UNIVERSITY COLLEGE of the FRASER VALLEY

COURSE IMPLEMENTATION DATE:	September 1993
COURSE REVISED IMPLEMENTATION DATE:	April 2007
COURSE TO BE REVIEWED:	November 2009
(Four years after UPAC final approval 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: **Faculty of Science, Health & Human Services/Physics**

COURSE NAME/NUMBER	FORMER COURSE NUMBER	UCFV CREDITS
Physics 252		**3**

Introduction to Twentieth Century Physics: Special Relativity and Quantum Physics

COURSE DESCRIPTIVE TITLE

CALENDAR DESCRIPTION:

This is an introductory 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, and geometrical interpretations of the Lorentz transformations, dynamics, conservation laws, and 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 the applications of quantum physics to atoms and nuclei.

PREREQUISITES: **Physics 112**
COREQUISITES:

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

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

TOTAL HOURS PER TERM: **75**

STRUCTURE OF HOURS:

Lectures:	**75**	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:	**36**	
EXPECTED FREQUENCY OF COURSE OFFERINGS:	**Once every two years**	
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):	Rob Woodside	Chairperson:	Gillian Mimmack *(Curriculum Committee)*
Department Head:	Norm Taylor	Dean:	Jackie Snodgrass

UPAC Approval in Principle Date:
UPAC Final Approval Date: December 14, 2005

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. Describe 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 of Relativity;
4. Solve Schrodinger's wave equation for simple time independent cases;
5. Demonstrate how quantum mechanics is necessary for a deeper understanding of the principles of physics and chemistry;
6. Understand the importance and beauty of science to all of mankind.
7. Solve various problems in each of the topic areas listed in the Calendar Description section.

METHODS:

This course will be presented using lectures, tutorials, and demonstrations. 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:

Departmental Review and/or Course Challenge

TEXTBOOKS, REFERENCES, MATERIALS:

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

TEXTS: Randy Harris, Non-classical Physics: Addison Wesley (1998)

REFERENCES:

1. Beiser, F.J., Modern Physics, McGraw Hill (1991)
2. Bernstein, Fishbane, Gasiorowicz, Modern Physics
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