

# AST 103L : Astronomical Observations

Spring 2019, Unique Number: 46570

*Classroom:* RLM 13.132, *class time:* Monday 7 - 9 PM

**Instructor:** Pawan Kumar  
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## Purpose

The point of this course is to understand the observations that astronomers make and how they are explained by theory.

## Prerequisites

You should understand some basic astronomy and mathematics (algebra and how to use a scientific calculator).

## Materials

You need a scientific calculator, or something that functions as one.

## Grading

There will be one assignment for each week ( $N$  assignments total) and 100% of your grade is from these. All assignments are worth 100 points, and your final numerical grade is:

$$\text{final grade in percent} = \frac{P}{(N-1)100} \times 100\%$$

where  $P$  is your total number of points. **All assignments will be done in class and you have to be present in order to receive any credit.** All labs carry equal weightage for the final grade. The final letter grade is determined from:

Grading Scale	
Grade	Final Score
A	94-100 %
A-	90-94 %
B+	86-90 %
B	82-86 %
B-	78-82 %
C+	75-78 %
C	72-75 %
C-	69-72 %
D+	66-69 %
D	63-66 %
D-	60-63 %
F	0-60 %

## Course Website

We will use Canvas as the course website. The syllabus, worksheets and all announcements will be posted there.

## Academic Honesty

You will work together in groups. There will be a section on each worksheet for your name and your group member names. Typically each member of your group will make a measurement, and you will record all measurements on your worksheet. You have to fill out your worksheet yourself, and write the name of the person who made the measurements beside each measurement. You can do calculations together, but everyone should participate and only you should write anything on your worksheet. **Your completed lab should always include date, day, your name and the names of all people in your group.**

## Attendance

**Please notify me at least a week in advance if you are going to miss a lab.** There are three sections for this course: Monday, Tuesday and Wednesday - from 7-9 pm at RLM 13.132. **If you cannot make it to your assigned section for a particular week, you can be accommodated in another section but only with prior notice. Absence from a lab is acceptable only in case of a documented illness.**

## Students with Disabilities

If you need academic accommodations, please contact 471-6259 (voice) or 232-2937 (video) as soon as possible. I will need an official letter outlining authorized accommodations.

# Learning Objectives

By the end of the semester you should understand the following:

1. How astronomers use parallax to measure distances to nearby stars
2. The relation between distance, size, and how big something looks
3. The relation between distance, how bright something looks, and how bright something intrinsically is
4. How to determine the speed of an object by how it moves on the sky
5. The basic properties of light (wavelength, energy, mass, speed, polarization, intensity)
6. How to determine the chemical composition of a star/galaxy from its spectrum
7. How to determine the speed of a star/galaxy from its spectrum
8. How to calculate the age of the universe from measurements of the speed and distance of galaxies
9. What the apparent and absolute magnitude of an object means and how to derive these quantities from fundamental properties like temperature, radius, and distance
10. How to calculate time dilation, length contraction, and relative velocity in special relativity
11. How to calculate gravitational time dilation, gravitational redshift, and the Schwarzschild radius, Hawking temperature, luminosity, and lifetime of a black hole in general relativity
12. The basic properties of a planet's orbit around a star such as eccentricity, semimajor axis, period, distance and speed at periapsis, and distance and speed at apoapsis
13. How extrasolar planets are detected and their properties determined
14. How the temperature of a planet is determined by the temperature, radius, and distance to the star it orbits and the chemical composition of its atmosphere