RARITAN VALLEY COMMUNITY COLLEGE
ACADEMIC COURSE OUTLINE
PHYS 150—ENGINEERING PHYSICS I

I. BASIC COURSE INFORMATION

A. Course Number and Title: PHYS 150 – Engineering Physics I

B. New or Modified Course: Modified

C. Date of Proposal: Fall 2008

D. Sponsoring Department: Science & Engineering

E. Semester Credit Hours: 4

F. Weekly Contact Hours : 6 Lecture: 4
Lab : 2

G. Prerequisites: Two years of college preparatory laboratory science, including a course in physics, and one semester of single-variable calculus, or equivalents; Corequisites: Calculus I or its equivalent

H. Laboratory Fees: Yes

I. Department Chair: Dr. Margaret Czerw, mczerw@raritanval.edu

II. CATALOG DESCRIPTION

Prerequisites: Two years of college preparatory laboratory science, including a course in physics, and one semester of single-variable calculus, or equivalents; Corequisites: Calculus I or its equivalent. This is the first semester of a three-semester sequence in introductory calculus-based physics, which is required for students majoring in the engineering sciences. It is also highly recommended for transfer students majoring in the physical sciences. Topics include kinematics and dynamics of particles and rigid bodies, Newton's Laws, energy and momentum, rotational motion, equilibrium and elasticity and gravitation. The Honors Option is available for this course.

III. STATEMENT OF COURSE NEED

Engineering Physics I is a standard course in the first year of any engineering physics course sequence. This course is needed to ensure the credibility and transfer articulations of the engineering sciences.

IV. PLACE OF COURSE IN COLLEGE CURRICULUM

A. Free elective
B. The course serves as a program requirement in Engineering Science.

C. Course Transferability: The course transfers as an engineering requirement or an elective. For New Jersey schools go to the NJ Transfer website, www.njtransfer.org. For all other colleges and universities go their individual websites.

V. OUTLINE OF COURSE CONTENT

This course explores the following topics:

A. Measurement and error analysis
B. One dimensional motion
C. Vectors
D. Two dimensional motion
E. Newton's Laws
F. Work and energy
G. Center of mass
H. Momentum
I. Rotational motion
J. Static equilibrium and elasticity
K. Gravitation

VI. EDUCATIONAL GOALS AND LEARNING OUTCOMES

A. EDUCATIONAL GOALS

Students will:

1. classify information (G.E. 1, G.E. 7);
2. analyze information (G.E. 1, G.E. 7);
3. synthesize information (G. E. 1, G.E. 7);
4. state a problem clearly (G.E. 1, G.E. 2);
5. compose hypotheses and problem solving strategies (G.E. 1, G.E. 7);
6. assess hypotheses and problem solving strategies (G.E. 1, G.E. 7);
7. interpret information (G.E. 1, G.E. 7);
8. discover information through research (G.E. 1, G.E. 3);
9. identify clearly defined and suitable research topics (G.E. 1, G.E. 3);
10. report on their analyses of research information (G.E. 1, G.E. 2, G.E. 3);

B. LEARNING OUTCOMES

Students will be able to:

1. interpret data accurately;
2. apply theoretical strategies to the analysis of data;
3. synthesize research results for the purposes of discussion and written work;
4. conceive reasonable inferences in response to observations;
5. analyze physics problems systematically and logically;
6. apply mathematical and/or statistical skills to other disciplines.

VII. MODES OF TEACHING AND LEARNING

Formats, modes, and methods for teaching and learning may be:

A. lecture/discussion
B. small group projects
C. student oral presentations
D. student collaboration
E. independent study

VIII. PAPERS, EXAMINATIONS, AND OTHER ASSESSMENT INSTRUMENTS

Assessment methods may be:

A. laboratory experimentation
B. problem solving individually and in peer dialogue
C. analysis of reading assignments and lecture in teams
D. other, as specified by instructor

IX. GRADE DETERMINANTS

In order to evaluate achievement of the goals and outcomes listed above, possible grade determinants may be:

A. Discussion questions
B. Homework problems
C. Exams and quizzes
D. Research projects and/or collaborative projects
E. Oral presentations
F. Laboratory reports
G. Class participation and preparation

X. TEXTS AND MATERIALS

A. textbooks
B. primary sources
C. journals and publications
D. web sources
E. databases
F. audio/visual sources

Samples of specific texts which may be featured:

- Halliday/Resnick/Walker, *Fundamentals of Physics,* Wiley (Most Recent Edition).

- Wilson/Hernandez, *Physics Laboratory Experiments*, Houghton-Mifflin (Most Recent Edition).

(Please Note: The course outline is intended only as a guide to course content and resources. Do not purchase textbooks based on this outline. The RVCC Bookstore is the sole resource for the most up-to-date information about textbooks.)

XI. RESOURCES

Students may need to use library databases and other library resources for critical research assignments.

XII. HONORS OPTION

Definition: The Honors Option conforms to the definitions of an Honors course in that students will engage in solving more sophisticated textbook-style problems than is normally required in the course, and will engage in an independent research project in experimental and/or theoretical physics.

A. Educational Goals and Learning Outcomes

Educational Goals

1. Students will improve the depth and/or breadth of his/her problem-solving skills through the analysis of challenging physics problems.

2. Students will engage in scientific research through:
   a. Posing a well-formulated research question;
   b. Completing a background investigation into historical and/or current physics literature relevant to this research question;
   c. Carrying out independent experimental and/or theoretical project to answer the research question.

Learning Outcomes

Upon completing the honors option, students will be able to:

1. Solve challenging introductory-level textbook-style physics problems;
2. Formulate a well-defined research question which can be investigated using experimental and/or theoretical physics techniques;
3. Complete a literature search relevant to a research topic;
4. Investigate a research topic by experimenting with laboratory equipment, running computer simulations and/or doing analytical calculations, and analyzing the results;
5. Communicate the research process and results through written and oral description.

B. Honors Option Content

1. In consultation with the instructor, students will substitute some homework problems with those rated at a higher level. For example, most textbooks rate the difficulty level of end-of-chapter problems as level 1, 2 or 3. Honors students will be assigned at least two more level 2 problems than the rest of the class (instead of the same number of level 1 problems), and at least two level three problems per chapter.

2. The research component will consist of one of the following:

    a. A more in-depth analysis of two of the (approximately) ten laboratory projects normally assigned during the term. This will entail further experimentation and/or calculation.
    b. Development of a new experimental laboratory project related to material covered in lecture or laboratory, which students in a non-honors course could perform.
    c. The experimental and/or theoretical investigation of a topic covered in lecture.

    Note: Student topic choices may be limited by the availability of school-owned equipment and/or resources.

C. Assessment Instruments for Honors Option Work

Students in introductory physics are commonly assigned textbook problems which require conceptual and mathematical explanations of physical phenomena, and experimental laboratory work. The Honors Option problem-solving component will be evaluated in terms of whether or not solutions to the attempted problems exemplify a higher skill level than that normally expected of students in the non-honors course. The Honors Option research component will be evaluated in terms of whether or not the level of sophistication of data acquisition and/or calculations, and analysis, is higher than what is normally expected of laboratory and/or computational work of students in the non-honors course.

D. Grade Determinants for Honors Option Work

In addition to quizzes, exams and homework assignments, the final grade will be based on the student's written solutions to Honors Option textbook problems and a detailed written description of all aspects of the Honors Option research project.