Lokmanya Tilak Jankalyan Shikshan Sanstha's
PRIYADARSHINI COLLEGE OF ENGINEERING, NAGPUR
(An Autonomous Institute affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
Department of Electronics and Communication Engineering

AN AUTONOMOUS INSTITUTE

SECOND YEAR ENGINEERINGCURRICULUM

UNDER GRADUATE PROGRAMME

(B.Tech. Second Year)

Electronics and Communication Engineering

WITH EFFECT FROM THE ACADEMIC YEAR 2023-2024.

Lokmanya Tilak Jankalyan Shikshan Sanstha's

PRIYADARSHINI COLLEGE OF ENGINEERING, NAGPUR

(An Autonomous Institute affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

Department of Electronics and Communication Engineering

SCHEME OF EXAMINATION (w.e.f. 2023-24)

THIRD SEMESTER B. TECH (Electronics & Communication Engineering)

Sr. No.	Course Code	Course Category	BOS/ Dept	Course	Contact Hours				Marks				Total Marks	ESE Duration
									Theory		Practical			
					L	T	P	Credits	CE	ESE	CE	ESE		
1	**24UEC301T**	**PCC**	**EC**	Electronic Devices & Circuits	3	1	0	4	40	60			100	3 Hours
2	**24UEC301P**	**PCC**	**EC**	**Lab:** Electronic Devices & Circuits	0	0	2	1			25	25	50	2 Hours
3	**24UEC302T**	**PCC**	**EC**	[1]Data Structures	2	0	0	2	20	30			50	2 Hours
4	**24UEC302P**	**PCC**	**EC**	**Lab:** [2]Data Structures	0	0	2	1			25	25	50	2 Hours
5	**24UEC303T**	**PCC**	**EC**	Network Theory & Analysis	3	0	0	3	40	60	--	--	100	3 Hours
6	**24UEC304P**	**PCC**	**EC**	**Lab:** Electronics Workshop-I	0	0	2	1			25	25	50	2 Hours
7	**24UEC305P**	**PCC**	**EC**	**Lab:** Software Simulation	0	0	2	1			25	25	50	2 Hours
8	**24UOE3XXT**	**OE**	**EC**	Open Elective-I	3	0	0	3	40	60			100	3 Hours
9	**24UBS307T**	**VEC**	**ASH**	Universal Human Values	2	0	0	2	20	30			50	2 Hours
10	**24UBS309T**	**MDM**	**ASH**	MDM-I	2	0	0	2	20	30			50	2 Hours
11	**24UEC310P**	**ELC**	**EC**	Field Project/Community Engagement Project	0	0	4	2			25	25	50	2 Hours
					15	**1**	**12**	**22**	**180**	**270**	**125**	**125**	**700**	

Open Elective-I	
Course Code	**Subject**
24UOE339T	Consumer Electronics
24UOE340T	Industrial Electronics
24UOE341T	Sensors and Systems

[1,2] Using Python

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Multi-Disciplinary Minors (MDM) Courses
Basket 1: Computer Science Engineering(MDM)

Sr. No.	Course Code	Course Category	BOS/ Dept	Course	Contact Hours				Marks				Total Marks	ESE Duration
									Theory		Practical			
					L	T	P	Credits	CE	ESE	CE	ESE		
1	**24UBS309T**	**MDM**	**ASH**	MDM-I Probability Theory and Stochastic Processes	2	0	0	2	20	30			50	02 Hours
2	**24UCT407P**		**CT**	MDM-II: Object Oriented Programming Lab	0	1	2	2			25	25	50	
3	**25UCT506T**		**CT**	MDM-III: Database Management Systems	2	0	0	2	20	30			50	2 Hours
4	**25UCT506P**		**CT**	Database Management Systems Lab	0	0	2	1			25	25	50	
5	**25UEC606T**		**ASH**	MDM-IV: Aptitude and Interview Skills(Placement Foundation)	2	0	0	2	20	30			50	2 Hours
6	**26UCT703T**		**CT**	MDM-V: Computer Networks	2	0	0	2	20	30			50	2 Hours
7	**26UCT703P**		**CT**	Computer Networks Lab	0	0	2	1			25	25	50	
8	**26UCT704T**		**CT**	MDM-VI: Computer Architecture	2	0	0	2	20	30			50	2 Hours
					10	**1**	**6**	**14**	**100**	**150**	**75**	**75**	**400**	

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Basket2: Green Technology and Sustainability Engineering(MDM)

Sr. No.	Course Code	Course Category	BOS/ Dept	Course	Contact Hours				Marks				Total Marks	ESE Duration
									Theory		Practical			
					L	T	P	Credits	CE	ESE	CE	ESE		
1	**24UBS309T**	**MDM**	**ASH**	MDM-I Probability Theory and Stochastic Processes	2	0	0	2	20	30			50	02 Hours
2	**24UCV404T**		**CV**	MDM-II: Introduction to Green Technology and Sustainable Development	2	0	0	2	20	30			50	02 Hours
3	**25UCV506T**		**CV**	MDM-III::Green Materials	3	0	0	3	40	60			100	03 Hours
4	**25UCV506P**		**CV**	**Lab:** Green Materials Testing Laboratory	0	0	02	1			25	25	50	04 Hours
5	**25UEC606T**		**ASH**	MDM-IV: Aptitude and Interview Skills(Placement Foundation)	2	0	0	2	20	30			50	02 Hours
6	**26UCV703T**		**CV**	MDM-V: e-waste Management	2	0	0	2	20	30			50	02 Hours
7	**26UCV704T**		**CV**	MDM-VI: Renewable Energy	2	0	0	2	20	30			50	02 Hours
					13	**0**	**02**	**14**	**140**	**210**	**25**	**25**	**400**	

Third Semester

Course Title: Electronic Devices and Circuits
Course Code: 24UEC301T **Course Category:** PCC
Teaching Scheme: L – T – P **Total Credits:** 04
3 – 1 – 0
Scheme of Examination: ESE: 60 Marks, **CE**: 40 Marks

Prerequisites: Knowledge of classical and quantum physics.

