

University of Hawai'i at Mānoa

College of Tropical Agriculture and Human Resources

Department of Natural Resources and Environmental Management



Graduate Student Guide

November 2017

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Introduction

This document is meant to help guide you in your academic journey in NREM, and facilitates the advising of NREM's incoming and continuing graduate students. The information presented here expands upon the NREM academic program description in the UHM catalog. The UHM Office of Graduate Education website (<http://www.manoa.hawaii.edu/graduate/>) contains further policy information. A student may petition the NREM Graduate Committee **via their faculty advisor** for an exception to the policies laid out herein.

NREM offers the following graduate degrees, certificates and specializations: Master of Environmental Management (MEM), Master of Science (MS Plans A, B, and C), and PhD degrees in Natural Resources and Environmental Management; a University-wide Graduate Resource Management Certificate; and a University-wide graduate degree specialization in Ecology, Evolution and Conservation Biology (<http://www.hawaii.edu/eecb/>).

The NREM graduate program brings together natural and social scientists to offer an integrative and inter-disciplinary program to understand and manage tropical and sub-tropical terrestrial and aquatic ecosystems. Emphasis is placed on island settings and their relevance to managing land- and seascapes. The NREM curriculum emphasizes the application of physical, biological, and social sciences to the conservation and sustainable management of natural, environmental, and economic resources. The program also provides a science-based foundation to assess the processes that control the structure and function of terrestrial and aquatic ecosystems, and the human behaviors and policies that impact those processes. Studies in NREM incorporate the various components and scales (spatial and temporal) that determine ecosystem structure and function, and that bear upon the social and economic welfare of residents in diverse communities and environmental settings.

Students are expected to acquire quantitative reasoning, critical thinking, and advanced skills that enable them to solve contemporary resource use and environmental problems and to assist in sound policy development and implementation. NREM graduates should be skilled in addressing natural resources and environmental policy and management issues of the competing needs of diverse clientele and communities. NREM graduates are expected to serve as professional leaders in natural resources and environmental management and policy, academic teaching and research, and applied research and extension in educational and governmental institutions, international, national and state technical assistance and policy agencies, agricultural and forestry industries, consulting firms, and private nonprofit and non-governmental organizations.

NREM issues are attracting considerable national and global attention, as well as growing donor interest, especially in the Asia/Pacific and tropical and subtropical regions. Graduate training, therefore, features collaboration with national and international institutions to foster programs that provide students with opportunities to learn about the ways in which people from other countries and cultures manage their natural resources and interact with their environments. As such, NREM has a diverse mix of domestic and international graduate students.

To underscore its integrative and global nature, the NREM Graduate Program features strong collaboration with other academic departments within and outside of the College of Tropical Agriculture and Human Resources (CTAHR), as well as collaborating institutions in and outside of Hawai'i such as transitional economies in Asia, Eastern Europe, and the Middle East. In addition, Cooperating and Affiliate Graduate Faculty complement and supplement NREM's expertise.

NREM Faculty

Graduate Program Committee

The graduate program committee is comprised of:

Graduate chair:

Dr. Catherine Chan
Office: Sherman 104
Phone: (808) 956-8708, Fax: (808) 956-6539
E-mail: chanhalb@hawaii.edu

Members:

Dr. PingSun Leung
Office: Gilmore 111
Phone: (808) 956-8562, Fax: (808) 956-6539
E-mail: psleung@hawaii.edu

Dr. Kimberly Carlson
Office: Sherman 130
Phone: (808) 956-2617, Fax: (808) 956-6539
E-mail: kimberly.carlson@hawaii.edu

Core NREM Faculty

(= Graduate Faculty)*

- *C. Chan-Halbrendt, PhD (Chair)—International agricultural development and environmental economics
- *K. Carlson, PhD—Tropical land systems science
- *L. J. Cox, PhD—Community economic development
- *S. E. Crow, PhD—Soil ecology and biogeochemistry
- *S. A. El-Swaify (Emeritus)—Natural resource degradation, erosion, conservation and environmental quality
- *C. I. Evensen, PhD—Natural resource management, environmental quality
- *J. B. Friday, PhD—Tropical forestry/agroforestry extension
- *P. V. Garrod, PhD (Currently unavailable for advising)—Marketing and production economics
- *C. Gopalakishnan (Emeritus)—Natural resource and environmental policy
- *T. W. Idol, PhD—Tropical forestry/agroforestry
- *J. J. K. Leary, PhD—Invasive species control
- *P. S. Leung, PhD—Aquaculture and fisheries economics, systems modeling
- *C. Litton, PhD—Terrestrial ecosystem ecology, biogeochemistry
- *T. Miura, PhD—Geospatial analysis, remote sensing
- S. Y. Nagano, MS—4-H youth program, county extension
- *K. L. Oleson, PhD—Ecosystem service valuation, environmental ethics, policy analysis
- *M. R. Price, PhD—Conservation ecology, community-based conservation, population genetics, geographic information systems, landscape genetics

- *R. Ryals, PhD—Agricultural ecosystem ecology
- *C. Trauernicht, PhD—Wildland fire management
- *Y. P. Tsang, PhD— Ecohydrology, hydrological modeling, landscape ecology
- *M. Vaughan, PhD—Eco-cultural restoration, community based management, environmental (‘āina based) education
- *J. F. Yanagida, PhD (Currently unavailable for advising)—Production economics, price analysis, international trade

Cooperating NREM Graduate Faculty

- K. Burnett, PhD (UHERO)—Invasive species assessment and management
- J. Cusick (WRRC)—Environmental history, environmental education, protected area politics, ecotourism
- J. Deenik, PhD (TPSS)—Soil fertility and quality
- J. DeFrank, PhD (TPSS)—Herbicide management
- A. El-Kadi, PhD (G&G/CEE)—Groundwater hydrology
- T. Giambelluca, PhD (GEOG)—Climatology, hydrology
- N. V. Hue, PhD (TPSS)—Organic cycling
- Q. Li, PhD (MBBE)—Environmental chemistry
- Y. Li, PhD (UH Hilo)—Forest ecosystem management
- T. Radovich, PhD (TPSS)—Organic and sustainable farming
- H. Valenzuela, PhD (PEPS)—Vegetation physiology and management

Affiliate NREM Graduate Faculty

- G. Bruland, PhD (Principia College)—Soil and water conservation
- J. Fox, PhD (East-West Center)—Social forestry
- A. Friedlander, PhD (USGS CRU)—Fisheries ecology
- C. Giardina, PhD (IPIF - USDA-FS)—Forest ecology
- S. Gray, PhD (Michigan State U)—Human ecology
- S. Hess, PhD (USGS)—Wildlife management
- D. Jacobs, PhD (Purdue U)—Regeneration of planted and natural forests, restoration ecology, tree physiology
- C. Lepczyk, PhD (Auburn U)—Ecosystem management, wildlife ecology, landscape ecology
- J. Lynch, PhD (National Institute of Standards & Technology, Hollings Marine Laboratory)—Marine environmental science
- R. Mackenzie, PhD (USDA Forest Service)—Aquatic ecology
- H. McMillen, PhD (US Forest Service, Northern Research Station) Community-based natural resource management, social-ecological systems, and global change
- M. Pan, PhD (NOAA Fisheries)—Fishery economics
- S. Pooley, PhD (NMFS)—Marine resource economics
- C. Ray, PhD (U of Nebraska-Lincoln)—ground water hydrology and chemistry
- A. Strauch, PhD (Commission on Water Resource Management, State Dept. of Land & Natural Resources)—Watershed hydrology
- M. Weijerman, PhD (JIMAR)—Tropical marine ecology and coastal management

K. Winter, PhD (Limahuli Garden & Preserve (National Tropical Botanical Garden))—Hawaiian ethno-botany, native ecosystem restoration, ahupuaa models, and integrated mauka to makai local level resource management

Specialization Areas

NREM is an interdisciplinary department that offers an integrative graduate curriculum necessary for quality decision-making and solution-oriented natural resource and environmental management. As a foundation for graduate training, all NREM students are expected to acquire a common base of knowledge embodied in a set of core courses. Beyond that, students are expected to develop knowledge and skills within a chosen specialization area. This helps to ensure that students have the real-world skills needed to perform specific tasks, analyze resource management and policy issues, carry out original research, and effectively perform outreach and educational activities.

