LSC Use Only Proposal No:	UWUCC Use Only Proposal No: ~~12-29h~~ 13-44h. 14-59.
LSC Action-Date: AP-10/11/12	UWUCC Action-Date: App-9/30/14 Senate Action Date: App 11/4/14

Curriculum Proposal Cover Sheet - University-Wide Undergraduate Curriculum Committee

Contact Person(s) **Stan Sobolewski**	Email Address **sobolews@iup.edu**
Proposing Department/Unit **Physics**	Phone **7-4590 or 7-2370**

Check all appropriate lines and complete all information. Use a separate cover sheet for each course proposal and/or program proposal.

1. Course Proposals (check all that apply)

_____ New Course _____ Course Prefix Change _____ Course Deletion

__X__ Course Revision _____ Course Number and/or Title Change __X__ Catalog Description Change

Current course prefix, number and full title: **PHYS 132 Physics II-C** Lecture

Proposed course prefix, number and full title, if changing:

2. Liberal Studies Course Designations, as appropriate

__X__ This course is also proposed as a Liberal Studies Course (please mark the appropriate categories below)

_____ Learning Skills __X__ Knowledge Area _____ Global and Multicultural Awareness _____ Writing Intensive (include W cover sheet)

_____ Liberal Studies Elective (please mark the designation(s) that applies – must meet at least one)

_____ Global Citizenship _____ Information Literacy _____ Oral Communication

_____ Quantitative Reasoning _____ Scientific Literacy _____ Technological Literacy

3. Other Designations, as appropriate

_____ Honors College Course _____ Other: (e.g. Women's Studies, Pan African)

4. Program Proposals

_____ Catalog Description Change _____ Program Revision _____ Program Title Change _____ New Track

_____ New Degree Program _____ New Minor Program _____ Liberal Studies Requirement Changes _____ Other

Current program name:

Proposed program name, if changing:

5. Approvals	Signature	Date
Department Curriculum Committee Chair(s)		4/23/2012
Department Chairperson(s)		4/23/2012
College Curriculum Committee Chair		4/23/12
College Dean		4/23/12
Director of Liberal Studies (as needed)		9/25/14
Director of Honors College (as needed)		
Provost (as needed)		
Additional signature (with title) as appropriate		
UWUCC Co-Chairs	Gail S Dehist	9/30/14

Received SEP 10 2014 Liberal Studies

Received APR 24 2012 Liberal Studies

Syllabus of Record

I. CATALOG DESCRIPTION

PHYS 132 Physics II-C Lecture 3c-0l-3cr

Prerequisites: PHYS 131 or equivalent, MATH 122 or 126 at least concurrently

A calculus based course in general college physics utilizing the techniques in problem solving learned in PHYS 131 applied to more advanced topics; topics covered are: Electric Fields, Magnetic Fields, Coulomb's Law, Gauss' Law, Ampere's Law, Circuits, Geometric Optics and Physical Optics.

II. COURSE OBJECTIVES

1. The student will be able to describe and predict various physical principals such as: the nature of the electric field, the meaning of electric potential, the ability of a lens to focus light, and the nature of refraction.

EUSLO 1 *Informed Learners*

Rationale: Homework and tests will include questions on the electric field, electric potential, optics and wave phenomenon. Demonstrations during lecture, accompanied by homework problems will enhance the understanding of the students in these areas. Understanding these principles will empower students to make predictions about these phenomena outside the context of this class.

2. The students enrolled in the course will use theoretical constructs can be used to make predictions in the areas of electromagnetism and optics.

EUSLO 1 *Informed Learners and* EUSLO 2 *Empowered Learners*

Rationale: Classroom lectures will provide foundational information and illustrative examples on the fundamental concepts of physics. Homework assignments will allow the students to elaborate on these concepts, and apply them to novel problems. Problems will often times connect various topics in the course. For example, a problem on electrostatics will require understanding of vector addition and force diagrams.

3. The students will solve problems in the stated topic areas. This development and all descriptive material employ calculus when applicable.

EUSLO 1 *Informed Learners and* EUSLO 2 *Empowered Learners*

Rationale: Assignments and class discussions will have students apply quantitative techniques to address problems within the physical world. The bulk of this course will consist of problem solving. The ability to solve physics problems empowers students to solve quantitative problems in their future career.

4. Students will be able to relate some of the "great moment" in the history of physics. This will include women and minorities.

EUSLO 1 *Informed Learners and* EUSLO 2 *Empowered Learners*

Rationale: Assigned readings from the text as well as outside sources will discuss the great moments in science, as well as contributions from women and minorities. Students will demonstrate knowledge and understanding of the interrelationships within and across disciplines.

