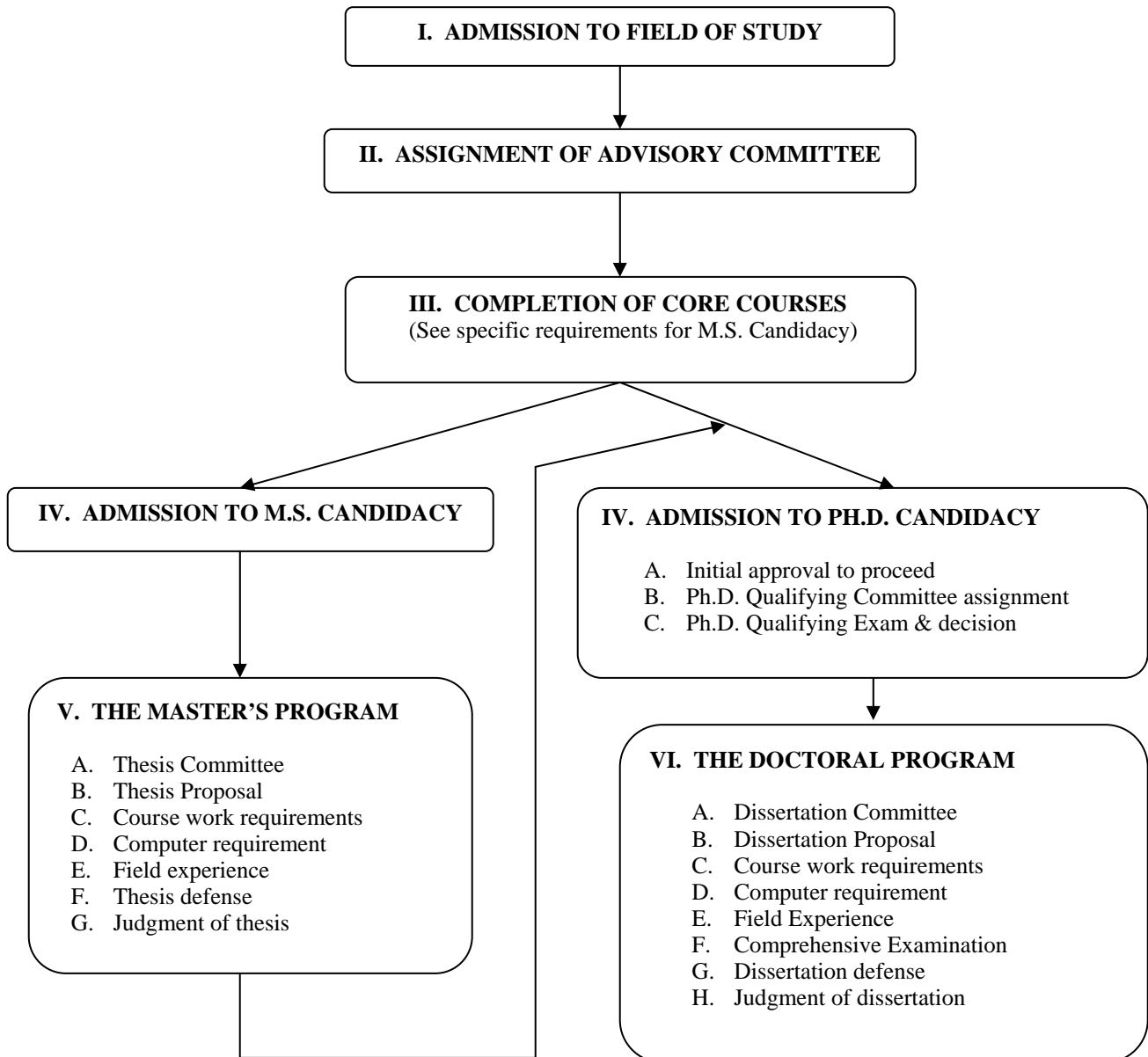


# DEGREE REQUIREMENTS AND PROCEDURES IN OCEANOGRAPHY

**PREAMBLE.** The current Graduate Information Bulletin of the University of Hawai‘i at Manoa should be consulted for general university regulations and advanced degree requirements. The present document focuses on additional requirements and procedures for the "field of study" of oceanography. Major milestones in the process are outlined in the flow diagram below; details are provided in the sections of the text corresponding to the Roman numerals and letters in this outline. Timelines for expected progress to degree are given in Table 1 (page 9). **Students are responsible for meeting all field of study and University requirements and deadlines.** As far as they are not general university rules, students have the right to request that exceptions be made to field of study rules in unusual situations or under extenuating circumstances. The procedure for such requests is a formal petition to the Oceanography Graduate Faculty. Petitions should be approved by the student's Advisory Committee and submitted to the Department Chair for consideration by the Graduate Faculty.



## **I. ADMISSION TO FIELD OF STUDY**

Applicants must have intensive, rigorous training in one of the basic sciences or engineering. Regardless of major, an applicant must have completed mathematical training including calculus through ordinary differential equations and vector calculus. Students lacking such training are considered to have a deficiency in mathematics and are required to take OCN/GG 312. Entering students who have had such formal training must demonstrate a working knowledge of calculus by taking a mathematics proficiency examination. Students who are judged to have a mathematical deficiency based on their performance on this examination must take OCN/GG 312. An applicant must also have a year each of physics and chemistry. The well-prepared student will have covered classical thermodynamics and will have had a semester each of biology and geology. Graduate students who are required to take UH undergraduate courses to make up for deficiencies in their undergraduate training or math proficiency must earn at least a grade of B in those courses.

