UNIVERSITY COLLEGE of the FRASER VALLEY

COURSE IMPLEMENTATION DATE: September 1993
COURSE REVISED IMPLEMENTATION DATE: September 1996
COURSE TO BE REVIEWED: September 2000
(Four years after implementation date) (MONTH YEAR)

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: **NATURAL SCIENCES**

PHYSICS 252		**4**
COURSE NAME/NUMBER	FORMER COURSE NUMBER	UCFV CREDITS

Introduction to Modern Physics: Special Relativity & Quantum Physics
COURSE DESCRIPTIVE TITLE

CALENDAR DESCRIPTION:

This course is intended for students who plan to complete a minor in physics and/or chemistry. The course is designed as the students' first university course in Einstein's theory of Special Relativity and Quantum Physics. The course will use qualitative discussions of the two theories along with the development of the more formal mathematics needed to acquire a deeper understanding of the theories. The topics in the Theory of Special Relativity include: problems which occurred in the "old physics", Lorentz transformations, geometrical interpretations of the Lorentz transformations, dynamics, conservation laws, the so-called paradoxes of relativity. The topics in Quantum physics include: the difficulties arising from the "old physics", short discussion of the first quantum theories (old quantum mechanics), Schrodinger's wave equation, simple time independent solutions for Schrodinger's equation and applications of quantum physics to atoms and nuclei.

PREREQUISITES: **Math 221 or Math 152**
COREQUISITES: **Math 112 and Physics 112**

SYNONYMOUS COURSE(S)
(a) Replaces: _____ *(Course #)*
(b) Cannot take: _____ *(Course #)* for further credit.

SERVICE COURSE TO: _____ *(Department/Program)* _____ *(Department/Program)*

TOTAL HOURS PER TERM: **60**
STRUCTURE OF HOURS:

Lectures:	**60**	Hrs
Seminar:		Hrs
Laboratory:		Hrs
Field Experience:		Hrs
Student Directed Learning:		Hrs
Other (Specify):		Hrs

TRAINING DAY-BASED INSTRUCTION
LENGTH OF COURSE: _____
HOURS PER DAY: _____

MAXIMUM ENROLLMENT: _____
EXPECTED FREQUENCY OF COURSE OFFERINGS: _____

WILL TRANSFER CREDIT BE REQUESTED? (lower-level courses only)	☒ Yes	☐ No
WILL TRANSFER CREDIT BE REQUESTED? (upper-level requested by department)	☐ Yes	☐ No
TRANSFER CREDIT EXISTS IN BCCAT TRANSFER GUIDE:	☐ Yes	☐ No

AUTHORIZATION SIGNATURES:

Course Designer(s): George McGuire
Chairperson: *(Curriculum Committee)*
Department Head: Tim Cooper
Dean: J.D. Tunstall
PAC Approval in Principle Date:
PAC Final Approval Date: February 28, 1996

LEARNING OBJECTIVES / GOALS / OUTCOMES / LEARNING OUTCOMES:

This course will introduce the students to the importance of the special Theory of Relativity and the Quantum Physics. The teaching emphasis will attempt to ensure the students have a good qualitative understanding of both theories along with an introduction to the equations which permit problems to be solved. Exams will include problem-solving questions along with descriptive problems. After successfully completing this course the students should be able to:

1. desribe the qualitative tenets of both theories;
2. state the fundamental postulates of each theory;
3. solve kinematic and dynamical problems using the equations from the Special Theory;
4. solve Schrodinger's wave equation for simple time independent cases;
5. demosntrate how quantum mechanics is necessary for a deepr understanding of the principles of physics and chemistry;
6. understand the importance and beauty of science to all of mankind.

METHODS:

This course will be presented using lectures, tutorials, demonstrations, directed study, computer assisted learning, experiments, and appropriate audio-visual aids. Problems will be assigned and marked weekly.

PRIOR LEARNING ASSESSMENT RECOGNITION (PLAR):

Credit can be awarded for this course through PLAR (Please check:) ☐ Yes ☐ No

METHODS OF OBTAINING PLAR:

TEXTBOOKS, REFERENCES, MATERIALS:

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

TEXTS: TBA

REFERENCES:

1. Epstein, C., Relativity Visualized, Insight Press, 1983
2. Epstein, C., The Meaning of Relativity, 5th Ed., Princeton University, 1956
3. Einstein, A., The Stafford Little Lectures, 1921
4. Einstein, A., & Infeld, L., The Evolution of Physics, Simon & Schuster, 1966
5. French, A.P., Special Relativity, Norton, 1968
6. Born, M., Einstein's Special Theory of Relativity, Dover, 1965

SUPPLIES / MATERIALS:

STUDENT EVALUATION:

[An example of student evaluation for this course might be:]

Assignments		20%
Mid-term	30%	
Final		50%

COURSE CONTENT:

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

A. Special Theory of Relativity
   1. History and Need for the Theory
   2. Lorentz Transformations
   3. Relativistic Kinematics
   4. Relativistic Dynamics

B. Modern Physics
   1. Quantization of Energy:

    - Thermal Radiation and Black Bodies
    - Heat capacities
2. Particle Nature of Radiation
    - Photoelectric Effect
    - Compton Effect
3. Wave Nature of Radiation
    - Matter Waves
    - Uncertainty Principle
4. The Old Quantum Theory
    - Thomson's Model of the Atom
    - Rutherford Model
    - Bohr Model
5. An Introduction to Quantum Mechanics
    - Wave Equation
    - Schrodinger's Equation
    - Simple solutions to Schrodinger's Equation