III. COURSE OUTLINE

A. Electric Fields — 4 hours
1. Coulomb's law
2. The electric field
3. Calculating the electric fields of various charge distributions
4. Motion of charged particles in a uniform field
5. Electric flux
6. Gauss' law
7. Applications of Gauss' law

B. Electric Potential and Capacitance — 5 hours
1. Potential difference and electric potential
2. Calculating potential from the field
3. Calculating potential from the charge distribution
4. Calculating field from potential
5. Electric potential energy
6. Calculation of capacitance
7. Energy stored in capacitors
8. Dielectrics

C. D.C. Circuits — 4 hours
1. Electric current
2. Resistance and Ohm's law
3. Energy and power in electric circuits
4. Resistors in series and parallel
5. Kirchhoff's rules
6. Measuring instruments

D. Magnetic Fields and their Sources — 5 hours
1. Definition and properties of the magnetic field
2. Motion of charged particles in a magnetic field
3. Magnetic force on a current
4. Torque on a current loop
5. Biot-Savart law
6. Ampere's law
7. Magnetism in matter

E. Faraday's law and Inductance — 4 hours
1. Faraday's law of induction
2. Lenz's law
3. Induced electric fields
4. Inductance
5. LR circuit
6. Energy and the magnetic field

F. Electromagnetic Oscillations and A. C. Circuits — 5 hours
1. Oscillations in an LC circuit
2. Series LCR circuit
3. Power in an A.C. circuit
4. Resonance
5. Transformer

G. Maxwell's equations and Electromagnetic Waves — 4 hours
1. Maxwell's equations
2. Plane electromagnetic waves
3. Energy of electromagnetic waves
4. Polarization

H. Geometric Optics — 4 hours
1. Reflection and refraction

2. Mirrors
3. Spherical refracting surfaces
4. Thin lenses
5. Optical instruments

I. Physical Optics 4 hours

1. Interference
2. Young's experiment
3. Intensity in double-slip interference
4. Interference in thin films
5. Single-slit diffraction
6. Intensity of the single-slit diffraction pattern
7. Resolving power
8. Diffraction grating

Three one hour exams	3 hours
Final Exam	2 hours

IV. EVALUATION METHODS

The final grade for the course will be determined as follows:

20% Problem assignments collected and graded daily.
60% Three one-hour examinations consisting primarily of word problems to be solved, but also definitions of important terms and short essays.
20% Cumulative final examination (2 hours)

V. GRADING SCALE

Score			Grade
100 %	to	90%	A
89%	to	80%	B
79%	to	70%	C
69%	to	60%	D
Less than		60%	F

VI. ATTENDANCE POLICY

Students are expected to attend all lectures. Individual faculty members assigned to this course will determine the specific attendance requirements for this course. In certain situations, such as illness, personal emergency or active military duty, students will be excused for missing class if a written excuse or other proof of absence is provided to the instructor. Individual faculty members will determine how the assignments or other work will be made up in the event of an excused absence. The course attendance policy will be consistent with the Undergraduate Attendance Policy in the IUP Undergraduate Catalog.

VII. REQUIRED TEXTBOOKS, SUPPLEMENTAL BOOKS AND READINGS

Textbook: Halliday, David and Resnick, Robert; Fundamentals of Physics (9th Edition) John Wiley & Sons, Inc, 2011.

VIII. SPECIAL RESOURCES

None noted.

IX . BIBLIOGRAPHY

Bueche, F., Hecht E., **Schaum's Outline of College Physics**, 11th Edition 2011, McGraw-Hill;

Giancoli, D., **Physics for Scientists and Engineers with Modern Physics,** 4th edition, 2008, Addison-Wesley

Knight, R., **Physics for Scientists & Engineers with Modern Physics**, 3rd Edition, 2013, Addison-Wesley

Serway, R., **Physics for Scientists & Engineers** 9th Edition, 2009, Brooks Cole

Wolfson, R., **Essential University Physics**, 2nd Edition, 2012 Addison-Wesley

Young, H., **College Physics,** 9th edition May 6, 2012, Addison Wesley

Young, H., Freedman, R., **University Physics with Modern Physics**, 11th Edition 2011, Addison Wesley

Liberal Studies Course Approval General Information
On a separate sheet of paper, please answer these questions

(Do not include this sheet or copies of the questions in your proposal; submit only the answers)

1) There has been only section of this class offered since its inception, and there will continue to be only one section for the foreseeable future.

2) This is an introductory course in physics for science majors. The bulk of the course content is on the concepts of physics and problem solving. While minorities and women are not an emphasis of the course, ethnic and racial minorities as well as women are discussed. When appropriate, members of underrepresented populations will be discussed. An example would be Emmy Noether. She was a mathematician who did her work in the early 20^{th} century. Noether's theorem has become a fundamental tool of modern theoretical physics and the calculus of variations. Noether's theorem is important, both because of the insight it gives into conservation laws, and also as a practical calculation tool.

