

Relevant Undergraduate Courses Taken at Millersville University

Updated September 2014, Stefan Cecelski

ESCI 241: Meteorology

Atmospheric structure and motions; physics of weather processes; weather and motion systems.

ESCI 340: Physical Meteorology

Distribution of meteorological variables in the atmosphere; governing principles in atmospheric science (gas laws, hydrostatic equilibrium, diffusion, conservation of energy, mass and momentum); radiative transfer, cloud processes and atmospheric electrification.

ESCI 341: Atmospheric Thermodynamics

First and second principles of thermodynamics, water-air systems, equilibrium of small droplets and crystals, thermodynamic processes in the atmosphere, atmospheric statics, vertical stability and aerological diagrams.

ESCI 342: Atmospheric Dynamics I

Meteorological coordinate systems; equations of motion; geostrophic, gradient and thermal winds; kinematics; circulation, vorticity and divergence theorems.

ESCI 343: Atmospheric Dynamics II

Diagnostics equations, viscosity and turbulence; energy equations and transformations; numerical weather prediction; general circulation.

ESCI 347: Satellite Meteorology

Theory of weather satellites including orbital characteristics and signal receipt, synoptic weather interpretation, mesoscale features, precipitation signatures, fog, wind shear, tropical weather systems.

ESCI 349: Chemistry of the Atmosphere

Theory, application, methods of analysis and instrumentation relevant to a study of the chemistry of the atmosphere.

ESCI 441: Synoptic Meteorology

Dynamics and physics of the atmosphere as revealed by observational data and numerical output; subjective and objective analysis of meteorological data; use of standard meteorological graphics software; current weather discussions.

ESCI 443: Climate Dynamics

A comprehensive treatment of the components of the climate system, feedback mechanisms and interactions; mean state of the climate system; a detailed and in-depth treatment of the earth-atmosphere radiation balance and general circulation; natural and

anthropogenic forcings and their effect on the climate system; climate models; and the current state of climate observing networks and model validation.

ESCI 444: Meso- and Storm-Scale Meteorology

Study of high-impact events that threaten life and property. Microphysical and dynamic aspects of severe convective systems, mesoscale convective complexes, squall lines, jet streaks, gravity waves, strong turbulence, damaging winds, hailstorms, tornadoes and flash flooding.

ESCI 445: Numerical Modeling of the Atmosphere and Oceans

Methods and mathematical concepts of numerical weather and ocean prediction models. Students must be able to program in one of the following languages: Fortran, C++, or IDL.

ESCI 446: Statistical Meteorology

Frequency distributions, sampling theory, linear and multiple regression analysis, time series, space variations of meteorological variables, statistical weather forecasting, forecast verification.

ESCI 448: Boundary Layers and Turbulence

Mean boundary layer characteristics; turbulence and its spectrum; governing equations to turbulent flow; prognostic equations for turbulent fluxes and variances; TKE; turbulence closure schemes; similarity theory; simulation techniques; convective and stable boundary layers; boundary layer clouds.

ESCI 282: FORTRAN Programming for Earth Sciences Applications

Programming in computational methods emphasizing FORTRAN applied to the earth sciences; numerical solution of equations of motion; statistical properties of digital images; analysis of periodical phenomena; use of National Center for Atmospheric Research graphics library.

ESCI 386: IDL Programming for Advanced Earth Sciences Applications

Overview of existing global data sets in geology, meteorology, and oceanography; HDF and NetCDF scientific data formats; use of Interactive Data Language (IDL) to analyze and display data.

MATH 235: Survey of Statistics

A survey of elementary probability theory, estimation, hypothesis testing and simple regression and correlation. Interpretation of statistical inference in the analysis of data.

MATH 322: Linear Algebra I

A rigorous introduction to linear algebra. Includes systems of linear equations, matrix algebra, determinants, vector spaces, inner product spaces, geometry in R^n , linear transformations, orthogonal transformations, eigentheory and diagonalization.

MATH 365: Ordinary Differential Equations

First order differential equations, linear first and second order initial-value problems, power series solutions; applications. Also includes at least one of the following topics: special functions of mathematical physics, Laplace transforms, systems of first order equations.

MATH 467: Partial Differential Equations

Fourier series and the method of separation of variables; the wave equation, heat equation and Laplace's equation; d'Alembert's formula. Maximum principles, energy integrals and uniqueness. Sturm-Liouville problems and eigenfunction expansions.