Examples of specialization areas in NREM include, but are not limited to:

- Aquaculture economics and management
- Coastal watershed management
- Contaminant hydrology
- Contaminant sources and transport in watersheds
- Ecological and environmental economics
- Economics of sustainable resource utilization
- Fishery economics and management
- Forest economics
- Forest ecosystem management
- Integrated resource management
- Irrigation and water management
- Land and water use policy assessment
- Land degradation processes and models
- Land resource inventory and interpretation
- Land, soil and water conservation reclamation and remediation
- Landscape ecology
- Natural resource and environmental non-market valuation
- Restoration ecology
- Remote sensing and geospatial analysis
- Sustainable community economic development
- Sustainable land and resource management
- Tropical forestry and agroforestry
- Water quality
- Watershed hydrology

A student's advisor and thesis/dissertation committee will assist in choosing appropriate coursework, research, and other activities to fully develop a specialization area within their first year in the department.

It is, however, the responsibility of students to know and observe all regulations and procedures relating to the program as well as those of UH Mānoa and the Office of Graduate Education.

Admission and Deficiencies

Regular, probationary, and conditional status is determined based on student's academic performance at the time of application. If you are admitted as regular status, you may start your formal graduate program immediately. If you are admitted as probationary or conditional status, you have specific criteria that must be fulfilled such as a BS or MS degree, course deficiencies, GREs [expected minimum GRE score of 302-308 combined Verbal and Quantitative Reasoning (equivalent to 1,100-1,200 on the prior scale)], or other documents. *These criteria are specified in your letter of acceptance, and should be discussed immediately with your advisor upon matriculation.* It is expected that students will move from probationary and/or conditional status to regular status by the end of their first year by completing **Form I**. Applicants for MS or MEM degrees are required to have a BS or equivalent degree and applicants for the PhD degree are expected to have an MS or equivalent degree (but see below for admission to the PhD degree with a BS degree).

NREM requires prior completed coursework (with a grade of C or higher) that is equivalent to or higher than NREM 310, NREM 220 (or ECON 130), NREM 203, CHEM 161, and BIOL 171 (See UHM Course Descriptions at <http://www.catalog.hawaii.edu/courses/description-index.htm>). Students who do not have coursework in one or more of these areas may be accepted into the program with course deficiencies, but will be required to make up these deficiencies within their first 1-2 semesters on campus and complete **Form I**.

The minimum required TOEFL score (for foreign applicants only) is: (a) MS or MEM student: 550, 213, or 80 for paper-based, computer-based, or internet-based examinations, respectively; and (b) PhD student: 600, 250, or 100 for paper-based, computer-based, or internet-based examinations, respectively. The minimum required IELTS score is: (a) MS or MEM student: 6.0 and (b) PhD student: 7.0. The TOEFL/IELTS requirement applies to all foreign students, except those who are native speakers of English or have received within the last five years a bachelor's or advanced degree from an accredited/recognized college or university in the Australia, Canada, Ireland, New Zealand, Singapore, the United Kingdom, or the United States. Students with low TOEFL/IELTS scores, if admitted, will be required to enroll in remedial ELI courses (English Language Institute <http://www.hawaii.edu/eli/index.html>).

Students Applying to PhD Program

(1) Admission to PhD after finishing NREM MS or MEM

An NREM PhD student who also completed his or her MS or MEM in NREM and has subsequently been accepted into the NREM PhD program has the option to take directed reading (NREM 699) for half of the required elective credits (12 of the 24) if NREM courses that are applicable to the student's degree have already been taken as part of the MS or MEM degree plan. At least 6 of the non-NREM 699 credits must be for graduate research methods courses. Also, the student is still required to take all 7 credits of NREM PhD core classes. In the case where a student took some/all of these core credits as electives during their MS or MEM degree program, an equivalent number of 600-level credits (but not NREM 699) must be taken.

(2) Admission to PhD without finishing NREM MS or MEM

A currently enrolled NREM MS or MEM student can be admitted into NREM's PhD program prior to completing their MS or MEM degree if ALL the following criteria are met:

- Unanimous approval by the student's MS or MEM committee
- Record of excellent academic achievement including, at a minimum:
 - o Maintaining a GPA >3.5 in the MS or MEM NREM program
- The student has the proven ability to undertake independent research, which can be demonstrated by ALL the following:
 - o Authored/co-authored (student as 1st author) a minimum of 1 presentation at a national or international professional conference
 - o Authored/co-authored (student as 1st author) a minimum of 1 peer reviewed journal article
 - o Accrued at least 2 years of meaningful research experience at school, jobs etc.

(3) Admission to PhD from BS

A student with only a BS degree can be admitted directly into NREM's PhD program if ALL the following criteria are met:

- A faculty member agrees to advise the student and commits to at least 3 years of funding
- Record of excellent academic achievement including, at a minimum:
 - o Undergraduate GPA >3.5
 - o Average verbal, quantitative and written GRE scores >75th percentile
- The student has the proven ability to undertake independent research, which can be demonstrated by ALL the following:
 - o Authored/co-authored (student as 1st author) a minimum of 1 presentation at a national or international professional conference
 - o Authored/co-authored (student as 1st author) a minimum of 1 peer reviewed journal article
 - o Accrued at least 2 years of meaningful research experience at school, jobs, or internships

Advising for Beginning Students

Admitted students will check in with her/his Advisor as soon as possible upon arriving on campus. An advisor has been identified by the NREM Graduate Committee for every incoming student based on the student's stated interests and consent of the advisor. If you do not know who your advisor is, check with the NREM office staff or the Graduate Chair immediately. The primary responsibilities of the advisor during your first semester on campus are to verify entrance and background deficiencies, prescribe remedial courses as early as possible in the student's program, and provide guidance in course selection. All these items should be completed by the end of the student's first year. *Submit **Form I** to Graduate Chair upon fulfilling all deficiencies. If you have no deficiencies, **Form I** should be submitted at the beginning of your first semester on campus.*

Degree Offerings and Specific Requirements

NREM offers MEM, MS, and PhD degrees.

MEM Degree

NREM offers a Master of Environmental Management degree, a course driven, professional program that includes an integrating capstone experience.

Requirements of MEM Degree

This is a course-driven professional degree that requires a total of 36 credits. Students are required to declare a concentration from one of four possible concentration areas (see below). Courses include the Primary Master's Core (9 credits), research methods (3 credits), a minimum of 9 elective credits from the chosen concentration area, a minimum of 3 elective credits from each of the other three concentration areas, and a 6-credit capstone experience.

Primary Master's Core (9 credits)

- NREM 600 Foundations of NREM and Policy (4)
- NREM 601 Social-Ecological Systems Analysis of NREM (4)
- NREM 701 Research Seminar in NREM (1)

Research Methods (3 credits)

- Course in research methods (3); 400-level or above

MEM Concentration Areas (total 18 credits)

MEM students will select a concentration area from one of four options: (a) Geospatial Analysis & Modeling, (b) Environmental Policy & Economics, (c) Applied Terrestrial Ecology, and (d) Land & Water Resource Management. They are required to take a minimum of 9 credits from their concentration area and 3 credits from each of the other areas. Of the 18 elective credits required: **(i) at least 12 credits must be NREM courses; and (ii) a maximum of 12 credits of upper-division undergraduate course credits (400-level) are allowed – however, this reduces to 9 credits if a 400-level course(s) is taken to fulfill the research methods requirement.** Course substitutions will be considered via a petition by a faculty advisor to the curriculum committee. Current MEM Concentration Areas can be found on the NREM Graduate website:

<https://cms.ctahr.hawaii.edu/nrem/GRADUATE/>

MEM Capstone Experience (6 credits)

A capstone experience is required for all MEM students. The capstone experience consists of: (i) NREM 695 (1 credit), to be taken when the student is preparing their proposal; and (ii) NREM 696 (3 credits) and NREM 699 (2 credits; register with faculty advisor), to be taken when the student has completed their capstone experience and is writing up their final document. All

capstone experiences require approval from the MEM Capstone Panel, which consists of the faculty advisor, the NREM 695 course instructor, and an at-large Panel member.

