

2012-2013 LONG SIGNATURE SHEET

Proposal Number: INES 02-20-2013
 Proposal Title: New course INES 8201
 Originating Department: Infrastructure and Environmental Systems *(Interdisciplinary Doctoral Program)*



TYPE OF PROPOSAL: UNDERGRADUATE _____ GRADUATE X UNDERGRADUATE & GRADUATE _____
 (Separate proposals sent to UCCC and Grad. Council)

DATE RECEIVED	DATE CONSIDERED	DATE FORWARDED	ACTION	SIGNATURES
2/20/2013	3/27/2013	4/8/2013	Approved	<u>DEPARTMENT CHAIR</u> INES Program Director: Jy S. Wu
4/10/13		4/23/2013	Approved	<u>COLLEGE CURRICULUM COMMITTEE CHAIR</u> Dr. John Diemer (INES Program Committee) Dr. Asis Nasipuri (CEGC)
			Approved	<u>COLLEGE FACULTY CHAIR (if applicable)</u> Dr. Jeff Kimble
4/23/13	4/23/13	4/23/13	Approved	<u>COLLEGE DEAN</u> Dr. Robert Johnson
			Approved	<u>GENERAL EDUCATION</u> (if applicable; for General Education courses)
			Approved	<u>UNDERGRADUATE COURSE & CURRICULUM COMMITTEE CHAIR</u> (for undergraduate courses only)
5-2-13	5-7-13	5-10-13	Approved	<u>GRADUATE COUNCIL CHAIR</u> (for graduate courses only) Rob Kay McGregor
				<u>FACULTY GOVERNANCE ASSISTANT</u> (Faculty Council approval on Consent Calendar)
				<u>FACULTY EXECUTIVE COMMITTEE</u> (if decision is appealed)

Course and Curriculum Proposal

INES 02-20-2013

I. HEADING AND PROPOSAL NUMBER

A. HEADING.

University of North Carolina at Charlotte

New, Graduate

Originating Unit - Infrastructure and Environmental Systems – INES

Interdisciplinary Doctoral Program

Dr. Jy S. Wu, INES Director (jwu@uncc.edu)

B. PROPOSAL NUMBER. INES 02-20-2013

C. TITLE. New graduate/doctoral course for the INES interdisciplinary doctoral program

INES 8201 ENVIRONMENTAL AND ECONOMIC ASSESSMENT OF ECOSYSTEMS

II. CONTENT OF PROPOSALS

A. PROPOSAL SUMMARY AND CATALOG COPY.

1. SUMMARY. The INES program proposes to add INES 8201 and to its curriculum.

B. JUSTIFICATION.

PROPOSAL NEEDS. INES requires students to complete a set of core courses and several specialized/elective courses that will provide students with appropriate background to perform dissertation research and undertake the Part II of the Qualifying Exam. INES has not yet provided sufficient catalog description of interdisciplinary courses but relies on cross-linking with graduate courses offered by participating departments. This is our first attempt to develop new specialized/elective interdisciplinary courses for the program. This course can be counted as one of the core courses or as a specialized/elective course.

1. PRE AND COREQUISITES. No pre and corequisites are needed. The course can be taken by doctoral students including INES with appropriate background in fundamental economics and environmental sciences.

2. CONSISTENCY OF COURSE NUMBERING. The proposed course is at the 8000 level for doctoral students only.

3. PROGRAM IMPROVEMENT. INES doctoral students will have an additional elective course to match their interest and course requirements.

4. PREVIOUSLY OFFERED: This proposed course was offered once in Fall 2012 as INES 8090/CEGR 6090 with an enrollment of five students including INES/PPOL doctoral and advanced graduate students.

C. IMPACT

1. STUDENTS SERVED. This course proposal will provide a doctoral level course for INES students as well as students from other doctoral programs.

2. EFFECT ON EXISTING COURSES AND CURRICULA.

a. The proposed courses will be taught in alternate Fall/Spring semesters.

b. There will be no effect on the offering of other courses; however, it will enhance course offerings in a more structured way.

c. It is expected there will be 5-10 students in each class offering.

