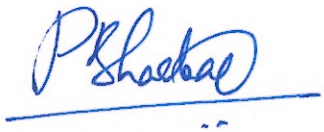
Department of Electronics

Discipline Specific Core Course: Electronics

Sem	Theory/ Practical	Course Title	Teaching/ Practical Instruction hour/week	Total Hour/ Sem	Duration of Exam in hours	Assessment Marks			Credits
						Summative	Formative	Total	
V	Theory	Microwave Communication	4	60	3	80	20	100	4
	Practical	Lab	4	60	3	40	10	50	2
	OR								
	Theory	Electronic Instrumentation	4	60	3	80	20	100	4
	Practical	Lab	4	60	3	40	10	50	2
	Elective	Electronic Devices and Circuits	4	60	3	80	20	100	3



B.Sc. ELECTRONICS
V SEMESTER

Programme Name	B.Sc. in Electronics	
Semester	Fifth Semester	
Course Title	**MICROWAVE COMMUNICATION**	
Course Code	ELE CT-5.1	No. of Credits:04
Teaching Hours	64	Duration of Exam: 3 hours
Formative Assessment Marks	20	Summative Assessment Marks: 80

Course Objectives:

The students are able to understand and gain the knowledge on

- Microwave communication systems.
- Basics of communications, Microwave devices for communications, Radar communication systems, Digital communications and their advantages. Finally on Cellular communication and wireless LANs
- Design and working of Microwave devices, Radar communications systems and Digital communication systems

Course Outcome:

After studying the syllabus, the students are able understand the principles of communications, and various communications systems, introduction to Radar systems, Digital communication and their advantages. Cellular communication and wires LANs systems.

UNIT I

Microwave devices for Communication: RF/Microwaves, EM spectrum, Wavelength and frequency, rectangular waveguides, circular waveguides, microwave cavities, microwave hybrid circuits, directional couplers, circulators and isolators, GUNN diode, READ diode, IMPATT diode, BARITT diode, PIN diodes, Schottky barrier diodes, Multi-cavity Klystron Magnetron, block diagram of Microwave communication and working, Applications.

UNIT II

RADAR Communication Systems: RADAIR principles, frequencies and powers used in RADAR, maximum Unambiguous range, detailed block diagram of pulsed RADAR system, RADAR range equation-derivation, factors influencing maximum range, effect of ground on RADAR antenna characteristics, Doppler effect, expression for Doppler frequency. MTI RADAR-block diagram, working, CW RADAR-block diagram, working, advantages, applications and limitations, FM CW RADAR-block diagram, numerical examples wherever applicable

UNIT III

Digital communication: Block diagram of digital transmission and reception, Bit Rate, Baud Rate Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK), Phase Shift Keying (PSK), Binary Phase Shift Keying (BPSK) and Quadrature Phase Shift Keying (QPSK) Advantage and disadvantages of digital transmission, characteristics of data transmission circuits-Shannon limit for information capacity, bandwidth requirements, data transmission speed, noise, cross talk, echo suppressers, distortion and equalizer, MODEM modes, classification.

UNITIV

Cellular Communication and Wireless LANs: Concept of cellular mobile communication -cell and cell splitting, frequency bands used in cellular communication, absolute RF channel numbers (ARFCN), frequency reuse, roaming and hand off, authentication of the SIM card of the subscribers, IMEI number, concept of data encryption, architecture (block diagram) of cellular mobile communication network, Multiplexing, FDMA, CDMA, TDMA, OFDMA, GSM Wireless LAN requirements Bluetooth, Wi-Fi, MIMO, LTE and 5G technology. Comparative study of GSM and CDMA, simplified block diagram of cellular phone handset, Major components of local area network-Primary characteristics of Ethernet-mobile IP, OSI model.

Books for Reference:

1 D Roddy and J. Collen, "Electronics communications", 4th edition, PHI, 2008

2 B. P. Lathi and Zhi Ding, "Modern Digital and Analog communication Systems", Oxford University Press, 4th Edition, 2010

3 Bernard Skla 'Digital Communications: Fundamentals and Applications, Pearson Education, 2nd edition, 2009.

4 David Tse, Pramod Viswanath 'Fundamentals of Wireless Communication', Cambridge University Press, 1st edition, 2005

5 Wayne Tomasi "Advanced Electronic Communication systems", - 6th edition, Low priced edition-Pearson education

6 Wayne Tomasi "Electronic Communication systems, Fundamentals through Advanced", 5th edn.

7 Kennedy & Davis "Electronic Communication systems", 4th edition-TATA McGraw Hill.

Experiments

1. Study of ASK Generation and Detection

2. Study of FSK Generation and Detection

3. Study of PSK Generation and Detection

4. Study of Time Division Multiplexing and Demultiplexing

5. Study of Frequency Multiplier.

6. QPSK Modulator and Demodulator

7. Determination of V-I Characteristics curve of a Gunn Diode

8. Study of notch filter.

9. Class C tuned amplifier

10. Study of Switched mode regulator using PWM.

11. Simulate NRZ, RZ, half-sinusoid and raised cosine pulses and generate eye diagram for polar signalling.

12. Pulse Code Modulation and Demodulation system.

13. Computations of the Probability of bit error for coherent binary ASK, FSK and PSK for an AWGN Channel and compare them with their Performance curves.

