

**Rochester Institute of Technology
Rochester, New York**

COLLEGE of SCIENCE
Center for Imaging Science

Interaction Between Light & Matter, 1051-313

- 1.0 Title:** Interaction Between Light & Matter **Date:** October 10, 2006
Credit Hours: 4
Prerequisite(s): Modern Physics I (1017-314).
Corequisite(s): .
Course proposed by: Rich Hailstone

2.0 Course information:

	Contact hours	Maximum students/section
Classroom	4	30
Lab		
Studio		
Other (specify _____)		

Quarter(s) offered (check)

Fall **Winter** **Spring** **Summer**

Students required to take this course: majors in undergraduate imaging science.

Students who might elect to take this course:

Undergraduates in COS or COE.

- 3.0 Goals of the course** (including rationale for the course, when appropriate)
Provide students with a basic knowledge foundation that enables him/her to understand and describe interaction between light and matter.
- 4.0 Course description** (as it will appear in the RIT Catalog, including pre- and co-requisites, quarters offered)

1051-313**Interaction Between Light & Matter**

This course is a continuation of Modern Physics. Concepts of atomic physics are reviewed and extended to understand absorption and emission. Molecular structure is then introduced and used to understand absorption and emission, including lasers. Finally, concepts associated with crystalline solids are studied, leading to a description of semiconductor devices. Imaging science applications will be introduced throughout the course. (1017-314, Modern Physics I). **Class 4, Credit 4 (F)**

5.0 Possible resources (texts, references, computer packages, etc.)

5.1 Tipler & Llewellyn, *Modern Physics*, 4th ed.

6.0 Topics

6.1 Atomic physics

- 6.1.1 Schrodinger equation in three dimensions
- 6.1.2 Quantization of angular momentum and energy in the H atom
- 6.1.3 H atom wave functions
- 6.1.4 Electron spin
- 6.1.5 Total angular momentum
- 6.1.6 Schrodinger equation for two (or more) particles
- 6.1.7 Ground states of atoms
- 6.1.8 Excited states and atomic spectra

6.2 Statistical physics

- 6.2.1 Classical statistics
- 6.2.2 Quantum statistics

6.3 Molecular Structure and spectra

- 6.3.1 Ionic and covalent bonding
- 6.3.2 Energy levels and spectra of diatomic molecules
- 6.3.3 Properties of Polyatomic molecules
- 6.3.4 Absorption, stimulated emission, and scattering
- 6.3.5 Lasers

6.4 Solid state physics

- 6.4.1 Structure of solids
- 6.4.2 Band theory of solids
- 6.4.3 Impurity semiconductors
- 6.4.4 Semiconductor junctions and devices

7.0 Intended learning outcomes and associated assessment methods of those outcomes

Learning Outcome	In class attendance and evaluation	Homework Assignments
7.1 Describe atomic structure and its effect on absorption and emission	X	X
7.2 Explain difference between classical and quantum statistics	X	X
7.3 Apply knowledge of molecular structure to understand absorption and emission.	X	X
7.4 Describe structure of crystalline solids, their energy bands, and how semiconductor devices operate.	X	X

8.0 Program or general education goals supported by this course

8.1 Satisfies one element of core course requirements for BS in Imaging Science.

8.2 Prepares undergraduate students in science and engineering for careers in science.

9.0 Other relevant information (such as special classroom, studio or lab needs, special scheduling, media requirements, etc.)

9.1 Classroom with computer projection system.

10.0 Supplemental information - NONE