- d. Enrollments in other courses will not be affected since this course is intended for doctoral students.
- e. Other areas of catalog copy will not be affected but, on the contrary, it enhances the INES courses presentation and listings.

III. RESOURCES REQUIRED TO SUPPORT PROPOSAL

A. PERSONNEL

- a. No need to add new faculty.
- b. Dr. Jy S. Wu (Civil and Environmental Engineering), Dr. Hilary Inyang (Civil and Environmental Engineering), Dr. Sandra Clinton (Geography and Earth Sciences), and Dr. Alice Tseng (Economics) have jointly taught this proposed course as a special topic class in the Fall 2012 semester. We expect this teaching team will continue to collaborate in the future

B. PHYSICAL FACILITY. No need of new facility.

C. EQUIPMENT AND SUPPLIES. No need of new equipment and supplies.

D. COMPUTER. Computing laboratories in EPIC and McEniry are adequate.

E. AUDIO-VISUAL. NA

F. OTHER RESOURCES. NA

G. SOURCES OF FUNDING. NA

IV. CONSULTATION WITH LIBRARY AND OTHER DEPARTMENTS OR UNITS

A. LIBRARY CONSULTATION. See attached support letter from the Library

B. CONSULTATION WITH OTHER DEPARTMENT. See attached support letters.

- Department of Civil and Environmental Engineering
- Department of Geography and Earth Sciences
- Department of Economics

V. INITIATION AND CONSIDERATION OF THE PROPOSAL

A. ORIGINATING UNIT: The proposal was approved by the INES Admission Committee on 02/26/2013. The proposal was circulated to all INES faculty. No objection was brought up by the program faculty.

B. CREDIT HOURS:

The appropriate faculty committee has reviewed the course outline/syllabus and has determined that the assignments are sufficient to meet the University definition of a 3 credit hours.

C. ATTACHMENTS.

1. Consultations (as attached)
2. Course syllabus (see attached boiler plate for syllabi)
3. Proposed Catalog Copy:

INES 8201. Environmental and Economic Assessment of Ecosystems. (3)
Prerequisite: permission of the instructor. Students will explore ways in which ecosystem services are measured, valued, and monetized by the society. The course includes topics in environmental risk assessment, ecosystems services

and evaluation, and environmental economics. It is appropriate for advanced graduate students with background in engineering, environmental sciences, business, and public policy. (Alternate Fall/Spring or on demand)

- a. For a new course or revisions to an existing course, check all the statements that apply:
- This course will be cross listed with another course.
 - There are prerequisites for this course.
 - There are corequisites for this course.
 - This course is repeatable for credit.
 - This course will increase/decrease the number of credits hours currently offered by its program.
 - This proposal results in the deletion of an existing course(s) from the degree program and/or catalog.
- b. If overall proposal is for a new degree program that requires approval from General Administration, please contact the facultygovernance@uncc.edu for consultation on catalog copy. NA
4. Academic Plan of Study: NA, this is not an undergraduate course
 5. Student Learning Outcomes: No change in SLOs
 6. Textbook Costs: No text book required

Course and Curriculum Proposal (Boiler Plate)

INES 02-15-2013

1. COURSE NUMBER AND TITLE

INES 8201 ENVIRONMENTAL AND ECOLOGICAL ECONOMICS

2. COURSE DESCRIPTION (CATALOG DESCRIPTION)

INES 8201. Environmental and Ecological Economics. (3) Prerequisite: permission of the instructor. Students will explore the ways in which ecosystem services are measured, valued, and monetized by the society. The course is divided into three lecture modules: (a) environmental economics, (b) risk analysis and management, and (c) ecosystem services and valuation. It is appropriate for advanced graduate students with background in engineering, environmental sciences, business, and public policy. (Alternate Fall/Spring or on demand)

3. Pre- or Co-requisites

No pre- or co-requisites are needed. The course can be taken by doctoral students including INES with good academic standing and background in fundamental economics and environmental science.

