UNIVERSITY COLLEGE OF THE FRASER VALLEY

COURSE INFORMATION

DISCIPLINE/DEPARTMENT: PHYSICS **IMPLEMENTATION DATE:** October 1994

Revised:_____

PHYSICS 485	Nonlinear Physics Laboratory	3
SUBJECT/NUMBER OF COURSE	**DESCRIPTIVE TITLE**	**UCFV CREDITS**

CALENDAR DESCRIPTION:
The study of nonlinear physics is important and useful because its models are used in so many disciplines, disciplines as diverse as business and ecology. This course is designed to integrate the computer's ability to perform: symbolic computations, simulations, equation solving and plotting, and model testing with the classroom theory along with the related theory covered in Physics 484. The text will include a large number of computer files which can be used to model, test, and simulate the text's examples. Topics include: nonlinear mechanics, interesting nonlinear systems, methods of solving nonlinear equations, topological analysis, limit cycles, analytical methods, forced oscillations of nonlinear systems, partial nonlinear differential equations, numerical techniques, etc. Access to a home, IBM compatible computer, will assist the student in doing the problems and in understanding the text's examples.

RATIONALE:

COURSE PREREQUISITES: Physics 221, Physics 381

COURSE COREQUISITES: Physics 484

HOURS PER TERM FOR EACH STUDENT						
	Lecture		**hrs**	**Student Directed Learning**	**15**	**hrs**
	Laboratory	**45**	**hrs**	**Other - specify:**		
	Seminar		**hrs**	_____		**hrs**
	Field Experience		**hrs**	**TOTAL**	**60**	**HRS**

MAXIMUM ENROLMENT:_____

Is transfer credit requested? ☐ **Yes** ☐ **No**

AUTHORIZATION SIGNATURES:

Course Designer(s):_____
G. McGuire

Chairperson: Art Last
Curriculum Committee

Department Head: Tim Cooper

Dean:_____
K. Wayne Welsh

PAC: Approval in Principle _____
(Date)

PAC: Final Approval: November 29, 1995
(Date)

OUTLN95/01/dd

Physics 485
NAME & NUMBER OF COURSE

SYNONYMOUS COURSES:

(a) replaces _____
(course #)

(b) cannot take _____ for further credit
(course #)

SUPPLIES/MATERIALS:

TEXTBOOKS, REFERENCES, MATERIALS (List reading resources elsewhere)

Enns, McGuire, Rangnekar, *Nonlinear Physics with Maple*, 1st Ed., TBA (1995)

References:

1. Jackson, E.A. *Perspectives of Nonlinear Dynamics*, Vol 1 and Vol. 2, Cambridge University Press, 1989, 1991
2. Moon, F.C., *Chaotic and Fractal Dynamics, An Introduction for Applied Scientists and Engineers*, Wiley, 1992
3. Hilborn, R.C., *Chaos and Nonlinear Dynamics*, Oxford University Press, 1994

OBJECTIVES:
This course is designed to provide students with:

1. an appreciation of the importance of nonlinear phenomena in the everyday world;
2. symbolic computational skills that are needed for employment in a highly technical society;
3. useful problem solving and critical thinking skills;
4. the skills needed to tackle problems in a variety of non-scientific disciplines;
5. an understanding of the capabilities and limitations of symbolic computational software;
6. a skill which makes them employable.

METHODS:

This course will be presented using lectures, demonstrations, experiments, and computer simulations. Heavy reliance will be made of the computer to simulate, model, animate, and test the text's and the experiment's nonlinear models. The students will be introduced to models not only from the physical sciences (biology, Chemistry, and physics), but from the humanities, medical and business.

Physics 485
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STUDENT EVALUATION PROCEDURE:

Experiments	20%
Mid-term	20%
Computer Simulations	20%
Final	40%

COURSE CONTENT

Experiments

1. Nonlinear air drag
2. Nonlinear Inductance
3. Diodes tunnel
4. Diode varactors
5. Chemical waves
6. Liquid solitons
7. Duffing
8. Forced Duffing
9. Sine-Gordon model
10. Nonlinear simple pendulum
11. Relaxation oscillations
12. Forced oscillations in time varying magnetic field
13. Nonlinear oscillations in quadrapole field