## **II. ASSIGNMENT OF ADVISORY COMMITTEE**

Students admitted to the Oceanography field of study will be assigned an Advisory Committee by the Department Chair. The Advisory Committee will initially consist of three oceanography graduate faculty members from at least two of the subdisciplines of oceanography. When the student is being supported by a research assistantship, the faculty member supporting the student will usually be a member of the initial Advisory Committee, and generally its chair. Otherwise, the committee will select a chairperson from among its members. The Committee Chair will be the student's official interim advisor and will be responsible for filing Form I. The committee must formally meet with the student as soon as possible after the student arrives, at the end of the student's first semester of residency, and subsequently at least once per semester. The committee will submit a written report following the initial meeting with the student. The committee will also submit progress reports at the end of the first semester and subsequently once per semester. These reports will be read and signed by the committee members and the student, circulated among the faculty of the student's subdiscipline, and included in the student's file. It is a requirement that the students inform their Committee of the courses they intend to take, prior to registering for them. The size of the Advisory Committee may be increased and its composition changed with the approval of the Department Chair prior to the official formation of the student's M.S. Thesis or Ph.D. Dissertation Committees. When formed, the student's M.S. or Ph.D. Committee will assume all of the responsibilities of the former Advisory Committee.

## **III. SUCCESSFUL COMPLETION OF CORE COURSES**

Of the four core courses (OCN 620, OCN 621, OCN 622, and OCN 623), each student must successfully complete at least the three courses outside his/her subdiscipline. For students in nonbiological disciplines the core sequence is completed by taking OCN 621. Students specializing in Biological Oceanography complete the core sequence by taking OCN 626, OCN 627 and OCN 628 instead of OCN 621. Students specializing in Marine Geology and Geochemistry must take CHEM 351 (if they have not already successfully completed a college-level course in physical chemistry). A student's grades in the core courses must average at least 3.0, using only the higher grade for any repeated course. It is unacceptable for a student to have a grade less than C in a core course or to have a grade of C in more than one core course. With the consent of the Advisory Committee, a student may repeat, at most, one core course in which his/her grade was less than B. A student with an unsatisfactory record in the core courses will be automatically dismissed from the program. Students who have made satisfactory grades in equivalent courses at other accredited institutions may use those credits to fulfill all or part of this core course requirement.

