University of the Philippines
Marine Science Institute

GRADUATE CURRICULUM

MS/Ph.D. in Marine Science:
Marine Biology
Marine Physical Sciences
Marine Biotechnology

I. Overview of the Curriculum

Core courses: These are designed to introduce the major divisions of marine science (marine biology, marine physical sciences and marine biotechnology) to all graduate students in their first year.

Electives: The crucial task of designing a program of study will be done both by the student and his Program Committee. Electives can be chosen from among graduate courses offered by the Institute and by other units of the college and of the University to prepare the student to competently pursue his chosen field of research.

Seminar: The spirit of the seminar is to expose the students to the latest research, issues and topics not necessary to their field. In addition, the course shall be conducted in a manner corresponding to a one–unit loading and therefore recommended to be restricted to readings, public presentations and discussions. Finally, students residing outside of Metro Manila and restricted from access to attend, may still enroll in the 1u seminar course. These students will then be tasked to submit to the seminar instructor a critique on each of the papers that were assigned for class discussion.

PhD students shall complete one seminar course every other year after 12u of courses have been credited to his/her program of study.

MS students need only to complete one seminar course.

II. Course Requirements

Core Courses	MS (Mar Biol)	Ph.D. (Mar Biol)	MS/Ph.D. (Phy. Sciences)	MS/Ph.D. (Mar Biotech)
MS 210 (Physical Ocean)	3	3	3	
MS 220 (Chemical Ocean)	3	3	3	
MS 230 (Geological Ocean)		3	3	
MS 240 (Biological Ocean)	3	3	3	3
MS 201 (Ocean Physics & Chemistry)				3**
MS 270 (Biochemistry of Marine Organisms)				3
MS 272 (Marine Biotechnology I)				3

*Majors in Marine Biology should take at least 9 units of biology electives. Majors in Physical Sciences should take at least 9 units of courses in the physical sciences.

May be substituted by **MS 210 (Physical Oceanography) and **MS 220 (Chemical Oceanography)**

MS

Core course	9 – 12u
Electives	12 – 15u
Seminar	1u
Thesis	6u

Ph.D.

	With M.S.	**With B.S.**
Core courses	12 – 15u	12 – 15u
Electives	12 (minimum)	33 (minimum)
Seminar Series*	1+	1+
Dissertation	12	1

*Every Ph.D. student shall complete one seminar course every other year after 12 units of courses have been credited to his/her program of study.

MSI Electives

Marine Biology:

MS 242	Marine Microbiology
MS 246	Marine Phytoplankton
MS 248	Marine Zooplankton
MS 250	Marine Ecology
MS 251	Population Biology of Marine Organisms
MS 252	Marine Biogeography
MS 253	Marine Chemical Ecology
MS 254	Seagrasses and Mangroves
MS 255	Coral Reef Ecosystems
MS 256	Marine Algae
MS 258*	Marine Fishes
MS 260	Marine Biodiversity
MS 261	Physiology of Marine Algae
MS 280	Management of Marine Resources
MS 283.	Marine Agronomy
MS 354	Marine Ecosystems Dynamics
MS 356	Phylogeny and Systematics of Marine Organisms
MS 360	Physiology of Marine Organisms
MS 361	Reproductive Biology of Marine Organisms
MS 366	Population Genetics of Marine Organisms
MS 397	Special Topics: Behavioral Ecology
MS 397	Special Topics: Restoration Ecology

MS 397	Special Topics: Seaweed Utilization
MS 398	Advanced Methods in Marine Science: Biostatistics
MS 398	Advanced Methods in Marine Science: Seaweed research – Physiological methods
MS 398	Advanced Methods in Marine Science: Collection, Preservation, Documentation & computer management of marine biodiversity data

Marine Physical Sciences:

MS 213	Dynamics of Oceans
MS 214	Waves and Tides
MS 216	Numerical Ocean Modeling
MS 217	Coastal and Estuarine Oceanography
MS 221	Marine Geochemistry
MS 222	Chemistry of Marine Coastal Environments
MS 226	Marine Pollution Chemistry
MS 226.1	Marine Pollution Chemistry laboratory
MS 397	Special Topics: Methods & Problems of Research
MS 397	Special Topics: Regional Oceanography
MS 398	Advanced Methods in Marine Science: Ocean Remote Sensing & Digital Image Analysis
MS 398	Advanced Methods in Marine Science: Data Analysis Methods in Ocean

