Date: December 9, 2011
Department: Environmental Resources Engineering (ERE)
Curriculum Title: M.P.S., M.S., and Ph.D. Environmental Resources Engineering Programs

☐ New curriculum and/or degree program OR ☑ Changes in existing curriculum(check all that apply):

☐ new program title ☐ new courses added ☐ new accreditation
☐ revised courses ☐ change in total cr. hrs. ☐ new assessment plan
☐ new course sequence ☐ new program objectives ☑ other significant change

Justification Narrative: please provide an explanatory narrative outlining the need or rationale for the new curriculum or program, or justifying the need to significantly change an existing curriculum (i.e. addressing emerging or changing societal demand, addressing changing technology, focusing on a new interdisciplinary body of knowledge, etc.)

1. The New York State Education Department has recently disaggregated SUNY ESF M.S., M.P.S., and Ph.D. Environmental and Resources Engineering Programs and approved the Environmental Resources Engineering (ERE) Graduate Programs. The Education Department's approval letter dated September 12, 2011 noted that graduates of the new M.S. and M.P.S. ERE Programs are eligible to receive one year of education/experience credit toward the 12 credits required for professional engineer licensure.

The State Education Department administers professional regulation through its Office of the Professions. To align with the State Education Department's professional regulation on awarding one year of education/experience credit for P.E. licensure, we are proposing to change from 12 credit hours of graduate coursework that must be completed in engineering courses to 15 credit hours of graduate coursework that must be completed in engineering and applied science courses. This modification will strengthen ERE graduate recruitment because graduation from the ERE M.S. and M.P.S. Programs, and likely Ph.D. Program, carries one year of education/experience credit toward the 12 credits required for P.E. licensure.

2. The expectations for admission to the ERE graduate programs include specific prerequisite and co-requisite courses in addition to "the general course expectations for the Division of Engineering". However, the descriptions on "the general course expectations for the Division of Engineering" have been removed from the current ESF Catalog. We are proposing to delete "the general course expectations for the Division of Engineering" from the prerequisite and co-requisite courses for admission to the ERE graduate programs and directly describe the expectations under each area of graduate study.

Institutional Impact:

Anticipated Enrollment: 25 per semester
Change from existing condition: 1) Change from minimum 12 credit hours of engineering courses to 15 credit hours of engineering and applied science courses.
2) Modify the Catalog descriptions about prerequisite
New Faculty or Staffing Requirements: None

New Technology and Classroom Resource Demands: None

New Computing Resources Requirements: None

New Accreditation Requirements: None

New Assessment Requirements (explain & describe): None

New Library Resources Requirements: None

New Transportation Requirements: None

New Forest Properties or Field Practicum Facilities Required: None

Impacts on other Departments at ESF (please obtain and attach response from affected departments): None

Impacts on Admissions (particularly transfer requirements and articulation agreements; please obtain and attach response from Admissions if an impact is anticipated) None

List courses taught outside the Department at ESF: None required

List courses taught outside the Department at SU: None required
  • Accessory Instruction credit hours at SU required per student in this curriculum: None
  • Accessory Instruction credit hours required per semester by this curriculum None
  • Change in Accessory Instruction needs over current programs and curricula None

Catalog Curriculum Narrative:
Please provide a narrative description of the program, the broad program objectives and learning outcomes, and a curriculum course outline using the precise format proposed for current use in the ESF catalog (if revising an existing program or curriculum proposal, please attach a copy of the original MS Word file with revisions shown in “track changes”):

Catalog revisions are attached at the end of this proposal

**Curriculum Transition Plan:**

Please provide a narrative description of your plan for transitioning from your existing curriculum to the proposed new curriculum. Please provide specific dates for implementing curriculum changes, overlap periods where old and new curricula may exist simultaneously, and final phase out of old curricula. Please also include impacts and mitigating considerations for students in mid-program during implementation, impacts of changes in semester delivery of existing courses, addition of new courses within a particular semester, etc.

These changes will be implemented for M.P.S., M.S., and Ph.D. students starting from the fall 2012 semester. Current students will not be affected. We will publish this curriculum change in the AY2012-2013 Catalog.

**ESF Catalog 2011/2012 pages 104-106:**

**Graduate Programs**

Graduate studies and research are primarily concerned with environmental and resource-related problems.

Students with a bachelor of science degree in engineering or in environmental sciences, physics, or mathematics have the opportunity to design an individual program of graduate study.

