ATM 230 — Advanced Atmospheric Turbulence (3 units)
Course Description: Dynamics and energetics of turbulence in the atmosphere including vorticity dynamics. Statistical description of turbulence; Eulerian and Lagrangian scales, spectral analysis, conditional sampling techniques. Turbulent diffusion; the closure problem, gradient-diffusion and second-order methods.
Prerequisite(s): ATM 121B or ATM 158.
Learning Activities: Lecture 3 hour(s).
Grade Mode: Letter.

ATM 233 — Advanced Biometeorology (3 units)
Course Description: Current topics in biometeorology. Physical and biological basis for water vapor, other gases, and energy exchange with the atmosphere. Topics include modeling and measuring turbulent transport from plant canopies, surface temperatures and energy budgets, bio-aerosol physics and aerobiology.
Prerequisite(s): ATM 133; or consent of instructor.
Learning Activities: Lecture/Discussion 3 hour(s).
Grade Mode: Letter.

ATM 240 — General Circulation of the Atmosphere (4 units)
Course Description: Dynamics of large-scale climatic variations over time periods from weeks to centuries. Description of the appropriate methods of analysis of atmospheric and oceanic observations. Conservation of mass, energy and momentum. Introduction to the range of climate simulations.
Prerequisite(s): ATM 121B.
Learning Activities: Lecture/Discussion 4 hour(s).
Grade Mode: Letter.

ATM 241 — Climate Dynamics (3 units)
Course Description: Dynamics of large-scale climatic variations over time periods from weeks to centuries. Description of the appropriate methods of analysis of atmospheric and oceanic observations. Conservation of mass, energy and momentum. Introduction to the range of climate simulations.
Prerequisite(s): ATM 121B.
Learning Activities: Lecture/Discussion 3 hour(s).
Grade Mode: Letter.

ATM 244 — Cloud & Precipitation Physics (3 units)
Course Description: Observations and modeling of clouds and precipitation. Physics and parameterization of cloud microphysical processes including nucleation, condensation/evaporation, deposition/sublimation, collision-coalescence and sedimentation.
Learning Activities: Lecture 3 hour(s).
Enrollment Restriction(s): Restricted to Atmospheric Science graduate group students or consent of instructor.
Grade Mode: Letter.

ATM 245 — Climate Change, Water & Society (4 units)
Course Description: Integration of climate science and hydrology with policy to understand hydroclimatology and its impact upon natural and human systems. Assignments: readings, take-home examination on climate and hydrologic science, paper that integrates course concepts into a research prospectus or review article.
Learning Activities: Lecture 4 hour(s).
Enrollment Restriction(s): Limited to 25 students.
Cross Listing: HYD 245, ECL 245.
Grade Mode: Letter.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
<th>Description</th>
<th>Prerequisites</th>
<th>Learning Activities</th>
<th>Grade Mode</th>
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<tbody>
<tr>
<td>ATM 250</td>
<td>Meso-Scale Meteorology</td>
<td>3</td>
<td>The study of weather phenomena with horizontal spatial dimensions between 2.5 and 2500 kilometers. Methods of observational study and numerical modeling of the structure and temporal behavior of these weather systems.</td>
<td>ATM 150; graduate standing; course in partial differential equations or consent of instructor.</td>
<td>Lecture 3 hour(s).</td>
<td>Letter.</td>
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<tr>
<td>ATM 255</td>
<td>Numerical Modeling of the Atmosphere</td>
<td>4</td>
<td>Principles of numerical modeling of the dynamic, thermodynamic and physical processes of the atmosphere. Hands-on experiments on model development using the shallow water equations and the primitive equations. Operational forecast models.</td>
<td>ATM 121B; ENG 005; ATM 150 recommended.</td>
<td>Lecture 2 hour(s), Laboratory 6 hour(s).</td>
<td>Letter.</td>
</tr>
<tr>
<td>ATM 260</td>
<td>Atmospheric Chemistry</td>
<td>3</td>
<td>Chemistry and photochemistry in tropospheric condensed phases (fog, cloud, and rain drops and aerosol particles). Gas-drop and gas-particle partitioning of compounds and effects of reactions in condensed phases on the fates and transformations of tropospheric chemical species.</td>
<td>ATM 160.</td>
<td>Lecture 3 hour(s).</td>
<td>Letter.</td>
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<tr>
<td>ATM 265</td>
<td>The Art of Climate Modeling</td>
<td>4</td>
<td>Over the past fifty years, global models have given us incredible insight into the Earth system. Provides an introduction to these models, with a focus on their design and the science questions they have been built to address.</td>
<td>ATM 121A.</td>
<td>Lecture 3 hour(s), Project.</td>
<td>Letter.</td>
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<tr>
<td>ATM 270A</td>
<td>Topics in Atmospheric Science: Meteorological Statistics</td>
<td>1-3</td>
<td>Applications and concepts in meteorological statistics.</td>
<td></td>
<td>Discussion 1-3 hour(s).</td>
<td>Letter.</td>
</tr>
<tr>
<td>ATM 270B</td>
<td>Topics in Atmospheric Science: Computer Modeling of the Atmosphere</td>
<td>1-3</td>
<td>Applications and concepts in computer modeling of the atmosphere.</td>
<td></td>
<td>Discussion 1-3 hour(s).</td>
<td>Letter.</td>
</tr>
<tr>
<td>ATM 270C</td>
<td>Topics in Atmospheric Science: Design of Experiments &amp; Field Studies in Meteorology</td>
<td>1-3</td>
<td>Applications and concepts in design of experiments and field studies in meteorology.</td>
<td></td>
<td>Discussion 1-3 hour(s).</td>
<td>Letter.</td>
</tr>
<tr>
<td>ATM 270D</td>
<td>Topics in Atmospheric Science: Solar &amp; Infrared Radiation in the Atmosphere</td>
<td>1-3</td>
<td>Applications and concepts in solar and infrared radiation in the atmosphere.</td>
<td></td>
<td>Discussion 1-3 hour(s).</td>
<td>Letter.</td>
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<tr>
<td>ATM 270E</td>
<td>Topics in Atmospheric Science: Aerosol &amp; Cloud Physics</td>
<td>1-3</td>
<td>Applications and concepts in aerosol and cloud physics.</td>
<td></td>
<td>Discussion 1-3 hour(s).</td>
<td>Letter.</td>
</tr>
<tr>
<td>ATM 270F</td>
<td>Topics in Atmospheric Science: Atmospheric Chemistry</td>
<td>1-3</td>
<td>Applications and concepts in atmospheric chemistry.</td>
<td></td>
<td>Discussion 1-3 hour(s).</td>
<td>Letter.</td>
</tr>
<tr>
<td>ATM 270G</td>
<td>Topics in Atmospheric Science: General Meteorology</td>
<td>1-3</td>
<td>Applications and concepts in general meteorology.</td>
<td></td>
<td>Discussion 1-3 hour(s).</td>
<td>Letter.</td>
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<tr>
<td>ATM 280A</td>
<td>Air Quality Policy in the Real World</td>
<td>4</td>
<td>In-depth investigation of an air quality problem with a team and mentor from government or industry. Science, engineering and policy will be involved. Findings will be presented orally and in writing.</td>
<td>(ATM 149 or ECI 149); ECI 242; consent of instructor, or equivalent of ECI 242.</td>
<td>Project.</td>
<td>Letter.</td>
</tr>
<tr>
<td>ATM 280B</td>
<td>Air Quality Policy in the Real World</td>
<td>4</td>
<td>In-depth investigation of an air quality problem with a team and mentor from government or industry. Science, engineering and policy will be involved. Findings will be presented orally and in writing.</td>
<td>ATM 280A; and consent of instructor.</td>
<td>Project.</td>
<td>Letter.</td>
</tr>
<tr>
<td>ATM 290</td>
<td>Seminar</td>
<td>1</td>
<td>Current developments in selected areas of atmospheric research. Topics will vary according to student and faculty interests.</td>
<td>Graduate standing in Atmospheric Science or related field.</td>
<td>Seminar 1 hour(s).</td>
<td>Satisfactory/Unsatisfactory only.</td>
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</tbody>
</table>
ATM 291A — Research Conference in Atmospheric Science: Air Quality Meteorology (1-3 units)
Course Description: Review and discussion of current literature and research in Air Quality Meteorology.
Prerequisite(s): Consent of instructor.
Learning Activities: Lecture/Discussion 1-3 hour(s).
Repeat Credit: May be repeated 6 unit(s).
Grade Mode: Satisfactory/Unsatisfactory only.

