Science of Natural and Environmental Systems (SNES)  
Requirements for the Major  
http://snes.eas.cornell.edu  
Last updated: 08/17/12

Note: Please be aware that many upper level courses have pre-requisites and some courses are only offered alternate years. Courses designed for non-science majors will not fulfill a requirement. If you are not sure, please check with your advisor.

Foundation  The following courses are required.

Biology  - 2 Introductory Courses
Recommended: BIOG 1140, 1440, 1500, BIOEE 1780

Calculus  - 2 semesters Math 1110/1120, or 1910/1920 (Engineering)

Chemistry and Physics  - 4 semesters (at least 1 semester of each);
Some suggested course sequences
   Chemistry 1st semester: 1560/2070 or 2080 (as a prereq for CSS 3650), 2090
   Chemistry 2nd semester: 1570/2080 or 2150/2160
   Physics 1101/1102, 2207/2208 (prereq is Math 1106 or 1120),
   Physics (Engineering based): 1112, 2213/2214 (prereq is Math 1910)
   Physics 1116

Statistics  - 1 semester  AEM 2100 (S), ILRST 2100 (S), Math 1710 (F/S), NtRes 3130 (F), or PAM 2100 (F)

DEA 1501  - Introduction to Human-Environment Relationships
        (special discussion section for “Writing in the major”)    (Spring)

NTRES/SNES 1101 - Intro to the Science and Management of Environmental and Natural Resources
        (only required for Freshman only)    (Fall)

NTRES 2010  - Environmental Conservation

Environmental Core  The following courses are required.

Biotic Systems  BIOEE 1610 Ecology and the Environment   (Fall/Spring)
Capstone Course  ALS 4770 Environmental Stewardship (recommended SR year)   (Spring)
Colloquium Series  SNES 2000 Environmental Sciences Colloquium
        (required twice, recommended SO & SR years)   (Fall)
Earth Systems  CSS 3650 Environmental Chemistry: Soil, Air and Water   (Spring)
Economic Systems  AEM 2500 Environmental and Resource Economics   (Fall/Spring)
Social Systems  NtRes 2201 Society and Natural Resources   (Spring)
        OR  DSOC 3240 Environment, Society and Land   (Fall)

SNES Concentrations  Choose one of four concentrations (or design your own)

The concentration component of the SNES major is intended to allow students to develop depth of knowledge and expertise in areas that are of specific interest to the student. A minimum of five courses is required. There are some common and popular concentration themes; however, students can be creative both in terms of the concept for the theme and in the courses chosen to develop the concept. The theme is one place where courses used for a minor or second major can be included.

Students may pursue one of four Faculty-designed Concentrations:

Environmental Agriculture: Students obtain a solid background in agriculture, including the impact of agriculture (e.g., via biotechnology), and to introduce approaches to mitigate soil and water pollution and environmental degradation.

Environmental Biology: Greater depth in biology though basic biology courses (e.g., genetics, evolution), organismal-focused courses (e.g., insects, birds, microbes), and ecosystem-centered courses (e.g., forest, lakes, streams)

Environmental Economics: Students obtain a solid background in economic theory and learn how important static and dynamic allocation problems arise when managing resources and environmental quality.

Environmental Information Science: Students obtain a critical understanding of the collection and use of environmental information, as well as to support students in developing skills necessary to acquire, process, and analyze environmental information.
Or, students may pursue a Student-designed Concentration: If you are interested to design your own concentration, please contact Suzanne, sw38@cornell.edu for more information.

Some examples:

Environment and Public Policy:
In addition to courses in natural systems or in built environments, a student might study ethics, democracy, and social problems.

Environmental Communications:
Greater depth in communication with courses on concepts and techniques might be combined with specialized courses dealing with environmental issues and policies.

Oceanography/Marine Science:
Interest in the physical, biological, or public policy aspects of oceans could be pursued through a variety of specialized courses in the Shoals Program, Earth and Atmospheric Sciences, or the Hawaii course, among many choices.

Sustainability:
The program of study could take many directions from in-depth work on technologies (e.g., energy, transportation), economic and social systems, systems analysis, to global environmental change. Students with interest in the built environment might utilize courses in City and Regional Planning, Design and Environmental Analysis, and engineering disciplines.

Courses for Concentrations

I. Environmental Agriculture
Choose one course from each group with at least two courses containing experimental work (*).

