EVALUATION SCHEME & SYLLABUS FOR B. TECH. FOURTH YEAR

ELECTRONICS AND COMMUNICATION ENGINEERING
Curriculum & Evaluation Scheme (VII & VIII semester)

AS PER

AICTE MODEL CURRICULUM

[Effective from the Session: 2025-26]

B.Tech. VII Semester

Course Code	Course Title	Periods			Evaluation Scheme				End Semest		Total	Credits
		L	T	P	CT	TA	Total	PS	TE	PE		
IHU701	Project Management & Entrepreneurship	3	0	0	20	10	30		70		100	3
IEC070-075	Department Elective –IV	3	0	0	20	10	30		70		100	3
IOE071-079	Open Elective-II	3	0	0	20	10	30		70		100	3
IOE080-089	Open Elective-III	3	0	0	20	10	30		70		100	3
IEC751	Project I	0	0	8				100			100	4
IEC752	Mini Project or Internship Assessment**	0	0	2				100			100	2
	MOOCs (Essential for Hons. Degree)											
	Total										**600**	**18**

Course	Course Title
	Department Elective IV
IEC070	Wireless & Mobile Communication
IEC071	VLSI Design
IEC072	Digital Image Processing
IEC073	Embedded System for Mobile Communication
IEC074	Optical Wireless Communication for Beyond 5G networks
IEC075	Quantum Communication

Open Elective II offered by Department

IOE075	Micro & Smart Systems

Open Elective III offered by Department

IOE086	Bio Medical Instrumentation

B.Tech. VIII Semester

S. No.	Course Cod	Course Title	Periods			Evaluation Scheme				End Semest		Total	Credits
			L	T	P	CT	TA	Total	PS	TE	PE		
1.	IEC851	Project II/Industrial Project	0	0	24				150		350	500	12
		MOOCs (Essential for Hons. Degree)											
		Total										**500**	**12**

IEC-070	WIRELESS AND MOBILE COMMUNICATION	3L:0T:0P	3 Credits

Unit	Topics	Lectures
I	**Wireless Communication Fundamentals:** Evolution of mobile radio communication fundamentals. General Model of Wireless Communication Link, Types of Signals, Cellular Infrastructure, Cellular System Components, Antennas for Cellular Systems, Operation of Cellular Systems, Channel Assignment, Frequency reuse, Channel Assignment strategies, Handoff Strategies Cellular Interferences, Sectorization; Wireless Channel and Radio Communication, Free Space Propagation Model, Channel Noise and Losses, Fading in Land Mobile Systems, Multipath Fading, Fading Effects on Signal and Frequency, Shadowing; Wireless Channel Modeling: AWGN Channel, Rayleigh Channel, Rician Fading Channel, Nakagami Fading Channel, Ocumura and Hata Path Loss Model; Channel Modeling: Stochastic, Flat Fading, Wideband Time-Dispersive Channel Modeling.	8
II	**Spread Spectrum and Diversity:** Theory of Vocoders, Types of Vocoders; Spread Spectrum Modulation, Pseudo-Noise Codes with Properties and Code Generation Mechanisms, DSSS and FHSS Systems, Time Hopping and Hybrid Spread Systems; Multicarrier Modulation Techniques, Zero Inter Symbol Interference Communication Techniques, Detection Strategies, Diversity Combining Techniques: Selection Combining, Threshold Combining, Equal Gain Combining, Maximum Ratio Combining; Spatial Diversity and Multiplexing in MIMO Systems, Channel Estimation.	8
III	**Equalization and Multiple Access:** Equalization Techniques: Transversal Filters, Adaptive Equalizers, Zero Forcing Equalizers, Decision Feedback Equalizers, and related algorithms; Multiplexing and Multiple Access: FDMA, TDMA, CDMA, OFDMA, SC-FDMA, IDMA Schemes and Hybrid Method of Multiple Access Schemes, RAKE Receiver; Multiple Access for Radio Packet Systems: Pure ALOHA, Slotted ALOHA, CSMA and their versions; Packet and Pooling Reservation Based Multiple Access Schemes.	8
IV	**Cellular Networks:** GSM system for mobile Telecommunication, General Packet Radio Service, Edge Technology; CDMA Based Standards: IS 95 to CDMA 2000, Wireless Local Loop, IMT 2000 and UMTS, Long Term Evolution (LTE), Mobile Satellite Communication.	8
V	**Other Wireless Networks:** Introduction to Mobile Adhoc Networks, Bluetooth, Wi-Fi Standards, WiMax Standards, Li-Fi Communication, Ultra-Wideband Communication, Mobile data networks, Wireless Standards IMT 2000, Introduction to 4G & 5G and concept of NGN.	8

Text Books:

1. T.S. Rappaport, "Wireless Communication-Principles and practice", Pearson Publications, Second Edition.
2. Upena Dalal, "Wireless Communication and Networks", Oxford Press Publications, first edition.
3. T L Singal, "Wireless Communications", McGraw Hill Publications, 2010.