**Facilities**

The teaching and research facilities in Baker Laboratory were renovated in 2008 and support graduate study and research with modern laboratories and instrumentation. We have dedicated laboratories for ecological engineering, geospatial engineering, and water resources engineering research and instruction, supported by campus staff; wood and machine shops, and analytical and technical services. Research and analysis is facilitated by a powerful range of computing platforms and software. Off-campus facilities include the extensive ESF properties, and numerous field sites supported by an array of field equipment for environmental resource engineering measurements.

The ERE program in environmental and resources engineering offers options in:

**Ecological Engineering (M.S., Ph.D.)**

Participating Faculty: DALEY, DIEMONT, ENDRENY, KROLL, SHAW, TAO
Ecological Engineering is the design of ecosystems for the mutual benefit of humans and the environment. Ideal design considers humans to be part of nature rather than apart from nature. At SUNY–ESF we believe that ecological engineering education and research should meet local to global needs. We teach and research sustainable solutions and approach ecological engineering broadly, working in many areas of the world and in most major areas of ecological engineering. Graduates from the ecological engineering option commonly find employment or continue their advanced graduate education in any of the following areas of practice:

- Ecosystem restoration, including watershed, river, forest and wetland restoration
- Design of sustainable systems for wastewater treatment and stormwater management
- Environmental remediation
- Urban ecosystem design and development
- Industrial ecology, life cycle analysis and sustainability analysis

Ecological Engineering emphasizes engineering design of ecosystems consistent with ecological principles of natural, self-organizing, self-maintaining systems. This interdisciplinary field incorporates knowledge in engineering, ecology and social sciences to produce energy- and information-efficient solutions to environmental problems. Public policy, ethics and values are considered in the decision-making process. Students select between alternative solutions to ecological resource problems, in recognition of environmental, economic, legal, social and managerial constraints.

Program prerequisite or co-requisite courses include at least one semester of study in thermodynamics, fluid mechanics, or statics; probability and statistics; ecology; and hydrology. Applicants are required to have a bachelor's degree in science or engineering with one year of study in calculus and one semester of study in computing methods, chemistry, and biology. These are in addition to general course expectations for the Division of Engineering.

Program mastery courses include at least one course (3+ credit hours per course) in each of the 4 areas of competence listed below (illustrative courses are listed in parenthesis).

- Ecosystem Restoration (e.g., Ecosystem Restoration Design, Sustainability Analysis, River Form and Process, Ecological Engineering in the Tropics)
- Pollutant Treatment (e.g., Methods in Ecological Treatment, Ecological Engineering for Waste Management, Stormwater Management)
Modeling (e.g., Hydrologic Modeling, Systems Engineering, Engineering Hydrology & Hydraulics)

Ecosystem Sciences (e.g., Microbial Ecology, Ecosystems, Systems Ecology, Tropical Ecology, Ecological Biogeochemistry, Plant Ecology and Global Change, Aquatic Ecosystem Restoration, Limnology, Environmental Chemistry)

At least 12-15 credit hours of graduate coursework must be completed in engineering and applied science courses. Research credits complete the degree requirements.

**Environmental Management (M.P.S.)**

Participating Faculty: DALEY, ENDRENY, IM, KROLL, QUACKENBUSH, SHAW

- Brownfield development
- Hazardous waste management
- Solid waste management
- Energy resources management
- Water resource management

Environmental Management combines environmental engineering with business management and environmental law or policy to provide breadth and perspective for the student aspiring to managerial responsibility in public or private employment. Student coursework is designed to enhance technical and problem-solving skills.

Program prerequisite or co-requisite courses include at least six 3-credit undergraduate courses from at least three of the following fields: chemistry, physics, geographic measurements, calculus, statistics, engineering mechanics, ecology, computer science, and economics.

Program mastery courses include at least 12-15 credit hours of graduate coursework completed in engineering and applied science courses; 3–6 credit hours in natural sciences; and 3-6 hours in resource management. A comprehensive project or practicum completes the M.P.S. degree requirements. Study programs are flexible and are tailored to the interests and strengths of individuals.

**Geospatial Information Science and Engineering (M.S., Ph.D.)**

Participating Faculty: IM, MOUNTRAKIS, QUACKENBUSH

- Remote sensing and digital image/video analysis
- Spatial and spatiotemporal databases
- Artificial intelligence/machine learning in spatial analysis and modeling
- Environmental resources monitoring, modeling and assessment

Geospatial Information Science and Engineering is designed for specialized research in spatial information acquisition, analysis, modeling and applications. This includes theoretical and applied study in sensing systems and the location, measurement, analysis and description of ground features and earth resources. It also includes use of geographic information systems (GIS) to incorporate spatial data into a wide range of environmental and engineering problems.

