

Course Information

Objective: This course aims to develop a theoretical understanding of the fundamental electronic and optical processes in semiconductors. Particularly, it may serve for the graduate students aiming to be involved in an experimental or theoretical research on semiconductors. Moreover, this course may provide background knowledge for the other graduate courses, such as PHYS 550.

Instructor: Ceyhun Bulutay, Room: SA-220, bulutay@fen.bilkent.edu.tr

Lecture Hours: Thursday 10:40-12:30 (SAZ-03) and Friday 8:40-9:30 (SAZ-02)

Recommended Books: Unfortunately there is no single textbook ☹

- S. L. Chuang, *Physics of Optoelectronic Devices* (Wiley, 1995)
- P. Harrison, *Quantum Wells, Wires and Dots* (Wiley, 2nd ed. 2005)
- P. Y. Yu and M. Cardona, *Fundamentals of Semiconductors: Physics and Material Properties* (Springer, 3rd ed. 2001)

Lecture Notes: will be posted on the course web page just prior/after to the lectures

Assessment: HW, Computer Project(s), Midterm, Studies of Classical Papers, Attendance (70% minimum) and Participation

Weekly Calendar (Tentative)

Electronic structure

Optics

Week		Subject
#1	Sep. 14	Semiconductor Culture
#2	Sep. 21	Multiband k.p theory
#3	Sep. 28	Multiband k.p theory (cont'd)
#4	Oct. 5	Wells, Wires, Dots: Envelope Function Approximation
#5	Oct. 12	Strain Effects, Superlattices, Modulation Doped QWs
#6	Oct. 19	Atomistic Electronic Structure with Pseudopotentials
#7	Oct. 26	Bayram Week
#8	Nov. 2	Computational Project
#9	Nov. 9	Pseudopotentials-based full zone k.p technique
#10	Nov. 16	Semiconductor Linear Optics
#11	Nov. 23	Semiconductor Linear Optics (cont'd)
#12	Nov. 30	Semiconductor Linear Optics (cont'd)
#13	Dec. 7	Semiconductor Nonlinear Optics
#14	Dec. 14	Semiconductor Nonlinear Optics (Cont'd)

More on Course Grading

- Attendance is crucial; mind the high pace!
- Lecture notes: <http://www.fen.bilkent.edu.tr/~bulutay/573/notes/>
- HW: about 5 in total, each set will be of a few moderately difficult questions
- Studies of Pedagogical Papers
 - ◆ About five key papers will be announced in the coming weeks
 - ◆ The detailed format depends on the number of students to be enrolled...
- A computer project on electronic structure will be announced

Grading Policy:

