PANIMALAR ENGINEERING COLLEGE

(An Autonomous Institution, Affiliated to Anna University, Chennai)

Bangalore Trunk Road, Varadharajapuram, Poonamallee,

Chennai – 600 123

FACULTY OF COMPUTER SCIENCE AND ENGINEERING AND INFORMATION TECHNOLOGY

OPEN ELECTIVES

OFFERED TO CSE,IT,AI&DS,CSBS AND AIML

REGULATION – 2023

PANIMALAR ENGINEERING COLLEGE

(An Autonomous Institution, Affiliated to Anna University, Chennai)

CHOICE BASED CREDIT SYSTEM

CURRICULUM AND SYLLABUS - R 2023

OPEN ELECTIVE – I

Sl.No	Course Code	Course Title	Category	Contact Periods	L	T	P	C
1.	23CE1010	Air Pollution and Control Engineering	OE	3	3	0	0	3
2.	23ME1008	Energy Conservation and Management	OE	3	3	0	0	3
3.	23GE1004	Hospital Waste Management	OE	3	3	0	0	3
4.	23ME1009	Industrial Nanotechnology	OE	3	3	0	0	3
5.	23EE1003	Logic and Distributed Control Systems	OE	3	3	0	0	3
6.	23EC1011	Telehealth Technology	OE	3	3	0	0	3

OPEN ELECTIVE – II

Sl.N O	Course Code	Course Title	Category	Contact Periods	L	T	P	C
1.	23EE1001	Basic Circuit Theory	OE	3	3	0	0	3
2.	23ME1010	Energy Engineering	OE	3	3	0	0	3
3.	23EC1004	Electronic Devices	OE	3	3	0	0	3
4.	23CE1009	Environmental and Social Impact Assessment	OE	3	3	0	0	3
5.	23GE1003	Hospital Management	OE	3	3	0	0	3
6.	23EC1002	Medical Electronics	OE	3	3	0	0	3
7.	23EC1009	Signals and Systems	OE	3	3	0	0	3
8.	23ME1006	Systems Engineering	OE	3	3	0	0	3
9.	23ME1944	Supply Chain Management	OE	3	3	0	0	3
10.	23CY1003	Waste Water Treatment	OE	3	3	0	0	3

OPEN ELECTIVE – I

23CE1010	AIR POLLUTION AND CONTROL ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To impart knowledge on the principle and design of control of Indoor/ particulate/ gaseous air pollutant and its emerging trends.

UNIT - I INTRODUCTION 9

Structure and composition of Atmosphere — Definition, Scope and Scales of Air Pollution – Sources and classification of air pollutants and their effect on human health, vegetation, animals, property, aesthetic value and visibility- Ambient Air Quality and Emission standards –Ambient and stack sampling and Analysis of Particulate and Gaseous Pollutants.

UNIT - II METEOROLOGY 9

Effects of meteorology on Air Pollution - Fundamentals, Atmospheric stability, Inversion, Wind profiles and stack plume patterns- Atmospheric Diffusion Theories – Dispersion models, Plume rise.

UNIT - III CONTROL OF PARTICULATE CONTAMINANTS 9

Factors affecting Selection of Control Equipment — Gas Particle Interaction — Working principle, Design and performance equations of Gravity Separators, Centrifugal separators Fabric filters, Particulate Scrubbers, Electrostatic Precipitators – Operational Considerations.

UNIT - IV CONTROL OF GASEOUS CONTAMINANTS 9

Factors affecting Selection of Control Equipment – Working principle, Design and performance equations of absorption, Adsorption, condensation, Incineration, Bio scrubbers, Bio filters – Process control and Monitoring - Operational Considerations.

UNIT - V INDOOR AIR QUALITY MANAGEMENT 9

Sources, types and control of indoor air pollutants, sick building syndrome and Building related illness- Sources and Effects of Noise Pollution – Measurement – Standards – Control and Preventive measures.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

1. An understanding of the nature and characteristics of air pollutants, noise pollution and basic concepts of air quality management
2. Ability to identify, formulate and solve air and noise pollution problems
3. Ability to design stacks and particulate air pollution control devices to meet applicable standards.
4. Ability to select control equipment's.
5. Ability to ensure quality, control and preventive measures.
6. An understanding of the nature and characteristics of air pollutants, noise pollution and basic concepts of air quality management

TEXT BOOKS:

1. Lawrence K. Wang, Norman C. Pareira, Yung Tse Hung, "Air Pollution Control Engineering", Tokyo, springer science + science media LLC,2004.
2. Noel de Nevers, "Air Pollution Control Engineering", Waveland press,Inc 2017.
3. Anjaneyulu. Y, "Air Pollution and Control Technologies", Allied Publishers (P) Ltd., India 2002.

REFERENCES:

1. David H.F. Liu, Bela G. Liptak, "Air Pollution", Lweis Publishers, 2000.
2. Arthur C. Stern, "Air Pollution (Vol.I – Vol.VIII)", Academic Press, 2006.
3. Wayne T.Davis, "Air Pollution Engineering Manual", John Wiley & Sons, Inc, 2000.
4. M.N Rao and HVN Rao, "Air Pollution", Tata Mcgraw Hill Publishing Company limited,2007.
5. C.S.Rao, "Environmental Pollution Control Engineering", New Age International(P) Limited Publishers,2006.

Internal Assessment				**End Semester Examinations**
Assessment I (100 Marks)		**Assessment II (100 Marks)**		
Individual Assignment / Case Study / Seminar / Mini Project	**Written Test**	**Individual Assignment / Case Study / Seminar / Mini Project**	**Written Test**	**Written Examinations**
40	60	40	60	100
40%				**60 %**

23ME1008	ENERGY CONVERSATION AND MANAGEMENT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To recall the key principles of energy conservation, including the importance of energy audits and energy efficiency standards.
- To conservation in industrial and commercial sectors, such as power factor improvement and waste heat recovery.
- To apply energy conservation measures in different sectors like building systems, motors, and refrigeration systems.
- To evaluate energy efficiency measures based on cost-effectiveness, environmental impact, and feasibility.

UNIT I ENERGY CONSERVATION ACT 2001: FRAMEWORK, POLICIES, AND IMPLEMENTATION 9

Introduction to energy & power scenario of world, National Energy consumption data and environmental aspects associated with energy utilization; Energy Auditing- need, types, methodology and barriers, role of energy managers, instruments of energy auditing.Energy conservation Act 2001 and its features, notifications under the Act, Schemes of Bureau of Energy Efficiency (BEE) including Designated consumers, State Designated Agencies, ECBC code for Building Construction.

UNIT II FINANCIAL MANAGEMENT 9

Energy Economics- discount period, payback period, internal rate of return, net present value; Life Cycle costing- ESCO concept.

UNIT III ENERGY MONITORING AND TARGETING 9

Defining monitoring & targeting, elements of monitoring & targeting, data and information-analysis, techniques – energy consumption, production, cumulative sum of differences (CUSUM).

UNIT IV ENERGY CONSERVATION IN ELECTRICAL UTILITIES 9

Components of EB billing, HT and LT supply, transformers, cable sizing; Concept of capacitors, power factor improvement, harmonics; Electric motors-motor efficiency computation, energy efficient motors; Illumination- Lux,Lumens, types of lighting, efficacy, LED lighting and scope of energy conservation in lighting.

UNIT V ENERGY EFFICIENCY IN THERMAL UTILITIES AND SYSTEMS 9

Thermal systems, Boilers, Furnaces, Heat exchangers and Thermic Fluid heaters- efficiency computation and energy conservation measures; Steam distribution and usage, steam traps, condensate recovery, flash steam utilization; Insulation & Refractories. Energy conservation in major utilities; pumps, fans, blowers, compressed air systems, Refrigeration& Air Conditioning systems, Cooling Towers, DG sets

TOTAL :45 PERIODS

COURSE OUTCOME

Upon completion of the course, students will be able to:

CO1 Understanding renewable energy sources and integrated into energy conservation strategies and management practices.

