

**PHYS 1401 (all sections): Astronomy Laboratory**  
**Syllabus for Spring 2020, M 2:30-5:25 pm, R 2:30-5:25 pm**

Instructor: Dr. Wayne Keith: 793-3874, [keith.wayne@mcm.edu](mailto:keith.wayne@mcm.edu)  
 Office Hours: S 110-C: MTWRF 9-11, and MWF 1-2:30  
 Web: <http://www.mcm.edu/~keith.wayne>  
 Text: Online lab handouts (on Moodle)  
 Required: tablet PC, scientific calculator, paper, pencil

**Lab Description:** This laboratory course is intended to compliment the Astronomy lecture by giving the student real-world hands-on experience with the phenomena discussed in class. In-class worksheets will be required for all labs, as well as typed lab reports for a few selected labs (see guidelines on back). Worksheets are due at the end of the lab period for which they are completed and reports are due at the beginning of the lab period the week following the performance of the lab.

**Lab Goal:** Acquaint the student with scientific laboratory techniques and emphasize the underlying physical principles of astronomy.

**Grading:** Your final grade (25% of the lecture grade) will be determined by averaging all submitted lab grades (worksheets and reports). Each item is therefore 1.67% of your final grade.

**Observing:** One lab during the semester will meet at a special place and time to observe the sky with telescopes. Details regarding the place and time will be announced during the semester.

**Attendance/Make up policy:** Failing to attend the lab meeting and/or not submitting a worksheet or lab report on time will result in a zero. No grades will be dropped, but if you cannot make a lab meeting, contact the instructor to see if you qualify to make it up.

**Phys1401 Lab Schedule**

All lab procedures are tentative and subject to change except **bold** dates.

Dates	Lab #	Laboratory	Items Due
1/13, 1/16	1	Scale of the Solar System	Worksheet
<b>1/20</b>		<b>No Lab – MLK</b>	
1/23, 1/27	2	Celestial Sphere	Worksheet
1/30, 2/3	3	Orbital Mechanics	Worksheet
2/6, 2/10	4	Simple Lens	Worksheet and Report
2/13, 2/17	5	Wavelength of Light	Worksheet and Report
2/20, 2/24	6	CLEA – HR Diagram	Worksheet
2/27, 3/2	7	Telescope Observing	Worksheet
<b>3/5, 3/9</b>		<b>No Lab – Spring Break</b>	
<b>3/12, 3/16</b>		<b>No Lab – Spring Break</b>	
3/19, 3/23	8	Nature of Light	Worksheet and Report
3/26, 3/30	9	CLEA – Dying Stars	Worksheet
4/2, 4/6	10	CLEA – Hubble Redshift	Worksheet
<b>4/9, 4/13</b>		<b>No Lab - Easter</b>	
4/16, 4/20	11	Trip to Mars	Worksheet
4/23, 4/27	12	CLEA – Astrometry	Worksheet
4/30, 5/4		Make Up Labs	
<b>5/7</b>		<b>No Lab</b>	

**Worksheets and Reports:** Worksheets should be printed and completed on hardcopy, reports should be submitted electronically on Moodle.

### **Astronomy Lab Report Guidelines**

A formal report is required of each student for selected experiments. Reports must be typed and will be judged on English usage as well as scientific content. The report should contain *and identify with section headings* the following items:

1. Identification: Name of author and co-experimenters, name and number of experiment, date experiment was performed. (5 points)
2. Abstract: A simple statement of the objectives of the experiment followed by a single comment about how well those objectives were met. Report any important numerical results. (5 points)
3. Apparatus: A list of the equipment used in the lab. Unfamiliar pieces of equipment should be described and diagrams should be included when possible. (10 points)
4. Theory: Discuss the underlying physical principles of the lab. Define new terms and give any mathematical formulae used. Explain how the formulae are used and what the variables stand for. (15 points)
5. Procedure: A brief, past tense narrative of what you actually did and why you did it. **This must be in the student's own words.** (10 points)
6. Data: Provide a table of the measurements made during the laboratory. Include units on all measurements. (10 points)
7. Analysis: provide a table of any calculations carried out using the measurements taken. Present any graphs made of your measurements. *Analyze* your results; tell me what the numbers actually mean. Discuss any graphs; tell me what you learned from them. Discuss any sources of uncertainty or how the measurements might have been improved. (15 points)
8. Conclusion: A brief discussion of what you conclude from your measurements and calculations. Mention any important numerical results. Make sure your conclusions are related to the principles discussed in the Theory section. (15 points)

The final 15 points will be given for the overall layout, organization, mechanics, grammar, and spelling of the write up.