COURSE SYLLABUS STEM Ed Abroad Program

Course Title: Physics for Engineers and Scientists II (including laboratory component)

Course Semester: Fall

University and Country: Adam Mickiewicz University; Poznan, Poland

Number of ECTS: 6 (lecture) and 2 (laboratory)

Course Designations for Transfer Credit: PY212 (NCSU), PHYS212 (ISU)

Content: Physics for Life Scientists II is the second course in a two-semester sequence of introductory non-calculus-based physics courses. The focus is on electricity and magnetism.

Pre-requisites: University level trigonometry and analytic geometry with a grade of C- or better. Physics for Life Scientists I with a grade of C- or better. Credit cannot be received for similar level Physics courses for Engineering and Science Majors or other introductory Physics courses taught without mathematics requirements.

Aims: By the end of this course, you will have an overview of the general principles of physics and know how they apply to Electricity & Magnetism. You will be able to solve elementary physics problems systematically, logically, and quantitatively through the use of techniques based on algebra, trigonometry, calculus, and graphical methods.

The Learning Objectives for each exam will be posted on each section's web site prior to the first lecture of the sequence leading up to that exam and will serve as both a study outline and a summary of items to review. The Learning Objectives also includes the topics listed below in **Course Lecture and Laboratory Topics**. A student must know and apply to demonstrate mastery of the material listed in these topics as presented in this course.

Recommended Books: Giancoli, Physics (for Life Science students), Pearson/Prentice-Hall (all editions)

Teaching Staff: Dr. Hab. Anna Kowalewska-Kudłaszyk (Lecture) [annakow@amu.edu.pl] and Dr. Hab. Zbigniew Fojud (Laboratory) [zbigniew.fojud@amu.edu.pl] taught with consultation by Dr. Keith Warren (NC State University).

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Grading System and Percentage Contribution

A. Lecture assessment

Lecture participation	5%
Continuous assessment (preparation for class)	5%
Homework	12%
Exam (3 @16% each)	48%
Final Exam, Cumulative	30%
Total	100%

B. Laboratory assessment

Preparation for laboratories	34%
Laboratory reports	66%
Total	100%

Only one lab can be omit. In that case of absence the formal sick leave is demanded.

AMU Grading system and scale

The grading system used at Adam Mickiewicz University, whose name is abbreviated as AMU or UAM, is as follows:

Tests, exams, homework assignments grading scale

5	100%-91%
4+	90%-86%
4	85%-76%
3+	75%-71%
3	70%-60%
2	59% and less

This translates into the following ECTS (European internationally recognized system) grading scale:

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ECTS Grade	AMU grade	Definition
A	5.0	EXCELLENT – outstanding performance with only minor errors
B+	4+ / 4.5	VERY GOOD – above the average standard but with some errors
B	4.0	GOOD – generally sound work with a number of notable errors
C+	3+ / 3.5	SATISFACTORY – fair but with significant shortcomings
C	3.0	SUFFICIENT – performance meets the minimum criteria
F	2.0	FAIL – considerable further work is required

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Hours: 3 Lecture hours and 1 Recitation hour per week. The laboratory component consists of 11 topics listed below. Each laboratory has a duration of 2.5 hours.

Course Lecture and Laboratory Topics:

Week	Topic	Readings in Giancoli
1	Electric charge and electric field	Class overview/Syllabus, Electric Charge, Induced Charge, Coulomb's Law
		Electric Field, Electric Field Continuous Charge Distribution
2		Field Lines, E-Fields and Conductors, Charges-Particle Motion, Electric Dipoles
	Gauss's law	Electric Flux, Gauss's Law, Gauss's Law Applications
3	Electric potential	Electric Potential: Fields and Point Charges, Charge Distributions
		Equipotentials, Dipoles, Calculation of Fields, The Electron Volt
4	Capacitance, dielectrics, electric energy storage	Capacitors, Capacitance, Series and Parallel Connections, Dielectrics
	Exam 1	
5	Electric currents and resistance	Electric Current, Ohm's Law, Resistors and Resistivity, Electric Power
	DC circuits	EMF, Resistors in Series and Parallel, Kirchhoff's Laws, RC Circuits,
6	Magnetism	Magnets and Magnetic Fields, Electric Currents and Fields
7		Forces on Currents, Forces on Moving Charges, Torque on Current Loops, Electric Motors,
	Sources of magnetic field	Magnetic Fields of Currents, Forces Between Wires
8		Ampere's Law, Magnetic Fields of Solenoids, Biot-Savart Law,
	Exam 2	
9		Induced EMFs, Faraday's and Lenz's Laws, Motional EMF

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	Electromagnetic induction and Faraday's law	Ferro-, Para- and Diamagnetism, Hysteresis, Transformers and Power Transmission
10	Inductance, electromagnetic oscillations, and ac circuits	Electric Generators, Mutual Inductance, Self-Inductance, Energy Storage in Magnetic Fields, LR Circuits
11		LC and RLC Circuits and Oscillations, AC Circuits
		RLC Series, Resonance in RLC Circuit
12	Maxwell's equations and electromagnetic waves	Maxwell's Equations, Electromagnetic, Waves
	Exam 3	
13	Light: reflection and refraction	Speed of Light, Poynting Vector, Radiation Pressure, Wireless Communications
		Law of Reflection, Plane and Spherical Mirrors, Snell's Law, Total Internal Reflection
14	Lenses and optical instruments	Thin Lenses, Lens Combinations, Corrective Lenses
15	The wave nature of light; interference	Huygens' Principle, Diffraction, Young Double-Slit Experiment, Thin Films Interference
	Diffraction and polarization	Single-Slit Diffraction, Diffraction Gratings
16		Polarization
18	**Final Exam, Cumulative**	

Lab schedule for Physics II

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The first lab **Intro to labs** is obligatory. Labs in the 2nd-4th and 10th-11th weeks all students perform at the same time. Labs in the 5th-9th weeks students perform cyclically according to the list of labs.

Week	Topics
1	Intro to labs - **obligatory**
2	Direct current and Kirchhoff's laws
3	Determination of current-voltage characteristics of a resistor, bulb and diode for direct current
4	Test of adjustment of a resistor strength.
5	Characteristics of transformer
6	Capacitors
7	The magnetic field of a long straight wire
8	Resonance in RLC circuit
9	Inductance of an inductor (a coil) in the alternate current circuit
10	Measurement of refractive coefficient of transparent solids and a liquid
11	Lenses
12	**An extra lab in a case of difficulties**