Course Objectives:

1. To learn the principle of Semiconductor Diodes.
2. To understand the working of different types of Diodes and its applications.
3. To study the working of Transistors and its applications.
4. To understand the working principle of MOSFET, JFET.
5. To understand and explain different types of oscillators.

Course Outcomes:

At the end of this course students will demonstrate the ability to:
CO1: Explain the working principles of semiconductor diode and its use in electronic circuits.
CO2: Analyze various circuits using diodes.
CO3: Explain and Analyze the concept of Bipolar Junction Transistor and its applications.
CO4: Describe working principle of various Amplifiers
CO5: Describe the working principle of oscillator.
CO6: Explain the construction and working principle of unipolar transistors

Course Contents:

UNIT I **[07 Hours]**

Semiconductor Diode:

Introduction of P-N Junction, Biasing of diodes, V-I characteristics of diode, static and dynamic resistance of diode, Avalanche & Zener breakdown, diode current equation, Transition and Diffusion Capacitance, types of diodes: Zener diode, Varactor Diode, LED, Photodiode, tunnel diode**.**

UNIT II **[08 Hours]**

Applications of diode:

Introduction to rectifiers, types of rectifiers: HWR and center tap and Bridge FWR (working principle, waveform and analysis). Rectifiers with filters: Capacitor, Inductor and π-type, Zener diode as regulator. Wave shaping circuits: Clippers and Clampers.

UNIT III **[08 Hours]**

Bipolar Junction Transistors:

Construction and Types of BJT, Biasing of BJT, BJT Configurations, V-I characteristics, Stability Factor, Compensation Techniques of BJT, Thermal Runaway, Transistor as an amplifier.

UNIT IV **[07 Hours]**

Unipolar Transistors:

Construction & working of JFET, JFET parameters, V-I characteristics, MOSFET (Enhancement-type & Depletion-type), V-I characteristics, UJT as relaxation oscillator. Introduction to CMOS Technology.

UNIT V **[08 Hours]**

Feedback Amplifiers:

Classification of Amplifiers, Concept of feedback, Transfer ratio or Gain, Negative feedback: Voltage Series, Current Series, Current Shunt, Voltage Shunt Feedback.

Large Signal Amplifiers: Introduction, features, classification, Concept of Quiescent Point. Class A, Class B, Class C, Class AB Amplifiers. Cross Over Distortion, Concept of Push Pull Amplifiers.

UNIT VI **[07 Hours]**

Oscillators:

Basic theory of oscillator and Barkhausen's criteria, classification of oscillator based on circuit components. RC phase shift oscillator, Wein bridge oscillator, LC oscillators, Hartley and Colpitts oscillator.

Suggested Self Readings:

Text Books

1. J. Millman and Halkias : " Electronic Devices and Circuits" , TMH Publications
2. Salivahanan, Suresh Kumar, Vallavaraj: "Electronic devices and circuits", TMH Publications.
3. G. Streetman, and S. K. Banerjee, "Solid State Electronic Devices" , 7th edition, Pearson,2014.
4. Thomas L.Floyd, "Electronic Devices Electron Flow Version" 9th edition, Prentice Hall, 2012.

Reference Books

1. S. M. Sze and K. N. Kwok, "Physics of Semiconductor Devices," 3rd edition, John Wiley & Sons, 2006.
2. C.T. Sah, "Fundamentals of solid state electronics," World Scientific Publishing Co. Inc, 1991.
3. Y. Tsividis and M. Colin, "Operation and Modeling of the MOS Transistor," Oxford Univ.Press, 2011.
4. Boylestad & Nashelsky : "Electronic Devices & Circuit Theory" , PHI publications.

Third Semester

Course Title: Electronic Devices and Circuits Lab

Course Code: 24UEC301P **Course Category: PCC**

Teaching Scheme: L – T – P **Total Credits:** 01

0 – 0 – 2

Scheme of Examination: ESE:25 Marks, **CE:** 25 Marks

Course Objectives:

2. Explain the basic concepts of different semiconductor components.
3. Plot and study the characteristics of semiconductor devices.
4. Calculate different performance parameters of transistors.
5. Use semiconductor devices in different electronic circuits and analyze it.

Course Outcomes:

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

CO1: Design circuits using various Semiconductor diodes and plot their characteristics.

CO2: Plot and analyze the characteristics of Bipolar and unipolar Transistors.

CO3:Apply the concept of positive feedback to design different types of oscillator.