## IV. ADMISSION TO M.S. CANDIDACY

Depending on the career goals of individual students, attaining the M.S. degree may be the ultimate objective of their enrollment in the Oceanography Degree Program or part of the normal progression from undergraduate education to the Ph.D. Students who do not enter the Program with an M.S. degree in Oceanography generally earn an M.S. enroute to the Ph.D., although this does not preclude pursuing the Ph.D. directly. The prerequisite for admission to M.S. candidacy is successful completion of core courses in at least two of the subdisciplines, including the student's area of specialization. Formal admission to M.S. candidacy occurs with the filing of Form I. See Section VI for admission to Ph.D. candidacy.

## V. THE MASTER'S PROGRAM

- A. SELECTION OF THESIS COMMITTEE**—Assisted by his/her Advisory Committee, the student will select a thesis topic and an appropriate Thesis Committee to replace the Advisory Committee. The Thesis Committee must consist of at least three members of the Graduate Faculty, one of whom may be from outside the field of study in oceanography. At least 50% of Committee members must be Oceanography Graduate Faculty, exclusive of affiliate and cooperating faculty. The chairperson of the Thesis Committee will be the student's official advisor. Selection of the Thesis Committee is officially recognized when Form II is filed.
- B. APPROVAL OF THESIS PROPOSAL**—The M.S. thesis topic should be a narrowly defined project which demonstrates the student's potential to bring a research idea from concept to completion. The appropriate scope of an M.S. project is approximately that of a refereed journal publication, but the end result does not have to be published to earn the M.S. degree. As part of the mentoring process and to facilitate progress toward the degree, faculty advisors are encouraged to take an early and active role in defining suitable project opportunities.

The M.S. thesis does not require a fully developed research proposal. However, the student must submit an acceptable thesis prospectus to his/her Thesis Committee within one year of admission to the Oceanography Field of Study. The prospectus is to be about three pages of text and should follow the format outlined below. Approval of the thesis topic is official when Form II is filed.

### Outline of Research Prospectus

1. TITLE
2. INTRODUCTION (Problem statement, rationale)
3. OBJECTIVES/HYPOTHESES (Concisely written list)
4. APPROACH (Brief overview with references to established methods)
5. EXPECTED RESULTS (What the research should achieve and its significance)
6. RESEARCH SCHEDULE (Dates for reaching project and degree milestones)

## C. COURSE WORK REQUIREMENTS

- 1. CREDIT HOURS AND DISTRIBUTION**—The M.S. Program requires a minimum of 36 credit hours, including 24 credits of course work as defined below, 6 credits of OCN 699 (Directed Research) and 6 credits of OCN 700 (Thesis Research). Students can register for OCN 700 only after a thesis proposal is approved and Form II is filed. The 24 semester hours of course work must be in courses numbered 600 or greater, but excluding Ocean 699, Ocean 700, and seminar courses. At least 12 of those semester hours must consist of courses taken from at least three of the groups listed below. Prior to completion of their graduate degree, students specializing in Biological Oceanography must have satisfactorily completed either an undergraduate or graduate course in statistics. Students specializing in Marine Geology and Geochemistry must take at least one, and preferably more, advanced biogeochemistry course. Courses may be added or deleted from these lists upon the recommendation of the Oceanography Curriculum Committee and with the approval of the Oceanography Faculty. Equivalent courses taken at other accredited institutions may be substituted for Group I-VI courses.

### **Group I Biological Oceanography**

|         |   |
|---------|---|
| OCN 626 | Marine Microplankton Ecology            |
| OCN 627 | Ecology of Pelagic Marine Animals       |
| OCN 628 | Benthic Biological Oceanography         |
| OCN 653 | Methods in Microbiological Oceanography |
| OCN 750 | Bio-optical Oceanography ("Topics")     |

### **Group II Geological Oceanography**

|         |   |
|---------|---|
| GG 600  | Equations of Geophysics                                   |
| GG 602  | Theoretical Petrology                                     |
| GG 615  | Micropaleontology   |
| GG 650  | Seismology  |
| GG 653  | Mantle Mineralogy   |
| GG 674  | Paleoceanography  |
| GG 681  | Continuum Mechanics                                       |
| GG 711  | Geological Evidence for Climate Change ("Special Topics") |
| OCN 631 | Ocean Minerals  |
| OCN 641 | Origin of Sedimentary Rocks                               |
| ORE 664 | Nearshore Processes and Sediment Transport                |