The Capstone Experience requirement may be fulfilled in several ways, based on each individual student's interests. Typical capstone experiences will involve: (i) an internship/coop/special field experience; (ii) an investigation of a special topic; and/or (iii) development of a project, directed readings/study, or a research project. Each student is expected to take the primary role in identifying and organizing their capstone experience. In meeting this requirement, it will be important for students to demonstrate that they are getting an "integrative" experience in natural resources and environmental management. Each student will be required to give a public proposal and defense presentation, and provide a written proposal and final document on their capstone experience, both of which will be evaluated by the MEM Capstone Panel.

NREM MEM – A Step-by-Step Planning Guide

1. Contact your academic advisor before the first semester begins. With your adviser, discuss (i) deficiencies (if any), (ii) transferrable credits (if any), (iii) course plan, and (iv) capstone experience.
2. Any deficiencies? If no, submit [Form I](#). If yes, complete the deficiencies by no later than the end of the first year and then submit [Form I](#).
3. Any transferrable credits? Credits earned for post-baccalaureate courses at an accredited institution of higher education or earned as a post-baccalaureate unclassified (PBU) student at UHM may be applied toward MEM degree requirements. If yes, submit a [Petition to Transfer Credits](#) form via your advisor to the NREM graduate chair during the first semester.
4. Make a tentative 2-year course plan, including a tentative timeline for the capstone experience.
 - The MEM Program requires 36 total credits. Courses include the Primary Master’s Core (9 credits), research methods (3 credits), a minimum of 9 credits from the chosen concentration area, a minimum of 3 credits from each of the other concentration areas, and a 6-credit capstone experience (see pages 11-14 for details).
 - Plan on completing the primary core requirement in the first year.
 - Plan on taking NREM 695 in the second or third semester and NREM 696 & NREM 699 in the last semester.

Core courses	Semester (to be) taken
NREM 600 (4)	_____
NREM 601 (4)	_____
NREM 701 (1)	_____
Elective courses	
Course in graduate research methods (3)	
Course Alpha/No. _____ Cr. ____	_____
Courses in your concentration area (9)	
Course Alpha/No. _____ Cr. ____	_____
Course Alpha/No. _____ Cr. ____	_____
Course Alpha/No. _____ Cr. ____	_____
Courses in other concentration area (9)	
Course Alpha/No. _____ Cr. ____	_____
Course Alpha/No. _____ Cr. ____	_____
Course Alpha/No. _____ Cr. ____	_____
Capstone experience	
NREM 695 (1)	_____
NREM 696 (3)	_____
NREM 699 (2)	_____

5. Identify your capstone experience (suggested timeline: by the end of first semester).
6. Register for NREM 695 when you are ready to work on a proposal, which should be in the second or third semester.
7. Defend your capstone proposal and submit [Form II](#) after successful defense.
 - The NREM 695 course instructor will organize the proposal defense.

8. Register for NREM 696 and NREM 699 (with your advisor) when you are completing or have completed the capstone experience, and are ready to write up a final capstone paper.
 - Consider filing a [Graduate Application for Degree \(Link to the Form\)](#) with the Office of Graduate Education. Nearly all MEM students graduate in the semester they take NREM 696 & NREM 699.
9. Defend your final capstone paper and submit [Form III](#) after successful defense.
 - The NREM 696 course instructor will organize the final defense.
10. Celebrate!

MS Degree

NREM offers three options for MS degrees:

Plan A – is a thesis-driven, research degree and a student will only be accepted into this plan if a faculty sponsor has agreed to advise the student.

Plan B – is a course driven, professional degree that also requires an integrating capstone experience. This Plan will not be available for enrollment after Fall 2017 and will be replaced by the Master of Environmental Management (MEM) degree.

Plan C – is only for students with exceptional prior work experience which requires a minimum of two semesters of full time resident study at UHM and a final written and oral comprehensive examination.

Once admitted, MS students must select a specialization (Plan A) or concentration (Plan B) area with the approval of their advisor. To meet the integrative, interdisciplinary intent of the NREM program, a set of graduate level courses (the Primary Master's Core) will be required of every student, regardless of his/her selected Plan option or specialization area.

Requirements of MS Degree

Plan A

In addition to the Primary Master's Core, a set of electives and thesis credits are required for a total of 30 credits. Electives provide background in research methods and depth in the student's area of specialization. The remaining credit requirements will be met with thesis credits (NREM 700) for conducting the research project. Once the thesis topic is finalized, a research proposal must be approved by the committee. An oral defense of the proposal in front of the thesis committee is also required for final approval of the thesis topic. ***A public thesis defense is also required, and an announcement with thesis abstract, defense date, and location must be sent to the graduate program chair, departmental secretary, and Graduate Division at least 2 weeks in advance.***

Primary Master's Core (9 Cr)

- NREM 600 Foundations of NREM and Policy (4)
- NREM 601 Social-Ecological Systems Analysis of NREM (4)
- NREM 701 Research Seminar in NREM (1)

Electives (15 Cr)

- Course in research methods (3); 400-level or above
- NREM graduate courses (6); 500-level or above
- Other graduate courses for specialization from within or outside of NREM (6); all 6 credits can be satisfied by 400-level course credits – however, this reduces to 3 credits if a 400-level course(s) is taken to fulfill the research methods requirement.

Thesis Option (6 Cr)

- NREM 700 Thesis (6)

* For additional course applicability criteria, refer to:

<http://manoa.hawaii.edu/graduate/content/course-applicability>.

Plan B

* This Plan will not be available for enrollment after Fall 2017 and will be replaced by the Master of Environmental Management (MEM) degree.

Plan B is a course-driven professional degree that requires a total of 36 credits. Students are required to declare a concentration from one of four possible concentration areas (see below). Courses include the Primary Master's Core (9 credits), research methods (3 credits), a minimum of 9 elective credits from the chosen concentration area, a minimum of 3 elective credits from each of the other three concentration areas, and a 6-credit capstone experience.

Primary Master's Core (9 credits)

- NREM 600 Foundations of NREM and Policy (4)
- NREM 601 Social-Ecological Systems Analysis of NREM (4)
- NREM 701 Research Seminar in NREM (1)

Research Methods (3 credits)

- Course in research methods (3); 400-level or above

Plan B Concentration Areas (total 18 credits)

Plan B students will select a concentration area from one of four options: (a) Geospatial Analysis & Modeling, (b) Environmental Policy & Economics, (c) Applied Terrestrial Ecology, or (d) Land & Water Resource Management. They are required to take a minimum of 9 credits from their concentration area and 3 credits from each of the other areas. Of the 18 elective credits required: **(i) at least 12 credits must be NREM courses; and (ii) a maximum of 12 credits of upper-division undergraduate course credits (400-level) are allowed – however, this reduces to 9 credits if a 400-level course(s) is taken to fulfill the research methods requirement.** Course substitutions will be considered via a petition by a faculty advisor to the curriculum committee. Current Plan B Concentration Areas can be found on the NREM Graduate website:

<https://cms.ctahr.hawaii.edu/nrem/GRADUATE/>

Plan B Capstone Experience (6 credits)

A capstone experience is required for all Plan B students. The capstone experience consists of: (i) NREM 695 (1 cr), to be taken when the student is preparing their proposal; and (ii) NREM 696 (3 cr) and NREM 699 (2 cr; register with faculty advisor), to be taken when the student has completed their capstone experience and is writing up their final document. All capstone experiences require approval from the Plan B Capstone Panel, which consists of the faculty advisor, the NREM 695 course instructor, and an at-large Panel member.

The Capstone Experience requirement may be fulfilled in several ways, based on each individual student's interests. In as much, it will vary from student to student, but typical capstone experiences will involve: (i) an internship/coop/special field experience; (ii) an investigation of a special topic; and/or (iii) development of a project, directed readings/study, or

a research project. Each student is expected to take the primary role in identifying and organizing their capstone experience. In meeting this requirement, it will be important for students to demonstrate that they are getting an “integrative” experience in natural resources and environmental management. Each student will be required to give a public proposal and defense presentation, and provide a written proposal and final document on their capstone experience, both of which will be evaluated by the Plan B Capstone Panel.

Plan C

Plan C is for students with exceptional prior work experience. Requirements include residence for two semesters of full-time study, a minimum of 18 graduate credit hours, and a final examination (written and oral). This option is only available to students who are mid-career professionals, having at least 5 years of relevant work experience in natural resources and environmental management.