4. Objectives of the Course

INES requires students to complete a set of core courses and several specialized/elective courses that will provide students with appropriate background to perform dissertation research and undertake the Part II of the Qualifying Exam. INES has not yet provided sufficient catalog description of interdisciplinary courses but relies on cross-linking with graduate courses offered by participating departments. This is our first attempt to develop new specialized/elective interdisciplinary courses for the program. This course can be counted as one of the core courses or as a specialized/elective course.

5. Instructional Method

This is a face-to-face classroom teaching including guest lecturers, student presentations and project assignment. This class was once taught in Fall 2012 with faculty expertise from Civil and Environmental Engineering (Dr. Jy S. Wu and Dr. Hilary Inyang), Geography and Earth Sciences (Dr. Sandra Clinton), and Economics (Dr. Alice Tseng). There were five graduate students enrolled with one doctoral student from the Public Policy program. We expect this team will continue to collaborate and teach in the future.

6. Means of Student Evaluation

There will be a class project related to environment/economic impact, ecosystems valuation and risk management of a given natural capital or resources. Students are required to provide a written report and make presentation of the project assignments. In addition, students are

assigned to review the literature, work on homework problems in environmental risk and economic analysis, and/or in-class exam. The class project accounts 75%. Other miscellaneous assignments make up the remaining 25%.

7. Policies Applied to this Course

1. University integrity
2. Attendance: must obtain permission in advance for missing a class
3. Grading will be based on 90-100 (A), 80-89 (B), 65-79 (C) and below 65 (U).
4. Additional requirements: no phones and beeper in class

8. Probable Textbooks or Resources

“Guidelines for Preparing Economic Analysis”, EPA 240-R-10-001, December 2010, US EPA.

“Valuing Ecosystem Services: Toward Better Environmental Decision-Making”

<http://www.nap.edu/catalog/11139.html>

Handouts and literature review papers

9. Topical Outline of Course Content

- a. Environmental Economic Analysis
 - i. Regulatory and non-regulatory approaches to pollution control
 - ii. Benefit and cost analysis
 - iii. Economic impact analysis
- b. Risk Analysis and Management
 - i. Elements and components of risk
 - ii. Risk analysis methodologies
 - iii. Risk-based infrastructure and environmental management
 - iv. Spatial Zonation Systems for Support of Hazard Identification
- c. Ecosystem services and valuation

10. Attachments

- a. Details of course description
- b. Letters of support: Department of Civil and Environmental Engineering, Department of Geography and Earth Sciences, Department of Economics, Department of Engineering Management.

INES 8090/CEGR 6090
Issues in Environmental and Ecological Economics

Tuesday, 12:30 – 3:15 pm
Fall 2012, EPIC 2224

This course will provide students with basic understanding, scientific principles and techniques for performing cost-benefits analysis of environmental processes, pollution control regulations and ecosystem services. Environmental economics tends to focus on human preference (demand-side) and efficient allocation of natural resources; while ecological economics attempts to deal with the science and environmental consequences of economic decision (supply-side) and the cost-benefit of preserving or protecting natural resources. The class will explore the ways in which ecosystem services are measured, valued, and monetized by society. The term “ecosystem services” can be referred to as the Earth’s “natural capital” that represents the goods and services provided to humanity. Examples of ecosystem services may include, but not limited to, carbon storage and sequestration, utilization of marginal lands, and water supply/quality. The course is divided into three lecture modules: (A) Environmental Economics, (B) Risk Analysis and Management, and (C) Ecosystem Services and Valuation. This class is appropriate for advanced graduate students with background in engineering, environmental sciences and public policy.

A: Environmental Economics (Jy S. Wu)

Guest Speaker: Alice Tseng

(1) Environmental Economic Analysis

Reading Material: “Guidelines for Preparing Economic Analysis”, EPA 240-R-10-001, December 2010, US EPA.

