D. COLLEGE CORE CURRICULUM

Natural and Physical Sciences

BIOL1411:	Introductory Biology
CHEM 1411:	Introductory Chemistry
CHEM 1421:	Chemistry for Engineers I
CHEM 1422:	Chemistry for Engineers II
GEOL 1411:	Introductory Physical Geology
PHYS 1411:	Introductory Physics
PHYS 1421:	Physics for Engineers I
PHYS 1422:	Physics for Engineers II

Course Title: BIOL 1411: Introductory Biology

Semester Credit Hours: 4 (3,1)

I. Course Overview

The objective of BIOL 1411 is to provide students with a foundation in basic biological principles. Students will gain familiarity with the biological world from both a taxonomic perspective (plant, animal, microbe) and process-based perspective (biochemistry, cell biology, physiology, ecology, behavior). Additionally, students will learn to integrate biological material into the broader world around them, and develop critical thinking and problem solving skills involving quantitative data from the natural sciences. This course is in the format of a three-credit lecture session and a mandatory, separately scheduled one-credit laboratory that accompanies it.

II. PMU Competencies and Learning Outcomes

Students of BIOL 1411 successfully graduating from this course will understand the Scientific Method, and will receive training in contemporary methodologies in the biological sciences. They will learn to generate data both individually, as well as in a cooperative effort in a small team setting. Students will learn to organize and critically analyze their data, using statistical and graphing tools where appropriate. Finally, students of BIOL 1310 will learn to communicate their conclusions in writing in a discipline-appropriate format.

III. Detailed Course Description

Topics covered in this course include cell biology, genetics, physiology, ecology, diversity of living organisms, evolution, interrelationships of structure and function, self regulation, and capture and use of energy. A brief survey of plants and animals will be included, as well as especially physiological aspects of human anatomy and physiology.

IV. Requirements Fulfilled

This course is a College Core course and serves in partial fulfillment of the eight-credit science requirement. BIOL 1411 is a recommended elective for all students and required of all students contemplating basic science training.

V. Required Prerequisites

BIOL 1411 does not have a prerequisite. However, successful completion of an introductory course in biology, geology chemistry or physics at the high school level will be helpful. This course should be taken as early as possible because of the organizational, analytical and communicative skills that it develops.

VI. Learning Outcomes

A. To learn the basic principles of biology as they apply to the existence of a diverse array of living organisms.

B. To develop an understanding of the natural biological world.

C. To learn how plants, animals and microbes co-exist and share common principles with respect to energy acquisition and use, reproduction and evolution.

D. To learn how to create a hypothesis and then test it.

E. To learn the Scientific Method and how to use the Scientific Method to test hypotheses.

F. To learn how to organize, analyze data, and then present logical, compelling scientific arguments.

VII. Assessment Strategy

Assessment for this course will consist of a combination of examinations based on lecture materials, examinations based on laboratory materials, and grades provided on submitted written materials, primarily from the laboratory exercises. Specific assessment will include:

- A series of four written exams testing the detailed knowledge of short sections of the course (each exam worth 10% of the final grade for a total of 40%).
- A final, comprehensive written exam (20% of the final grade)
- Laboratory grade forming 40% of the course, divided as follows:
    - five written laboratory reports for 25% of the grade
    - three written lab exams for 15% of the grade.

Note: One of the most common reasons for low achievement in this course is failure to regularly attend and participate in the laboratory section of the course.

This science course will teach students how to work both individually and in a small team setting. The comprehensive exams will encourage students to integrate what they have learned from individual lectures or experiments into a more comprehensive understanding of the subject matter, and as such will begin at an early stage in the student's university education to build the skills and understanding that will be necessary for the capstone course in their discipline.

VIII. Course Format

The course will consist of a combination of lecture presentations and a mandatory, separate laboratory class.

Attendance in both lecture and laboratory is mandatory. Lectures will consist primarily of presentation and discussion of material outlined below. Occasional films and Web-based presentations will be made. Laboratories will consist of an initial presentation/demonstration by the laboratory instructor, followed by laboratory exercises completed in small groups of two to three students.

A key feature will be the creation of data, the analysis of that data, and the communication of the findings in the form of a series of written laboratory reports.

Web supplement: The course homepage (using suitable commercial Web tool) will include:

- Course syllabus
- Course assignments
- Keys to quizzes and exams
- Course e-mail utility
- Course discussion list
- Student course grades

Classroom Hours (6 hours per week) **Class:** 3
Lab: 3

IX. Topics to Be Covered

A. Introduction / the study of life
B. The Scientific Method
C. Molecules of cells
D. Cell structure and function
E. Membrane structure and function
F. Cell division
G. DNA structure and replication
H. Patterns of gene inheritance
I. Evolution
J. Microbiology
K. Plants
L. Animals
M. Human organization
N. Musculoskeletal system
O. Digestive system
P. Cardiovascular system
Q. Respiratory system
R. Urinary system and excretion
S. Reproductive system
T. Development

X. Laboratory Exercises

The laboratory component of this course will consist of a weekly series of three hour laboratory exercises. The topics to be covered, in order, are:

A. Introduction and science lab safety
B. Scientific Method
C. Microscopy and cell structure
D. Cell function
E. Mitosis and meiosis
F. DNA isolation
G. Mendelian genetics
H. Human genetics
I. Taxonomy
J. Plant biology
K. Animal biology
L. Basic mammalian anatomy
M. Cardiovascular system
N. Reproductive system and development

XI. Technology Component

A. <u>In Class</u>

Faculty and laboratory instructors will use state-of-the-art multi-media equipment to both project their materials and incorporate appropriate Web sites into their lectures in a real time basis. Laboratories will use computerized projection equipment and data recording and analyzing equipment, either as demonstrations or as part of small team laboratory exercises.

B. <u>Outside of Class</u>

Faculty will provide e-mail and/or Web site interaction regarding the course material, and will post materials on a dedicated course Web site. Students will be able to ask questions, observe and respond to the answers of other students, and independently follow up their studies by accessing appropriate Web sites from a provided list.

XII. Special Projects/Activities

This course does not require a special project.

XIII. Textbooks and Teaching Aids

A. Required Textbooks

Audesirk, Teresa, Gerald Audesirk, and Bruce Byers. *Life on Earth*, Third Edition. Upper Saddle River, New Jersey: Prentice Hall, 2003. ISBN: 0130899410

B. Alternative Textbooks

Most introductory biology textbooks would be adequate, though some confusion might arise from small differences in order of presentation.