List of Experiments

1. Familiarization with the Electronic Instruments like function generator, CRO, DC power Supply.
   a) Use of multimeter as voltmeter, ammeter, Ohmmeter, continuity meter.
   b) Measurement of voltage and frequency with CRO and DSO, saving and accessing waveform on DSO.
2. Design a) A forward bias circuit and b)Reverse bias circuit of a diode.
   Plot its characteristics and calculate its parameters.
3. Design diode positive and negative. Use suitablefrequency and plot waveforms.
4. To design zener diode as voltage regulator.
5. To determine the operating voltages of different colors of LEDs and measure minimum current and forward bias voltages across them.
6. Design a Half-wave rectifier circuits and plot its waveform.
7. Design a Full-wave rectifier circuits and plot its waveform.
8. To plot input and output characteristic of (BJT) transistor in CE configuration.
9. To plot input and output characteristic of (BJT) transistor in CB configuration.
10. To study the concept of phase shift on CRO / DSO and measure phase shift in degrees/ radians.
11. To design RC/ LC Oscillator.
12. To design transistor as an audio amplifier, Measure its efficiency.
13. One mini project using transistor, MOSFET and general electronic components.

Third Semester

Course Title: Data Structures

Course Code: 24UEC302T **Course Category: PCC**

Teaching Scheme: L – T – P **Total Credits: 02**

2– 0 – 0

Scheme of Examination: ESE:30 Marks, **CE:** 20 Marks

Course Objectives:

This course will enable students to

1. Implement Object Oriented Programming concepts in Python.
2. Understand Lists, Dictionaries and Regular expressions in Python.
3. Understanding how searching and sorting is performed in Python.
4. Understanding how linear and non-linear data structures works.
5. To learn the fundamentals of writing Python scripts.

Course Outcomes:

The students should be able to:

CO1: Examine Python syntax and semantics and apply Python flow control andfunctions.

CO2:Create, run and manipulate Python Programs using core data structures likeLists

CO3:Apply Dictionaries and use Regular Expressions.

CO4:Interpret the concepts of Object-Oriented Programming as used in Python.

Course Content:

UNIT I [07 Hours]

OOPS Concepts: class, object, constructors, types of variables, types of methods.Inheritance: single, multiple, multi-level, Polymorphism: with functions and objects, with class methods, with inheritance,Abstraction: abstract classes.

UNIT II [08 Hours]

Data Structures and Arrays:

Data Structures: Definition, Linear Data Structures, Non-Linear Data Structures Python Specific List, Tuples, Set, Dictionaries, Comprehensions and its Types, Strings, slicing. Arrays - Overview, Types of Arrays, Operations on Arrays, Arrays vs List.Searching and sorting.

UNIT III [07 Hours]

Linked List and Queues:

Linked Lists – Implementation of Singly Linked Lists, Doubly Linked Lists, Circular Linked Lists. Stacks - Overview of Stack, Implementation of Stack (List & Linked list), Queues: Overview of Queue, Implementation of Queue (List & Linked list)

UNIT IV [08 Hours]

Graphs:

Introduction, Directed vs Undirected Graphs, Weighted vs Unweighted Graphs, Representations, Breadth First Search, Depth First Search. Trees - Overview of Trees, Tree Terminology, Binary Trees: Introduction, Implementation, Applications. Tree Traversals, Binary Search Trees: Introduction, Implementation, AVL Trees: Introduction, Rotations, Implementation.

Suggested Self Readings:

Text Books

1. Michael T. Goodrich , Data structures and algorithms in python
2. Narasimha Karumanchi, Data Structures and Algorithmic Thinking with Python

Reference Books

1. Dr Basant Agarwal, Benjamin Baka, Hands-On Data Structures and Algorithms with Python: Write complex and powerful code using the latest features of Python 3.7, 2nd Edition
2. Kent D. Lee and Steve Hubbard, Data Structures and Algorithms with Python
3. Bradley N Miller and David L. Ranum, Problem Solving with Algorithms and Data tructures Using Python
4. R. Nageswara Rao , Core Python Programming -Second Edition, , Dreamtech Press

Third Semester

Course Title: Data Structures

Course Code: 24UEC302P **Course Category: PCC**

Teaching Scheme: L – T – P **Total Credits: 01**

0– 0 – 2

Scheme of Examination: ESE:25 Marks, **CE:** 25 Marks

List of Experiments

1. Write a Python program for class that has three instance variables of type str, int, and float.
2. Write a Python programme for inheritance Hierarchy based on Polygon class having abstract methods area( ) and perimeter( ).
3. Write a python program to implement Method Overloading and Method Overriding.
5. Write a Python program to generate the combinations of n distinct objects taken from the elements of a given list.
6. Write a program for Linear Search and Binary search.
7. Write a program to implement Bubble Sort and Selection Sort.
8. Write a program to implement Stacks and Queues.
9. Write a program to implement Singly Linked List.
10. Write a program to implement Doubly Linked list.
11. Write a program to implement Binary Search Tree.
12. Write a program to convert infix to post fix notation.
13. Write a program to illustrate tree traversals a)In order b)Preorder c)Post order.

Third Semester

Course Title: Network Theory & Analysis

Course Code : **24UEC303T** **Course Category: PCC**

Teaching Scheme:L– T– P **Total Credits: 03**

3- 0- 0

Scheme of Examination: ESE: 60 Marks, **CE:** 40 Marks

Prerequisites : : Linear algebra, vector analysis, matrix analysis and complexcalculus.

Course Objectives: The objective of this course is to provide students withunderstanding of

1. To make the students capable of analyzing any given electrical network.
2. Various methods of analysis of electric networks under transient and steady state conditions.
3. To make the students learn how to synthesize an electrical network from a given impedance /admittance function.

Course Outcomes:

At the end of this course students will be able to :

CO1:Apply Mesh analysis method to analyze electrical circuits.

CO2:Apply Nodal analysis method to analyze electrical circuits.

CO3:Apply network theorems for the analysis of networks.