Reference Books:

1. Andrea Goldsmith, "Wireless Communications", Cambridge University Press, 2005.
2. S. Haykin & M. Moher, "Modern wireless communication", Pearson, 2005.

Course Outcomes: At the end of this course students will demonstrate the ability to:

1. Express the basic knowledge of mobile radio & cellular communication fundamentals and their application to propagation mechanisms, path loss models and multi-path phenomenon.
2. Analyze the performance of various voice coding and diversity techniques.
3. Apply the knowledge of wireless transmission basics to understand the concepts of equalization and multiple access techniques.
4. Examine the performance of cellular systems being employed such as GSM, CDMA and LTE using various theoretical and mathematical aspects.
5. Express basic knowledge of Mobile Adhoc networks and the existing & upcoming data communication networks in wireless and mobile communication domain.

IEC-071	VLSI DESIGN	3L:0T:0P	3 Credits

Unit	Topics	Lectures
I	**Introduction:** VLSI Design flow, general design methodologies; critical path and worst case timing analysis, overview of design hierarchy, layers of abstraction, integration density and Moore's law, VLSI design styles, packaging, CMOS Logic, Propagation Delay definitions, sheet resistance.	8
II	**Interconnect Parameters:** Resistance, Inductance, and Capacitance, skin effect and its influence , lumped RC Model, the distributed RC Model, transient Response, RC delay model, Linear Delay Model, Logical Effort of Paths, Scaling.	8
III	**Dynamic CMOS design:** steady-state behavior of dynamic gate circuits, noise considerations in dynamic design, charge sharing, cascading dynamic gates, domino logic, np-CMOS logic, problems in single-phase clocking, two-phase non-overlapping clocking scheme, Sequential CMOS Logic Circuits, Layout design.	8
IV	**Semiconductor Memories:** Dynamic Random Access Memories (DRAM), Static RAM, non-volatile memories, flash memories, Pipeline Architecture. Low – Power CMOS Logic Circuits: Introduction, Overview of Power Consumption, Low – Power Design through voltage scaling,	8
V	**Introduction to Testing:** Faults in digital circuits. Modeling of faults, Functional Modeling at the Logic Level, Functional Modeling at the Register, Structural Model and Level of Modeling. Design for Testability, Ad Hoc Design for Testability Techniques, Controllability and Observability, Introduction to Built-in-self-test (BIST) Concept.	8

Text Book:

1. Sung-Mo Kang & Yosuf Leblebici, "CMOS Digital Integrated Circuits: Analysis & Design",Mcgraw Hill, 4th Edition.
2. Neil H.E.Weste, David Money Harris, "CMOS VLSI Design – A circuits and Systems Perspective" Pearson, 4th Edition.
3. D. A. Pucknell and K. Eshraghian, "Basic VLSI Design: Systems and Circuits", PHI, 3rd Ed.,1994.

Reference Books:

1. R. J. Baker, H. W. Li, and D. E. Boyce , " CMOS circuit design, layout, and simulation", Wiley-IEEE Press,2007.
2. M. Abramovici, M.A. Breuer and A.D. Friedman, "Digital Systems and Testable Design" , Jaico Publishing House.

Course Outcomes: At the end of this course students will demonstrate the ability to:

1. Express the concept of VLSI design and CMOS circuits and delay study.
2. Analyze mathematical methods and circuit analysis models in analysis of CMOS digital electronics circuits.
3. Design and analyze various combinational & sequential circuits based on CMOS technology.
4. Examine power logic circuits and different semiconductor memories used in present day technology.
5. Interpret faults in digital circuits, Fault Models and various Testing Methodologies.