Primary Master's Core (9 credits)

- NREM 600 Foundations of NREM and Policy (4)
- NREM 601 Social-Ecological Systems Analysis of NREM (4)
- NREM 701 Research Seminar in NREM (1)

Electives (9 Cr)

NREM graduate courses (9 credits of 500-level or above, and no more than 3 credits of NREM 699)

* For additional course applicability criteria, refer to:

<http://manoa.hawaii.edu/graduate/content/course-applicability>.

NREM MS Plan A – A Step-by-Step Planning Guide

1. Contact your academic advisor before the first semester begins. With your adviser, discuss (i) deficiencies (if any), (ii) transferrable credits (if any), and (iii) course plan.
2. Any deficiencies? If no, submit [Form I](#). If yes, complete the deficiencies by no later than the end of the first year and then submit [Form I](#).
3. Any transferrable credits? Credits earned for post-baccalaureate courses at an accredited institution of higher education or earned as a post-baccalaureate unclassified (PBU) student at UHM may be applied toward MS degree requirements. If yes, submit an [Petition to Transfer Credits](#) form via your advisor to the NREM graduate chair during the first semester.
4. Make a tentative course plan. The NREM MS Plan A program requires 30 total credits, including 9 Primary Master’s Core course credits, 15 elective course credits, and 6 thesis credits (see page 10 for details).

Core courses	Semester (to be) taken
NREM 600 (4)	_____
NREM 601 (4)	_____
NREM 701 (1)	_____
Elective courses	
Course in graduate research methods (3)	
Course Alpha/No. _____ Cr. ____	_____
NREM graduate courses (6)	
Course Alpha/No. _____ Cr. ____	_____
Course Alpha/No. _____ Cr. ____	_____
Other graduate courses for specialization (6)	
Course Alpha/No. _____ Cr. ____	_____
Course Alpha/No. _____ Cr. ____	_____
Thesis credits	
NREM 700 ¹⁾ (6)	_____

¹⁾ Master’s Plan A students may register for NREM 700F after completing all Plan A requirements including the required NREM 700 credits. Students enrolled in one credit of 700F are considered to be carrying a full-time load. Use an [Enrollment in GRAD 700F](#) form to enroll in NREM 700F.

5. Form your thesis committee and submit [Form IIa](#) (suggested timeline: by the end of first semester).
 - Review the “[Committee Composition](#)” policy and guidelines available at the Office of Graduate Education website when considering potential committee members.
6. Defend your thesis proposal and submit [Form II](#) after successful defense.
 - An oral defense of the proposal in front of the thesis committee is required for final approval of the thesis topic. While recommended, a public seminar is not required for a master’s thesis proposal defense.
 - Review the “[Thesis & Dissertation](#)” policy and guidelines available at the Office of Graduate Education website. It is important to familiarize yourself with the policies associated with MS thesis at this stage.
 - Remember to bring [Form II](#) to the defense.

7. Defend your final thesis.
 - Review the “[Final Defense](#)” policy and guidelines available at the Office of Graduate Education website before scheduling a defense.
 - **The final thesis defense must be open to the public.** An announcement with thesis title, abstract, defense date, and location must be sent to the NREM Graduate Chair and NREM Office Assistant **no later than two weeks prior to the defense.**
 - Remember to bring [Form III](#) to the defense.
 - The [Style and Policy Manual for Thesis and Dissertation](#) is available at the Office of Graduate Education website.
 - Consider filing a [Graduate Application for Degree \(Link to the Form\)](#) with the Office of Graduate Education. Most students graduate in the semester they hold the defense.
8. Submit [Form III](#) after successful defense.
9. Submit a copy of the written thesis, along with [Form IV](#), to the Office of Graduate Education. The [Style and Policy Manual for Thesis and Dissertation](#) is available at the Office of Graduate Education website.
10. Celebrate!

NREM MS Plan B – A Step-by-Step Planning Guide

1. Contact your academic advisor before the first semester begins. With your adviser, discuss (i) deficiencies (if any), (ii) transferrable credits (if any), (iii) course plan, and (iv) capstone experience.
2. Any deficiencies? If no, submit [Form I](#). If yes, complete the deficiencies by no later than the end of the first year and then submit [Form I](#).
3. Any transferrable credits? Credits earned for post-baccalaureate courses at an accredited institution of higher education or earned as a post-baccalaureate unclassified (PBU) student at UHM may be applied toward MS degree requirements. If yes, submit an [Petition to Transfer Credits](#) form via your advisor to the NREM graduate chair during the first semester.
4. Make a tentative 2-year course plan, including a tentative timeline for the capstone experience.
 - The MS Plan B Program requires 36 total credits. Courses include the Primary Master’s Core (9 credits), research methods (3 credits), a minimum of 9 credits from the chosen concentration area, a minimum of 3 credits from each of the other concentration areas, and a 6-credit capstone experience (see pages 11-14 for details).
 - Plan on completing the primary core requirement in the first year.
 - Plan on taking NREM 695 in the second or third semester and NREM 696 & NREM 699 in the last semester.

Core courses	Semester (to be) taken
NREM 600 (4)	_____
NREM 601 (4)	_____
NREM 701 (1)	_____
Elective courses	
Course in graduate research methods (3)	
Course Alpha/No. _____ Cr. ____	_____
Courses in your concentration area (9)	
Course Alpha/No. _____ Cr. ____	_____
Course Alpha/No. _____ Cr. ____	_____
Course Alpha/No. _____ Cr. ____	_____
Courses in other concentration area (9)	
Course Alpha/No. _____ Cr. ____	_____
Course Alpha/No. _____ Cr. ____	_____
Course Alpha/No. _____ Cr. ____	_____
Capstone experience	
NREM 695 (1)	_____
NREM 696 (3)	_____
NREM 699 (2)	_____

5. Identify your capstone experience (suggested timeline: by the end of first semester).
6. Register for NREM 695 when you are ready to work on a proposal, which should be in the second or third semester.
7. Defend your capstone proposal and submit [Form II](#) after successful defense.
 - The NREM 695 course instructor will organize the proposal defense.

8. Register for NREM 696 and NREM 699 (with your advisor) when you are completing or have completed the capstone experience, and are ready to write up a final capstone paper.
 - Consider filing a [Graduate Application for Degree \(Link to the Form\)](#) with the Office of Graduate Education. Nearly all MS Plan B students graduate in the semester they take NREM 696 & NREM 699.
9. Defend your final capstone paper and submit [Form III](#) after successful defense.
 - The NREM 696 course instructor will organize the final defense.
10. Celebrate!

NREM MS Plan C Degree Checklist

Name: _____ **Advisor:** _____

1. Check for deficiencies and submit **Form I** as soon as possible, and no later than the end of the 1st year.
2. Requirements include residence for two semesters of full-time study, a minimum of 18 graduate credit hours, and a final examination (written and oral)

NREM core courses (9)	Semester Taken:
NREM 600	Semester: _____
NREM 601	Semester: _____
NREM 701	Semester: _____
Elective (9)	
Course Number _____; Credits ____	Semester: _____
Course Number _____; Credits ____	Semester: _____
Course Number _____; Credits ____	Semester: _____

Submit Form I	Date _____
Submit Form II	Date _____
Final Examination (written and oral)	Date _____
Submit Form III	Date _____
Application for Graduation Submitted	Date _____

PhD Degree

The PhD degree in NREM is awarded only to students with outstanding scholarly achievement. Applicants for the PhD program with academic records that do not match NREM Master's core requirements will be expected to incorporate these into their PhD program. To meet the integrative, multi-disciplinary intent of this program, a set of graduate level courses (Primary PhD Core) will be required of every student regardless of his/her selected specialization area. In addition, a set of electives will also be required. These electives are meant to provide background in research methods and depth in the student's specialization area. The remaining degree requirements will be met by dissertation credits (NREM 800). All PhD students must pass a written and oral Comprehensive Examination (described below) before being advanced to candidacy. The student's dissertation committee is responsible for designing and administering the Comprehensive Examination.