CO2 Analysis energy efficiency strategies in sectors such as building construction, heating and cooling systems, and manufacturing processes..

CO3 Energy audits in real-world environments, applying tools and methodologies to identify inefficiencies and propose solutions for improving energy usage..

CO4 Analyze the energy consumption patterns in residential, industrial, and commercial sectors, identifying areas for potential energy savings and improvement.

CO5 Evaluate the cost-effectiveness, long-term savings, and environmental benefits of implementing energy-efficient technologies and practices.

TEXT BOOKS

1. Witte L.C., Schmidt P.S. and Brown D.R., “Industrial Energy Management and Utilization”, Hemisphere Publ., Washington, 1988..
2. Callaghan P.W., “Design and Management for Energy Conservation”, Pergamum Press, Oxford.

REFERENCE BOOKS

1. Murphy W.R. and McKay G., “Energy Management”, Butterworth’s, London, 1987.
2. Bureau of Energy Efficiency, “Energy Manager Training Manual”, Reference book No:1 to 4.
3. Dale R Patrick, Stephen W Fardo, “Energy Conservation Guidebook”, 2nd Edition, CRC Press.
4. Shobh Nath Singh, "Non-Conventional Energy Resources", Pearson Education India; First edition (2015).

ONLINE COURSES / RESOURCES:

1. https://www.ktuassist.in/2020/03/ktu-me482-energy-conservation-and.html#google_vignette
2. https://archive.nptel.ac.in/courses/112/105/112105221/
3. https://snscourseware.org/snscenew/notes.php?cw=CW_5d29ce841fa8b

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**3**	**3**									**1**
CO2	**3**	**3**	**3**			**2**	**2**					**1**
CO3	**3**	**3**	**3**			**2**	**2**					**1**
CO4	**3**	**3**	**3**			**2**	**2**					**1**
CO5	**3**	**3**	**3**			**2**	**2**					**1**

Internal Assessment				**End Semester Examinations**
Assessment I (100 Marks)		**Assessment II (100 Marks)**		
Individual Assignment / Case Study / Seminar / Mini Project	**Written Test**	**Individual Assignment / Case Study / Seminar / Mini Project**	**Written Test**	**Written Examinations**
40	60	40	60	100
40%				**60 %**

23GE1004	HOSPITAL WASTE MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- Understand the hazardous materials used in
- Understand various waste disposal procedures and management.
- Understand the various facility guidelines of administrative area safety and control of hazardous energy
- Understand the inputs of healthcare immunizations and medication safety.

UNIT - I HEALTHCARE HAZARD CONTROL AND UNDERSTANDING ACCIDENTS 9

Healthcare Hazard Control: Introduction, Hazard Control, Hazard Control Management and responsibilities, Hazard Analysis, Hazard Control and Correction, Personal Protective Equipment, Hazard Control Committees and System Safety. Understanding Accidents: Accident Causation Theories, Human Factors, Accident Deviation Models, Accident Reporting, Accident Investigations, Accident Analysis, Organizational Functions That Support Accident Prevention, Workers' Compensation.

UNIT - II BIOMEDICAL WASTE MANAGEMENT 9

Biomedical Waste Management : Types of wastes, major and minor sources of biomedical waste, Categories and Classification of biomedical waste, hazard of biomedical waste, need for disposal of biomedical waste, waste minimization, waste segregation and labelling, waste handling, collection, storage and transportation, treatment and disposal.

UNIT - III HAZARDOUS MATERIALS 9

Hazardous Materials : Hazardous Substance Safety, OSHA Hazard Communication Standard, DOT Hazardous Material Regulations, Healthcare Hazardous Materials, Medical Gas Systems, Hazardous Waste Operations and Emergency Response Standard, Respiratory Protection.

UNIT - IV FACILITY SAFETY 9

Facility Safety : Introduction, Facility Guidelines: Institute, Administrative Area Safety, Slip, Trip, and Fall Prevention, Safety Signs, Colours, and Marking Requirements, Tool Safety, Machine Guarding, Compressed Air Safety, Electrical Safety, Control of Hazardous Energy, Landscape and Grounds Maintenance, Fleet and Vehicle Safety.

UNIT - V INFECTION CONTROL, PREVENTION AND PATIENT SAFETY 9

Healthcare Immunizations, Centres for Disease Control and Prevention, Disinfectants , Antiseptics, OSHA Blood borne Pathogens Standard and Healthcare Opportunistic Infections. Patient Safety: An Organizational Function, Errors and Adverse Events, Safety Cultures, Patient-Centred Healthcare

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

1. Analyse various hazards, accidents and its control.
2. Design waste disposal procedures for different biomedical wastes.
3. Categorize different biomedical wastes based on its properties.
4. Outline the Hazardous safety and its Healthcare hazardous Material regulations.
5. Design different safety facility in hospitals.
6. Propose various regulations and safety norms.

TEXT BOOKS:

1. Tweedy, James T., Healthcare
2. Anantpreet Singh, SukhjitKaur, Biomedical Waste Disposal, Jaypee Brothers Medical Publishers (P) Ltd (2012).
3. Solid and Hazardous Waste Management, Second Edition by M.N. Rao (Author), Razia Sultana (Author)-BS Publications.
4. Infectious and Medical Waste Management By Peter A. Reinhardt -CRC Press

REFERENCES:

1. R.C.Goyal, "Hospital Administration and Human Resource Management", PHI - Fourth Edition,2006
2. J. Landrum, "Medical Waste Management and disposal", Elsevier, 1991

Internal Assessment				End Semester Examinations
Assessment I (100 Marks)		Assessment II (100 Marks)		
Individual Assignment / Case Study / Seminar / Mini Project	Written Test	Individual Assignment / Case Study / Seminar / Mini Project	Written Test	Written Examinations
40	60	40	60	100
40%				60 %

23ME1009	INDUSTRIAL NANOTECHNOLOGY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To understand the applications of nanotechnology in agriculture, food, textiles, cosmetics, chemical, and defense industries.
- To analyze the role of nanostructured materials and processes in enhancing functionality across various industries, including water treatment and environmental protection.
- To apply the principles of nanotechnology to develop smart materials, coatings, and systems for industrial and defense applications.
- To evaluate the environmental and health impacts of nanomaterials and implement sustainable practices for their production and usage.

UNIT I NANOTECHNOLOGY IN AGRICULTURE AND FOOD INDUSTRIES 9

Agriculture industry: - Precision farming, Smart delivery system – Insecticides usingNanotechnology – Nano fertilizers -Nanofertigation - Nano-seed Science.Food industry: Nanopackaging for enhanced shelf life - Smart/Intelligent packaging – Foodprocessing and food safety and bio-security -Electrochemical sensors for food analysis andcontaminant detection..

UNIT II NANOTECHNOLOGY IN TEXTILES AND COSMETICS INDUSTRIES 9

Textiles Industry: Production of Nano-woven fibers from electrospinning – Controlling parametersand morphologies of nanofibers – Nanocomposite fibers; Bionics: Swim-suits with shark-skin effect,Soil repellence, Lotus effect; Nano finishing in textiles: UV resistant, anti-bacterial, hydrophilic, self-cleaning, flame retardant finishes; Modern textiles: Lightweight bulletproof vests and shirts, Colourchanging property, Waterproof and Germ proof clothes.Cosmetics Industry: Formulation of Gels, Shampoos, Hair-conditioners (Micellar self-assembly andits manipulation) - Sun-screen dispersions for UV protection using titanium oxide - Anti-aging cream- Colour cosmetics.

UNIT III NANOTECHNOLOGY IN CHEMICAL AND ELECTROCHEMICAL INDUSTRIES 9

Nanocatalysts - Smart Materials - Nanostructures for molecular recognition (0D, 1D and 2D) - Molecular encapsulation and its applications – Nanoporous Zeolites – Nano-reactors – Solid lubricants- Nanotechnology in Electrometallurgy, Electroplating industry and Corrosion protective organiccoatings - Electrolytic production of metal nanopowders, Electrochemical exfoliation for the
production of Graphene and other metal chalcogenides – Electrochemical preparation ofNanostructured conducting polymers.