CO4:Evaluate Transient Analysis of R-L-C- networks

CO5:Apply Laplace transforms to analyze networks and Synthesize waveforms

CO6: Evaluate two port network paramenters

Course Content:

UNIT I **[07 Hours]**

Mesh Anaysis :

Network Components and its types, Ohm's Law, Voltage Source, Current sources, Source transformation and Network Reduction, Mesh Analysis for complicated network containing independent sources and reactances, Super Mesh analysis.

UNIT II **[07 Hours]**

Node Analysis:

Nodal Analysis for complicated network containing independent sources and reactances. Super Node analysis, Duality.

UNIT III **[08 Hours]**

Network Theorems:

Superposition Theorem, Thevenin's Theorem, Norton's Theorem and Maximum Power Transfer Theorem and Reciprocity Theorem as applied to ac-dc circuits.

UNIT IV **[07Hours]**

Transient Analysis:

Initial Conditions, Final Conditions, Steps for finding Initial Conditions and Final Conditions, Transient response of electrical networks such as R-L, R-C to standard inputs and evaluation of initial and final conditions.

UNIT V [08 Hours]

Application of Laplace Transform:

Laplace Transform Formulae & Properties, Laplace Transform of Basic R, L and C components, Analysis of electrical circuits using Laplace transform for standard inputs, Synthesis of Few typical waveforms & their Laplace Transform

UNIT VI [08 Hours]

Two Port Network Parameters:

Z Parameter, Y Parameter, Hybrid Parameter, ABCD Parameter, Reciprocity and Symmetry Conditions, Analytical treatment of all Parameters.

Suggested Self Readings:

Sr.No	Text Books

1. Van Valkenburg, "Network Analysis", Third Edition, 2009, Prentice Hall of India
2. Sudhakar A. Shyammohan, "Circuits and Networks", Third Edition, 2006, Tata McGraw-Hill.
3. D. Roy Choudhary, "Networks and Systems", New Age Internationa Publishers, 2nd Edition, 2012

Reference Books

1. K. V. V. Murthy and M. S. Kamath, "Basic Circuit Analysis", Jaico Publishers1999
2. K. Sureshkumar, "Electric Circuits & Network", Pearson Publication
3. W. H. Hayt and J. E. Kemmerly, "Engineering Circuit Analysis", McGraw HilEducation, 2013.
4. Network analysis : G.K. Mittal, Khanna Publications.

Third Semester

Course Title: Electronics Workshop - I

Course Code : **24UEC304P** **Course Category: PCC**

Teaching Scheme: L – T – P **Total Credits: 01**

0 – 0 – 2

Scheme of Examination: ESE: 25 Marks, **CE:** 25 Marks

Course Objectives:

The objective of this course is to provide students with understanding of

1. To learn basic concepts, of all active, passive components and different types of Electronic components used in DC circuits, AC circuits
2. To learn basics of Semiconductor devices, Power supply, Bipolar and Field effect transistors.
3. Learn to use the simulation software tools for the analysis of Electrical and Electronic Circuits.

Course Outcomes:

At the end of this course students will be able to :

CO1:Identify & perform testing of different Electronic Components &Semiconductor devices.

CO2:Design printed circuit board.

CO3:Perform simulation of circuit using software.

Any 8 experiments from the list given below be performed including one mandatory mini project.

List of Experiments

1. Identification & Testing of different types of Voltage Sources (Battery, Solar Cell, AC Source) using Digital Multimeter.
2. Identification & Testing of different types of Resistors.
3. Identification & Testing of different types of Inductors & Capacitors.
4. Identification & Testing of different types of Diodes (Rectifier, Zener &LED).
5. Identification & Testing of different types of Transistors (BJT, FET).
6. Identification & Testing of different types of Transformers.
7. Identification & Analysis of different types of Relays.
8. Identification & Analysis of different types of Sensors.
9. Identification & Analysis of different types of Motors (DC, Stepper & Servo)
10. Design Procedure of a Single Sided PC Boards.
11. Design of a Single Sided PCB Layout using Software.
12. Use of a DSO/CRO for any simple Circuit analysis.
13. Mini-Project.

Sr.No	Reference Book

1. James M. Kirkpatrick, "Electronic Drafting and Printed Circuit Board Design", Galgotia Publications Pvt. Ltd

Third Semester

Course Title: Software Simulation Lab

Course Code: **24UEC305P** **Course Category: PCC**

Teaching Scheme: L – T – P **Total Credits: 01**

0 – 0 – 2

Scheme of Examination: **ESE:** 25 Marks **CE:** 25 Marks

Prerequisites: Basic knowledge of Electronic Circuits

Course Objectives:

1. Students become able to formulate and solve engineering problems in electric and electronic circuits using MATLAB and LTspice/pSpice.
2. Learn to insert simple instructions to MATLAB, to find the solution of amathematical and electronic system
3. Learn to use the LTspice/pSpice simulation software tool for the analysis of Electrical and Electronic Circuits.

Course Outcomes:

At the end of this course students will be able to:

CO1: Write a MATLAB / Scilab program for the given problem.

CO2: Interpret mathematical analysis of the given problem and plot various functions.

CO3: Examine electronic circuits using LTspice/pSpice Software.

Course Contents:

Any 10 Practicals are to be performed including mini project from the list given below.

