

July 2008

## **ENERGY & ENVIRONMENT PROGRAM** (Master's of Environmental Management)

The Energy & Environment program is designed to train students who wish to help lead the transition to a sustainable energy future. Climatic, economic and geopolitical factors are some of the many challenges and opportunities arising from the dynamic intersection between energy and the environment. Recognizing and acting on these issues will require innovative thinkers and leaders who understand the energy system and the important interconnections between policy, markets, technology and the environment.

The Energy and Environment program aims to provide students with the skills and knowledge necessary to effectively address energy and environmental challenges. Over the course of the program, students will gain:

- A broad perspective on the current energy system and future alternatives.
- A fundamental understanding of science & technology as it relates to energy and environment.
- Background in the economics, policy and business of energy.
- First-hand exposure to the energy sector and energy leaders.
- Critical skills in data analysis and modeling.
- Experience with communication, facilitation, project management and teamwork.

Students pursuing this course of study will be well prepared for positions focused on transitioning from conventional to sustainable energy. Potential roles include helping government and advocacy groups to design and implement new policies, working with regulatory and research groups to assess policy compliance and effectiveness, and enabling private-sector firms to think strategically about trends in science and policy.

Energy use is one of the most complex and multi-faceted problems influencing the future of the environment. Students wishing to complete the Energy & Environment track will need to complete multi-disciplinary coursework that addresses the diverse aspects of energy. The track is organized along four broad themes: (1) Science & Technology, (2) Markets & Policy, (3) Tools and (4) Energy Electives.

Joint degrees are available to students interested in combining their energy expertise with a deeper background in business (Fuqua School of Business), engineering (Pratt School of Engineering), law (Duke Law School), and public policy (Sanford Institute).

### **PREREQUISITES**

Prerequisites for admission to the school are (1) some previous training in the natural sciences or the social sciences related to the student's area of interest in natural resources; (2) at least one semester of college calculus; (3) a college statistics course that includes descriptive statistics, probability distributions, hypothesis testing, confidence intervals, correlation, and simple linear regression. The Energy & Environment track also requires introductory microeconomics (which can be met by introductory economics that is mainly micro rather than macro). Deficiencies must be made up prior to matriculation or during the first year of residence; these courses do not count toward degree requirements.

## **CREDIT REQUIREMENTS**

Students must complete at least 48 units of credit. These units are distributed among the following:

- Core Course (3 credits)
- Science & Technology (6 credits)
- Markets & Policy (5-6 credits)
- Tools (9 credits)
- Energy Electives (6 credits)
- Free Electives (11-14 credits)
- Master's seminar and project (5-7 credits)

Note that although a course may qualify for more than one category, it can only be counted once toward a program requirement. Students should work closely with their advisor to ensure that all requirements are met and that elective courses are appropriate to the program.

### **CORE COURSE (3 credits)**

The purpose of the core course is to provide an introduction and broad overview of energy and environmental issues, and forms the foundation for further energy courses. As a result, students should make every effort to take Energy and the Environment during their first semester.

All students are required to take the following course:

ENVIRON 211                      Energy and the Environment (3 credits, fall)

### **SCIENCE & TECHNOLOGY (6 credits)**

These courses provide students with the foundation of energy technologies and their environmental impacts. Courses describe how energy is converted into useful services like heat and power and assess the impact of energy-related activities on ecosystems, air quality, and global change.

All students are required to take the following course:

ENVIRON 298.23                      Energy Technology & Its Impact on the Environment (3 credits, spring)

Students are required to take at least one of the following courses:

EOS 211                      The Climate System (3 credits, fall)  
EOS 212                      Climate Change (3 credits)  
ENVIRON 235                      Air Quality Management (3 credits, fall)  
ENVIRON 236                      Water Quality Management (3 credits, fall)  
EOS 251S                      Global Environmental Change (3 credits, spring)  
EOS 272                      Biogeochemistry (3 credits, fall)  
BIO 217                      Ecology and Global Change (3 credits, spring)

Other courses that look at the impact of energy-related activities on ecosystems, air quality, and global change may also qualify for this category

### **MARKETS & POLICY (5-6 credits)**

The physical processes and environmental impacts of the energy system occur within a market and policy context, and the following courses seek to teach students about how individuals and organizations can act within that context to manage and/or change the energy system.

