Interdisciplinary Programs

Aging and Gerontology

Degrees and Certificates Offered: Undergraduate Certificate in Aging, BA in liberal studies (emphasis on aging), Graduate Certificate in Gerontology

See the Department of Public Health within the "School of Medicine" section of the *Catalog* for more information.

Cell and Molecular Biology

Biomedical Science A 209
1960 East-West Road
Honolulu, HI 96822
Tel: (808) 956-8552
Fax: (808) 956-9530
Web: www.hawaii.edu/cmb

Graduate Faculty

R. L. Cann, PhD (Chair)—evolutionary genetics, MtDNA, and molecular phylogenetics

Biochemistry

Y. Hokama, PhD—inflammation, C-reactive peptides, and pathology

D. M. Jameson, PhD—energetics and dynamics of protein interactions; fluorescence spectroscopy

S. E. Seifried, PhD—molecular recognition and transcriptional control

A. G. Theriault, PhD—molecular biology of lipid metabolism and heart disease

Contents

Cancer Biology

J. S. Bertram, PhD—cancer preventative agents, gap junctions, and intercellular communication

R. V. Cooney, PhD—carcinogenesis

L. N. Kolonel, MD, MPH, PhD—dietary and biomarker studies in multiethnic populations

A. F. Lau, PhD—oncogenes, cellular transformation and signal transduction

C-W. Vogel, MD, PhD—biochemistry of cellular toxins, neuroblastoma

R. K. Wada, MD—molecular oncology, oncogene regulation, tumor differentiation

Cell Signaling

A. Fleig, PhD—excitation-contraction coupling in muscle

R. Penner, MD, PhD—calcium signaling in neurons and immune cells

Developmental Biology

H. G. de Couet, PhD—neurogenetics, cytoskeleton, cell motility

M. G. Hadfield, PhD—settlement and metamorphosis of marine invertebrate larvae

T. D. Humphreys, PhD—immune system of sponges, evolutionary foundations of animal immunity, molecular biology of hemichordates

S. Lozanoff, PhD—developmental biology and craniofacial development

M. McFall-Ngai, PhD—microbial symbiosis in shaping animal developmental biology

S. Robinow, PhD—hormonal regulation of central nervous system development of *Drosophila melanogaster*

E. G. Ruby, PhD—molecular physiology of bacterial adaptation to host associations

Genetics

R. L. Cann, PhD—molecular and evolutionary genetics of animal populations
D. S. Haymer, PhD—molecular genetics of Diptera
J. A. Hunt, PhD—thalassemia gene mutations, evolutionary genetics of Hawaiian *Drosophila*
S. Kathariou, PhD—molecular biology of bacterial virulence
T. W. Lyttle, PhD—structure of *Drosophila* heterochromatin, evolution of chromosomal rearrangements
S. Robinow, PhD—hormonal regulation of central nervous system development of *Drosophila melanogaster*
J. F. Scott, PhD—yeast DNA replication

Immunology/Retrovirology

S. Chang, PhD—immunology, molecular approaches to vaccine development
V. Nerukar, PhD—viral pathogens, marine virology, molecular epidemiology
E. Tam, MD—mast cell proteases, asthma, and immunology
K. Yamaga, PhD—immunological mechanisms of disease
R. Yanagihara, MD—viral pathogens, molecular phylogeny, emerging infections

Matrix Pathobiology

C. D. Boyd, PhD—molecular genetics of human connective tissue
K. Csiszar, PhD—lysyl oxidase tumor suppressor family
Z. Urban, PhD—elastic fiber pathologies, gene mapping

Neurobiology / Neurophysiology

D. C. Blanchard, PhD—psychopharmacology and neurobiology of behavior
R. J. Blanchard, PhD—experimental ethology and ethnopharmacology
I. Cooke, PhD—cellular neurobiology, peptidergic neurons in culture
D. K. Hartline, PhD—small network neurophysiology
M. D. Rayner, PhD—sodium channel control mechanisms
S. Robinow, PhD—hormonal regulation of central nervous system development
J. Stollberg, PhD—mechanisms of aggregation of acetycholine receptors