Requirements of PhD Degree

Primary PhD Core (7 Cr)

- NREM 611 Resource and Environmental Policy (3)
- NREM 612 Predicting and Controlling Degradation in Human-Dominated Terrestrial Ecosystems (3)
- NREM 701 Research Seminar in NREM (1)

Electives (24 Cr)

- Graduate research methods (6); 500-level or above
- NREM graduate courses (9); 500-level or above
- Other graduate courses for specialization from within or outside of NREM (9); a maximum of 9 credits of upper-division undergraduate course credits (400-level) allowed

Dissertation (1 Cr)

- NREM 800 Dissertation (1)

PhD Comprehensive Examination Policy

The outcome of the comprehensive examination is the acceptance of the student to the PhD candidacy in NREM. Based on this examination, the student's committee will determine if the student: *(i)* is ready, *(ii)* needs to take more courses to remediate deficiencies in her/his training, or *(iii)* that the student is not fit for the NREM PhD program. In the process of administering the examination, the committee will test the rigor of the student's training as: *(i)* a scientist in general (that the student can follow the scientific method and procedure to address a research problem and also has the analytical skills to conduct research), *(ii)* a scientist in NREM (has in-depth knowledge of what makes her/him unique compared to other graduates of UH that might have similar interests; in other words, a NREM student focusing on hydrology should not only be trained to deal with a hydrology problem but also should be able to address the natural resources

and environmental management implications of that problem as compared to a hydrology graduate from Civil and Environmental Engineering, Geology and Geophysics, or Geography), and (iii) a scientist in her/his specialty area (for example, a NREM PhD student with a specialty in hydrology should have more in-depth expertise in hydrology than other NREM PhD students working in other specialty areas). Based on this understanding, the comprehensive examination questions can cover: (i) her/his specialty (i.e., hydrology, forest ecology and management), (ii) general topics related to NREM (i.e., core courses, background knowledge), (iii) knowledge of general research methods (i.e., statistics, analysis methods, etc.), and (iv) the proposed dissertation research.

Requirements:

1. Take Written and then Oral Comprehensive Examinations on proposed dissertation research, courses, and specialty area when most coursework (~80%) and the research proposal have been completed.
2. Required public Seminar on Research Proposal (publicly advertised at least two weeks in advance).
3. Required public Seminar on Dissertation Defense (publicly advertised at least two weeks in advance).

Guidelines:

Written Exam:

- Student should begin scheduling and preparing for the examination at least 3 months in advance.
- Questions will be contributed by each committee member.
- Questions from each Committee member should be related to course work and/or reading materials provided by the Committee member and from the proposed dissertation research. The student will send a list of courses that s/he has taken at UHM, and elsewhere to Committee members. All committee members should already have a copy of the research proposal. The student will also consult with each member individually for instructions as to areas to prepare for the exam.
- No more than 24 contiguous hours to complete each committee member's examination question(s), to be administered on same or separate days over a period not to exceed two calendar weeks.
- Open or closed book, at each committee member's discretion.
- Committee members will have at least one week to review the answers and provide a grade of Pass, Low Pass, or Fail. Committee members may meet with the student to provide feedback from the examination.
- Passing the written exam requires NO more than one failing grade from the committee. That is, if two or more members issue a failing grade on their questions, the written exam is considered a FAIL.
- In the event of a failed written exam, the student will have one more opportunity to take another written exam within six months with the same examining committee.
- If the student passes the written exam, s/he will then proceed to the oral exam as described below.

Oral Exam:

- The oral examination will be on the research proposal and on the written examination.
- The primary deciding factor is whether the student has sufficient course background and knowledge to be able to conduct the proposed research activities and whether the research activities are doable and of sufficient academic rigor.
- In the event of a failed oral exam, the student will have one more opportunity to take another oral exam within six months with the same examining committee.

NREM Doctor of Philosophy (PhD) – A Step-by-Step Planning Guide

1. Contact your academic advisor before the first semester begins. With your adviser, discuss (i) deficiencies (if any), (ii) transferrable credits (if any), and (iii) course plan.
2. Any deficiencies? If no, submit [Form I](#). If yes, complete the deficiencies by no later than the end of the first year and then submit [Form I](#).
3. Any transferrable credits? Neither credits earned for post-baccalaureate courses at an accredited institution of higher education, nor credits earned as a post-baccalaureate unclassified (PBU) student at UHM are applicable toward doctorate requirements; however, they may be used to waive equivalent elective course credit requirements. Consult your advisor first and then contact the NREM graduate chair if you believe you have such credits.
4. Make a tentative course plan. The PhD Program requires 32 total credits, 7 of which are the Primary PhD Core courses, 24 are elective courses, and the remaining one is a dissertation credit (see page 21 for details).

Core courses	Semester (to be) taken
NREM 611 (3)	_____
NREM 612 (3)	_____
NREM 701 (1)	_____
Elective courses	
Course in graduate research methods (6)	
Course Alpha/No. _____ Cr. ____	_____
Course Alpha/No. _____ Cr. ____	_____
NREM graduate courses (9)	
Course Alpha/No. _____ Cr. ____	_____
Course Alpha/No. _____ Cr. ____	_____
Course Alpha/No. _____ Cr. ____	_____
Other graduate courses for specialization (9)	
Course Alpha/No. _____ Cr. ____	_____
Course Alpha/No. _____ Cr. ____	_____
Course Alpha/No. _____ Cr. ____	_____
Dissertation credit	
NREM 800 ¹⁾ (1)	_____

¹⁾ Students enrolled in one credit of NREM 800 are considered to be carrying a full-time load.

5. Form your dissertation committee and submit [Form IIa](#) (suggested timeline: by the end of first year).
 - Review the “[Committee Composition](#)” policy and guidelines available at the Office of Graduate Education website when considering potential committee members.
6. Schedule a comprehensive exam and a dissertation proposal defense when most course work (~80%) and the dissertation proposal have been completed (see pages 21-23 for details).
 - You should begin scheduling and preparing for the examination at least 3 months in advance.

- You can take the exam first and then defend the proposal, or defend the proposal first and then take the exam. Discuss with your advisor which order is more appropriate for your situation.
7. Take written and then oral comprehensive exams (see pages 21-23 for details).
 8. Defend your dissertation proposal and submit [Form II](#) after successful defense.
 - **The proposal defense must be open to the public.** An announcement with dissertation title, abstract, defense date and location must be sent to the NREM Graduate Chair and NREM Office Assistant **no later than two weeks prior to the defense.**
 - Review the “[Thesis & Dissertation](#)” policy and guidelines available at the Office of Graduate Education website. It is important to familiarize yourself with the policies associated with PhD dissertation at this stage.
 9. Defend your final dissertation.
 - Review the “[Final Defense](#)” policy and guidelines available at the Office of Graduate Education website before scheduling a defense.
 - **The final dissertation defense must be open to the public.** An announcement with dissertation title, abstract, defense date and location must be sent to the Office of Graduate Education, NREM Graduate Chair, and NREM Office Assistant **no later than two weeks prior to the defense.** Use [this form](#) to inform the Office of Graduate Education of the final defense.
 - The [Style and Policy Manual for Thesis and Dissertation](#) is available at the Office of Graduate Education website.
 - Consider filing a [Graduate Application for Degree \(Link to the Form\)](#) with the Office of Graduate Education. Most students graduate in the semester they hold the defense.
 10. Submit [Form III](#) after successful defense.
 11. Submit a copy of the written dissertation, along with [Form IV](#), to the Office of Graduate Education. The [Style and Policy Manual for Thesis and Dissertation](#) is available at the Office of Graduate Education website.
 12. Celebrate!

