Student Learning Objectives

- Understand the basic principles of the climate system and its components.
- Be able to describe important climate phenomena affecting regional and global climate at seasonal, interannual, and decadal timescales.
- Be able to explain the basic principles of building and running climate models of increasing complexity.
- Be able to perform intermodel comparison studies and process climate model output for use in research and applications.
- Be able to list the features, advantages, and limitations of global climate models.
- Be able to prepare and present a climate model study as they would in a scientific conference.
- Be able to assess and effectively communicate uncertainty in climate model simulations and projections of future climate.
- Be able to access climate model data of interest, compare with observational data, and perform model-data comparison and the application of the statistical resolution.

Course Policies

- **Academic Dishonesty**: Will not be tolerated. Any violation will result in a minimum grade of F for the assignment, and possibly the course. In egregious cases, the instructor may file an official complaint with the Dean of Students office, which may end up on your permanent student record or lead to suspension from the program.
- **Collaboration**: Not permitted. You are not allowed to take home any exam questions.
- **Final Exam**: TO make copies of the exam, you must take the exam on the scheduled day and time. No assignment will be accepted after the exam.

Final Exam

- **Final Exam Date**: November 15th, 2022
- **Exam Time**: 10:00 AM - 12:30 PM
- **Exam Format**: Closed book, closed notes

**Final Exam Day Schedule**

- **Monday**: Review of previous material
- **Tuesday**: Final exam

**Assignments**

- **Assignments**: 30% of your grade will be based on completing the online modules and assignments each week and participating in the in-person portion of the course. This is an ‘active’ learning course, and will require your full engagement.

**Final Exam Preparation**

- **Start Class**: Failure to comply will negatively affect your participation score.
- **Study Material**: Your study material should include all homework assignments and class notes.
- **Exam Review**: Review all homework assignments and class notes.

**Final Exam Tips**

- **Exam Day**: Be prepared and bring all necessary materials.
- **Exam Time**: Use your time wisely and manage your stress.
- **Exam Environment**: Remember to stay calm and focused.

**Final Exam Day**

- **Final Exam Day**: November 15th, 2022
- **Exam Time**: 10:00 AM - 12:30 PM
- **Exam Format**: Closed book, closed notes
<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Comments/Readings</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.1: Course Syllabus &amp; Introduction</td>
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1.2: HPC set-up  
**Zoom:** Intro and HPC set-up  
web/python |
| 2    | 2.1: Earth’s energy balance (EBMs) |  
**Zoom:** EBM lab and modules  
python |
| 3    | 3.1: Climate change: Shortwave Radiation  
3.2: Climate change: Longwave Radiation  
**Zoom:** Build Your Own Earth |  
web |
| 4    | 4.1: Anthropogenic Climate change  
4.2: A historical perspective  
**Zoom:** The Charney Report discussion & term project examples |  
web |
| 5    | 5.1: Climate Sensitivity and Feedbacks (theory)  
5.2: Important Climate Feedbacks  
**Zoom:** Climate feedback exercise & term project examples/brainstorming |  
python |
| 6    | 6.1: Climate Variability-Interannual. Mechanisms, Impacts, Modeling  
6.2: Intro to Climate Datasets and Climate Variability Calculations  
**Zoom:** Connecting Climate Variability & Change to Applications |  
python |
| 7    | 7.1: Climate model development: Dynamical Core  
7.2: Climate model development: Parameterizations  
**Zoom:** Term project resources & discussion, team selection |  
web |
| 8    | 8.1: Climate model development: Model tuning.  
8.2: Model genealogy & uncertainty  
**Zoom:** Knutti et al. discussion, Submit Term project proposal |  
Knutti et al. 2013 |
| 9    | 9.1: Basic components of an Earth System Model.  
9.2: Intro to Climate Databases and raw Model output (CMIP).  
Example analysis: Temperature & wind changes in HI (model intercomparison)  
**Zoom:** Example discussion (python). Term project feedback in breakout rooms.  
Project milestone: complete lit review and data search |  
python |
| 10   | 10.1: Control experiments and model skill  
10.2: Equilibrium, transient & single-forcing experiments  
**Zoom:** Single-forcing exercise discussion.  
Project milestone: model-obs comparison (as needed) |  
panoply |
| 11   | 11.1: Climate data analysis & visualization in Python  
11.2: Examining ENSO simulations in a CMIP6 model |  
python |
<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
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<tbody>
<tr>
<td>12</td>
<td>Election Day</td>
</tr>
<tr>
<td>11.2</td>
<td>KNMI climate explorer. Online processing: Observations</td>
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<tr>
<td>11.2</td>
<td>KNMI climate explorer exercises (feedback)</td>
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<tr>
<td>13</td>
<td>Term Project components and Feedback: Write a scientific abstract</td>
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<tr>
<td>13.1</td>
<td>Project completion, feedback</td>
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<td>14</td>
<td>Thanksgiving</td>
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<tr>
<td>15</td>
<td>Class overview &amp; outlook. Knowledge Survey</td>
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<tr>
<td>14.1</td>
<td>Class overview &amp; outlook. Presentation tips &amp; logistics</td>
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<tr>
<td>16</td>
<td>Deadline to submit presentation videos. NO EXCEPTIONS. Assignment: Watch and critique presentations.</td>
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<tr>
<td>16</td>
<td>Lightning presentations. Take Home Exam passed out and discussed</td>
</tr>
<tr>
<td>17</td>
<td>Final Exam &amp; Project Poster DUE @ 4:15 pm</td>
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