

Syllabus: AST 480: Astrophysics Capstone

Course Title: AST 480: Astrophysics Capstone

Semester: Fall 2024

Instructor: Dr. Kevin Lee

Email: klee@asu.edu

Office: SANCA 280C, The Polytechnic School, ASU

Office Phone: (480) 727-6000

Office Hours: Fridays 2:00-4:30 PM OR by appointment

Class Time & Place: Wednesday or Friday 3:00-4:15 PM in SANCA 285

Course Description:

This capstone course focuses on addressing fundamental questions in astrophysics through the design and analysis of models and experiments. Students will design, implement, and analyze an astrophysical experiment or model that explores a key question in the field. The course includes the development of a project proposal, model design, data analysis, and presentation of findings through a report and at the Innovation Showcase.

Course Objectives:

Design and implement an astrophysical model or experiment.

Analyze and interpret data from simulations or observations.

Validate the model against real-world data or existing theories.

Effectively present the project at the Innovation Showcase.

Learning Outcomes:

Gain expertise in astrophysical modeling and data analysis.

Develop practical skills in experiment design and implementation.

Improve communication skills through written reports and presentations.

Enhance the ability to manage astrophysics projects from conception to completion.

Group Project and Required Subtasks:

The group project for this course will involve the design and analysis of an astrophysical model or experiment that explores a fundamental question in the field. The project will be broken down into the following subtasks:

1. **Project Proposal (Week 3):**

- Create a proposal outlining the astrophysical question being addressed, the proposed model or experiment, and the anticipated outcomes. Include a timeline and assign roles to team members.

2. **Model Design and Simulation (Weeks 4-6):**

- Design the astrophysical model or experiment, and develop simulations to test its validity. Analyze data from existing telescopes or simulations to refine the model.

3. **Experiment Implementation (Weeks 7-10):**

- Implement the experiment or gather observational data. Test the model against real-world data to validate or refine the hypothesis.

4. **Data Analysis and Interpretation (Weeks 11-12):**

- Analyze the data collected, interpret the results, and compare them to existing theories or models in astrophysics.

5. **Final Report and Presentation (Weeks 13-15):**

- Document the entire research process, including design decisions, challenges, and outcomes in a final report.
- Prepare a presentation and poster for the Innovation Showcase that highlights the key aspects of the project.

Groups are expected to collaborate closely, meeting regularly to discuss progress and resolve any issues. Instructor check-ins will be scheduled to provide guidance and feedback.

Evaluation:

Class meetings (5): 20 points

Individual meetings (3): 12 points

Project Proposal: 10 points

Model Design and Simulation: 15 points

Experiment Implementation: 18 points

Data Analysis and Interpretation: 10 points

Final Report: 10 points

Presentation: 5 points

Poster: 10 points

Total: 100 points

Course Policies:

Attendance and Participation: Regular attendance and active participation are crucial for success in this course. Students are expected to attend all scheduled class meetings and individual sessions. If a student is unable to attend a class, they should inform the instructor in advance and arrange to complete any missed work.

Academic Integrity: All students must adhere to ASU's academic integrity policy. Any form of academic dishonesty, including plagiarism, will be reported and may result in severe penalties, including a failing grade for the course.

Accommodations: Students with disabilities or special needs should contact the ASU Disability Resource Center to arrange appropriate accommodations and notify the instructor as soon as possible.

Important Dates:

Class Week 1: Introductions & Project Brainstorming (Aug 26)

Individual Meeting #1: Discuss Ideas and Readings (Sep 4)

Class Week 2: Proposal Presentation & Group Feedback (Sep 18)

Individual Meeting #2: Proposal Feedback & Methods Discussion (Oct 2)

Class Week 3: Revised Proposal Presentation & CERTT Tour (Oct 23)

Individual Meeting #3: Data Analysis & Progress Review (Nov 13)

Class Week 4: Professional Development & Project Discussion (Nov 27)

Innovation Showcase: Final Presentations & Poster Display (Dec 6)