ESCI 341.01 – Atmospheric Thermodynamics (CRN 4700)  
Fall 2010  
T, Th 8:00 – 9:15 a.m., Caputo 400

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

Office Hours: Monday 1:00 p.m. – 3:00 p.m.  
Tuesday 10:00 a.m. – 11:00 a.m.  
Wednesday 10:00 a.m. – 11:00 a.m.  
Thursday 3:00 p.m. – 4:00 p.m.  
Other times by appointment

Required text: A First Course in Atmospheric Thermodynamics (2nd Ed.), Petty

Recommended texts: Schaum’s Mathematical Handbook of Formulas and Tables, Spiegel  
Glossary of Meteorology (2nd edition), American Meteorological Society

Additional reading: There are additional readings at the Ganser Library e-reserve site, which is accessed via http://library.millersville.edu/forms.

Required equipment: Students are required to purchase a personal response system (PRS) unit for use in classroom exercises and for weekly in-class quizzes. These units will be made available at the University Book Store, and may also be found elsewhere. The unit we are using is the Interwrite PRS RF.

Final exam: Tuesday, December 14, 2:45 – 4:45 p.m.

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

<table>
<thead>
<tr>
<th>Grade</th>
<th>A</th>
<th>A-</th>
<th>B+</th>
<th>B</th>
<th>B-</th>
<th>C+</th>
<th>C</th>
<th>C-</th>
<th>D+</th>
<th>D</th>
<th>D-</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Percent</td>
<td>94</td>
<td>90</td>
<td>87</td>
<td>83</td>
<td>80</td>
<td>77</td>
<td>73</td>
<td>70</td>
<td>67</td>
<td>63</td>
<td>60</td>
<td>0</td>
</tr>
</tbody>
</table>

The final grade will be determined from exams and PRS homework and quizzes. These will count in the following proportions:

- Regular Exams (2 or 3) 50%
- PRS Quizzes/Homework 25%
- Final Exam (cumulative) 25%
- Total 100%

Exams: The regular exams will not necessarily cumulative, but later material certainly builds on prior concepts, and so earlier material may show up on any exam. The final examination will cover material from the entire course.
**Make-up exams:** Make-up exams will be given only if the exam was missed due to illness, emergency, or university-sanctioned activity. 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 will consist of a written exam, plus an additional oral examination that will count for 20% of the score.

**PRS Quizzes:** There will be frequent PRS quizzes and homework assignments. These require the use of a PRS clicker. There are no make-ups for the PRS quizzes, but if you have a documented, legitimate excuse for missing a quiz I will not count the missed questions against your PRS score.

**Formulas and Constants:** If there are equations or constants that I expect you to commit to memory, I will explicitly tell you when I introduce them. It is up to you to pay attention and to note these equations or constants in your notes. If you ask me later, “Which equations and constants should I have memorized?” I will simply tell you to look at your notes.

**Written Exercises:** There are written exercises given at the end of some of the online 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 I strongly encourage you to do, and understand, all of the written exercises.

**Attendance:** The decision to attend class is yours. However, I reserve the right to consider your attendance when determining whether to bump a borderline grade to the higher grade. Habitual late arrival, early departure, or disruptive behavior may result in a lowering of the final grade.

**Physical or learning disabilities:** If you have a documented physical or learning disability and need special accommodations, please let me know.

**Course Objectives:** Upon completion of this course, students will be expected to demonstrate an understanding of and be proficient in the following areas:

- The language and definitions of thermodynamics
- The first and second laws of thermodynamics as they relate to the atmosphere
- The kinetic theory of gases
- Assumptions and limitations of ideal gas theory
- Specific heat and its relation to the structure of molecules
- Thermodynamics of the water substance and moist air
- The differences in the various thermodynamic diagrams, and their strengths and weaknesses
- The use of the skew $T$-$\log p$ and other thermodynamic diagrams
- The concepts of stability and instability, lapse rates, and stability indices
- Thermodynamics of phase changes and multi-phase systems
- Importance and use of thermodynamic potentials
- Energy minimum and entropy maximum principles as they relate to equilibrium
- Key phenomena where thermodynamics is a principal mechanism
Course content

- Mathematical review
- Thermodynamic systems and equilibrium
- First law of thermodynamics
- Enthalpy and specific heat
- Kinetic theory of gases
- Ideal gases
- Adiabatic processes
- Entropy and the second law of thermodynamics
- Energy minimum and entropy maximum principles
- Thermodynamic potentials
- Humidity and vapor pressure
- Phase changes
- Surface tension, curvature, and solutions
- Thermodynamics of moist air
- Static stability
- Thermodynamic diagrams