- Regulatory and non-regulatory approaches to pollution control (USEPA, Chapters 4 and 5)
 - o Chapter 4: economic efficiency and cost-effectiveness, design versus performance-based standard, market-oriented or hybrid approaches, uncertainty, non-regulatory approaches.
 - o Chapter 5: baseline for economic analysis of potential benefits and costs of proposed regulations.
- Benefits and Costs (USEPA, Chapters 6, 7 and 8)
 - o Chapter 6: methods for discounting future values, social discounting, shadow price of capital, Ramsey framework for intergenerational discounting, the Stern review for the economics of climate change.
 - o Chapter 7: effect-by-effect approach, willingness-to-pay or accept, human health issues, economic valuation to ecological changes/benefit analysis, non-monetized benefits
 - o Chapter 8: social cost, equilibrium analysis, typology of costs, models for estimating the costs of environmental regulations, marginal analysis
- Economic Impact Analysis (USEPA, Chapter 9)
- Presentation of Analysis and Results (USEPA, Chapter 11)

(2) Group Project: Economic Aspects of the Corn-Ethanol Biofuel Cycle

Reading Material: “Thermodynamics of the Corn-Ethanol Biofuel Cycle”, Patzek, T.W. UC Berkeley, August 14, 2005.

B: Risk Analysis and Management (Hilary Inyang)

- (1) Elements and Components of risk
Basic concepts in probability theory and their utility in systems analysis; risk and uncertainty; hazards versus risks; and recognition of risk factors
- (2) Risk Analysis Methodologies
Basics of risk measurements; risk perception versus risk assessment; structural and systems vulnerability analyses; multi-objective decision analysis; risk-cost analysis; and fundamentals of environmental risk assessment. (Both human health and ecological exposures). Assignment of mini-projects to students
- (3) Risk-based Infrastructure and Environmental Management
Factor of safety approaches; risk-based maintenance of systems, risk-based options selection, risk-based regulatory systems; fundamentals of environmental risk management (environmental impact assessments, environmental audits, pollution prevention, the precautionary principle, etc); approach to risk-based remediation of polluted sites.
- (4) Spatial Zonation Systems for Support of Hazard Identification
Zonation of hazards that threaten infrastructure and the environment globally; applications of hazard monitoring systems; visualization systems for hazards, e.g. GIS; production and use of risk/hazard zonation maps.
- (5) Class Presentation by Student Groups
Course section review and presentation of both written and oral summaries by students on mini-projects assigned during Lecture.

C. Ecosystem Services and Valuation (Sandra Clinton)

- (1) Defining Ecosystem Services and Valuation
Reading Material:
Valuing Ecosystem Services: Toward Better Environmental Decision-Making
<http://www.nap.edu/catalog/11139.html>
Costanza, R., R. d'Arge, R. de Groot, S. Farberk, M. Grasso, B. Hannon, K. Limburg, S. Naeem, R.V. O'Neill, J. Paruelo, R. G. Raskin, P. Suttonkk and M. van den Belt. 1997. The Value of the World's Ecosystem Services and Natural Capital. *Nature* 387: 253-260.
Turner, R.K. and G.C. Daily. 2008. The Ecosystem Services Framework and Natural Capital Conservation. *Environ Resource Econ* 39:25–35.
Daily, G.C. and P.A. Matson. 2008. Ecosystem services: From theory to implementation. *PNAS* 105: 9455-9456
Ehrlich, P.R., P.M. Kareiva, and G.C. Daily. 2012. Securing natural capital and expanding equity to rescale civilization. *Nature* 486: 68-73.
Case Studies – readings TBA
- (2) Group Projects
Small-scale testing using the InVest tool from the Natural Capital Project
<http://www.naturalcapitalproject.org/>
<http://www.naturalcapitalproject.org/toolbox.html>



J. Murrey Atkins Library

Consultation on Library Holdings

To: Dr. Jy Wu
From: Alison Bradley
Date: 2/24/13
Subject: INES 8201 Environmental and Economic Assessment of Ecosystems

Summary of Librarian's Evaluation of Holdings:

Evaluator: Alison Bradley Date: 2/24/13

Check One:

- 1. Holdings are superior
2. Holdings are adequate (checked)
3. Holdings are adequate only if Dept. purchases additional items.
4. Holdings are inadequate

Comments:

Library holdings should be adequate to support student research for this course (see list of items held by subject heading below). Students will have access to relevant databases including GeoRef, Environment Complete, Environmental Sciences and Pollution Management, Compendex, ASCE Digital Library, ScienceDirect, and many others.