UNIT IV NANOTECHNOLOGY IN DEFENCE 9

Military applications of Nanotechnology -Nano-Battle suit – Nano-drones – Nano- Satellites – Nano-Propellants and Explosives – Camouflage distributed sensors - Amour protection - Implanted Nano-systems - Mini-/Micro robots - Small satellites and Space launchers -Nano-Nuclear, Chemical and Biological weapons - Chemical/Biological protection.

UNIT V NANOTECHNOLOGY IN ENVIRONMENTAL AND HEALTH EFFECTS 9

Overview of physical, chemical, and biological processes concerning the environment-Nanomaterialbased adsorbents and photocatalysts for water and wastewater treatment – Nanomaterials foradsorption of heavy metals – Nanoparticles for degradation of organic and organic compounds -Treatment of Arsenic using Nano TiO2 and other nanoparticles – Nanomembranes in drinking water purification and desalination – Environmental impacts of Nanomaterials on human and animal health – Safety issues and regulatory practices in handling Nanomaterals – Environmental hazard inprocessing of Nanomaterials – Emerging issues of nano/microplastics - Green synthesis/zero-waste
processes

TOTAL :45 PERIODS

COURSE OUTCOME

Upon completion of the course, students will be able to:

CO1 Understanding the fundamentals and industrial applications of nanotechnology in agriculture, food, textiles, and cosmetics industries.

CO2 Utilize nanomaterials for enhanced efficiency in chemical processes and electrochemical industries.

CO3 Analyze the design and functionality of nanotechnology-enabled systems for defense, including nano-battle suits and nano-drones.

CO4 Assess the environmental and health implications of nanotechnology and recommend eco-friendly alternatives or regulations for safer practices.

CO5 Design innovative solutions using nanotechnology for challenges in water purification, pollutant degradation, and industrial advancements.

TEXT BOOKS

1. P. Brown and K. Stevens, Nanofibers and Nanotechnology in Textiles, Woodhead publication,London, 2006.
2. J. Altmann, Routledge, Military Nanotechnology: Potential Applications and Preventive ArmsControl, Taylor and Francis Group, 2006.
3. Jennifer Kuzma and Peter VerHage, Nanotechnology in agriculture and food production, WoodrowWilson International Center, (2006).
4. Lynn J. Frewer, WillehmNorde, R. H. Fischer and W. H. Kampers, Nanotechnology in the Agri-food sector, Wiley-VCH Verlag, (2011).
5. Q. Chaudry, L.Castle and R. Watkins Nanotechnologies in Food, RSC Publications, 2010.

REFERENCE BOOKS

1. W.N.Chang, Nanofibers Fabrication, Performance and Applications, Nova Science Publishers Inc.,(2009).
2. M.R. Rifi and F.H.Covitz, Industrial Electrochemistry, Marcel Dekker Inc, New York, 1974.
3. K.I.Popov, S.S.Djokic and B.N.Grgur, Fundamentals of Electrometallurgy, Kluwer AcademicPublishing 2002.
4. A.J.Bard&L.R.Faulkner, Electrochemical methods-Fundamentals and Applications John Wiley &Sons, 3rd Edition, 2001.

ONLINE COURSES / RESOURCES:

1. https://archive.nptel.ac.in/courses/102/104/102104069/
2. https://www.classcentral.com/course/swayam-nanotechnology-in-agriculture-14205
3. https://alison.com/course/advancements-in-food-processing-and-nanotechnology#google_vignette

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**3**					**2**					**1**
CO2	**3**	**3**					**2**					**1**
CO3	**3**	**3**	**2**	**2**			**2**					**1**
CO4	**3**	**3**				**2**	**2**					**1**
CO5	**3**	**3**	**2**	**2**			**2**					**1**

Internal Assessment				**End Semester Examinations**
Assessment I (100 Marks)		**Assessment II (100 Marks)**		
Individual Assignment / Case Study / Seminar / Mini Project	**Written Test**	**Individual Assignment / Case Study / Seminar / Mini Project**	**Written Test**	**Written Examinations**
40	60	40	60	100
40%				**60 %**

23EE1003	LOGIC AND DISTRIBUTED CONTROL SYSTEM	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To give an overview of the automation technologies such as PLCs, SCADA and DCS used in industries
- To provide a fundamental understanding of the different languages used for PLC Programming
- To provide insight into some of the advanced principles those are evolving for present and future automation.

UNIT - I PLC & SCADA 9

PLC: Evolutions of PLCs – Programmable Controllers – Architecture, I/O modules – Comparative study of Industrial PLCs. SCADA: Remote terminal units- Master station - Communication architectures.

UNIT - II BASICS OF PLC PROGRAMMING(LADDER) 9

Basics of PLC programming – Ladder Logic – Relay type instructions – Timer/Counter instructions – Program control instructions – Data manipulation and math instructions – Programming Examples

UNIT - III PLC PROGRAMMING (OTHER LANGUAGES) 9

Functional block programming - Sequential function chart – Instruction list – Structured text programming – PLC controlled sequential Process Examples.

UNIT - IV DISTRIBUTED CONTROL SYSTEM 9

DCS: Evolution & types – Hardware architecture – Field control station – Interfacing of conventional and smart field devices (HART and FF enabled) with DCS Controller – Communication modules – Operator and Engineering Human interface stations – Study of any one DCS available in market.

UNIT - V ADVANCED TOPICS IN AUTOMATION 9

Introduction to Networked Control systems – Plant wide control – Internet of things – Cloud based Automation – OLE for Process Control – Safety PLC – Case studies: PLC - SCADA - DCS.

TOTAL: 45 PERIODS

COURSE OUTCOME(S):

Upon completion of the course, students will be able to:

CO1 Ability to understand all the important components such as PLC, SCADA, DCS,I/O modules and field devices of an industrial automation system

CO2 Ability to develop PLC program in different languages for industrial sequential applications.

CO3 Able to select and use most appropriate automation technologies for a given application.

CO4 Ability to gain knowledge on the recent developments in industrial automation.

TEXT BOOKS:

1. F.D. Petruzella, Programmable Logic Controllers, Tata Mc-Graw Hill, Third edition, 2010
2. Michael P. Lukas, Distributed Control Systems: Their Evaluation and Design, Van Nostrand

Reinhold Co., 1986
3. D. Popovic and V.P.Bhatkar,' Distributed computer control for industrial Automation' Marcel Dekker, Inc., Newyork ,1990.

REFERENCE BOOKS:

1. Clarke, G., Reynders, D. and Wright, E., "Practical Modern SCADA Protocols: DNP3,4. 60870.5 and Related Systems", Newnes, 1st Edition, 2004.
2. Hughes, T.A., "Programmable Logic Controllers: Resources for Measurements and Control Series", 3rd Edition, ISA Press, 2004.
3. McMillan, G.K., "Process/Industrial Instrument and Controls Handbook", 5th Edition, McGraw- Hill handbook, New York, 1999.
4. NPTEL Notes on, "Programmable Logic Control System" by Department of Electrical Engg., IIT Kharagpur.

Internal Assessment				**End Semester Examinations**
Assessment I (100 Marks)		**Assessment II (100 Marks)**		
Individual Assignment / Case Study / Seminar / Mini Project	**Written Test**	**Individual Assignment / Case Study / Seminar / Mini Project**	**Written Test**	**Written Examinations**
40	60	40	60	100
40%				**60 %**

23EC1011	TELEHEALTH TECHNOLOGY	L	T	P	C
		3	0	0	3

OBJECTIVES:

- Learn the key principles for telemedicine and health.
- Understand telemedical technology.
- Know telemedical standards, mobile telemedicine and it applications

UNIT - I TELEMEDICINE AND HEALTH 9

History and Evolution of telemedicine, Organs of telemedicine, Global and Indian scenario, Ethicaland legal aspects of Telemedicine - Confidentiality, Social and legal issues, Safety and regulatory issues, Advances in Telemedicine.

