Course Syllabus: SPACE598 The Sun and the Heliosphere
Course Schedule: 9:00 AM - 10:30 AM, Tuesdays and Thursdays
Course Location: CSRB 2238
Instructor: Prof. Lulu Zhao
Email: zhlulu@umich.edu
Office Hours: Tuesdays 11:00 AM - 12:00 PM
Office Location: CSRB 2129C

Contact Information

For questions about the course material or logistics, feel free to reach out during office hours or by email. A response can generally be expected within 24 hours.

Course Description

This course explores the physics of the Sun, its structure, dynamics, and the solar eruptive events and their impact on the heliosphere. The course combines theoretical foundations with modern observational data and prepares students to engage in solar and space physics research.

Learning Objectives

This course is designed to familiarize the students with the important topics in the solar and heliospheric community and prepare the students for the future research. By the end of the course, students will be able to:

1. Understand the basic theories of the Sun, including solar convection, solar wind, and solar magnetic fields.
2. Understand the key solar phenomena such as sunspots, solar flares, coronal mass ejections (CMEs), and solar energetic particles (SEPs).
3. Explore the structure and dynamics of the heliosphere.
4. Evaluate the effects of solar activity on space weather and its impact for Earth and other planets.
5. Gain familiarity with observational and modeling techniques used in solar and heliospheric physics.

Prerequisites

1. Introductory physics (mechanics and electromagnetism)
2. Basic calculus
3. Introduction to Space Physics SPACE574

Course Format

Lectures: Conceptual explanations and discussions of solar and heliospheric physics.
The lectures will be given in person only. In exceptional situations the instructor might give some classes by zoom. The appropriate zoom link will be provided before time.
Projects: Exploration of current research questions in solar and heliospheric physics.

Grading

Projects (90%): Three projects.
Participation and Discussion (10%): Engagement in class discussions and activities.

Course Policies

Attendance: Regular attendance is encouraged. If you miss a class, you are responsible for catching up on the material.
Deadlines: Late submissions will incur a penalty unless prior arrangements are made.
Academic Integrity: Collaboration is encouraged, but all submitted work must be your own. Plagiarism or cheating will not be tolerated.
Accessibility: Students requiring accommodations should contact the instructor and the university's accessibility office.

Tentative Schedule

Week	Class	Time	Tentative Schedule
1	1	Jan. 9th	Introduction (rules+projects+schedule) solar interior
2	2	Jan. 14th	Solar atmosphere and solar wind
	3	Jan. 16th	Solar spectroscopy - Guest Lecture: Judit Szente
3	4	Jan. 21st	Solar magnetic field and solar cycle - **Project 1 release**
	5	Jan. 23rd	Solar magnetic field and solar cycle
4	6	Jan. 28th	CMEs
	7	Jan. 30th	CME generation and propagation - Guest Lecture: Nishtha Sachdeva
5	8	Feb. 4th	Project 1 presentation
	9	Feb. 6th	Project 1 presentation
6	10	Feb. 11th	Solar flares
	11	Feb. 13th	Magnetic reconnection - Guest Lecture: Fan Guo
7	12	Feb. 18th	SEPs
	13	Feb. 20th	Shock acceleration
8	14	Feb. 25th	CIRs - **Project 2 release**
	15	Feb. 27th	Outer heliosphere
9		Mar. 4th	Spring Break

		Mar. 6th	Spring Break
10	16	Mar. 11th	Project 2 presentation
	17	Mar. 13th	Project 2 presentation
11	18	Mar. 18th	Cosmic Rays
	19	Mar. 20th	Pickup ions
12	20	Mar. 25th	Radio emissions in the heliosphere
	21	Mar. 27th	Waves in the heliosphere
13	22	Apr. 1st	Modeling in the heliosphere - PIC
	23	Apr. 3rd	Modeling in the heliosphere - MHD - **Project 3 release**
14	24	Apr. 8th	Modeling in the heliosphere - Particle
	25	Apr. 10th	Space weather and its prediction
15	26	Apr. 15th	Space weather and its prediction
	27	Apr. 17th	Project 3 presentation
16	28	Apr. 22th	Project 3 presentation
	29	Apr. 24th	Final Project Feedback