IEC-072	DIGITAL IMAGE PROCESSING	3L:0T:0P	3 Credits

Unit	Topics	Lectures
I	**Introduction:** Overview of Image Processing, Application area of image processing, Digital Image Representation, Types of images, Digital Image Processing Operations, Fundamental steps in DIP, Overview of Digital Image Systems, Physical Aspect of Image Acquisition, biological Aspect of Image Acquisition, sampling & quantization, Digital Halftone Process, Image storage and File formats.	8
II	**Image Enhancement:** Need for image enhancement, Image enhancement operations, Image enhancement in spatial domain, histogram based techniques, Spatial Filtering concepts, Image smoothing and sharpening spatial and frequency domain filters, homomorphic filtering. **Image Restoration:** Introduction to degradation, types of Image degradations, image degradation models, noise modeling, estimation of degradation functions, Image restoration in presence of noise only, periodic noise and band pass and band reject filtering, difference between enhancement & restoration, Image restoration techniques.	8
III	**Image Transforms:** Need for image transforms, Properties of Fourier transform, Discrete cosine transform, Discrete sine transform, Hadamard transform, Haar transform, Slant transform, SVD and KL transforms.	8
IV	**Image Compression:** Image compression model, type of redundancy, compression algorithms and its types, lossless compression algorithms, lossy compression algorithms, image and video compression standards.	8
V	**Image Segmentation:** Introduction, Detection of Discontinuities, Edge Detection, Hough Transforms and Shape Detection, corner detection, Principle of thresholding, Principle of region - growing.	8

Text Book:

1. Rafael C. Gonzalez Richard E woods Steven L. Eddins, ‘‘Digital Image Processing’’, Mc Graw Hill, 3rd Edition, 2008.
2. Anil K Jain, “Fundamentals of Digital Image Processing”, Prentice-Hall of India Pvt. Ltd, 1989.

Reference Books:

1. Jayaraman, “Digital Image Processing”, Tata Mc Graw hill Education, India, 2009.
2. S. Sridhar, “Digital Image Processing”, OXFORD University Press, Second Edition, 2011.

Course Outcomes: At the end of this course students will demonstrate the ability to:

1. Describe the concept and need for image processing.
2. Implement the various techniques for image enhancement and restoration both in spatial and frequency domains.
3. Interpret the various types of image transforms and their properties.
4. Distinguish between lossless and lossy image compression algorithms and examine their performances in spatial and frequency domains.
5. Examine the various image segmentation techniques.

IEC-073	EMBEDDED SYSTEM FOR MOBILE COMMUNICATION	3L:0T:0P	3 Credits

Unit	Topics	Lectures
I	Typical Embedded System: Core of the Embedded System, Memory, Sensors and Actuators, Communication Interface, Embedded Firmware, Other System Components.	8
II	Characteristics and Quality Attributes of Embedded Systems: Hardware Software Co-Design and Program Modeling: Fundamental Issues in Hardware Software Co-Design, Computational Models in Embedded Design, Introduction to Unified Modeling Language, Hardware Software Trade-offs. Introduction to wireless technologies: WAP services, Serial and Parallel Communication, Asynchronous and synchronous Communication, FDM,TDM, TFM, Spread spectrum technology	8
III	Introduction to Bluetooth: Specification, Core protocols, Cable replacement protocol Bluetooth Radio: Type of Antenna, Antenna Parameters, Frequency hoping Bluetooth Networking: Wireless networking, wireless network types, devices roles and states, adhoc network, scatter net Connection establishment procedure, notable aspects of connection establishment, Mode of connection, Bluetooth security, Security architecture, Security level of services, Profile and usage model: Generic access profile (GAP), SDA, Serial port profile,	8
IV	Secondary Bluetooth profile Hardware: Bluetooth Implementation, Baseband overview, packet format, Transmission buffers, Protocol Implementation: Link Manager Protocol, Logical Link Control Adaptation Protocol, Host control Interface, Protocol Interaction with layers.	8
V	5G RADIO SPECTRUM: 5G spectrum landscape and requirements, Spectrum access modes and sharing scenarios, 5G spectrum technologies. 5G CHANNEL MODEL: The 5G wireless Propagation Channels: Channel modeling requirements, propagation scenarios and challenges in the 5G modeling. 5G USE CASES AND SYSTEM CONCEPT: Use cases and requirements, 5G system concept.	8

Text Book:

1. Hibu K V, “Introduction to Embedded Systems”, THM Publication
2. C.S.R. Prabhu and A.P. Reddi,“ Bluetooth Technology”, PHI Publication
3. Afif Osseiran, Jose F Monserrat, Patrick Marsch, “5G Mobile and Wireless Communications Technology”, Cambridge University Press, 2016