Program prerequisite or co-requisite courses include at least one year of physics and calculus, one course in statistics, and one engineering science course in surveying, numerical methods, or computer science. These are in addition to general course expectations for the Division of Engineering.

Program mastery courses include at least one course (3+ credit hours) in each of the four Geospatial Information Science and Engineering areas (illustrative courses are listed in parenthesis):

- Remote sensing (e.g., Principles of Remote Sensing, Remote Sensing of the Environment)
- Geographic information systems (e.g., Introduction to Spatial Information, GIS for Engineers, GIS-Based Modeling, Introduction to Global Positioning Systems,
- Spatial analysis and programming (e.g., Spatial Analysis, Digital Image Analysis, Numerical and Computing Methods, Systems Engineering, Design and Analysis of Algorithm, Introduction to Artificial Neural Networks, Introduction to Database Management Systems, Data Mining, Artificial Intelligence)
- Statistics (e.g., Statistical Analysis, Multivariate Statistical Methods, Nonparametric Statistics, Analysis of Variance, Regression Analysis, Map Accuracy Assessment, Sampling Methods)

Ph.D. students will take an additional course in at least two of these areas (6+ credit hours total). These areas of competence form the basis for your graduate coursework and are supplemented by studies in systems analysis, environmental sciences and management, and geography. Departmental and other seminars are also required. Of the total graduate coursework, at least 12-15 credit hours must be completed in engineering and applied science courses. Research credits complete the degree requirements.

**Mapping Sciences (M.P.S.)**

Participating Faculty: IM, MOUNTRAKIS, QUACKENBUSH

- Geographic information systems (GIS)
Mapping Sciences covers the development and practice of mapping technologies for environmental and engineering applications. Technologies used include GIS and GPS, as well as remote sensing and image processing tools.

Program prerequisite or co-requisite courses include at least one year of both physics and calculus, one course in statistics, and one course in either surveying or computer science. Students admitted without necessary background would be required to take additional prerequisite courses.

Program mastery courses are taken so students upon completion demonstrate competency in spatial data acquisition and fundamental spatial analysis concepts. This is typically achieved through completion of fundamental courses in remote sensing, geographic information systems, spatial analysis, and statistics. Students may specialize by taking advanced courses in the mapping sciences, statistics, computing, environmental sciences and management, or other fields.

A comprehensive project or practicum completes the M.P.S. degree requirements. Study programs are flexible and are tailored to the interests and strengths of individuals.

**Water Resources Engineering (M.S., Ph.D.)**

Participating Faculty: DALEY, ENDRENY, KROLL, SHAW

- Watershed hydrology monitoring, modeling, management
- Hydrologic and hydraulic experimentation and analysis
- Water resource systems engineering
- Stochastic and deterministic modeling
- Pollutant fate and transport
- River and watershed restoration

Water Resources Engineering deals with analysis and design of water resource systems through field, laboratory, and computer methods. Emphasis is placed on coordinating engineering to reduce impacts on human and natural systems. Students select among alternative solutions to water resource problems, in recognition of environmental, economic, legal, social and managerial constraints. Laboratory equipment includes soil columns, a river table and two tilting and sediment circulating flumes, all supported by
monitoring sensors. Analytical techniques using statistics, numerical analyses, and computer applications are emphasized. Modeling efforts include computational fluid dynamics, GIS, and remote sensing applications, distributed and real-time models, and model calibration and validation.

Program prerequisite or co-requisite courses include probability and statistics, fluid mechanics, and engineering hydrology. Applicants are required to have a bachelor’s degree in science or engineering with one year of study in calculus and one semester of study in computing methods. These are in addition to general course expectations for the Division of Engineering.

Program mastery courses include at least one course (3+ credit hours) in each of the four areas of competence listed below (illustrative courses are listed in parenthesis). These areas of competence form the basis for your graduate coursework. Departmental and other seminars are also required.

- Environmental Hydraulics (e.g., Engineering Hydrology and Hydraulics, Open Channel Hydraulics, Transport Processes, Environmental Sediment Transport)
- Water Resources Modeling (e.g., Hydrologic Modeling, Systems Engineering, Groundwater Modeling)
- Hydrologic Zones and Fluxes (e.g., River Form and Process, HydroMeteorology, Vadose Zone Physics, Limnology, Hydrogeology)
- Water Quality (e.g., Water Pollution Engineering, Ecological Biogeochemistry, Environmental Chemistry; Environmental Aqueous Geochemistry,)

At least 12–15 credit hours of graduate coursework must be completed in engineering and applied science courses. Research credits complete the degree requirements.