UNIT - II TELEMEDICALTECHNOLOGY 9

Principles of Multimedia - Text, Audio, Video, data, Data communications and networks, PSTN,POTS, ANT, ISDN, Internet, Air/ wireless communications Communication infrastructure for telemedicine – LAN and WAN technology. Satellite communication, Mobile communication.

UNIT - III TELEMEDICAL STANDARDS 9

Data Security and Standards: Encryption, Cryptography, Mechanisms of encryption, phases of Encryption. Protocols: TCP/IP, ISO-OSI, Standards to followed DICOM, HL7, H. 320 series Video Conferencing, Security and confidentiality of medical records, Cyber laws related to telemedicine

UNIT - IV MOBILE TELEMEDICINE 9

Tele radiology: Image Acquisition system Display system, Tele pathology, Medical information storage and management for telemedicine- patient information, medical history, test reports, medical images, Hospital information system.

UNIT - V TELE MEDICAL APPLICATIONS 9

Telemedicine – health education and self care. · Introduction to robotics surgery, Telesurger, Telecardiology, Teleoncology, Telemedicine in neurosciences, Business aspects-Project planning and costing, Usage of telemedicine.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon successful completion of the course, student will be able to;

1. Describe principles used for telemedicine and telehealth
2. Apply multimedia technologies in telemedicine.
3. Explain Protocols behind encryption techniques for secure transmission of data.
4. Explain various telemedical standards
5. Analyse patient information in hospital
6. Apply telehealth in healthcare.

TEXT BOOKS:

1. Norris, A.C. “Essentials of Telemedicine and Telecare”,Wiley,2012.

REFERENCES:

1. Wootton,R.,Craig,J.,Patterson,V.(Eds.),“IntroductiontoTelemedicine.Roya lSo ciety of Medicine” Press Ltd, Taylor & Francis 2016
2. O'Carroll, P.W., Yasnoff, W.A.,Ward,E., Ripp,L.H., Martin, E.L.(Eds), “Public Health Informatics and Information Systems”, Springer, 2013.
3. Simpson, W. Video over IP. A practical guide to technology and applications. Focal Press Elsevier, 2006
4. Bemmel, J.H. van, Musen, M.A. (Eds.) Handbook of Medical Informatics. Heidelberg, Germany: Springer, 1997 MohanBansa l, “MedicalInformatics”, TataMcGraw-Hill,2014.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2									
CO2	3	3	2									
CO3	3	3	3	2								
CO4	3	3	3	3								
CO5	3	3	2									
CO6	3	3	3	3								

Internal Assessment				**End Semester Examinations**
Assessment I (100 Marks)		**Assessment II (100 Marks)**		
Individual Assignment / Case Study / Seminar / Mini Project	**Written Test**	**Individual Assignment / Case Study / Seminar / Mini Project**	**Written Test**	**Written Examinations**
40	60	40	60	100
40%				**60 %**

OPEN ELECTIVE – II

23EE1001	BASIC CIRCUIT THEORY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To introduce electric circuits and its analysis
- To impart knowledge on solving circuit equations using network theorems
- To introduce the phenomenon of resonance in coupled circuit
- To educate on obtaining the transient response of circuits.
- To introduce Phasor diagrams and analysis of three phase circuits
- To introduce electric circuits and its analysis

UNIT - I BASIC CIRCUITS ANALYSIS CABLES 9

Resistive elements – Ohm's Law Resistors in series and parallel circuits – Kirchhoff's laws – Mesh current and node voltage - methods of analysis.

UNIT - II NETWORK REDUCTION AND THEOREMS FOR DC AND AC CIRCUITS 9

Network reduction: voltage and current division, source transformation – star delta conversion. Thevenin's and Norton Theorems – Superposition Theorem – Maximum power transfer theorem – Reciprocity Theorem – Millman's theorem.

UNIT - III TRANSIENT RESPONSE ANALYSIS 9

L and C elements -Transient response of RL, RC and RLC Circuits using Laplace transform for DC input and A.C. sinusoidal input.

UNIT - IV THREE PHASE CIRCUITS 9

A.C. circuits – Average and RMS value - Phasor Diagram – Power, Power Factor and Energy. Analysis of three phase 3-wire and 4-wire circuits with star and delta connected loads, balanced & un balanced – phasor diagram of voltages and currents – power measurement in three phase circuits..

UNIT - V RESONANCE AND COUPLED CIRCUITS 9

Series and parallel resonance – their frequency response – Quality factor and Bandwidth - Self and mutual inductance – Coefficient of coupling – Tuned circuits – Single tuned circuits.

TOTAL: 45 PERIODS

COURSE OUTCOME(S):

Upon completion of the course, students will be able to:

CO1 Ability to comprehend the basics of circuit analysis.
CO2 Ability of solve electrical circuits using theorems
CO3 Ability to analyze the transient response
CO4 Able to comprehend the three phase circuits
CO5 Able to understand coupled circuits

TEXT BOOKS:

1. William H. HaytJr, Jack E. Kemmerly and Steven M. Durbin, “Engineering Circuits Analysis”, McGraw Hill publishers, edition, New Delhi, 2013.
2. Charles K. Alexander, Mathew N.O. Sadiku, “Fundamentals of Electric Circuits”, Second Edition, McGraw Hill, 2013.
3. Allan H. Robbins, Wilhelm C. Miller, “Circuit Analysis Theory and Practice”, Cengage Learning India, 2013
4. Sudhakar A and Shyam Mohan SP, “Circuits and Network Analysis and Synthesis”, McGraw Hill, 2015.

REFERENCE BOOKS:

1. Chakrabarti A, “Circuits Theory (Analysis and synthesis), Dhanpath Rai& Sons, New Delhi, 1999.
2. Jegatheesan, R., “Analysis of Electric Circuits,” McGraw Hill, 2015.
3. Joseph A. Edminister, Mahmood Nahri, “Electric circuits”, Schaum‟s series, McGrawHill, New Delhi, 2010.
4. M E Van Valkenburg, “Network Analysis”, Prentice-Hall of India Pvt Ltd, New Delhi, 2015
5. Mahadevan, K., Chitra, C., “Electric Circuits Analysis,” Prentice-Hall of India Pvt Ltd., New Delhi, 2015.

Internal Assessment				**End Semester Examinations**
Assessment I (100 Marks)		**Assessment II (100 Marks)**		
Individual Assignment / Case Study / Seminar / Mini Project	**Written Test**	**Individual Assignment / Case Study / Seminar / Mini Project**	**Written Test**	**Written Examinations**
40	60	40	60	100
40%				**60 %**

23ME1010	ENERGY ENGINEERING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To provide a comprehensive understanding of various energy sources, including both renewable and non-renewable, and their role in global energy systems.
- To equip students with the knowledge of energy conversion processes, systems, and technologies such as thermal, mechanical, and electrical energy systems.
- To develop an understanding of energy management practices, energy efficiency techniques, and their application in different sectors like industry, residential, and commercial spaces.
- To analyze the environmental impacts of energy systems and explore sustainable energy policies and technologies that contribute to environmental conservation and climate change mitigation.

UNIT I INTRODUCTION TO ENERGY ENGINEERING 9

Introduces to various energy sources, categorizing them into conventional and non-conventional types, including fossil fuels, nuclear energy, and renewable sources like solar, wind, and biomass. Energy conversion processes, focusing on thermodynamic laws and their application in energy systems

UNIT II RENEWABLE ENERGY SYSTEMS 9

Solar energy (both thermal and photovoltaic), wind energy (wind turbine technology and performance), biomass energy, and emerging sources like geothermal and ocean energy.