C. Supplemental Print Materials

1. Mader, Sylvia. *Laboratory Manual to Accompany Inquiry Into Life*, Tenth Edition. New York, New York: McGraw Hill, 2002. ISBN: 0072437367
2. Other supplemental print materials as provided by the publisher.

D. Supplemental Online Materials

1. Other supplemental online materials as provided by the publisher.
2. Instructors will develop a list of suitable, contemporary Web sites that are appropriate for the topics and level of detail that they will teach.

Course Title: CHEM 1411: Introductory Chemistry

Semester Credit Hours: 4 (3,1)

I. Course Overview

The objective of CHEM 1411 is to provide students with a foundation in basic chemical principles. Students will be introduced to chemistry at a basic, fundamental level. They will gain familiarity with chemical equations and reactions, and will be given the tools necessary to solve chemical problems that they might encounter on a daily basis. An important component will be understanding the impact of chemistry on all aspects of humans and human civilization. Students will learn to integrate chemical understanding the broader world around them, and develop critical thinking and problem solving skills involving quantitative data from the natural sciences. This course is in the format of a three-credit lecture session and a mandatory, separately scheduled, one-credit laboratory that accompanies it.

II. PMU Competencies and Learning Outcomes

Students of CHEM 1411 successfully graduating from this course will understand the Scientific Method, and will receive training in contemporary methodologies in the chemical sciences. They will learn to generate data both individually, as well as in a cooperative effort in a small team setting. Students will learn to organize and critically analyze their data, using statistical and graphing tools where appropriate. Finally, students of CHEM 1411 will learn to communicate their conclusions in writing in a discipline-appropriate format.

III. Detailed Course Description

Topics covered in this course include a basic introduction to matter and energy and how they are interrelated. Elements, atoms and modern atomic theory will form the base for understanding how chemical components interact through chemical reactions. Students will learn how chemical reactions are described and how they are governed. Finally, the properties of different physical phases of matter (gases, liquids and solids) will be investigated.

IV. Requirements Fulfilled

This course is a College Core course and serves in partial fulfillment of the eight-credit science requirement. CHEM 1310 is a recommended elective for all students and required of all students contemplating basic science training.

V. Required Prerequisites

CHEM 1411 does not have a prerequisite. However, successful completion of an introductory course in biology, geology chemistry or physics at the high school level will be helpful. This course should be taken as early as possible because of the organizational, analytical and communicative skills that it develops.

VI. Learning Outcomes

A. To learn the basic principles of chemistry as they apply to energy, matter, and other aspects of the physical world that surrounds us.

B. To develop an understanding of chemical processes, and the interdependence of chemistry with both physics and mathematics.

C. To develop fundamental laboratory skills.

D. To learn to use chemical terms correctly.

E. To learn how chemical processes are dynamic and ongoing, and influence daily events in societies around the world.

F. To learn how to create a hypothesis and then test it.

G. To learn the Scientific Method and how to use the Scientific Method to test hypotheses.

H. To learn how to organize, analyze data, and then present logical, compelling scientific arguments.

VII. Assessment Strategy

Assessment for this course will consist of a combination of examinations based on lecture materials, examinations based on laboratory materials, and grades provided on submitted written materials, primarily from the laboratory exercises. Specific assessment will include:

- A series of four written exams testing the detailed knowledge of short sections of the course (each exam worth 10% of the final grade for a total of 40%).
- A final, comprehensive written exam (20% of the final grade).
- Laboratory grade forming 40% of the course, divided as follows:
    - five written laboratory reports for 25% of the grade
    - three written lab exams for 15% of the grade.

    Note: One of the most common reasons for low achievement in this course is failure to regularly attend and participate in the laboratory section of the course.

This science course will teach students how to work both individually and in a small team setting. The comprehensive exams will encourage students to integrate what they have learned from individual lectures or experiments into a more comprehensive understanding of the subject matter, and as such will begin at an early stage in the student's university education to build the skills and understanding that will be necessary for the capstone course in their discipline.

VIII. Course Format

The course will consist of a combination of lecture presentations and a mandatory, separate laboratory class.

Attendance in both lecture and laboratory is mandatory. Lectures will consist primarily of presentation and discussion of material outlined below.
Occasional films and Web-based presentations will be made. Laboratories will consist of an initial presentation/demonstration by the laboratory instructor, followed by laboratory exercises completed in small groups of two to three students. A key feature will be the creation of data, the analysis of that data, and the communication of the findings in the form of a series of written laboratory reports.

Web supplement: The course homepage (using suitable commercial Web tools) will include:

- Course syllabus
- Course assignments
- Keys to quizzes and exams
- Course e-mail utility
- Course discussion list
- Student course grades

Classroom Hours (6 hours per week) **Class:** 3
Lab: 3

IX. Topics to Be Covered

A. Introduction to chemistry
B. The Scientific Method
C. Introduction, measurements and calculations
D. Matter and energy
E. Elements and atoms
F. Modern Atomic Theory
G. Chemical bonding
H. Elements, ions and nomenclature
I. Chemical reactions
J. Reactions in aqueous solutions, acids and bases
K. Chemical composition
L. Chemical quantities
M. Gases
    1. Pressure
    2. Volume
    3. Temperature

X. Laboratory Exercises

The laboratory component of this course will consist of a series of weekly three-hour laboratory exercises. The topics to be covered, in order, are:

A. Introduction and science lab safety
B. Scientific Method, measurements and the metric system
C. Physical and chemical properties of substances
D. Chemical reactions and equations
E. Periodic table exercise, nomenclature practice
F. Mixtures, physical separation and solubility
G. Chemical changes and reactions
H. Indicators, acids and bases
I. Hydrates, percent composition, and formulas
J. Stoichiometry of chemical reactions

XI. Technology Component

A. <u>In Class</u>

Faculty and laboratory instructors will use state-of-the-art multi-media equipment to both project their materials and incorporate appropriate Web sites into their lectures in a real time basis. Laboratories will use computerized projection equipment and data recording and analyzing equipment, either as demonstrations or as part of small team laboratory exercises.

B. <u>Outside of Class</u>

Faculty will provide e-mail and/or Web site interaction regarding the course material, and will post materials on a dedicated course Web site. Students will be able to ask questions, observe and respond to the answers of other students, and independently follow up their studies by accessing appropriate Web sites from a provided list.

XII. Special Projects/Activities

This course does not require a special project.

