SRI VENKATESWARA UNIVERSITY:TIRUPATI
B.Sc ELECTRONICS (MAJOR)
SEMESTER-III
w.e.f.2024-25

COURSE 5: SEMICONDUCTOR DEVICES AND MATERIALS

Theory Credits: 3 3 hrs/week

Objective:

1. To provide basic knowledge and concepts of Semiconductor materials and devices.
2. To facilitate students learn on the physical principles and operational characteristics of Semiconductor devices and some of its important applications. Pre-requisites: Basic understanding of semiconductors.

Outcomes:

- Ability to apply basic concepts of Inorganic and Organic Semiconductor materials forelectronic device application in modern electronic industry.
- Detailed knowledge of various classifications and applications to VLSI, LEDs and solarcells.
- Holistic view of the latest progress in two-dimensional (2D)-one-dimensional (1D) andnano materials.
- Emphasis on nano-electronic applications such as Schottky barrier transistors, flexibleElectronics.

Unit I:

Inorganic and Organic Semiconductor: Energy bands, carrier transport, mobility, drift-diffusivity, excess carrier, injection and recombination of the excess carriers, carrier statistics; High field effects: velocity saturation, hot carriers and avalanche breakdown.

Unit II:

Majority carrier Devices: MS contacts rectifier and non-rectifier, MIS structures, MESFET, hetero-junction, HEMT and band diagrams, I-V and C-V characteristics.

Unit III:

MOS structures: Semiconductor surfaces; The ideal and non-ideal MOS capacitor band diagrams and CVs; Effects of oxide charges, defects and interface states. MOSFET: Structures and Device Characteristics, Short-Channel effects. Charge coupled Devices (CCDs), application to VLSI.

Unit IV:

Nonvolatile Memory Device. Optoelectronic Devices: solar cell, photo detectors, LEDs, laser diodes. Nano structures and concepts: quantum wells, supper lattice structures, nanorod, quantum dot, CNTs, 2D materials: grapheme, BN, MoS_2 etc, matamaterials.

UNIT-V:

Multistage Amplifiers: BJT at high frequencies, frequency response of RC coupled amplifiers and transformer coupled amplifier.

Reference Books

1. Donald A. Neamen, Semiconductor Physics and Devices Basic Principles, 3rd edn.McGraw-Hil (2003)
2. B.G. Streetman and Sanjay Banerjee, Solid State Electronic Devices, 6th Edn., PrenticeHall, 2006.
3. S. M. Sze and Kwok K. Ng Physics of Semiconductor Devices, Wiley (2013).
4. M. Hussa, A. Dimoulas and A. Molle, 2D Materials for NanoElectronics, CRC press(2016)
5. M.S.Tyagi, Introduction to Semiconductor Materials and Devices, Willey, StudentEdition

SEMESTER-III

COURSE 5: SEMICONDUCTOR DEVICES AND MATERIALS

Practical Credits: 1 2 hrs/week

List of Experiments

1. To study the Hall Effect: determine the Hall coefficient, type of semiconductor andcarrier concentration in the given semiconductor sample.
2. To study the four probe method: calculate the resistivity and energy band gap of givensemiconductor sample.
3. To determine the resistivity of the given semiconductor specimen using Vander Pauwmethod.
4. To design a MOSFET as switching regulator for given duty cycle and plot the current-voltage (I-V) characteristic of MOSFET using Keithley.
5. To design a phase controlled rectifier using SCR and plot the I-V characteristic of SCRusing Keithley.
6. To design a relaxation oscillator using UJT and plot the I-V characteristic of UJT usingKeithley.
7. I-V characteristics measurement of a p-n diode/LEDs using Keithley - calculate itsideality factor.

SRI VENKATESWARA UNIVERSITY:TIRUPATI
B.Sc ELECTRONICS (MAJOR)
SEMESTER-III
w.e.f.2024-25
COURSE 6: DIGITAL ELECTRONICS

Theory Credits: 3 3 hrs/week

Objectives:

- To understand the number systems, Binary codes and Complements.
- To understand the Boolean algebra and simplification of Booleanexpressions.
- To analyze logic processes and implement logical operations usingcombinational logic circuits.
- To understand the concepts of sequential circuits and to analyzesequential systems in terms of state machines.
- To understands characteristics of memory and their classification.
- To implement combinational and sequential circuits using VHDL.