Marine Biotechnology:

MS 273	Marine Biotechnology II
MS 278	Marine Natural Products
MS 385	Marine Toxicology
MS 397	Special Topics: Applications of Mol Biol & Biochem Tech to Mar Studies
MS 397	Special Topics: Development of Bioassays for Mar Samples for Assessment of Therapeutic Potential
MS 397	Special Topics: Molecular Targets of Anticancer Agents
MS 397	Special Topics: Biological Structures
MS 398	Advanced Methods in Marine Science: Methods in Algal Polysaccharide Chemistry
MS 398	Advanced Methods in Marine Science: Chemical Methods of Analysis in Marine Science
MS 398	Advanced Methods in Marine Science: Experimental methods in marine natural products

Legend:

*Subjects taught by non-MSI faculty

Other suggested electives:

National Institute of Molecular Biology and Biotechnology

MBB 215 The Biology of Viruses

MBB 221 Advances in Cell and Tissue Culture

MBB 222 Molecular Basis of Growth Regulation

MBB 225 Advanced Molecular Physiology

MBB 230 Principles of Instrumentation in Molecular Biology

MBB 241 Advances in Genetic Engineering

MBB 280 Advances in Microbial Biotechnology

MBB 350 Advanced Cellular and Molecular Immunology

MBB 390 Bioinformatics

Institute of Chemistry

Chem 240	Advanced Biochemistry
Chem 241	Lipids and Related Systems
Chem 242	Carbohydrates and Related Systems
Chem 243	Nucleic Acids
Chem 244	Proteins
Chem 245	Enzymes
Chem 250	Chemical Thermodynamics I
Chem 257	Chemical Kinetics

Institute of Biology

Bio 220	Chemical Physiology
Bio 240	Advanced Genetics
Bio 241	Advanced Molecular Genetics
Bio 242	Cytogenetics
Bio 250	Advanced Cell and Molecular Biology
Bio 251	Advanced Immunobiology
Bio 273	Advanced Parasitology
Microbio 221	Physiology of Microorganisms
Microbio 261	Microbial Ecology
Microbio 287	Industrial Microbiology

Department of Chemical Engineering, College of Engineering

Ch.E. 292	Biochemical Engineering

III. COURSE DESCRIPTION

MARINE SCIENCE 201. OCEAN PHYSICS AND CHEMISTRY (to be offered 2nd semester of every other year)
Introduction to physical and chemical properties and processes in marine waters.
Prerequisite: Introductory Calculus, Elementary Organic Chemistry and basic Physical Chemistry
Credit: 3 u

MARINE SCIENCE 210. PHYSICAL OCEANOGRAPHY
Physical properties of seawater, general distribution of salinity, temperature and density, waves and currents, ocean atmosphere interactions.
Prerequisite: Math 100 or COI
Credit: 3 u

MARINE SCIENCE 213. DYNAMICS OF OCEANS
Dynamical principles which govern the behavior of the oceans in response to the effects of gravity, rotation, stratification, and other external forces.
Prerequisite: MS 210 or COI
Credit: 3 u

MARINE SCIENCE 214. WAVES AND TIDES
Quantitative discussions on surface, long standing and internal waves; seiches, tsunamic, storm surges, swells, tide–producing forces and tides.
Prerequisite: COI
Credit: 3 u

MARINE SCIENCE 216. NUMERICAL OCEAN MODELLING
Numerical problem solving on topics pertaining to wind–driven barotropic models; simple thermohaline models; baroclinic models; mixed models; problems in ocean modeling.
Prerequisite: MS 210 or COI
Credit: 3 u

MARINE SCIENCE 217. COASTAL AND ESTUARINE OCEANOGRAPHY
Ocean dynamics modified by thermohaline effects, presence of coast and shallow bathymetry.
Prerequisite: MS 210 or COI
Credit: 3 u

MARINE SCIENCE 220. CHEMICAL OCEANOGRAPHY
Chemical features of and processes in marine waters and sediments, and their interrelationships with the physical and biological systems.
Prerequisite: Analytical Chemistry or COI
Credit: 3 u

MARINE SCIENCE 221. MARINE GEOCHEMISTRY

The study of oceans as a geochemical system with emphasis on global biogeochemical cycles.