UNIT III NON-RENEWABLE ENERGY SOURCES 9

Traditional energy sources, primarily fossil fuels such as coal, oil, and natural gas, and their extraction, processing, and environmental impacts.energy storage technologies, such as batteries, hydrogen storage, and compressed air systems.

UNIT IV ENERGY CONVERSION SYSTEMS 9

Heat engines and power cycles, such as the Rankine and Brayton cycles, and examines the design and operation of internal combustion engines and gas turbines.

UNIT V ENERGY MANAGEMENT AND ENVIRONMENTAL IMPACT 9

Energy efficiency and conservation strategies across industrial, residential, and commercial sectors, including techniques for energy auditing and management. This unit also highlights the environmental impacts of energy systems, such as greenhouse gas emissions and air pollution, and introduces life cycle assessment (LCA) methods for evaluating energy systems.

TOTAL :45 PERIODS

COURSE OUTCOME

Upon completion of the course, students will be able to:

CO1 understanding of various conventional and non-conventional energy sources, their advantages, limitations, and application areas

CO2 Analyze the performance of energy conversion systems, including heat engines, power cycles, and renewable energy technologies like solar, wind, and biomass..

CO3 Design and optimize systems that integrate renewable energy sources with existing infrastructure for improved sustainability and efficiency.

CO4 Ability to conduct energy audits, implement energy conservation measures, and propose energy-saving strategies for different sectors.

CO5 Evaluate the environmental impacts of energy systems, using tools like life cycle assessment (LCA), and develop strategies to minimize the carbon footprint and promote sustainable energy use.

TEXT BOOKS

1. Turner, W. C., Energy Management Handbook, 7th ed., Fairmont Press, Lilburn, 2009.

2. Twidell, J. and Weir, T., Fundamentals of Renewable Energy, 2nd ed., Taylor & Francis, London, 2006.

REFERENCE BOOKS

1. Boyle, G., Renewable Energy: Power for a Sustainable Future, 3rd ed., Oxford University Press, Oxford, 2012.
2. Jones, J. B. A., Energy: Its Use and the Environment, 5th ed., W.H. Freeman and Company, New York, 2010.
3. Yaw, D. T., Introduction to Energy Engineering, 2nd ed., Wiley, New York, 2013.
   Various authors, Energy Policy and the Environment, CRC Press, Boca Raton, 2008.

ONLINE COURSES / RESOURCES:

1. https://learnengineering.in/och752-energy-technology/
2. https://ocw.mit.edu/courses/2-60j-fundamentals-of-advanced-energy-conversion-spring-2020/pages/lecture-notes/
3. https://www.vssut.ac.in/lecture_notes/lecture1428910296.pdf

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**3**				**1**						**1**
CO2	**3**	**3**	**1**			**1**						**1**
CO3	**3**	**3**	**1**			**1**						**1**
CO4	**3**	**3**				**1**						**1**
CO5	**3**	**3**	**1**			**1**						**1**

Internal Assessment				**End Semester Examinations**
Assessment I (100 Marks)		**Assessment II (100 Marks)**		
Individual Assignment / Case Study / Seminar / Mini Project	**Written Test**	**Individual Assignment / Case Study / Seminar / Mini Project**	**Written Test**	**Written Examinations**
40	60	40	60	100
40%				**60 %**

23EC1004	ELECTRONIC DEVICES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To understand the working of PN junction diode.
- To study the basic working of BJT.
- To gain knowledge on FET.
- To acquaint the knowledge on special semiconductor and power devices.
- To know the operation of optical devices.

UNIT - I SEMICONDUCTOR DIODE **9**

PN junction behavior, PN junction diode, Current equations, Energy Band diagram, Diffusion and drift current densities, forward and reverse bias characteristics, Transition and Diffusion Capacitances, Switching Characteristics, Breakdown in PN Junction Diodes. Characteristics of PN diode using simulation tool.

UNIT - II BIPOLAR JUNCTION TRANSISTORS **9**

NPN -PNP - Operations-Early effect -Current equations – Input and Output characteristics of CE, CB, CC - h-parameter model, Ebers Moll Model, Multi Emitter Transistor. Case studies.Characteristics of BJT using simulation tool.

UNIT - III FIELD EFFECT TRANSISTORS **9**

JFETs – Drain and Transfer characteristics, -Current equations -Pinch off voltage and its significance- MOSFET- Characteristics- Threshold voltage -Channel length modulation, D- MOSFET, E- MOSFET- Characteristics – Comparison of MOSFET with JFET. Characteristics of JFET and MOSFET using simulation tool.

UNIT - IV SPECIAL SEMICONDUCTOR DEVICES AND POWER DEVICES **9**

Semiconductor Devices: Metal-Semiconductor Junction- MESFET, DUAL GATE MOSFET, Zener diode-Varactor diode - Gallium Arsenide device, LDR.
Power Devices: UJT, SCR, Diac, Triac, Power BJT.
Characteristics of Zener diode, UJT, and SCR using simulation tool.

UNIT - V OPTICAL DEVICES **9**

Optical absorption, solar cells, Photodetector, Photoluminescence, electroluminescence, Photo transistor, Opto- Coupler, LCD, CCD.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon successful completion of the course, student will be able to;

CO1 Understand the V – I characteristics of semiconductor diode.

CO2 Classify the configurations of BJT and understand its equivalence circuits.

CO3 Explain the drain – transfer characteristics of FET.

CO4 Illustrate the concepts of special semiconductor devices.

CO5 Explain the concepts of power devices

CO6 Outline the operation of optical devices.

TEXT BOOKS:

1. Donald A Neaman, ¯Semiconductor Physics and Devices‖, Fourth Edition, Tata Mc Graw Hill Inc. 2012.
2. Salivahanan. S, Suresh Kumar. N, Vallavaraj.A, ¯Electronic Devices and circuits, Third Edition, Tata McGraw- Hill, 2008.

REFERENCE BOOKS:

1. Robert Boylestad and Louis Nashelsky, ¯Electron Devices and Circuit Theory Pearson Prentice Hall, 10th edition, July 2008.
2. R.S.Sedha, ¯ A Text Book of Applied Electronics Chand Publications, 2006.
3. Yang, ¯Fundamentals of Semiconductor devices, McGraw Hill International Edition.

WEB REFERENCES:

1. https://www.digimat.in/nptel/courses/video/108101091/L01.html

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1	3	3	-	-	-	-	-	-	-
CO2	3	1	2	3	3	-	-	-	-	-	-	-
CO3	3	1	1	3	3	-	-	-	-	-	-	-
CO4	3	1	1	3	3	-	-	-	-	-	-	-
CO5	3	1	1	3	3	-	-	-	-	-	-	-
CO6	3	1	1	3	3	-	-	-	-	-	-	-

Internal Assessment				**End Semester Examinations**
Assessment I (100 Marks)		**Assessment II (100 Marks)**		
Individual Assignment / Case Study / Seminar / Mini Project	**Written Test**	**Individual Assignment / Case Study / Seminar / Mini Project**	**Written Test**	**Written Examinations**
40	60	40	60	100
40%				**60 %**

23CE1009	ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To impart the knowledge and skills to identify, assess and mitigate the environmental and social impacts of developmental projects

UNIT-I INTRODUCTION 9

Impacts of Development on Environment – Rio Principles of Sustainable Development- Environmental Impact Assessment (EIA) - Objectives - Historical development - EIA Types - EIA in project cycle -EIA Notification and Legal Framework.

UNIT-II ENVIRONMENTAL ASSESSMENT 9

Screening and Scoping in EIA – Drafting of Terms of Reference, Baseline monitoring, Prediction and Assessment of Impact on land, water, air, noise, flora and fauna - Matrices – Networks – Checklist Methods - Mathematical models for Impact prediction.

