ANDHRA PRADESH STATE COUNCIL OF HIGHER EDUCATION

MINOR

Subject: Electronics

w.e.f. AY 2023-24

COURSE STRUCTURE

Year	Semester	Course	Title of the Course	No. of Hrs /Week	No. of Credits
I	II	1	Fundamental of Electricity and Electronics	3	3
			Fundamental of Electricity and Electronics Practical Course	2	1
II	III	2	Semiconductor devices and Materials	3	3
			Semiconductor devices and Materials Practical Course	2	1
	IV	3	Electrical and electronics instrumentation	3	3
			Electrical and electronics instrumentation Practical Course	2	1
		4	Microprocessor system	3	3
			Microprocessor system Practical Course	2	1
III	V	5	Cellular Mobile Communication	3	3
			Cellular Mobile Communication Practical Course	2	1
		6	Computer Network	3	3
			Computer Network Practical Course	2	1

SEMESTER-II

COURSE 1: FUNDAMENTALS OF ELECTRICITY AND ELECTRONICS

Theory Credits: 3 3 hrs/week

Objectives

The students will learn:

1) basics of electrostatics, Gauss theorem and its applications,
concept of a capacitor, various types of capacitors and dielectric constant,
magnetic effects of current, cells and the measuring instruments like ammeter andvoltmeter,
2) basics of p-n junction, rectifying action of a diode, regulated power supplies andwave shaping circuits, and
3) transistor and its three modes of operation, h-parameter model of a transistor andthe frequency response of an amplifier.

UNIT-I

Electrostatics: Electric charges - Coulomb's law - Electric field - Electric intensity and electric potential - Relation between electric potential and intensity - Electric intensity and potential due to a uniform charged conducting sphere at a point outside, on, andinside the conductor.

Electric dipole - Dipole moment - Intensity and potential due to a dipole - Statementand proof of Gauss law - Application of Gauss law to uniformly charged solid sphere.

UNIT-II

Capacitors: Definition and unit of capacity - Capacitance of a parallel plate capacitor - Effect of dielectric on capacity - Capacitors in series and parallel - Energy stored in acharged capacitors - Loss of energy on sharing of charges between two capacitors - Force of attraction between plates of charged parallel plate capacitor - Kelvin's attracted disc electrometer - Measurement of potential and dielectric constant.

Type of capacitors - Mica capacitor, Electrolytic capacitors, Variable air capacitor - Uses of capacitors.

UNIT-III

Electrical Measurements: Carey-Foster bridge - Determination of specific resistance - Potentiometer - Calibration of low and high range voltmeters - Calibration of Low range ammeter.

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Magnetic Effect of Current: Biot-Savart's law [Force on a conductor carrying currentplaced in a magnetic field - Principle, construction and theory of a moving coil ballistic galvanometer - Measurement of figure of merit of B.G. - Comparison of capacitors using B.G.

UNIT-IV

Diode circuits and power Supplies: Junction diode characteristics - Half and full wave rectifiers - Expression for efficiency and ripple factor - Construction of low range power peak using diodes - Bridge rectifier - Filter circuits - Zener Diode - Characteristics - Regulated power supply using Zener diode - Clipper and Clamper using diodes.
Differentiator and integrator using resistor and capacitor.

UNIT-V

Transistor circuits: Characteristics of a transistor in CB, CE modes - Relatively merits Graphical analysis in CE configuration - Transistor as a amplifier - RC coupled

Single stage amplifier - Frequency response - Thevenin's and Norton's theorems - h parameters.

Basis logic gates AND, OR, and NOT - Construction of basic logic gates using diodesand transistors.

Text Books

Electricity and Magnetism - *M. Narayanamoorthi and Others*, National PublishingCo., Chennai.
Electricity and Magnetism - *R. Murugeshan*, S. Chand & Co. Ltd., New Delhi,Revised Edition, 2006.
Principles of Electronics - *V.K. Mehta*, S. Chand & Co., 4/e, 2001.
Basic Electronics - *B.L. Theraja*, S. Chand & Co., 4/e, 2001.

Reference Books

Electricity and Magnetism - *Brijlal & Subrahmanyam*, Ratan Prakashan Mandir,Agra.
Fundamentals of Electricity and Magnetism - *B.D. Duggal & C.L. Chhabra*, ShobanLal Nagin Chand & Co., Jallundur.
Physics, Vol. II - *Resnick, Halliday & Krane*, 5/e, John Wiley & Sons, Inc.,.
Basic Electronics - *B. Grob*, McGraw - hill, 6/e, NY, 1989.
Elements of Electronics - *Bagde & Singh*, S. Chand

SEMESTER-III

COURSE 2: 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: (12 Hours)

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: (12 Hours)

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: (12 Hours)

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: (12 Hours)

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: (12 Hours)

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, 3rdedn.McGraw-Hil (2003)
2. B.G. Streetman and Sanjay Banerjee, Solid State Electronic Devices, 6thEdn., 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 2: 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.

