

Version posted Aug. 28, 2022 (Please see <http://eclipse.montana.edu/syllabus.html> to make sure this is the most current version). Note space below for institution-specific content to include. For any questions, contact [nebp@montana.edu](mailto:nebp@montana.edu)

## **Introduction to Scientific Ballooning: The Nationwide Eclipse Ballooning Project (NEBP)**

*Atmospheric Science track*

**1-credit special topics course**

### **Course description**

This course offers an introduction to academic scientific ballooning and a NASA-funded project called the Nationwide Eclipse Ballooning Project (NEBP). The course previews an upcoming field campaign during which teams across the nation will launch weather balloons into the stratosphere and collect data during two solar eclipses: an annular eclipse on Oct. 14, 2023, and a total solar eclipse on April 8, 2024.

Students in this course will study past eclipse balloon flight campaigns and learn about common platforms and payloads; sensors, electronics and data loggers; communication with ground stations and the FAA regulations related to uncrewed balloon flights; and how to collect, analyze and share data. Additionally, students will acquire complementary skills that support a future STEM career, including teamwork, project management, communication and how to support Diversity, Equity, Inclusion and Access in STEM.

**Prerequisites:** None

### **Learning objectives**

Students who complete this course will:

- Identify the details of planning a scientific stratospheric ballooning field campaign
- Understand foundational information about eclipses, balloon flight trajectories, Earth's atmosphere and meteorology
- Understand how to carry out science/engineering balloon-launch campaigns during eclipses
- Apply best practices for collecting, analyzing and disseminating results
- Develop and apply STEM career skills such as communication, teamwork, project management
- Exemplify foundational principles of Diversity, Equity, Inclusion and Access in STEM

### **Materials**

No textbook is required for this course. Students will access scientific papers, multimedia modules, NASA websites and other resources. All materials are open source and will be provided electronically/online. Internet access is required.

*Institution-specific information:*

*Instructor, time of class and location office hours and location, communication, expectations, grading, attendance, drop/add dates, student code of conduct, institutional policies., etc.*

*We recommend your syllabus include resources on how you create an inclusive learning environment; links to resources for student well-being and disability accommodations; and a land acknowledgement that is appropriate for your institution.*

### **Tentative Schedule:**

#### *Week 1:*

- Introduction to Scientific Ballooning, NASA SciAct and the Nationwide Eclipse Ballooning Project (NEBP).
- Overview of how the course also includes non-technical STEM career skills, such as teamwork; communication; and project management.

#### *Week 2:*

- How to plan a field campaign – teamwork, roles, materials, scheduling.
- Introduction to Diversity, Equity, Inclusion and Access in STEM; STEM identity.

#### *Week 3:*

- Eclipses and heliophysics —historical, contemporary and worldviews.
- Citizen science and other NASA SciAct projects.

#### *Week 4:*

- Introduction to flight, meteorology and Earth's atmosphere.
- Weather Research and Forecasting Model (WRF).

#### *Week 5:*

- Ballooning for scientific data collection; Lessons learned from previous eclipse campaigns
- Mission planning—Project management, constraints, risks, safety and operations.
- Balloon trajectory predictions.

#### *Week 6:*

- Meteorology – Skew-t plots, temperature lapse rates
- Overview of radiosondes.

#### *Week 7*

- NEBP Big Picture: What happens on the Engineering Track

#### *Week 8*

- Meteorology: Sensors and instruments
- Gravity waves

*Week 9*

- Teamwork and communication; roles and responsibilities during a campaign

*Week 10*

- WRF for scientific ballooning.
- Satellite observations

*Week 11*

- Radiosondes and Standard Operating Procedures.

*Week 12*

- Data collection and analysis.

*Week 13*

- Final launch preparation: Schedule and timing of events pre- and post- flight; launch kits.
- Contingency planning
- FAA regulations related to unmanned balloon flights

*Week 14:*

- Wrapping up a field campaign.
- Data analysis.
- Communicating science to peers and to the public.

*Week 15/16:*

- Final assessments, projects, debriefs.
- STEM career exploration – next steps.