing technology in the marine sciences, including electromagnetic, acoustic, and seismic methods. Generation, transmission, and reception methods. Active and passive systems, multispectral techniques, and signal analysis systems. **Prerequisites:** PHYS 202 or 208, BIOL 112. Junior or senior classification or approval of instructor.

MARS 420 Biological Oceanography

Credits 3. 2 Lecture Hours. 3 Lab Hours. Study of biological and biogeochemical processes in the marine environment; discussion of the role of phytoplankton, zooplankton, bacteria, vertebrates and their benthic counterparts in the oceanic food web and how they relate to the earth system and climate change. **Prerequisite:** BIOL 112, OCNG 251, or MARS 102.

MARS 423 Ecological Economics

Credits 3. 3 Lecture Hours. An integrated study of management of ecology and economics; conceptual and professional economic and environmental policies; ethical concerns and economic benefits of nature to humans, human and nature's economies, and the complex connections between humans and nature with the valuing of ecosystems integrity. **Prerequisite:** Junior or senior classification.

MARS 425 Coastal Wetlands Management

Credits 3. 3 Lecture Hours. Wetlands management laws, regulations, wetland delineation and applications of Geographic Information System (GIS) to wetlands management; biological species in wetlands delineation; basic biogeochemical cycles and interactions in wetlands. **Prerequisites:** BIOL 112, GEOL 101, and GEOL 102; concurrent enrollment in MARS 426 or approval of instructor.

MARS 426 Coastal Wetlands Delineation Laboratory

Credit 1. 3 Lab Hours. Coastal wetlands delineation, including mapping techniques, Geographic Information System (GIS) and theodolite; biological species and biogeochemical factors in wetlands delineation. **Prerequisites:** BIOL 112, GEOL 101, and GEOL 102; concurrent enrollment in MARS 425 or approval of instructor.

MARS 430 Marine Geology

Credits 4. 3 Lecture Hours. 3 Lab Hours. Geological and physical processes that controls the formation and evolution of ocean basins and passive and active continental margins. **Prerequisite:** GEOL 101 and GEOL 102, or MARS 102.

MARS 431 Geological Oceanography-Earth's Climate

Credits 3. 3 Lecture Hours. Understanding the complex interactions of the earth system and the critical role that geological oceanography plays in these interactions, specifically the paleoceanographic/climate change aspects of geological oceanography. **Prerequisites:** GEOL 101, OCNG 251, junior or senior classification or approval of instructor.

MARS 432 Peak Oil, Global Warming and Resource Scarcity

Credits 3. 3 Lecture Hours. The concept of peak oil, resource depletion, and human-induced climate change and the broad consequences for food and water supplies, mortality rates, conflict, migration, and political stability; scientific/social/political debates surrounding these issues, and the individual/local/national/global options for living in a globally-warmed world with declining natural resources. **Prerequisites:** Any two from GEOL 101, GEOL 102, OCNG 251, MARS 280, or approval of instructor.

MARS 435 Exploration Geophysics

Credits 3. 3 Lecture Hours. Physiomechanical properties of rocks and sediments; seismic reflection and refraction principles applicable to offshore, coastal and onshore exploration; determination of media velocity and stratigraphy from reflection and refraction studies in both marine and non-marine systems. **Prerequisites:** PHYS 202, PHYS 208, or PHYS 207, and PHYS 217/ENGR 217; GEOL 101; GEOL 102; MATH 151, MATH 142, or MATH 147.

MARS 440 Chemical Oceanography

Credits 3. 2 Lecture Hours. 3 Lab Hours. Chemical and biogeochemical processes in the marine environment and how they relate to the earth system; topics include the role of chemical oceanography in earth system science and global change, interactions of the ocean with the atmosphere, continents and the seafloor; the physical and chemical composition of sea water; chemical speciation; biogeochemical cycles of major, minor, nutrient, trace elements and gases in the oceans; marine organic and isotope geochemistry; sedimentary chemistry and diagenesis. **Prerequisite:** CHEM 120.

MARS 450 Principles of Marine Instrumental Analysis

Credits 3. 2 Lecture Hours. 3 Lab Hours. Fundamental principles and practical applications for state-of-the-art analytical instrumentation applied to marine and environmental science. Topics include atomic and molecular spectroscopy, gas and liquid chromatography, radiochemistry, x-ray spectroscopy, mass spectrometry and field instrumentation. Students work with instruments and make presentation on them to the class. **Prerequisites:** CHEM 102 and 228, PHYS 202, MATH 131 or 151. Junior or senior classification or approval of instructor.

MARS 456 Coastal Water Policy

Credits 3. 3 Lecture Hours. History, past and present legislation, the government entities and agencies molding the policies affecting coastal water policy in Texas. **Prerequisite:** Junior or senior classification or approval of instructor.

MARS 460 Capstone Undergraduate Research Experience I

Credit 1. 1 Lecture Hour. Methodology for research outlines, organization and strategies; research ethics, writing and presentation of results. **Prerequisites:** MARS 491 or concurrent enrollment, senior classification or approval of instructor.

MARS 461 Capstone Undergraduate Research Experience II

Credit 1. 1 Lecture Hour. Research and scientific communications; development of a scientific abstract, poster presentation, oral presentation or written scientific paper. **Prerequisites:** MARS 491 or concurrent enrollment, senior classification or approval of instructor.

MARS 470 Eco-Environmental Modeling

Credits 3. 3 Lecture Hours. Biological components are in chemical and physical environments which are influenced by the bio-system and flows of energy, water and chemical species. Coupling to the complex atmospheric, aquatic and terrestrial systems is important. Modeling entails mathematical tools and the underlying science, focusing on scientific models, from the simplest to the elaborate. **Prerequisites:** CHEM 102, BIOL 112 and MATH 151 or approval of instructor.

MARS 481 Seminar

Credit 1. 1 Lecture Hour. Problem-oriented discussion session. Topics and reports selected for current relevance. May be repeated once only for credit. **Prerequisite:** Junior or senior classification or approval of instructor.

MARS 484 Undergraduate Internship

Credits 0 to 6. 0 to 6 Other Hours. Supervised study in a research or teaching laboratory within or outside of the Texas A&M University System. Student involvement is to consist of real-life learning or marine sciences research, teaching, management or a combination of these. **Prerequisites:** Junior or senior classification or approval of instructor. Approval of the department head.

MARS 485 Directed Studies

Credits 1 to 6. 1 to 6 Other Hours. Special topics and problems suited to analysis by individuals or small groups concerning special aspects of marine sciences. **Prerequisites:** Junior or senior classification or approval of instructor. Approval of department head.

MARS 488 Writing Intensive Directed Studies in Marine Sciences

Credits 1 to 6. 1 to 6 Other Hours. A writing-intensive course leading to the equivalent of a mini thesis in an area of interest to the faculty and student; introduces students to the rigors of writing for publication in professional journals in their major. **Prerequisite:** Junior or senior classification.

MARS 489 Special Topics in Marine Sciences

Credits 1 to 4. 1 to 4 Lecture Hours. Study of selected topics in an identified area of marine sciences. **Prerequisite:** Junior or senior classification or approval of instructor.

MARS 491 Research in Marine Sciences

Credits 0 to 4. 0 to 4 Other Hours. Research conducted under the direction of faculty member in Marine Sciences. May be repeated 2 times for credit. Please see academic advisor in department. Registration in multiple sections of this course is possible within a given semester provided that the per semester credit hour limit is not exceeded.

Prerequisites: Junior or senior classification and approval of instructor.