Unit – I

NUMBER SYSTEM AND CODES: Decimal, Binary, Hexadecimal, Octal. Codes: BCD, Gray and Excess-3 codes- code conversions- Complements (1's, 2's,9's and 10's), Addition -Subtraction using complement methods.

Unit- II

BOOLEAN ALGEBRA AND THEOREMS: Boolean Theorems, De-Morgan's laws. Digital logic gates, Multi level NAND & NOR gates. Standard representation of logic functions (SOP and POS), Minimization Techniques (Karnaugh Map Method: 2,3 variables).

Unit-III

COMBINATIONAL DIGITAL CIRCUITS:
Adders-Half & full adder, Subtractor-Half and full subtractors, Parallel binary adder, Magnitude Comparator, Multiplexers (4:1)) and Demultiplexers (1:4), Encoder (8-line-to-3- line) and Decoder (3-line-to-8-line). IC-LOGIC FAMILIES: TTL logic, CMOS Logic families(NAND&NOR Gates).

UNIT-IV

SEQUENTIAL DIGITAL CIRCUITS:
Flip Flops: S-R FF , J-K FF, T and D type FFs, Master-Slave FFs, Excitation tables, Registers:- Serial In Serial Out and Parallel In and Parallel Out, Counters Asynchronous-,Mod-8,Mod- 10,Synchronous-4-bit &Ring counter.

UNIT-

MEMORY
DEVICES:
General Memory Operations, ROM, RAM (Static and Dynamic), PROM, EPROM, EEPROM,EAROM,

TEXT BOOKS:

1. M.Morris Mano, " Digital Design " 3rd Edition, PHI, New Delhi.
2. Ronald J. Tocci. "Digital Systems-Principles and Applications" 6/e. PHI.New Delhi. 1999.(UNITS I to IV)
3. G.K.Kharate-Digital electronics-oxford university press
4. S.Salivahana&S.Arivazhagan-Digital circuits and design
5. Fundamentals of Digital Circuits by Anand Kumar

Reference Books :

1. Herbert Taub and Donald Schilling. "Digital Integrated Electronics" .McGraw Hill. 1985.
2. S.K. Bose. "Digital Systems". 2/e. New Age International. 1992.
3. D.K. Anvekar and B.S. Sonade. "Electronic Data Converters :Fundamentals & Applications". TMH. 1994.
4. *Malvino and Leach. " Digital Principles and Applications". TMG Hill Edition.*

Outcomes:-

- ✓ Develop a digital logic and apply it to solve real life problems.
- ✓ Analyze, design and implement combinational logic circuits.
- ✓ Classify different semiconductor memories.
- ✓ Analyze, design and implement sequential logic circuits.
- ✓ Simulate and implement combinational and sequential logic circuits usingVHDL

SEMESTER-III

COURSE 6: DIGITAL ELECTRONICS

Practical Credits: 1 2 hrs/week

LAB LIST:

1.Verification of IC-logic gates

2.Realization of basic gates using discrete components (resistor, diodes & transistor)

3.Realization of basic gates using Universal gates (NAND & NOR gates)

4.Verify Half adder and full adder using gates

5.Verify Half subtractor and full subtractor using gates.

6. Verify the truth table Multiplexer and demultiplexer.

5. Verify the truth table Encoder and decoder.
6. Verify the truth table of RS , JK, T-F/F using NAND gates
7. 4-bit binary parallel adder and subtractor using IC 7483
8. BCD to Seven Segment Decoder using IC -7447/7448

SRI VENKATESWARA UNIVERSITY:TIRUPATI
B.Sc ELECTRONICS (MAJOR)
SEMESTER-III
w.e.f.2024-25
COURSE 7: ANALOG ELECTRONICS

Theory Credits: 4 5 hrs/week

a. the design and working of RC coupled amplifiers, transformer coupled amplifiersand power amplifiers,

b. the concept of negative and positive feedback,

c. pulse shaping and Schmitt trigger, and

d. the op-amp characteristics, frequency response and its linear and non-linear applications.

UNIT-I

Amplifiers: General principles of small signal amplifiers - Classifications - RC Coupled amplifiers - Gain - Frequency response - Input and output impedance - Multistage amplifiers - Transformer coupled amplifiers - Equivalent circuits at low, medium and high frequencies — Emitter follower.

Class A and Class B power amplifiers - Single ended and push-pull configurations - Power dissipation and output power calculations.

