Course	GEOS 498: *Global Climate Change* (Fall semester, 2018)
Instructor	Dr. Shane D. Mayor
Lectures	Mon. and Weds. from 4:00–5:15 PM in PHSC 213
Office hours	Mon. & Weds. from 1:00–2:30 PM and Fri. from 1:00–2:00 PM. (Please e-mail first. If not in office, look in lab: PHSC 128.)
Office	PHSC 117
Mailbox	Department of Geological and Environmental Sciences office (PHSC 217)
Phone	530–898–6337
E-mail	sdmayor@csuchico.edu
Class webpage	http://physics.csuchico.edu/~sdmayor/teaching/GEOS498_F18/index.html
Required Books	Goosse, H., *Climate System Dynamics and Modelling*, 1st Edition, ©2015, Cambridge University Press, 358 pages. Link. Gettleman, A. and R. B. Rood, *Demystifying Climate Models, A Users Guide to Earth System Models*, ©2016, Springer, 274 pages. Available on-line for free at publisher website. Hardcover or paperback available here.
Optional	Hartmann, D. L., *Global Physical Climatology*, 2nd Edition, ©2016, Elsevier, 485 pages. Link McGuffie, K. and A Henderson-Sellers, *The Climate Modelling Primer*, ©2014, Wiley Blackwell, 439 pages. Link Marshall, J. and R. A Plumb, *Atmosphere, Ocean, and Climate Dynamics*, ©2008, Academic Press, 319 pages. Link Brönnimann, S., *Climatic Changes Since 1700*, ©2015, Springer, 360 pages. Link IPCC, 2013: *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Stocker, T. F., D. Qin, G.-K. Plattner, M. Tignor, S. K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P. M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 1535 pp. Link
Course Overview	This 3-unit, upper-division, lecture-based course will focus on physical processes and energy imbalances in the atmosphere, ocean, and cryosphere that result in global climate change. It will also introduce students to climate system dynamics and climate modeling. Topics will include atmospheric radiative transfer; the effect of aerosol particles and greenhouse gases; the thermodynamics of moist air, clouds, and convection; the energy balance at the surface; the hydrologic cycle wth emphasis on precipitation and the cryosphere, general atmospheric and oceanic circulations; the global energy balance; and natural and anthropogenically forced climate change.
Prerequisites	GEOS 170. PHYS 202A or 204A and MATH 109 or MATH 120.

Note — This is a new course, taught for the first time. As such, it is likely that the student's experience will be different from that of the typical undergraduate course or a course that has been performed many times by the professor. Here, we blaze a new trail together and students take a larger role in their own education.

Course Grade — The course grade may be based on a number of homeworks, quizzes, exams, and assignments. Attendance will also be a factor.

Dropping — You may drop (or add) without obtaining permission until Friday, September 7. From September 8 to September 21, you must obtain permission from the instructor to drop. After Friday, September 21, you will need a serious and compelling reason to drop and your request must be approved by the Department Chair and the College Dean. Students adding after classes have started are responsible for obtaining a syllabus and lecture notes and making up any missed quizzes and assignments.

Etiquette — **Please do not eat in lecture.** The noises and smells may be a distraction for your peers. Plan your day so that you have adequate nourishment before class. Please silence mobile phones and put them away. Texting and surfing the web while in class is rude. Please do not hold conversations with neighbors during lecture. Also, please be mindful of the volume of your voices when in lab: voices carry and professionalism is important.

Please come to class on time. Walking in several minutes late is a distraction for everyone. We understand if it happens due to unforseen events or higher priority appointments, but chronic lateness projects a lack of maturity and respect, and it will be taken into account for your course grade.

Plagiarism — Plagiarism is a serious violation of academic integrity and when detected will result in a failing grade for the course and an incident report submitted to the Office of Student Judicial Affairs. For more information on plagiarism, please see the university's Academic Integrity webpage. If you still have a question about what plagiarism is and how to avoid it, please contact the instructor by e-mail or visit during office hours.

Disabilities — If you need course adaptations or accommodations because of a disability or chronic illness, or if you need to make special arrangements in case the building must be evacuated, please make an appointment with the instructor as soon as possible, or see me during office hours. Please also contact the Accessibility Resource Center (ARC) as they are the designated department responsible for approving and coordinating reasonable accommodations and services for students with disabilities. ARC will help you understand your rights and responsibilities under the Americans with Disabilities Act and provide you further assistance with requesting and arranging accommodations.

GEOS 498, *Global Climate Change*, Fall 2018, List of meeting dates and **tentative** schedule.

1	Mon.	27	Aug.	**Chapter 1: Description of the Climate System and Its Components**
2	Weds.	29	Aug.	1.2 The Atmosphere, 1.3 The Ocean
3	Mon.	3	Sept.	1.4 The Cryosphere
4	Weds.	5	Sept.	1.5 The Land Surface and the Terrestrial Biosphere
	Fri.	7	Sept.	*Last day to add or drop without special permission of instructor.*
	Mon.	10	Sept.	*Labor Day. Campus closed.*
5	Weds.	12	Sept.	**Begin Chapter 2: Energy Balance, Hydrological and Carbon Cycles**
6	Mon.	17	Sept.	2.1 The Earth's Energy Budget and 2.2 The Hydrologic Cycle
7	Weds.	19	Sept.	2.3 The Carbon Cycle
	Fri.	21	Sept.	*No adding or dropping after this date without Chair's and Dean's approval.*
8	Mon.	24	Sept.	Exam 1 on Chapters 1 and 2.
9	Weds.	26	Sept.	**Chapter 3: Modelling the Climate System**, 3.2 A Hierarchy of Models
10	Mon.	1	Oct.	3.3 Components of a Climate Model
11	Weds.	3	Oct.	3.4 Numerical Resolution of the Equations
12	Mon.	8	Oct.	3.4 Numerical Resolution of the Equations
13	Weds.	10	Oct.	3.5 Model Evaluation
14	Mon.	15	Oct.	3.6 Combining Model Results and Observations
15	Weds.	17	Oct.	**Chapter 4: Response of the Climate System to a Perturbation**
16	Mon.	22	Oct.	4.2 Physical Feedbacks
17	Weds.	24	Oct.	4.3 Geochemical, biogeochemical, and biophysical feedbacks
18	Mon.	29	Oct.	Exam 2 on Chapters 3 and 4.
19	Weds.	31	Oct.	**Chapter 5: Brief History of Climate: Causes and Mechanisms**
20	Mon.	5	Nov.	5.2 Internal Climate Variability
21	Weds.	7	Nov.	5.3 Reconstructing past climates
22	Mon.	12	Nov.	5.4 Climate since the Earth's Formation
23	Weds.	14	Nov.	5.5 The Last Million Years: Glacial-Interglacial Cycles
	Mon.	19	Nov.	*Thanksgiving Break. No classes held.*
	Weds.	21	Nov.	*Thanksgiving Break. No classes held.*
24	Mon.	26	Nov.	5.6 The Last Deglaciation and the Holocene
25	Weds.	28	Nov.	5.7 The Last Century
26	Mon.	3	Dec.	**Chapter 6: Future Climate Changes**
27	Weds.	5	Dec.	6.1 Scenarios
28	Mon.	10	Dec.	6.2 Climate Changes over the Twenty-First Century
29	Weds.	12	Dec.	6.3 Long-Term Climate Changes
30	Mon.	17	Dec.	Final Exam week begins (Chapters 5 and 6 on Final Exam)