### **Group III Chemical Oceanography**

|          |  |
|----------|--|
| GG 639   | Stable Isotope Biogeochemistry         |
| OCN 633  | Chemical Oceanography Lab Methods      |
| OCN 635  | Isotopic Marine Geochemistry           |
| OCN 635L | Radiochemical Techniques               |
| OCN 638  | Earth System Science and Global Change |
| OCN 642  | Elemental Composition Changes          |
| OCN 643  | Topics in Marine Geochemistry          |
| OCN 644  | Sedimentary Geochemistry               |
| OCN 645  | Marine Organic Geochemistry            |

### **Group IV Physical Oceanography**

|             |   |
|-------------|---|
| OCN 640     | Advanced Physical Oceanography            |
| OCN 660     | Ocean Waves I                             |
| OCN 661     | Ocean Waves II                            |
| OCN 662     | Marine Hydrodynamics                      |
| OCN 663     | Satellite Oceanography                    |
| OCN 664     | Ocean Instrumentation and Technology      |
| OCN/MET 665 | Small-Scale Air-Sea Interaction           |
| OCN/MET 666 | Large-Scale Ocean-Atmosphere Interactions |
| OCN 667     | Advanced Geophysical Fluid Dynamics I     |
| OCN 668     | Advanced Geophysical Fluid Dynamics II    |
| OCN 760     | Topics in Physical Oceanography           |

### **Group V Mathematical Methods and Statistics**

|             |   |
|-------------|---|
| GG 710, 711 | Statistical Analysis of Geological Data                               |
| MET 631     | Statistical Meteorology   |
| OCN 650     | Mathematical Techniques for Oceanographers                            |
| ORE 608     | Probability and Statistics for Ocean Engineers (cross-listed OCN 760) |
| PHYS 600    | Methods of Theoretical Physics  |
| ZOOL 631    | Biometry  |
| ZOOL 632    | Advanced Biometry   |

## **Group VI Meteorology**

|             |   |
|-------------|---|
| MET 600     | Atmospheric Dynamics I                    |
| MET 601     | Atmospheric Dynamics II                   |
| MET 607     | Mesoscale Meteorology                     |
| MET 610     | Tropical Climate & Weather                |
| MET 616     | Monsoon Meteorology                       |
| MET 620     | Physical Meteorology                      |
| MET 621     | Cloud Physics                             |
| MET 636     | Air Pollution Meteorology                 |
| MET/OCN 665 | Small-Scale Air-Sea Interaction           |
| MET/OCN 666 | Large-Scale Ocean-Atmosphere Interactions |
| MET 745     | Mid-latitude Dynamic Meteorology          |

The student's cumulative grade point average (GPA) in the core courses and in Group I - VI courses (including equivalent courses from other accredited institutions) must be at least 3.0 in order to graduate from the Oceanography Department. If the cumulative GPA in these courses remains below 3.0 for two consecutive semesters, the student will be dismissed from the program.

**2. SEMINAR REQUIREMENT**—All students must successfully complete a seminar course in oceanography during their residence at the University of Hawai‘i. Students may meet the requirement in either of two ways:

- a) Attend a total of fifteen individual seminars. These may be seminars sponsored by oceanography, HIG, HIMB, or any other department, as long as the material is appropriate to the student's oceanographic studies. The student will obtain a log sheet on which to note dates, speakers, and topics of seminars attended. When the student has attended fifteen seminars, he/she will present the log to his/her advisor for inclusion in his/her file and shall register for 1 credit of Ocean 780 on a CR/NC (credit/no credit) basis.
- b) Take one of the occasionally offered seminar courses such as Ocean 750, Topics in Biological Oceanography, provided that the main function of the course is to expose the student to current research. Since this type of course is offered irregularly, a student must not count on taking this option unless he/she has determined that an appropriate course will be available during his/her period of residence. Such courses can be taken on a CR/NC basis or for a letter grade. Successful completion of graded courses requires a C or better.

