

PHYSICS M20C LAB SYLLABUS

SPRING 2019

PROFESSOR: H. FRED MEYER

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OFFICE HOURS: 10:00 am to 11:00 am Thursdays

LAB MANUAL: Physics M20C Lab Manual, V1.5, C. Harper, Sunshine Publishing (2016)

The course prerequisite is Physics M20BL, the co-requisite is Physics M20C lecture. If you have not taken, or are not taking Physics M20C lecture, you should not be in this class. If you drop the lecture portion of the class, you will be dropped from the lab as well.

Course description: This is the laboratory course for third semester calculus-based physics encompassing wave motion, optics, and modern physics. The labs reinforce the concepts learned in the lecture part of the course and go into more depth on measurements and uncertainties.

Course Objectives: Upon successful completion of the course you will be able to:

- analyze real-world experimental data, including appropriate use of units and significant figures.
- relate the results of experimental data to the physical concepts discussed in the lecture portion of the class.
- assemble and perform experiments in wave motion, optics, and modern physics following instructions in the laboratory manual.
- measure and record the data, including estimated uncertainty, using appropriate units.
- reduce and analyze data, calculate experimental uncertainties, produce and analyze graphs, and summarize the experiment and its results using an appropriate technical writing style.
- critically evaluate the experimental results and procedures using accepted values and other relevant information, and draw conclusions regarding the efficacy of the experimental procedure.
- suggest changes to the experimental procedure which, if implemented, could reduce the experimental uncertainty and/or error.
- suggest practical applications for the values measured, conclusions reached, or methods utilized in the experiment.

Course Learning Outcomes: In addition to the above this course will also develop the following skills and knowledge:

- Students completing PHYS M20C/M20CL will be able to discern between relevant and irrelevant evidence, formulate appropriate hypotheses, and distinguish between experiments to determine which one(s) leads to an appropriate conclusion.
- Students completing PHYS M20C will be able to analyze problems from Wave Mechanics, Optics, and Modern Physics and will be able to recognize and apply equations to solve problems.
- Cultivating problem solving and decision making skills to understand the scientific method and use the different parts to study the physical world.
- Developing critical creative and dialog thinking. Being able to recognize advanced concepts and the essence of problems involving Wave Mechanics, Optics, and Modern Physics.
- Cultivating problem solving skills and decision making capabilities. Taking advanced principles to solve problems involving Wave Mechanics, Optics, and Modern Physics.

Assignments:

Students shall read the lab experiment prior to coming to lab class and complete any pre-lab assignment. **The pre-lab assignments will be handed at the beginning of the lab period otherwise, points will be deducted.** If the availability of equipment allows, students shall work in groups of two and take the necessary data during class time. All students shall keep their own data sheet and record their own data. This data sheet must be signed by the professor prior to leaving class. Plan on spending the full class period in the lab. Data sheets will be signed at the end of class or when all data has been taken and all calculations completed. When finished with taking data, before putting away equipment, analyze the data, including graphing, as time permits. Doing so will often indicate if more data is needed. **Each student should do their own calculations and compare them with their partner's calculations and results. Laboratory reports will be required for each lab and each student is to do their report independently. Any joint writing will result in an "F" on that report.**

All lab reports are due at the beginning of the class period at the class period following the class period when the experiment was performed. **Late reports will not be accepted.** Students should have access to Microsoft EXCEL and WORD (with equation editor) in order to write reports.

Attendance: Attendance at each lab session is required. You cannot use another student's data, you must take your own and use it. **Unless prior arrangements have been made with your instructor, there are no make-up labs. If one lab is missed, the lowest grade earned on any lab for the semester will be assigned. If a second lab is missed, a grade on zero will be assigned**

Grading: Most labs are one period labs and are worth twenty points each. Some labs may be worth forty points on a selected basis. You will be told in advance if a lab is worth forty points. Ten points is assigned by the professor based on the student's attitude and behavior in the laboratory. A grade of "A" is assigned for a score of 90% or better, "B" for 80% to 90%, "C" for 70% to 80%, "D" for 60% to 70% and "F" for below 60%.

If you should decide to drop the class, you must do it before the deadline listed in the schedule of classes or a grade will be assigned. **Dropping the class is the student's responsibility, not the instructors.**

No smoking, vaping, no texting, no phone calls, and no eating allowed in the classroom. Drinking is only allowed from containers which are spill proof.

Any lab reports not given back to the students by the end of the last lab session will be destroyed.

**Drop dates: Jan 27-last day to drop without a W
April 19-last day to drop with a W**

Students with a disability, whether physical, learning, or psychological, who believe they need accommodations in this class are encouraged to contact ACCESS soon as possible so accommodations can be set up in a timely fashion. Accommodations are based on eligibility and can only be provided if you have submitted verification from ACCESS in the form of a Confidential Memo. The ACCESS office can be reached at 805-378-1461 and is located in the LMC building.

Contact information:

Mary Reese, Science, Math Division Dean, office AC233, phone 805-378-1572
Department Chair: Dr. Erik Reese, PS-233, 805-378-1488

PHYSICS M20CL THURSDAY LAB SCHEDULE-SPRING 2019

DATE	LAB
1/10/2019	ERROR PROPAGATION -HANDOUT
1/17/2019	Melde's Experiment WM-1
1/24/2019	Speed of Sound in Air (formal report) HANDOUT
1/31/2019	Speed of Sound in Thin Metal Rods WM-3
2/7/2019	The Index of Refraction of Glass and Water O-1
2/14/2019	Minimum Angle of Deviation-Prism –handout
2/21/2019	Ray-Tracing Lab, Part I– Handout
2/28/2019	Ray-Tracing Lab, Part II– Handout
3/7/2019	Spherical Concave Mirrors and Thin Lenses O-3

3/14/2019	Systems of Thin Lenses O-4
3/21/2019	Polarization-handout
3/28/2019	Spring Break
4/4/2019	Young's Double Slit O-5
4/11/2019	Electron Diffraction (a formal lab) MP-2
4/18/2019	Hydrogen Spectrum/Rydberg Constant MP-1
4/25/2019	MAKE-UP LAB DAY
5/2/2019	Gamma Absorption in Lead (L12)
5/9/2019	Final

SCHEDULE AND SYLLABUS ARE SUBJECT TO CHANGE