Sr.No	List of Experiments
1.	Introduction to MATLAB/ Scilab Environment
2.	Perform simple mathematical operations using MATLAB/ Scilab.
3.	Perform simple matrix and array manipulations using MATLAB/Scilab.
4.	Generate and plot various discrete and continuous signals using MATLAB/Scilab.
5.	Calculate different types of performance measures using MATLAB/Scilab.
6.	Introduction to LTspice/pSpice Environment.
7.	DC Analysis of Thevenin's theorem.

8. DC Analysis of Rectifier circuit (Half/Full).
9. Design and simulation of any R-L-C circuit using LTspice/pSpice.
10. Design and simulation of class C amplifier using LTspice/pSpice.
11. Design and simulation of class A amplifier using LTspice/pSpice.
12. Design and simulation of class B amplifier using LTspice/pSpice.
13. Design and simulation of class AB amplifier using LTspice/pSpice.
14. Transient analysis of Transistorized Amplifier circuit.
15. Mini Project using MATLAB/ Scilab/ LTspice/pSpice.

Suggested Self Readings:

Sr.No	Reference Books

1. Stephen Chapman: "Matlab programming for Engineers" Thomson Learning Publication
2. Amit Kumar Singh: "Electronic Circuit SPICE Simulation withLTspice", Kindle Edition
3. Muhammad Rashid: "Introduction to PSpice Using OrCAD for Circuits and Electronics"' PHI Publications

Third Semester

Course Title: Consumer Electronics

Course Code: 24UOE339T **Course Category: OE**

Teaching Scheme: L – T – P **Total Credits: 03**

3 – 0 – 0

Scheme of Examination: ESE:60 Mks, **CE:** 40 Mks

Course Objectives:

1. To give students an in depth knowledge of various electronic consumer Electronics gadgets,
2. To study various audio and video devices and systems
3. Further this subject will introduce the students with working principles, block diagram, main features of consumer electronics gadgets/goods/devices.

Course Outcomes:

At the end of the course the students shall be able to:

1. Explain various audio gadgets used in domestic and commercial applications.
2. Explain various video gadgets used in domestic applications.
3. Explain various video gadgets used in Commercial applications.
4. Explain satellite communication technology along with DTH for day to day applications.
5. Describe various types of home appliances used in domestic life like washing machine, oven RO plant, Mixer, grinder, vaccume cleaner etc.
6. Explain various types of home appliances used in domestic life like printers, food processors, Induction devices, scanner and fax machines etc.

Course Contents:

UNIT I [07 Hours]

Audio Systems:

Audio amplifier, microphone, loudspeaker, Public address systems, What is DJ, Audio as Data and Signal, Digital Audio Processes Outlined, Time Compression and Expansion. block diagram of home theatre & working.

UNIT II [07 Hours]

Video Systems: Part I:

Elements of TV communication system, Scanning and its need, Difference betweena conventional CTV with LCD & LED TVs. Principle of LCD and LED TV and function of its different section. Basic principle and working of 3D TV. IPS panels and their features. Different types of interfaces like HDMI, USB, RGB etc. TV Remote Control– Types, parts and functions, IR Code transmitter and IR Code receiver. Working principle, operation of remote control. Different adjustments, general faults in remote control.

UNIT III [07 Hours]

Video Systems: Part II

Projectors: - Differentiate LCD and LED projectors. Specifications of LED Projector Working principle of LED Projector. Most frequently occurring faults in a LED

projector and Cameras: - Types of cameras and their specifications used in CCTV systems. CCTV setup and its components Working of Digital Video Recorders and types of DVRs.

UNIT IV [08 Hours]

Satellite Communication and Technology:

Basic satellite communication, Merits& Demerits of satellite communication, applications, types of satellite & its orbits, Satellite Frequency Bands. Basic components of DTH system: MODEM, PDA, LNBC, Satellite receiver terminal, dish installation aspects, Azimuth & elevation settings of dish/ DTH receiver. Types of cables used in DTH system, set top box features, block diagram of set top box.

UNIT V [07 Hours]

Introduction to different type of domestic/commercial appliances Part I:

Washing M/c: different types of machines, washing techniques, basic working principle of manual, semi- automatic and fully automatic machines, study the working of motors, different types of timers, power supply circuits. Vacuum cleaner working principle, Various parts & functions of Mixer/Grinder, speed control circuit & auto overload protector.

UNIT VI [08 Hours]

Introduction to different type of domestic/commercial appliances Part II:

Operation of Micro-wave oven: Different types of ovens, study the various functions of Oven, Block diagram of microwave oven, Electrical wiring diagram of microwave oven, Microwave generation system-circuit.

Printers: - Printer & its types, principle, parts, working of dot matrix, inkjet & Laser printer, Advantages, disadvantages of each, comparison between impact &non- impact printers & cables used to connect the various printers to computer.

Digital Electronic Lock, Copier, Scanner, fax machine.

Suggested Self Readings:

Sr.No	Text Books
1.	Consumer Electronics 1 Edition (English, Paperback, Bali S. P.)
2.	Consumer Electronics (English, Paperback, Gupta B R)
3.	Consumer Electronics – A Conceptual Approach" by Dr J S CHITODE
4.	A Beginners Guide to Consumer Electronics Repair: Hand Book and Tutorial" by Douglas Kinney
5.	"Troubleshooting Consumer Electronics Audio Circuits" by H Davidson
6.	Consumer Electronics 1 Edition (English, Paperback, Bali S. P.)
7.	Consumer Electronics (English, Paperback, Gupta B R)

Third Semester

Course Title: Industrial Electronics

Course Code: 24UOE340T **Course Category: OE**

Teaching Scheme: L – T – P **Total Credits: 03**

3 – 0 – 0

Scheme of Examination: ESE:60 Marks, **CE:** 40 Marks

Prerequisites : Basics of Electrical and ElectronicsEngineering.

