## GHY 1011-101 – Global Climate Change – Spring 2020 MWF 11:00 – 11:50 AM – 293 Rankin Science West

| Professor:    | L. Baker Perry, Ph.D.  |
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| Office hours: | MWF 8:00 AM – 9:00 AM, 10:00 – 11:00 AM; F 2:00 – 4:00 PM, or by appointment |

**Course Description:** In this class students will acquire the scientific background and develop the skills necessary to understand elements of global climate change. The course will include a comprehensive study of physical patterns within the atmosphere, the interrelated processes that cause them, an examination of how the patterns and processes have changed through time due to both natural and anthropogenic forcing mechanisms, and projections of future change at various spatial scales. We will focus on the components of atmospheric science, the detection and attribution of past and present climate change, and projections for future climate change. Students will employ the scientific method to answer problems and address issues that complement the lecture material and focus on aspects of global climate change. In a series of field-based experiments, students will first develop a scientific hypothesis, collect data relevant to the hypothesis, examine the data using quantitative and graphic techniques, and reach conclusions about their stated hypothesis. In lecture, laboratory and through readings that focus on opposing viewpoints, students will be introduced to controversial issues in global climate change. Students will then discuss the methods, findings, and results supporting these opposing viewpoints. <u>Along with BIO 1103, GHY 1012, and GLY 1104, GHY 1011 is part of the Global Environmental Change theme in the Science Inquiry Perspective of the General Education program.</u>

## **Course Goals:**

*Thinking Critically and Creatively:* Within the laboratory sections students will acquire and examine some of the raw data that have guided scientists in making their conclusions about global change issues. Given the opportunity to evaluate these data, students will draw their own conclusions, thus enabling them to decide if data-guided decisions are scientifically valid. Students will be engaged in creative problem-solving through experiments that ask them to conceptualize a problem, define it, decide how to solve the problem, and convey information at each stage.

*Communicating Effectively:* Effective communication of research results is an important part of the scientific process. Exercises in the laboratory sections will allow students to develop their scientific writing skills by requiring them to formulate hypotheses, present results, and draw final conclusions. Additionally, students will be required to verbally defend their conclusions that, in turn, will be based on data analyses or reasoned analysis of refereed journal articles. During discussion (of readings or presentations they have attended), students will be required to verbalize their analyses and conclusions.

*Making Local to Global Connections:* A significant portion of the course content will be devoted to understanding how physical processes and patterns have developed within the Earth's atmosphere and how these have changed on various temporal scales, both naturally (e.g., the waxing and waning of ice ages in Earth's climate history) and as a result of human actions (e.g., land cover changes). Students will explicitly assess the role of humans as a forcing mechanism in global climate change.

Understanding Responsibilities of Community Membership: Out of both necessity (e.g., sharing of meteorological equipment) and design, students will be required to work in small groups on many of the exercises in the laboratory sections. Students also will work in small groups to discuss their positions on controversial issues related to global climate change and on selected course assessment exercises.

# **Required Text:**

Kauffman, C.M. 2017. *Our Changing Climate: Introduction to Climate Science*. American Meteorological Society, Boston, MA.

# Additional Readings will be available on AsUlearn

| Grading:                   |     |
|----------------------------|-----|
| Final Laboratory Grade     | 25% |
| Lecture Midterm Exams (3)  | 30% |
| Comprehensive Final Exam   | 20% |
| Attendance                 | 15% |
| Homework and Participation | 10% |

# Students must pass (i.e., a grade exceeding 60.0) both the lecture section components (exams, annotated bibliography, attendance) and the laboratory to pass this course.

**Exams:** Make up exams will only be given due to a verifiable emergency. <u>It is the student's responsibility</u> to contact the faculty member within 24 *hours* of the scheduled exam to request a makeup. Otherwise, the student will receive an automatic zero.

**Final Exam**: The final exam is cumulative and scheduled for May 1. <u>All students will take the final at this time</u>.

**Annotated Bibliography:** The annotated bibliography will consist of a summary of five refereed publications that address one of the global climate change themes or issues discussed during the semester. Additional information will be provided at a later date.

**Homework and Participation:** There will be a variety of homework and participation activities over the course of the semester. Assignments will be posted on AsUlearn.

Attendance: Course attendance is expected and will be taken on a routine basis. Two absences are allowed without penalty; each additional absence results in a 2.5-point deduction from your attendance grade.

# **Letter Grading Scale:**

| Highest | Lowest | Letter |
|---------|--------|--------|
| 100.0   | 93.0   | А      |
| 92.9    | 90.0   | A-     |
| 89.9    | 87.0   | B+     |
| 86.9    | 83.0   | В      |
| 82.9    | 80.0   | B-     |
| 79.9    | 77.0   | C+     |
| 76.9    | 73.0   | С      |
| 72.9    | 70.0   | C-     |
| 69.9    | 67.0   | D+     |
| 66.9    | 63.0   | D      |
| 62.9    | 60.0   | D-     |
| 59.9    | 0.0    | F      |

#### Statement of Student Engagement with Courses:

In its mission statement, Appalachian State University aims at "providing undergraduate students a rigorous liberal education that emphasizes transferable skills and preparation for professional careers" as well as "maintaining a faculty whose members serve as excellent teachers and scholarly mentors for their students." Such rigor means that the foremost activity of Appalachian students is an intense engagement with their courses. In practical terms, students should expect to spend two to three hours of studying for every hour of class time. Hence, a fifteen hour academic load might reasonably require between 30 and 45 hours per week of out-of-class work.