Plant Molecular Physiology

D. Borthakur, PhD—regulation of genes in the rhizosphere bacteria by root exudates
J. Hu, PhD—molecular biology of plant viruses
S. Patil, PhD—biochemistry and molecular biology of host-parasite interactions
H. Yamamoto, PhD—photosynthesis, carotenoid function

Reproduction Function

G. Bryant-Greenwood, PhD—molecular and cell biology of human fetal membranes and decidua
Y. Marikawa, PhD—molecular control of the body plan of vertebrate embyros
L. Millar, MD—effects of distension on gene expression in human fetal membranes and decidua
W. S. Ward, PhD—tertiary structure of DNA, nuclear structure, and genetic instability
R. Yanagimachi, DSci—mammalian germ cells, assisted reproduction, cloning and transgenesis

Degrees Offered: MS in biomedical science (cell and molecular biology), PhD in biomedical science (cell and molecular biology)

The Academic Program

The cell and molecular biology (CMB) program in biomedical science represents an interdisciplinary approach to graduate education with faculty in many sub-disciplines of biology dedicated to helping qualified students pursue original research using technical innovations of modern molecular biology. The first cohort of students was admitted in August 2000. The CMB program brings together faculty from three colleges and three research institutes, all who share a desire to train the next generation of students in this fast-moving and conceptually challenging area. Planning for collaborative research is emphasized in this program, as well as solid training in a variety of laboratory techniques.

Master's students fall into two categories, depending on whether they opt for a Plan A (thesis) or Plan B (non-thesis). The MS Plan B is usually a terminal degree, appropriate for professionals in medical technology, government, and related fields who wish to obtain broad training in modern genetics to advance their credentials in their chosen fields. The completion of the MS Plan A serves as a qualifying examination for students who intend to continue toward the PhD in cell and molecular biology. It may also serve as a terminal degree for those who wish to pursue careers as research technicians, either in the public or private sector. Those who seek the PhD degree usually wish to make a career in college and university teaching and research, in research for industry and government, or in medicine, dentistry, or medical technology.

The CMB program provides fellowships for PhD students in their first year of training, and additional support in the way of teaching assistantships for qualified applicants after that time. Training in the program is intended to prepare students for careers in academia, in research institutes, and in the ever-expanding areas of biotechnology in the private sector.

Advising

For complete details regarding the program, contact the CMB program chair or visit the Web site www.hawaii.edu/cmb.

Graduate Study

Applicants are expected to have at least a bachelor's degree emphasizing biological or physical sciences with courses in calculus, organic chemistry, biochemistry, genetics, and cellular and molecular biology. Applicants with

MD degrees are welcome. Results of the Graduate Record Examination (GRE) general test should be submitted with the application, and students whose native language is not English are required to take the Test of English as a Foreign Language (TOEFL). Three letters of recommendation from former instructors or research supervisors must also be submitted.

Master's Degree

The core of the CMB program is a specialized lecture class, spanning two semesters (CMB 621-622). The remaining credit requirements can be fulfilled by specialized courses, seminars, and research units as recommended by the particular committee and research adviser each student picks to guide their academic program. Following the completion of the two semester core course, the student is expected to pass a qualifying exam, form a committee, and then propose, complete, and defend an original research project (MS Plan A) or study plan and research paper (MS Plan B).

Doctoral Degree

PhD candidates do not need to have completed a master's degree. If an MS was not earned through the CMB program, the core lecture class is required (CMB 621-622). Formal course requirements beyond the core include additional courses specified by the dissertation committee and three laboratory rotations. The student is expected to form a committee, and then propose, complete, and defend an original research project.

