

Curriculum Proposal Signature Sheet

PHYS III
The Joy of Physics - on a Bicycle

TITLE OF PROPOSAL

Type of Proposal

Program

- New
- Changes within Major
- Changes within Cognate *
- Changes in Minor or Track
- Changes in Concentration*
- Program Deletion

Course

- New
- Changes in Course taken only by Majors
- Changes in Course required of Non-Majors*
- Changes in Course open to Non-Majors
- Deletion of Course taken only by Majors
- Deletion of Course required of Non-Majors*
- Deletion of Course open to Non-Majors

Physics and Electrical Engineering Review and Approval 10/20/10

SPONSORING DEPARTMENT(S)

DATE(S)

Signature of Sponsoring Chair(s)/Date

Engineering

Christine Z... 10/20/10

* For starred items Chairs of affected Departments/Programs must sign below before Dean's review

Dean's Preliminary Review Proposal: Complete

Additional preliminary comments below

- Satisfies U of S Curricular Requirements
- Consistent with College Goals/Mission

Dean's Signature/Date

DM

11-2-10

CAS

CPS

SOM

GRAD

DHC

Preliminary FSCC Disposition:

- Committee recommends approval (*new program proposals require a Recommendation from the full Senate*)
- Proposal will require minimal review: Anticipated FS Meeting Date: _____
- Proposal will require significant review: Anticipated FS Meeting Date: _____

FSCC Chair Signature/Date _____

Issues: _____

Additional Signatures

_____	_____	_____
Department	Signature	Date
_____	_____	_____
Department	Signature	Date
_____	_____	_____
Department	Signature	Date

RECEIVED

OCT 21 2010

UNIVERSITY of SCRANTON
CAS ASSOCIATE DEAN

New Course - Submitted by Joseph W. Connolly Ph.D., Professor, Physics/EE

JWC 10-6-10

Course Title: The Joy of Physics – On a Bicycle

Course Number: Physics 111

Date Of Initial Offering: Fall 2011
Semester year

Rationale for Course level

Bicycles are fun – they evoke pleasant memories of youthful freedom, athletic performance, and personal accomplishment. The sense of satisfaction gained when we first learn how to ride a two-wheeler is a lasting memory. No matter what your age, when you hop on a bike, you are ten years old again. In spite of the machine often being viewed as a toy, there is significant basic physics involved in the operation of the bicycle. The purpose of this course is to use the fun and joy of the bicycle to learn the fun and joy of physics.

Credit Hours: 3 credits Format: lecture lab other: _____

Frequency: annual each semester alternate years

Prerequisites: One year of high school algebra and a little trigonometry and geometry.

Rationale for pre-requisites (if pre-requisites are listed)

Basic algebra, trigonometry and geometry are the language of basic physics.

Catalog Description (50 word maximum)

This course, of basic physical science, is designed to satisfy the natural science requirement. The objective is to use the fun and joy of the bicycle to understand the fun and joy of physics. We will examine physics principles such as concepts of motion, forces, gravity, work, energy, power, heat, conservation, and explore their applications to the bicycle and cyclist.

Similar Courses being offered at the University

Within the Physics/EE Department, there are other GE type courses that involve basic physical principles. These include: Physics 102 (Earth Science), Physics 113 (The Science of Light and Photography), Physics 101 (The Solar System) and approximately a half dozen more. Each course has its own special emphasis without excessive overlap.

**Discuss
Extent of
overlap with
existing
courses**

Of course, any new course that involves basic physical principles will share some overlap with existing courses in the same department. This newly proposed course will have primary emphasis on mechanics topics such as: forces, Newton's Three Laws, friction, gravity, linear motion, energy, power, rotational kinematics, and dynamics. However, the proposed course offers a unique perspective on these classical physical topics. We will explore the application of these topics to a familiar object, the bicycle, that is generally perceived as fun, as a "toy"; as a pleasant memory from childhood. In spite of the bicycle ubiquitous presence, the machine is not well understood. There is mystery - almost magic- in its behavior -in its mechanical efficiency, in its ability to balance on two wheels. We have developed simple algebraic analysis and explanations for complex topics (such as time averages of forces and velocities) that normally require the use of the calculus. We will show how spreadsheets computations can be used in lieu of integral calculus.

