UPAC FORM #2 (Page 1)

OFFICIAL COURSE OUTLINE INFORMATION

Students are advised to keep course outlines in personal files for future use.

Shaded headings are subject to change at the discretion of the department and the material will vary - see course syllabus available from instructor

FACULTY/DEPARTMENT: Faculty of Science, Health & Human Services/Physics

PHYS 393       3

COURSE NAME/NUMBER  FORMER COURSE NUMBER  UCFV CREDITS

Computer Algebra Physics I

COURSE DESCRIPTIVE TITLE

CALENDAR DESCRIPTION:

This is the first of two courses designed to illustrate how computer algebra systems (CAS) can be used in physics. The emphasis is on using computer algebra methods to form, manipulate, simplify, and plot equations along with its ability to interactively answer "what if" questions. No prior knowledge of any CAS software is assumed or needed.

PREREQUISITES: Physics 221

or COREQUISITES: Physics 221

SYNONYMOUS COURSE(S)

(a) Replaces: N/A

(b) Cannot take: N/A for further credit.

SERVICE COURSE TO:

TOTAL HOURS PER TERM: 45

STRUCTURE OF HOURS:

TRAINING DAY-BASED INSTRUCTION

LENGTH OF COURSE:

HOURS PER DAY:

MAXIMUM ENROLLMENT: 24

EXPECTED FREQUENCY OF COURSE OFFERINGS:

WILL TRANSFER CREDIT BE REQUESTED? (lower-level courses only)

WILL TRANSFER CREDIT BE REQUESTED? (upper-level requested by department)

TRANSFER CREDIT EXISTS IN BCCAT TRANSFER GUIDE:

AUTHORIZATION SIGNATURES:

Course Designer(s): George McGuire

Chairperson: Art Last (Curriculum Committee)

Department Head: Norm Taylor

Dean: Wanda Gordon

UPAC Approval in Principle Date: 

UPAC Final Approval Date: Feb. 2, 2007
LEARNING OBJECTIVES / GOALS / OUTCOMES / LEARNING OUTCOMES:

Learning Objectives:
1. Students should be able to use a CAS to interactively form, manipulate, simplify, and solve equations.
2. Students should be able to use a computer to communicate, visually present, and discuss their solutions in a more efficient and effective manner.
3. Students should have a competent and working knowledge of the material enumerated in this course outline.

Goals:
1. To provide opportunities for the students to acquire and deepen their computer and physics problem-solving skills.
2. To provide opportunities for the students to enhance their critical and abstract reasoning skills.
3. To provide opportunities for the students to gain confidence in their problem-solving abilities.

Learning Outcomes:
1. Students who successfully complete this course should gain confidence in their ability to use their knowledge of physics and computers in a manner which makes them more employable.
2. Students should augment the skills needed to help ensure their success in other physics courses and in industry.

METHODS:
1. The computer algebra system used in this course will be Maple.
2. The course will need to be taught in a room containing computers. The upper-level physics lab might be used as an alternate room.
3. The teaching style will abandon the "sage on the stage" with its companion "talk and chalk" lecture style in favour of a more student "hands-on" and instructor facilitator approach.
4. The course contains enough extra material to allow the students to make choices and delve deeper into problems of their choice and interest.
5. A research problem will be assigned and the student will be expected to present their results to their classmates.

PRIOR LEARNING ASSESSMENT RECOGNITION (PLAR):
Credit can be awarded for this course through PLAR (Please check:) ☒ Yes ☐ No

METHODS OF OBTAINING PLAR:
Please refer to the Physics PLAR policy on the department's webpage.

TEXTBOOKS, REFERENCES, MATERIALS:
[Textbook selection varies by instructor. An example of texts for this course might be:]

Recommended Readings:

SUPPLIES / MATERIALS:
The classroom must be computer equipped.
Although not essential, it is recommended that students have a home computer.

STUDENT EVALUATION:
[An example of student evaluation for this course might be:]
Marked assignments 40%
Research problem and report 20%
Final exam 40%
COURSE CONTENT:

[Course content varies by instructor. An example of course content might be:]

The Graphs of Physics
1. Data simulation and graphical evaluation
2. Investigating and asking “what if” questions
3. Topics: waves, similitude, gradient, contour plots, Fermat’s Principle

Deriving Model Equations
1. Linear Correlation
2. Multiple regression

Algebraic Models
Examples from a variety of disciplines and areas

Monte Carlo Methods
1. Random walks
2. Monte Carlo Integration
3. Probability Distributions

Phase Plane Portraits
1. Stability
2. Classification of nonlinear stationary points

Linear ODE Models
1. Problem solving techniques
2. Special functions: i.e., Bessel and Legendre ODE Models

Nonlinear ODE Models
1. First order models
2. Second order models
3. Limit cycles