Selected Specialized Courses

Cell Biology

- BOT 617 Biological Electron Microscopy
- BOT 674 Plant Growth and Development
- HORT 614 Cellular Genetics of Crops
- MICR 641 Ultrastructure of Cells
- MICR 655 Advanced Virology
- PMP 620 Plant Biochemistry
- REPR 603 Biology of Gametes, Fertilization, and Embryos
- ZOOL 610 Topics in Developmental and Reproductive Biology
- TRMD 604 Infectious Disease Microbiology
- TRMD 671 Advanced Medical Protozoology
- TRMD 690 Seminar in Tropical Medicine and Public Health

Molecular Biology

- BIOC 624 Protein Interactions
- BIOC 730 Phage, Plasmids, and Recombinant DNA
- BIOP 633 Nucleic Acids
- CMB 680 Molecular Genetics
- CMB 654 Seminars in Human, Molecular, and Evolutionary Genetics
- CMB 625 Advanced Topics in Genetics
- MICR 625 Advanced Immunology
- MICR 661 Regulation of Gene Expression in Microorganisms
- MICR 671 Advanced Microbial Genetics
- PMP 673 Organization and Expression of the Plant Genome
- PMP 680 Methods in Plant Molecular Biology

Neurobiology

- PHRM 640 Neuropharmacology
- PHYL 606 Human Neurophysiology
- PHYL 607 Membrane Physiology
- PHYL 615 Introduction to Axonology
- PHYL/ZOOL 642 Cellular Neurophysiology
- ZOOL 712 Topics in Nerve/Muscle Physiology

Communication and Information Sciences

Degrees Offered: PhD

See the "Colleges of Arts and Sciences" section of the *Catalog* for more information.

Environmental Studies

Degrees and Certificates Offered: Undergraduate Certificate in Environmental Studies, BA in liberal studies (emphasis on environmental studies)

See the "Colleges of Arts and Sciences" section of the *Catalog* for more information.

Graduate Interdisciplinary Specializations

These graduate specializations offer graduate students the opportunity to complete a course of study utilizing courses and faculty from several different fields. Participants must apply for admission and must also be admitted to a 'regular' graduate program.

Ecology, Evolution, and Conservation Biology

Snyder 407
2538 McCarthy Mall
Honolulu, HI 96822
Tel (808) 956-4602
Fax: (808) 956-4707
Web: www.hawaii.edu/eecb

Graduate Faculty

S. Conant, PhD (Chair)—conservation biology, life history and ecology of Hawaiian birds
S. K. Atkinson, PhD—reproductive biology of marine animals
W. W. Au, PhD—sensory biology of cetaceans
R. L. Cann, PhD—conservation genetics and molecular evolution
G. D. Carr, PhD—plant biosystemics, cytogenetics, hybridization and speciation
C. C. Daehler, PhD—invasive plants, plant-insect interactions

H. G. de Couet , PhD—developmental and molecular evolution
D. C. Duffy, PhD—conservation biology (basic and applied)
L. A. Freed, PhD—evolutionary ecology, behavioral ecology and conservation biology
G. H. Goldstein, PhD—physiological plant ecology and terrestrial ecology
D. W. Greenfield, PhD—ichthyology, marine biology, biosystematics, zoogeography, community ecology
M. G. Hadfield, PhD—larval biology of marine invertebrates, conservation and demography of Hawaiian tree snails
D. Haymer, PhD—molecular evolution
J. A. Hunt, PhD—molecular evolution
K. Y. Kaneshiro, PhD—sexual selection and biology of small populations
S. C. Keeley, PhD—plant molecular systematics and evolution
R. A. Kinzie, PhD—aquatic ecology, coral reefs and tropical streams
T. W. Lyttle, PhD—population genetics and chromosome evolution
M. Q. Martindale, PhD—evolution of development of metazoan animals
W. McClatchey, PhD—ethnopharmacology, evolution of species and civilizations, systematic botany
M. D. Merlin, PhD—biogeography, ethnobotany, Pacific natural history
R. H. Messing, PhD—behavioral ecology of insect parasitoids and biological control
C. W. Morden, PhD—molecular systematics and evolution of plants and algae
D. Mueller-Dombois, PhD—vegetation ecology
J. D. Parrish, PhD—ecology of aquatic (marine) communities, fishery biology
D. K. Price, PhD—evolutionary genetics of behaviors
M.A. Ridgley, PhD—human-environment systems analysis: modelling and evaluation of society-environment interactions
E. G. Ruby, PhD—mechanisms underlying symbiotic bacterial colonization of animal tissues
C. M. Smith, PhD—physiological ecology of marine macrophytes, marine ecology
L. E. Sponsel, PhD—human ecology in tropical forests and deforestation
J. S. Stimson, PhD—population ecology
A. D. Taylor, PhD—population ecology
A. Teramura, PhD—environmental stress physiology, global climate change, ecosystem analysis and biodiversity
L. Wester, PhD—plant geography, biogeography of islands, human-plant relationships
C. Womersley, PhD—environmental physiology, biochemical adaptation, parasitology
D. Woodcock, PhD—vegetation and climate

