Environmental Earth Systems Science Program

(Interdisciplinary Program of the Division of Science and the Grove School of Engineering)

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General Information
The City College offers the following undergraduate degree in Environmental Earth Systems Science:

B.S.

Programs and Objectives
Environmental Earth Systems Science (EESS) is designed for students interested in emerging environmental issues as well as environmental policy. A combined curriculum of science and engineering courses provides a foundation for studying emission control, climate change, global warming, resource management, public health, and environmental remediation. These broad areas will continue to drive environmental research for the coming decades with the goal of providing lawmakers with accurate information for developing sound environmental policies. The EESS degree program is designed to connect major existing environmental research programs at CCNY, including the National Oceanic and Atmospheric Administration Center for Cooperative Remote Sensing Science and Technology (NOAA-CREST) and the National Aeronautics and Space Administration Center for Optical Sensing and Imaging (NASA-COSI). Together, the curriculum and associated science and engineering research provide a superior basis for entry into careers in environmental and earth system science at local and federal levels and in related industries as well as government regulatory and policy arenas.

Program Facilities and Research
Environmental Earth Systems Science and the related centers provide state-of-the-art equipment in the areas of remote sensing, hydrology and groundwater hydrology, emergent contaminant evaluation and remediation, subsurface sensing-environmental geophysics, aerosol particulate collection and analysis and a host of related fields. The remote sensing laboratories coordinate a state-of-the-art LIDAR sensor with environmental aerosol collectors (such as the Environmental Beta-Attenuation Monitor) and a new satellite receiving station together with sophisticated satellite data analysis software (such as Interactive Data Language and ENVI). The EESS facilities also include a complete Weather Center that operates a wide range of weather-analyzing systems including a Mesoscale Meteorological System (MMIS) and coordinated links with the National Weather Service.

The Geochemical and Geophysical Laboratories include an extensive array of equipment including x-ray fluorescence, x-ray diffraction, atomic absorption spectrometers, inductively coupled mass spectrometer, gas chromatography-mass spectrometry, and ion chromatography. Specialized systems include photo-dye tracing diffusion systems, electromagnetic geophysics, engineering seismic system, proton precession magnetometer and related techniques. The laboratories have access to scanning and transmission electron microscopes and image-processing software.

Program Requirements
The EESS Program leads to a Bachelor of Science degree whereas its sister program Earth System Science and Environmental Engineering leads to a Bachelor of Engineering degree (see the Engineering Section of this Bulletin). The two programs share some of the lower and upper division courses, but do not have the same requirements. Both programs have suggested degree concentrations for students, but these can be modified to better suit a particular area of study interest. There is an EESS/ESE Committee responsible for assuring that course tracks are appropriate for each student.

Students entering the EESS will be advised by the EESS general advisor, Associate Professor Patricia Kenyon. By year three, students are expected to declare a track focusing on a particular environmental area of study and create an appropriate program of study from a list of approved Elective Courses

Flexibility within EESS is achieved by creating a core sequence of essential courses and a relatively large number of electives. This allows a student to focus on specific career objectives.

Requirements for EESS Majors
A GPA of 2.0 or higher in the major is required for graduation. The GPA in the major is calculated from courses in the major based in the major department only, and that have been taken at City College or through ePermit, including all courses in excess of the minimum required for the degree.

All EESS majors must take the mathematics and science courses and the Major Requirements listed below. In addition, each student will complete the requirements for one of the three tracks listed. Courses marked with * must be completed with a minimum grade of C.

Science (includes Science Requirements in General Education Core):
BIO 10100: Biological Foundations I 4
CSC 10200: Introduction to Computing 3
CHEM 10301–10401: General Chemistry* 8
PHYS 20700-20800: General Physics* 8
EAS 10600: Earth System Science* 4

Mathematics:
MATH 20100: Calculus I* 3
MATH 20200: Calculus II* 3
MATH 20300: Calculus III* 4
MATH 39100: Methods of Differential Equations* 3
*Minimum grade of “C” required

Total Math and Science credits 40

Major Requirements:
EAS 21700: Systems Analysis of Earth 4
EAS 30800: ESS Modeling/Databases 3
EAS 30000: Earth and Environmental Science Seminar 3
EAS 33000: Geographic Information Systems 3
EAS 47200: Environmental Project 5-6
CHEM 33000: Physical Chemistry I 3

Total Major Requirements 20

Technical Electives for Student's Track

Track 1: Environmental Chemistry Requirements:
EAS 41300: Environmental Geochemistry 3

Additional electives from the Program Technical list below to reach 27 credits.
Electives must include a minimum of 5 additional courses in Chemistry.