UNIT-II

Feedback Amplifiers: Basic concept of feedback amplifiers - Transfer gain with feedback - General characteristics of negative feedback amplifier - Effect of negative feedback on gain - Gain stability - Distortion and bandwidth - Input and output resistance in the case of various types of feedback - Analysis of voltage and current in feedback amplifier circuits.

UNIT-III

Operational Amplifiers: Principles - Transfer characteristics - Various offset parameters - Differential gain - CMRR - Slew rate – Bandwi

UNIT-IV

Op-amp Circuits: Basic operational amplifier circuits under inverting and non- inverting modes - Adder - Subtractor - Integrator - Differentiator - Comparator - Sine, square and triangular waveform generators - Active filters - Sample and Hold circuits.

UNIT-V

Oscillators: Positive feedback - Stability issues - Feedback requirement of oscillations -

Barkhausen criterion for oscillation - Hartley, Colpitts, Phase shift and Wien bridge oscillators - Condition for oscillation and frequency derivation - Crystal oscillator - UJT relaxation oscillator. Monostable, bistable and astable multivibrators - Schmitt trigger.

Text Books

1. Introduction to Integrated Electronics - *V. Vijayendran*, S.Viswanathan (Printers & Publishers) Pvt. Ltd., Chennai, 2005.

2. Electronic Circuits and Systems - *Y.N. Bapat*, Tata McGraw Hill Publishing Co. Ltd.

Reference Books

1. Electronic Devices and Circuits - *G.K. Mithal*, Khanna Publishers, Delhi.

2. Hand Book of Electronics - *Gupta & Kumar*, Pragati Prakashan, Meerut.

3. Electronic Devices and Circuit Theory - *R. Boylestad & L. Nashelsky*, Prentice Hallof India Private Limited, 6/e.

4. Electronic Devices and Circuits - *J.P. Agarwal & Amit Agarwal*, PrakasamPublishers.

5. Linear Integrated Circuits - *D. Roy Choudhury & Shail Jain*, New Age International (P) Limited.

SRI VENKATESWARA UNIVERSITY:TIRUPATI
B.Sc ELECTRONICS (MAJOR)
SEMESTER-III
w.e.f.2024-25
COURSE 8: ELECTRONIC COMMUNICATION SYSTEMS

Theory Credits: 3 3 hrs/week

The students will learn :

a. fundamentals of antenna, their characteristics and types,

b. amplitude modulation and demodulation and radio wave transmission andreception,

c. frequency modulation and demodulation and FM radio wave transmission andreception,

d. Principle of analog and digital pulse modulation and their applications,

e. transmission and detection of digital signals.

UNIT-I

Antenna - Effective resistance - Efficiency - Directive gain - Bandwidth, Beam widthand polarization - Dipole - Folded dipole - Arrays - Yagi - Uda - Helical - Discone - Parabolic - Dish Antennas - Ground wave, sky wave and space ware propagation - Skip distance - Maximum usable frequency.

UNIT-II

Modulation - Needs for Modulation - Types of Modulation - Amplitude Modulation - Generation and detections circuits - Balanced Modulator - DSB/SC and SSB Modulation - VSB modulation. Block diagram of AM Radio transmitter and super heterodyne Receiver.

UNIT-III

Frequency Modulation - Definition - Derivation of Modulated wave - Generation of FM - Varactor diode and Reactance tube Modulators - Detectors - Balanced slope detector, Foster Seeley discriminator, ratio detector - Block diagram of FM transmitter and receiver.

UNIT-IV

Pulse Modulation - Sampling theorem - PAM, PWM, , PCM - quantizing, sampling, coding, decoding, quantization error, delta modulation and adaptive delta modulation.

UNIT-V

Multiplexing - FDM, TDM, CDMA - ASK, FSK, PSK –Advantages of DigitalCommunication - Introduction to Microwave, Fiber optic, Satellite Communications
- RADAR - range equation.

Text Books

1. Electronic Communication Systems - *George Kennedy*, McGraw Hill BookCompany, 4/e, 2005.

2. Communication Engineering - *T.G. Palanivelu*, Anuradha Publicatons, 1/e, 2002.

Reference Books

1. Communication System - *Roddy & Coolen*, 4/e, Pearson Education, 2005.

2. Principles of Communication Engineering - *Anok Singh*, 4/e, SathyaprakasamPublications, 2004.

3. Electronic Communication Systems *Wayne Tomasi*, 4/e, Pearson Education, 2004.