ESCI 340 – Physical Meteorology (CRN: 7831)
Spring 2010
T, Th 11:00 a.m. – 12:15 p.m.
Caputo Hall 400

Professor: Dr. Alex DeCaria
Office: Caputo Hall, Room 410
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Class website: http://www.atmos.millersville.edu/~adecaria

Office Hours: Monday 1:00 p.m. – 2:00 p.m.
Tuesday 10:00 a.m. – 11:00 a.m.
Tuesday 2:00 p.m. – 3:00 p.m.
Wednesday 11:00 a.m. – 12:00 p.m.
Friday 9:00 a.m. – 10:00 a.m.
Other times by appointment

Required texts: A Short Course in Cloud Physics (3rd ed.), Rogers and Yau
A First Course in Atmospheric Radiation (2nd ed.), Petty

Recommended texts: Glossary of Meteorology (2nd ed.), American Meteorological Society
Schaum's Mathematical Handbook of Formulas and Tables (2nd ed.), Spiegel and Liu

The recommended texts will not only be useful to this course, but to many of your other courses.

PRS clicker: A PRS clicker is also required for the class, and should be brought to class every day.

Final examination: Friday, May 7, 12:30 – 2:30 p.m.

Grading: There is no curve. The following grade scale will be used:

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<tr>
<th>Grade</th>
<th>Minimum Percent</th>
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<tbody>
<tr>
<td>A</td>
<td>94</td>
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<tr>
<td>A-</td>
<td>90</td>
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<tr>
<td>B+</td>
<td>87</td>
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<td>B</td>
<td>83</td>
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<tr>
<td>B-</td>
<td>80</td>
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<td>C+</td>
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<td>C</td>
<td>73</td>
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<td>C-</td>
<td>70</td>
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<td>D+</td>
<td>67</td>
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<td>D</td>
<td>63</td>
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<tr>
<td>D-</td>
<td>60</td>
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The course will be divided into two separate parts. Part I will cover cloud physics. Part II will cover atmospheric radiation. The grading will be determined as follows:

PRS Quizzes/Homework 12%
Cloud Physics Exam #1 22%
Cloud Physics Exam #2 22%
Radiation Exam #1 22%
Radiation Exam #2 22%
Total 100%
Exam Policy: Make-up exams will be given only if the exam was missed due to illness, emergency, or university-sanctioned activity. Documentation may be required. If you know in advance that you will miss an exam you must make arrangements to take the exam early. Exams taken after the regularly scheduled examination may include an additional oral component that will count for 20% of the exam grade.

Written Exercises: Written exercises are included at the end of many of the on-line notes. They will not be graded, but questions regarding them will be answered in class. The written exercises also stress concepts discussed in class, so it is strongly suggested that the student do, and understand, all of the written exercises.

PRS Quizzes and Homework: There will be weekly PRS quizzes, and sometime PRS homework assignments. Tardiness or forgetting your clicker are not legitimate excuses for a missing a PRS quiz or homework assignment, so it is important to be on time to class and to bring your clicker. Documented illness, family emergency, or university sanctioned events are legitimate excuses for missing a PRS quiz or homework assignments. In this event, the questions that you missed will not be counted against you.

Attendance: The decision to attend class is yours. I do not keep a formal record of attendance. However, I reserve the right to take attendance and class participation into account when determining whether or not to bump a borderline score up to the next higher grade. Late arrival and early departure are disruptive, and if habitual may result in a lowering of the final grade.

Course Objectives: A student who has mastered the subject matter of this course is expected to be able to:

- Articulate the fundamental laws of electromagnetic (EM) radiation, and explain their physical significance.
- Describe the mechanisms by which EM radiation is absorbed and emitted by gaseous atoms and molecules.
- Explain the fate of short and long wave radiation as it travels through the atmosphere.
- Derive the radiative transfer equations for both short and longwave radiation, and apply the equations to atmospheric radiation problems.
- Describe the properties of the Sun, and explain how solar radiation is generated.
- Explain the factors which determine the amount of solar radiation received at the top of the atmosphere, as well as at the surface of the atmosphere.
- Explain the radiation budget of the earth/atmosphere system, and discuss the effects of changes in the solar constant and albedo on the radiation and surface temperature of the earth.
- Explain the first and second laws of thermodynamics as they are applied to the atmosphere.
- Explain the effects of mixing and convection on atmospheric temperature, potential temperature, and humidity profiles.
- Describe the processes by which cloud droplets are formed, including the role of the solute and curvature effects.
- Explain the possible mechanisms by which cloud droplets grow into precipitation sized particles.
- Explain the principles behind weather radar and its use in detecting precipitation.

Time permitting, additional objectives are:
- Explain the electrical properties of the earth/atmosphere system, and describe the fair weather electric field.
- Discuss the theories by which charge separation occurs in convective clouds.
- Explain the properties and characteristics of the various kinds of lightning flashes.