UNIT-III ENVIRONMENTAL MANAGEMENT PLAN 9

Plan for mitigation of adverse impact on water, air and land, water, energy, flora and fauna - Environmental Monitoring Plan – EIA Report Preparation – Public Hearing- Environmental Clearance

UNIT-IV SOCIO ECONOMIC ASSESSMENT 9

Baseline monitoring of Socio economic environment – Identification of Project Affected Personal – Rehabilitation and Resettlement Plan- Economic valuation of Environmental impacts – Cost benefit Analysis-

UNIT-V CASE STUDIES 9

EIA case studies pertaining to Infrastructure Projects – Roads and Bridges – Mass Rapid Transport Systems - Airports - Dams and Irrigation projects - Power plants.

TOTAL:45PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

1. Carry out scoping and screening of developmental projects for environmental and social assessments
2. Explain different methodologies for environmental impact prediction and assessment
3. Plan environmental impact assessments and environmental management plans
4. Evaluate environmental impact assessment reports

TEXTBOOKS:

1. Canter, R.L, "Environmental impact Assessment ", 2nd Edition, McGraw Hill Inc, New Delhi,1995.
2. Lohani, B., J.W. Evans, H. Ludwig, R.R. Everitt, Richard A. Carpenter, and S.L. Tu, "Environmental Impact Assessment for Developing Countries in Asia", Volume 1 – Overview, Asian Development Bank,1997.
3. Peter Morris, RikiTherivel "Methods of Environmental Impact Assessment", Routledge Publishers,2009.

REFERENCES:

1. Becker H. A., Frank Vanclay,"The International handbook of social impact assessment" conceptual and methodological advances, Edward Elgar Publishing,2003.
2. Barry Sadler and Mary McCabe, "Environmental Impact Assessment Training Resource Manual", United Nations Environment Programme,2002.
3. Judith Petts, "Handbook of Environmental Impact Assessment Vol. I and II", Blackwell Science New York, 1998.
4. Ministry of Environment and Forests EIA Notification and Sectoral Guides, Government of India, New Delhi, 2010.

Internal Assessment				**End Semester Examinations**
Assessment I (100 Marks)		**Assessment II (100 Marks)**		
Individual Assignment / Case Study / Seminar / Mini Project	**Written Test**	**Individual Assignment / Case Study / Seminar / Mini Project**	**Written Test**	**Written Examinations**
40	60	40	60	100
40%				**60 %**

23GE1003	HOSPITAL MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To understand the fundamentals of hospital administration and management
- To know the market related research process
- To explore various information management systems and relative supportive services
- To learn the quality and safety aspects in hospital

UNIT-I **9**

OVERVIEW OF HOSPITAL ADMINISTRATION

Distinction between Hospital and Industry, Challenges in Hospital Administration – Hospital Planning- Equipment Planning – Functional Planning - Role of hospital administration – Hospital system – Need for scientific planning and design of hospitals

UNIT-II **9**

HUMAN RESOURCE MANAGEMENT IN HOSPITAL

Principles of HRM – Functions of HRM – Profile of HRD Manager – Human Resource Inventory – Manpower Planning – Significance – Importance of HR Planning – Factors influencing HR Planning Process – Job Analysis

UNIT-III **9**

RECRUITMENT AND TRAINING

Different Departments of Hospital, Recruitment, Selection, Training Guidelines – Methods of Training – Evaluation of Training – Leadership grooming and Training, Promotion – Transfer Performance Appraisals: Techniques & Practices

UNIT-IV **9**

SUPPORTIVE SERVICES

Medical Records Department – Central Sterilization and Supply Department – Pharmacy – Food Services - Laundry Services –Transportation services – Mortuary services – Hospital security services

UNIT-V **9**

COMMUNICATION AND SAFETY ASPECTS IN HOSPITAL

Purposes – Planning of Communication, Modes of Communication – Telephone, ISDN, Public Address and Piped Music – CCTV. Security – Loss Prevention – Fire Safety – Alarm System – Safety Rules – Challenges of e-health – electronic medical records

TOTAL:45PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

1. Explain the principles of Hospital administration
2. Identify the importance of Human resource management
3. List various marketing research techniques
4. Identify Information management systems and its uses
5. Explain the principles of Hospital administration

TEXTBOOKS:

1. R.C.Goyal, "Hospital Administration and Human Resource Management", PHI – Fourth Edition, 2006
2. G.D.Kunders, "Hospitals – Facilities Planning and Management – TMH, New Delhi – Fifth Reprint 2007
3. Stephen P. Robbins and Mary Coulter, Management (Prentice Hall of India Pvt. Ltd., New Delhi)
4. J.E. Park and K. Park, Textbook of Preventive and Social Medicine (M/S BanarsidasBhanot Publishers, Jabalpur)
5. Elaine La Monica, Management in Health Care (Macmillan Press Ltd, London) References
6. B.M. Sakharkar, Principles of Hospital Administration and Planning (Jaypee Brothers Medical Publishers Pvt. Ltd., New Delhi)

REFERENCES:

1. Cesar A.Caceres and Albert Zara, "The Practice of Clinical Engineering, Academic Press, New York, 1977.
2. Norman Metzger, "Handbook of Health Care Human Resources Management", 2nd edition Aspen Publication Inc. Rockville, Maryland, USA, 1990.
3. Peter Berman "Health Sector Reform in Developing Countries" - Harvard University Press, 1995.
4. William A. Reinke "Health Planning For Effective Management" - Oxford University Press.1988
5. Blane, David, Brunner, "Health and SOCIAL Organization: Towards a Health Policy for the 21st Century", Eric Calrendon Press 2002.
6. Arnold D. Kalcizony& Stephen M. Shortell, "Health Care Management", 6th Edition Cengage Learning, 2011.

Internal Assessment				**End Semester Examinations**
Assessment I (100 Marks)		**Assessment II (100 Marks)**		
Individual Assignment / Case Study / Seminar / Mini Project	**Written Test**	**Individual Assignment / Case Study / Seminar / Mini Project**	**Written Test**	**Written Examinations**
40	60	40	60	100
40%				**60 %**

23EC1002	MEDICAL ELECTRONICS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the sources and characteristics of various biomedical signals and their recording techniques.
- To explore the principles and methods of measuring biochemical and non-electrical physiological parameters.
- To study the design and operation of assistive medical devices and imaging systems.
- To gain knowledge about physical medicine applications and biotelemetry systems.
- To examine recent advancements in medical instrumentation, including telemedicine and emerging technologies.

UNIT - I ELECTRO-PHYSIOLOGY AND BIO-POTENTIAL RECORDING 9

Sources of bio medical signals, Bio-potentials, Bio potential electrodes, biological amplifiers, ECG, EEG, EMG, PCG, typical waveforms and signal characteristics.

UNIT - II BIO-CHEMICAL AND NON ELECTRICAL PARAMETER MEASUREMENT 9

pH, PO2, PCO2, Colorimeter, Blood flow meter, Cardiac output, respiratory, blood pressure, temperature and pulse measurement, Blood Cell Counters.

UNIT - III ASSIST DEVICES AND IMAGING SYSTEM 9

Cardiac pacemakers, DC Defibrillator, Dialyser, Ventilators – Positive pressure ventilator, Magnetic Resonance Imaging Systems, Ultrasonic Imaging Systems – principles - Types - Applications.

UNIT - IV PHYSICAL MEDICINE AND BIOTELEMETRY 9

Diathermies - Shortwave, Ultrasonic and Microwave type and their applications, Surgical Diathermy, Biotelemetry - Single channel – Multichannel – Applications.

UNIT - V RECENT TRENDS IN MEDICAL INSTRUMENTATION 9

Telemedicine for healthcare , Insulin Pumps, Radio pill, Endomicroscope, Brain machine interface: Fundamentals of BMI – Structure of BMI system – Classification of BMI, Lab on a chip (LOC) - Challenges of LOC- Applications of LOC.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

1. Describe the characteristics and recording methods of biomedical signals like ECG, EEG, and EMG.
2. Explain the measurement principles for biochemical and non-electrical physiological parameters
3. Apply knowledge of assistive devices and imaging systems in medical applications.
4. Differentiate between various physical medicine techniques (e.g., diathermies) and biotelemetry systems.
5. Create innovative solutions using emerging technologies like telemedicine and lab-on-a-chip for healthcare applications..

