

## ERE Professional Master's of Science Program Curriculum

Students in the Environmental Resources Engineering Professional Master's of Science (PERE-MS) will be required to complete a minimum of 30 units of coursework for the M.S. degree. The coursework for the students is divided into core program requirements, engineering design courses in an area of specialization, and elective courses. Table 1 provides an example schedule for a renewable energy focused PERE-MS student. Table 2 provides an example schedule for a water resources/water quality focused PERE-MS student. A strong focus on client-based service learning which combines experiential education with complementary direct instruction is a key innovative aspect of the curriculum. The program also includes an emphasis on the development of professional tools that are often neglected in graduate engineering education, including economics, policy, communication, and professional/ research ethics.

**Core Requirements:** Core program requirements include a graduate colloquium, a resource economics course, and a policy course with an energy or water focus.

*Colloquium (1 unit):* The colloquium will emphasize the development of communication skills for academic and professional work, including proposal writing, oral presentations, and poster presentations. Curriculum will include direct instruction for conducting ethical research.

*Economics and Policy Courses (8 units):* The economics and policy course requirements are designed to provide students with foundational tools for the analysis of energy and water related resource issues. They are also intended to provide students with knowledge about the broader policy context for their respective professional fields.

*Summer Internship:* Professional partners and PERE-MS students will be paired based on interest and ability. The internship is expected to be the focus of the PERE-MS master's project. Students will begin preparation for their internship in the second semester and then finish their project in the third semester, with support from courses described below. We anticipate students will receive compensation for the summer internship in most cases.

*Professional Preparation & Master's Project (4 units):* Two new courses will be developed for the PERE-MS program to leverage the maximum benefit from the students' summer internship with a professional partner. The first course will occur before the internship and provide direct instruction on professional skills such as professional ethics, client interactions and literature review methods. Professional partners will provide guest lectures and will assist in the development of the new curriculum. After the summer internship, the second course will provide writing and technical guidance for completing the Master's project.

**Engineering Design Course Requirements (9 units):** Students will be required to complete at least three **graduate level engineering design courses** (see Table 3). These courses are intended to allow students to develop engineering design skills in an area of specialization (renewable energy systems, water resources, water quality, and energy conservation).

**Elective Courses (9 units):** Students must choose three upper division or graduate level elective courses in consultation with their academic adviser. The courses should be in engineering or natural science disciplines. In general, these courses will be used to complement the engineering design coursework in each student's area of specialization.

**Table 1. Example PERE-MS Program 3 Semester Course Schedule for a Student Interested in Energy**

	<b>Units</b>
<b>Semester 1</b>	
Graduate Colloquium (SCI 698)	1
Policy Course #1 (ENGR 532: Energy, Environment, and Society)	4
Engineering Design Course #1 (ENGR 577 – Solar Thermal Engineering)	3
Elective Course #1 (WSHD 458: Climate Change & Land Use)	3
<b>Semester 1 Total Units</b>	<b>11</b>
<b>Semester 2</b>	
Policy Course #2 (ENGR 535 Development Technology)	4
Engineering Design Course #2 (ENGR 571: Thermodynamics and Energy Systems II)	3
Professional Development in Engineering (ENGR 700)	1
Elective Course #2 (PHYX 316: Electronic Instrumentation)	4
<b>Semester 2 Total Units</b>	<b>12</b>
<b>Summer</b>	
Internship Work Experience	
<b>Semester 3</b>	
Econ Course (ECON 550: Energy and Climate Economics)	4
Engineering Design Course #3 (ENGR 575: Renewable Energy Power Systems)	3
Elective Course #3 (ENGR 421: Computational Methods for ERE IV)	3
Professional Development in Engineering (ENGR 700)	3
<b>Semester 3 Total Units</b>	<b>13</b>
<b>Program Total Units</b>	<b>36</b>

**Table 2. Example PERE-MS Program 3 Semester Course Schedule for a Student Interested in Water Resources/Water Quality**

	<b>Units</b>
<b>Semester 1</b>	
Graduate Colloquium (SCI 698)	1
Econ Course (ECON 423/423D: Natural Resource Economics)	4
Engineering Design Course #1 (ENGR 545: Water Resources Planning & Management)	3
Elective Course #1 (WSHD 458: Climate Change & Land Use)	3
<b>Semester 1 Total Units</b>	<b>11</b>
<b>Semester 2</b>	
Policy Course (ENGR 535: Development Technology)	4
Engineering Design Course #2 (ENGR 551: Water and Wastewater Design)	3
Professional Development in Engineering (ENGR 700)	1
Elective Course #2 (ENGR 548: River Hydraulics)	3
<b>Semester 2 Total Units</b>	<b>11</b>
<b>Summer</b>	
Internship Work Experience	
<b>Semester 3</b>	
Engineering Design Course #3 (ENGR 555: Engineered Natural Treatment Systems)	3
Elective Course #3 (CHEM 328: Brief Organic Chemistry)	4
Professional Development in Engineering (ENGR 700)	3
<b>Semester 3 Total Units</b>	<b>10</b>
<b>Program Total Units</b>	<b>32</b>

**Table 3. List of Approved Graduate Level Engineering Courses\***

Engr 501 – Environmental Systems Analysis I	Engr 548 – River Hydraulics
Engr 518 – Applied Hydraulics	Engr 551 – Water and Wastewater Design
Engr 521 – Advanced Numerical Methods for Engineers	Engr 555 – Engineered Natural Treatment Systems
Engr 531 – Air Quality Management	Engr 571 – Advanced Thermodynamics and Energy Systems
Engr 541 – Hydrology II	Engr 573 – Building Energy Analysis
Engr 543 – Groundwater Systems	Engr 575 – Renewable Energy Power Systems
Engr 545 – Water Resources Planning and Management	Engr 577 – Solar Thermal Engineering

\*Most of these courses are cross listed with the BS senior engineering design electives to ensure sufficient student enrollments. Graduate students enroll in a 500-level course and undergraduates enroll in a 400-level course. Additional course assignments and a higher performance level are required for graduate enrollees.

\*ECON 550: Economics of Energy and Climate Policy is offered every other fall (next offering Fall 2012)

\*Students taking ECON 423 should also take ECON 423 D