Track 2: Hydrology and Climate Requirements:
EAS 30900: Fundamentals of Atmospheric Science 3
EAS 34500: Hydrology 3
EAS 41300: Environmental Geochemistry 3
EAS 42600: Environmental Remote Sensing/Image Analysis 3
EAS 44600: Groundwater Hydrology 3
EAS 48800: Climate Change 4

Total Track 2: 19

Additional electives from the Program Technical list below to reach 27 credits.

Track 3: Ecosystems and Environmental Science Requirements*:
BIO 10200: Biological Foundations II 4
BIO 20600: Introduction to Genetics 4
BIO 22800: Ecology and Evolution 4

Total Track 3: 12

Additional credits from the Program Technical list below to reach 27 credits. Electives must include a minimum of 2 additional courses in biology.
*Pending approval by the Biology Department

Program Technical Electives:
BIO 20700: Organismic Biology 4
BIO 22800: Ecology and Evolution 4
BIO 22900: Cell and Molecular Biology 4
BIO 34500: Botany 4
BIO 35000: Microbiology 4
BIO 45300: Conservation Biology 3
BIO 45500: Advanced Ecology 3
BIO 45900: Biological Oceanography 3
BIO 48500: Evolution 3
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<td>Quantitative Analysis</td>
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<td>Organic Chemistry I</td>
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<td>CHEM 26300</td>
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<td>CHEM 33200</td>
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<td>Environmental Organic Chemistry</td>
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<td>EAS 32800</td>
<td>Global Environmental Hazards</td>
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<td>EAS 22700</td>
<td>Structural Geology</td>
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<td>EAS 34500</td>
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<tr>
<td>EAS 36500</td>
<td>Coast and Ocean Processes</td>
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<td>EAS 41300</td>
<td>Environmental Geochemistry</td>
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<td>EAS 41700</td>
<td>Satellite Meteorology</td>
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<td>EAS 42600</td>
<td>Environmental Remote Sensing and Image Analysis</td>
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<td>EAS 43900</td>
<td>Mineral and Energy Resources</td>
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<td>EAS 44600</td>
<td>Groundwater Hydrology</td>
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<td>EAS 45000</td>
<td>Environmental Field Methods</td>
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<td>EAS 48800</td>
<td>Climate Change</td>
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<td>EAS 56100</td>
<td>Geophysics</td>
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<td>EAS 56500</td>
<td>Environmental Geophysics</td>
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<td>EAS 56600</td>
<td>Solid Earth Geochemistry</td>
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<td><strong>Total Technical Electives:</strong></td>
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<td><strong>Free Electives to reach 120 credits:</strong></td>
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**Additional Requirements**

**GENERAL EDUCATION REQUIREMENTS ("PATHWAYS")**

In general, students are required to complete 42 credits of General Education coursework, with some adjustments for transfer students. See the General Education Requirements (Pathways) section of the Bulletin for more information. Earth and Atmospheric Science students will satisfy their "Pathways" requirements most efficiently by following these recommendations:

**Fixed Core**
- English Composition I: FIQWS
- English Composition II: ENGL 21003
- Mathematical and Quantitative Reasoning: MATH 20100
- Life and Physical Sciences: CHEM 10301

**Flexible Core**
- World Cultures and Global Issues: any of CLAS offerings in this category
- Individual and Society: any of CLAS offerings in this category
- U.S. Experience in Its Diversity: any of CLAS offerings in this category
- Creative Expression: any of CLAS offerings in this category
- Scientific World: BIO 10100
- Additional course in Scientific World: CHEM 10401 or PHYS 20700

**College Option**
- Speech 11100, 00380 or exemption on the basis of demonstrated proficiency
- Foreign language – two semesters of college-level study, or exemption on the basis of two years of high-school level study, or demonstrated proficiency
- Philosophy - any of CLAS offerings in this category

**Faculty Advisors**

For a complete list of participating Science and Engineering Faculty, please refer to the section on Earth System Science and Environmental Engineering in the Grove School of Engineering section of this Bulletin.