Prerequisite: MS 220 or COI

Credit: 3 u

MARINE SCIENCE 222. CHEMISTRY OF MARINE COASTAL ENVIRONMENTS

Applications of principles of chemical oceanography to the understanding of various coastal systems including coral reefs, mangroves, seagrass beds, and estuaries.

Prerequisite: MS 220 or COI

Credit: 3 u

MARINE SCIENCE 226. MARINE POLLUTION CHEMISTRY

Sources, sinks and fate of various types of pollutants in the marine environment.

Prerequisite: General Inorganic Chem, General Organic Chem, & Analytical Chem or equivalents or COI

Credit: 3 u

MARINE SCIENCE 226.1. MARINE POLLUTION CHEMISTRY LABORATORY

Field and laboratory studies to apply concepts and techniques in marine pollution chemistry.

Coreq: MS 226

Credit: 2 u

MARINE SCIENCE 230. GEOLOGICAL OCEANOGRAPHY

An introduction to the origin, morphology, structure and processes of the seafloor and ocean margins (for non–geology majors).

Prerequisite: Geo 11 or COI

Credit: 3 u

MARINE SCIENCE 240. BIOLOGICAL OCEANOGRAPHY

The relationship of biological systems to the marine physio–chemical environment.

Prerequisite: MS 210 or MS 201

Credit: 3 u

MARINE SCIENCE 242. MARINE MICROBIOLOGY

The diversity and role of marine microorganisms in energy flow and biogeochemical cycling

Prerequisite: COI

Credit: 3 u

MARINE SCIENCE 246. MARINE PHYTOPLANKTON

Marine phytoplankton and their role in primary productivity.

Prerequisite: Phycology or COI

Credit: 3 u

MARINE SCIENCE 248. MARINE ZOOPLANKTON

Dynamics of marine systems with emphasis on Philippine coastal environments.

Prerequisite: Invertebrate Zoology or COI

Credit: 3 u

MARINE SCIENCE 250. MARINE ECOLOGY

Fundamental ecological principles as applied to the marine environment.

Prerequisite: Undergraduate ecology or COI

Credit: 3 u

MARINE SCIENCE 251. POPULATION BIOLOGY OF MARINE ORGANISMS

Study of populations of marine organisms, factors that regulate their size, interspecific interactions, and their life history strategies.

Prerequisite: Consistent with Marine Ecology and Biological Oceanography or equivalent

Credit: 3 u

MARINE SCIENCE 25. MARINE BIOGEOGRAPHY

Understanding the spatio–temporal variability in the distribution patterns of marine biota and the dynamic processes which cause these patterns.

Prerequisite: COI

Credit: 3 u

MARINE SCIENCE 253. MARINE CHEMICAL ECOLOGY

The role of biomolecules (hormones, secondary metabolites, and others) in the interaction of marine organisms and their potential ecological and economic applications.

Prerequisite: COI

Credit: 3 u

MARINE SCIENCE 254. SEAGRASSES AND MANGROVES

Distribution and production ecology of seagrasses and mangroves with emphasis on their role in the productivity and stability of coastal habitats.

Prerequisite: Taxonomy of Higher Plants, consistent with Marine Ecology or equivalent

Credit: 3 u

MARINE SCIENCE 255. CORAL REEF ECOSYSTEMS

Structure, function and ecological significance of coral reefs and their major living components.

Prerequisite: COI

Credit: 3 u

MARINE SCIENCE 256. MARINE ALGAE

Taxonomy, morphology and ecology of marine benthic algae.

Prerequisite: COI

Credit: 3 u

MARINE SCIENCE 258. MARINE FISHES

Taxonomy, morphology and ecology of marine fishes.

Prerequisite: Comparative Vertebrate Anatomy

Credit: 3 u

MARINE SCIENCE 260. MARINE BIODIVERSITY

The variety, variability and natural relations of marine living organisms viewed at the structural (organismal to ecosystem) level.

Prerequisite: Undergraduate Ecology course or COI

Credit: 3 u

MARINE SCIENCE 261. PHYSIOLOGY OF MARINE ALGAE

Physiological features of marine algae — growth and differentiation, structure–function relationships, and adaptation strategies.