14. DPSK Transmitter and receiver QPSK Transmitter and Receiver.

Programme Name	B.Sc. in Electronics	
Semester	Fifth Semester	
Course Title	**ELECTRONIC INSTRUMENTATION**	
Course Code	ELE CT-5.2	No.of Credits:04
Teaching Hours	64	Duration of Exam: 3 hours
Formative Assessment Marks	20	Summative Assessment Marks: 80

Course Objectives:

The students are able to understand and gain the knowledge on

- Electronic Instrumentation.
- Fundamentals of electronic measurement systems
- Design and working of the various electronic instruments viz., Voltmeters, Multimeters, Oscilloscopes, Lock-in amplifiers and Phase locked loops and Function generators
- Transducers and their characteristics

Course Outcome:

After studying the syllabus, the students are able to understand the principles of various electronic instruments and their design and working. Also, students will be able to design and construct function generators, lock-in amplifiers, PLLs. The students understand working of various transducers and their characteristics.

UNIT-I

Measurements: Accuracy and precision. Significant figures. Error and uncertainty analysis. Shielding and grounding. Principle of PMMC. Basic Measurement Instruments: DC measurement-ammeter, voltmeter, ohm meter, AC Voltmeters, Digital voltmeters (integrating and non-integrating). Block diagram principle of measurement of I,V,R. Digital Multimeter; Measurement of Impedance: A.C. bridges, Measurement of Inductance (Anderson's bridge), Measurement of Capacitance (De Sauty's bridge). Measurement of frequency by Wien's bridge.

UNIT-II

Oscilloscope: Block Diagram, CRT, Vertical Deflection, Horizontal Deflection. Screens for CRT, Oscilloscope probes, measurement of voltage, frequency and phase by Oscilloscope. Digital Storage Oscilloscopes. LCD display for instruments. Basic Principles of Voltage Controlled Oscillator, Phase detector (XOR & edge triggered) and Phase Locked Loop (PLL). Basic idea of PLL IC 565 or 4046.

UNIT-III

Principle of Lock-in-amplifier, Design and applications of Lock-in Amplifiers. Signal Generators: Function generator, Pulse Generator. Introduction toRS232, GPIB, USB ports. Arduino microcontroller and interfacing. Virtual Instrumentation: software like LabView.

UNIT-IV

Classification of transducers: Active and Passive transducers, Basic Characteristics of transducers, Resistive: Potentiometer. Temperature compensation & applications, capacitive (variable air gap type), Inductive (LVDT) & piezoelectric transducers. Temperature transducers: RTD & Semiconductor IC sensors, Photo transducers: Photo-resistors, Photo-diode, Photo-transistor & photovoltaic cells.

Books for Reference:

1. W.D. Cooper and A. D. Helfrick, Electronic Instrumentation and Measurement Techniques, Prentice Hall (2005).

2. E.O. Doebelin, Measurement Systems: Application and Design, McGraw Hill Book fifth Edition (2003).

3. David A. Bell, Electronic Devices and Circuits, Oxford University Press (2015).

4. Alan S. Morris, "Measurement and Instrumentation Principles". Elsevier (Butterworth Heinmann-2008).

5. S. Rangan, G. R. Sarma and V. S. Mani, Instrumentation Devices and Systems. Tata Mcgraw Hill (1998).

6. Introduction to measurements and instrumentation, 4th Edn., Ghosh, PHI Learning

7. Nakra and Chowdary, Instrumentation Measurement and Analysis, 4thEdn, Tata McGraw Hill

8. H.S. Kalsi, Electronic Instrumentation and Measurements, 4thEdn., McGraw Hill

Experiments

1. Measurement of resistance by Wheatstone bridge and measurement of bridge sensitivity.

2. Measurement of Capacitance by De Sauty's bridge.

3. Measurement of self inductance by Anderson's bridge.

4. Measurement of frequency by Wien's bridge.

5. Conversion of Galvanometer into ammeter.

6. Conversion of Galvanometer into voltmeter.

7. To determine the Characteristics of resistance transducer (Strain Gauges)

8. Study of PLL using Kit

9. Design and construction of 565 PLL

10. Study of Lock-in-amplifier.

11. Study of pulse generator using ICs.

12. Design and Construction of 8038 Function Generator.

13. To determine the Characteristics of LVDT.

14. To determine the Characteristics of Thermistor.

15. To determine the Characteristics of Photo-transducers

Programme Name	B.Sc. in Electronics	
Semester	Fifth Semester	
Course Title	**ELECTRONIC DEVICES AND CIRCUITS**	
Course Code	ELECTIVE-I	No. of Credits:03
Teaching Hours	64	Duration of Exam: 3 hours
Formative Assessment Marks	20	Summative Assessment Marks: 80

Course Objectives:

- The students are able to understand and gain the knowledge on
- Electronic Devices and Circuits.
- Fundamentals of Electronic components, Network theorems and various analog electronics devices. Basic of operational amplifiers, configurations and applications of operational amplifiers.
- Boolean Algebra, Number systems and various logic gates and applications of logic gates

Course Outcome:

Upon completing the course, the student will be able to understand various fundamental principles of network analysis, number systems and Boolean algebra and become familiar with the basic operation of electronic devices and circuits which are the building blocks of all electronic circuits, devices and gadgets.

