## REVISED LIST OF OPEN ELECTIVES

**TO BE OFFERED IN THE EVEN SEMESTER (MIT CAMPUS)**

**R-2019**

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>CONTACT PERIODS</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>DEPARTMENT OF PRODUCTION TECHNOLOGY</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>B.E. Production Engineering</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>PR5691</td>
<td>Reliability Analysis and Maintainability</td>
<td>OE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td>PR5692</td>
<td>Biomimetic Engineering</td>
<td>OE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>B.E. Mechanical Engineering</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>ME5691</td>
<td>Basic Automobile Engineering</td>
<td>OE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td>ME5692</td>
<td>Product Design and Process Development</td>
<td>OE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>DEPARTMENT OF AUTOMOBILE ENGINEERING</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>AU5691</td>
<td>Automotive Power Train System</td>
<td>OE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>6.</td>
<td>AU5692</td>
<td>Two-Wheeler Technology</td>
<td>OE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>DEPARTMENT OF AEROSPACE ENGINEERING</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>AE5691</td>
<td>Control Engineering Principle</td>
<td>OE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>DEPARTMENT OF ELECTRONICS ENGINEERING</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>EI5691</td>
<td>Introduction to Industrial Instrumentation and Control</td>
<td>OE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>9.</td>
<td>EI5692</td>
<td>Introduction to Industrial Data Communication</td>
<td>OE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>DEPARTMENT OF INFORMATION AND COMMUNICATION ENGINEERING</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>IT5695</td>
<td>Basics of Programming and Data Structures</td>
<td>OE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>11.</td>
<td>IT5696</td>
<td>Fundamentals of Information Security</td>
<td>OE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>DEPARTMENT OF ELECTRONICS ENGINEERING</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td>EC5695</td>
<td>Microcontroller Programming for Industrial Applications</td>
<td>OE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>13.</td>
<td>EC5696</td>
<td>Introduction to Communication Systems</td>
<td>OE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Course Code</td>
<td>Course Title</td>
<td>Type</td>
<td>Credits</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------</td>
<td>-------------</td>
<td>---------------------------------------------------</td>
<td>------</td>
<td>---------</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14.</td>
<td>CS5693</td>
<td>Data Structures and Applications</td>
<td>OE</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15.</td>
<td>CS5694</td>
<td>Machine Learning using Python</td>
<td>OE</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16.</td>
<td>RP5691</td>
<td>Polymer Properties</td>
<td>OE</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17.</td>
<td>RP5692</td>
<td>Polymers in Electrical and Electronics Applications</td>
<td>OE</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
OBJECTIVES

- The ability to use statistical tools to characterize the reliability of an item.
- The working knowledge to determine the reliability of a system and suggest approaches to enhancing system reliability.
- The ability to select appropriate reliability validation methods.
- To identify and correct the causes of failures.
- To improve effectiveness and efficiency of maintenance.

UNIT I  RELIABILITY BASICS  

UNIT II  LIFE DATA ANALYSIS  

UNIT III  RELIABILITY EVALUATION  
Reliability of simple systems - Different configurations - Redundancy - m/n system - Complex systems: RBD - Boolean truth table - Cut and tie sets - Fault Tree Analysis - Standby system.

UNIT IV  RELIABILITY TRACKING  
Life testing methods: Failure terminated - Time terminated - Sequential Testing - Reliability growth monitoring - Reliability allocation - Software reliability.

UNIT V  MAINTAINABILITY  
Analysis of downtime - Repair time distribution - System MTTR - Maintainability - Factors affecting maintainability of systems - Design for maintainability - System Availability - Replacement theory.

TOTAL: 45 PERIODS

OUTCOMES:

- Analyse the interference between strength and stress, or life data for estimating reliability;
- Apply the appropriate methodologies and tools for enhancing the inherent and actual reliability of components and systems, taking into consideration cost aspects; specify life test plans for reliability validation

REFERENCES
OBJECTIVES

- To appreciate and follow nature’s design
- To understand living organism body interfaces with surrounding environment
- To learn sensing organs and path navigation in vertebrates
- To understand the working principles of mobility by various living organisms
- To introduce the ways of recreating biomimetic structures

UNIT I OVERVIEW OF BIOMIMETICS

Basic principles, building blocks, material property charts, nature’s designs, examples of successful biomimetic designs.