Affiliate Graduate Faculty

A. Allison, PhD—systematics and population biology
A. Asquith, PhD—insect systematics and conservation
R. J. Cabin, PhD—experimental investigations of the ecological dynamics of alien plant species invasions and native plant restoration efforts within the Hawaiian Islands.
E. W. Campbell III, PhD—applied and basic herpetology, invasive species management, conservation biology, predator ecology.
J. Canfield, PhD—conservation biology of silverswords and vegetation restoration
R. H. Cowie, PhD—evolutionary biology and conservation of land and freshwater snails
P. Cox, PhD—ethnobotany, plant evolutionary ecology
N. L. Evenhuis, PhD—systematics and evolution of *Diptera*
J. Ewel, PhD—ecosystem processes in terrestrial communities
K. Ewel, PhD—wetland ecology and systems ecology
D. Foote, PhD—ecology and conservation of native Hawaiian insects
F. G. Howarth, PhD—evolutionary biology of cave ecosystems and insect conservation
L. L. Loope, PhD—conservation biology, plant ecology
J. E. Maragos, PhD—human impact on marine ecosystems and coral reefs
S. E. Miller, PhD—systematics and biogeography, especially of *Lepidoptera*
D. Ragone, PhD—Pacific Island ethnobotany, especially conservation and use of traditional crops, focusing on breadfruit.
B. A. Wilcox, PhD—ecosystem conservation biology

The Academic Program

The objectives of the interdisciplinary graduate specialization in ecology, evolution, and conservation biology (EECB) are to do the following:

A. Exploit Hawai'i's unique opportunities to integrate tropical population biology and natural history studies with modern laboratory techniques;
B. Provide the interdisciplinary, conceptual, and technical training to participate in academic and research programs in ecology, evolution, and conservation biology; and
C. Foster scholarly training in research programs involving expertise in ecology, evolution, and conservation biology.

Modern theories of ecology, evolution, and conservation biology share a core of concepts and techniques that span classical academic disciplines. This common core, coupled with the emergence of powerful new technologies, invites cross-disciplinary approaches, which generate many of today's most exciting scientific knowledge.

The EECB program provides opportunities for students in many traditional subdisciplines represented at Mānoa. This intercollegiate, interdisciplinary graduate program brings together faculty members from agronomy and soil science, anthropology, biomedical sciences (genetics and molecular biology), botanical sciences, entomology, geography, horticulture, microbiology, oceanography, and zoology, with all their skills and technologies, to provide the training students need to contribute effectively to this research area.

EECB is implemented as a "specialization" within existing graduate programs of the departments whose

faculty participate in this program. While the EECB program is designed primarily for a doctor of philosophy degree, it also includes a master of science degree for students who wish to pursue positions such as might be available in state and federal forestry and wildlife conservation programs or in biological resource management positions with private organizations such as The Nature Conservancy. Students accepted to the EECB graduate specialization have already been accepted into a graduate program of one of the various departments participating in the EECB program. Course work in statistics, organic chemistry, biochemistry, genetics, evolution, and ecology are considered important for admission into the EECB program.

Request complete details on the EECB program from the chair of the program at the previously listed address.

Admission Requirements

All applicants will be required to submit undergraduate transcripts, statements of career goals, three letters of recommendation, and results of the Graduate Record Examination. Although a GRE advanced test score is not required for admission, applicants are advised to submit the results of an appropriate advanced test. Before s/he can be admitted, an applicant must have a faculty sponsor who is also a member of the EECB graduate faculty. Ordinarily, though not necessarily, the sponsor would become the student's graduate adviser/committee chair.