XIII. Textbooks and Teaching Aids

A. Required Textbooks

Corwin, Charles. *Introductory Chemistry: Concepts and Connections*. Upper Saddle River, New Jersey: Prentice Hall Publishing Co., 2004. ISBN: 0131448501

B. Alternative Textbooks

Most introductory chemistry textbooks would be adequate, though some confusion might arise from small differences in order of presentation.

C. Supplemental Print Materials

Other supplemental print materials as provided by the publisher.

D. Supplemental Online Materials

1. Other supplemental online materials as provided by the publisher.
2. Instructors will develop a list of suitable, contemporary Web sites that are appropriate for the topics and level of detail that they will teach.

Course Title: CHEM 1421: Chemistry for Engineers I

Semester Credit Hours: 4 (3,1)

I. Course Overview

The objective of CHEM 1421 is to create a substantial base for a two-semester chemistry sequence to provide the additional chemistry required by engineering students prior to specialized courses in chemical engineering applications. This course is not to be taken by non-engineering students. The approach, like that of the following semester CHEM 1422, will be largely conceptual leading to an understanding of chemistry and chemical processes. Students in this course will gain familiarity with the chemical/atomic structure of ions, molecules and atoms and how they react. Emphasis will be on a quantitative approach involving chemical reactions and their control. This course is in the format of a three-credit lecture session and a mandatory, separately scheduled, one-credit laboratory that accompanies it.

II. PMU Competencies and Learning Outcomes

Students of CHEM 1421 successfully graduating from this course will receive training in contemporary methodologies in chemistry forming a suitable base for the additional chemistry required of engineers. They will learn to generate data both individually, as well as in a cooperative effort in a small team setting. Students will learn to organize and critically analyze their data, using statistical and graphing tools where appropriate. Finally, students of CHEM 1421 will learn to communicate their conclusions in writing in the form of a scientific journal article.

III. Detailed Course Description

Topics covered in this course create a base in chemistry that will be subsequently used in CHEM 1422. Beginning with an introduction to chemistry, this course will delve into atomic structure, ions and molecules. Students will learn to quantify chemical reactions, and how reactions occur in gases, liquids and solids. The nature of chemical bonding and the forces controlling it will be considered, as will molecular geometry as it relates to chemical structure. Each topic will build upon the growing base formed by previously learned material.

IV. Requirements Fulfilled

CHEM 1412 satisfies the first semester of the two-semester chemistry requirement for engineering students.

V. Required Prerequisites

Scoring well in high school chemistry is a prerequisite. MATH 1321: Pre-Calculus is a co-requisite.

VI. Learning Outcomes

A. To appreciate atomic structure, and the periodic interrelationships of elements.

B. To achieve an understanding of how chemical bonds form, are broken, and the implications for chemical reactions.

C. To learn the chemical properties of gases, liquids and solids.

D. To understand how the chemical nature of substances and their interactions underlies many engineering applications.

E. To learn scientific skills, how to organize and analyze chemical data, and then present logical, compelling scientific arguments based on these data.

F. To understand the complementary nature of topics in chemistry, and how each new piece of information builds on forming a conceptual base.

VII. Assessment Strategy

Assessment for this course will consist of a combination of examinations based on lecture materials, examinations based on laboratory materials, and grades provided on submitted written materials, primarily from the laboratory exercises. Specific assessment will include:

- A series of four written exams testing the detailed knowledge of short sections of the course (each exam worth 10% of the final grade for a total of 40%).
- A final, comprehensive written exam (20% of the final grade).
- Laboratory grade forming 40% of the course, divided as follows:
    - five written laboratory reports for 25% of the grade
    - three written lab exams for 15% of the grade.

    Note: One of the most common reasons for low achievement in this course is failure to regularly attend and participate in the laboratory section of the course.

This science course will teach students how to work both individually and in a small team setting. The comprehensive exams will encourage students to integrate what they have learned from individual lectures or experiments into a more comprehensive understanding of the subject matter, and as such will begin at an early stage in the student's university education to build the skills and understanding that will be necessary for the capstone course in their discipline.

VIII. Course Format

The course will consist of a combination of lecture presentations and a mandatory, separate laboratory class.

Attendance in both lecture and laboratory is mandatory. Lectures will consist primarily of presentation and discussion of material outlined below. Occasional films and Web-based presentations will be made. Laboratories will consist of an initial presentation/demonstration by the laboratory instructor, followed by laboratory exercises completed in small groups of two to three students. A key feature will be the creation of data, the analysis of that data, and the communication of the findings in the form of a series of written laboratory reports.

Web supplement: The course homepage (using suitable commercial Web tools) will include:

- Course syllabus
- Course assignments
- Keys to quizzes and exams
- Course e-mail utility
- Course discussion list
- Student course grades

Classroom Hours (6 hours per week) **Class:** 3
Lab: 3

IX. Topics to Be Covered

A. Introduction to chemistry
B. Ions, molecules and atoms
C. Quantifying chemical relationships and reactions
D. Aqueous reactions/solutions chemistry
E. Gas behavior and properties
F. Thermochemistry
G. Atomic structure
H. Quantum theory
I. Periodic relationship of elements
J. General concepts of chemical bonding
K. Molecular geometry and hybridization
L. Organic chemistry

X. Laboratory Exercises

The laboratory component of this course will consist of a weekly series of three hour laboratory exercises. The topics to be covered, in order, are:

A. Orientation and chemistry lab safety
B. Unknown identifications using substance properties
C. Quantitative separation of mixture components
D. Solubility of salts
E. Chemical reaction classifications
F. Empirical formula determinations
G. Reactions in chemical solutions
H. Enthalpy changes in chemical systems
I. R – ideal gas constant
J. Molecular mass of volatile compounds
K. Diffusion in gases
L. Chemical synthesis
M. Molecular geometry

XI. Technology Component

A. <u>In Class</u>

Faculty and laboratory instructors will use state-of-the-art multi-media equipment to both project their materials and incorporate appropriate Web sites into their lectures in a real time basis. Laboratories will use computerized projection equipment and data recording and analyzing equipment, either as demonstrations or as part of small team laboratory exercises.

B. <u>Outside of Class</u>

Faculty will provide e-mail and/or Web site interaction regarding the course material, and will post materials on a dedicated course Web site. Students will be able to ask questions, observe and respond to the answers of other students, and independently follow up their studies by accessing appropriate Web sites from a provided list.

XII. Special Projects/Activities

This course does not require a special project.

