

12.307

Weather and Climate Laboratory Syllabus

Instructors:

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Summary

The course comprises four projects chosen to explore fundamentals of climate science and illuminate major contemporary environmental challenges facing mankind – see list below. Each project includes hands-on experiments in a rotating fluid laboratory and exploration of data from the EAPS Synoptic Laboratory.

Course structure

Four projects are carried out during the semester, each taking approximately 3 weeks to complete. The first three projects include a fluids laboratory component and analysis of observations of the atmosphere and ocean. For the fourth project, students define their own research questions that guide further inquiry into some aspect of the first three projects. Each project includes written notes which are used to convey theory and background material underpinning the theme of the project. The lecture component is kept to a minimum, allowing us to focus on hand-on activities working in groups. Results from each project are summarized in an oral presentation to the rest of the class, and students submit written reports for projects 1-3. The presentations and reports are designed to help students develop strategies for effective professional communication (e.g., in conference presentations, journal articles, or technical reports), and we require that students revise and re-submit written reports after receiving comments from the instructors. The course grade is based on the written reports for projects 1-3 and the oral presentation of project 4.

Projects:

Project 1: [Weather and extremes – hurricanes](#)

Lab: the balanced vortex experiment.

Data: hurricane data.

Project 2: [Tracer transport and fronts](#)

Lab: thermal front experiment

Data: tracers in the atmosphere and thermal fronts

Project 3: [Heat and moisture transport – the general circulation](#)

Lab: the general circulation experiment.

Data: heat and moisture transport.

Project 4: [Dig Deeper – dig deeper in one of the previous projects](#)

Text Book

Marshall and Plumb: Atmosphere, Ocean and Climate Dynamics (Academic Press)

Grading

The final grade for the course will be based on the written reports of Project 1, 2, 3 and the presentation of Project 4. Each of these 4 components will be weighted equally to yield the final grade. The grade for each report will be based on both the initial draft (20%) and the revised project report (80%). If submission deadlines are missed for either draft or final report, there will be a penalty of 1/2 point out of 10 for every day the report is late. The final grade for the course will be a letter-grade.