TEXT BOOKS:

1. Leslie Cromwell, "Biomedical Instrumentation and Measurement", Prentice Hall of India, New Delhi, 2017.

REFERENCES:

1. Khandpur, R.S., "Handbook of Biomedical Instrumentation", TATA Mc Graw- Hill, New Delhi, 2013.
2. John G.Webster, "Medical Instrumentation Application and Design", 3rd Edition, Wiley India, 2014.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2										2
CO2	2	3		2	2							2
CO3	3	2	3	2	3						2	2
CO4	2	3		3	2							2
CO5	2	2	2	2	3						2	3
CO6	3	2	3	3	3						3	3

Internal Assessment				End Semester Examinations
Assessment I (100 Marks)		Assessment II (100 Marks)		
Individual Assignment / Case Study / Seminar / Mini Project	Written Test	Individual Assignment / Case Study / Seminar / Mini Project	Written Test	Written Examinations
40	60	40	60	100
40%				60 %

23EC1009	SIGNALS AND SYSTEMS	L	T	P	C

COURSE OBJECTIVE:

- To Understand the basic properties of signals.
- To Discuss the classification of systems using properties.
- To Apply Fourier and Laplace transforms for continuous time signals.
- To Explain an LTI continuous time system in time and frequency domain.
- To Illustrate discrete time signals from the Fourier and Z domains.

UNIT - I CLASSIFICATION OF SIGNALS AND SYSTEMS 9

Standard signals: Step, Ramp, Pulse, Impulse, Real and complex exponentials, and Sinusoids - Classification of signals: Continuous time (CT) and Discrete Time (DT) signals, Periodic &Aperiodic signals, Deterministic & Random signals, Energy & Power signals - Classification of systems: CT systems and DT systems, Static & Dynamic, Causal & Non- causal, Linear & Nonlinear, Time variant & Time invariant, Stable & Unstable.

UNIT - II ANALYSIS OF CONTINUOUS TIME SIGNALS 9

Fourier Series of standard periodic signals: Sine, Cosine, Sawtooth and Square wave - Analysis of Continuous Time Signals: Fourier Transform, Properties of FT, Inverse FT, Laplace Transform, Unilateral LT and Bilateral LT, Properties of Unilateral LT - Inverse LT. Case study: Application of FS and FT- Filter, Modulation.

UNIT - III LINEAR TIME INVARIANT CONTINUOUS TIME SYSTEMS 9

Impulse response - convolution integral – Graphical method - Properties of convolution integral- Overall impulse response for interconnected systems - Fourier and Laplace transforms in analysis of CT systems - Solving of Differential Equation.

UNIT - IV ANALYSIS OF DISCRETE TIME SIGNALS 9

Baseband signal sampling - notion of aliasing with examples, Analysis of Discrete Time Signals: Discrete Time Fourier Transform (DTFT), Properties of DTFT, Inverse DTFT- Analysis of Discrete Time Signals: Z Transform, Properties of Z Transform, Inverse Z Transform.

UNIT - V LINEAR TIME INVARIANT-DISCRETE TIME SYSTEMS 9

Impulse response - Convolution sum - Graphical method - Properties of Discrete Convolution - Overall impulse response for interconnected systems - Solving of Difference equations - Solution of Difference equation using DTFT- Solution of difference equation using Z-transform.

TOTAL: 45 PERIODS

COURSE OUTCOME(S):

Upon successful completion of the course, student will be able to;

CO1 Understand the basics of signals and its classifications.

CO2 Explain the basic systems and its classifications.

CO3 Apply Fourier and Laplace transforms for continuous time signals

CO4 Demonstrate the analysis of CT- LTI systems using Fourier and Laplace Transform.

CO5 Analyze the Characteristics of DT signals using DTFT and Z- Transform

CO6 Investigate the DT- LTI systems using Fourier and Z- Transform

TEXT BOOKS:

1. Signals & Systems, Alan V. Oppenheim, Alan S. Willsky, S. Hamid Nawab, 2nd Ed., Pearson Education, 2013.
2. B.P.Lathi,"Principles of Linear Systems and Signals",Second Edition,Oxford,2009.

REFERENCE BOOKS:

1. S. Haykin and B. Van Veen, "Signals and Systems", 2nd Edition, Wiley, 2003.
2. R.E. Zeimer, W.H.Tranter and R.D.Fannin, "Signals & Systems - Continuous and Discrete", Pearson, 2007.
3. Alan Stuller, "An Introduction to Signals and Systems", Thomson, 2007.

WEB REFERENCES:

1. http://www.nptelvideos.in/2012/12/signals-and-system.html
2. https://freevideolectures.com/course/3177/signals-and-systems

ONLINE COURSES / RESOURCES:

2. https://www.edx.org/course/signals-and-systems-part-1
3. https://www.edx.org/course/signals-and-systems-part-2

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2									
CO2	3	3	2									
CO3	3	3	3	2								
CO4	3	3	3	3								
CO5	3	3	2									
CO6	3	3	3	3								

Internal Assessment				**End Semester Examinations**
Assessment I (100 Marks)		**Assessment II (100 Marks)**		
Individual Assignment / Case Study / Seminar / Mini Project	**Written Test**	**Individual Assignment / Case Study / Seminar / Mini Project**	**Written Test**	**Written Examinations**
40	60	40	60	100
40%				**60 %**

23ME1001	SYSTEMS ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- Illustrate the life cycle phases and framework for systems engineering.
- Describe about systems engineering process.
- Apply ergonomic and system dynamic models for evaluation of alternatives.
- Create knowledge on Reliability, Markov and Time series models for analysis f alternatives.
- Describe about decision assessment methods in systems engineering.

UNIT-I INTRODUCTION 9

Definitions of Systems Engineering, Systems Engineering Knowledge, Life cycles, Life-cycle phases, logical steps of systems engineering, Frame works for systems engineering.

UNIT-II SYSTEMS ENGINEERING PROCESSES 9

Formulation of issues with a case study, Value system design, Functional analysis, Business Process Reengineering, Quality function deployment, System synthesis, Approaches for generation of alternatives.

UNIT-III ANALYSIS OF ALTERNATIVES - I 9

Cross-impact analysis, Structural modeling tools, System Dynamics models with case studies, Economic models: present value analysis – NPV, Benefits and costs over time, ROI, IRR; Work and Cost breakdown structure.

UNIT-IV ANALYSIS OF ALTERNATIVES – II 9

Reliability, Availability, Maintainability, and Supportability models; Stochastic networks and Markov models, Queuing network optimization, Time series and Regression models, Evaluation of large scale models

UNIT-V DECISION ASSESSMENT 9

Decision assessment types, Five types of decision assessment efforts, Utility theory, Group decision making and Voting approaches, Social welfare function; Systems Engineering methods for Systems Engineering Management

TOTAL:45PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

1. Be able to recognize life cycle phases in systems engineering.
2. Apply steps in systems engineering process for large scale problems.
3. Able to develop system dynamic models for analyzing alternatives.
4. Gain ability to evaluate alternatives in large scale problems.
5. Be able Attain confidence in assessment and arrive decisions for complex problems.

TEXTBOOKS:

1. Andrew P. Sage, James E. Armstrong Jr. “Introduction to Systems Engineering”, John Wiley and Sons, Inc, 2000.
2. Alexander Kossiakoff, Steven M. Biemer, Samuel J. Seymour, David A. Flanigan "Systems Engineering Principles and Practice", 3rd Edition

REFERENCES:

1. Andrew P.Sage, “Systems Engineering”, John Wiley & Sons, 1992.
2. Andrew P.Sage, William B.Rouse, “Hand book of Systems Engineering and Management”, John Wiley & Sons, 1999.

