EE739- LASER SYSTEMS

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Course Description: The course addresses light emitting devices. These devices are at the forefront of communication, sensing systems, manufacturing and even electrical tools. High-speed, ultra-small lasers and detectors are at the core of optical communication systems. At the same time, high power lasers are presently curving complex shapes in metals and ceramic materials. The course will cover topics, such as traditional and non-traditional materials (semiconductors, dielectrics etc., carbon nanotubes and graphene), structures (optical waveguides and electronic channels), detection methods as applied to optical and bio-optical systems, laser sources and detectors and fundamentals of light-matter interactions.

Text: J. Verdeyen, Laser Electronics, Prentice Hall, NJ, 1995.
Reference: K. J. Ebeling, "Integrated Opto-Electronics", Springer Verlag , 1993.

Grading Policy: MT: 40%; Final: 40%; Research paper: 15%; HW: 5%

Honor code: The NJIT honor code will be upheld and that any violations will be brought to the immediate attention of the Dean of Students.

Course Outline

Week	Topic	Chapter	Problems
1	Gaussian Beams	1:3	2,3,4,5,18
2	Guided Waves	1:4	6,7,9,10
3	Resonators	1:5,6	5:1,2; 6:1,23
4	Atomic Radiation	1:7	1,2,3,5
5	Laser Oscillation	1:8	1,2,3,4
6	Laser Oscillation	1:8	6,7,8
	MIDTERM 1		
8	Laser Characteristics	1:9	1,6,17,26
9	Laser Excitation	1:10	6,7,13,25
10	Semiconductor Lasers	1:11	1,2,8,9
11	Quantum Well Lasers	1:11	14,17,18
12	Optical Communication	Handout	
13	Optical Communication	Handout	
14	Optical Interconnects	Handout	

Course Learning Outcomes:

Students should be able to understand and comprehend the followings:

1. Concepts of basic solids states (e.g., semiconductors)
2. Concepts of wave-propagation
3. Concepts of gain
4. Concepts of emission and absorption

Relevant Student Outcomes:

(a) Ability to identify, formulate and solve engineering problemsrelated to electrooptics (CLO 1, 2, 3)
(b) Ability to analyze and solve problems at hand (CLO 1, 2, 3)
(c) Ability to communicate effectively (CLO 4)
(d) Ability to understand the underlined constraints upon design of systems, components, or processes related to optoelectronics, such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability (CLO 1, 2, 3)
(e) Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice; (CLO 1, 2, 3)