# Fall 2016, ECE 4300, Lasers and Optoelectronics

**Lectures: 10:10am-11:00am MWF @ 140 Bard Hall**

**Instructors: Debdeep Jena (DJ) and Clif Pollock (Clif)**

| Class # | Day | Dates | Day | Lecture Topics | Reading (Tentative) Verdeyen Chp | Assgn | Posted | Due |
|---|---|---|---|---|---|---|---|---|
| 1 | W | 24-Aug | DJ | What is a Laser? Analogy to electronic oscillators | 0 | | | |
| 2 | F | 26-Aug | DJ | Resonators, Gain, Oscillator, Photon gain by Stimulated Emission | 0 | | | |
| 3 | M | 29-Aug | DJ | 3-Level Systems, Oscillator Modes, Ultrashort Pulses, Mode Locking | 1 | | | |
| 4 | W | 31-Aug | DJ | Maxwell wave equations, Material Media, Polarization as a source term | 1 | 1 | 31-Aug | |
| 5 | F | 2-Sep | Clif | Beam spreading, Brewster angle, Diffraction as a transform, Ray tracing | 1 & 2 | | | |
| | M | 5-Sep | Labor Day | | | | | |
| 6 | W | 7-Sep | Clif | Ray tracing, ABCD matrices for optical cavity design | 2 | | | |
| 7 | F | 9-Sep | Clif | Stability analysis by ABCD matrices, Laser beams | 2 | | | |
| 8 | M | 12-Sep | Clif | Gaussian Beams, Beam parameters, Beam Curvature and Propagation | 3 | | | |
| 9 | W | 14-Sep | Clif | ABCD Law for Gaussian Beams, Application to Stable Laser Cavities | 3 & 5 | | | 14-Sep |
| 10 | F | 16-Sep | DJ | Optical Mode Volume, Resonant Optical Cavities | 5 & 6 | 2 | 15-Sep | |
| | M | 19-Sep | XX | Class cancelled, makeup class on 23 September | | | | |
| 11 | W | 21-Sep | Clif | Resonant Optical Cavities | 6 | | | |
| 12 | F | 23-Sep | DJ | Gain in Resonant Optical Cavities, Blackbody Radiation | 6&7 | | | |
| 13 | F | 23-Sep | DJ | Planck & Einstein theories of Blackbody Spectrum, Laser Demos | 7 | | | |
| 14 | M | 26-Sep | Clif | Einstein A & B coefficients, Lineshape, Gain Spectrum, Broadening | 7 | | | 26-Sep |
| 15 | W | 28-Sep | Clif | Review Class (Chapters 1-6) | Review | 3 | 27-Sep | |
| 15E | F | 30-Sep | DJ | 1st Prelim Exam | | | | |
| 16 | M | 3-Oct | Clif | Gain, cross-section and population inversion | 7 & 8 | | | |
| 17 | W | 5-Oct | Clif | Lasing Threshold, Mode Selection, Gain Saturation | 8 | | | |
| 18 | F | 7-Oct | Clif | Lasing & gain saturation in homogeneous & inhomogeneous systems | 8 | | | |
| | M | 10-Oct | No Class- Fall Break | | | | | |
| 19 | W | 12-Oct | DJ | Prelim discussion, Laser Physics Recap | 8 | | | 12-Oct |
| 20 | F | 14-Oct | DJ | Amplified Spontaneous Emission, Summary of Chp 8 | 8 | 4 | 14-Oct | |
| 21 | M | 17-Oct | Clif | Efficiency and optimal laser design | 9 | | | |
| 22 | W | 19-Oct | Clif | Laser dynamics: Q-Switching of lasers | 9 | | | |
| 23 | F | 21-Oct | DJ | Laser dynamics: Mode-Locked Lasers | 9 | | | |
| 24 | M | 24-Oct | DJ | Active Mode Locking, AM and FM mode Locking | 9 | | | |
| 25 | W | 26-Oct | DJ | Saturable Amplifiers and Absorbers, Chp 9 summary, Chp 10 intro | 9 & 10 | | | 26-Oct |
| 26 | F | 28-Oct | DJ | Review Class (Chapters 6-9) | Review | 5 | 28-Oct | |
| 26E | M | 31-Oct | Clif | 2nd Prelim Exam (Tentative) | | | | |
| 27 | W | 2-Nov | Rana | Various types of Lasers: I | 10 | | | |
| 28 | F | 4-Nov | DJ | Various types of Lasers: II | 10 | | | |
| 29 | M | 7-Nov | DJ | Semiconductor Lasers | 11 | | | |
| 30 | W | 9-Nov | DJ | Semiconductor Lasers | 11 | | | 9-Nov |
| 31 | F | 11-Nov | DJ | Semiconductor Lasers | 11 | 6 | 11-Nov | |
| 32 | M | 14-Nov | DJ | Laser Electromagnetics: Selected Topcis | 12 | | | |
| 33 | W | 16-Nov | DJ | Classical Model of the Laser | 13 | | | |
| 34 | F | 18-Nov | DJ | Classical Model of the Laser | 13 | | | |
| 35 | M | 21-Nov | DJ | Quantum Theory of the Laser | 14 | | | |
| | W | 23-Nov | No Class- Thanksgiving Break | | | | | |
| | F | 25-Nov | No Class- Thanksgiving Break | | | | | |
| 36 | M | 28-Nov | DJ | Quantum Theory of the Laser | 14 | | | 28-Nov |
| 37 | W | 30-Nov | DJ | Quantum Theory + Photon Detection | 14 & 16 | 7 | 29-Nov | |
| 38 | F | 2-Dec | DJ | Photon Detection | 16 | | | |
| | | | | | | | | 7-Dec |
| | M | 12-Dec | | Final Exam (2:00-4:30 pm) Phillips 219 | All | | | |