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.

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<th>FACULTY/DEPARTMENT:</th>
<th>PHYSICS 252</th>
<th>NATURAL SCIENCES</th>
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<tr>
<td>COURSE NAME/NUMBER</td>
<td>PHYSICS 252</td>
<td>FORMER COURSE NUMBER</td>
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<tr>
<td>Introduction to Modern Physics: Special Relativity &amp; Quantum Physics</td>
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**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), Schrödinger’s wave equation, simple time independent solutions for Schrödinger’s equation and applications of quantum physics to atoms and nuclei.

**PREREQUISITES:**
Math 221 or Math 152

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

**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

**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 ☐

**COURSE IMPLEMENTATION DATE:** September 1993

**COURSE REVISED IMPLEMENTATION DATE:** September 1996

**COURSE TO BE REVIEWED:** September 2000 (MONTH YEAR)

**AUTHORIZATION SIGNATURES:**
- Course Designer(s): ____________________________
- Chairperson: George McGuire (Curriculum Committee)
- Department Head: ____________________________
- Dean: Tim Cooper
- 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. 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;
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.

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
3. Einstein, A., The Stafford Little Lectures, 1921

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
   Schrödinger's Equation
   Simple solutions to Schrödinger's Equation