Mechanical design – hierarchical construction, bio-composites, structure & properties of bamboo, silks, bones, teeth, shells, antlers and beaks, impact resistance, fracture mitigation, damping, self-healing.

UNIT II BIO INSPIRED SURFACES

Biological information, Dealing with friction, Muscles and artificial muscles, lotus effect, gecko adhesion, Desert beetle, pitcher plants, bio-fouling, coating, Silver ant and heat dissipation, insulation of fur and feathers, constructal theory.

UNIT III BIO INSPIRED SENSORS

Biological sensors, Bio-inspired sensors- structural colours, compound eyes, antireflection, stealth, imaging. Navigation – short & long range navigation techniques of bees, ants, turtles - migratory birds

UNIT IV BIO INSPIRED MOBILITY

Mechanical stiffness and motion, Neural control, Robot controllers, Running, Robustness, Crawling – Soft robotics, Gliding and Flapping flight, Hydrostatic stiffness and motion - Swimming-Macroscale walking, Macroscale flying.

UNIT V FABRICATION FOR MICRO/NANO STRUCTURES


OUTCOMES

- To describe the nature’s design in damping, light weight high strength, self-healing etc.
- To elucidate living organism physical interactions with environment
- To relate the modern electronics to natural sensing organs and path navigation in vertebrates
- To explain the conceptual working principles of mobility by various living organisms
- To state the ways of manufacturing biomimetic nano/micro structures

TEXT BOOKS

2. Lakhtakia A, Martin-Palma RJ (eds); Engineered biomimicry; Elsevier, 2013

REFERENCES

COURSE OBJECTIVES:
The main learning objective of this course is to prepare the students for:
1. Classifying the types of chassis and identify different class of automobiles
2. Outline the hybrid vehicle system architecture and their merits and demerits.
3. Illustrating the functions of various transmission systems.
4. Imparting the working of different braking and steering systems.
5. Understanding the working of electrical and electronic components

UNIT I INTRODUCTION
Types of automobiles, vehicle construction and different layouts, chassis, frame and body, Aerodynamic Drag, Specifications, Performance Parameters, Bharat New Vehicle Safety Assessment Program (BNVSAP) – Crash Test norms.

UNIT II HYBRID ELECTRIC VEHICLES
History and need for electric and hybrid vehicles, Concept of hybrid electric drive train, architecture of series and parallel hybrid electric drive train, merits and demerits, mild and full hybrids, plug-in hybrid electric vehicles and range extended hybrid electric vehicles, Fuel cell vehicles, comparison of diesel, petrol, electric and hybrid vehicles based on performance and emissions, limitations of electric vehicles and technical challenges

UNIT III TRANSMISSION SYSTEMS
Clutch-types and construction, gear boxes, manual and automatic, propeller shaft, slip joints, universal joints, Differential, and rear axle.

UNIT IV STEERING, BRAKES AND SUSPENSION SYSTEMS

UNIT V SAFETY AND COMFORT SYSTEMS

COURSE OUTCOMES:
Upon completion of this course, the students will be able to:
1. Distinguish the different types of automobiles and chassis.
2. Interpret the various types of engines and their emission control.
3. Select the appropriate transmission systems.
4. Compare the braking and steering systems.
5. Infer the functions of different electrical and electronic components.

TEXT BOOKS:

REFERENCES:
COURSE OBJECTIVES:
The main learning objective of this course is to prepare the students for:
1. Applying the principles of generic development process; and understanding the organization structure for new product design and development.
2. Identifying opportunity and planning for new product design and development.
3. Conducting customer need analysis; and setting product specification for new product design and development.
4. Generating, selecting, and screening the concepts for new product design and development.
5. Testing and prototyping the concepts to design and develop new products.