Other NREM Graduate Program Policies

1. A “NREM graduate course” is defined as a NREM course at the 500-level or above.
 - MS Plan A: A maximum of 6 credits at the 400-level may be taken to meet the degree requirement, excluding the “NREM graduate courses” degree requirement
 - MEM and MS Plan B: A maximum of 12 credits at the 400-level may be taken to meet the degree requirement
 - PhD: A maximum of 9 credits at the 400-level may be taken to meet the “other than NREM graduate courses” degree requirement
2. Note: a course used to meet a deficiency cannot be used to satisfy any other graduate degree program requirement (e.g., if you have a deficiency in Statistics, you may NOT take a graduate-level Statistics class to simultaneously meet your deficiency and graduate research methods requirements).
3. For those students who have an undergraduate, MEM, and/or MS degree(s) in NREM and are continuing for a PhD in NREM, the following rules apply:
 - Any courses (credits) used to fulfill a BS/MS degree requirement cannot be used toward a PhD degree requirement
 - If NREM 611/612 (PhD primary core requirements) has been taken during the MS degree, that student must take other appropriate graduate level courses as a substitute to these courses. The student will consult with their advisor and committee members regarding appropriate substitute course(s).
 - NREM 701 must be taken again to fulfill the core course requirements.
4. NREM PhD students who were admitted first to the NREM MS or MEM program and then to the NREM PhD program prior to completing their MS or MEM degree
 - Are required to complete all the NREM PhD program requirements, including
 - PhD primary core and elective course requirements
 - Dissertation credit requirement
 - Comprehensive exam
 - Public proposal and final defenses with their PhD dissertation committee
 - With the discretion of their PhD dissertation committee, can apply courses the students took during their NREM MS or MEM program toward fulfilling the PhD primary core and elective course requirements. Accordingly, the total number of credits these students need to take in the PhD program will be reduced by the number of credits of these courses.
5. In addition to Graduate Division requirements, graduate student must submit their petition (a memo and a CV of the proposed committee member) to the NREM Graduate Committee for approval to add a non-UH Mānoa graduate faculty member to their graduate committee prior to submitting the same petition to the UHM Office of Graduate Education.
6. The following number of 699 credits can be used to fulfill NREM graduate degree program credit requirements:
 - MS Plan A: up to 6 credits
 - MEM and MS Plan B: 0 credits (699 can be used on a case-by-case basis via a petition), excluding 2 credits for the Capstone Experience requirement
 - MS Plan C: up to 3 credits
 - PhD admitted to PhD program with NREM MS completed: up to 12 credits
 - All other PhD: up to 9 credits

Permanent Advisor and Thesis/Dissertation Committee

Within 1-2 regular semesters of starting the NREM graduate program, all students should have established an effective working relationship with her/his permanent advisor. MS Plan A students should form their thesis committee and submit Form IIa (suggested timeline: by the end of their first semester). PhD students should form their dissertation committees by the end of their first year and submit Form IIa, and complete their comprehensive examinations by the end of the second year. A PhD advisor must be NREM graduate faculty or cooperating graduate faculty. Submit **Form II** to Graduate Chair upon approval of research proposal by the committee (PhD students must have also passed their comprehensive examination at this juncture). The advisor will guide the student's program and assist with the development of a thesis/dissertation research topic and proposal, schedule and administer the Comprehensive (for PhD students only) and Defense examinations, and oversee the completion of the degree requirements. The latter two tasks will be assisted by the Committee as necessary. Refer to the section above, "PhD Comprehensive Examination," for details.

Guidelines for MS Thesis Committee

A MS thesis committee must be headed by an NREM graduate faculty or cooperating graduate faculty member, and must consist of at least three professionals. The majority of committee members must be from the NREM graduate faculty, cooperating graduate faculty, or affiliate graduate faculty. Approval of a committee member outside the University of Hawai'i must be approved first by the NREM graduate committee and then by the UHM Office of Graduate Education. A fourth and/or fifth member may be added to the committee when deemed appropriate/necessary to provide required expertise, but the majority of committee members must still be from the NREM graduate faculty, cooperating graduate faculty or affiliate graduate faculty. Consult with your major advisor about your research interest and potential thesis committee members. Committee members are responsible for providing feedback on proposed research, guidance on appropriate coursework and reviewing thesis drafts in a timely manner.

Guidelines for PhD Dissertation Committee

PhD dissertation committee consists of a minimum of five professionals, all of whom must hold a PhD degree and the majority of whom must be graduate faculty, cooperating graduate faculty, or affiliate faculty members in NREM. One external committee member must be a graduate faculty member from a different department at the University of Hawai'i (the University representative). Your dissertation committee will be responsible for designing and proctoring the comprehensive exam, providing guidance on appropriate coursework, providing feedback on proposed research, and reviewing dissertation drafts in a timely manner. The dissertation committee chair shall have primary responsibility for the supervision of the student's work, setting deadlines, and guiding student progress.

Financial Support

Departmental Funding

The NREM department offers a limited number of Teaching Assistantships (TA), typically for up to 1 year, to current and incoming graduate students on a competitive basis that include a stipend and full tuition waiver. An announcement will be made towards the end of every semester for TAs for the following semester. Students interested in applying for a TA are encouraged to check with the NREM Graduate Chair or department secretary about the deadlines and procedure for application.

Research Assistantship

NREM offers research assistantships (RA) to its current and incoming students through ongoing funded research projects, which also includes a full tuition waiver. Typically, an RA supports the research activities of a faculty member who is the principal investigator (PI) of a funded project. The project PI is responsible for advertising and interviewing potential candidates, and candidates should talk with the PI about the expectations.

Graduate Student Organization Grant

The graduate student organization (GSO) at the University of Hawai'i at Mānoa, represents the academic interests of graduate students attending the university and endeavors to facilitate research initiatives from graduate students through its grants and awards program. The GSO provides awards to graduate students for conducting research and attending conferences worldwide. Check with your NREM GSO representative about these programs and inform him/her before applying for funding. Interested students can also refer to the GSO website at <http://gso.hawaii.edu/html/index.php> for more information about application processes and eligibility criteria.

Other Financial Aid

Graduate Division Achievement Scholarship

<http://manoa.hawaii.edu/graduate/content/achievement-scholarships>

Graduate Division Fellowships/Scholarships

<http://manoa.hawaii.edu/graduate/content/fellowships-scholarships>

East-West Center Fellowships/Scholarships

<http://www.eastwestcenter.org/scholarships-fellowships>

Western Interstate Commission on Higher Education (WICHE)

<http://manoa.hawaii.edu/graduate/content/wiche-program>

Graduate Resource Management Certificate

NREM is a partner in offering the multidisciplinary campus-wide Graduate Resource Management Certificate. The Graduate Resource Management Certificate is a cooperative program primarily involving the College of Social Sciences (Urban and Regional Planning, Anthropology, Economics, and Geography), the College of Tropical Agriculture and Human Resources (NREM), 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 seeking expertise in environmental resource management. 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 Department of Urban and Regional Planning (808-956-7381).

Courses

NREM graduate courses

NREM 600 Foundations of Natural Resource and Environmental Management and Policy (4) Critical evaluation of environmental and social components of NREM and policy. Students develop research skills and integrative knowledge important for all resource managers in, e.g., ecology, applied economics, hydrology, policy/management, soils, and human dimensions. Pre: graduate standing or consent.

NREM 601 Social-Ecological Systems Analysis of Natural Resource and Environmental Management (4) Case study approach to building the structural and behavioral framework for complex, dynamic systems underlying sustainable NREM and policy, emphasizing the transdisciplinary interactions of the ecological and economic components. Pre: 600, and ECON 130 or NREM 220, and BIOL 171, or consent. (Spring only)

NREM 611 Resource and Environmental Policy (3) Exploration of institutional and policy dimensions of natural resource development, management, allocation, markets and pricing, focusing on their environmental impacts. Emphasis on policy analysis using case studies and empirical findings. Original paper required. A-F only. Pre: ECON 300 or ECON 301, or consent. (Fall only)

NREM 612 Predicting and Controlling Degradation in Human-Dominated Terrestrial Ecosystems (3) Historic, present, and projected trends in understanding and managing human-dominated ecosystems; predicting, measuring and mitigating degradation especially in terrestrial ecosystems with a focus on small volcanic islands in tropical settings. A-F only. Pre: 301 and 304 (or equivalent) and 600. Recommended 461, or consent. (Fall only)

NREM 620 Kaiaulu: Care and Collaborative Management of Natural Resources (3) Engagement with theory and practice of collaboration to care for natural resources. Topics include community based management, common property, Hawaiian knowledge, co-management, and access through readings, discussion, and projects with Hawai'i communities. (Spring only)

NREM 627 Applied Microeconomic Analysis (3) Economic applications to the agricultural and nonagricultural industries are emphasized. Econometric techniques are used to estimate demand, supply, production and cost functions which are analyzed in terms of economic theory and market information. A-F only. Pre: AREC 626 and ECON 627, or consent.

NREM 631 Sustainable Agriculture Seminar (3) Critical evaluation of existing and alternative cropping systems from a long-term perspective. Value conflicts and resolution. Repeatable unlimited times. Pre: graduate standing or advanced undergraduate standing, and consent.

