

## ***AT721 – Course Syllabus Spring 2014***

In-Class Meetings: M 1-2:15pm; W 2-3:15pm ; ACRC Classroom (212B)

Make-up Classes: F 2-3:15pm (as necessary)

Instructor: Chris O'Dell, odell@atmos.colostate.edu

Office: 203 ACRC (on the atmospheric science campus)

Office Hours: Fridays 1-3pm or by appointment

Webpage: <http://reef.atmos.colostate.edu/~odell/at721/index.html>

### **Course Content and Goals**

The purpose of this course is to introduce students to the fundamental aspects of remote sensing retrievals in two parts, the forward problem and the inverse problem. The class will cover common forward modeling components: optical properties of the atmosphere and surface, radiative transfer techniques and approximations, and instrument characteristics. Regarding inverse modeling, a solid introduction to optimal estimation will be given.

Upon completion of the class, students will:

- Have gained a solid knowledge of the necessary components of forward models for different remote sensing projects
- Be able to use various modules (both off-the-shelf and self-written) to construct their own forward models
- Have constructed a simple but realistic scalar radiative transfer model
- Use forward models to conduct sensitivity studies
- Understand the physical basis of optimal estimation
- Be able to apply optimal estimation to retrieval problems and information theoretic problems (i.e. channel selection)

### **Books References**

Liou, K.N., 2002: *Introduction to Atmospheric Radiation*.

Petty, G.W., 2004: *A first course in Atmospheric Radiation*

Rodgers, C.D., 2000: *Inverse Methods for Atmospheric Soundings: Theory and Practice*

Stephens, G.L., 1994: *Remote Sensing of the Lower Atmosphere*

Relevant journal article referenced will be provided throughout the class

### **Course Evaluation**

- ***Homeworks and Projects:***

Students will “learn by doing” in this class. Therefore, homeworks will form the bulk of the grade of this class. There will be short weekly-to-biweekly homeworks that will include derivations of equations as well as writing computer code. For

assignments that are appropriate, a student will be asked to show his/her solutions and lead a discussion of this with other students.

- ***Final Project:***

The students will be expected to build a large forward model consisting primarily of a scalar radiative transfer model, and to use this model to answer questions about a remote sensing application of their choice. It may or may not involve actual inverse modeling.

- ***Grading Scheme***

Homeworks	60% of grade
Project Presentation	15% of grade
Project Write-up	15% of grade
Class Participation	10% of grade

The grading breakdown will be as follows:

97-100	A+
93-97	A
90-93	A-
87-90	B+
83-87	B
80-83	B-
74-80	C
64-74	D

### **Honor Code**

This course will adhere to the CSU Academic Integrity Policy as found in the General Catalog (<http://www.catalog.colostate.edu/Content/files/2012/FrontPDF/1.6POLICIES.pdf>) and the Student Conduct Code (<http://www.conflictresolution.colostate.edu/conduct-code>). At a minimum, violations will result in a grading penalty in this course and a report to the Office of Conflict Resolution and Student Conduct Services.