SEMESTER-IV

COURSE 3: ELECTRICAL AND ELECTRONIC INSTRUMENTATION

Theory Credits: 3 3 hrs/week

The students will learn :

a. basic concepts of indicating instruments.

b. various electronic instruments such as CRO, storage oscilloscopes, functiongenerators, spectrum analyzer etc.,

c. transducers, sensors and display devices.

UNIT-I

DC and AC indicating Instruments: Accuracy and precision - Types of errors - PMMC galvanometer, sensitivity, Loading effect - Conversion of Galvanometer into ammeter, Voltmeter and Shunt type ohmmeter- Multimeter.

Electrodynamometer - Thermocouple instrument - Electrostatic voltmeter - Watt-hour meter.

UNIT-II

DC and AC bridges: Wheatstone bridge - Kelvin's bridge - Balancing condition for AC bridge - Maxwell's bridge - Schering's bridge - Wein's bridge - Determination of frequency.

UNIT-III

Oscilloscopes: Block diagram - Deflection Sensitivity - Electrostatic Deflection - Electrostatic Focusing - CRT Screen - Measurement of Waveform frequency, phase difference and Time intervals - Sampling Oscilloscope - Analog and Digital Storage Oscilloscopes.

UNIT-IV

Instrumentation Amplifiers and Signal Analysers: Instrumentation amplifier - Electronic Voltmeter and Multimeter - Digital Voltmeter - Function Generator - Wave Analyser - Fundamentals of Spectrum Analyser.

UNIT-V

Transducer and Display Devices: Strain Gauge - Unbounded Strain Gauge - LVDT - Resistance Thermometer - Photoelectric Transducer - Pen Recorder - Audio Tape Recorder - Seven Segment Display - LCD.

Text Books

1. Electronic Instrumentation and Measurement Techniques - *W.D. Cooper & A.D. Helfrick*, Prentice Hall of India.

2. Electronic Instrumentation and Measurement - *Kalasi*.

Reference Books

1. A Course in Electrical and Electronic Measurement and Instrumentation - *A.K. Sawhney*, Dhanpat Rai and Sons.

2. Electronic Instrumentation and Measurements - *P.B. Zbar*, Mc Graw Hill International.

3. Measurement Systems Application and Design - *Ernest O. Doebelin*, 4/e, TataMcGraw Hill Publishing Co. LTD

SEMESTER-IV

COURSE 4: MICROPROCESSOR SYSTEMS

Theory Credits: 3 3 hrs/week

OBJECTIVES:

- To understand basic architecture of 16 bit and 32 bit microprocessors.
- To understand interfacing of 16 bit microprocessor with memory and peripheralchipsinvolving system design.
- To understand techniques for faster execution of instructions and improve speed of operation and performance of microprocessors
- To understand RISC based microprocessors.
- To understand concept of multi core processors.

UNIT -I: (12Hrs)

CPU ARCHITECTURE *Introduction to Microprocessor, INTEL -8085(P)*

Architecture, CPU, ALU unit, Register organization, Address, data and control Buses. Pin configuration of 8085. Addressing modes 8086 Microprocessor: Architecture, Pin description. Instruction format, Instruction Executiontiming, Addressing modes

UNIT -II: (12 Hrs)

8085 Instruction Set:

Data transfer Instruction, Logical Instructions, Arithmetic Instructions, Branch Instructions,Machine Control instructions.

UNIT -III: (12Hrs)

Assembly Language Programming using 8085, Programmes for Addition, Subtraction, Multiplication,Division, largest and smallest number in an array. BCD to ASCII and ASCIIto BCD.

UNIT -IV: (12Hrs)

Basic 8086 Configurations – Minimum mode and Maximum Mode, Interrupt Priority Management I/O Interfaces: Serial Communication interfaces, Parallel Communication, Programmable Timers, Keyboard and display, DMA controller

UNIT -V: (12Hrs) ARM PROCESSOR: Introduction to 16/32 bit processors, Arm architecture& organization, Arm based MCUs, Programming model, Instruction set.