Requirements for the Graduate Specialization in EECB

All students in the program are required to attend the weekly "evoluncheon" seminar series where students, postdoctoral researchers, faculty and visiting scientists give presentations.

Course requirements for all EECB graduate students:

- one course in ecology at the 600 or 700 level (at least 2 credits)
- one course in evolution at the 600 or 700 level (at least 2 credits)
- one course in conservation biology at the 600 or 700 level (at least 2 credits)

For one subject area, students may petition the EECB Graduate Education Committee to have a 400-level course (at least 3 credits) substitute for a course requirement. While we do not recommend this option for most students, relevant course offerings in each area may sometimes not be available at the 600 level.

Master's Degree with Specialization in EECB (Plan A)

- 30 credits total 18 credits at the 400-700 level (excluding 699 and 700)
- *At least 12 of these 18 credits must be at the 600 or 700 level
- 8 credits of 699 and/or 700
- At least one graduate seminar

Master's Degree with Specialization in EECB (Plan B)

Same course requirements as plan A except that:

- no more than 9 credits of 699 can be applied toward the degree
- a minimum of 18 credits must be in courses numbered 600-798

Doctoral Degree with Specialization in EECB

- at least 10 credits from among the courses listed below
- additional course work may be required by the Graduate Education Committee, depending on background and experience prior to entering the program.
- at least one graduate seminar

In addition to course requirements for the specialization in EECB, each department (e.g. botany, genetics, geography, zoology) has its own, separate course requirements. In some cases, courses taken to fulfill EECB requirements will also count towards department requirements. Please consult with your department's graduate chair to determine which courses can count towards departmental requirements.

Course Offerings

New courses or one-time offerings not listed here may also count towards the EECB requirement. Please consult with the graduate faculty chair or graduate education committee.

Note: The 400-level courses are listed below primarily to show the diversity of relevant offerings available. Six credits of 400-level courses can count toward the Master's specialization (see MS requirements above), but 400-level courses normally do not count towards the EECB area requirements that must be fulfilled by all students.

Ecology

- BOT 450 Natural History of the Hawaiian Islands (3)
- BOT 453 Plant Ecology and Environmental Measurements (4)
- BOT 454 Vegetation Ecology (4)
- BOT 456 Plant-Animal Interactions (3)
- BOT 482 Adaptations of Plants to Marine Environmental (3)
- BOT 482L Adaptations of Plants to Marine Environmental (1)
- BOT 650 Ecology Seminar (2)
- BOT 651 Invasion Biology (3)
- ENTO 671 Insect Ecology (3)
- GEOG 402 Agricultural Climatology(3)
- MICR 485 Microbial Ecology (3)
- MICR 485L Microbial Ecology Lab (2)
- MICR 680 Advanced in Microbial Ecology (3)
- OCN 626 Marine Microplankton Ecology
- OCN 627 Ecology of Pelagic Marine Animals (3)
- OCN 628 Benthic Ecology
- ZOOL 439 Animal Ecology (3)
- ZOOL 439L Laboratory in Animal Ecology (2)
- ZOOL 450 Natural History of the Hawaiian Islands (3)

- ZOOL 460 Avian Biology (3)
- ZOOL 606 Principles of Animal Behavior (2)
- ZOOL 606L Principles of Animal Behavior Lab (1)
- ZOOL 620 Marine Ecology (3) ZOOL 621 Evolutionary Ecology (4)
- ZOOL 623 Quantitative Field Ecology (3)

Evolution

- BOT 411 Morphology and Evolution of Land Plants (4)
- BOT 450 Natural History of the Hawaiian Islands (3)
- BOT 461 Principles of Plant Systematics(4)
- BOT 462 Plant Evolution (3)
- BOT 480 Algal Diversity and Evolution (4)
- BOT 661 Hawaiian Vascular Plants (3)
- BOT 662 Advanced Systematics (4)
- BOT 675 Molecular Systematics and Evolution (3)
- ENTO 462 Systematic Entomology (3)
- ENTO 633 Insect Genetics (3)
- CMB 604 Evolutionary Genetics (2)
- CMB 625 Advanced Topics in Genetics (2)
- CMB 650 Population Genetics (3)
- CMB 680 Molecular Genetics (3)
- HORT 615 Quantitative Genetics (3)
- MICR 671 Advanced Microbial Genetics (3)
- ZOOL 450 Natural History of the Hawaiian Islands (3)
- ZOOL 480 Animal Evolution (3)
- ZOOL 606Principles of Animal Behavior (2)
- ZOOL 606L Principles of Animal Behavior Lab (1)
- ZOOL 621 Evolutionary Ecology (4)
- ZOOL 719 Topics in Systematics and Evolution (V)

