Curriculum Proposal Cover Sheet 14-296

LSC Use Only Proposal No:	*UWUCC Use Only* Proposal No: 13-2026
LSC Action-Date: AP-9/4/14	UWUCC Action-Date: AP-9/23/14 Senate Action Date: App 10/7/14

Curriculum Proposal Cover Sheet - University-Wide Undergraduate Curriculum Committee

Contact Person(s)	Email Address
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Proposing Department/Unit	Phone
Physics	7-4590, 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: SCI 101 Fundamentals of Physics

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)	S Sobolewski	4-10-2014
Department Chairperson(s)		4-10-2014
College Curriculum Committee Chair		4-16-14
College Dean		4/16/14
Director of Liberal Studies (as needed)		9/15/14
Director of Honors College (as needed)		
Provost (as needed)		
Additional signature (with title) as appropriate	Edel Reilly TECC Sara Smithhisler	4/18/14
UWUCC Co-Chairs	Gail S Sedrust	9/24/14

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I. CATALOG DESCRIPTION

SCI 101 Fundamentals of Physics **2c-21-2.5cr**

Prerequisite: Early childhood education/special education major or instructor permission

A conceptual course in physics for the non-science major. High school physics is not a prerequisite. Class and lab presentations concentrate upon dispelling naive concepts and developing a better understanding and appreciation of the physical world. The topics of motion, heat, light, sound, electricity, magnetism, and the atom are presented in context with our everyday experiences. Does not fulfill the Liberal Studies requirement except for majors in early childhood education/special education major.

II COURSE OBJECTIVES

1. To develop an understanding of the role of physics in describing the phenomena of nature.

EUSLO 1 *Informed Learners*

Rationale: Assignment in both lecture, but especially lab, will require students to observe phenomena in nature and explain these processes using the conceptual framework of physics. Students will demonstrate information literacy skills, including the ability to access, evaluate, interpret, and use information from a variety of sources. (Scientific Literacy)

2. To provide the necessary experiences in the laboratory so that the processes of observation, classification and generalization may be used.

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

Rationale: Assignment in lab will require students to observe phenomena in one situation, and make a generalization that will apply to similar, broader situation. Students will demonstrate information literacy skills, including the ability to access, evaluate, interpret, and use information from a variety of sources. (Scientific Literacy) Students will interpret, analyze, and use numerical and graphical data. (Quantitative Reasoning)

3. To be able to explain some of the more common natural phenomena in terms of the physical processes involved.

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

Rationale: Assignment in lab and lecture will require students to observe phenomena and explain the phenomena with physics concepts. Students will interpret, analyze, and use numerical and graphical data. (Quantitative Reasoning)

4. To be able to use mathematics and graphical techniques to arrive at numerical answers for scientific problems.

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

Rationale: Assignments in lab and lecture will require students to construct graphs of their data, and use the data to make specific predictions about the phenomena under study. Students will interpret, analyze, and use numerical and graphical data. (Quantitative Reasoning)

5. Describe the relevance of science in modern society.

EUSLO 3 *Responsible Learner*

Rationale: Assignments in lecture and lab will have the students demonstrate the importance of science in most of the lives of the students. An intellectually honest individual knows that science is an important part of modern society. Students will demonstrate knowledge and understanding of the interrelationships within and across disciplines. (Scientific Literacy)

6. Evaluate how scientific applications impact human welfare as a foundation for making intelligent judgments concerning the worth of the applications of science.

EUSLO 1 *Informed Learners* and EUSLO 2 *Empowered Learners* and EUSLO *3 Responsible Learner*

Rationale: Assignments in lecture and lab will be given where the facts of the discipline will be juxtaposed with the need of society. A responsible learning appreciates the necessity or examining science with a critical point of view. Students will demonstrate knowledge and understanding of the interrelationships within and across disciplines. (Scientific Literacy)

7. Provide an understanding of some of the "great moments" in the history of physics and the individuals, including women and minorities, responsible for them.