Prerequisite: MS 260 or equivalent or COI

Credit: 3 u

MARINE SCIENCE 270. BIOCHEMISTRY OF MARINE ORGANISMS

Structure–function relationships of biomolecules, bioenergetics, catalysis, and regulation of metabolic pathways; and comparative biochemistry of marine organisms.

Prerequisite: Elementary Biochemistry or COI

Credit: 3 u

MARINE SCIENCE 272. MARINE BIOTECHNOLOGY I

Principles of genomics, proteomics, bioinformatics, and genetic manipulation with emphasis on their application in the study of marine organisms.

Prerequisite: Undergraduate–level courses in biochemistry, molecular biology, and genetics and COI

Credit: 3 u

MARINE SCIENCE 273. MARINE BIOTECHNOLOGY II

Molecular, biotechnological, and related techniques in the study and utilization of marine organisms.

Prerequisite: MS 272

Credit: 3 u

MARINE SCIENCE 278. MARINE NATURAL PRODUCTS

Survey of natural products from marine organisms: chemistry, biosynthesis, isolation, purification and biological activity.

Prerequisite: MS 270 or COI

Credit: 3 u

MARINE SCIENCE 280. MANAGEMENT OF MARINE RESOURCES

Biological and economic concepts for developing and managing the living resources of the sea.

Prerequisite: Plant Morphoanatomy, Fundamentals of Ecology or COI

Credit: 3 u

MARINE SCIENCE 283. MARINE AGRONOMY

Ecology and culture of economically important seaweeds and the utilization of their products.

Prerequisite: MS 260 or equivalent

Credit: 3 u

MARINE SCIENCE 300. M.S. THESIS

Prerequisite: Completion of all course requirements

Credit: 6 u

MARINE SCIENCE 354. MARINE ECOSYSTEM DYNAMICS

Principles and processes underlying the structure and function of marine ecosystems.

Prerequisite: MS 250 or equivalent or COI

Credit: 3 u

MARINE SCIENCE 356. PHYLOGENY AND SYSTEMATICS OF MARINE ORGANISMS

The principles of phylogenetic systematics with special reference to marine taxa.

Prerequisite: Marine Algae or Marine Fishers or COI

Credit: 3 u

MARINE SCIENCE 360: PHYSIOLOGY OF MARINE ORGANISMS

Physiological adaptations of biota to the marine environment with focus on marine animals.

Prerequisite: Undergraduate Animal Physiology course or COI

Credit: 3 u

MARINE SCIENCE 361. REPRODUCTIVE BIOLOGY OF MARINE ORGANISMS

Reproduction in major groups of marine organisms with special reference to cycles and periodicity, in relation to internal and external control mechanisms.

Prerequisite: COI

Credit: 3 u

MARINE SCIENCE 366. POPULATION GENETICS OF MARINE ORGANISMS

The principles of population genetics with emphasis on the application of genetic markers for the assessment and management of wild and cultured organisms.

Prerequisite: Undergraduate genetics or COI

Credit: 3 u

MARINE SCIENCE 385. MARINE TOXINOLOGY

The biological significance, mode of production, biochemistry, toxicology and mechanisms of action of marine toxins.

Prerequisite: COI

Credit: 3 u

MARINE SCIENCE 396. SEMINAR

Readings and public presentations on current research, issues and topics

Prerequisite: COI

Credit: 1 u; every PhD student shall complete one seminar course every other year after 12 u of courses have been credited to his/her program of study; MS students shall complete only one seminar course.

MARINE SCIENCE 397.SPECIAL TOPICS IN MARINE SCIENCE

Discussions on current and emerging topics/issues in the marine sciences.

Prerequisite: COI

Credit: 3 u (may be repeated for additional credit as long as the topics are not the same).

MARINE SCIENCE 398. ADVANCED METHODS IN MARINE SCIENCE

Specialized techniques used in marine science research.

Prerequisite: COI

Credit: 3 u (may be repeated for additional credit as long as the topics are not the same).

MARINE SCIENCE 399. RESEARCH

Conceptualization, conduct of actual research and preparation of scientific manuscript on a research problem.

Prerequisite: COI

Credit: 3 u (may be repeated for a maximum of 9 u)

MARINE SCIENCE 400. DISSERTATION

Prerequisite: Passed Candidacy Examination and completion of all course requirements

Credit: 12 u

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CONTACT

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