**D. COMPUTER REQUIREMENT**— Students are required to demonstrate, to the satisfaction of the thesis/dissertation committee, competence in the technical use and management of computers. The specific knowledge and skills required are: 1) the ability to manage a personal computer or workstation, including a working knowledge of operating system basics, file structure, software installation, establishing network connections, and computer security; 2) a working knowledge of an algorithmic computer language; 3) knowledge of internet techniques including online searching and file transfer; 4) the ability to manage datasets including importing data to a program or database, exporting data in customized tabular and graphical formats, transforming or merging datasets, and securing data (i.e., back-up and long-term storage techniques).

**E. FIELD EXPERIENCE**—At least 30 days of field experience, including work aboard a research vessel, is required. To meet this requirement, the students must obtain a log sheet from the ocean office to document dates and nature of field work. After completion, this log sheet must be approved and signed by the student's advisor and included in the student's file.

- F. **FINAL EXAMINATION (THESIS DEFENSE)**—The Master's degree in Oceanography requires a written thesis (Plan A). Upon completion of the proposed research, each student will submit a thesis draft to his/her Master's Committee. Students should note that two to three months are often required for review and revision of the thesis. A final oral examination will be scheduled after the draft thesis is accepted by the Committee. The examination will cover the thesis and related areas. After a period of presentation and questioning open to all students and faculty, the Committee will examine the candidate in private. The acceptability of the thesis defense will then be determined by majority vote of the Committee and officially recognized with the filing of Form III.
- G. **JUDGMENT OF THESIS**—The acceptability of the final version of the thesis will be decided by majority vote of the Committee and officially recognized with the signing of the signature page.
- H. **CONSIDERATION FOR ADMISSION TO PH.D. CANDIDACY**—Students nearing completion of M.S. work may be considered for admission to Ph.D. candidacy according to the procedures outlined in Section VI.

## VI. ADMISSION TO PH.D. CANDIDACY

*Note: Graduate Division rules allow a student only two attempts to gain admission to Ph.D. candidacy. A second denial results in loss of status as a classified graduate student and dismissal from the program.*

- A. **INITIAL APPROVAL TO PROCEED**—It is the faculty's experience that research and Thesis authorship leading to the M.S. significantly increase a student's scientific maturity and form an important foundation for more advanced independent work. In addition, since work done to satisfy M.S. requirements will also satisfy certain Ph.D. requirements, the average total time to the Ph.D. is not significantly different for students who gain an M.S. *en route* compared to those who do not. A student entering this department without a Master's degree will therefore normally be encouraged by his or her Advisory Committee to work toward the M.S. even when the student's ultimate goal is the Ph.D. A student entering without a Master's in oceanography who would prefer to work directly toward the Ph.D. must obtain the unanimous written approval of his or her advisory committee before notifying the Department Chair.

A student working toward a Master's degree in this department who desires to be accepted as a Ph.D. candidate should take no official action until nearing the end of the M.S. program. At that time the student must obtain the unanimous written approval of his or her M.S. Committee on the "Approval to Proceed toward Ph.D. Candidacy" form before notifying the Department Chair. Whether or not unanimous approval is given, this form must be signed by M.S. Committee members and the student no later than at the signing of the M.S. thesis.

- B. **ASSIGNMENT OF THE PH.D. QUALIFYING COMMITTEE**—Upon notification of a student's desire to enter the Ph.D. program (with approval of the appropriate committee; see above), the Department Chair will appoint a five-member Ph.D. Qualifying Committee (PQC). The PQC will normally be chaired by the student's prospective Dissertation Committee chairperson. In selecting the other PQC members, the Department Chair must seek the advice and consent of the PQC chair, who should be aware of (but is not bound by) the student's preferences. All PQC members must be in the Oceanography Graduate Faculty, at least four with instructional appointments. Normally two will be from the student's sub-discipline, with the others from each of the other sub-disciplines.
- C. **PH.D. QUALIFYING EXAM AND PQC DECISION**—The student must submit a draft research proposal to the PQC and should seek guidance from the committee members during its preparation. When the proposal is acceptable to the committee, they will meet formally with the student to discuss the scope, format, and scheduling of the examination to be given. The PQC chairperson will summarize this preliminary discussion in a written report to be signed by all members of the committee, and copies will be given to the student and entered in the student's file. The Ph.D. Qualifying Exam is verbal, with the option of an additional written component. Verbal exams are by their nature somewhat flexible in scope and format in order that perceived areas of weakness can be

probed, so only general guidelines can be given. The first part of the exam period is usually devoted to the student's presentation of his/her proposed research, and the rest of the time is used for questions from PQC members. Questions should focus on the student's research area, but the focus should be broad rather than narrow, and questions should also probe the student's knowledge of scientific connections between the proposed research and other oceanographic sub-disciplines.

