**ESS**

**Earth and Space Sciences**

**ESS 501: Foundations of Earth Science**
Comprehensive analysis of the New York State Earth Science Curriculum taught by an experienced Earth Science teacher. This course is intended for science teachers and science education students.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

**ESS 511: Pine Barrens Sustainability**
The ecologically diverse Long Island Pine Barrens region provides a habitat for a large number of rare and endangered species, but faces challenges associated with protection of a natural ecosystem that lies in close proximity to an economically vibrant urban area that exerts intense development pressure. In this course we will consider the interaction of the ecological, developmental and economic factors that impact the Pine Barrens and the effectiveness of decision support systems in promoting sustainability of the Pine Barrens.

*3 credits, Letter graded (A, A-, B+, etc.)*

**ESS 522: The Planets**
A study of present knowledge of planets and their satellites, the interplanetary medium, asteroids, meteorites, comets, and the Sun. Emphasizes the methods of science including the history of astronomical sciences, ongoing deep-space missions, modern astronomical instrumentation, and exoplanet discoveries. Emphasis will be placed on topics contained in the Earth Science curriculum in New York State. A research report is required. This course is intended for science teachers and science education students and requires knowledge of trigonometry, algebra and introductory college level physics.

*Offered
Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

**ESS 523: Collisions in the Solar System**
A discussion of the evidence that comet and asteroid impacts have played a significant part in the evolution of the Earth, and other planets of the solar system, as well as an assessment of the actual and perceived hazard posed by terrestrial impacts and discussion of what can be done about it. Research report required. This course is intended for science teachers and science education students and requires knowledge of trigonometry, algebra and introductory college level physics.

*Offered
Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

**ESS 524: The Universe**
The origin, evolution, and ultimate fate of the universe. The course begins with a historical approach with emphasis on the evolution of cosmological ideas from geocentric universes to the Big Bang. Consideration of the evolution of the universe from the earliest moments after the Big Bang to the distant future, including the formation of the galaxies, stars, and planets. Research report required. This course is intended for science teachers and science education students and requires knowledge of trigonometry, algebra and introductory college level physics.

*Offered
Spring 304 The Universe.
Offered
Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

**ESS 532: Atmospheric Fundamentals**
This course considers: the principles of atmospheric thermodynamics to assess adiabatic and saturated adiabatic processes; the concepts of radiative transfer such as blackbody radiation, scattering, absorption, and emission by molecules and particles will be discussed; tropospheric and stratospheric chemistry with its subsequent effects on air pollution and chemical cycles; meteorological physical concepts such as geostrophic and gradient winds, and general circulation; and the microphysics of cloud formation and precipitation. Research report required. This course is intended for science teachers and science education students.

*Offered
Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

**ESS 533: Global Climate**
This course explores the fundamental physical processes associated with various weather phenomena: tropical cyclones, extratropical cyclones, fronts, convective storms, and local air-sea and mountain flows. The latest analysis techniques, datasets, and tools will be used to understand the climatology and structural evolution of these weather phenomena. Basic forecasting techniques will be applied using observations and numerical model output. Research report required. This course is intended for science teachers and science education students.

*Offered
Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

**ESS 534: Air Pollution and Control**
This course provides an overall picture of air pollution caused by gas phase species and airborne particulate matter. The sources of air pollution and the transport of air pollutants will be discussed. We will study the underlying chemical processes which can lead to the formation of secondary air pollutants. Their effect on an urban, regional, and global scale and on human health will be assessed. National and international air quality policy regulations will be discussed. The causes and consequences of the stratospheric ozone hole will be outlined. The international efforts in form of policy protocols to stop stratospheric ozone depletion will be discussed. The natural greenhouse effect will be introduced and our current understanding of global warming will be presented. Research report required. This course is intended for science teachers and science education students.

*Offered
Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

**ESS 536: Principles of Weather Analysis and Forecasting**
This course explores the fundamental physical processes associated with various weather phenomena: tropical cyclones, extratropical cyclones, fronts, convective storms, and local air-sea and mountain flows. The latest analysis techniques, datasets, and tools will be used to understand the climatology and structural evolution of these weather phenomena. Basic forecasting techniques will be applied using observations and numerical model output. Research report required. This course is intended for science teachers and science education students.

*Offered
Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

**ESS 541: Earth’s Surficial Environment**
The course includes creating and using topographic maps, weathering, soil development, stream systems, groundwater, glacial geology, mass movement, erosion and deposition. Instruction will include lectures and laboratory exercises. Research report required. This course is intended for science teachers and science education students.

*Offered
Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

**ESS 542: Tectonic Environment**
The use of maps in recognizing, describing and interpreting tectonic features in New York State and around the world; understanding the origin of structural features of the earth’s crust and interior; using seismic data to understand the tectonic significance of earthquakes and to describe the earth materials through which seismic waves travel; and understanding the role of plate tectonics in the earth’s geologic evolution. Instruction will include lectures and laboratory exercises. Research report required.
This course is intended for science teachers and science education students. Offered
Spring, 3 credits, Letter graded (A, A-, B+, etc.)

ESS 543: Rocks and Minerals
Identification, properties, formation and occurrence of rock-forming minerals: characterizing igneous, sedimentary and metamorphic rocks including the diverse geologic settings in which they occur with emphasis on their occurrence in the Metropolitan New York area. Instruction will include lectures and laboratory exercises. Research report required. This course is intended for science teachers and science education students.
Offered
Fall, 3 credits, Letter graded (A, A-, B+, etc.)

ESS 544: Geology of New York
The course will explore the geologic development of New York from the Mesoproterozoic to the present and will also explore how the rocks were dated using radiometric methods and fossils. Research report required. This course is intended for science teachers and science education students.
Offered
Spring, 3 credits, Letter graded (A, A-, B+, etc.)

ESS 585: Directed Studies
Special studies directed by various faculty members to be taken for variable and repetitive credit.
Fall, Spring, and Summer, 1-3 credits, Letter graded (A, A-, B+, etc.)
May be repeated for credit.

ESS 589: Research for Earth Science Teachers
This course is intended to provide science teachers or graduate students in the Science Education program an opportunity to obtain research experience. A written report is required.
Fall, Spring and Summer, 1-3 credits, Letter graded (A, A-, B+, etc.)
May be repeated for credit.

ESS 600: Independent Research
This course is required for students in MAT Earth Science and MS in Geosciences with a concentration in Earth and Space Sciences to document that the student has completed an independent research project as part of a graduate earth science academic or research course.
S/U grading

ESS 601: Topics in Earth and Space Sciences
This course is intended for science teachers or science education students.
Fall, Spring, and Summer, 1-3 credits, Letter graded (A, A-, B+, etc.)
May be repeated for credit.

ESS 610: Capstone Project in Earth and Space Sciences
This required capstone project considers unifying themes or "big ideas" such as scale and structure, models, stability, and change, systems and interactions, energy and time as they apply to astronomy, atmospheric science and geology. This capstone course integrates "big ideas" across the earth and space sciences. Students should have taken at least two undergraduate or graduate courses in each of astronomy, atmospheric science and geology.
1 Credit, ABCF Grading
1 credit, Letter graded (A, A-, B+, etc.)