Ve/Vm504 Solid State Physics

Fall 2018 Course Syllabus

Class Schedule

Monday & Wednesday 10:00-11:40 AM

Location: CRQ

Instructor

Prof. BAO, Hua

Room 522, JI Building

Office Hour: any time as long as I am available in the office

Email: hua.bao@sjtu.edu.cn

Teaching Assistant

Office hour: TBD Location: TBD Email: TBD

Textbook

Introduction to Solid State Physics by C. Kittel

Reference

Heat Transfer Physics by Massoud Kaviany

Introduction to Quantum Mechanics by D. J Griffiths

Course Outline

Introduction
Introduction to quantum mechanics and statistical mechanics, crystal structure, reciprocal lattice, chemical bonding

Thermal properties
Lattice vibration, lattice dynamics, phonon, heat capacity, thermal conductivity, introduction to lattice dynamics, phonon Boltzmann Transport Equation

Electrical properties
Free electron gas, tight-binding, band structure, semiconductors, introduction to ab initio calculation

Optical properties
Light-matter interaction, mechanisms and models

Grading Policy

In-class exercises 25%
Homework 20%
Course Project 20%
Final 35%

List of Topics

1. Crystal structure
2. Introduction to quantum mechanics
3. Chemical bonding
4. Introduction to statistical mechanics
5. Lattice vibration 1
6. Lattice vibration 2
7. Lattice dynamics
8. Thermal properties of solids
9. Phonon in nanostructures
10. Free electron gas
11. Band structure 1
12. Band structure 2
13. Semiconductor 1
14. Semiconductor 2
15. Introduction to semiconductor device
16. Introduction to electromagnetic theory
17. Dielectric properties
18. Optical phonon and quantum theory of light
19. Solid state energy conversion
20. Final exam review