Group 1: Systems Course
- ANSC/CSS 4120 Whole-Farm Nutrient Management (Spring)
- BIOEE/HORT 4730 Ecology of Agricultural Systems (Fall)
- CSS/IARD 4140 Tropical Cropping Systems: Biodiversity, Social, and Environmental Impacts (Fall)
- NTRES 4800 Global Seminar: Building Sustainable Environments and Secure Food Systems for a Modern World (Spring)

Group 2: Biotechnology
- BIOMI/CSS 3970 Environmental Microbiology (Spring)
- BIOPL 3430 Molecular Biology and Genetic Engineering of Plants (Spring)
- BIOPL/CSS 3470 Laboratory in Molecular Biology & Genetic Engineering of Plants (*) (Spring)
- CSS 4100 The GMO Debate: Environmental Impacts (Spring)
- PLBR 2010 Plants, Genes, and Global Food Production (Fall)

Group 3: Crop Protection and the Environment
- CSS 3150 Weed Biology and Management (*) (Fall)
- CSS/ENTOM 4440 Integrated Pest Management (*) (Spring)
- ENTOM 3070 Pesticides, the Environment and Human Health (Fall)
- ENTOM 2410 Applied Entomology in the Field (Fall)
- PLPA 3010 Biology and Management of Plant Diseases (Fall)

Group 4: Soil Management
- CSS 3210 Soil Management for Sustainability (Spring)
- CSS 4720 Nutrient Management in Agroecosystems (*) (Spring)
- CSS/HORT 4660 Soil Ecology (*) (Spring)
- CSS/EAS 4830 Environmental Biophysics (Fall)

Group 5: Crop and Animal Production
- ANSC 3510 Dairy Herd Management (Spring)
- CSS 4050 Field Crop Systems (Fall)
- HORT 4420 Berry Crops: Culture and Management (Fall)
- HORT 4450 Ecological Orchard Management (Spring)
- NTRES 3250 Forest Management and Maple Syrup Production (Spring)
  (or related course on production)
II. **Environmental Biology** *(Note: Curriculum changes will continue through 2012)*

*Choose six courses to complete the concentration.*

**Group 1: Foundations in Biology**  *Choose two courses.*

- Biochemistry BIOBM 3300 Principles of Biochemistry, Individual Instruction (Fall/Spring)
  - or BIOBM 3330 Principles of Biochemistry: Proteins, Metabolism, and Molecular Biology (Summer)
  - or the sequence BIOBM 3310/BIOBM 3320 Principles of Biochemistry: Proteins and Metabolism (Fall)

- Evolution BIOEE 1780 Evolutionary Biology (Fall/Spring)
  - or BIOPL 4480 Plant Evolution & the Fossil Record (Spring)

- Genetics BIOGD 2810 Genetics (Fall/Spring)
  - or ENTOM 4700 Ecological Genetics (Spring)
  - or NTRES 2830 Genetics for Population Biologists (Fall)

**Group 2: The Physical and Biological Environment**  *Choose two courses.*

- BEE 3710 Hydrology and the Environment (Spring)
- BIOEE 4570 Limnology: Ecology of Lakes (alternate years) (Spring)
- BIOEE 4620 Marine Ecology (alternate years) (Fall)
- BIOEE 4780 Ecosystem Biology (alternate years, next 2013) (Spring)
- CSS 4660 Soil Ecology (Spring)
- CSS/EAS 4830 Environmental Biophysics (4) (Fall)
- EAS/BIOEE 3500 Dynamics of Marine Ecosystems (Fall)
- NTRES 3220 Global Ecology and Management (Spring)
- NTRES/BIOEE 4560 Stream Ecology (alternate years) (Fall)

**Group 3: Plants, Animals, Microbes and the Environment**  *Choose two courses.*

- BIOEE 4660 Physiological Plant Ecology, Lectures (alternate years) (Spring)
- BIOEE 4700/4720 Herpetology Lectures/Laboratory (Spring)
- BIOEE 4750 Ornithology (Spring)
- BIOEE 4760 Biology of Fishes (Fall)
- BIOMI 2900 General Microbiology (Fall/Spring)
- BIOMI/CSS 3970 Environmental Microbiology (Spring)
- BIOMI 4180 Microbial Ecology (Spring)
- CSS 3150 Weed Biology and Management (Fall)
- ENTOM 2120 Insect Biology (Fall)
- ENTOM 3440 Insect Conservation Biology (Spring)
- ENTOM 3070 Pesticides, the Environment and Human Health (Fall)
- ENTOM/BIOEE 4550 Insect Ecology (Fall)
- HORT 4400 Restoration Ecology (Fall)
- NTRES 3110 Fish Ecology, Conservation and Management (Spring)
- NTRES 3140 Conservation of Birds (Summer)
- NTRES 4100 Conservation Biology (Fall)
- NTRES 4110 Quantitative Ecology and Management of Fisheries Resources (Spring)
- NTRES 4120 Wildlife Population Analysis (Spring)
- NTRES 4200 Forest Ecology (Fall)
- NTRES 4220 Wetland Ecology and Management (Fall)
- PLPA 3010 Biology and Management of Plant Diseases (Fall)
- PLPA 3090 Fungi (Fall)
- PLPA 4010 Microbial Pathogens vs Plants: Molecular Weapons, Defenses, and Rules of Engagement (Spring)
- PLPA 4020 Biology of Plant Pathogens (Spring)
- PLPA 4330 Disease Ecology (Fall)
III. Environmental Economics

