

# Earth System Science (ESS)

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## ESS 501 - SURVEY ATMOSPHERIC SCIENCE

Semester Hours: 3

General survey of the field of atmospheric science includes thermodynamics, atmospheric dynamics, cloud physics, and atmospheric radiation. Quantitative examination of atmospheric properties including atmospheric composition, structure and dynamics.

## ESS 502 - SCI & SOC ASPTS NATRL DISASTER

Semester Hours: 3

Examination of the physical causes of major natural geophysical hazards and their impact on the natural and built environment, society and the economy. Evaluation of the ability to forecast events, and develop sound mitigation and recovery measures. Specific case studies are considered.

## ESS 507 - ENVRNMTL THRTS PBL PY DEC MKG

Semester Hours: 3

Researchers, policymakers and environmental campaigners have identified 25 potential future threats to the global environment. This course examines the nature and consequences of these threats and their potential impacts for the survival of the human race.

## ESS 508 - PYTHON FOR ID ESS APPLICATIONS

Semester Hours: 3

Introduction to GIS model building, Python programming, and automation of scripts for ArcGIS. Techniques in Model Builder, Python, and the methods for automation will be taught using data from numerous available data sources across the internet with heavy emphasis on the Earth Sciences.

## ESS 509 - SCI PROGRMNG FOR EARTH & ATMOS

Semester Hours: 3

Survey of data types and languages commonly used in the meteorological community along with practical application to meteorology. Course is designed to prepare students for graduate work and research in atmospheric science.

## ESS 510 - OPERATIONAL WEATHER FORECAST'G

Semester Hours: 3

Operational Meteorology covers subjective and objective methods of atmospheric prognosis, including techniques for forecasting operationally-important weather elements. Course explores interpretation, use and systematic errors of computer-generated products, human factors within forecasting, and application of meteorological theory in an operational setting. Course instruction is accomplished through analysis of various weather events from beginning to completion.

## ESS 514 - GEOSPATIAL APPLICATIONS

Semester Hours: 3

An introductory look at the ways in which GIS can be put to use in different fields of study, drawing examples from Demography, Sociology, Archaeology, History and Ecology. Focus on cartography and map creation principles and public geospatial data acquisition.

## ESS 515 - ADVANCED TOPICS IN GIS

Semester Hours: 3

Advanced continuation of concepts applied in Geospatial Applications. Students will learn through modules of real world scientific research how to use further tools in ArcGis including: 3D Analyst, Spatial Analyst, Network Analyst. Topics include web data dissemination, spatiotemporal analysis and some basic spatial statistics measures. Prerequisite: ESS 514.

## ESS 561 - ATMOSPHERIC RADIATION I

Semester Hours: 3

## ESS 590 - SPECIAL TOPICS IN ESS

Semester Hours: 3

Selected topics of interest not included under other courses.

## ESS 610 - LAND USE APP & SUSTAINABILITY

Semester Hours: 3

Study of land use and sustainability issues using satellite image processing and GIS. International examples of urbanization, agriculture, transportation, water management, and natural resources exploitation. Discussions of current literature and quantitative analyses of satellite and situ data. Prerequisite: ESS 515 or consent of instructor.

ESS 612 - ADV GIS EARTH ATMOSPHERE PROBL

Semester Hours: 3

Advanced GIS and remote sensing/image processing. Discussion, guided readings, and group labs to interact with student peers and instructor to develop geospatial solutions to problems relevant to their thesis research including appropriate research design, data collection, and analysis.

Prerequisites: ESS 515 and ESS 610.

ESS 625 - AIR POLL APP & DEC MAKG REMOTE

Semester Hours: 3

Course will review principles of air pollution, measurement methods, regulation, national and international standards and how research is used to make decisions regarding air quality. The course will use ground-based, satellite, and numerical modeling information through a case study approach.

Prerequisites: ESS/ATS 501.

ESS 630 - PHYSICAL CLIMATOLOGY

Semester Hours: 3

This course examines the physical aspects of the global climate system, including the global energy balance, surface energy balance, hydrologic cycle, climate classification, ocean circulation, natural and anthropogenic climate change and other selected topics such as climate sensitivity. Prerequisites: ATS 501 or ATS 541.

ESS 632 - ENERGY, CLIMATE, ENVIRONMENT

Semester Hours: 3

This course focuses on energy and its impact on the environment including climate change and air pollution. Specific energy forms, such as fossil fuels, nuclear energy, solar energy, are discussed.

ESS 670 - SATELLITE REMOTE SENSING I

Semester Hours: 3

Using a hands on approach, this course covers a broad range of topics concerning digital image processing applied to the remote sensing of atmospheric, cloud and surface properties using various satellite data sets. Prerequisites: ESS 509.

ESS 676 - REMOTE SENSING OF ENVIRONMENT

Semester Hours: 3

This course pursues both basic and advanced concepts in radiative transfer processes and retrieval algorithms of land surface biophysical variables from remote sensing observations, with an emphasis on the hands-on experience of data preprocessing and information extraction by using ENVI.

Prerequisite: ESS 514.

ESS 680 - NUMERICAL MOD APPL ESS

Semester Hours: 3

This course will provide the physical basis for numerical model applications in the earth-atmosphere system including spatial and temporal scales.

Prerequisites: ESS 501 and ESS 509.

ESS 690 - SPECIAL TOPICS IN ESS

Semester Hours: 3

Selected topics of interest not included under other courses.

ESS 698 - MASTERS CAPSTONE

Semester Hours: 3

An extended research project resulting in a substantive paper that involves the original collection, analysis and/or interpretation of scientific data and/or results. Conducted under the guidance of an advisor. Required for MS ESS non-thesis option.

ESS 699 - MASTER'S THESIS

Semester Hours: 3-6

A minimum of six thesis credit hours is required for MS degree.

ESS 780 - SEMINAR

Semester Hour: 1

Speakers are invited to report on research relevant to the field of Atmospheric and Earth System Science. Students are expected to attend at least twelve seminars and to write short descriptions of the presentations.

**ESS 781 - STUDENT SEMINAR**

Semester Hour: 1

Guest speakers reports on research relevant to the fields of Atmospheric and Earth System Science. Students are expected to attend weekly seminars, submit a paper based on at least ten talks, and make a 15 minute conference-type presentation on a research topic in atmospheric science selected in agreement with their advisor.

**ESS 782 - PROFESSIONAL DEVELOPMENT**

Semester Hour: 1

Topics concerning professional ethics, writing scientific journal articles, proposals and resumes, preparing budgets, networking, time management, conference presentations, research administration, funding agencies, stress and burnout will be discussed.