XIII. Textbooks and Teaching Aids

A. Required Textbooks

Chang, Raymond. *Chemistry,* Seventh Edition. New York, New York: McGraw-Hill, 2002.
ISBN: 007282832

B. Alternative Textbooks

None

C. Supplemental Print Materials

Other supplemental print materials as provided by the publisher.

D. Supplemental Online Materials

1. Other supplemental online materials as provided by the publisher.
2. Instructors will develop a list of suitable, contemporary Web sites that are appropriate for the topics and level of detail that they will teach.

Course Title: CHEM 1422: Chemistry for Engineers II

Semester Credit Hours: 4 (3,1)

I. Course Overview

The objective of CHEM 1422 is to build upon the base provided in the prerequisite CHEM 1421, and to provide the additional chemistry required by engineering students prior to specialized courses in chemical engineering applications. This course is not to be taken by non-engineering students. The approach, like that of the CHEM 1421, will be largely conceptual leading to an understanding of chemistry and chemical processes. Students in this course will gain familiarity with the physical chemistry of liquids and solids, the nature of equilibrium, acids and bases, and thermodynamics and electrochemistry. This course is in the format of a three-credit lecture session and a mandatory, separately scheduled one-credit laboratory.

II. PMU Competencies and Learning Outcomes

Students of CHEM 1422 successfully graduating from this course will receive training in contemporary methodologies in chemistry forming a suitable base for the additional chemistry required of engineers. They will learn to generate data both individually, as well as in a cooperative effort in a small team setting. Students will learn to organize and critically analyze their data, using statistical and graphing tools where appropriate. Finally, students of CHEM 1422 will learn to communicate their conclusions in writing in the form of a scientific journal article.

III. Detailed Course Description

Topics covered in this course build upon the base received in CHEM 1421: Chemistry for Engineers I, and will begin with a discussion of the tools of chemistry. As in CHEM 1421, each topic builds upon the growing base formed by previously learned material

IV. Requirements Fulfilled

CHEM 1422 satisfies the first semester of the two-semester chemistry requirement for engineering students.

V. Required Prerequisites

MATH 1422: Calculus I
CHEM 1421: Chemistry for Engineers I

VI. Learning Outcomes

A. To understand how intermolecular forces result in the properties of liquids and solids.

B. To appreciate the kinetics of chemical reactions and the general concepts involved in chemical equilibria.

C. To learn how acids and bases interact and the implications of pH to chemical reactions.

D. To understand the laws of thermodynamics and their involvement in chemical reactions, including those with engineering applications.

E. To learn scientific skills, how to organize and analyze chemical data, and then present logical, compelling scientific arguments based on these data.

F. To understand the complementary nature of topics in chemistry, and how each new piece of information builds on forming a conceptual base.

VII. Assessment Strategy

Assessment for this course will consist of a combination of examinations based on lecture materials, examinations based on laboratory materials, and grades provided on submitted written materials, primarily from the laboratory exercises. Specific assessment will include:

- A series of four written exams testing the detailed knowledge of short sections of the course (each exam worth 10% of the final grade for a total of 40%).
- A final, comprehensive written exam (20% of the final grade).
- Laboratory grade forming 40% of the course, divided as follows:
  - five written laboratory reports for 25% of the grade
  - three written lab exams for 15% of the grade.

  Note: One of the most common reasons for low achievement in this course is failure to regularly attend and participate in the laboratory section of the course.

This science course will teach students how to work both individually and in a small team setting. The comprehensive exams will encourage students to integrate what they have learned from individual lectures or experiments into a more comprehensive understanding of the subject matter, and as such will begin at an early stage in the student's university education to build the skills and understanding that will be necessary for the capstone course in their discipline.

VIII. Course Format

The course will consist of a combination of lecture presentations and a mandatory, separate laboratory class.

Attendance in both lecture and laboratory is mandatory. Lectures will consist primarily of presentation and discussion of material outlined below. Occasional films and Web-based presentations will be made. Laboratories will consist of an initial presentation/demonstration by the laboratory instructor, followed by laboratory exercises completed in small groups of two to three students. A key feature will be the creation of data, the analysis of that data, and the communication of the findings in the form of a series of written laboratory reports.

Web supplement: The course homepage (using suitable commercial Web tools) will include:

- Course syllabus
- Course assignments
- Keys to quizzes and exams
- Course e-mail utility
- Course discussion list
- Student course grades

Classroom Hours (6 hours per week) **Class:** 3
Lab: 3

IX. Topics to Be Covered

A. Intermolecular forces
B. Liquids and solids
C. Physical properties of solutions
D. Chemical kinetics and reaction speed
E. General concepts in chemical equilibria
F. Acids and bases
G. Acid-base solubility equilibria
H. Thermodynamics, entropy, free energy and equilibria
I. Electrochemistry

X. Laboratory Exercises

The laboratory component of this course will consist of a weekly series of three hour laboratory exercises. The topics to be covered, in order, are:

A. Orientation and chemistry lab safety
B. Stoichiometry
C. Enthalpy and substance phase changes
D. Colligative properties of solutions
E. Titration and neutralization reactions
F. Analysis of an acid
G. Chemical reaction rates
H. Equilibrium constant determination
I. Acid-base properties of salt solutions

J. Solubility product constant determination
K. Chromatography for mixture separation
L. Identification of unknowns: Cation
M. Identification of unknowns: Anion
N. Chemical synthesis
O. Titration: oxidation and reduction
P. Electrochemistry and electrochemical cells

XI. Technology Component

A. In Class

Faculty and laboratory instructors will use state-of-the-art multi-media equipment to both project their materials and incorporate appropriate Web sites into their lectures in a real time basis. Laboratories will use computerized projection equipment and data recording and analyzing equipment, either as demonstrations or as part of small team laboratory exercises.

B. Outside of Class

Faculty will provide e-mail and/or Web site interaction regarding the course material, and will post materials on a dedicated course Web site. Students will be able to ask questions, observe and respond to the answers of other students, and independently follow up their studies by accessing appropriate Web sites from a provided list.

XII. Special Projects/Activities

This course does not require a special project.

XIII. Textbooks and Teaching Aids

A. Required Textbooks

Chang, Raymond. *Chemistry*, Seventh Edition. New York, New York: McGraw-Hill, 2002.
ISBN: 007282832

B. Alternative Textbooks

None

C. Supplemental Print Materials

Other supplemental print materials as provided by the publisher.

D. Supplemental Online Materials

1. Other supplemental online materials as provided by the publisher.
2. Instructors will develop a list of suitable, contemporary Web sites that are appropriate for the topics and level of detail that they will teach.