EUSLO 1 *Informed Learners* and EUSLO 2 *Empowered Learners* and *EUSLO 3 Responsible Learner*

Rationale: Responsible learners will recognize science as a human activity. Assignments illustrating the people of science and their great discoveries will enhance this appreciation. Students will demonstrate knowledge and understanding of the interrelationships within and across disciplines. (Scientific Literacy)

Key assessment matrix as required by TECC
This course is required for Elementary Education majors

Course Outcome	Conceptual Framework (Danielson)	INTASC standard	NCATE/NSTA Standards	Course assessment measuring outcomes
1	1a	1	1a,1b,1c,1d,1e,2a,2b	Test & Homework
2	1a	1	1a,1b,1c,1d,1e,2a,2b	Test & Homework
3	1a	1	1a,1b,1c,1d,1e,2a,2b	**Laboratory Presentation**
4	1a	1	1a,1b,1c,1d,1e,2a,2b	Test & Homework
5	1a	1	1a,1b,1c,1d,1e,2a,2b	***Test*** & Homework
7	1a	1	1a,1b,1c,1d,1e,2a,2b	**Laboratory Presentation**

Course assessments **underlined in bold** are to be designated as key assessments

III. COURSE OUTLINE

A. Mechanics
- I. Kinematics – Galileo (2 hour)
  - a. Displacement, velocity, Acceleration
  - b. Free Fall and Air Resistance
- 2. Dynamics – Newton (2 hours)
  - a. Newton's Laws of Motion - Inertia, Force, and Action-Reaction
  - b. Impulse-Momentum
  - c. Friction
- 3. Nonlinear Motion (1 hour)
  - a. Projectiles
  - b. Circular motion
- 4. Energy (2 hours)
  - a. Work and Power
  - b. Potential and Kinetic Energies
  - c. Simple Machines
  - d. Conservation of Energy
- 5. Gravity and Satellite Motion (1 hour)

B. Properties of Matter (2 hours)
- 1. Atomic Nature of Matter
- 2. Solids and Density
- 3. Liquids - Buoyancy in Liquids, sinking and floating
- 4. Gases and Buoyancy

C. Heat (2 hours)
- 1. Temperature, Heat, and Expansion
- 2. Heat Transfer - Conduction, Conduction and Radiation
- 3. Change of State
- 4. Heat Energy - Sources and Uses

D. Sound (2 hours)
- 1. Vibrations and waves
- 2. Sound, music and hearing

E. Electricity and Magnetism (2 hours)
- 1. Static Electricity
- 2. Current Electricity and Circuits
- 3. Electricity and the Body
- 4. Magnetism
- 5. Electromagnetic Induction

F. Light (3 hours)
- 1. Propel lies of Light
- 2. Reflection and Mirrors
- 3. Refraction and Lenses
- 4. Vision and Color
- 5. Dispersion and Scattering

G. Light Waves (2 hour)
- 1. Interference and Diffraction
- 2. Polarization

H. Light Emission (2 hour)
- 1. Incandescence
- 2. Fluorescence

3. Phosphorescence

I. Quantum Physics (1 hour)
   1. Discovery of the Nucleus
   2. Spectra
   3. Energy levels

J. The Nucleus and Radioactivity (1 hour)
   1. X-Rays and Radioactivity
   2. Radiation
   3. Isotopes
   4. Half-life and Decay
   5. Radiation and the Body

K. Fission and Fusion (1 hour)
   1. Fission and Reactors
   2. Fusion and the Stars

Topics covered in the laboratory

1. Time, Distance, Investigations Exp.
2. Motion Down a Ramp
3. Weight, Gravity and Friction
4. Simple Machines
5. Work and Energy
6. Current, and Electric Circuits
7. Spring Break
8. Electric Circuits
9. Magnetism
10. Electric Motors
11. Harmonic Motion- Simple Pendulum
12. Waves and Resonance
13. Light, Mirrors and Lenses

IV. Evaluation Methods

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

40% TESTS - 3 hourly exams consisting of multiple choices, true-false, matching and short essay
10% FINAL EXAM
20% QUIZZES given during the lecture
30% LAB PERFORMANCE

Two lab presentations at 20% of the lab grade (6% of course grade) plus 13 lab investigations for 80% of the lab grade (24% of the course grade)

Grading Scale: A: >90% B: 80-89% C: 70-79% D: 60-69% F: <60%

V. Attendance policy

Students are expected to attend all lectures and complete all labs. 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.