Conservation Biology

- ANTH 415 Ecological Anthropology (3)
- ANTH 435 Human Adaptation to Forests (3)
- ANTH 620H Human Ecology (3)
- BOT 651 Invasion Biology (3)
- BOT/ZOOL 690 Conservation Biology (3)
- BIOL 490 Wildlife and Plant Conservation (3)
- ENTO 675/675L Biological Control
- GEOG 411 Human Dimensions of Global Environmental Change (3)
- GEOG 412 Environmental Impact Assessment (3)
- GEOG 455 Resource Management (3)
- GEOG 752 Research Seminar: Resource Management (3)
- GEOG 758 Research Seminar: Conservation (3)
- BIOL/GEOG 410 Human Role in Environmental Change (3)
- OCN 621 Biological Oceanography (3) (content varies, but may be counted towards a specific area, depending on the topic)
- GEOG 750 Research Seminar: Biogeography
- ZOOL 714 Topics in Animal Behavior

Marine Biology

Edmondson 152
2538 McCarthy Mall
Honolulu, HI 96822
Tel: (808) 956-8617
Fax: (808) 956-9812
Web: www2.hawaii.edu/~wormlab/gradspec.html

Graduate Faculty

I. A. Abbott, PhD—botany
G. Ahearn, PhD—zoology
M. Alam, PhD—microbiology
M. J. Atkindon, PhD—oceanography/HIMB
S. K. Atkinson, PhD—HIMB/zoology
W. W. L. Au, PhD—HIMB
J. H. Bailey-Brock, PhD—zoology
R. R. Bidigare, PhD—oceanography
R. E. Brock, PhD—sea grant/zoology
C. Brown, PhD—HIMB
R. Cann, PhD—genetics
T. A. Clark, PhD—oceanography/HIMB
S. Conant, PhD—zoology
I. Cooke, PhD—zoology
H. G. de Couet, PhD—zoology
M. Diamond, PhD—anatomy
A. Fast, PhD—HIMB
G. Grau, PhD—zoology
D. Greenfield, PhD—zoology
R. W. Grigg, PhD—oceanography
S. R. Haley, PhD—zoology
L. Herman, PhD—psychology
K. Holland, PhD—HIMB
T. D. Humphreys, PhD—biochemistry
D. Jameson, PhD—biochemistry
P. Jokiel, PhD—HIMB/zoology
D. Karl, PhD—oceanography
S. Kathariou, PhD—microbiology
E. A. Kay, PhD—zoology
R. Kinzie III, PhD—zoology
M. Landry, PhD—oceanography
E. Laws, PhD—oceanography
P. Loh, PhD—microbiology
G. Losey, PhD—zoology
P. E. Nachtigall, PhD—HIMB
J. Parrish, PhD—zoology
E. Reese, PhD—zoology
F. Robert, PhD—microbiology
H. Roitblat, PhD—psychology
C. Smith, PhD—botany
J. Stimson, PhD—zoology
C. Whittow, PhD—physiology
R. Young, PhD—oceanography

The Academic Program

The marine biology specialization is a University wide program focusing on recent advances in the understanding of marine systems at the ecological, organismic, and cellular-

molecular levels. Students can select courses, advisors, and research opportunities from a wide range of specialities, including: marine botany, ecology, genetics, virology, microbiology, and zoology, aquaculture, behavioral biosystematics, biological oceanography, coral reef biology, fisheries and molecular biology.