UNIT I INTRODUCTION TO PRODUCT DESIGN & DEVELOPMENT

UNIT II OPPORTUNITY IDENTIFICATION & PRODUCT PLANNING

UNIT III IDENTIFYING CUSTOMER NEEDS & PRODUCT SPECIFICATIONS

UNIT IV CONCEPT GENERATION & SELECTION

UNIT V CONCEPT TESTING & PROTOTYPING

COURSE OUTCOMES:
Upon completion of this course, the students will be able to:
1. Apply the principles of generic development process; and understand the organization structure for new product design and development.
2. Identify opportunity and plan for new product design and development.
3. Conduct customer need analysis; and set product specification for new product design and development.
4. Generate, select, and screen the concepts for new product design and development.
5. Test and prototype the concepts to design and develop new products.

TEXT BOOK:

REFERENCES:
OBJECTIVES:
- To introduce the various layout of vehicle chassis, engine types.
- To expose the need, constructional details and working principle of various clutches.
- To envisage the working of manual transmission systems.
- To explicate the operating principle of various automatic transmission systems.
- To relate the importance of driveline components, wheels and tyres.

UNIT I  INTRODUCTION

UNIT II  CLUTCH

UNIT III  GEAR BOX

UNIT IV  AUTOMATIC TRANSMISSION

UNIT V  FINAL DRIVE AND DIFFERENTIAL

TOTAL: 45 PERIODS

OUTCOMES:
On completion of the course the students will,
- Visualize the power flow of various vehicle layouts.
- Understand the working principle the various positive engagement clutches.
- Appraise upon the constructional details and working principle of the manual transmission systems.
- Compare and contrast between various automatic transmission systems.
- Summarize the significant driveline components, wheels and tyres.

TEXT BOOKS

REFERENCES:
OBJECTIVES

- Identify various Engine layout for Two wheeler.
- Evaluate the necessity of Engine subsystems in Two Wheeler.
- Selection of Transmission system for Two wheeler
- Selection of Brakes, Wheels and Tyres for Two wheeler.
- Evaluate the current Two-wheeler technological advancements.

UNIT I  \hspace{1cm} \textbf{POWER PLANT} \hspace{2cm} 9


UNIT II  \hspace{1cm} \textbf{ENGINE SUB – SYSTEMS AND STARTING SYSTEM} \hspace{3cm} 9


UNIT III  \hspace{1cm} \textbf{STRUCTURE AND SUB – SYSTEMS} \hspace{3cm} 9


UNIT IV  \hspace{1cm} \textbf{BRAKES AND WHEELS} \hspace{3cm} 9


UNIT V  \hspace{1cm} \textbf{ELECTRICAL SYSTEM AND RECENT TRENDS} \hspace{3cm} 9


OUTCOMES

On successful completion of this course students will be able to:

- Understand the assembly and layout pattern of Two Wheelers Engine.
- Understand the Ignition system and Fuel system involved in two wheelers.
- Understand the different types of Suspension systems and Transmission systems.
- Understand the working of Brakes, Types of Wheels and Tyres in Two wheelers.
- Understand the basic Auto Electrical systems and recent trends in Two wheeler.

TOTAL: 45 PERIODS

TEXT BOOKS:

4. K. K. Ramalingam, Two Wheelers, Scitech publications, Chennai

REFERENCES:

OBJECTIVES:
• To introduce the mathematical modeling of systems, open loop and closed loop systems and analyses in time domain and frequency domain.
• To impart the knowledge on the concept of stability and various methods to analyze stability in both time and frequency domain.
• To introduce sampled data control system.

UNIT I MATHMATICAL MODELLING
Introduction – transfer function – simple electrical, mechanical, , pneumatic , hydraulic and thermal systems – analogies

UNIT II FEEDBACK CONTROL SYSTEMS
Control system components - Block diagram representation of control systems, Reduction of block diagrams, Signal flow graphs, Output to input ratios

UNIT III TIME DOMAIN ANALYSIS
Response of systems to different inputs viz., Step impulse, pulse, parabolic and sinusoidal inputs, Time response of first and second order systems, steady state errors and error constants of unity feedback circuit.

UNIT IV STABILITY ANALYSIS
Necessary and sufficient conditions, Routh-Hurwitz criteria of stability, Root locus and Bode techniques, Concept and construction, frequency response.

