PHYS222: Modern Physics
Spring 2006

Teacher: Dr. Kelly Krieble Office: Room 109, Collier Hall of Science Phone: ext. 1437 e-mail: krieblek@moravian.edu	Classroom: CHS 107 M,W,F 9:10-10:00 Th 10:20-11:10 Lab: CHS 107 M 12:45-3:45
	Office Hours: By appointment

Course Text: **Modern Physics for Scientists and Engineers**, 2nd ed., Thornton and Rex.

Course Objectives: The primary aim of this course is to provide students with a working knowledge of the concepts leading to the breakdown of classical physics and the emergence of modern quantum theory. The course material follows an historical approach, and contains a substantial experimental and writing component. Students will learn and develop mathematical and physical techniques for solving a wide range of problems. In the laboratory portion of the course students will learn about experimental design and gain experience using a variety of equipment for making physical measurements. This course satisfies the Writing Across the Curriculum requirement.

Course Content and Schedule of Topics:

Topic	*Approximate Time Span*	*Readings*
Relativity	4 weeks	Chapter 2
Scattering and diffraction a. Photon interactions b. Bragg diffraction c. Rutherford scattering	2 weeks	
Bohr Theory	1 week	Chapter 4
Quantization a. X-rays b. Franck-Hertz c. Wilson-Sommerfeld d. Harmonic oscillator	1.5 weeks	Chapter 3
Wave-Particle Duality a. DeBroglie wavelength b. Complimentarity c. Phase and group velocity d. Uncertainty principle	2 weeks	Chapter 5
Quantum numbers a. Schroedinger equation b. Angular momentum c. Energy splitting and g factors d. Zeeman effect	2 weeks	Chapters 6, 7, 8
Elementary particles and conservation laws	1.5 weeks	Chapter 14
Nuclear physics and radioactivity	2 weeks	Chapters 12, 13

Grading Policy:

A = 90%-100%
B = 80%-89%
C = 70%-79%
D = 60%-69% (If you're even thinking of numbers this low, perhaps you are in the wrong class!)
F = below 60%

Assessment:	**% Weight**
Homework Problems	**20**
Labs	**25**
Paper and Presentation	**10**
Exams	**25**
Final Exam	**20**

Homework Problems:

As illustrated above, the problem sets constitute a significant portion of your grade. Your work on these problem sets, as well as lab reports and papers, is subject to the Moravian College Policy on Academic Honesty. Refer to the Student Handbook or ask your instructor if you have any doubts or questions about any submitted work.

Due dates and late policy: there will be a 50% deduction for tardy work up until solutions to the homework are posted in the physics periodical room. Work submitted after that time will receive a zero.

Labs:

To augment your overall learning experience and provide an experimental aspect to the course, you will be required to perform several labs during the term (unless otherwise stated, the due date for handing in a lab report is one week after the lab is performed). To instill good laboratory report writing skills, lab reports will be submitted throughout the semester with an emphasis on a particular aspect of the complete lab report. Both student and instructor alike will critique these emphasized aspects. It is hoped that by breaking down the lab reports into manageable pieces, student will not be overwhelmed by the enormous tasks involved in writing a quality report. Use of the writing handbook will be encouraged. There will be a copy of the Bedford writing handbook available in our modern physics lab. Unless otherwise stated, the MLA style will be used for all citations.

Emphasized aspects of a lab report (by lab):

1. Introduction (Historical Background and Theory)
2. Schematic of Apparatus (using a drawing editor such as Visio, etc.)
3. Procedure
4. Data presentation (Data tables, graphs, etc.)
5. Calculations and error analysis (using equation editor)
6. Results & Comparisons
7. Conclusions
8. Bibliography and Citations

Typical weekly lab schedule:

Day	Assignment/Activity
Monday	Lab briefing and experimentation
Tuesday	Experimentation
Wednesday	Experimentation
Thursday	Submission of emphasized aspect of lab report to instructor and peer reviewers (ungraded)
Friday	Return of submitted portion of lab report
Monday	Submission of final informal lab report

Schedule of experiments:

Week	Experiments:
1-6	Interferometer
1-6	Relativistic Energy
1-6	Millikan Oil Drop Experiment
1-6	Balmer Series in H and D
1-6	X-Ray Diffraction
1-6	Photoelectric effect
7-14	Electron diffraction
7-14	Forced Harmonic Motion
7-14	X-Ray Fluorescence (Moseley's Law)
7-14	Coincidence
7-14	Franck-Hertz
7-14	EPR
7-14	Compton Effect

Students will also have the opportunity to peer review each other's work. For each lab report turned in, students must have their lab peer-edited (with comments and suggestions/corrections) by one other student from the class for grammar, content, style, and readability. The peer-edited copy (with comments) and corrected/revised copies will be submitted to the instructor with the final report.

Paper and Presentation:

Throughout the semester students will be researching a famous physicist/discovery and will write a formal research paper (approximately 10-15 pages long). Assignments throughout the term will include: selecting a topic, producing a preliminary and final annotated bibliography, rough drafts, and writing the final draft of the paper. A presentation will be given on this work during the last week of classes.

Exams:

At least three (in-class) one-hour exams during the semester.

Final comprehensive exam:

An exam on all material covered during the semester.

Attendance Policy:

Students are expected to come to class. To that end, I WILL take attendance, and reserve the right to raise/lower your grade based on your attendance.

Good luck in the coming semester. Should you have any comments about the class during the semester, please feel free to discuss them with me. I will welcome any suggestions for improving the course. Since I am looking for you to do your best work, you should demand excellence from me as well.

Subject to Revision