### Academic Integrity Code:

As a community of learners at Appalachian State University, we must create an atmosphere of honesty, fairness, and responsibility, without which we cannot earn the trust and respect of each other. Furthermore, we recognize that academic dishonesty detracts from the value of an Appalachian degree. Therefore, we shall not tolerate lying, cheating, or stealing in any form and will oppose any instance of academic dishonesty. This course will follow the provisions of the Academic Integrity Code, which can be found on the Office of Student Conduct Web Site: <u>www.studentconduct.appstate.edu</u>.

### **Students with Disabilities:**

Appalachian State University is committed to making reasonable accommodations for individuals with documented qualifying disabilities in accordance with the Americans with Disabilities Act of 1990, and Section 504 of the Rehabilitation Act of 1973. Those seeking accommodations based on a substantially limiting disability must contact and register with The Office of Disability Services (ODS) at www.ods.appstate.edu or 828-262-3056. Once registration is complete, individuals will meet with ODS staff to discuss eligibility and appropriate accommodations.

### **Statement on Homelessness and Food Insecurity:**

Any student who has difficulty affording groceries or accessing sufficient food to eat every day, or who lacks a safe and stable place to live, and believes this may affect their performance in the course, is urged to contact the Dean of Students, 324 Plemmons Student Union, for a list of resources and support. The ASU Food Pantry and Free Store is a free resource with pantry and personal care items, located in the Office of Sustainability on the bottom floor of East Hall.

| <u>Date</u> | Topic   | Readings                  |
|-------------|---|---------------------------|
| 13-Jan      | Introduction to Course                                  | Syllabus and Course Links |
| 15-Jan      | Defining Climate and Climate Science                    | Chapter 1                 |
| 17-Jan      | Observing Earth's Climate System I                      | Chapter 2                 |
| 20-Jan      | No Class MLK Holiday                                    |                           |
| 22-Jan      | Observing Earth's Climate System II                     | Chapter 2                 |
| 24-Jan      | Tools for Investigating Earth's Climate                 | Chapter 3                 |
| 27-Jan      | Radiation and Heat in Climate System I                  | Chapter 4                 |
| 29-Jan      | Radiation and Heat in Climate System II                 | Chapter 4                 |
| 31-Jan      | Global Atmospheric Circulation I                        | Chapter 6                 |
| 3-Feb       | Global Atmospheric Circulation II                       | Chapter 6                 |
| 5-Feb       | Catch-up, Discussion, and Review                        | Review                    |
| 7-Feb       | Exam I  | Study!                    |
| 10-Feb      | Water in Earth's Climate System I                       | Chapter 5                 |
| 12-Feb      | Water in Earth's Climate System II                      | Chapter 5                 |
| 14-Feb      | El Niño-Southern Oscillation                            | Chapter 7                 |
| 17-Feb      | Atmosphere-Ocean Oscillations                           | Chapter 7                 |
| 19-Feb      | Instrumental Surface Temperature Record                 | Chapter 8                 |
| 21-Feb      | Natural Drivers of Climate Change                       | Chapter 8                 |
| 24-Feb      | Feedbacks and Biogeochemical Cycles                     | Chapter 8                 |
| 26-Feb      | Anthropogenic Drivers I: Greenhouse Gases               | Chapter 8                 |
| 28-Feb      | Anthropogenic Drivers II: Aerosols and Landcover Change | Chapter 8                 |
| 2-Mar       | Catch-up, Discussion, and Review                        | Review!                   |
| 4-Mar       | Exam II   | Study!                    |
| 6-Mar       | Journey Into Climate: Dr. Paul Mayewski                 |                           |
| 9-Mar       | No Class Spring Break                                   |                           |
| 11-Mar      | No Class Spring Break                                   |                           |
| 13-Mar      | No Class Spring Break                                   |                           |
| 16-Mar      | Introduction to Paleoclimatology                        | Chapter 9                 |
| 18-Mar      | Ice Cores   | Chapter 9                 |
| 20-Mar      | Climates of Geologic Time                               | Chapter 9                 |
| 23-Mar      | Global Climate Models                                   | Chapter 10                |
| 25-Mar      | Climate Projections                                     | Chapter 10                |
| 27-Mar      | Extreme Events  | Chapter 10                |
| 30-Mar      | Precipitation and Drought                               | Chapter 10                |
| 1-Apr       | Tropical Cyclones                                       | Chapter 10                |
| 3-Apr       | Climate Surprises                                       | Chapter 10                |
| 6-Apr       | Catch-up, Discussion, and Review                        |                           |
| 8-Apr       | Exam III  |                           |
| 10-Apr      | No Class State Holiday                                  |                           |
| 13-Apr      | Ocean and Cryosphere Vulnerabilities                    |                           |
| 15-Apr      | Human and Ecosystem Vulnerabilities                     |                           |
| 17-Apr      | Climate Change Mitigation and Energy Use                | Chapter 12                |
| 20-Apr      | Geoengineering the Climate System                       | Chapter 12                |
| 22-Apr      | Human Needs, Actions, and Public Policy                 | Chapter 13                |
| 24-Apr      | Uncertainty and Scientific Consensus                    | Chapter 14                |
| 27-Apr      | Public Discourse of Climate Change                      | Chapter 14                |
| 29-Apr      | Catch-up, Discussion, and Review                        |                           |
| 1-May       | Final Exam (11:00 am - 1:30 pm) 4                       |                           |