**Required.**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>AEM 4500</td>
<td>Resource Economics</td>
<td>(Fall)</td>
</tr>
<tr>
<td>AEM 4510</td>
<td>Environmental Economics</td>
<td>(Spring)</td>
</tr>
<tr>
<td>ECON 1110</td>
<td>Introductory Microeconomics</td>
<td>(Fall, Spring, Winter &amp; Summer)</td>
</tr>
<tr>
<td>ECON 1120</td>
<td>Introductory Macroeconomics</td>
<td>(Fall, Spring, Winter &amp; Summer)</td>
</tr>
<tr>
<td>ECON 3130</td>
<td>Intermediate Microeconomic Theory</td>
<td>(Fall, Spring, &amp; Summer)</td>
</tr>
<tr>
<td>ECON 3140</td>
<td>Intermediate Macroeconomic Theory</td>
<td>(Fall, Spring, &amp; Summer)</td>
</tr>
</tbody>
</table>

**Choose one course.**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>AEM 4110</td>
<td>Introduction to Econometrics</td>
<td>(Fall)</td>
</tr>
<tr>
<td>AEM 4120</td>
<td>Computational Methods for Management and Economics</td>
<td>(Spring)</td>
</tr>
<tr>
<td>BEE 4750</td>
<td>Environmental Systems Analysis</td>
<td>(Fall)</td>
</tr>
<tr>
<td>CRP/NTRES 4440</td>
<td>Resource Management and Environmental Law</td>
<td>(Spring)</td>
</tr>
</tbody>
</table>

IV. Environmental Information Science

**Information Acquisition**

**Group 1: Remote Information Acquisition**  Choose one course.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSS/CEE 4110</td>
<td>Remote Sensing for Environmental Resource Inventory</td>
<td>(Fall)</td>
</tr>
<tr>
<td>CSS 6600/CEE 6100</td>
<td>Remote Sensing Fundamentals</td>
<td>(Fall)</td>
</tr>
</tbody>
</table>

**Group 2: Ground-based Information Acquisition**  Choose two courses.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>BEE 4270</td>
<td>Water Sampling and Measurement</td>
<td>(Fall)</td>
</tr>
<tr>
<td>BIOEE 2630</td>
<td>Field Ecology</td>
<td>(Fall)</td>
</tr>
<tr>
<td>BIOEE 4560</td>
<td>Stream Ecology (alternate years)</td>
<td>(Fall)</td>
</tr>
<tr>
<td>COMM 2820</td>
<td>Research Methods in Communication Studies</td>
<td>(Fall)</td>
</tr>
<tr>
<td>DSOC 3130</td>
<td>Social Indicators and Research</td>
<td>(Fall)</td>
</tr>
<tr>
<td>EAS 3010</td>
<td>Evolution of the Earth System</td>
<td>(Fall)</td>
</tr>
<tr>
<td>EAS 4170</td>
<td>Field Mapping in Argentina</td>
<td>(Summer)</td>
</tr>
<tr>
<td>EAS 4370</td>
<td>Geophysical Field Methods</td>
<td>(Fall)</td>
</tr>
<tr>
<td>NTRES 4200/4201</td>
<td>Forest Ecology</td>
<td>(Fall)</td>
</tr>
<tr>
<td>NTRES 4220/4221</td>
<td>Wetland Ecology and Management</td>
<td>(Fall)</td>
</tr>
</tbody>
</table>

**Information Processing**  Choose one course.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEE 6150</td>
<td>Digital Image Processing</td>
<td>(Spring)</td>
</tr>
<tr>
<td>CRP 4080</td>
<td>Introduction to GIS</td>
<td>(Spring)</td>
</tr>
<tr>
<td>CSS 4200</td>
<td>Geographic Information Systems</td>
<td>(Spring)</td>
</tr>
<tr>
<td>CSS 6200</td>
<td>Spatial Modeling and Analysis</td>
<td>(Spring)</td>
</tr>
</tbody>
</table>

**Information Analysis**  Choose one course.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>BEE 4750</td>
<td>Environmental Systems Analysis</td>
<td>(Fall)</td>
</tr>
<tr>
<td>BIOEE 3620</td>
<td>Dynamic Models in Biology</td>
<td>(Spring)</td>
</tr>
<tr>
<td>NTRES 3100</td>
<td>Applied Population Ecology</td>
<td>(Fall)</td>
</tr>
<tr>
<td>NTRES 4110</td>
<td>Quantitative Ecology and Management of Fisheries Resources</td>
<td>(Spring)</td>
</tr>
<tr>
<td>NTRES 4120</td>
<td>Wildlife Population Analysis: Techniques and Models</td>
<td>(Spring)</td>
</tr>
<tr>
<td>NTRES 4240</td>
<td>Landscape Impact Analysis</td>
<td>(Spring)</td>
</tr>
</tbody>
</table>