23ME1944	SUPPLY CHAIN MANAGEMENT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

- To understand the role, scope, and strategic importance of logistics and supply chain management.
- To analyze and design supply chain networks and distribution systems.
- To study transportation's role and design transportation networks within the supply chain.
- To explore sourcing strategies, supplier relationships, and coordination challenges like the bullwhip effect.
- To examine the role of IT in enhancing customer and supplier relationships and the future of e-business in SCM.

UNIT I INTRODUCTION 9

Role of Logistics and Supply chain Management: Scope and Importance- Evolution of Supply Chain - Decision Phases in Supply Chain - Competitive and Supply chain Strategies – Drivers of Supply Chain Performance and Obstacles.

UNIT II SUPPLY CHAIN NETWORK DESIGN 9

Role of Distribution in Supply Chain – Factors influencing Distribution network design – Design options for Distribution Network Distribution Network in Practice-Role of network Design in Supply Chain – Framework for network Decisions.

UNIT III LOGISTICS IN SUPPLY CHAIN 9

Role of transportation in supply chain – factors affecting transportations decision – Design option for transportation network – Tailored transportation – Routing and scheduling in transportation.

UNIT IV SOURCING AND COORDINATION IN SUPPLY CHAIN 9

Role of sourcing supply chain supplier selection assessment and contracts- Design collaboration - sourcing planning and analysis - supply chain co-ordination - Bull whip effect – Effect of lack of coordination in supply chain and obstacles – Building strategic partnerships and trust within a supply chain.

UNIT V SUPPLY CHAIN AND INFORMATION TECHNOLOGY 9

The role IT in supply chain- The supply chain IT frame work Customer Relationship Management – Internal supply chain management – supplier relationship management – future of IT in supply chain – E-Business in supply chain.

TOTAL :45 PERIODS

COURSE OUTCOME

Upon completion of the course, students will be able to:

CO1 Understand the key concepts, scope, and strategic importance of logistics and supply chain management in business.

CO2 Understanding effective supply chain networks and distribution systems based on relevant factors and design options.

CO3 Apply transportation management principles to optimize transportation networks, routing, and scheduling in the supply chain.

CO4 Evaluate sourcing strategies, supplier selection, and coordination issues such as the bullwhip effect to improve supply chain performance.

CO5 Assess the role of Information Technology (IT) in supply chain management and develop solutions to integrate IT systems for enhanced customer and supplier relationships.

TEXT BOOKS

1. Sunil Chopra, Peter Meindl and D.V.Kalra, “Supply Chain Management: Strategy, Planning, and Operation”, 7th edition, Pearson, 2019.
2. James B. Ayers, “Handbook of Supply Chain Management”, 2nd edition, Auerbach Publications, 2006.

REFERENCE BOOKS

1. Jeremy F. Shapiro, “Modeling the Supply Chain”, 2nd edition, Thomson Brooks/Cole, 2006.
2. G. Srinivasan , “Quantitative models in Operations and Supply Chain Management, 2nd edition, PHI, 2018.
3. David J.Bloomberg , Stephen Lemay and Joe B.Hanna, “Logistics”, PHI 2002.

ONLINE COURSES / RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc24_hs128/preview
2. https://nptel.ac.in/courses/110106045
3. https://ocw.mit.edu/courses/esd-273j-logistics-and-supply-chain-management-fall-2009/pages/lecture-notes/

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**3**									**1**	**1**
CO2	**3**	**3**									**1**	**1**
CO3	**3**	**3**									**1**	**1**
CO4	**3**	**3**									**1**	**1**
CO5	**3**	**3**									**1**	**1**

Internal Assessment				**End Semester Examinations**
Assessment I (100 Marks)		**Assessment II (100 Marks)**		
Individual Assignment / Case Study / Seminar / Mini Project	**Written Test**	**Individual Assignment / Case Study / Seminar / Mini Project**	**Written Test**	**Written Examinations**
40	60	40	60	100
40%				**60 %**

23CY1003	WASTE WATER TREATMENT	L	T	P	C
		3	0	0	3

OBJECTIVES: To impart Knowledge on the following topics:

- To provide basic under standings about the requirements of water, its preliminary treatment
- To give the students a broad understanding of all issues related to the analysis and design of water supply and wastewater disposal systems.

UNIT-I WATER AS A RESOURCE, ITS QUALITY & PARAMETERS 9

Water sources- water quantity- maintenance of water cycle- impurities in water- effects of impurities in water- water quality parameters- physical, chemical & biological. Characteristics of potable water- wastewater effluent standards -water quality indices. Need for water and wastewater treatment - associated environmental laws- drinking water and wastewater discharge standards, water reuse and recycling concepts.

UNIT-II INDUSTRIAL WATER TREATMENT 9

Filtration – size and shape characteristics of filtering media – sand filters hydraulics of filtration – design considerations – radial, up flow, high rate and multimedia filters, pressure filter. Water softening – lime soda, zeolite and demineralization processes- industrial water treatment for boilers.

UNIT-III CONVENTIONAL TREATMENT METHODS 9

Taste and odour control – adsorption – activated carbon treatment – removal of color – iron and manganese removal – aeration, oxidation, ion exchange and other methods – effects of fluorides – fluoridation and de fluoridation –desalination - conventional activated sludge process and its modifications – trickling filter, bio-towers and rotating biological contactors-corrosion prevention and control – factors influencing corrosion – Lange Lier index – corrosion control measures.

UNIT-IV WASTE WATER TREATMENT 9

Description and design of wastewater collection system- Quantity and quality of wastewater- wastewater treatment plant layout and related issues- Sewage and waste water treatments systems: A. Primary treatment methods - B. Secondary treatment methods and - C. Tertiary treatment methods. Equalization neutralization – screening and grid removal – sedimentation – oil separation gas stripping of volatile organics – biological oxidation – lagoons and stabilization basins – aerated lagoons - Chemical oxidation - types of reactors and reactors analysis

UNIT-V DOMESTIC WASTE WATER TREATMENT METHODS& RECENT TRENDS 9

Water purification systems in natural systems - Rate of water supplies for urban and rural systems. Unit operations and processes, treatment flow-diagrams for different sources of water. Water supply norms -Advanced water treatment, Automation in Water Supply and Smart Water Supply Systems, Package treatment units, implications of 24x7 supply, Water Economics & Pricing and application of nano materials package treatment units

TOTAL:45 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

1. Understand water quality standards and parameters
2. Understand the principles and operation of water treatment systems
3. Attain knowledge about the conventional treatment methods used in water
4. Analyze the various planning & design of waste water collection & conveyance and treatment systems.
5. Understand the need for advanced water treatment with automation in treatment, water economics and patented material

TEXTBOOKS:

1. Metcalf and Eddy, “Wastewater Engineering”, 4th ed., McGraw Hill Higher Edu., 2002.
2. W. Wesley Eckenfelder, Jr., “Industrial Water Pollution Control”, 2nd Edn., McGraw Hill Inc., 1989.

REFERENCES:

1. S.P. Mahajan, “Pollution control in process industries”, 27th Ed. Tata McGraw Hill Publishing Company Ltd., 2012.
2. M. Lancaster, “Green Chemistry: An Introductory Text”, 2nd edition, RSC publishing, 2010.
3. C.S. Rao, “Environmental Pollution Control Engineering”, New Age International, 2007.
4. Water Supply and Pollution Control. Authors: Warren Viessman Jr. and Mark J. Hammer. 7th Edition 2005. Publisher: Pearson Education
5. Wastewater Microbiology, 2nd Edition. Wiley-Liss; 2nd edition (February 16, 1999)

Internal Assessment				**End Semester Examinations**
Assessment I (100 Marks)		**Assessment II (100 Marks)**		
Individual Assignment / Case Study / Seminar / Mini Project	**Written Test**	**Individual Assignment / Case Study / Seminar / Mini Project**	**Written Test**	**Written Examinations**
40	60	40	60	100
40%				**60 %**