SUNY Orange SYLLABUS

35204 - Modern Physics

3 lect., 3 lab., 4 cr. (Fall)

Study of the development of Physics since 1900. Study of waves in light and matter. Includes comparison of Galileo's and Einstein's relativity, relativistic kinematics and dynamics; wave-particle duality, black body radiation and Planck's constant; Introduction to quantum theory and wave mechanics; introduction to molecular and solid state physics; atomic structure and the periodic table; nuclear reactions and energy. Elementary particles and the Standard Model; applications to cosmology.

Prerequisite: 35102, 35106, or 35203

TEXT AND MATERIALS:

This course will cover the topics presented in chapters 1 through 15 of the text: Serway, Moses and Moyer, Modern Physics, Second Edition (Fort Worth: Harcourt College Publishers, 1997) [ISBN 0-03-001547-2]. The student will also need a ruled laboratory notebook and a scientific calculator. Should the student desire a programmable calculator, we recommend the HP 48G+, or the HP 49. Laboratory materials will be distributed throughout the semester.

RELATIONSHIP TO PROGRAMS:

Physics 35204 is designed both as the third course in the General Physics I & II sequence and as an engineering elective for the A. S. in Engineering Science. All students interested in a physics major or interested in eventual physics teaching should take this course after their General Physics I & II sequence is completed.

COURSE OBJECTIVES:

The student who successfully completes this course can

- demonstrate an understanding of methodologies employed by natural scientists.
- employ observation, hypothesis development, measurement and data collection on an appropriate level.
- describe the importance of modeling in the pursuit of scientific understanding.
- relate the development of relativistic physics to classical physics.
- apply the complexities of the wave/particle duality to observed phenomena.
- apply the boundary constraints for standing waves to simple physical systems.

- apply physical principles of quantum ideal to atomic and molecular structure.
- calculate the energy balance in atomic and nuclear reactions.
- relate the microscopic with the macroscopic in current cosmology.
- read any modern treatment of cosmological issues with understanding.
- record laboratory data and explain results in a clear and professional fashion
- reduce data and prepare graphs using spreadsheet (Excel).
- declare (with a clear conscience) that they have enjoyed learning the above.

GRADING SYSTEM:

The grading for this course will be determined as follows

Exam # 1 --	15 %
Exam # 2 --	15 %
Exam # 3 --	15 %
Final Exam --	20 %
Lab. Work --	20 %
Homework/Quizzes	15 %

ALL CLASS ASSIGNMENTS (HOMEWORK SETS & LAB REPORTS) WILL BE DUE AS ANNOUNCED BY THE INSTRUCTOR IN CLASS. NO LATE ASSIGNMENTS WILL BE ACCEPTED.

INSTRUCTOR OFFICE HOURS: -- TBA

ATTENDANCE AND WITHDRAWAL:

Perfect attendance is simply assumed in this course. Without such attendance and dedication to the homework one will not be successful in Physics. The student's grade will reflect any lack of attendance, simply because of the difficulty of the material. It is the student's responsibility to speak with the instructor and withdraw from the course if things are not going well. The instructor will not initiate the withdrawal. An early consult with the instructor can save a great deal of later confusion.

SUPPORT SERVICES:

Tutoring services are available in the Library. There is also tutoring in Physics available in the Mathematics Study Lounge in Ha 311. The Physical Science Study Lounge (Harriman 315) has proven a valuable resource for students assisting each other in reviewing the material and working together solving homework problems. This strategy, used correctly, can be of great assistance to you. Take advantage of it. Also, get to know your advisor on a personal level.

There are services available for students with disabilities. Any such conditions should be communicated privately to the instructor on the first day of class so that any necessary special arrangements or accommodations can be made.

The following texts are on reserve in the Library. They can be very helpful to you if you take advantage of them.

J. Richard Christman, A Student's Companion to Halliday/Resnick/Krane. This guide is matched to your previous text and it is a good supplementary review text. (Reserve # 178)

Edward Derringh, Selected Solutions to Halliday/Resnick/Krane. (Reserve # 177.) This book is matched to the text we are using. It is important that you consult this book only after you have worked independently on the assignment for a significant amount of time. Using this resource unwisely can seriously impact on your performance in the course. Simply transcribing these solutions for submission to the instructor will result in an F for the course, since you will not be able to pass the examinations without doing your own hard work on course assignments. The purpose of having the manual on reserve is to assist you when the instructor is not available.

Fredrick Bueche, Shaum's Outline of College Physics. This text has excellent, clearly worked out problems related to every section of the text. Reserve # 179 Also see: Alvin Halpern, Schaums Outline "3000 Solved Problems in Physics". This text virtually covers every topic of our course. It is an excellent study aid.

Serway and Faughn, College Physics and Faughn & Tigue, Instructors Manual With Solutions for Serway and Faughn. These two books should be used together. The complete solutions manual matches this non-calculus text and this resource should be helpful - especially if you have missed some of the material the first time around. (Reserve # 183)

NOTE REGARDING CLASS SYLLABUS

The following weekly lecture schedule should be viewed as tentative to the extent that some adjustments may seem advisable as the course progresses.

A detailed syllabus with HW assignments is distributed during the first class meeting.

SYLLABUS

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WEEK	TOPIC	CHAPTER
1.	Wave Invariant Relativity	1
2.	Quantum Theory of Light	2
3.	Particle Nature of Matter	3
4.	Matter Waves	4
5.	Quantum Mechanics -- 1-Dimension	5
6.	Quantum Mechanics -- 3-Dimensions	6
7.	Atomic Structure	7
8.	Statistical Physics	8
9.	Molecular Structure	9
10.	Solid State Physics	10
11.	Superconductivity	11
12.	Nuclear Structure	12
13.	Nuclear Physics Applications	13
14.	Particles, Standard Model & Cosmology	14
15.	Review/Deadlines/Test	