3) Students enrolled in this course will be required to read a research articles from a physics journal selected by the instructor

4) This class is the introductory course for Physics, Pre-Engineering, and Chemistry majors.

Part II SUMMARY OF CHANGE

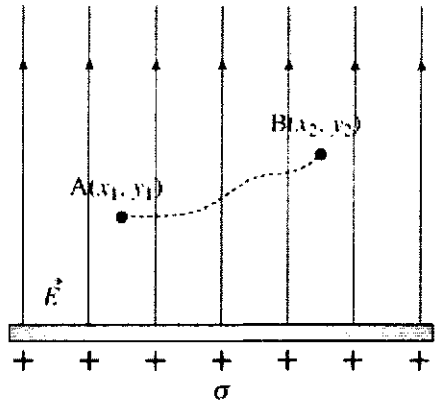
The primary objectives, topics and course activities are not being significantly changed. The purpose of this course revision is to map the course objectives to the new Liberal Studies Expected Undergraduate Student Learning Objectives. (EUSLO) This has been incorporated into the course objectives above.

Secondly, PHYS 131 General Physics I-C has been added as a prerequisite. Material in PHYS 131 is essential for PHYS 132; this prerequisite should have been initially incorporated in the course.

Part III letters of support

None are necessary – The objectives of the courses have not changed, the objectives are being mapped to the new Liberal Studies Standards.

Potential Difference and Potential near a Charged Sheet



Description: Find the potential difference between two points near a charged sheet. Find the potential for a point near a charged sheet for different choices of reference points (of zero potential).

Let $A = (x_1, y_1)$ and $B = (x_2, y_2)$ be two points near and on the same side of a charged sheet with surface charge density $+\sigma$. The electric field $\vec{E}$ due to such a charged sheet has magnitude $E = \frac{\sigma}{2\epsilon_0}$ everywhere, and the field points away from the sheet, as shown in the diagram.

Part A

What is the potential difference $V_{AB} = V_A - V_B$ between points A and B?

Hint A.1 Formula for potential difference

The formula for the potential difference $V_{AB} = V_A - V_B$ between two points A and B in an electric field $\vec{E}$ is

$$V_{AB} = -\int_B^A \vec{E} \cdot d\vec{l}$$

,

where the line integral can be taken along any path l from B to A.

Hint A.2 Calculating the line integral

The line integral from $B = (x_2, y_2)$ to $A = (x_1, y_1)$ of $\vec{C} = C_x\mathbf{i} + C_y\mathbf{j}$, a constant vector field (i.e., independent of x and y), is given by

$$\int_B^A \vec{C} \cdot d\vec{l} = \int_{x_2}^{x_1} C_x\,dx + \int_{y_2}^{y_1} C_y\,dy$$
$$= C_x(x_1 - x_2) + C_y(y_1 - y_2)$$

.

Express your answer in terms of some or all of E, x_1, y_1, x_2, and y_2.

ANSWER:

$$V_{AB} = V_A - V_B = \begin{array}{l} E(y_2 - y_1) \\ E(|y_2| - |y_1|) \end{array}$$

Note that the expression $E(y_2 - y_1)$ will not yield the correct potential if you apply it to two points on opposite sides of the sheet. For example, the expression does not indicate that two points on opposite

sides of the sheet and the same distance from it are at the same potential ($V_{AB} = V_A - V_B = 0$), which is clear from the symmetry of the situation. If you take care in carrying out the integration to observe the change in the direction of the electric field as you pass from one side of the sheet to the other, you will find that the potential difference between A and B is actually given by

$$V_{AB} = E(|y_2| - |y_1|)$$

Recall that the potential *difference*, the quantity asked for in Part A, is a well-defined quantity for any situation. The potential, however, is only defined once you pick a point as the zero-potential point. Different choices simply change the potential by an additive constant, so the potential difference will stay the same, regardless of what point you designate as having zero potential.

Part B

If the potential at $y = \pm\infty$ is taken to be zero, what is the value of the potential at a point V_A at some positive distance y_1 from the surface of the sheet?

Hint B.1 How to approach the problem

Substitute appropriate values for V_B and y_2 in the equation $V_A - V_B = E(|y_2| - |y_1|)$.

ANSWER:

- (•) ∞
- ( ) $-\infty$
- ( ) 0
- ( ) $-E \cdot y_1$

Part C

Now take the potential to be zero at $y = 0$ instead of at infinity. What is the value of V_A at point A some positive distance y_1 from the sheet?

Hint C.1 How to approach the problem

Substitute appropriate values for V_B and y_2 in the equation $V_A - V_B = E(|y_2| - |y_1|)$.