1) To allow the student to experience the concepts presented in lecture

EUSLO 1 *Informed Learners*

Rationale: Science is a Hands-On activity, when the students have an opportunity to measure, record data, and formulate hypotheses; the concepts of learned in lecture will become more apparent to the student.

2) To allow the student to become familiar with the systems of measurement and the instruments associated with those systems

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

Rationale: In every laboratory investigation, students will take data in various units. Force, time, current, electric potential, magnetic field, and, like intensity are some of the phenomenon that will be measured and in each instance the student will need to record a proper unit. Students will interpret, analyze, and use numerical and graphical data. (Quantitative Reasoning)

3) To allow the student to become familiar with various analytical techniques, including graphing and graphical analysis of the data

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

Rationale: In every investigation, the student will construct a graph and interpret or draw a conclusion from the graph. This will be informed learners as to how scientists arrive at conclusions empowering the students with the understanding of the scientific process. Students will interpret, analyze, and use numerical and graphical data. (Quantitative Reasoning)

4) To allow the student to overcome the reluctance to manipulate simple apparatus in exploring phenomena

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

Rationale: Most of the equipment in this course is not esoteric Scientific Equipment, but things that can be found at the local hardware store. Meter sticks, light bulbs, multi meters, ammeters, volt meters and the like, are all used in this course. Once the student has finished this course he or she will be comfortable using most measuring devices common to every day measurement. This will result in an empowered learner. Students will demonstrate problem-solving skills using a variety of methods and tools. (Scientific Literacy)

5) To develop student's ability to quantify data through the performance of a laboratory exercise and to analyze the data to produce meaningful physics relationships.

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

Rationale: Quantification is a critical part of every laboratory course. The ability to make connections between various data is a key element in science. Students will be asked to take the data they have gathered and refute or confirm a hypothesis based upon the data they have gathered. This will empower them with the ability to understand how science works in the in the world. Students will interpret, analyze, and use numerical and graphical data. (Quantitative Reasoning)

6) To require student presentations that must be developed though referenced investigations, resulting in a written report following a prescribed format. To require that the student presentations contain sufficient demonstrations and hands-on activities that will properly reinforce the concept being developed, utilizing "nuts-and-bolts" apparatus that can be found in their everyday environment.

Rationale: Students will demonstrate knowledge and understanding of the ways of modeling the natural, world. (Quantitative Reasoning)

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).

Part II

Liberal Studies Course Approval Checklist
Instruction Sheet

Use this checklist for all Liberal Studies categories other than writing-intensive sections; a different checklist is available for this if you have questions, contact the Liberal Studies Office, 103 Stabley, telephone 357-5715

This checklist is intended to assist you in developing your course to meet IUP's Criteria for Liberal Studies and to arrange your proposal in a standard order for consideration by the Liberal Studies Committee (LSC) and the University-Wide Undergraduate Curriculum Committee (UWUCC). When you have finished, your proposal will have these parts:

_X_ Standard UWUCC Course Proposal Cover Sheet, with signatures and Liberal Studies course designation checked

_X_ Course syllabus in UWUCC format

NA_ UWUCC course analysis questionnaire Needed only if this is a new course not previously approved by the University Senate These are not considered by the LSC but will be forwarded to the UWUCC along with the rest of the proposal after the LSC completes its review

This is not a new course; it has been approved by the University Senate

_X__ Assignment instructions for one of the major course assignments and a grading rubric or grading criteria for that assignment

_X_ Answers to the four questions listed in the Liberal Studies Course Approval General Information (one page)

Submit the original of the completed proposal to the Liberal Studies Office (103 Stabley) In addition to the signed hard copy, email the proposal as a Word or RTF file attachment to Liberal-Studies@iupedu

Please Number All Pages

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) This course has always been taught by one instructor, and will continue to be so for the near future.

2) This class investigates mathematical descriptions of the physical world. While this topic is not an emphasis of the course, ethnic and racial minorities as well as women are discussed when appropriate. For example in the history of the development of nuclear fission, Lise Meitner was the female scientist who initially developed the fission reaction. Although she did the research, the results were published under the name of her colleague; Otto Hann. Women just did not publish chemistry and physics papers in the 1930's.

