I. Crystal properties

II. Introduction to quantum mechanics
   A. Photoelectric effect
   B. Bohr’s model
   C. Matter as waves; wave function
   D. Uncertainty principle
   E. Schrödinger wave equation
   F. Potential wells, tunneling
   G. Hydrogen atom
   H. Many-electron atoms

III. Energy bands and charge carriers in semiconductors (4 contact hours)
   A. Energy-band structure of solids; metals, dielectrics, semiconductors
   B. Electrons and holes; effective mass
   C. Bonds in solids; intrinsic semiconductor
   D. Doping; extrinsic semiconductors

IV. Statistical mechanics
   A. Distribution function; the Fermi level
   B. Electrons and holes at equilibrium
   C. Temperature dependence of carrier concentrations
   D. Compensation and space charge neutrality

V. Physics of charge transport
   A. Carrier drift
   B. Carrier diffusion

VI. Excess carriers in semiconductors
   A. Generation and recombination
   B. Minority carrier lifetime
   C. Diffusion length
   D. Continuity equation
   E. Steady state carrier injection

VII. P-N junctions
   A. P-N junction contact potential
   B. P-N junction under applied bias
   C. Space-charge region; junction capacitance
   D. Reverse-bias
   E. Electric breakdown

VIII. Metal-semiconductor junctions
   A. Schottky barriers
   B. Ohmic contacts
IX. Metal-oxide-semiconductor contact
   A. The ideal MOS capacitor
   B. Real MOS capacitor
   C. MOS capacitance-voltage analysis

X. Introduction to transistors
   A. Bipolar junction transistor
   B. Metal-oxide-semiconductor field-effect transistor