Reference Books:

1. C. Y. William, Lee, "Mobile communication engineering theory and applications", TMH, Publication
2. Gordon L. Stuber, “Principles of Mobile Communication”, KLUWER ACADEMIC PUBLISHERS, 2nd Edition, 2002
3. Joseph C. Liberti, Theodore S. Rappaport, “Smart Antennas for Wireless Communications”, Prentice Hall PTR, 1999

Course Outcomes: At the end of this course students will demonstrate the ability to:

1. To develop the understanding of the importance of embedded systems, its components, peripherals and requirements.
2. To learn of about hardware and software co-design used in microcontrollers and their issues and trade-offs
3. Understanding about the Wireless technologies, Bluetooth protocols and communication using Bluetooth Radio antenna and its types
4. Describe about the Bluetooth networking, connection establishment procedure, Bluetooth security architecture and its levels
5. Apply 5G spectrum requirement, its channel model and use cases, and current research avenues in 5G domain

IEC-074	Optical Wireless Communication for Beyond 5G Networks	3L:0T:0P	3 Credits

Unit	Topics	Lectures
I	Introduction: Optical Wireless Communication Systems Existing wireless Access Schemes, OWC/Radio Comparison, Potential OWC Application Areas. Optical Sources: LEDs and Lasers (Internal and External Quantum Efficiency, Power and Luminous Efficiency. PIN and APD Photodetector, Photo detection Techniques	8
II	Indoor Optical Wireless Communication Channel Modelling, LOS Propagation Model, Non-LOS Propagation Model, Interference from other Light sources. Indoor OWC links, Effect of Ambient Light Sources on Indoor OWC Link Performance.	8
III	Outdoor Optical Wireless Communication Channel Modelling, Atmospheric Channel Loss, Beam Divergence, Pointing Loss, Different Atmospheric Turbulence Models, System Performance Analysis: Outdoor OWC links.	8
IV	Underwater Optical Wireless Communication Channel Modelling, Absorption, scattering, Turbulence, Multipath interference, Physical obstruction, and Background noise. Link Performance for Multipath Propagation, FSO Link Performance under the Effect of Atmospheric turbulence.	8
V	Digital Baseband Modulation Techniques like PAM, PPM, PIM. Multi-carrier Modulation (OFDM) for OWC, Color Shift Keying, NOMA. Modern application in 5G networks and beyond: O-OFDM and CSK Modulation Schemes, WiFi/LiFi Co-existence,V2V Communications	8

Text Book:

1. Advanced Optical Wireless Communication Systems, Shlomi Arnon, John Barry, George Karagiannidis, Robert Schober, and Murat Uysal... CAMBRIDGEUNIVERSITY PRESS
2. Optical Wireless Communications System and Channel Modelling, Z. Ghassemlooy W. Popoola S. Rajbhandari. CRC Press
3. Optical Communications, Gerd Keiser, New York, McGraw-Hill Companies.

Reference books:

1. Saad Z. Asif, "5G Mobile Communications Concepts and Technologies", CRC Press, Taylor & Francis Group, First Edition, 2018
2. Harri Holma, Antti Toskala, Takehiro Nakamura, "5G Technology 3GPP NEW RADIO", John Wiley & Sons First Edition,2020

Course Outcomes: At the end of this course students will demonstrate the ability to:

1. Fundamental principles of Optical Wireless Communication device and system,

2. Indoor OWS channel models and system performance analysis.

3. Outdoor OWS channel models and system performance analysis.

4. Under water OWS channel performance, multipath interference and FSO Link

Digital modulation techniques and current research trends in 5G and beyond.

IEC-075	Quantum Communication	3L:0T:0P	3 Credits

A Quantum Communication syllabus typically covers the fundamental principles of quantum mechanics, quantum information theory, and their applications in secure communication protocols. Key topics include quantum entanglement, quantum key distribution, quantum teleportation, and the integration of quantum systems with classical networks.

Course Objective

The objective of this course is to present the core mathematical concepts and theory behind the principles of Quantum Communication and discuss the working principle behind quantum communication systems as well as some fundamental limits of quantum communication through classical and quantum channels.

Learning Outcomes Upon successful completion of this course, students will:

- acquire a broad understanding of the mathematical concepts behind quantum communication and computing.
- be able to recognize and design various quantum communication systems and modulation schemes
- be prepared to venture into more advanced areas of quantum communication research.

