MANGALORE UNIVERSITY
Department of Physics
MSc Physics

PHS 504: ELECTRONICS I

(52 Hrs.)

Course Outcome

CO1 The student will be well versed with the designing and fabrication of printed circuit board (PCB) and integrated circuits (IC).

CO2 The student will have good understanding of characteristics and applications of special semiconductor devices.

CO3 Will be able to handle Operational amplifier.

CO4 Will have knowledge of digital IC technologies and interfacing different logic families.

Unit I Printed circuit board design techniques. Layout scale, grid system, board types. Materials and aids, documentation – circuit diagram, component list, layout sketch, mechanical drawing. PCB parameters – resistance, inductance, capacitance. Component spacing, conductor spacing, cooling requirements and packing density. PCB manufacturing – copper clad laminates, Types of laminates and properties of laminates. Mentions of plating. Etching – different etchants, pollution minimisation. Multilayer boards. Soldering techniques – wave soldering.

IC fabrication technologies - wafer preparation - chemical vapour deposition - diffusion - ion implantation – photolithography. Fabrication of resistors, capacitors, BJT and MOS devices   [13 hrs]

Unit II Characteristics and simple applications of special semiconductor devices - Schottky barrier diode - varactor diode - Tunnel diode - Photo diode – LED - Thermistor - solar cell, IGBT. CMOS inverter.

Amplifiers - cascade amplifiers - cascode amplifiers. Darlington connection. Power amplifiers - Class A, Class B & Class AB amplifiers. Power transistor heat sinking. Silicon controlled switch, DIAC and TRIAC applications   [13 hrs]

Unit III Operational amplifiers: Voltage references (5V) - voltage level detector - Comparator IC 311 - Phase shifter - precision rectifier - peak detector - instrumentation amplifier – Noise in electronic devices. Active filters - 40 dB/decade roll off (low pass, high pass & band pass).

Precision triangle & square wave generator - IC AD630. Voltage to frequency and frequency to voltage converter – IC9400. Analog multiplier - IC AD633 - squaring a dc voltage and doubling the frequency of ac. Frequency multiplier using phase locked loop IC565. [13 hrs]

Unit IV Digital IC technologies and interfacing different logic families. Programmable logic devices - Programmable array logic PAL 16L8 - Generic array logic GAL 22V10. PLD programming using ABEL.– Implementation 8 bit serial in/parallel out shift register using GAL 22V10. Digital to analog converter AD558. Analog to digital conversion - Successive approximation ADC - microprocessor compatible ADC AD670. [13 hrs]

Text Books:

1. Walter C Bosshart, 'Printed Circuit Boards - Design and Technology' (Tata McGraw Hill, 1983)
2. Henry W Ott, 'Noise Reduction Techniques in Electronic Systems' (John Wiley, 1989)
3. Jaspreet Singh, 'Semiconductor Devices' (McGraw Hill, 1994)
4. Boylestad R &Nashelsky L, 'Electronic Devices and Circuit Theory' VIII Edn. (PHI, 2002)
5. Coughlin R F & Driscoll F F, 'Operational Amplifiers and Linear Integrated Circuits', VI Edn. (Pearson Education Asia, 2002).
6. Gayakwad R A, 'Opamps and Linear Integrated Circuits' IV Edn. (PHI, 2002)
7. Floyd T L, 'Digital Fundamentals', VII Edn. (Pearson Education Asia, 2002)

Reference Books:

1. Neamen Donald, 'Electronic Circuit Analysis and Design' II Edn. (Tata McGraw Hill, 2002)
2. Floyd T L, 'Electronic Devices', V Edn. (Pearson Education Asia, 2001)
3. Sedra A & Smith, 'Microelectronics' IV Edn. (Oxford University Press, India, 1998)
4. Franco S, 'Designing with Operational Amplifiers and Analog Integrated Circuits', III Edn. (McGraw Hill, 2001)
5. Tocci R J, 'Digital Systems, Principles and Applications', VIII Edn. (Pearson Education Asia, 2001)
6. Wakerly, 'Digital design', III Edn. (Expanded), (Pearson Education Asia, 2002)
7. Winzer J, 'Linear integrated circuits' (Saunders College Publ., 1992).