NREM 637 Resource Economics (3) Analysis of problems of development and management of natural resources with emphasis on resources in agriculture and role in economic development. Pre: ECON 608 and ECON 629. (Cross-listed as ECON 637)

NREM 652 Information Research Skills (1) Examines the use of libraries and information technology for scholarly investigation in support of scientific research; provides experience utilizing and critically evaluating a variety of print and electronic sources in basic and applied sciences. Pre: consent. (Cross-listed as ANSC 652, FSHN 652, and TPSS 652)

NREM 658 Advanced Environmental Benefit Cost Analysis (3) Advanced environmental benefit-cost analysis will require that proficiency be demonstrated on fundamentals and address topics related to sustainability, including income equality, non-market goods, risk, cost of public funds, and the social discount rate.

NREM 660 Hydrologic Processes in Soils (3) (2 Lec, 1 3-hr Lab) Hydrologic properties in soils and the processes involved in water infiltration drainage and solute transport. Emphasis on key parameters required for modeling. Recommended: CEE 424 or consent. (Fall only) (Cross-listed as BE 664 and CEE 625)

NREM 662 Watershed Hydrology (3) Application of basic hydrologic processes and management practices occurring on small islands watersheds. Pre: 203 or equivalent and 304 or equivalent; or consent. (Once a year)

NREM 664 Small Watershed Modeling (3) Introduction to process-based modeling of watershed with emphasis on model applications. Deals with the characterization and simulation of small watershed hydrolic and pollutant transport processes. Pre: CEE 424 (or concurrent) or GG 425 (or concurrent) or BS degree from NREM, or consent. (Spring only)

NREM 665 Coastal and Wet and Ecology and Management (3) Study of marshes, mangroves, sea grass beds, and coral reefs. Emphasis on the hydrology, biogeochemistry, productivity, and community dynamics of these systems. Response to perturbations and management strategies will also be discussed. Pre: advanced undergraduate coursework in hydrology, soils, and ecosystem ecology recommended. (Alt. years)

NREM 670 Interdisciplinary Methods for Agrarian Systems (3) Interdisciplinary methodologies for conducting research and impact analyses on agrarian systems, sustainable development, and resource management. Repeatable one time. Pre: consent. (Cross-listed as TPSS 670) (Alt. years: fall)

NREM 671 International Agricultural Systems (2) Analysis of trends and strategies in international agricultural research and development. International agricultural research centers (IARC), Food and Agriculture Organization (FAO), university networks and consortia, and private voluntary organizations (PVOs). Pre: graduate standing or advanced undergraduate standing, and consent.

NREM 677 Remote Sensing of the Environment (3) Fundamentals, techniques, and applications of remote sensing for natural resource assessments and environmental monitoring. Lab consisting of field radiometric exercises, computer modeling of energy-matter interaction, processing, and analysis of remotely sensed imagery. Pre: one physics course (e.g. PHYS 151),

one calculus course (e.g. 203), and one statistics course (e.g. 310), or consent. Recommended: either GEOG 470 or GG 460 or one introductory remote sensing course. (Alt. years)

NREM 680 Ecosystem Ecology (4) (2 Lec, 1 3-hr Lab) Principles of ecosystem ecology with emphasis on tropical forests, human impacts, and global environmental change. Factors controlling ecosystem structure, productivity, nutrient cycling, plant-soil-atmosphere interactions, and energy balance. Field and laboratory methods in ecosystem science. Pre: advanced undergraduate coursework in ecology and soil science; graduate standing; and consent. (Alt. years: spring)

NREM 682 Restoration Ecology (3) Graduate seminar on foundations of restoration ecology, application of ecological theory to restoration practice. Emphasis on restoration of structure and function in degraded terrestrial ecosystems using case studies from Hawai'i and around the world. Pre: advanced undergraduate ecology course and graduate standing, or consent. Completion of 680 recommended, but not required. (Alt. years)

NREM 685 Landscape Ecology (3) Focuses on the history, theories, and contemporary views of landscapes; including scale, land cover, land use, landscape metrics, disturbance regimes, land management, landscape change, the relationship of landscapes to species, and modeling. Pre: graduate students, or consent. (Alt. years)

NREM 690 Conservation Biology (3) Theories and concepts of ecology, evolution and genetics for conservation of biological diversity. Topics will include restoration ecology, management planning, laws and policies, biological invasions. Pre: BIOL 375 and either ZOO 480 or BOT 462; and either ZOO 410, 439, 620, 623, BOT 453, 454, 456, or 492. (Cross-listed as BOT 690 and ZOO 690)

NREM 691 Advanced Topics in Natural Resources and Environmental Management (V) Study and discussion of significant topics and problems at an advanced level. Offered by visiting or existing faculty as a special course. Repeatable one time. Pre: graduate standing or consent.

NREM 695 Master's Plan B Capstone Preparation (1) Preparation for NREM Master's Plan B capstone experience. NREM majors only. A-F only. Pre: 600 (or concurrent), 601, 605 (or concurrent), a graduate methods course, and at least 12 graduate elective credits. (Fall only)

NREM 696 Master's Plan B Capstone Experience (3) Capstone experience for NREM Master's Plan B students. NREM majors only. A-F only. Pre: 695 or concurrent.

NREM 699 Directed Research (V) Repeatable unlimited times. Pre: graduate standing.

NREM 700 Thesis Research (V) Repeatable unlimited times.

NREM 701 Research Seminar (1) Presentation and discussion of student research proposals, theses and dissertations, and research presentations by NREM faculty, students, and invited speakers. A-F only. Pre: consent.

NREM 800 Dissertation Research (V) Repeatable unlimited times.

Other Departments at UHM with potentially relevant courses

- **Botany**
- **Civil and Environmental Engineering**
- **Educational Psychology**
- **Geology and Geophysics**
- **Geography**
- **Tropical Plant and Soil Sciences**
- **Zoology**

“Suggested” Graduate Level Research Methods Courses (statistics)

Ultimately, the choice of a course to meet the graduate level research methods requirement is between the student, their advisor, and thesis/dissertation committee. Therefore, this list is not comprehensive.

BE 622 Experimental Methods in Cause-Effect Modeling (3) Factorial designs and fractional factorial designs for screening variable and response optimization, Response surface methodology. Experimental designs appropriate to building and testing multi-variable behavior relationships. Sequential experimental designs.

CEE 626 Surface Water Hydrology (3) Deterministic and probabilistic methods include reliability of empirical distributions, multiple regression analysis, extreme value analysis and domain of attraction. Short-memory models for stochastic simulation of streamflows include autoregressive, Markov chain and moving average models. Time series analysis of hydrologic data is discussed. Pre: consent. (Alt. years)

ECON 628 Quantitative Methods (3) Probability; density and distribution functions; expectation, variance, and co-variance; central limit theorem; maximum likelihood methods; statistical estimation, testing and inference; bivariate regression. Pre: one of 321, AREC 310 or MATH 241 or consent. (cross-listed as AREC 626)

ECON 629 Econometrics (3) Specification, statistical estimation, inference and forecasting of econometric models. Includes advanced topics for single-equation models, pooled models, qualitative dependent variables, simultaneous systems, distributed lags, and time series. Pre: 628 or consent. (cross-listed as AREC 634)

ECON 686 Strategic Behavior and Experimental Economics (3) Experimental economics: methodology. Experimental game theory. Market experiments. Applications include: topics in industrial organization, provision of public goods, asset markets, auctions. Repeatable one time. Pre: 606 and 608 or consent.

EDEP 601 Introduction to Quantitative Methods (3) Introductory statistics in education and social sciences. Topics include probability distributions; sampling distributions; hypothesis testing using t-tests, correlation, simple regression, ANOVA; and applications in research. (Meets PhD common inquiry methods requirement or elective.)

EDEP 604 Multiple Regression in Behavioral Research (3) Introduction to linear statistical models as principle of data analysis. Topics include multiple regression models with continuous and categorical predictors. ANOVA with multiple factors, ANOVA with repeated measures, and ANCOVA. Pre: 601 or consent. (Cross-listed as PSY 612 and SW 654)

EDEP 605 Factor Analysis (3) Theory and method of factor analysis and related methods of multivariate analysis. (Cross-listed as PSY 613 and SW 655)

EDEP 606 Multivariate Methods (3) Multivariate forms of multiple linear regression, analysis of variance and co-variance. Multiple discriminant analysis, canonical correlation, and principal-components analysis are discussed. (Cross-listed as PSY 614 and SW 656)

ES 480 Qualitative Research Methods (3) Introduction to qualitative data collection methods; explore methods of analyzing data including grounded theory method, discourse analysis and narrative analysis and those used in ethnic, gender and community studies. A-F only. Pre: one upper division ES or SOCS course or consent.