Course Objectives:

1.To give students an in depth knowledge of various electronic consumer Electronics gadgets.
2.To study various audio and video devices and systems.
3.Further this subject will introduce the students with working principles, block diagram, main features of consumer electronics gadgets/goods/devices.

Course Outcomes:

At the end of the course the students shall be able to:

1. Explain fundamental physical and technical base of Electromechanical sensors.
2. Describe basic laws and phenomena that define behavior of sensors.
3. Explain Anlog process control devices .
4. Create analytical design and development solutions for sensors and actuators.
5. Describe fundamentals of PLC and Scada.
6. Describe application and development of sensors used with PLC.

Course Content:

UNIT I **[08 Hours]**

Electronic and Electromechanical Sensors:

Mechanical and Electrical Switch Classifications, Mutually and mechanically activated Electronic Circuit Switches, Discrete Output Devices, Discrete Automation, Electronic Sensors: Non-contact Sensors, Sensor Output Interfaces, Sensor Applications and Selection, Integrating Sensors into Power and Control Circuits, Position, displacement, velocity, acceleration, force, flow,level temperature, humidity, Thermocouples, RTD, LVDT, strain gauges.

UNIT II **[08 Hours]**

Smart Sensors:

Accelerometers, Force Sensors, Load Cells, Torque Sensors, Pressure Sensors, Microphones, Impact Hammers, MEMS Sensors, Sensor Arrays. Smart Transducers, Ultrasonic Transducers, Sonic Transducers.

UNIT III **[07 Hours]**

Actuators:

Smart Actuators: Displacement Actuators; Force Actuators; Power Actuators; Vibration Dampers; Shakers; Fluidic Pumps; Motors, Solenoid valves, Hydraulic systems, Pneumatic Systems, DC and AC stepper motors, Dosing equipment weigh feeders, dosing pumps, extrusion – bulk and film electronic components.

UNIT IV **[07 Hours]**

Analog Process Control Devices and safety:

Process Actuators and Output Devices, Control Valves, Electrical Heating Elements, Control Sensors, Transmitters, and Transducers, Temperature Sensors, Pressure Sensors, Flow Sensors, Level Sensors, Position Sensors, Presence Sensors, Interlock Devices.

UNIT V [08 Hours]

Programmable Logic Controllers (PLCs) SCADA (Supervisory Control and Data Acquisition System): Part I

Functions of PLC, Architecture, Selection of PLC, Networking of PLCs, Ladder Programming, Interfacing Input and Output devices with PLC, PLC based automated systems. SCADA Elements, Features, Applications, Communications, Introduction to DCS.

UNIT VI [07 Hours]

Programmable Logic Controllers (PLCs) SCADA (Supervisory Control and Data Acquisition System) : Part II

Rotory encoders, digipots.0-10V and 4-20mA systems, used in PLCs for analog input and output signals, Automation: Transfer machines, robotics basics, Application of PLCs,Industrial heating.

Suggested Self Readings:

Sr.No. Text Books

1. Madhuchhanda Mitra, Programmable Logic controllers and Industrial Automation.
2. S. K. Bhattacharya and S. Chatterjee, "Industrial Electronics &Control", TataMcGraw Hill, 2003.
3. Terry. L. M. Bartell, "Industrial Electronics", Delmer Publishers, 1997.
4. Samarjit Sen Gupta, Penram International Publishing India Pvt. Ltd.

Sr.No. Reference Books/Links

1. John W. Webb, Ronold A Reis, Programmable Logic Controllers, Principles and Applications: 5th Edition, Prentice Hall of India Pvt. Ltd
2. Stuart A. Boyer, SCADA supervisory control and data acquisition, ISAPublication.
3. Curtis Johnson, Process Control Instrumentation Technology: 8th Edition Pearson Education

Third Semester

Course Title: Sensors and Systems

Course Code: 24UOE341T **Course Category:OE**

Teaching Scheme: L – T – P **Total Credits: 03**

3 – 0 – 0

Scheme of Examination: ESE:60 Marks, **CE:** 40 Marks

Course Objectives:

1. To understand basic working principle of various types of sensors.
2. To understand the sensors used in automobile applications.
3. To understand the sensors used in industries
4. To understand the various sensors used in IoT smart city project.
5. To illustrate various actuators and motors used in robotics field.

Course Outcomes:

At the end of the course, students will be able to:

CO1: Explain fundamental physical and technical base of sensors and actuators.

CO2: Describe basic laws and phenomena that define behavior of sensors and actuators.

CO3: Analyze various approaches, procedures and results related to sensors and actuators.

CO4: Create analytical design and development solutions for sensors and actuators.

CO5: Interpret the acquired data and measured results.

CO6: Describe application and development of sensors and actuators

Course Content:

UNIT I [07 Hours]

Basics of Sensors:

Sensors / Transducers: Principles, Classification, Parameters, Characteristics, Environmental Parameters (EP), Characterization, Design procedure while choosing the sensors for various application. Types of sensors: Inductive, capacitive and resistive sensors.

UNIT II [08 Hours]

Sensors used in Automobile Industries:

Camshaft Position Sensor ,Throttle Position Sensor ,Vehicle Speed Sensor, Voltage sensor, Fuel Temperature Sensor, Manifold Absolute Pressure (MAF) Sensor, Coolant Sensor, Spark Knock Sensor, Oxygen Sensor, Engine Speed Sensor, Mass airflow sensor. Selection of appropriate model & types of sensors, their Interfacing with microcontroller.

