PY313: Modern Physics

Instructor: Dr. Olga Novgorodova et al.

Lectures: twice a week at 90 minutes each

Discussion: once a week at 60 minutes

Pre-Labs: 5 pre-lab sessions at 60 minutes each

Labs: 5 labs during the semester

Prerequisites: PY211, PY212 and MA124

Course Description: Physics 313 will examine the development of modern physics leading up to and including quantum mechanics, relativity and their application to problems in atomic, molecular, solid state, nuclear and particle physics. These applications lie at the heart of much of current technology.

Approximate List of Topics to be Covered / Course Outcomes

As an outcome of completing this course, a student will:

1. Gain an increased understanding of production and service operations in manufacturing companies.

2. Develop an increased facility for using major CAD systems to do engineering design.

3. Learn about the creative process of product design and development, and other key steps that are required to turn a creative idea into a real commercial product.

4. Gain experience with product and process design for sheet metal, castings and plastic parts.

5. Develop experience with business ideation, demand confirmation and resource specification for designed products.

6. Gain experience in creating an operations plan for a manufactured product that specifies both product and process.

7. Gain experience and confidence in working in a team environment.

8. Gain a facility for producing well-organized and clearly written engineering reports.

Required Textbooks /Materials

- Modern Physics Thorton and Rex, 3rd Edition. (An electronic version is available)

- Calculator A scientific calculator is required.

Homework Problem Sets
There will be a homework problem set assignments nearly every week of the semester. You may get help from other students in the class, but the work you submit must be your own. Doing these problem sets is the best preparation for the course exams. For the first five weeks, they will be due at noon Thursdays (Dresden time) to Silke Fimmel. For the following weeks, they will be due Thursdays at the beginning of class. Late homework will note be accepted.
Discussion Sections

Discussion sections are a required part of the course. The discussion sessions provide an opportunity to work through some of the conceptual ideas of modern physics in an informal setting with expert guidance.

Laboratory Sections are a required part of the course. The schedule of lab experiments for the course is included in the course schedule. You will need to print the pdf file of the writeup for the assigned lab yourself since no hardcopies will be provided. For those labs with a pre lab, you must complete the prelab prior to going to lab since some use online simulations. During each lab session, you are expected to perform the experimental measurements and usually to perform an initial analysis of the data to check for any problems. Your data page(s) must be initialed by the lab coordinator before leaving the lab. Completed labs must be turned in at your next lab class. The lab reports may be written on loose leaf paper of your choice, i.e., no lab book is required. You must complete all seven labs for this course, during the weeks they are assigned. There are no scheduled makeup labs.

Labs and Prelabs in even Calendar weeks

Lab Report Format

- Title of experiment and your name, ID#, lab coordinator(or TF), and lab partner(s). Introduction/Theory: Write your own brief paragraph summarizing the objectives of the experiment, including physical principles, theory, and concepts involved.

- Experimental Setup/Procedures: Write a brief paragraph describing the apparatus and the specific techniques being used to perform the experiment. Discuss how you actually made the measurements.

- Data: The data you took in the measurements. Your data page(s) must be initialed by your TF/Coordinator before leaving the lab.

- Data Analysis Discussion, Graphs, and Tables: Prepare the basic equations and tables that you will need in order to perform the calculations required to analyze your data. This part should be well organized so that you can clearly tabulate your final answers in your report. All figures, graphs, tables and Equations should be numbered and have a caption. If no caption, the item will be ignored and no credit will be given for it's inclusion. May be inline or in an appendix.

- Questions: Answer the questions listed in the lab writeup. Your TF/Coordinator may delete or modify some of the required questions. These changes will be announced during the lab introduction.

- Conclusions: Write a brief paragraph summarizing the results and conclusions derived from your data. Be sure that your conclusions are supported by your data. Discuss any inconsistencies between your result and what you expected to be the outcome of the experiment.

Academic Conduct:

Students enrolled in this course are expected to follow the Boston University Student Code of Academic Conduct for all assignments and exams. Violations of the code must be reported to the Deans office. For more information, please visit the following website: http://www.bu.edu/cas/students/undergradresources/code.

Course Grades

• Midterm Exam #1 (5/3/12), 20% • Midterm Exam #2 (6/14), 20% • Final Exam (7/12/12), 25% • Laboratory Reports, 15%

• Homework Problem Sets, 15% • Lecture & Discussion attendance, quizzes, etc., 5%

Lecture Schedule

Week	Topic	Chapter
1	Introduction/ Relativity Quantum Theory of Light Laboratory 1 Quantum Theory of Light	1 3 3
2	Relativity Relativity Discussion session	2 2
3	Relativity Particle Nature of Matter Laboratory	2 4
4	Particle Nature of Matter Matter Waves	4 5
5	Matter Waves	5
6	Quant. Mech. in One Dim.	6
7	**Midterm Exam**	
8	Tunneling Phenomena	7
9	Quant. Mech. in Three Dim.	8
10	Atomic Structure	9
11	Molecular Structure Statistical Physics	11 10
12	Statistical Physics	10
13	**Final Examination**	