

# **Photonics and Laser Applications in Engineering ENSC 460-4 (Undergraduate) (3-0-2) 894-3 (Graduate) (3-0-0)**

## **Professor**

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## **Schedule For 99-1**

Tuesday: 5:30 - 7:00 pm, Thursday 5:30 - 7:00 pm: Rm SCB 8662

## **Description**

This course covers the theory and practice of photonics and laser application in engineering and industrial areas. The emphasis will be in applications to photonics, optical signal processing microelectronics, materials processing, industrial applications and entertainment, with laser theory employed only to support this. The students will also be introduced to Photonics, the combination of optical processing and electronics. The course will include a laboratory demonstrations/experiments with practical laser/optical processing. In addition each student will do a lab project: Undergraduates (460) will do a minor project (about 2 hours per week), 894 Graduate students a major project.

## **Prerequisites**

An introductory optics course (eg Phys 121) or permission of instructor.

## **General topics Covered**

### **Introduction to light and lasers:**

Spectrum, laser vs regular light, how do lasers work

### **Basic Optical Engineering**

Geometric Optics, Radiometry, Photometry, Physical Optics, Optics design Software.

### **Introduction to lasers:**

Basic laser theory of operations, comparison of types lasers, practical operations and care of lasers.

### **Laser Safety**

Dangers in laser uses, potential damages, safety procedures

### **Laser Surface Treatment:**

Laser heat treatment, surface melting, alloying, cladding, cutting, stereolithography (building 3D objects with lasers), Medical applications, laser pantography.

### **Lasers in Microelectronics:**

Laser in IC repair, mask making/repair, rapid prototyping, rapid thermal annealing, laser chemical vapor deposition, laser micromachining.

### **Photonics, Fiber optics and Integrated Optics**

Photodetectors, nonlinear optics, Guided light, integrated optics, optical signal processing, optical computing, optical/and introduction to fiber optic cables.

### **Laser Automation and In Process Sensing:**

In process monitoring, process control, chemical analysis, laser scanners, range determination.

### **Consumer, Entertainment and Holography Applications**

compact disk operation/mastering, Applications in laser light shows, laser printers, holography

### **Future laser applications**

laser fusion, laser driven aircraft and space craft

## **Text Book**

Full notes will be supplied to students

Reference: Industrial Lasers and their Applications, 2nd Ed.: James Luxon & David E. Parker, Prentice Hall (1994)

## **Marking**

Best of: 15% Weekly Assignments, 20% Midterm test, 35% Final Exam, 30% Project/Labs  
20% Weekly Assignments, 50% Final Exam, 30% Project/Labs