VE 420 Physical Principles Underlying Smart Devices
Summer 2016
University of Michigan-Shanghai Jiao Tong University Joint Institute

Instructor: Qianli Chen
qianli.chen@sjtu.edu.cn, Phone: 34207213
Office: JI building 217
Office Hours: Friday 2 – 3:30 pm
Other time by appointment

Lectures: Monday & Wednesday 10:00 – 11:40 am,
Friday (even) 8:00 – 9:40 am, F210 Dong Xia Yuan

Teaching Assistant: GAO Xuejiao
gaoxuejiao3@163.com,
Office: Micro/Nano building 2-611
Office Hours: Monday 7:00 – 9:00 pm

Textbooks: **Required:** Kittel, "*Introduction to Solid State Physics*", 8th ed.
Helpful: Introduction to Quantum Mechanics by D. J Griffiths
Aschcroft & Mermin, "*Solid State Physics*"

Course topics: VE420 provides a general introduction to solid state physics, the underlying physics behind solid state devices. General topics include: Crystal structure; Crystal binding; Phonons; Free electron Fermi gas; Low dimensional conductor; Electronic structure – Energy bands; Properties of semiconductors; Dielectrics response; Light absorption and emission; Magnetism.

Homework: Homework problems will be assigned weekly. They will be due in one week. Late homework will **not** be accepted. You are encouraged to discuss the problems with your classmates, but you should hand in your unique version.

Exam: There will be one midterm exam and one final exam.

Project: You are required to form groups of 3 and study a topic related to the solid state devices. You can also choose to describe your own creative ideas, for which you will get bonus points. More details about the topics will be announced during the class. Each group will give a presentations of 25 minutes + 5 minutes Q&A.

Grading:

In-class exercises + Homework	30%
Lab report	10%
Midterm	20%
Project	20%
Final	20%

Honor code refresh: All students in the class are presumed to be bound by the Honor Code of the Joint Institute (see JI's Student Handbook for Undergraduate Students for more details). Any violation of the honor polices will be reported to the Honor Council, and if guilt is established penalties may be imposed.

Topics to be covered

Crystal structure; Diffraction; Crystal binding
Lattice vibration; Phonons; Thermal property
Free electron Fermi gas;
Heat capacity, electrical conduction;
Electronic structure – Energy bands;
Properties of semiconductors; Semiconductor devices
Dielectric function;
Magnetism;
Microelectronic Processing