3) In the laboratory portion of the course, students give a presentation. In the process of preparing for this presentation, references besides the text book are required.

4) The breadth of SCI 101 is much broader than PHYS 131. In the introductory major's course, great care is taken to develop the mathematical skills necessary for Physics. PHYS 131 goes into the depth of physics problems solving and quantitative analysis. This course is much less mathematical and covers the discipline in broad terms. Students in this class are future elementary education teachers. This class gives examples of how to do science for young children.

Sample assignment from Lab portion of the course (Please note that SCI 105 and SCI 101 share the same laboratory activities.)

In this Investigation, you will:

1. Use the electronic timer and photogates with a car and ramp.
2. Identify the variables that influence how fast a car travels down a ramp.
3. Learn how to design experiments that provide good scientific results.

Question: How do we ask questions and get answers from nature?

We do experiments to collect evidence that allows us to unravel nature's puzzles. You can think of an experiment as asking a question about the universe: "What would happen if I did this?" If your experiment is well planned, the results of the experiment provide the answer you are looking for. If your experiment is not planned correctly, you will still get results but you may not know what they mean. In this Investigation, you will experiment with speed and the angle of a ramp. Only by paying careful attention to the variables can you make sense of your results.

A Setting up the experiment

The faster you go the shorter the time it takes to reach your destination. With two photogates you can measure time very accurately. Set up the ramp and car as instructed by your teacher. Each group in the class will have a different ramp angle. The angle is determined by which hole in the stand you use to attach the ramp. Put two photogates on the ramp so that you can measure time for the car. Plug the photogate closest to the top of the ramp into input A of the timer and the other photogate into input B.

a. Look around the class and note which hole each group is using for its ramp. With your group, make a prediction as to which group will have the fastest car, and therefore the shortest time from A to B. This prediction is your group's hypothesis. Write down this hypothesis so you can compare it to your results.

b. Roll the car down the ramp and record the time it takes to go from photogate A to photogate B. Be sure you look at the timer reading with the A and B lights on.

c. Compare your results with other groups'. Did the times that everyone measured agree with your hypothesis about how the angle of the ramp would affect the speed? Why or why not?

d. Is there a better way to test whether increasing the ramp angle makes the car go faster? Explain how you would redo this experiment so the results make sense.

B Variables in an experiment

Variables are the factors that affect experimental results. In part 1, each group did the experiment with too many differences, instead of only the angle of the ramp. That made it hard to compare results. In an experiment, you have to keep everything the same and only change one variable at a time. If you only change one thing at a time, when you get a result you know it was caused by the variable you changed. What variables will affect how fast the car moves down the ramp? List all the variables discussed by your group.

C Doing a controlled experiment

In this part of the Investigation, you will repeat the time measurements of the car, but as you will see, each group will attach the photogates in the same way. This will allow groups to more accurately compare results.

1. In the table, record any variables you think should be controlled to make the experiment a comparison of how cars behave on ramps of different angles. Write values for these variables in the table. These values will not change during the experiment.
2. Develop a good technique for rolling the car down the ramp so you get three times that are within 0.0005 seconds of each other.
3. Using your new technique and setup, record the time it takes the car to travel from photogate A to photogate B. Once you have your new results, compare them with the results of the other groups.

    a. Did your times agree with your hypothesis about how they would change with the angle of the ramp?
    b. In one or two sentences describe why this experiment was better or worse than your first experiment.

Your answer should talk about cause and effect relationships and variables.

D Applying what you learned

a. It is often easy to confuse cause and effect. When we see something happen, we think up a reason for why it happened, but we don't always get the right reason. If you drop a piece of paper and a steel weight at the same time, which one hits the ground first? If the paper is flat, the steel always hits first. Why does the steel hit first? Is it because heavier objects fall faster, or is there another reason? In your answer give at least one other reason why a steel weight might fall faster than a flat sheet of paper.

b. Plan and perform another experiment to test the effect of one of the other variables on the speed of the car. Create a data table and a procedure for controlling the variables you don't want to change.

End of sample lab

Part III letters of support

Not necessary - We are only mapping the course objectives to the new Liberal Studies objectives; the course objectives themselves are not changing. It is common knowledge this is happening University wide.