Course Title: GEOL 1411: Introductory Physical Geology

Semester Credit Hours: 4 (3,1)

I. Course Overview

The objective of GEOL 1411 is to provide students with a foundation in basic geological principles. Students will gain familiarity with the geological world, including the earth's composition and geologic processes. An important component will be an understanding of the interactions between humans, human civilization, and the geologic process. Additionally, students will learn about geologic hazards, and how they can be overcome or contained. Students will learn to integrate geological material into the broader world around them, and develop critical thinking and problem solving skills involving quantitative data from the natural sciences. This course is in the format of a three-credit lecture session and a mandatory, separately scheduled one-credit laboratory that accompanies it.

II. PMU Competencies and Learning Outcomes

Students of GEOL 1411 successfully graduating from this course will understand the Scientific Method, and will receive training in contemporary methodologies in the geological sciences. They will learn to generate data both individually, as well as in a cooperative effort in a small team setting. Students will learn to organize and critically analyze their data, using statistical and graphing tools where appropriate. Finally, students of GEOL 1411 will learn to communicate their conclusions in writing in a discipline-appropriate format.

III. Detailed Course Description

Topics covered in this course include minerals and a brief survey of the types of rocks and how they are produced. The course will consider erosion and how it occurs, the involvement and storage of groundwater, and the unique geology of deserts and shorelines. Plate tectonics and mountain building, as well as earthquakes will be investigated. While world geology will be the focus, emphasis will be placed on Middle Eastern geology where appropriate.

IV. Requirements Fulfilled

This course is a College Core course and serves in partial fulfillment of the eight-credit science requirement. GEOL 1411 is a recommended elective for all students and required of all students contemplating basic science training.

V. Required Prerequisites

GEOL 1411 does not have a prerequisite. However, successful completion of an introductory course in biology, geology chemistry or physics at the high school level will be helpful. This course should be taken as early as possible because of the organizational, analytical and communicative skills that it develops.

VI. Learning Outcomes

A. To learn the basic principles of geology as they apply to the physical world that surrounds us.

B. To develop an understanding of the geologic process in the natural world.

C. To learn how geologic processes are dynamic and ongoing, and influence daily events in societies around the world.

D. To learn how to create a hypothesis, and then test it.

E. To learn the Scientific Method, and how to use the Scientific Method to test hypotheses.

F. To learn how to organize, analyze data, and then present logical, compelling scientific arguments.

VII. Assessment Strategy

Assessment for this course will consist of a combination of examinations based on lecture materials, examinations based on laboratory materials, and grades provided on submitted written materials, primarily from the laboratory exercises. Specific assessment will include:

- A series of four written exams testing the detailed knowledge of short sections of the course (each exam worth 10% of the final grade for a total of 40%).
- A final, comprehensive written exam (20% of the final grade).
- Laboratory grade forming 40% of the course, divided as follows:
  - five written laboratory reports for 25% of the grade
  - three written lab exams for 15% of the grade.

  Note: One of the most common reasons for low achievement in this course is failure to regularly attend and participate in the laboratory section of the course.

This science course will teach students how to work both individually and in a small team setting. The comprehensive exams will encourage students to integrate what they have learned from individual lectures or experiments into a more comprehensive understanding of the subject matter, and as such will begin at an early stage in the student's university education to build the skills and understanding that will be necessary for the capstone course in their discipline.

VIII. Course Format

The course will consist of a combination of lecture presentations and a mandatory, separate laboratory class.

Attendance in both lecture and laboratory is mandatory. Lectures will consist primarily of presentation and discussion of material outlined below. Occasional films and Web-based presentations will be made. Laboratories will consist of an initial presentation/demonstration by the laboratory instructor, followed by laboratory exercises completed in small groups of two to three students. A key feature will be the creation of data, the analysis of that data, and the communication of the findings in the form of a series of written laboratory reports.

Web supplement: The course homepage (using suitable commercial Web tools) will include:

- Course syllabus
- Course assignments
- Keys to quizzes and exams
- Course e-mail utility
- Course discussion list
- Student course grades

Classroom Hours (6 hours per week) **Class:** 3
Lab: 3

IX. Topics to Be Covered

A. Introduction to physical geology
B. The Scientific Method
C. Minerals
D. Igneous rocks
E. Volcanoes
F. Sedimentary rocks
G. Metamorphic rocks
H. Weathering and soils
I. Mass wasting
J. Running water
K. Groundwater
L. Glaciers
M. Deserts
N. Shorelines
O. Ocean floor
P. Earthquakes and Earth's interior
Q. Plate tectonics
R. Mountain building
S. Geologic time
T. Development

X. Laboratory Exercises

The laboratory component of this course will consist of a weekly series of three hour laboratory exercises. The topics to be covered, in order, are:

A. Introduction and science lab safety
B. Scientific Method
C. Minerals
D. Igneous rocks and radon
E. Sedimentary rocks
F. Metamorphic rocks and weathering
G. Maps and air photos
H. Stream processes
I. Groundwater
J. Glaciers and deserts
K. Shorelines and ocean floors
L. Plate tectonics
M. Rock deformation and geologic structures
N. Geologic time

XI. Technology Component

A. <u>In Class</u>

Faculty and laboratory instructors will use state-of-the-art multi-media equipment to both project their materials and incorporate appropriate Web sites into their lectures in a real time basis. Laboratories will use computerized projection equipment and data recording and analyzing equipment, either as demonstrations or as part of small team laboratory exercises.

B. <u>Outside of Class</u>

Faculty will provide e-mail and/or Web site interaction regarding the course material, and will post materials on a dedicated course Web site. Students will be able to ask questions, observe and respond to the answers of other students, and independently follow up their studies by accessing appropriate Web sites from a provided list.

XII. Special Projects/Activities

This course does not require a special project.

XIII. Textbooks and Teaching Aids

A. Required Textbooks

Tarbuck, Edward, Fredrick Lutgens, and Dennis Tasa. *Essentials of Geology*, Eighth Edition. Upper Saddle River, New Jersey: Prentice Hall Publishing Co., 2003.
ISBN: 0-13-114865-6

B. Alternative Textbooks

Most introductory geology textbooks would be adequate, though some confusion might arise from small differences in order of presentation.

C. Supplemental Print Materials

1. Busch, Richard and Dennis Tasa. *Laboratory Manual in Physical Geology*, Sixth Edition. Upper Saddle River, New Jersey: Prentice Hall Publishing Co., 2003.
   ISBN: 0-13-046333-7
2. Other supplemental print materials as provided by the publisher.

