ENEE 496 LASERS AND ELECTRO-OPTIC DEVICES

Course Number 22821 - 3 credits

Time: Spring Semester 2002, 3:30 - 4:45 pm TuTh

Place: EGR 3106

Instructor: Prof. Christopher C. Davis

Office: A.V. Williams Building, Room 2401, x5-3637, davis@eng.umd.edu.

Web Page: www.ece.umd.edu/~davis

Office hours: 11:00am - 12:30pm TuTh and by appointment. I am also frequently available at other times. You are welcome to visit.

Method of grading:

Project: 10% - Both computer projects and research reports on topics of current interest in the laser area will be available.

Homework: 10% - If you do the homeworks you will do much better in the examinations. In addition, performance on homeworks will be used to determine grade in borderline case. Homework questions often show up again on examinations.

Closed book examinations:

First Examination 22.5%

Second Examination 22.5%

Final Examination 35%

The Final Examination will be in class on Wednesday, May 22, from 10:30am - 12:30pm.

Homework solutions will be made available after each homework set is completed.

Students with special needs or documented disabilities should contact me to discuss accommodations.

Course Synopsis

I hope to cover most of the following topics.

Spontaneous and stimulated transitions - Einstein coefficients, line-broadening, gain of an optical frequency amplifier, gain saturation, optical resonators - Fabry-Perot interferometers, theory of laser oscillation, rate equations, optically pumped solid state lasers, gas discharge lasers, ($He-Ne, Ar^+, CO_2, CO, etc.$), UV lasers, chemical lasers, gas dynamic lasers, T.E.A. and E-beam lasers, dye lasers, semiconductor lasers, transverse modes, and coherence. I hope to also cover a selection of the followng topics; nonlinear optics, second harmonic generation, frequency mixing, electro-optic effect, electro-optic devices (modulators, beam deflectors, etc.), laser applications (communication systems, medical applications, isotope separation, laser induced fusion, etc.), Gaussian beams, fiber optics.

This course is recommended to those who wish to study the basic principles of laser operation, the properties of laser radiation, and phenomena which occur at optical frequencies. Theoretical and practical aspects of lasers, opto-electronic devices, and laser applications will be discussed. Lasers and their associated technology are vital to world-wide communications and this course is recommended to students with an interest in communications who wish to learn about the hardware infrastructure that makes modern optical communication systems operate. The level of the course is such that no knowledge of quantum mechanics and only a basic knowledge of electromagnetic theory is required.

The course will use Prof. Davis's book, *Lasers and Electro-Optics*, published by Cambridge University Press, 1996.