TEXTBOOKS:

1. Microprocessor Architecture, Programming and Applications

2. with the 8085 – PenramInternational Publishing, Mumbai.- Ramesh S. Gaonakar

3. Microcomputer Systems the 8086/8088 family – YU-Cheng Liu and Glenn SA Gibson

4. Microcontrollers Architecture Programming, Interfacing and System Design

– Raj Kamal Chapter: 15.1, 15.2, 15.3, 15.4.1

5. 8086 and 8088 Microprocessor by Tribel and avatar singh

REFERENCES:

1. Microprocessors and Interfacing – Douglas V.Hall

2. Microprocessor and Digital Systems – Douglas V. Hall

3. Advanced Microprocessors & Microcontrollers - B.P.Singh & Renu Singh – New Age

4. The Intel Microprocessors – Architecture, Programming and Interfacing – Bary B.Brey.

5. Arm Architecture reference manual –Arm ltd.

OUTCOMES:

- The student can gain good knowledge on microprocessor and implement in practicalapplications
- Design system using memory chips and peripheral chips for 16 bit 8086microprocessor.
- Understand and devise techniques for faster execution of instructions, improve speedof operations and enhance performance of microprocessors.
- Understand multi core processor and its advantages
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SEMESTER-IV

COURSE 4: MICROPROCESSOR SYSTEMS

Practical Credits: 1 2 hrs/week

List of Experiment

Programs using Intel 8085 /8086

1. Addition and Subtraction (8 bit and 16-bit)
2. Multiplication and Divition (8-bit)
3. Largest number in an array.
4. Smallest number in an array.
5. BCD to ASCII and ASCII to BCD .
6. Program To Convert Two Bcd Numbers In To Hex
7. Program To Convert Hex Number In To Bcd Number.
8. Program To Find The Square Root Of A Given Number.
9. Interfacing Experiments Using 8086 Microprocessor (Demo):

1. Traffic Light Controller
2. Elevator,
3. 7-Segment Display

SEMESTER-V

COURSE 5: CELLULAR MOBILE COMMUNICATION

Theory Credits: 3 3 hrs/week

The students will learn:

a. basics of digital cellular system, cordless telephony and cell structure

b. GSM wireless protocol and markup language fundamentals

c. basics of WLL and Bluetooth technology

UNIT-I

Advanced mobile phone service - Global system for mobile communication - Digital cellular system -

Cordless telephony - Third generation wireless systems.

UNIT-II

7 Cell structure - Hand off - roaming management - Hand off detection - Channel assignment techniques - Interference - ACI, CCI - Intersystem hand off and authentication - Network signaling - Cellular digital packet data

UNIT-III

GSM - Network signaling, mobility management, short message service - International roaming, administration and operation.

UNIT-IV

Wireless application protocol - Architecture - Datagram - Transport layer securities - Transaction protocol - Session protocol application environment, wireless markup language, WML - Script wireless telephony applications.

UNIT-V

Third generation mobile services - Wireless local loop - Bluetooth technology.

Text Books

1. Mobile Communications - *Jochen Schiller*, 7/e, Pearson Education, 2003.

2. Principles of Wireless Networks - *Kauch Pahalavan & Prahanet Krishnamoorthy*,2/e, Pearson Education, 2004.

Reference Books

1. Wireless and Mobile Networks Architecture - *Yi-Bing Lin & Imnch Chlantee*, JohnWiley, 2001.

2. Wireless and Mobile Communication - *Rapparport*, Pearson Education, 2001.

SEMESTER-V

COURSE 6: COMPUTER NETWORK

Theory Credits: 3 3 hrs/week

Objective

The students will learn :

a. provides a general introduction to computer networking that would be useful toall personnel who deal with distributed systems,

b. encompassing both technical and managerial aspects.

c. to help students better understand the challenges and opportunities faced bymodern business,

d. topics include LAN and WAN implementations, the Internet and internetapplications.

UNIT-I

Network structure Point to Point, Broadcast, Multicast - Horizontal and vertical distribution - Star, Mesh, tree, bus structures - OSI 7 layer model - Architecture - Functions of layers - Packet switches, circuit switching and message switching.

UNIT-II

Physical layer - Transmission media - Channel allocation methods - ALOHA, S-ALOHA, FINITE ALOHA - LAN Protocols IEEE802.3, 802.4, 802.5, 802.6 and 802.11.

UNIT-III

Data link layer - Framing - Error detection - Error correction - CRC - Stop and wait - Go band N - Sliding window Protocol - Selective repeat.

UNIT-IV

Network layer - Routing algorithms and congestion control algorithms - Repeaters, Bridges, Routers and Gateways, Inter networking - Introduction to transport layer and session layer.

UNIT-V

Presentation layer - coding, compression and cryptography - Introduction to Application layer - High performance networks - ATM, Fast Ethernet, FDDI, DQDB, SONET and SDH.

Text Books

1. Computer Networks - *Andrew S. Tanenbaum*, 4/e, Pearson Education, 2005.

2. Data and Computer Communication - *W. Stallings*, 7/e, Pearson Education, 2006.

Reference Books

1. Introduction to Data Communications and Networking - *Behrouz & Forouzan*,4/e, McGraw Hill Book Company, 2004.

2. Telecommunication Networks - Protocols Modeling and Analysis - *Misha Stewartz*,2/e, Pearson Education, 2002.