

MES 603 – CONDENSED MATTER PHYSICS

FALL 2008

INTRODUCTORY INFORMATION

Textbook: C. Kittel, Introductory Solid State Physics (Wiley)
Reference book: N. V. Ashcroft and N. D. Mermin, Solid State Physics (Saunders)
Instructor: Dr. A. G. Petukhov
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Class hours: M 4:00 p.m. - 5:50 p.m., EEP 247
W 10:00 a.m. - 11:50 a.m. EEP 247

Office hours: T, W 4:00-5:00 P. M., Other times by appointment

Grading:	3 two-hour or	300	Above 90%	A
	take-home exams		80-90%	B
	Final exam	100	70-80%	C
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	Total	400	Less than 60%	F

Chapter I. Interatomic forces. Types of bonding. Crystalline and amorphous solids. The Bravais lattices. Elements of symmetry. The reciprocal lattice. Diffraction of X-rays in crystals. Atomic and crystal scattering factors. Defects in solids.

Chapter II . One-dimensional lattice waves and vibrational modes. Phonons. Specific heat: the Debye and the Einstein models. Thermal conductivity. Elastic constants and sound waves in crystals.

Chapter III. Energy bands and the Bloch theorem. Brillouin zones . The nearly-free electron and the tight-binding models. The Pauli principle and classification of solids. Dynamics of a Bloch electron and effective mass approximation. Quasi-particles: conduction electrons and holes, excitons, polarons. The free-electron gas. Electrical conductivity of metals. Thermal properties of metals. Magnetic-field effects in metals.

Chapter IV. Intrinsic and doped semiconductors. Electrical and magnetic properties. Optical properties. Photoconductivity and luminescence. Disordered semiconductors. The p-n junction and transistor. The semiconductor laser. Integrated circuits.