COURSE TITLE: **ENGINEERING PHYSICS** INSTRUCTOR: **MR. NICASTRO**
LEVEL: **CP** ROOM: **D205**
TEXT USED: **NONE** CREDITS: **5 (FULL YEAR)**

GENERAL INFORMATION

Engineers see opportunity where others see problems.

- John Collier, Myron Tribus Professor of Engineering
Thayer School of Engineering

This course is designed to integrate the established theories of physics with the real-world applications in today's technology.

Physics, a subject closely related to engineering, lends itself to designing and inventing devices. Students will be given some introduction to augment their intuitive (or already-learned) understanding of many of the laws of physics, including those that have to do with motion and other everyday human activities. High-tech areas of physics, such as radar, superconductors, motors, electrical circuits, lasers, probes and sensors, figure prominently in popular culture.

It is not intended to be presented as a "traditional" course, although *comprehension of scientific principles* will be stressed. It IS intended to be a "hands-on" multi-faceted approach to problem solving within the context of techniques used by engineers today.

Working in teams to develop viable solutions, students will learn to value their own thinking and trust their own judgment. They will develop an appreciation for how science and mathematics work outside the classroom. They will learn how to communicate their ideas to business and professional people as well as to teachers and fellow students. They will learn how to do technical research and creatively apply their findings and recommendations as one of possibly many alternative solutions of a problem. Most important, they will become fully engaged as they grapple with the less structured problems they will encounter in their future in the classroom and in employment.

Approaching problems from an engineering perspective, each team defines and redefines its problem, sets specifications, brainstorms solutions, and selects a single potential solution to explore. As they work together, they know they will iterate the cycle, perhaps many times, until they have devised a solution - a design and/or a device - that is unique, timely, and useful in the everyday world.

Students will learn that the problem-solving cycle also works beyond mathematics, science and technology, as we are all faced with problems throughout our entire life.

Although many of the problems and projects during the year will be teacher-defined, there will be opportunities for students to propose their own problems to the class for solution using the prescribed techniques of engineering. Some may be done in the classroom, some on school grounds, and some perhaps outside of the school, in and for the community. Project timelines may be as short as a week, or as long as a semester. Much of the work that teams do may require extensive out-of-class-time.
Some projects may be narrowly defined, discipline-specific, others may take them far from the classroom.

Students will all be expected to actively contribute to their assigned team(s) in many different ways: research, design, constraints, specifications, alternatives, brainstorming, cost reckoning, scavenging, record-keeping, written reports, oral and/or multimedia presentation (either to the rest of the class, or an outside "review board").

They will also be expected to show competency in the scientific principles of physics that will be applied, and the terminology specific to the problem or project they intend to solve.

Particular attention will be given to (but by no means restricted to) four general areas of engineering: structural, mechanical, electrical and civil. Problems and/or projects will be taken mostly from these areas.

Students will **all** be given the opportunity to act in leadership roles within their team at some time during the year.

Evaluation will also be multi-faceted, consisting of both individual and "team" grades.

Individual grades will be assessed on the basis of individual performance, using such tools as neat, accurate and thorough record-keeping, individual formal written reports and oral presentations, contribution to the team, as witnessed by fellow team members, or the team leader, and, finally, testing to show the individual's competency in the area, and familiarity with the team's solution and approach.

Team grades will be assessed on the basis of team performance in both the process and the end result.

It is important to note here that since much of the work done in this class is done by teams of students, students will be given opportunities to help grade each other in a fair and equitable manner.

More specific information about grading will be given in class, and will be flexible enough to deal with a variety of situations.

Many of the ideas for this introductory course will be taken from the Dartmouth Project for Teaching Engineering Problem Solving, an initiative of the Thayer School of Engineering at Dartmouth College, and with some assistance from Worcester Polytechnic Institute. It is also our hope that local industries and some governmental agencies will get involved in the presentation of this course.

Parental contact is best by email: www.nick_nicastro@wrsd.net

EVALUATION

PERFORMANCE-BASED: 50%
This consists of all team/individual challenges presented to each student. Scores are determined by the degree to which the challenge is met, and the ranking of the team/individual score within that section.

WRITTEN WORK: 30%
ANY work that is assigned to be done in class or out of class is regarded as "written work." This is work done by the individual student and may consist of video reviews, project reflections, etc. It must be turned in by the assigned due date, or it will be graded as a 0.

PARTICIPATION: 20%
This category does not necessarily pertain to asking/answering questions in class discussion, but on day-to-day active involvement in classroom activities.