**Special
Resources
Required
(e.g. library,
equipment,
materials/
facilities)**

I will make use of traditional elementary physics demonstrations. I would like this course to be scheduled in one of our newly outfitted demonstration classroom. It is also requested that the classroom be media equipped.

Characteristics (check any/all that apply):

Major: Required Elective

GE : submitted to CCC will be submitted to CCC: October 15, 2010 Area Free only
date

<input type="checkbox"/> Humanities (CA)	<input type="checkbox"/> S/B Sciences (S)	<input type="checkbox"/> Cultural Diversity (D)
<input type="checkbox"/> Humanities (CH)	<input checked="" type="checkbox"/> Natural Science (E)	<input type="checkbox"/> Writing Intensive(W)
<input type="checkbox"/> Humanities (CL)	<input type="checkbox"/> Theology/Phil (P)	
<input type="checkbox"/> Humanities (CF)	<input type="checkbox"/> Quantitative Reasoning (Q)	

Interdisciplinary: YES NO **Team Teaching:** YES NO

Exclusively For Special Programs/Concentrations: NO YES (Name) _____

Home College: CAS PCPS KSOM GRAD

Required Attachments:

- Syllabus with student learning objectives, assessment/evaluation mechanisms, and outline of topics
- Description of, or example of, readings/papers/projects/examinations
- Assessment/evaluation based course improvement mechanisms

Syllabus

Physics 111 – The Joy of Physics – on a Bicycle, Dr. Joseph W. Connolly

"Wherever the spirit wished to go, there the wheels went, and they were raised together with the living creatures; for the spirit of the living creatures was in the wheels"
New American Bible – Book of Ezekiel, Chapter 1, Verse 20

Fall 2011

Text: "The Joy of Physics – On a Bicycle" – Connolly - Preprint edition available in bookstore

Office: Harper-McGinnis Wing, St. Thomas room 284

Office Hours: Any day before or after class is good, also Tuesday and Thursday from 11:15 to 2:30. Other times are available by appointment. I am happy to meet with you to discuss matters of significance.

Phone: 941-7508

Email: jwc305@scranton.edu

Objective:

This course is an introductory level course for non-science majors. It is designed to fulfill the natural science requirements. The purpose of the course is to familiarize the student with basic physics principles and to appreciate the application of the concepts to the bicycle and its rider. The course will also demonstrate how basic mathematics (algebra, trigonometry, and geometry) is used to gain insight into the sophisticated nature of these profoundly simple physical laws.

Grading:

The grade will be based on three one-hour exams, a comprehensive final and quizzes:

3 ONE HOUR EXAMS:	100 POINTS EACH
COMPREHENSIVE FINAL EXAM:	200 POINTS
EXTRA CREDIT – surprise quizzes:	max of 20 POINTS

Special Projects – A student may earn up to 20 additional points by performing one of several real world, outdoor cycling experiments. These will involve actual measurements on physical phenomena such as velocity, acceleration, energy, power, air resistance, balancing, etc. Details on each "experiment" and the required "lab report" will be provided in supplemental handouts. In order to receive the benefit of the Special Project credit, a student may not have more than **two recorded absences**. Please consider your attendance habits now, should you later decide you really want the extra points.

You can't always get what you want

You can't always get what you want

You can't always get what you want

But if you try sometimes well you just might find

You get what you need

Oh baby, yeah, yeah!

Mick Jagger and the Rolling Stones

Tentative Exam dates: September ??, October ?? and November ?? for the one hour exams. The final is given according to the schedule put out by the Registrar's Office (Tentatively scheduled for December ?? at ??). Anyone who cannot make a scheduled test should discuss the situation with me before the test is given. Ordinarily, make-up exams will be given only in cases of documented medical or family emergencies.