MET 631 Statistical Meteorology (3) Probability; frequency distributions of atmospheric variables; linear models; time series analysis (frequency and time domain); principal component analysis; statistical weather forecasting and verification. Pre: MATH 371 (alt. years)

PLAN 605 Planning Models (3) Allocation, decision, derivation, and forecasting models used in the analysis of demographic, economic, land use, and transportation phenomena in urban and regional planning. Repeatable one time. Pre: one of ECON 321, GEOG 380, or SOC 476; or consent.

PPST 691 Methods of Demographic Analysis (3) Statistical evaluation and analysis of population data; data sources; population growth; composition; standardization of rates; mortality and the life table; nuptiality and fertility distribution, migration, urbanization; projections and stable population theory. Pre: basic statistics or consent. (cross-listed as PH 659)

SOC 605 Seminar in Advanced Statistics (3) Multivariate analysis. Analysis of variance; multiple regression procedures; multiple classification analysis, stepwise regression, discriminant functional analysis and path analysis. Pre: 476

SOC 605L Advanced Statistics Laboratory (1) Required lab for computer applications for analysis of sociological data. CR/NC only. Pre: 476 or consent. Co-requisite: 605

SOC 606 Research Methods and Design (3) Emphasis on theory selection, theory construction and choice of research strategies

SOC 608 Survey Research Design and Analysis (3) Survey study designs, survey sampling, questionnaire construction, interviewing, pre-tests, pilot studies, logic of measurement and association, table construction and elaboration models. Pre: consent. (cross-listed as EDEA 608)

SOC 609 Seminar Qualitative Research (3) Advanced seminar on conducting fieldwork in natural social settings with emphasis on qualitative techniques, political and ethical considerations, data management and assessment, interpretation and reflexive writing. Repeatable once only. Pre: 478 or consent

TPSS 603 Experimental Design (4) Design of experiments and variance analyses in biological and agricultural research. Pre: graduate standing or consent. Recommended: ZOO 632. (Cross-listed as ANSC 603)

ZOOL 631 Biometry (4) (3 Lec, 1/2 hr discussion) Basic statistical methods: design of studies; data exploration; probability; distributions; parametric and non parametric one-sample, two sample, multi sample, regression and correlation analysis; frequency tables. Pre: MATH 241 or consent

ZOOL 632 Advanced Biometry (4) (3 Lec, 1 2-hr Discussion) Multivariate statistical methods: multiple regression and correlation; multiway anova; general linear models; repeated measures and multivariate anova; loglinear analysis and logistic regression. Pre: 631 and MATH 241, or consent.

“Suggested” Graduate Level Research Methods Courses (field-practical)

Ultimately, the choice of a course to meet the graduate level research methods requirement is between the student, their advisor, and thesis/dissertation committee. Therefore, this list is not comprehensive.

BE 606 Instrumentation and Measurement (3) Measurement concepts and operating principles applied to the selection and use of instruments important to scientists and engineers dealing with biological systems, including automatic data acquisition and processing. Pre: CHEM 151, MATH 241 and ME 311 or consent

COM 612 Communication Research Methods (3) Introduction to the major steps in the research process. Emphasis on the methodological approaches to making choices among alternatives at each step of a research cycle

GEOG 680 Geospatial Analysis of Natural Resource Data (3) The application of geostatistics to estimate spatial dependence to improve soil and regional sampling; provide insight into underlying soil, geographic and geologic process, and to provide quantitative scaling up of point measurements to fields, regions and watersheds. State-space modeling also will be included. A to F only. Pre: 488, ZOOL 631, or Times Series Analysis course or consent (cross-listed as TPSS 680)

Style and Policy Manual for Theses and Dissertations

Graduate Division Requirements

The margin settings, title page and signature page of the thesis or dissertation must meet Graduate Division requirements. Students who submit pages that do not meet these requirements will be asked to reformat the pages. Consult the Style and Policy Manual for Theses and Dissertations for details at <http://manoa.hawaii.edu/graduate/content/style-policy>.

Departmental Information

Conference Room Students may use the department conference room located in Sherman 103 or class room located in Sherman 111 for seminar presentation or for meetings directly related to NREM such as thesis defense. Please be sure to check and reserve the room with the NREM staff. The key for the conference room can be picked up from the office and must be returned when you are done.

Computers Many laboratories and the libraries on campus are equipped with personal computers for conducting research. CTAHR has its own computer lab and printing facility located in AgSci-215. See the link for lab use policies and access <http://agsci002.ctahr.hawaii.edu/215Portal/>.

Projectors and laptops are available for seminar presentations and NREM projects. Please check the equipment log located in Sherman 101 for reservation dates and times.

Fax Machine You may receive faxes related to NREM through the departmental fax machine. However, no personal faxing will be allowed.

Keys Graduate Assistants will be issued an office key at the time of hire. Please do not loan your key to unauthorized persons. If you lose a key, please notify the NREM staff as soon as possible. You must return all keys when your affiliation with the NREM department ends.

Laboratory and Field Equipment Laboratory and equipment needed for conducting research will be provided for all students by the department through their advisors.

Mailboxes You will be assigned a mailbox located in the department front office in Sherman 101. Check it daily for mail and other correspondence. The office is open from 7:45am – 11:45am and from 1:00pm – 4:45pm. Personal mail such as bank statements should be sent to your home address as the mailboxes are not secured.

Office Supplies Office supplies are not available for student use. However, some supplies are available for Graduate Assistants in relation to their departmental duties. Basic supplies for the offices of Graduate Assistants will be provided by the advisor.

Stationery & Shipping Supplies University of Hawaii stationery is available for Graduate Assistants for correspondence in relation to their official duties and should be approved by their advisors.

- Outgoing packages should be prepared and labeled and brought to the NREM office.
- An account number (obtained from supervisor) must be provided in order for us to schedule a pick-up (for FedEx or UPS).
- An outgoing mailbox is available in the department front office for stamped letters or on-campus mail.
- You may use the departmental address for mail delivery related to NREM. However, you are responsible for pick-up of large and bulky packages.

Telephone Use Long distance calls are not permitted on University of Hawai'i telephones except for official business with advisor approval.

University Vehicles Only University of Hawai'i employees (including Graduate Assistants) with a valid Hawai'i driver's license may drive University vehicles.

To rent a vehicle:

- Obtain a Daily Rental Request Form from NREM office.
- Complete the form and phone in your vehicle reservation to Transportation Services at X68875.
- Return the form to NREM office so that it can be faxed to Transportation Services.
- The original will be returned to your mailbox.
- You must present the form to Transportation Services to obtain the vehicle.

Xerox Copies There is a departmental copy machine available in Sherman 101. Personal copies including class materials are 10 cents per page. A color copier is also available for use by Graduate Assistants for work-related projects.

Desk Assignment There are limited desk spaces for graduate students in the department. Check with your advisor for desk space in her or his lab. If your advisor cannot accommodate you then the department will try to find a desk space for you in one of our graduate student offices. Please contact the Graduate Chair for a desk assignment.

Student Organizations

UH Mānoa Graduate Student Organization (GSO): <http://gso.hawaii.edu/gso2/index.html>

- Every spring, a GSO representative of NREM must be nominated and elected. The GSO representative will work with the Graduate Chair and Departmental Chair to carry out the election for the next representatives.

Student Activity and Program Fee Board: www.hawaii.edu/sapfb/

University of Hawai‘i Graduate Division and NREM Forms

The University of Hawai‘i Graduate Division website contains links to the following form-fillable forms and petitions (<http://manoa.hawaii.edu/graduate/content/forms>):

- Forms I-IV for MS Plan A students
- Forms I-IV for PhD students
- Graduate Application for Degree
- Petition for Leave of Absence
- Petition to Transfer Credits
- Petition to Substitute or Waive Courses
- Petition for Submission of Undergraduate Excess Credits Toward a Master's Degree
- Graduate Assistant Petition to Enroll in More than 9 Credits
- Graduate Assistant Petition to Work More than 20 Hours

The NREM Graduate Program website (<http://cms.ctahr.hawaii.edu/nrem/GRADUATE.aspx>) has links to many of these same forms, and contains links to:

- Forms I-III for MEM and MS Plan B students
- NREM Graduate Student Organization (GSO)
- The most current version of the NREM Graduate Student Guide

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