OSE 4520 - LASER ENGINEERING

Required Text: Laser Engineering, Kelin J. Kuhn, Prentice Hall, (1998), ISBN 0-020366921-7

Instructor: Dr. Peter J. Delfyett, CREOL 272; 823-6812; delfyett@creol.ucf.edu

Prerequisites: Calculus, Differential Equations, Vector Calculus, Electromagnetic Theory, Wave Propagation, Interference, Diffraction & Coherence,

Topics to be Covered:

I. Laser Fundamentals: Overview, Energy states in atoms, Basic stimulated emission, Power and energy, Monochromaticity, coherency and linewidth, spatial coherence, longitudinal and transverse modes, gain profile;

II. Energy States and Gain: Laser states, multiple-state laser systems, linewidth and the uncertainty principle, broadening of fundamental linewidths; basics of gain, blackbody radiation, gain.

III. The Fabry Perot Etalon: Longitudinal modes in the laser resonator cavity, quantitative analysis of a Fabry Perot etalon, illustrative Fabry Perot etalon calculations.

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IV. Transverse Mode Properties: TEM transverse modes, Gaussian beam propagation, ray matricies, Gaussian beams in resonant cavities, ABCD Law

V. Gain Saturation: Saturation of the exponential gain process, homogeneous and inhomogeneous gain saturation, Rate equations, Laser output power characteristics

VI. Transient Processes: Relaxation oscillations, Q-switching; Mode-locking

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VII. Introduction to Nonlinear Optics: The nonlinear polarizability, Second harmonic generation, Optical parametric oscillation, Raman scattering.

VIII. Conventional Solid State, Transition-Metal Solid State and Semiconductor Lasers: Laser materials, Laser transition in Nd:YAG & Ti:Sapphire, Pump technologies,

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There will be two in class exams and an in class final exam. There may also be short "quizzes" that can serve as 'extra-credit'. The role of the quizzes will be to assist in the determination of final grades. Homework's will be "assigned" to provide guidance as to how to do problems.

Approximate weighting: Homework: 10%; 2 Exams: 25% each; Final: 40 %; Total: 100%.
Grading Policy: The +/- system will be used.