

EC 010 304 SOLID STATE DEVICES

Teaching Scheme

3 lecturer hours and 1 tutorial hour

Credit :4

Objectives

- *To provide students with a sound understanding of existing electronic devices, so that their studies of electronic circuits and systems will be meaningful.*
- *To develop the basic tools with which students can later learn about newly developed devices and applications.*

Module I (13 hours)

Bonding forces in solids – Energy Bands – Metals, semiconductors and insulators – Direct and indirect Semiconductors – Variation of Energy Bands with alloy composition – Charge carriers in semiconductors – Electrons and holes – Effective mass – Intrinsic and extrinsic materials.

Charge concentrations – Fermi level – Electrons and hole concentrations at equilibrium – Temperature dependence of carrier concentrations – Compensation and space charge neutrality.

Drift of carriers in electric and magnetic fields – Drift and resistance – Effects of temperature on doping and mobility – High-field effects – Hall effect.

Module II (13 hours)

Excess carriers in semiconductors – Carrier lifetime – Direct and indirect recombination – Steady state carrier generation – Quasi Fermi levels.

Diffusion of carriers – Diffusion process – Diffusion coefficient – Einstein relation – Continuity equation – Steady state carrier injection – Diffusion length.

P-N junctions – Equilibrium conditions – Contact potential – Equilibrium Fermi levels – Space charge at a junction – Forward and reverse biased conditions – Steady state conditions – Qualitative description of current flow at a junction – Carrier injection – Diode equation – Majority and minority currents through a p-n junction – V-I characteristics of a p-n junction diode.

Module III (12 hours)

Reverse breakdown in p-n junctions – Zener and avalanche mechanisms – Breakdown diodes.

Time variation of stored charge in p-n junctions – Reverse recovery transient – Switching diodes – Capacitance of p-n junctions – Varactor diodes.

Metal-semiconductor junctions – Schottky barriers – Rectifying and ohmic contacts.

Optoelectronic devices – Optical Absorption – Solar Cells – Photo detectors – Photoluminescence and electroluminescence – Light emitting diodes – Laser diodes.

Module IV (12 hours)

Bipolar Junction Transistor – Bipolar Transistor action – Basic principle of operation – Simplified current relations – Modes of operation – Majority and minority current components – Emitter injection efficiency – Base transport factor – Current transfer ratio – Current amplification factor – Amplification and switching – Base width modulation – Avalanche Breakdown – Base resistance and emitter crowding.

Field Effect Transistor – Basic JFET operation – pinch off and saturation – Transconductance and amplification factor – V-I characteristics – Transfer characteristics

Basic principles of high frequency transistors – Schottky transistors; Phototransistors

Solution Manual For Taub Schilling

Robert R. Redfield

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Solutions manual to accompany Taub/Schilling: Principles of communication systems David Manela,1986 **Solutions Manual to Accompany Principles of Communication Systems** Herbert Taub,Donald L. Schilling,Tamotsu Inukai,1971

Books in Print Supplement ,1985 *Subject Guide to Books in Print* ,1983 **Scientific and Technical Books and Serials in Print** ,1989 *Books in Print* ,1977 Signal Processing, Theories and Applications ,1980 **Manufacturing Systems: Modelling, Management and Control 1997** Peter Kopacek,1997-07-02 The IFAC TC on Manufacturing Modelling Management and Control MIM was founded on the IFAC World Congress Sydney 1993 The goals of this workshop concerned the development comparison and classification of formal models in the field of Computer Integrated Manufacturing Systems in a descriptive as well as prescriptive way Computer Integrated Manufacturing Systems are able to integrate optimization methods simulation models procedures and knowledge based tools The target for the workshop activities were related to the specification of requirements for new models which are used in simulating and designing manufacturing management and control strategies including discrete event and continuous representations Technical areas of interest at the system level included tools for plant layout design process planning production planning and control Technical areas of interest at the component level included models for functional description of flexible manufacturing and assembly systems oriented to production activity control process supervision and maintenance *Electronics* ,1978

British Books in Print ,1985 *Radio-electronics* ,1978 Scientific and Technical Books in Print ,1972 Whitaker's Cumulative Book List ,1977 **Solutions Manual to Accompany Taub** Tuvia Apelewicz,Herbert Taub,Donald L. Schilling,1977 Student Solution Manual for Introduction to Chemical Principles H. Stephen Stoker,Nancy J.

Gardner,2013-04-22 The Student Solutions Manual includes full solutions to all odd numbered end of chapter problems in the text and answers to all multiple choice practice test questions Student's Solution Manual Mark Dugopolski,2004-04

Solutions Manual Merhyle F. Spotts,T. E. Shoup,L.E. Hornberger,2003-08-31 **Solution Manual to Accompany Basic Principles and Calculations in Chemical Engineering** David Mautner Himmelblau,James B. Riggs,2004-01

Student Solution Manual ,2001 Solutions Manual Nivaldo J.. Tro,Mary Beth Kramer,Kathy Thrush Shaginaw,2009-05-01

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