All students are required to take the following course:

ENVIRON 298.80                      Energy Economics & Policy (3 credits, fall)

In addition, students are required to take at least one of the following courses:

ENVIRON 252                      Sustainability and Renewable Resource Economics (3 credits, spring)  
ENVIRON 274                      Environmental Politics (3 credits, spring)  
ENVIRON 285                      Land Use Principles and Policies (3 credits, fall)  
ENVIRON 298.83                      Climate Change Economics & Policy (3 credits, spring)  
ENVIRON 326                      Global Environmental Politics (3 units, fall)  
ENVIRON 331                      Business Strategy for Environmental Sustainability (3 credits, spring)  
ENVIRON 355                      International Environmental Law (3 credits, spring)  
EGRMGMT 274                      Commercializing Tech Innov (3 units, fall)  
LAW 235                              Environmental Law (3 credits, spring)  
LAW 516A and 516B                      Climate Change and the Law (3 credits, spring)  
PUBPOL 388.08                      International Energy Systems & Sustainable Devel. (3 credits, spring)  
MARKETNG 463                      Marketing High Technology (3 Credits, fall)  
Other courses that address legal, political or economic subjects may also qualify for this category.

### **TOOLS (9 credits)**

In addition to a broad understanding of science, technology, markets and policy, students will need specific tools in modeling and analysis to effectively address energy-related challenges.

All students are required to take the following two courses:

ENVIRON 210                      Applied Data Analysis for Environmental Science (3 credits, fall)  
ENVIRON 298.29                      Energy Modeling (3 credits, spring)

In addition, students are required to take at least one of the following courses:

ENVIRON 259.001                      Fundamentals of Geospatial Analysis (3 credits, fall)  
ENVIRON 271                      Economic Analysis of Environmental Policies (3 credits, fall)  
ENVIRON 272                      Evaluation of Public Expenditures (3 credits, fall)  
ENVIRON 280                      Social Science Surveys for Environmental Mgmt (3 credits, spring)  
ENVIRON 350                      Program Evaluation of Environmental Policies (3 credits, spring)  
ENVIRON 352                      Spatial Analysis in Ecology (3 units, fall)  
ENVIRON 374                      Business Principles (3 credits, spring)  
ENVIRON 385                      Environmental Decision Analysis (3 credits, spring)  
EOS 240                              Intro to Computer Modeling in the Earth Sciences (3 credits, fall)  
DECISION 411                      Forecasting (3 units, fall)  
EGRMGMT 260                      Project Management (3 units, fall)  
EGRMGMT 232                      Adv Corp Finance Tech (3 units, spring)  
PUBPOL 311                      Microeconomics: Policy Appl (3 units, spring)  
PUBPOL 313                      Quantitative Evaluation Methods (3 units, spring)  
Other courses may also qualify for this category.

### **ENERGY ELECTIVES (6 credits)**

Energy electives allow students to apply the various perspectives and tools they have learned to address a cross-cutting problem or issue. Many of the 1 credit courses listed are taught by visiting faculty or energy practitioners; **offerings will change regularly, depending on instructor availability and student interest.** Students may count up to 3 1-credit courses towards the energy elective requirement.

A total of 6 credits of energy electives are required from the following:

ENVIRON 298.19	Hydrocarbons: Houston Field Trip (1 credit, fall)
ENVIRON 298.20	Transportation and Energy (3 credits, fall)
ENVIRON 298.22	Understanding Energy Models and Modeling (1 credit, spring)
ENVIRON 298.76	World Trade in Energy (3 credits, spring)
ENVIRON 299	Independent studies on energy topics may count as energy electives
ENVIRON 301.02	Bringing Renewables to Market (1 credit, fall)

### **FREE ELECTIVES (11-14 credits)**

Students may satisfy the balance of their credits by taking any courses that satisfy the guidelines set by the Nicholas School.

### **MASTER'S SEMINAR and PROJECT (5-7 credits)**

Students register for ENV 398.09S, the Energy & Environment masters project seminar, each semester and receive one credit total for all semesters enrolled. Students also register for ENV 399, Master's Project, during the last semesters of study when work is done on the master's project. A master's project for 4 to 6 units of credit is required. Students should identify project topics in the second semester of the first year. Final proposals (approved and signed by the advisor) are due early in the first semester of the second year of enrollment. Both the proposal and final report must be well written; most require several major revisions to reach acceptable standards. Guidelines for completion of the proposal and final project can be found on the Nicholas School's web site.

### **JOINT DEGREE STUDENTS**

Students pursuing a joint degree are required to complete a minimum of 36 hours towards the MEM. Joint degree students usually meet this requirement by avoiding the free electives in their MEM program. Depending on the nature of the other degree program, the faculty advisor may modify the Energy & Environment program requirements that are duplicated by the joint degree.

### **PARTICIPATING FACULTY MEMBERS**

Faculty members serving as advisors in the Energy and Environmental program are listed below. Please consult the Nicholas School home page for a description of their research interests.

Lincoln Pratson (Chair)	206 Old Chemistry
Richard Newell	106 Old Chemistry
Dalia Patino-Echeverri	A150 LSRC
Paul Baker	301 Old Chemistry
Peter Haff	203 Old Chemistry
Martin Smith	A122 LSRC
Erika Weinthal	A135 LSRC