ILLINOIS VALLEY COMMUNITY COLLEGE

COURSE OUTLINE

DIVISION: Natural Sciences Business

COURSE: Phy 2002-General Physics III (Magnetism, Optics and Modern Physics)-Engineering

Date: 9/26/2013

Credit Hours: 4.0

Prerequisite(s): At leat C in MTH 2001and PHY 2001

Delivery Method:

☒ **Lecture**	**2 Contact Hours**	**(1 contact = 1 credit hour)**
☒ **Seminar**	**1 Contact Hours**	**(1 contact = 1 credit hour)**
☒ **Lab**	**2 Contact Hours**	**(2 contact = 1 credit hour)**
☐ **Clinical**	**0 Contact Hours**	**(3 contact = 1 credit hour)**
☐ **Online**		
☐ **Blended**		

Offered: ☐ **Fall** ☒ **Spring** ☐ **Summer**

IAI Equivalent –***Only for Transfer Courses***-go to *http://www.itransfer.org*:

CATALOG DESCRIPTION:

This course is for students majoring in chemistry, engineering and physics. This course includes the concepts of magnetic field, A.C. current and circuits, electromagnetic waves, light, optics, atomic and nuclear physics..

GENERAL EDUCATION GOALS ADDRESSED

Upon completion of the course, the student will be able:

☒ To apply analytical and problem solving skills to personal, social and professional issues and situations.
☐ To communicate orally and in writing, socially and interpersonally.
☐ To develop an awareness of the contributions made to civilization by the diverse cultures of the world.
☒ To understand and use contemporary technology effectively and to understand its impact on the individual and society.
☒ To work and study effectively both individually and in collaboration with others.
☐ To understand what it means to act ethically and responsibly as an individual in one's career and as a member of society.
☐ To develop and maintain a healthy lifestyle physically, mentally, and spiritually.
☐ To appreciate the ongoing values of learning, self-improvement, and career planning.

EXPECTED LEARNING OUTCOMES AND RELATED COMPETENCIES:

Outcome 1 *– Students will be able to demonstrate a basic understanding of magnetic fields including the sources of the fields and the effects they have on moving particles.*

Competency 1.1 Students will be able to compute the force on a charged particle due to a magnetic field and determine the motion of a charged particle in a magnetic field.

Competency 1.2 Students will be able to compute the magnetic force on a current-carrying wire or coil and the magnetic torque on a current-carrying coil.

Competency 1.3 Students will be able to compute the magnetic field produced by a moving charged particle, by a current element, and by a current-carrying conductor.

Competency 1.4 Students will be able to know and apply Ampere's Law to determine a magnetic field.

Outcome 2 *– Students will be able to demonstrate a basic understanding of dynamic electromagnetic fields and their applications to simple electronics.*

Competency 2.1 Students will be able to describe what is meant by, and compute, a

nonelectrostatic field and an induced electric field.

Competency 2.2 Students will be able to know and apply Faraday's Law and Lenz's Law to the solution of problems involving induced electric fields, including motional emfs.

Competency 2.3 Students will be able to solve simple problems involving electric motors.

Competency 2.4 Students will be able to define and compute mutual and self inductance and the energy associated with an inductor.

Competency 2.5 Students will be able to solve problems involving R-L and L-C circuits.

Competency 2.6 Students will be able to solve simple A.C. circuit problems involving resistors, capacitors, and inductors. This includes computing capacitive and inductive reactances, impedance, and electric power.

Competency 2.7 Students will be able to solve simple transformer problems.

Outcome 3 – Students will be able to demonstrate a basic understanding of geometrical optics including refraction, reflection, lenses, mirrors, and various optical devices.

Competency 3.1 Students will be able to know and apply the laws of reflection and refraction of light to the solution of problems.

Competency 3.2 Students will be able to describe the dispersion of light by a prism and by lenses.

Competency 3.3 Students will be able to describe total internal reflection of light and solve problems involving total internal reflection.

Competency 3.4 Students will be able to describe, in words and determine graphically and mathematically, the formation of images by a single reflection or refraction at a plane or spherical surfaces. This includes determining the position and size of any image formed.

Competency 3.5 Students will be able to describe in words and compute mathematically and graphically the position and size of images formed by lenses and various optical instruments, including the eye, the magnifier, the camera, the compound microscope, and the telescope.

Outcome 4 – Students will be able to demonstrate a basic understanding of the wave nature of light.

Competency 4.1 Students will be able to be able to describe in words and mathematically the diffraction and interference of light by a single slit, a double slit, and a diffraction grating.

Competency 4.2 Students will be able to describe in words and mathematically the interference of light from coherent sources, by thin films, by the Michelsen interferometer, by a crystal.