Unit No.	Topics to be Covered	Lecture
I.	**Mathematical Tools:** Introduction to vector spaces, inner-product spaces, linear independence, basis, Finite dimensional Hilbert spaces, linear operators, projectors, Eigen value decomposition, Tensor products; Analysis and probability, limit, infimum, supremum, continuity, compact sets, convexity, dual function, probability distributions.	8
II.	**Elements of Quantum Mechanics:** The notion of qubits, axioms of a closed quantum system, quantum dynamical systems, quantum measurements and POVM.	8
III.	**Introduction to Quantum decision theory:** Analysis of a quantum communication system, introduction to the Helstrom decision theory of quantum binary communication systems, decision theory of K-ary Quantum communication systems, Holevo's theorem, constellation of quantum states.	8
IV.	**Introduction to Quantum Communication Systems:** Introduction to Glauber's representation of coherent quantum states, Quantum binary communication systems and different modulation schemes: OOK, BPSK, QAM, PSK, PPM, overview of quantum squeezed states.	8
V.	**Introduction to Quantum Information Theory:** Notion of density operators, partial trace, reduced density operator, Schmidt rank, purification of mixed states, entanglement, quantum teleportation. Introduction to classical information theory: Shannon entropy, classical channels and channel coding. Notion of von- Neumann entropy, quantum channels, accessible information and Holevo bound, transmission through a noisy quantum channel. Introduction to Quantum Cryptography and Quantum Key Distribution.	8

Text Book:

1. Quantum Communications, Gianfranco Cariolaro, Springer, 2015.
2. Quantum Communication, Quantum Networks, and Quantum Sensing, Ivan B. Djordjevic, Academic Press, 2022.

Reference Books:

1. Principles of Quantum Communication Theory: A Modern Approach, Sumeet Khatri, and Mark M. Wilde, 2021, Pre-release version, available freely at https://www.markwilde.com/teaching/2021-fall-qit/.
2. Quantum Computation and Quantum Information, Michael Nielsen and Isaac Chuang, Cambridge University Press, 2010.

Course Outcome: After completion of the course student will be able to:

1. An understanding of the basic mathematical tools used throughout quantum communication.
2. Introduced to the most basic notion and theory of quantum mechanics as used in quantum communication
3. A good understanding of the basic decision theory of quantum communication systems
4. Acquire a fundamental understanding of the physical quantum systems and their operating principles which can be used for quantum communication.
5. Acquire a basic understanding of the different notions associated with quantum information theory and will learn a few of its applications in quantum cryptography and quantum key distribution

IOE-075	MICRO AND SMART SYSTEMS	3L:0T:0P	3 Credits

Unit	Topics	Lectures
I	**Miniaturization:** Introduction, Need of miniaturization, Microsystems versus MEMS, Need of micro fabrication, smart materials, structures and systems, integrated Microsystems, applications of smart materials and Microsystems.	8
II	**Micro sensors, actuators, systems and smart materials:** Silicon capacitive accelerometer, piezo-resistive pressure sensor, conductometric gas sensor, an electrostatic combo -drive, a magnetic micro-relay, portable blood analyzer, piezoelectric inkjet print head, micro-mirror array for video projection, smart materials and systems.	8
III	**Micromachining technologies:** Silicon as a material for micro machining, thin film deposition, lithography, etching, silicon micromachining, specialized materials for Microsystems, advanced processes for micro fabrication.	8
IV	**Modeling of solids in Microsystems:** Bar, beam, energy methods for elastic bodies, heterogeneous layered beams, bimorph effect, residual stress and stress gradients, poisson effect and the anticlastic curvature of beams, torsion of beams and shear stresses, dealing with large displacements, In-plane stresses. **Modeling of coupled electromechanical systems:** Electrostatics, Coupled Electro-mechanics: statics, stability and pull-in phenomenon, dynamics. Squeezed film effects in electro-mechanics.	8
V	**Integration of micro and smart systems:** Integration of Microsystems and microelectronics, microsystems packaging, case studies of integrated Microsystems, case study of a smart-structure in vibration control. Scaling effects in Microsystems: scaling in: mechanical domain, electrostatic domain, magnetic domain, diffusion, effects in the optical domain, biochemical phenomena.	8

Text Books:

1. G. K. Ananthasuresh, K. J. Vinoy, S. Gopalakrishnan, K. N. Bhat and V. K. Aatre, Micro and smart systems, Wiley India, 2010.
2. S Nihtianov, A. Luque, Smart Sensors and MEMS, Woodhead publishing limited 2014.

