

## **Bloomington - Joint Masters Program**

### **MS in Physics and MS in Environmental Science**

**April 2010**

This combined master's program is a 50-credit hour (two-year) program that gives the student more depth and breadth than is possible in a single degree. The student must complete a minimum of 18 credit hours in each of the two degree programs. M.S. in Physics and M.S.E.S. degrees are awarded concurrently after the student has completed the requirements for both degrees.

#### **Application and Admission**

The student must apply to and be accepted by both the Department of Physics and the Master of Science in Environmental Science program in the School of Public and Environmental Affairs.

#### **Program Requirements**

(50 credit hours)

The combined M.S.in Physics–M.S.E.S. program requires a minimum of 50 credit hours distributed among six components:

- physics core,
- environmental science core,
- business, economics, policy, and law competencies,
- tool skills,
- energy concentration,
- and professional experience.

#### **Physics Core**

**Required Courses** (12 credit hours)

Select four courses from the following list:

- PHYS-P 510 Environmental Physics (3 cr.)
- PHYS-P 540 Digital Electronics (3 cr.)
- PHYS-P 541 Analog Electronics (3 cr.)
- PHYS-P 543 Mathematical Methods for Biophysics (3 cr.)
- PHYS-P 556 Statistical Physics (3 cr.)
- PHYS-P 575 Introductory Biophysics (3 cr.)
- PHYS-P 583 Signal Processing and Information Theory (3 cr.)

#### **Environmental Science Core**

**Required Courses** (12 credit hours)

Select four courses from the following list:

- SPEA-E 515 Fundamentals of Air Pollution (3 cr.)
- SPEA-E 526 Applied Mathematics for Environmental Science (3 cr.)
- SPEA-E 527 Applied Ecology (3 cr.)
- SPEA-E 536 Environmental Chemistry (3 cr.)
- SPEA-E 538 Statistics for Environmental Science (3 cr.)
- SPEA-E 539 Aquatic Chemistry (3 cr.)
- SPEA-E 552 Environmental Engineering (3 cr.)
- SPEA-E 570 Soil Science (3 cr.)

## **Business, Economics, Policy, and Law Competencies**

(Typically 6–9 credit hours)

Each student should demonstrate a competency in these areas of environmental management. The selection of courses will vary according to the student's professional objectives. Courses should be selected in consultation with faculty advisors from both programs.

BUS courses to be determined

SPEA-E 535 International Environmental Policy (3 cr.)

SPEA-E 543 Environmental Management (3 cr.)

SPEA-V 517 Public Management Economics (3 cr.)

SPEA-V 596 Sustainable Development (3 cr.)

SPEA-V 625 Environmental Economics and Policy (3 cr.) (P: V517)

SPEA-V 643 Environmental Resource Management and Policy (3 cr.) (P: V517)

SPEA-V 645 Environmental Law (3 cr.)

SPEA-V 674 Energy Economics and Policy

## **Tool Skill Courses**

(Typically 3–6 credit hours)

Students are encouraged to acquire competency in analytical methods by focusing on tool skills appropriate to their professional objectives. Courses should be selected in consultation with faculty advisors from both programs

SPEA-E 512 Risk Communication (3 cr.)

SPEA-E 518 Vector-based Geographic Information Systems (3 cr.)

SPEA-E 519 Applied Remote Sensing of the Environment (3 cr.)

SPEA-E 529 Applications of Geographic Information Systems (3 cr.)

SPEA-E 560 Environmental Risk Analysis (3 cr.)

SPEA-V 506 Statistical Analysis for Effective Decision Making (3 cr.)

SPEA-V 507 Data Analysis and Modeling for Public Affairs (3 cr.)

SPEA-V 539 Management Science for Public Affairs (3 cr.)

SPEA-V 541 Benefit-Cost Analysis of Public Environmental Policies (3 cr.)

SPEA-V 547 Negotiation and Alternative Dispute Resolution (3 cr.)

SPEA-V 562 Public Program Evaluation (3 cr.)

PHYS-P 540 Digital Electronics (3 cr.)

PHYS-P 541 Analog Electronics (3 cr.)

PHYS-P 543 Mathematical Methods for Biophysics (3 cr.)

PHYS-P 583 Signal Processing and Information Theory (3 cr.)

## **Energy Concentration**

**Required Courses** (Typically 15 to 18 credit hours)

This concentration addresses various aspects of energy production, storage, distribution, and use. Emphasis will be on the environmental impacts of energy use, both local and global, and on the economic and policy issues associated with our energy needs. This concentration is based on course offerings in SPEA, Physics, and other departments in COAS. At least two courses should be selected from the Physics department and at least two courses should be selected from SPEA. Courses should be selected in consultation with faculty advisors from both programs.

SPEA-E 515 Fundamentals of Air Pollution (3 cr.)

SPEA-E 520 Environmental Toxicology (3 cr.)

SPEA-E 542 Hazardous Materials (3 cr.)

SPEA-E 560 Environmental Risk Analysis (3 cr.)  
SPEA-E 562 Solid and Hazardous Waste Management (3 cr.)  
SPEA-E 574 Energy Resources, Teaching and Analysis  
PHYS-P 510 Environmental Physics (3 cr.)  
PHYS-P 537 Neutron Physics and Scattering (3 cr.)  
PHYS-P 557 Solid State Physics (3 cr.)  
PHYS-P 581 Modeling and Computation in Biophysics (3 cr.)  
PHYS-P 609 Computational Physics (3 cr.)  
PHYS-P 615 Condensed Matter Physics I (3 cr.)  
PHYS-P 616 Condensed Matter Physics II (3 cr.)  
GEOG-G 542 Sustainable Energy Systems (3 cr.)  
GEOG-G 532 Physical Meteorology/Climatology (3 cr.)

### **Capstone and Seminar Courses**

(5 credit hours)

Each candidate for the M.S. in Physics - M.S.E.S. Joint degree program should take a 3-credit hour course during which they participate in a team to carry out an integrative project that addresses a multidisciplinary problem. Capstone course credit may be double-counted in either Concentration or Tool Skill requirements. This requirement may be met in one of the following ways:

1. SPEA-V 600 Capstone in Public and Environmental Affairs, sections with an environmental or energy focus.
2. An alternative course with a similar structure, such as SPEA-E 560 Environmental Risk Analysis or other approved course.

Each candidate for the M.S. in Physics – M.S.E.S Joint degree program must enroll in E680 Seminar in Environmental Science and P508 Current Research in Physics for a total of two (2) credit hours. Seminar course credit may be double counted for the concentration requirements.

### **Experiential Requirement**

(0–6 credit hours)

Each candidate for the M.S. in Physics - M.S.E.S. Joint degree must obtain professionally relevant experience through one of the following options:

1. Approved Internship (0–6 credit hours) The student will work with the SPEA Office of Career Services to arrange for a suitable internship. Internships vary greatly according to the expectations and requirements of the sponsor. Students are expected to give careful attention in the selection of an internship suitable to their professional goals.
2. Prior Professional Experience (0–6 credit hours) Students who have had significant environmental management, technical or administrative work experience in the past may receive 6 credit hours. To receive 3 credit hours, a student must have a minimum of one year's technical or administrative work experience. To receive 4–6 credit hours, the student should have two or more years of experience in environmental science or environmental management.

Determination of professional credit is made separately from decisions about transfer of credit. Under no circumstances will prior professional experience credit and transfer credit total more than 21 hours. Students receiving prior professional experience credit should carefully plan the balance of their program with their faculty advisors.