

PHYSICS 335

FALL 2009

Lecturer: Prof. Michael A. Kovash
Office: C-P 371, 257-1150
Office Hours: M-W-F 9:00 - 10:00
and by appointment
e-mail: kovash@pa.uky.edu

Physics 335 is intended to provide students with a working knowledge of the techniques of data and error analysis used by physicists in a laboratory setting. Although the emphasis of the course will be on developing practical methods by which data can be analyzed, our discussion will be broad enough to provide an understanding of the basis for these techniques, as well as their limitations.

The explicit goals of this course are:

- To develop a working knowledge of the statistical techniques by which the results of laboratory measurements are used to determine best-fit estimates of physical parameters,
- To develop methods for estimating the uncertainties associated with parameters that are derived from measurements, and
- To learn respect for both the power and the limitations of numerical answers to ‘real-life’ physics problems.

Classwork will consist of regular lectures on topics taken directly from the book, *Data Reduction and Error Analysis for the Physical Sciences*, third edition, by Philip R. Bevington and D. Keith Robinson. Students will find it advantageous to read the assigned sections of the text *before* they arrive for class. Homework problems from the textbook will be assigned to accompany most lectures; students should put in the time and effort required to solve all of these exercises. We will hold regular ‘homework days’ during which problem solutions will be given and student answers will be collected. Two problems from each homework set will be graded.

Students are not discouraged from working together on the homework assignments. However, given that a large part of the learning process occurs while searching for the homework solutions, students are warned not to become a weak, non-contributing member of a homework coalition. For these students, the proper alternative is to seek help from the instructor.

Two exams will be given: one, a take-home exam, will be given near the mid-point of our

coverage of the material in the text; a second in-class hour exam will be given at the end of our lectures. There will not be a final exam in this course. All written tests will consist of problems similar to, but not the same as, those assigned for homework. Students should use a non-programmable calculator to solve the exam problems.

Working in small teams, every student will collect data on the process of impact cratering this semester. Then, everyone will do their own analysis of those data and prepare a technical report covering both their analysis as well as an interpretation of their results. The technical report project will be graded on a pass/fail basis, and everyone must pass this component to pass the course. Reports which are judged to be lacking in some aspect will be returned to the student for correction.

Students with a valid excuse for missing an exam should discuss it with the instructor before the exam, if possible. A student who misses an exam must take a make-up exam. Students must complete both written tests and the technical report to receive credit and a grade for the course.

Final numerical scores will be based upon the following point tally: take-home exam, 100 points; hour exam, 100 points; and homework scores, 100 points. Final letter grades will be assigned according to a 'curve' of the final point distribution. Students who have chronically poor class attendance will be explicitly penalized in their final grade. Students whose final technical report is judged to be in the top 20% of the class will have their course grade boosted by one letter grade; students in the next 20% will receive a boost of 1/2 letter grade (a low B remains a B, but an above-average B becomes an A).

PHY 335 is a one-hour class, but the schedule book shows class meeting times that are appropriate to a three-hour class. Instead of following the published schedule, we will meet on Tuesdays and Thursdays from 9:30 - 10:20, and we will complete the course by late October.

Your instructor will be available during office hours, and at other times by appointment, to help you learn and use this material. **Take advantage of that opportunity.**

Course evaluations are an important component of our Department's instructional program. An on-line course evaluation system was developed to allow each student ample time to evaluate each component of the course and instructor, thus providing the Department with meaningful numerical scores and detailed commentary while minimizing the loss of instructional time in the classroom. To access the system, simply go to the Department of Physics Web page at www.pa.uky.edu and click on the link for Course Evaluations; then follow the instructions. You will need to use your student ID# to log into the system, and this will also allow us to monitor who has filled out evaluations. However, when you log-in you will be assigned a random number that will keep all your comments and scores anonymous.

DAILY ASSIGNMENTS

	DATE	LECTURE (9:30 - 10:20)	READ	HOMEWORK
R	27 Aug	Introduction; Goals	Ch. 1&2	1.1-3
T	1 Sep	Probability; Moments		1.4-7
R	3 Sep	Binomial Distribution		2.2-6
T	8 Sep	Homework Day Distribute Crater Project		
R	10 Sep	Poisson Distribution		2.12,13
T	15 Sep	Gaussian Distribution		2.10,16,18
R	17 Sep	Error Propagation	Ch. 3	3.1,2,5,9
T	22 Sep	Homework Day TAKE-HOME EXAM – Ch. 1,2,3		
W	23 Sep	TAKE-HOME EXAM DUE BY 4 P.M.		
R	24 Sep	Maximum Likelihood	Ch. 4	4.1,5,7
T	29 Sep	χ^2 Distribution		4.13,14
R	1 Oct	Homework Day		
T	6 Oct	Least Squares – Linear	Ch. 6	6.1,4
R	8 Oct	Least Squares – Linear		6.5 (use $\sigma_i = 0.02 \times L_i$; L is position, not extension; mass in grams)
T	13 Oct	Least Squares – Nonlinear		
R	15 Oct	Homework Day		
T	20 Oct	HOUR EXAM – Ch. 4,6		
R	22 Oct	CRATER PROJECT DUE		