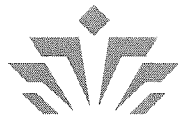
Table with 2 columns: LC Subject Heading, Total items held. Rows include Environmental economics (182), Environmental risk assessment (148), and Ecological risk assessment (55).

Alison Bradley

Evaluator's Signature

2/24/13

Date



UNC CHARLOTTE

The WILLIAM STATES LEE COLLEGE *of* ENGINEERING

9201 University City Boulevard
3252 EPIC
Charlotte, NC 28223-0001

Department of Civil and
Environmental Engineering

704/687-1219
FAX: 704/ 687-0957

Memorandum

To: Dr. Jy Wu, Director, INES Ph.D. Program

From: Dr. John L. Daniels, Interim Chair, CEE Department

Subject: Consultation regarding proposed INES 8201 Course

Date: March 12, 2013

I have reviewed the proposal for the proposed course, INES 8201 Environmental and Economic Assessment of Ecosystems. In addition this information has been forwarded to our graduate committee chair, Dr. Vincent Ogunro as well as relevant faculty in the environmental engineering group. All feedback has been positive. The course appears to meet an ongoing need in INES to have sufficient breadth and depth in its interdisciplinary course offerings.

From CEE's perspective, there are no reservations and this course has our full support. Please let me know if you require more information.



UNC CHARLOTTE

The University of North Carolina at Charlotte
9201 University City Boulevard
Charlotte, NC 28223-0001

Department of Geography and Earth Sciences

704 / 687-5973

Fax 704 / 687-5906

To: Dr. Jy Wu, Director, INES Interdisciplinary Doctoral Program

From: Dr. Craig Allan, Chair, Department of Geography and Earth Sciences

Subject: Consultation Regarding the Proposed INES 8201 Course

Date: April 4, 2013

I have reviewed the proposal for the proposed course, "INES 8201: Environmental and Economic Assessment of Ecosystems" and discussed this course offering with our faculty. The Department believes that this course represents an important elective for GES supported INES students, environmentally focused student's in the Geography and Urban and Regional Analysis PhD program and potentially Public Policy (PPOL) PhD students. The interdisciplinary teach team assembled to contribute to the course would seem well to be well qualified to offer it at the graduate level

The Department of Geography and Earth Sciences is in full support of this course. Please let me know if I can be of further assistance.



UNC CHARLOTTE

BELK COLLEGE *of* BUSINESS

9201 University City Blvd, Charlotte, NC 28223-0001
P 704.687.7577 F 704.687.4014 www.belkcollege.uncc.edu

Memorandum

To: Dr. Jy Wu, Director, INES Interdisciplinary Doctoral Program

From: Dr. Jennifer Troyer, Chair, Department of Economics

Subject: Consultation Regarding the Proposed INES 8201 Course

Date: March 6, 2013

I have reviewed the proposal for the proposed course, “INES 8201: Environmental and Economic Assessment of Ecosystems”. In addition to our meeting to discuss the proposal, I met with Rob Roy McGregor (M.S. in Economics Program Director), Peter Schwarz (Economics faculty with teaching research interests in environmental economics), and Alice Tseng (who guest lectured in the first iteration of this course taught in Fall 2012) to discuss the proposal. My consultation letter builds upon all of those discussions.

This is a very interesting interdisciplinary course with both economic and non-economic content. In our meeting, we discussed the mix of content in the course. While the mix might differ from the approach that an economist might take in teaching the course, my sense is that the course content is substantive and will fit well with the needs of interested students in the INES program. In particular, I think that the title is reflective of what the course intends – to give students tools to allow them to be able to assess the impact of environmental processes and regulations and ecosystem services.

In sum, the Department of Economics is very supportive of this course. Please let me know if I can be of further assistance.