Competency 4.3 Students will be able to describe in words what is meant by a polarized light and four ways (reflection, double refraction, absorption, and scattering) in which light may be polarized; solve simple problems involving polarized light. Describe, in words, optical stress analysis and optical activity, as these terms relate to polarized light.

Outcome 5 – Students will be able to demonstrate a basic understanding modern physics including, quantum mechanics, wave/particle duality, atomic physics, nuclear physics, and relativity

Competency 5.1 Students will be able to describe, in words, the photoelectric effect, the Compton effect, and pair production; solve problems based on the photoelectric effect and the Compton effect.

Competency 5.2 Students will be able to describe, in words and mathematically, the structure of the atom, including the Rutherford atom, the Bohr models of the atom, and the Quantum Mechanical model of the atom.

Competency 5.3 Students will be able to describe the process of nuclear decay, its causes and resulting particles.

Competency 5.4 Students will be able to mathematically determine the energy of decaying particles and mass defect

Competency 5.5 Students will be able to describe and mathematically use the concepts of special relativity for discussions and problem solving.

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COURSE TOPICS AND CONTENT REQUIREMENTS:

1. Magnetic fields and forces
2. Sources magnetic fields and effects
3. Electromagnetic induction
4. Inductance

5. A.C. Circuits
6. Electromagnetic waves
7. Nature and propagation of light
8. Geometric Optics -- Reflection and Refraction of Light; Image Formation by Lenses and Mirrors, Optical Instruments
9. Physical Optics -- Diffraction and Interference; Polarization
10. Wave nature of particles
11. Quantum Physics, Atomic models, molecules and condensed matter.
12. Nuclear Structure; Atomic and Nuclear physics applications
13. Relativity

INSTRUCTIONAL METHODS:

1. Lectures and interactive lecture demonstration (ILDs), Activity-based physics and other audio-visual aids and technologies.

2. Homework assignments and related class discussion sessions.

3. Micro – computer based laboratory exercises.

4. Modeling and guided practice of a variety of physics problems.

INSTRUCTIONAL MATERIALS:

Physics for scientist and engineers, a strategic approach, with modern physics (including student work book, with masteringphysics), 3rd edition. Randall D. Knight

STUDENT REQUIREMENTS AND METHODS OF EVALUATION:

Reading of textbook, note taking, and participation in classroom discussions as well as performing laboratory experiments are required of the students. Students are assigned approximately 15 homework problems per Chapter. Solutions of graded problems are discussed after grading if and when necessary. Evaluation of the students will include written problem class tests and one problem-orientated comprehensive final exam, written reports of laboratory experiments, quizzes and homework assignments

OTHER REFERENCES

University Physics with Modern Physics with Mastering Physics, 13/E
Hugh D. Young, Roger A. Freedman,

Classical Dynamics of particles and systems, Thornton and Marion, 2004, Brooks/Cole

The Mechanical Universe and Beyond the Mechanical Universe

Physics Demonstration series, by Physics Curriculum and Instruction, 2001

Course Competency/Assessment Methods Matrix

Course Prefix, Number and Name	Assessment Options																																	
For each competency/outcome place an "X" below the method of assessment to be used.	**Assessment of Student Learning**	Article Review	Case Studies	Group Projects	Lab Work	Oral Presentations	Pre-Post Tests	Quizzes	Written Exams	Artifact Self Reflection of Growth	Capstone Projects	Comprehensive Written Exit Exam	Course Embedded Questions	Multi-Media Projects	Observation	Writing Samples	Portfolio Evaluation	Real World Projects	Reflective Journals	Applied Application (skills) Test	Oral Exit Interviews	Accreditation Reviews/Reports	Advisory Council Feedback	Employer Surveys	Graduate Surveys	Internship/Practicum /Site Supervisor Evaluation	Licensing Exam	In Class Feedback	Simulation	Interview	Written Report	Assignment
Assessment Measures – Are direct or indirect as indicated. List competencies/outcomes below.	**Direct/ Indirect**	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	I	I	I	I	D	D								
Students will be able to demonstrate a basic understanding of magnetic fields including the sources of the fields and the effects they have on moving particles					X			X	X																						X	X
Students will be able to demonstrate a basic understanding of dynamic electromagnetic fields and their applications to simple electronics.					X			X	X																						X	X
Students will be able to demonstrate a basic understanding of geometrical optics including refraction, reflection, lenses, mirrors, and various optical devices.					X			X	X																						X	X
Students will be able to demonstrate a basic understanding of the wave nature of light.					X			X	X																						X	X
Students will be able to demonstrate a basic understanding modern physics including, quantum mechanics,					X			X	X																						X	X

wave/particle duality, atomic physics, nuclear physics, and relativity circuits design.																																