E - Resources: https://nptel.ac.in/courses/112/108/112108092/

Course Outcomes: At the end of this course students will demonstrate the ability to:

1. Interpret the need of Microsystems and Miniaturization.
2. Design the smart materials, actuators and Micro sensors.
3. Interpret the Micromachining Technologies.
4. Analyze the modeling of solids in Microsystems.
5. Evaluate the case studies of mart systems.

BIOMEDICAL INSTRUMENTATION

IOE-086	BIOMEDICAL INSTRUMENTATION	3L:0T:0P	3 Credits

COURSE OBJECTIVE: Students undergoing this course are expected to:

1. Understand General Mathematical Procedures
2. Analysis cardiovascular measurements.
3. Learn respiratory system measurements
4. Learn working of ophthalmology instruments.
5. Analysis Bio-telemetry.

BIOMEDICAL INSTRUMENTATION 3 0 0		
Unit	**Topic**	**Lectures**
I	Introduction: Specifications of bio-medical instrumentation system, Man-Instrumentation system Components, Problems encountered in measuring a living system. Basics of Anatomy and Physiology of the body. Bioelectric potentials: Resting and action potentials, propagation of action potential, The Physiological potentials – ECG, EEG, EMG, ERG, EOG and Evoked responses. Electrodes and Transducers: Electrode theory, Biopotential Electrodes – Surface electrodes, Needle electrodes, Microelectrodes, Biomedical Transducer.	8
II	Cardiovascular Measurements: Electrocardiography – ECG amplifiers, Electrodes and Leads, ECG –Single channel, Three channel, Vector Cardiographs, ECG System for Stresses testing, Holter recording, Blood pressure measurement, Heart sound measurement. Pacemakers and Defibrillators. Patient Care & Monitoring: Elements of intensive care monitoring, displays, diagnosis, Calibration & Reparability of patient monitoring equipment.	8
III	Respiratory system Measurements: Physiology of Respiratory system. Measurement of breathing mechanism – Spirometer. Respiratory Therapy equipments: Inhalators, Ventilators & Respirators, Humidifiers, and Nebulizers & Aspirators. Nervous System Measurements: Physiology of nervous system, Neuronal communication, Neuronal firing measurements.	8
IV	Ophthalmology Instruments: Electroretinogram, Electroculogram, Ophthalmoscope, Tonometer for eye pressure measurement. Diagnostic techniques: Ultrasonic diagnosis, Ecocardiography, Eco-encephalography, Ophthalmic scans, X-ray & Radio-isotope diagnosis and therapy, CAT-Scan, Emission computerized tomography, MRI	8
V	Bio-telemetry: The components of a Bio-telemetry system, Implantable units, Telemetry for ECG measurements during exercise, for Emergency patient monitoring. Prosthetic Devices and Therapies: Hearing Aides, Myoelectric Arm, Diathermy, Laserapplications in medicine.	8

Text Books:

1. R. S. Khandpur, "Handbook of Biomedical Instrumentation", 3rd Ed., Mc Graw Hill Education.
2. Cromwell, "Biomedical Instrumentation and Measurements" PHI
3. S. K. Venkata Ram, "Bio-Medical Electronics &Instrumentation (Revised)", Galgotia.
4. J. G. Webster (editor), "Medical Instrumentation Application & Design", 3rd Ed WILEY, India

Reference Book:
1. J. G. Webster, "Bio- Instrumentation", Wiley
2. S. Ananthi, "A Text Book of Medical Instruments", New Age International
3. Carr & Brown, "Introduction to Biomedical Equipment Technology", Pearson
4. Chatterjee & Miller, "Biomedical Instrumentation Systems," Cengage.

Course Outcome: After completion of the course student will be able to:

1. Understand the Man-Instrumentation system Components, Problems encountered in measuring aliving system.

2. Design Electrocardiography – ECG amplifiers, Electrodes and Leads, ECG –Single channel, Three channel, Vector Cardiographs, ECG System for Stresses testing, Holter recording, Blood pressuremeasurement.
3. Realization of Physiology of Respiratory system. Measurement of breathing mechanism –Spirometer. Respiratory Therapy equipments.
4. Aware Electroretinogram, Electrooculogram, Ophthalmoscope, Tonometer for eye pressuremeasurement. Diagnostic techniques.
5. Understand The components of a Bio-telemetry system, Implantable units, Telemetry for ECGmeasurements during exercise.