D. Supplemental Online Materials

1. Other supplemental online materials as provided by the publisher.
2. Instructors will develop a list of suitable, contemporary Web sites that are appropriate for the topics and level of detail that they will teach.

Course Title: PHYS 1411: Introductory Physics

Semester Credit Hours: 4 (3,1)

I. Course Overview

The objective of PHYS 1411 is to investigate the fundamental principles that underlie the behavior of the universe. The approach will be largely a conceptual one that leads to an understanding of physics rather than just the ability to solve mathematical problems that are examples of physics. Students will gain familiarity with the forces and laws of nature that govern the physical world, from the sub-atomic to astronomical levels. Importantly, students will be guided through concepts in physics that ultimately let them recognize important, practical applications in the everyday world of fundamental physical principles. This course is in the format of a three-credit lecture session and a mandatory, separately scheduled one-credit laboratory that accompanies it.

II. PMU Competencies and Learning Outcomes

Students of PHYS 1411 successfully graduating from this course will understand the Scientific Method, and will receive training in contemporary methodologies in physics. They will learn to generate data both individually, as well as in a cooperative effort in a small team setting. Students will learn to organize and critically analyze their data, using statistical and graphing tools where appropriate. Finally, students of PHYS 1411 will learn to communicate their conclusions in writing in a discipline-appropriate format.

III. Detailed Course Description

Topics covered in this course begin with consideration of classic Newtonian mechanics, including energy, work, position, velocity and acceleration. Lectures and labs will then focus on fluids, heat, light and optics, and sound, with an emphasis of practical implications of each of these concepts. Electricity and magnetism and their use in modern society will then be investigated. A brief survey of astronomy will indicate how physical principles apply in the cosmos as well as in our own homes. The course will conclude with a discussion of nuclear physics and energy production.

IV. Requirements Fulfilled

This course is a College Core course and serves in partial fulfillment of the eight-credit science requirement. PHYS 1411 is a recommended elective for all students and required of all students contemplating basic science training.

V. Required Prerequisites

PHYS 1411 requires advanced high school mathematics. Successful completion of an introductory course in biology, geology, chemistry, or physics at the high school level will also be helpful. This course should be

taken as early as possible because of the organizational, analytical and communicative skills that it develops.

VI. Learning Outcomes

A. To learn the basic principles of physics as they apply to the physical world that surrounds us.

B. To develop an understanding of energy, work, efficiency, and other concepts in the natural world.

C. To learn how physics influence everyday events in our societies.

D. To learn how to create a hypothesis, and then test it.

E. To learn the Scientific Method, and how to use the Scientific Method to test hypotheses.

F. To learn how to organize, analyze data, and then present logical, compelling scientific arguments.

VII. Assessment Strategy

Assessment for this course will consist of a combination of examinations based on lecture materials, examinations based on laboratory materials, and grades provided on submitted written materials, primarily from the laboratory exercises. Specific assessment will include:

- A series of four written exams testing the detailed knowledge of short sections of the course (each exam worth 10% of the final grade for a total of 40%).
- A final, comprehensive written exam (20% of the final grade).
- Laboratory grade forming 40% of the course, divided as follows:
  - five written laboratory reports for 25% of the grade
  - three written lab exams for 15% of the grade.

  Note: One of the most common reasons for low achievement in this course is failure to regularly attend and participate in the laboratory section of the course.

This science course will teach students how to work both individually and in a small team setting. The comprehensive exams will encourage students to integrate what they have learned from individual lectures or experiments into a more comprehensive understanding of the subject matter, and as such will begin at an early stage in the student's university education to build the skills and understanding that will be necessary for the capstone course in their discipline.

VIII. Course Format

The course will consist of a combination of lecture presentations and a mandatory, separate laboratory class.

Attendance in both lecture and laboratory is mandatory. Lectures will consist primarily of presentation and discussion of material outlined below. Occasional films and Web-based presentations will be made. Laboratories will consist of an initial presentation/demonstration by the laboratory instructor, followed by laboratory exercises completed in small groups of two to three students. A key feature will be the creation of data, the analysis of that data, and the communication of the findings in the form of a series of written laboratory reports.

Web supplement: The course homepage (using suitable commercial Web tools) will include:

- Course syllabus
- Course assignments
- Keys to quizzes and exams
- Course e-mail utility
- Course discussion list
- Student course grades

Classroom Hours (6 hours per week) **Class:** 3
Lab: 3

IX. Topics to Be Covered

A. Introduction to physics
B. Newtonian mechanics
C. Position, velocity, and acceleration
D. Newton's laws of motion and units
E. Work, kinetic energy, and potential energy
F. Conservation of energy and efficiency in simple machines
G. Fluid mechanics: work and energy
H. Thermodynamics: work and energy
I. Conservation of energy related to thermodynamic systems
J. Light and optics, properties of light and wave motion
K. Laws of reflection and refraction, lenses and mirrors
L. Sound, properties of sound waves
M. Intensity and frequency of sound
N. Electricity
O. Units of electrical measurement, Ohm’s law
P. Capacitors, inductors, and resistors in electrical circuits
Q. Natural magnetism and electromagnetic devices
R. History of astronomy, structure and origin of the Solar System
S. Introduction to quantum physics
T. Nuclear equations, nuclear decay
U. Sub-atomic particles and their properties

X. Laboratory Exercises

The laboratory component of this course will consist of a weekly series of three hour laboratory exercises. The topics to be covered, in order, are:

A. Introduction and science lab safety
B. Scientific Method, quantitative reasoning
C. Metric system, measurement and calibration
D. Vectors and operation with vectors, refraction, mirrors and lenses
E. Force and motion
F. Center of gravity
G. Simple machines
H. Hydrostatic and Archimedes balance
I. Oscilloscope, circuits, wiring
J. Ohm's law, resistivity, diodes
K. Magnetism
L. Astronomy and astronomical observation

XI. Technology Component

A. In Class

Faculty and laboratory instructors will use state-of-the-art multi-media equipment to both project their materials and incorporate appropriate Web sites into their lectures in a real time basis. Laboratories will use computerized projection equipment and data recording and analyzing equipment, either as demonstrations or as part of small team laboratory exercises.

B. Outside of Class

Faculty will provide e-mail and/or Web site interaction regarding the course material, and will post materials on a dedicated course Web site. Students will be able to ask questions, observe and respond to the answers of other students, and independently follow up their studies by accessing appropriate Web sites from a provided list.