The marine biology specialization is available to graduate students in botany, microbiology, oceanography, and zoology. Prospective graduate students should apply first to one of these programs. Applications from students who have been accepted to botany, microbiology, oceanography, or zoology who have also indicated a desire to specialize in marine biology are reviewed by the Marine Biology Admissions Committee.

Students specializing in marine biology supplement the courses required for a degree in their chosen field with courses specific to marine biology. The actual selection is determined by the student in consultation with his or her advisor. Graduate student research is carried out in the laboratories of the graduate faculty. These include laboratories in Edmondson Hall, Snyder Hall, the St. John Laboratory (botanical sciences), the Marine Science Building, the Hawai'i Institute of Marine Biology (located on Coconut Island in Kaneohe Bay), the Bekesy Laboratory, and the Kewalo Laboratory of the Pacific Biomedical Research Center. Research capabilities include DNA sequencing using PCR technology; video and acoustic recording for ecological and behavioral studied of coral reef and planktonic organisms; transmission and scanning electron, ultraviolet, and light microscopy; electrophoretic analysis; flow cytometry; and radioisotope tracer studies.

Selected courses:

- ANSC 360 Topics in Aquaculture Science (3)
- ANSC 450 Aquaculture Production (3)
- BE 604 Aquaculture Systems (3)
- BOT 480 Algal Diversity and Evolution (4)
- BOT 482 Adaptations of Plants to Marine Environments (3)
- BOT 680 Marine Macrophytes Seminar (2)
- MICR 653 Methods in Microbiology Oceanography (3)
- OCN 450 Aquaculture Production (3)
- OCN 621 Biological Oceanography (3)
- OCN 626 Marine Microplankton Ecology (4)
- OCN 627 Ecology of Pelagic Marine Animals (4)
- OCN 628 Benthic Biological Oceanography (4)
- OCN 653 Methods in Microbiology Oceanography (3)
- OCN 750 Topic in Biological Oceanography (V)
- PHYL 701 Undersea and Hyperbaric Physiology (3)
- PSY 633 Behavioral Processes of Marine Mammals (3)
- ZOOL 466 Fisheries Science (3)
- ZOOL 467 Ecology of Fishes (3)
- ZOOL 475 Biology of Invertebrates (3)
- ZOOL 620 Marine Ecology (3)
- ZOOL 666 Systematic Ichthyology (3)
- ZOOL 716 Topics in Fish and Fisheries Biology (V)

International Cultural Studies

Certificate Offered: Graduate Certificate in International Cultural Studies

See the "Colleges of Arts and Sciences" section for more information.

Liberal Studies

Degree Offered: BA in liberal studies

See the "Colleges of Arts and Sciences" section for more information.

Peace Studies

Degrees and Certificates Offered: Undergraduate Certificate in Peace Studies, BA in liberal studies (emphasis on peace studies). See the "Colleges of Arts and Sciences" section for more information.

Population Studies

Certificate Offered: Graduate Certificate in Population Studies. See the "Colleges of Arts and Sciences" section for more information.

Resource Management

Social Sciences 107
2424 Maile Way
Honolulu, HI 96822
Tel: (808) 956-7381

Certificate Offered: Graduate Resource Management Certificate

The Graduate Resource Management Certificate is a cooperative program primarily involving the College of Social Sciences, the Department of Urban and Regional Planning (anthropology, economics, geography), the College of Tropical Agriculture and Human Resources (agronomy and soil science, agricultural and resource economics), and the East-West Center (Program on Environment, Program on Resources: Energy and Minerals). Because of its diverse topical components, multidisciplinary faculty, and practical application throughout Asia and the Pacific, the program is ideal for students who are pursuing graduate studies in traditional disciplines and also seeking expertise in environmental resource management.

This program provides students with specialized training in an area that augments their primary field and develops their pragmatic problem-solving and decision-making skills through analysis of real-world problems. Any student who has previously been admitted as a classified graduate student at the University of Hawai'i at Mānoa is eligible to apply for admission to this certificate program. Interested applicants should contact their adviser or any representative of the program in the collaborating departments and institutions.

To earn this certificate, students are expected to complete 15 credit hours, at least 9 of which are at the graduate level. For more information, contact the program office.