UNIT III [08 Hours]

Sensors used in Automation Industries:

Rotary transformer, torque transducer, passive seed sensors, smart position sensor, non-contact hall effect rotary position sensors, current and voltage sensors, hot metal detector, proximity and

displacement sensor. Selection of appropriate model & types of sensors. their calibration, characterization.

UNIT IV [08 Hours]

Sensors used in IoT Smart City Applications:

Temperature Sensor, Pressure Sensor, Accelerometer and Gyroscope Sensor, IR Sensor, Optical Sensor,Gas Sensor, Smoke Sensor, rain sensor, motion sensor, RFID. Selection ofappropriate model & types of sensors Case Study: Designing sensors interface for :

1. Smart traffic light system.
2. Waste management system.

UNIT V [07 Hours]

Actuators and motors used in Robotics:Part I

Pneumatic and Hydraulic Actuation Systems- Actuation systems, Pneumatic and hydraulic systems, Directional Control valves, Pressure control valves, Cylinders, Servo and proportional control valves, Process control valves, Rotary actuators.

UNIT VI [07 Hours]

Actuators and motors used in Robotics: Part II

Mechanical Actuation Systems Types of motion, Kinematic chains, Cams, Gears, Ratchet and pawl, Belt and chain drives, Bearings, Mechanical aspects of motor selection, Electrical Actuation Systems, Electrical systems, Mechanical switches, Solid-state switches, Solenoids, D.C. Motors, A.C. Motors, Stepper motors.

Suggested Self Readings:

Text Books

1. Stefan Johann Rupitsch, Jacob Fraden, Sensors and Signal Conditioning Wiley-Blackwell, 2008 Handbook of modern sensors, Springer,.
2. Senturia S. D., Piezoelectric Sensors and Actuators: Fundamentals and Applications, Springer, 2018

Reference Books/Links

1. W. Bolton, "Mechatronics", Pearson Education Limited.
2. Jacob Fraden , Stefan Johann Rupitsch; Sensors and Signal Conditioning Wiley-Blackwell, 2008,Handbook of modern sensors, Springer,
3. Senturia S. D.; Piezoelectric Sensors and Actuators: Fundamentals and Applications, Springer, 2018
4. D. Patranabis, "Sensors and Transducers", PHI Learning PrivateLimited.
5. W. Bolton, "Mechatronics", Pearson Education Limited

Third Semester

Course Title: Universal Human Values

Course Code: 24UBS307T **Course Category: VEC**

Teaching Scheme: L – T – P **Total Credits: 2**

2 – 0 – 0

Scheme of Examination : ESE:30 Marks **CE:** 20 Marks

Prerequisites: Basic knowledge of ethical educationand human values.

Course Objectives:

To help students to see the need for developing a holistic perspective of life and strengthen self-reflection by sensitizing them about self, family, society and nature/existence.

Course Outcomes: After completion of this course, students will be able to:

CO1: Analyze the essentials of value education and self-exploration.

CO2: Evaluate coexistence of the self with the body.

CO3: Develop sustained happiness through identifying the essentials of humanvalues.

CO4: Identify the importance of harmony in family, society and universal order.

Course Content:

UNIT IV [08 Hours]

Value education:

Definition, need for value education. The content and the process of value education, basic guidelines for value education, self- exploration as a means of value education.

UNIT II [07 Hours]

Concept of Swasthya and Sanyam :

Harmony of self with body, coexistence of self and body,understanding the needs of self and the body, understanding the activities in the self and in the body.

UNIT III [08 Hours]

Values in relationship:

Trust, respect, affection, care, guidance, reverence, glory, gratitude and love, the five dimensions of human endeavour – Siksha, Swasthya, Nyay, Utpadan and Vinimaya.

UNIT IV [06 Hours]

Basics for ethical human conduct:

Definitiveness in ethical human conduct, human rights violations and social disparities, concept of value-based life and its importance.

Suggested Self Readings:

Text Books

1. A Foundation Course in Human Values and Professional Ethics, R.R. Gaur,
2. R Asthana, G.P. Bagaria, 2nd Revised Edition, Excel Books, New Delhi,2019
3. Professional Ethics and Human Values, Premvir Kapoor,Khanna Book Publishing, New Delhi, 2019.
4. Universal Human Values And Professional Ethics By Dr. Ritu Soryan, S.K.Katraia & Sons Publishing, 2022.
5. Human Values & Professional Ethics by Dr.Gurudas Singh, Bhavya Books,3rd Edition 2002.

Third Semester

Course Title : Probability Theory and Stochastic Processes

Course Code : 24UBS309T **Course Category:MDM**

Teaching Scheme: L – T- P

2 – 0 – 0 **Total Course Credit : 02**

Scheme of Examination : ESE:30 Marks **CE:** 20 Marks

Prerequisites : Knowledge of Limits, Differential Calculus.

Course Objective:

1. To introduce concepts of probability, standard distribution and its applications.
2. To equip the students to analyze random signals & Processes.

Course Outcome:

At the end of this course students will demonstrate the ability to

CO1: Apply advanced probability tools to solve real world problems.

CO2: Relate behaviour of two random signals using joint distribuions.

CO3: Analyse the nature of signals using Expectation and variance.

CO4: Examine noise in signals using Stochastic Processes.