XII. Special Projects/Activities

This course does not require a special project.

XIII. Textbooks and Teaching Aids

A. Required Textbooks

Hewitt, Paul. *Conceptual Physics*, Ninth Edition. San Francisco, California: Benjamin Cummings, 2002.
ISBN: 0321052021

B. Alternative Textbooks

Most introductory physics textbooks would be adequate, though some confusion might arise from small differences in order of presentation.

C. Supplemental Print Materials

Other supplemental print materials as provided by the publisher.

D. Supplemental Online Materials

1. Other supplemental online materials as provided by the publisher.
2. Instructors will develop a list of suitable, contemporary Web sites that are appropriate for the topics and level of detail that they will teach.

Course Title: PHYS 1421: Physics for Engineers I

Semester Credit Hours: 4 (3,1)

I. Course Overview

The objective of PHYS 1421 is to create a base for a two-semester physics sequence to provide the additional physics required by engineering students prior to specialized courses in engineering physics applications. This course is not to be taken by non-engineering students. The approach, like that of the following semester PHYS 1422, will be largely a conceptual leading to an understanding of physics rather than just the ability to solve mathematical problems that are examples of physics. Students in this course will gain familiarity with single particle kinematics and dynamics, multi-particle systems, rotational motion, oscillations, waves and sound. This course is in the format of a three-credit lecture session and a mandatory, separately scheduled one-credit laboratory that accompanies it.

II. PMU Competencies and Learning Outcomes

Students successfully graduating from this course will receive training in contemporary methodologies in physics forming a suitable base for the additional physics required of engineers. They will learn to generate data both individually, as well as in a cooperative effort in a small team setting. Students will learn to organize and critically analyze their data, using statistical and graphing tools where appropriate. Finally, students will learn to communicate their conclusions in writing in the form of a scientific journal article.

III. Detailed Course Description

Topics covered in this course create a base in physics that will be subsequently used in PHYS 1422. Beginning with a discussion of the tools of physics, this course moves on to discuss motion and acceleration, Newton's Laws of physics, friction and the types of motions and their characteristics. Momentum is investigated, along with the key forces of inertia, torque and angular momentum. The course concludes with consideration of harmonics, waves and sound. As in PHYS 1421: Introductory Physics, each topic builds upon the growing base formed by previously learned material.

IV. Requirements Fulfilled

PHYS 1421 satisfies the first semester of the two-semester physics requirement for engineering students.

V. Required Prerequisites

PHYS 1421 requires the application of algebra to problem solving. MATH 1321: Pre-Calculus is a prerequisite.

VI. Learning Outcomes

A. To achieve a foundation for continuing studies in physics concepts and practices.

B. To understand the relationship of mathematical representations to their associated physical principles and concepts.

C. To learn the basic principles of Newtonian physics especially as they apply to engineering applications.

D. To learn scientific skills, how to organize and analyze physical data, and then present logical, compelling scientific arguments based on these data.

E. To understand the complementary nature of topics in physics, and how each new piece of information builds on a forming conceptual base.

VII. Assessment Strategy

Assessment for this course will consist of a combination of examinations based on lecture materials, examinations based on laboratory materials, and grades provided on submitted written materials, primarily from the laboratory exercises. Specific assessment will include:

- A series of four written exams testing the detailed knowledge of short sections of the course (each exam worth 10% of the final grade for a total of 40%).
- A final, comprehensive written exam (20% of the final grade).
- Laboratory grade forming 40% of the course, divided as follows:
    - five written laboratory reports for 25% of the grade
    - three written lab exams for 15% of the grade.

    Note: One of the most common reasons for low achievement in this course is failure to regularly attend and participate in the laboratory section of the course.

This science course will teach students how to work both individually and in a small team setting. The comprehensive exams will encourage students to integrate what they have learned from individual lectures or experiments into a more comprehensive understanding of the subject matter, and as such will begin at an early stage in the student's university education to build the skills and understanding that will be necessary for the capstone course in their discipline.

VIII. Course Format

The course will consist of a combination of lecture presentations and a mandatory, separate laboratory class.

Attendance in both lecture and laboratory is mandatory. Lectures will consist primarily of presentation and discussion of material outlined below Occasional films and Web-based presentations will be made. Laboratories will consist of an initial presentation/demonstration by the laboratory

instructor, followed by laboratory exercises completed in small groups of two to three students. A key feature will be the creation of data, the analysis of that data, and the communication of the findings in the form of a series of written laboratory reports.

Web supplement: The course homepage (using suitable commercial Web tools) will include:

- Course syllabus
- Course assignments
- Keys to quizzes and exams
- Course e-mail utility
- Course discussion list
- Student course grades

Classroom Hours (6 hours per week) **Class:** 3
Lab: 3

IX. Topics to Be Covered

A. Tools of physics
B. Speed, velocity, acceleration and motion
C. Vectors and scalars
D. Newton's Laws
E. Friction
F. Motion with constant acceleration, projectile and circular motion
G. Work, kinetic and potential energy, conservation of energy
H. Linear momentum, conservation of momentum, rotational kinematics
I. Inertia, torque, angular momentum
J. Harmonics and harmonic motion
K. Pendulums, balance, statics
L. Waves and sound

X. Laboratory Exercises

The laboratory component of this course will consist of a weekly series of three hour laboratory exercises. The topics to be covered, in order, are:

A. Errors in measurement, accuracy, precision
B. Acceleration due to gravity
C. Projectile motion
D. Newton's Second Law
E. Centripetal force
F. Energy conservation, force and potential energy
G. Momentum conservation
H. The ballistic pendulum
I. Moment of inertia
J. Simple harmonic motion
K. Pressure, volume, Boyle's Law

XI. Technology Component

A. In Class

Faculty and laboratory instructors will use state-of-the-art multi-media equipment to both project their materials and incorporate appropriate Web sites into their lectures in a real time basis. Laboratories will use computerized projection equipment and data recording and analyzing equipment, either as demonstrations or as part of small team laboratory exercises.

B. Outside of Class

Faculty will provide e-mail and/or Web site interaction regarding the course material, and will post materials on a dedicated course Web site. Students will be able to ask questions, observe and respond to the answers of other students, and independently follow up their studies by accessing appropriate Web sites from a provided list.

XII. Special Projects/Activities

This course does not require a special project.