UNIT-I

Electronic Components: Electronic passive and active components, types and their properties, Concept of Voltage and Current Sources, electric energy and power. (Qualitative only)

Network Theorems: Superposition, Thevenin's, Norton's, Maximum Power Transfer, and Reciprocity Theorems. DC and AC analysis of RC and RL circuits, RLC series and parallel Resonant Circuits.

PN junction diode: Ideal and practical diodes, Formation of Depletion Layer, Diode Equation and I-V characteristics. Idea of static and dynamic resistance, Zener diode, Reverse saturation current, Zener and avalanche breakdown.

Rectifiers: Half-wave and Full-wave (Centre tap and Bridge) rectifiers, expressions for output voltage, ripple factor and efficiency (mention only), Shunt capacitor filter. (Numerical examples wherever applicable).

UNIT-II

Voltage regulator: Block diagram of regulated power supply, Line and Load regulation, Zener diode as voltage regulator circuit diagram, load and line regulation, disadvantages. Fixed and Variable IC Voltage Regulators (78xx, 79xx, LM317), Clippers (shunt type) and clampers (Qualitative analysis only), Voltage Multipliers.

Bipolar Junction Transistor: Construction, types, CE,CB and CC configurations (mention only), VI characteristics of a transistor in CE mode, Regions of operation (active, cut off and saturation), leakage currents (mention only), Current gains a, ß and y and their inter-relations, de load line and Q point. Applications of transistor as amplifier and switch circuit and working. (Numerical examples wherever applicable).

UNIT-III

Transistor biasing and Stabilization circuits- Fixed Bias and Voltage Divider Bias. Thermal runaway, stability and stability factor. Transistor as a two-port network, h-parameter equivalent circuit.

Amplifier: Small signal analysis of single stage CE amplifier using h-parameters. Input and Output impedances, Current and Voltage gains. Advantages of CC amplifier. Class A, B and C Amplifiers (qualitative). Types of coupling, Two stage RC Coupled Amplifier-circuit, working and its Frequency Response, loading effect, GBW product, Darlington transistor, Current gain.

Special semiconductor diodes: Varactor diode, Schottky diode, Tunnel diode, - construction, characteristics, working, symbol, and applications for each.LED, LCD and solar cell-construction, operation and applications, 7-segment display, concept Of common anode and common cathode types. (Numerical problems, wherever applicable)

UNIT-IV

Number System: Decimal, Binary, Octal and Hexadecimal number systems, base conversions. Representation of signed and unsigned numbers, Binary arithmetic; addition, subtraction by 1's and 2's complement method, BCD code (8421, 2421, Excess-3), Gray code, error checking and correction codes (Only parity check).

Boolean Algebra: Constants, variables, operators, basic logic gates-AND, OR,NOT, Positive and negative logic, Boolean laws, Duality Theorem, De Morgan's Theorem, simplification of Boolean expressions-SOP and POS. Derived logic gates (NAND, NOR, XOR & XNOR), Universal property of NOR and NAND gates. (Numerical examples wherever applicable).

Books for Reference:

1. Robert L. Boylestad, "Introductory circuit analysis", 5" edition., Universal Book 2003.
2. R.S.Sedha, "A Text book of Applied Electronics", 7th edition., S. Chand and Company Ltd. 2011
3. A.P. Malvino, "Principles of Electronics", 7th edition. TMH, 2011.
4. Electronic devices and circuit theory by Boylestad, Robert Nashelsky
5. David A. Bell" Electronic Devices and Circuits", 5th Edition, Oxford Uni. Press, 2015
6. Thomas L. Floyd, Digital Fundamentals, Pearson Education Asia (1994)
7. Digital Principles and Applications, A.P. Malvino, D.P.Leach and Saha, 7th Ed., 2011, Tata McGraw
8. Fundamentals of Digital Circuits, Anand Kumar, 2ndEdn, 2009, PHI Learning Pvt. Ltd.
9. Digital Circuits and systems, Venugopal, 2011, Tata McGraw Hill.
10. Digital Systems: Principles & Applications, R.J.Tocci, N.S. Widmer, 2001, PHI Learning.
11. M. Nahvi& J. Edminister, "Electrical Circuits", Schaum's Outline Series TMGH2005
12. S. A. Nasar," Electrical Circuits", Schaum's outline series, Tata McGraw Hill, 2004
13. J. Millman and C. C. Halkias, "Integrated Electronics", Tata McGraw Hill, 2001
14. A.S. Sedra, K.C. Smith, A.N. Chandorkar "Microelectronic circuits", 6thEdn., Oxford University Press, 2014
15. J. J. Cathey, "2000 Solved Problems in Electronics", Schaum's outline Series, TMG1991