The PQC is charged with evaluating the student's readiness for independent research at the doctoral level. This evaluation will be based on: (1) the student's performance in the Qualifying Exam; (2) the quality of the student's draft research proposal; (3) the student's academic record in formal coursework; and (4) the record of previous successfully conducted research (*e.g.*, the M.S. thesis, scientific publications, and OCN 699). Admission to Ph.D. candidacy requires approval of at least four of the five PQC members. There are only two possible outcomes: approval or denial of admission to candidacy. No conditions or qualifications may be attached to these outcomes, but the committee may make suggestions for the student's guidance. The PQC chairperson will prepare a written report, to be signed by all committee members, giving the outcome of the exam, summarizing reasons for the committee's evaluation, and describing suggestions (if any) given to the student. Copies will be given to the student and entered in the student's file.

Students who receive a first denial of admission to Ph.D. candidacy, and who do not have a Master's degree in oceanography, will enter the M.S. program and may seek approval to retake the Ph.D. Qualifying Exam when nearing the end of their M.S. work (see VI.A above). Students receiving a first denial of admission who already hold a Master's degree in oceanography may retake the Qualifying Exam once at the discretion of the PQC.

## VII. THE DOCTORAL PROGRAM

- A. **DISSERTATION COMMITTEE**—The Ph.D. Dissertation Committee consists of at least five members, one of whom, the "outside member", must be a member of the Graduate Faculty in a field of study other than Oceanography. In addition, at least 50% of Dissertation Committee members must be Oceanography Graduate Faculty, exclusive of affiliate and cooperating faculty. The chairperson of the Dissertation Committee will be the student's official advisor. Formal admission to Ph.D. candidacy occurs when Form I is filed.
- B. **APPROVAL OF DISSERTATION PROPOSAL**—A student admitted to Ph.D. candidacy should already have at least a draft proposal or prospectus (see Section VI). A revised proposal must be formally approved by the Dissertation Committee within 6 months of the student's advancement to candidacy. Approval of dissertation topic is official when Form II is filed.
- C. **COURSE WORK REQUIREMENTS**—Same as Section V.C.
- D. **COMPUTER REQUIREMENT**—Same as Section V.D.
- E. **FIELD EXPERIENCE**—Same as Section V.E.
- F. **COMPREHENSIVE EXAMINATION**—Students admitted to Ph.D. candidacy must take the Comprehensive Examination within 18 months of their admission to candidacy. The Department Chairperson will schedule the Comprehensive Examination at the end of 18 months after admission if the student has failed to do so. The Comprehensive Examination may be oral or a combination of oral and written. The purpose of the examination is to determine whether the student has a high level of competence in the general area of his/her proposed research, including both the major field of study and any appropriate other field. The student will pass the examination with the recommendation of at least four of the five members of the Dissertation Committee. The results of the examination will be documented on Form II. The examination may be repeated once at the discretion of the Committee.

- G. FINAL EXAMINATION (DISSERTATION DEFENSE)**—Upon completion of the proposed research, a dissertation will be submitted to the Dissertation Committee. Experience has shown that two to three months may be required for review and revision. When the Committee is satisfied that acceptable research has been completed, a final oral examination will be scheduled. The examination will be conducted and evaluated in the same manner as the M.S. thesis defense (see Section V.F.) and officially recognized with the filing of Form III.
- H. JUDGMENT OF DISSERTATION**—Once the final version of the dissertation has been submitted, its acceptability will be decided by a majority vote of the Dissertation Committee and officially recognized with the signing of the signature page.