XIII. Textbooks and Teaching Aids

A. Required Textbooks

Tipler, Paul and Gene Mosca. *Physics for Scientists and Engineers*, Fifth Edition. New York, New York: W.H. Freeman, 2004. ISBN: 0716743892

B. Alternative Textbooks

None

C. Supplemental Print Materials

Other supplemental print materials as provided by the publisher.

D. Supplemental Online Materials

1. Other supplemental online materials as provided by the publisher.
2. Instructors will develop a list of suitable, contemporary Web sites that are appropriate for the topics and level of detail that they will teach.

Course Title: PHYS 1422: Physics for Engineers II

Semester Credit Hours: 4 (3,1)

I. Course Overview

The objective of the course is to build upon the base offered in PHYS 1421, and provide the additional physics required by engineering students prior to specialized courses in engineering physics applications. This course is not to be taken by non-engineering students. The approach, like that of the prerequisite PHYS 1421, will be largely a conceptual leading to an understanding of physics rather than just the ability to solve mathematical problems that are examples of physics. Students in this course will gain familiarity with electricity, magnetism, nuclear physics and how light interacts with matter. This course is in the format of a three-credit lecture session and a mandatory, separately scheduled one-credit laboratory that accompanies it.

II. PMU Competencies and Learning Outcomes

Students successfully completing this course will receive training in contemporary methodologies in physics forming a suitable base for the additional physics required of engineers. They will learn to generate data both individually, as well as in a cooperative effort in a small team setting. Students will learn to organize and critically analyze their data, using statistical and graphing tools where appropriate. Finally, students will learn to communicate their conclusions in writing in the form of a scientific journal article.

III. Detailed Course Description

Topics covered in this course build upon the base received in PHYS 1421, and will begin with electricity (charge, field, potential), capacitors and DC circuits. Magnetism and electromagnetic induction will then be discussed. The course concludes with modern physics, nuclear physics and elementary particles, light and physical optics. As in PHYS 1421, each topic builds upon the growing base formed by previously learned material.

IV. Requirements Fulfilled

PHYS 1413 satisfies the second semester of the two-semester physics requirement for engineering students.

V. Required Prerequisites

PHYS 1422 requires successful completion of PHYS 1421: Physics for Engineers I. This course will require some calculus, but primarily the application of algebra to problem solving. MATH 1422: Calculus I is a prerequisite.

VI. Learning Outcomes

A. To achieve a foundation for continuing studies in physics concepts and practices.

B. To understand the relationship of mathematical representations to their associated physical principles and concepts.

C. To learn the basic principles of electricity, magnetism, light and modern physics, especially as they apply to engineering applications.

D. To learn scientific skills, how to organize and analyze physical data, and then present logical, compelling scientific arguments based on these data.

E. To understand the complementary nature of topics in physics, and how each new piece of information builds on a forming conceptual base.

VII. Assessment Strategy

Assessment for this course will consist of a combination of examinations based on lecture materials, examinations based on laboratory materials, and grades provided on submitted written materials, primarily from the laboratory exercises. Specific assessment will include:

- A series of four written exams testing the detailed knowledge of short sections of the course (each exam worth 10% of the final grade for a total of 40%).
- A final, comprehensive written exam (20% of the final grade).
- Laboratory grade forming 40% of the course, divided as follows:
  - five written laboratory reports for 25% of the grade
  - three written lab exams for 15% of the grade.

  Note: One of the most common reasons for low achievement in this course is failure to regularly attend and participate in the laboratory section of the course.

This science course will teach students how to work both individually and in a small team setting. The comprehensive exams will encourage students to integrate what they have learned from individual lectures or experiments into a more comprehensive understanding of the subject matter, and as such will begin at an early stage in the student's university education to build the skills and understanding that will be necessary for the capstone course in their discipline.

VIII. Course Format

The course will consist of a combination of lecture presentations and a mandatory, separate laboratory class.

Attendance in both lecture and laboratory is mandatory. Lectures will consist primarily of presentation and discussion of material outlined below. Occasional films and Web-based presentations will be made. Laboratories will consist of an initial presentation/demonstration by the

laboratory instructor, followed by laboratory exercises completed in small groups of two to three students. A key feature will be the creation of data, the analysis of that data, and the communication of the findings in the form of a series of written laboratory reports.

Web supplement: The course homepage (using suitable commercial Web tools) will include:

- Course syllabus
- Course assignments
- Keys to quizzes and exams
- Course e-mail utility
- Course discussion list
- Student course grades

Classroom Hours (6 hours per week) **Class:** 3
Lab: 3

IX. Topics to Be Covered

A. Electric charge
B. Electric fields
   1. Coulomb's Law
   2. Point charges
   3. Dipoles
   4. Gauss' Law
C. Electric potential
D. Capacitors, DC circuits, RC circuits, Ampere's law
E. Magnetism
F. Electromagnetic induction, inductance, AC circuits, Maxwell equations
G. Modern physics
H. Nuclear physics and elementary particles
I. Light, images, interference, diffraction
J Geometrical and physical optics, lasers

X. Laboratory Exercises

The laboratory component of this course will consist of a weekly series of three hour laboratory exercises. The topics to be covered, in order, are:

A. Using a multimeter
B. Oscilloscope
C. Circuit and, wiring
D. Ohm's Law, resistivity, diodes
E. DC motors
F. Magnetism and induction
G. AC motors
H. Geometrical optics
I. Images and lenses

XI. Technology Component

A. In Class

Faculty and laboratory instructors will use state-of-the-art multi-media equipment to both project their materials and incorporate appropriate Web sites into their lectures in a real time basis. Laboratories will use computerized projection equipment and data recording and analyzing equipment, either as demonstrations or as part of small team laboratory exercises.

B. Outside of Class

Faculty will provide e-mail and/or Web site interaction regarding the course material, and will post materials on a dedicated course Web site. Students will be able to ask questions, observe and respond to the answers of other students, and independently follow up their studies by accessing appropriate Web sites from a provided list.

XII. Special Projects/Activities

This course does not require a special project.

XIII. Textbooks and Teaching Aids

A. Required Textbooks

Tipler, Paul and Gene Mosca. *Physics for Scientists and Engineers*, Fifth Edition. New York, New York: W.H. Freeman, 2004. ISBN: 0716743892

B. Alternative Textbooks

None

C. Supplemental Print Materials

Other supplemental print materials as provided by the publisher.

D. Supplemental Online Materials

1. Other supplemental online materials as provided by the publisher.
2. Instructors will develop a list of suitable, contemporary Web sites that are appropriate for the topics and level of detail that they will teach.