ATM 291B — Research Conference in Atmospheric Science: Biometeorology (1-3 units)
Course Description: Review and discussion of current literature and research in Biometeorology.
Prerequisite(s): Consent of instructor.
Learning Activities: Lecture/Discussion 1-3 hour(s).
Repeat Credit: May be repeated 6 unit(s).
Grade Mode: Satisfactory/Unsatisfactory only.

ATM 291C — Research Conference in Atmospheric Science: Boundary Layer Meteorology (1-3 units)
Course Description: Review and discussion of current literature and research in Boundary Layer Meteorology.
Prerequisite(s): Consent of instructor.
Learning Activities: Lecture/Discussion 1-3 hour(s).
Repeat Credit: May be repeated 6 unit(s).
Grade Mode: Satisfactory/Unsatisfactory only.

ATM 291D — Research Conference in Atmospheric Science: Climate Change (1-3 units)
Course Description: Review and discussion of current literature and research in Climate Change.
Prerequisite(s): Consent of instructor.
Learning Activities: Lecture/Discussion 1-3 hour(s).
Repeat Credit: May be repeated 6 unit(s).
Grade Mode: Satisfactory/Unsatisfactory only.

ATM 291E — Research Conference in Atmospheric Science: General Meteorology (1-3 units)
Course Description: Review and discussion of current literature and research in General Meteorology.
Prerequisite(s): Consent of instructor.
Learning Activities: Lecture/Discussion 1-3 hour(s).
Repeat Credit: May be repeated 6 unit(s).
Grade Mode: Satisfactory/Unsatisfactory only.

ATM 291F — Research Conference in Atmospheric Science: Atmospheric Chemistry (1-3 units)
Course Description: Review and discussion of current literature and research in Atmospheric Chemistry.
Prerequisite(s): Consent of instructor.
Learning Activities: Lecture/Discussion 1-3 hour(s).
Repeat Credit: May be repeated 6 unit(s).
Grade Mode: Satisfactory/Unsatisfactory only.

ATM 298 — Group Study (1-5 units)
Course Description: Group study.
Prerequisite(s): Consent of instructor, graduate standing.
Learning Activities: Variable.
Grade Mode: Satisfactory/Unsatisfactory only.

ATM 299 — Research (1-12 units)
Course Description: Research.
Prerequisite(s): Consent of instructor. Graduate standing.
Learning Activities: Variable.
Grade Mode: Satisfactory/Unsatisfactory only.