

PHYS 3270: Advanced Physics Laboratory
Course Syllabus for Spring 2012, W 1:00-4:55 pm

Instructor: Dr. Wayne Keith: 793-3874, keith.wayne@mcm.edu
Office Hours: S 110-C: MF 1-2:30, R 11-12, F 10-12, and R 2:30-5:30
Web: <http://www.mcm.edu/~keith.wayne>
Text: On Moodle

The texts from 2520 (University Physics) and 3300 (Modern Physics) are useful.

Required: tablet PC, lab notebook, scientific calculator, paper, pencil
Pre-requisites: PHYS 3300 (Modern Physics)

Course Description: This is a required course for physics majors. This course is intended to advance the student's practice and experience in physical measurements and serve as an introduction to the techniques and instruments used in experimental research in optics, atomic and nuclear physics, and astrophysics. This is an experience-enriched course.

Grading: 75% Lab reports: See below and lab report grading guidelines on Moodle for details.
10% Student-leader performance: The grade will be based on the quality of the lecture, leading the class through the experiment, and feedback received from other students in class.
15% Final group project: (5% for final presentation, 8% for final group report, 2% peer review inside of the group).

Classroom Rules: Students are expected to be present and on-time for all class meetings. In the case of excused absences, advance notice should be given to the instructor so that alternate plans can be made for the missed activities. **All** make up work must be authorized by the instructor. Computers should be used in class for course-related purposes only; violators will forfeit the use of their computer during class for a period of time up to the remainder of the semester.

ADA Policy: If you have a documented disability that may impact your performance in this class and for which you may require accommodations, you must be registered with and provide documentation of your disability to the Disability Services Office, President Hall, 793-4880.

Final notes: Class discussion is strongly encouraged; please feel free to ask questions, during class or outside of class, about anything that is not clear. All students will prepare a lecture to introduce at least two of the lab activities. It is important to properly prepare for your lecture so that you and the rest of the class will know how to perform the experiment.

Lab Reports: A formal written report should be written for each experiment. Reports may be written as a group, with one student writing a draft and the other revising and editing. Both the draft and the final report must be submitted via Moodle by the appropriate deadlines. The "lead author" roll will be assigned by the instructor for each experiment. Late work **WILL NOT BE ACCEPTED** without prior permission from the instructor.

Group Project: The last several weeks of the semester will be devoted to a large experimental project or projects undertaken by the class in conjunction with CHEM3432 (Physical Chemistry II Laboratory) students. The entire combined class will be working on creating additional laboratory experiments and/or data analysis to be used in Advanced Physics Lab or Physical Chemistry Lab in future years. Particular roles will be assigned to every student working on the project or projects; active contribution from every student is expected.

PHYS 3270 Spring 2012 Course Schedule

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

Date	Lab #	Topic
1/18	0	Introduction, Syllabus Lecture: Error Analysis and Experimental Techniques
1/25	1	Ratio of heat capacity at constant pressure to heat capacity at constant volume for an ideal gas
2/1	2	Millikan oil drop and the charge of the electron
2/8	3	Ratio of charge to mass for the electron
2/15	4	Interference
2/22	5	Diffraction
2/29	6	Dispersion and Spectroscopy
3/7	7	Photoelectric effect (with chem3432)
3/14		Spring Break
3/21	8	Black Body Radiation
3/28	9	Nuclear Experiments: Part 1
4/4	10	Nuclear Experiments: Part 2
4/11	11	Final Group Project With chem3432 Creation and testing of new experiments to be used in Advanced Physics Laboratory (and/or Physical Chemistry II)
4/18		
4/25		
5/2		
5/9		
		Presentation of the Group Project

Course objectives and goals	Linked to which departmental program goal(s)	Linked to which institutional goal(s)?	Types of evidence used to demonstrate student achievement of objectives & goals
Students will enhance their understanding of the basic concepts of Electromagnetism, Optics, Atomic and Nuclear Physics introduced in University and Modern Physics courses	<ul style="list-style-type: none"> - to enhance non-physics science majors' understanding of science through the application of the scientific process into disciplines that overlap their interests, but view the material from a different perspective, thereby providing a richer understanding of the interconnectedness of their discipline to other fields - to prepare physics graduates for a wide range of career opportunities including not only graduate study in physics, engineering, pre-med, or other sciences; but also, science teaching and careers in industry and science-related business 	1, 2, 3, 8	Successful completion of the pre-lab lectures as a student-leader. Successful completion of the "theory" sections in the lab reports and presentations.
Students will improve their laboratory techniques and proficiency in the use of laboratory equipment.	<ul style="list-style-type: none"> - to prepare physics graduates for a wide range of career opportunities including not only graduate study in physics, engineering, pre-med, or other sciences; but also, science teaching and careers in industry and science-related business 	1, 2, 3, 8	Successful completion of the "equipment" and "experimental procedure" sections in the lab reports and presentations.
Students will sharpen their data analysis skills and the ability to use the appropriate computer software for the error analysis.	<ul style="list-style-type: none"> - to enhance non-physics science majors' understanding of science through the application of the scientific process into disciplines that overlap their interests, but view the material from a different perspective, thereby providing a richer understanding of the interconnectedness of their discipline to other fields - to prepare physics graduates for a wide range of career opportunities including not only graduate study in physics, engineering, pre-med, or other sciences; but also, science teaching and careers in industry and science-related business 	1, 2, 3, 8	Successful completion of the "data" and "analysis" sections in the lab reports and presentations.

Institutional Goals:

1. Students acquire an education shaped by Christian values.
2. Students are equipped for successful careers and post-graduate education.
3. Students acquire an enthusiasm for lifelong learning through expanded intellectual and cultural experiences.
4. Students, in a community where leadership is cultivated, acquire a solid basis for future lives of leadership.
8. The institution will engage in an ongoing pursuit of excellence in curricula, programs, and policies.