Course Content:

UNIT I [08 Hours]

Introduction to Probability:

Introduction to Probability, events, Axioms of probability, Baye's Theorem and application, Functions of Random Variables, Introduction and Definition of Continuous and Discrete Random Variables, Probability/ Cumulative distribution functions, Probability Density Functions.

UNIT II [07 Hours]

Joint Probability Distributions :

Joint Distributions of discrete and continuous random variables, Conditional Distribution.

UNIT III [07 Hours]

Mathematical Expectation:

Mathematical expectation, Variance and Standard deviation, Moments, Moment generating function, Characteristic functions of random varialbes, skewness and kurtosis, Conditional Expectations.

UNIT IV [08 Hours]

Special Probability Distribution & Stochastic Processes:

Binomial distribution, Poisson distribution, Normal distribution, Stochastic Processes: Definition,

classification. Stationary processes, Mean and Covariance function, Noises in communication system.

Suggested Self Readings:

Text Books

1. B. S. Grewal ; Higher Engineering Mathematics (Khanna Publications),
2. Erwin Kreyszig ; Advanced Engineering Mathematics (Wiley),
3. H. K. Dass ; Advanced Engineering Mathematics (S. Chand),
4. Murray Spiegel, John Schiller, R. A. Srinivasan; Probability and Statistics (Schaum's Outline Series)
5. Papourlis and S. Unnikrishnan Pillai, Probability, Random Variables and Stochastic Processes, Fourth Edition, McGraw Hill

Third Semester

Course Title: Field Project/Community Engagement Project

Course Code: 24UEC310P **Course Category: ELC**

Teaching Scheme: L – T – P **Total Credits: 02**

0 – 0 – 4

Scheme of Examination : ESE:25 Marks **CE:** 25 Marks

Course objectives:

The objectives of field project for engineering students typically encompasses several key goals:

1. **Practical Application of Theory**: To apply theoretical knowledge gained in the classroom to real-world scenarios, bridging the gap between academic concepts and practical implementation.
2. **Problem-Solving Skills**: To develop and enhance problem-solving abilities by working on complex, real-life engineering problems that require innovative and effective solutions.
3. **Technical Skills Development**: To gain hands-on experience with tools, technologies, and methodologies relevant to their field of study, such as software, equipment, and engineering processes.
4. **Research and Analytical Skills**: To conduct research, collect data, analyze findings, and draw conclusions, thereby honing their analytical and critical thinking skills.
5. **Teamwork and Collaboration**: To work effectively as part of a team, fostering collaboration, communication, and project management skills. This often involves working with peers, faculty, and industry professionals.
6. **Project Management**: To learn how to plan, execute, monitor, and complete a project within set deadlines and budget constraints, developing time management and organizational skills.
7. **Professional Development**: To gain exposure to the professional work environment, understand workplace dynamics, and build a network of professional contacts.
8. **Ethical and Social Responsibility**: To understand and address ethical considerations and the social impact of engineering projects, promoting responsible and sustainable engineering practices.
9. **Documentation and Reporting**: To practice documenting project work comprehensively and effectively, including writing reports, preparing presentations, and maintaining project logs.
10. **Innovation and Creativity**: To encourage innovative thinking and creativity in designing and implementing engineering solutions.

Course Outcomes:

At the end of this course :

CO1: Students will be able to work with different engineering tools, technologies, and methodologies, reinforcing their technical skills.

CO2: Students will be able to work on real-world problems enhances their ability to develop and implement effective solutions.

CO3: Students will be able to work in a team & collaboratively with others.

Course Contents:

Perform any two activity by a group of 4 to 5 Students.

List of Field Projects Activities

Low-Cost Medical Monitoring Devices: Affordable devices for monitoring vital signs (like heart rate, temperature, etc.) that can be used in rural healthcare settings.

Solar-Powered Gadgets: Solar-powered chargers or lights to provide renewable energy solutions in areas with unreliable electricity.

Smart Agriculture Systems: Sensors and systems for monitoring soil moisture, temperature, and humidity to optimize agricultural productivity.

Assistive Technology: Devices to assist people with disabilities, such as voice-controlled home automation systems or prosthetic limb controllers.

Water Quality Monitoring Systems: Sensors to monitor water quality parameters like pH, turbidity, and contaminants in local water bodies.

Electronic Waste Management: Solutions for recycling and managing electronic waste, including devices for sorting and processing e-waste materials.

Traffic Management Systems: Smart traffic lights or congestion monitoring systems to optimize traffic flow and reduce congestion.

Educational Electronics Kits: Low-cost educational kits or tools that teach basic electronics concepts to school students or hobbyists.

Community Communication Systems: Systems for emergency communication or local news dissemination in remote or underserved areas.

Smart Home Energy Management: Devices for optimizing home energy usage, such as smart meters or energy-efficient appliances.

Remote Sensing and Environmental Monitoring: Sensors and data logging systems for monitoring environmental parameters like air quality or forest fire risk.

Renewable Energy Projects: Small-scale renewable energy systems like wind turbines or micro-hydro generators for local power generation.

Electronic Voting Systems: Secure and accessible electronic voting systems to improve the efficiency and transparency of elections.

Telemedicine Devices: Telemedicine platforms or devices that enable remote healthcare consultations and diagnostics.

Safety and Security Systems: Surveillance systems or alarms with IoT integration for enhancing community safety and security.

Note : 1) Make survey on any two topic.
2) Prepare report and Present in front of subject expert

Marking Scheme :

Activity 1

Survey	Report	Presentation	Attendance	Total
10	05	05	05	25

Activity 2

Survey	Report	Presentation	Attendance	Total
10	05	05	05	25