Course Subject, Number and Title:
Astronomy 500: Techniques of Modern Observational Astrophysics

Credits: 3

Course URL: **http://**user.astro.wisc.edu/~mab/education/astro500/
Handouts, lectures and homework and readings will be posted.

Course Designations and Attributes
Level - Advanced
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Grad 50% - Counts toward 50% graduate coursework requirement

Meeting Time and Location: TR 9:30-10:45 PM, 4421 Sterling

Instructional Mode: synchronous

How Credit Hours are met by the Course: Traditional Carnegie Definition – One hour (i.e. 50 minutes) of classroom or direct faculty/instructor instruction and a minimum of two hours of out of class student work each week *per credit* over approximately 15 weeks, or an equivalent amount of engagement over a different number of weeks. This is the status quo and represents the traditional college credit format used for decades. This class has regular classroom meetings and assigns homework, reading, writing, and preparation for quizzes and exams.

INSTRUCTORS AND TEACHING ASSISTANTS

Instructor Title and Name: Professor Matthew Bershady

Instructor Availability: Office hours will be 1:15-2:00PM on Tuesdays by appointment, held via zoom.

Instructor Email / Preferred Contact: mab@astro.wisc.edu

Teaching Assistant: N/A
TA Office Hours: N/A
TA Email/Preferred Contact: N/A

OFFICIAL COURSE DESCRIPTION

Course Description: An introduction to astrophysics data collection. Students will be familiarized with the concepts, techniques, skills and resources needed to plan, obtain, reduce and interpret observations of astronomical objects.

Requisites: None

LEARNING OUTCOMES

Course Learning Outcomes: The course outline attached to the course web page details the topics and concepts the student will be expected to master by the end of the course. In addition, the student will acquire a proficiency in computing quantities associated with and that characterize astronomical flux systems, source detection and signal-to-noise, optical imaging and spectroscopic instruments, and telescopes. Conceptual mastery and computational proficiency will be fostered and evaluated on the basis of homework problem-sets and exams.

GRADING

- The approximate weights will be given to your final grade:
  | Midterm-1 30% | Midterm-2 30% | Projects 25% | Participation 15% |

DISCUSSION SESSIONS: N/A

LABORATORY SESSIONS: N/A

REQUIRED TEXTBOOK, SOFTWARE & OTHER COURSE MATERIALS

- Textbooks: While there is no single good text for this course, the following are valuable references for this course and in a future astronomical career. The McLean text is recommended. All of you should look carefully at all the texts, on reserve in the Astronomy Library. If you find them useful, I recommend you purchase your own copies. Walker, Kitchin, and Gray are paperbacks.

  Recommended:
  - McLean, “Electronic Imaging in Astronomy,” Wiley

  Suggested:
  - Gordon Walker, "Astronomical Observations," Cambridge Univ. Press.
  - Daniel Schroeder, "Astronomical Optics," Academic Press

  Other Useful References:
  - Kitchin, "Astrophysical Techniques," Adam Hilger, Ltd
  - Bevington & Robinson, "Data Reduction and Error Analysis for the Physical Sciences," McGraw-Hill
  - David Gray, “The Observation and Analysis of Stellar Photospheres,” Cambridge U. Press
  - Cox, “Allen’s Astrophysical Quantities,” Athlone Press

- Software*:* You will need access to a computer with astronomical imaging software which may include IRAF, python (and suitable libraries) or IDL.

EXAMS, QUIZZES, PAPERS & OTHER MAJOR GRADED WORK

- There will two Midterms (in-class) and no final exam. Exams will be in class and closed-book, closed-note, with access to electronic devices only for rudimentary arithmetic calculations.

PROBLEM-SETS & PROJECT ASSIGNMENTS

- There will be a 5 problem sets distributed over the semester for your own work.
    - Your solutions are not to be handed in; you are not graded on these.
    - You are encouraged to work with your class-mates to solve the problems.
    - Solutions will be posted for your exam preparation.
- Two projects will be assigned. You are again free to discuss these with your classmates, but you must show your own reasoning and write up your own report.
    - These reports are part of your graded course work.
    - Your reports must be legible, written in standard English, organized, and concise. They may be illustrated as needed, with illustrations clearly explained.
    - Your reports will be transmitted electronically.

OTHER COURSE INFORMATION

- Handouts, lectures and homework and readings will be posted on the course url given above.

RULES, RIGHTS & RESPONSIBILITIES

- See the Guide's Rules, Rights and Responsibilities

ACADEMIC INTEGRITY

By enrolling in this course, each student assumes the responsibilities of an active participant in UW-Madison's community of scholars in which everyone's academic work and behavior are held to the highest academic integrity standards. Academic misconduct compromises the integrity of the university. Cheating, fabrication, plagiarism, unauthorized collaboration, and helping others commit these acts are examples of academic misconduct, which can result in disciplinary action. This includes but is not limited to failure on the assignment/course, disciplinary probation, or suspension. Substantial or repeated cases of misconduct will be forwarded to the Office of Student Conduct & Community Standards for additional review. For more information, refer to studentconduct.wiscweb.wisc.edu/academic-integrity/.

ACCOMMODATIONS FOR STUDENTS WITH DISABILITIES

McBurney Disability Resource Center syllabus statement: "The University of Wisconsin-Madison supports the right of all enrolled students to a full and equal educational opportunity. The Americans with Disabilities Act (ADA), Wisconsin State Statute (36.12), and UW-Madison policy (Faculty Document 1071) require that students with disabilities be reasonably accommodated in instruction and campus life. Reasonable accommodations for students with disabilities is a shared faculty and student responsibility. Students are expected to inform faculty

[me] of their need for instructional accommodations by the end of the third week of the semester, or as soon as possible after a disability has been incurred or recognized. Faculty [I], will work either directly with the student [you] or in coordination with the McBurney Center to identify and provide reasonable instructional accommodations. Disability information, including instructional accommodations as part of a student's educational record, is confidential and protected under FERPA." http://mcburney.wisc.edu/facstaffother/faculty/syllabus.php

DIVERSITY & INCLUSION

Institutional statement on diversity: "Diversity is a source of strength, creativity, and innovation for UW-Madison. We value the contributions of each person and respect the profound ways their identity, culture, background, experience, status, abilities, and opinion enrich the university community. We commit ourselves to the pursuit of excellence in teaching, research, outreach, and diversity as inextricably linked goals.

The University of Wisconsin-Madison fulfills its public mission by creating a welcoming and inclusive community for people from every background – people who as students, faculty, and staff serve Wisconsin and the world." https://diversity.wisc.edu/

CODE OFCONDUCT

- The Astronomy Department Code of Conduct is applicable to this course. See http://www.astro.wisc.edu/about-us/code-of-conduct/.