The quizzes will be unannounced, and there will be no make-up for any reason.

ATTENDANCE OF YOUR MIND AND PARTICIPATION IN CLASS IS EXPECTED. IF YOU ARE IN THE ROOM BUT ENGAGED IN USING ELECTRONIC GADGETS –CELL PHONES/COMPUTERS/IPODS - INCLUDING TEXTING -YOU ARE NOT PRESENT AND WILL BE MARKED ABSENT!

The course will include the following topics; we will examine the basic physics of each concept and illustrate the application of these concepts to the bicycle and its rider:

- Introduction to the joy of physics on a bicycle
- The magic of the wheel
- Evolution of the bicycle
- Mathematics review
- Concepts of vectors, vector arithmetic
- Linear motion, speed, velocity, acceleration
- Forces, Newton's 3 laws of motion
- Human musculoskeletal system
- Rolling resistance
- Air resistance
- Gravity
- Work and energy
- Types of energy
- Conservation of energy
- Rotational dynamics, moments, and torques
- Rotational kinematics, centripetal acceleration, and forces
- Unstable equilibrium
- Momentum and impulse, linear and rotational
- Atoms and molecules
- Concepts of temperature and heat
- Heat transfer
- Phases of water
- Elasticity of materials
- Strength of materials

- Bending theory
- Applications of Photoshop and AutoCAD to determine geometric properties

Note: Many of the above topics are associated with a classical physics course. They will be presented in this course with an emphasis on conceptual and intuitive understanding. We will make use of fundamentals of high school algebra and trigonometry to comprehend fully the conceptual and intuitive ideas. We will also employ a unique and simple spreadsheet methodology to gain insight into physical concepts that are normally studied with the calculus.

DISRUPTIVE BEHAVIOR/ATTENDANCE

This is a college level course; I expect mature, professional behavior from the students. The policy for this course will result in a grade reduction for each missed or disrupted class.

Disruptions in class include activities such as:

- coming in late especially through the front door
- talking during class
- silly noises
- leaving early
- "packing up" before the end of class
- "other" to be defined as necessary
- use of cell phones –PLEASE MAKE SURE THEY DO NOT RING DURING CLASS!!!!!!!!!!!!!!!!!!!!!!
- use of electronic gadgets

A special note to Seniors: I take this course very seriously; it will receive my best effort. If you treat the course lightly – missing class, doing poorly on exams etc – you will fail this course. Sometimes, a senior who fails this course does not graduate. There is no extra credit beyond what is on the first page of this syllabus.

IF YOU DO NOT EXPECT TO BE ABLE TO COMPLY WITH THE TERMS OF THE SYLLABUS – DROP THE COURSE NOW!

Description of, or example of, readings/papers/projects/examinations.

"The Joy of Physics - On a Bicycle" will be taught in a traditional manner of lecture/discussions. The exams will also be traditional in that they will consist of questions that examine the student's grasp of the fundamental ideas. My experience with similar courses such as "Earth Science" and "The Science of Light and Photography" has strengthened my belief that undergraduate students need not be coddled or sheltered from a respectable level of mathematical rigor. Test questions will explore the student's conceptual understanding and the ability to apply basic principles of physics.

We will also offer to the students the opportunity to gain a limited amount of extra credit by performing simple "lab experiments" on actual bicycles. These experiments will allow the student to learn in a "hands-on" fashion the concepts of motion, energy, forces, etc. At present, I see the extra credit as a relatively small contribution to the final grade. My concern is that excessive amounts of bonus points encourage a careless approach to the study for examinations. In certain courses, I allow an extra credit project to be used to "drop" a lowest exam.

Assessment/evaluation based course improvement mechanisms

I will make use of traditional course evaluations and my own end of semester survey. The dialog nature of my lectures provides ongoing feedback on the effectiveness of the presentation level.