ANSWER:

- ( ) ∞
- ( ) $-\infty$
- ( ) 0
- (•) $-E \cdot y_1$

Note that the potential is zero everywhere on the sheet, that is, at every point whose y coordinate is zero. You always have the freedom to choose a convenient location and reference potential with respect to which other potentials are measured, since it is potential differences and not absolute potentials that actually matter when one is doing something with charges in the real world. Potentials, however, are a useful calculational and bookkeeping tool. For example, if there were four points of interest in an electrical unit, there would be six possible potential differences, so it would be easier to keep track of the four potentials corresponding to the four points instead of working with potential differences.

For the case of a charged sheet, it is clear that choosing the potential at the sheet to be zero is a more

convenient choice than choosing the potential to be zero far away from the sheet. In this way, the potentials of points near the sheet remain finite. The opposite is true for a point charge.

GRADING SCHEME.

This assignment is delivered on-line. Each student will access the web site and answer each question sequentially.

Question-specific feedback and follow-up text only appear when students are shown whether their answer is correct.

The students will have six attempts per question. If the student exhausts all attempts or gives up, the correct answer will be shown immediately.

There is a 3% reduction for each incorrect answer.

Deduct 3% credit for incorrectly answering any other type of question before the last attempt.

Students can view hints. There are questions within the hints which the student may answer for credit

Credit will be given for questions answered correctly in the hint.

Bonus credit of 2% will be given if the student does not open the hint

Deduct credit for exhausting all attempts or giving up on a question in a hint.

OLD SYLABUS OF RECORD

Catalog Description:
PHYS 132 Physics II-C Lecture
Syllabus of Record

PHYS 132

3 lecture hours

Prerequisites: MATH 122, 126 (At least concurrently)

A calculus based course in general college physics utilizing the techniques in problem solving learned in PHYS 131 applied to more advanced topics; topics covered are: Electric Fields, Magnetic Fields, Coulomb's Law, Gauss' Law, Ampere's Law, Circuits, Geometric Optics and Physical Optics.

II. COURSE OBJECTIVES

1. To provide through demonstrations examples of: motion and its causes, the physics of fluids, longitudinal waves (sound) and thermodynamics.

2. To provide sound theoretical connections among the various topics developing the theories from first principles and definitions.

3. To develop in the student a facility for problem solving in the stated topic areas. This development and all descriptive material employs the calculus when applicable.

4. To provide an understanding of some of the "Great moment" in the history of physics and the individuals, including women and minorities, responsible for them.

III. COURSE OUTLINE

A. Electric Fields
    1. Coulomb's law
    2. The electric field
    3. Calculating the electric fields of various charge distributions
    4. Motion of charged particles in a uniform field
    5. Electric flux
    6. Gauss' law
    7. Applications of Gauss' law

B. Electric Potential and Capacitance
    1. Potential difference and electric potential
    2. Calculating potential from the field
    3. Calculating potential from the charge distribution
    4. Calculating field from potential
    5. Electric potential energy
    6. Calculation of capacitance
    7. Energy stored in capacitors
    8. Dielectrics

C. D.C. Circuits
    1. Electric current
    2. Resistance and Ohm's law
    3. Energy and power in electric circuits
    4. Resistors in series and parallel

5. Kirchhoff's rules
6. Measuring instruments

D. Magnetic Fields and their Sources
1. Definition and properties of the magnetic field
2. Motion of charged particles in a magnetic field
3. Magnetic force on a current
4. Torque on a current loop
5. Biot-Savart law
6. Ampere's law
7. Magnetism in matter

E. Faraday's law and Inductance
1. Faraday's law of induction
2. Lenz's law
3. Induced electric fields
4. Inductance
5. LR circuit
6. Energy and the magnetic field

F. Electromagnetic Oscillations and A. C. Circuits
1. Oscillations in an LC circuit
2. Series LCR circuit
3. Power in an A.C. circuit
4. Resonance
5. Transformer

G. Maxwell's equations and Electromagnetic Waves
1. Maxwell's equations
2. Plane electromagnetic waves
3. Energy of electromagnetic waves
4. Polarization

H. Geometric Optics
1. Reflection and refraction
2. Mirrors
3. Spherical refracting surfaces
4. Thin lenses
5. Optical instruments

I. Physical Optics
1. Interference
2. Young's experiment
3. Intensity in double-slip interference
4. Interference in thin films
5. Single-slit diffraction
6. Intensity of the single-slit diffraction pattern
7. Resolving power
8. Diffraction grating

IV. EVALUATION METHODS

The final grade for the course will be determined as follows:

20% Problem assignments collected and graded daily.

60% Three one-hour examinations consisting primarily of word problems to be solved, but also definitions of important terms and short essays.

20% Cumulative final examination (2 hours)