The course work requirements for Biological Oceanography graduate students are outlined below. An individual student's program is the result of consultation with the individual's faculty adviser and advisory committee to assure that course work meets School and option requirements and also reflects the student's background and areas of interest within Biological Oceanography. Waivers for School requirements should be referred to the Graduate Program Coordinator; waivers for Biological Oceanography requirements should be referred to the student's advisory committee.

**CORE BIOLOGICAL OCEANOGRAPHY COURSES**

Biological Oceanography students are expected to complete the following courses in their first two years. In addition, all first-year graduate students must complete a research project (minimum of 2 credits as Ocean 600). Acceptable alternatives to Ocean 600 include Ocean 534, summer courses offered by Biological Oceanography faculty at the Friday Harbor Laboratories, Ocean 575, and some laboratory courses offered by other departments and schools on campus (with prior approval from the adviser).

**OCEAN 530 MARINE BACTERIA, ARCHAEA AND VIRUSES (3)** Role of marine microorganisms in transformations of dissolved and particulate organic matter. Functional and phylogenetic diversity of Bacteria, Archaea and viruses in the marine environment, the fate of organic carbon in the microbial loop, and the interrelationship of the carbon cycle with other biogeochemical cycles. Prerequisite: permission of instructor. (Morris) Offered: W, odd years

**OCEAN 531 MARINE PHYTOPLANKTON AND BIOGEOCHEMISTRY (3)** Phytoplankton in the marine environment: evolution, ecology, primary productivity, and physiology, with an emphasis on their role in the global carbon cycle; spatial and temporal distributions of phytoplankton and how these patterns may change as ocean conditions change; methods for determining distributions and role in different ocean ecosystems. Prerequisite: permission of instructor. (Armbrust) Offered: W, even years

**OCEAN 532 MARINE ZOOPLANKTON ECOLOGY (3)** The role of zooplankton in ecosystems and biogeochemical cycles. Distribution and abundance of zooplankton in space and time; small-scale distributions; morphology and behavior; population dynamics, energetics, and secondary production; trophic structure and dynamics; biogeography; impacts of climate change; and models of populations and food chains. Prerequisite: permission of instructor. (Keister) Offered: W, even years

**OCEAN 533 MARINE BENTHIC ECOLOGY (3)** Analysis of marine communities associated with the porous boundaries of the ocean, from sedimented seafloor and hydrothermal vents to sea ice cover (inverted benthos); emphasis on nutrition to these communities, including sinking organic aggregates, themselves porous habitats, and the role of symbiosis; complements coursework that focuses on the pelagic realm. Prerequisite: permission of instructor. (Deming) Offered W, odd years

**OCEAN 535 BIOLOGICAL OCEANOGRAPHY (3)** Major patterns and processes in upper ocean pelagic ecosystems, with emphasis on quantitative analysis of mechanisms controlling production and abundances of organisms, from plankton to fish; introduction to interdisciplinary study of effects of anthropogenically induced changes in climate and ocean chemistry on organisms, ecosystem processes, and biogeochemical cycles. (Frost) Offered: A
SEMINARS

There is a weekly seminar in Biological Oceanography. Students are required to attend their first year and required to present their research results after their first two years. In addition, courses on special topics of interest are offered as OCEAN 539, Seminar in Biological Oceanography.

ADVANCED COURSE WORK

Master's level students are required to take a minimum of 3 credits of advanced oceanography courses or seminars on specialty topics; doctoral students are required to take at least 3 more oceanography credits. Advanced courses are offered in alternating years and explore subdisciplines of biological oceanography in greater depth than the core courses. Advanced seminars serve the important role of treating current specialized and often interdisciplinary topics; the emphasis is on student presentations. Advanced summer courses are offered at the Friday Harbor Laboratories in some years.

OCEAN 539 MODELING POPULATIONS IN THE OCEAN (3) Mathematical concepts and modeling methods most central to posing and answering quantitative questions about biological processes in marine environments. Lectures, literature readings and computer lab exercises that familiarize students with theoretical background and modeling software (Matlab, Maple, FreeMat, FiPy) relevant to population dynamics, population structure, and physical biology. (Grünbaum) Offered: Sp, alternate years

OCEAN 539 ENVIRONMENTAL GENOMICS (3) Molecular biology concepts and bioinformatic methods central to utilizing genomic data in an environmental context. Lectures, literature readings and computer lab exercises that familiarize students with theoretical background, current databases and software tools relevant to inferring phylogenetic and functional information from genomic, transcriptomic and proteomic data, from organisms and mixed communities. (Rocap) Offered: Sp, alternate years

OCEAN 570 MARINE MICROBIAL INTERACTIONS (1-3, max 9) New research directions in the analysis of the structure, function, and dynamics of marine microbial populations; emphasis on interactions between unicellular organisms (Bacteria, Archaea, phytoplankton, protists) and viruses; assemblages in specialized environments; sites and patterns of genetic exchange and evolutionary implications. (Instructor varies) Prerequisite: Ocean 530, 531 or permission of instructor. Offered: alternate years.

OCEAN 572 MARINE PROTIST ECOLOGY (3) The single celled marine eukaryotes have an astonishing diversity of form and function and play key roles as producers, consumers and biogeochemical recyclers. Ecology of phagotrophic ('protozoa') and mixotrophic (both photosynthetic and phagotrophic) protists, including: interactions with predators and prey, adaptations to changing environments, evolutionary and ecological implications of mixotrophy. Prerequisite: OCEAN 532 or permission of instructor. (Lessard) Offered: alternate years.

OCEAN 578 ADVANCED TOPICS IN BIOLOGICAL OCEANOGRAPHY (9) A special topics course offered during Summer Quarter at the Friday Harbor Laboratories.

THE SCHOOL OUT-OF-OPTION REQUIREMENTS

Every graduate student is required to take a minimum of one 3-credit, numerically-graded, 500-level course from each option outside their own for a total of three courses and 9 credits. Each option will provide a list of courses that can be taken to fulfill this requirement. The student is expected to complete this breadth requirement prior to receiving an MS degree. A Graduate Student Affairs committee, chaired by the Graduate Program Coordinator, will address any requests for waivers.

UNIVERSITY OF WASHINGTON SCHOOL OF OCEANOGRAPHY