UNIT V STATE SPACE TECHNIQUE
State vectors – state space models -Digital Controllers – design aspects

OUTCOMES:
• Ability to apply mathematical knowledge to model the systems and analyse the frequency domain.
• Ability to check the stability of the both time and frequency domain

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
- To give an adequate knowledge about various techniques used for various parameters of measurement in Industries.
- To provide exposure to four important process variables namely level, pressure, flow and temperature.
- To understand, analyze and design various measurement schemes that meet the desired specifications and requirements of real time processes.
- To acquire knowledge about the principles of conventional continuous controllers namely ON/OFF and PID controller.
- To get an overview of advanced control schemes used for industrial applications.

UNIT I LEVEL AND PRESSURE MEASUREMENT

UNIT II TEMPERATURE MEASUREMENT

UNIT III FLOW MEASUREMENT

UNIT IV PROCESS CONTROL

UNIT V ADVANCED CONTROL SCHEMES
Ratio Control – Feed forward control - Cascade control – Model predictive control – Examples from boiler systems and distillation column.

TOTAL : 45 PERIODS

OUTCOMES:
- Apply the knowledge about the instruments to use them more effectively.
- Ability to select appropriate level and pressure measuring instruments according to the application.
- Ability to design signal conditioning circuits and compensation schemes.
- Able to understand the different conventional control actions, their relative merits, demerits and their typical applications.
- Able to analyze the need for advanced control and methods of implementation of these control techniques.
- Ability to design & implement a suitable control scheme for a given process.

TEXT BOOKS:

REFERENCES:
EI5692 INTRODUCTION TO INDUSTRIAL DATA COMMUNICATION L T P C 3 0 0 3

OBJECTIVES
- To impart the basic concepts of data networks
- To introduce the serial communication interface standards for industrial data networks.
- To familiarize the students with the principles of MODBUS and CANBUS protocols.
- To introduce Foundation Fieldbus and HART Protocols.
- To introduce the principles of Wireless Networks used in Industrial Data Communication

UNIT I DATA NETWORK BASICS 9

UNIT II SERIAL COMMUNICATION STANDARDS 9

UNIT III FUNDAMENTALS OF MODBUS AND CANBUS 9

UNIT IV INTRODUCTION TO FIELDBUS AND HART 9

UNIT V WIRELESS NETWORKS FOR INDUSTRIAL DATA COMMUNICATION 9

TOTAL : 45 PERIODS

OUTCOMES
- Acquire knowledge about basic concepts of data networks
- Gain familiarity with various serial interface standards used in industrial datanetworks.
- Gain knowledge on the principles of MODBUS and CANBUS protocols.
- Get familiarized with Foundation Fieldbus and HART Protocols.
- Gain familiarity with wireless networks for industrial data communication.
- Apply the knowledge of various communication standards for different application and use them more effectively.
TEXT BOOKS

REFERENCES
2 NPTEL Notes on “Fieldbus Networks” and “Computer Networks”, IIT Kharagpur.

MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

<table>
<thead>
<tr>
<th>PO,PSO</th>
<th>PO 01</th>
<th>PO 02</th>
<th>PO 03</th>
<th>PO 04</th>
<th>PO 05</th>
<th>PO 06</th>
<th>PO 07</th>
<th>PO 08</th>
<th>PO 09</th>
<th>PO 10</th>
<th>PO 11</th>
<th>PO 12</th>
<th>PSO 1</th>
<th>PSO 2</th>
<th>PSO 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>COOE2.1</td>
<td></td>
<td></td>
<td>S</td>
<td>S</td>
<td>S</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COOE2.2</td>
<td></td>
<td></td>
<td>S</td>
<td>S</td>
<td>S</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COOE2.3</td>
<td></td>
<td></td>
<td>S</td>
<td>S</td>
<td>S</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COOE2.4</td>
<td></td>
<td></td>
<td>S</td>
<td>S</td>
<td>S</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COOE2.5</td>
<td></td>
<td></td>
<td>S</td>
<td>S</td>
<td>S</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COOE2.6</td>
<td></td>
<td></td>
<td>S</td>
<td>S</td>
<td>S</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

IT5695 BASICS OF PROGRAMMING AND DATA STRUCTURES

OBJECTIVES:
- To introduce the basics of C programming language.
- To learn the concepts of structures and pointers.
- To learn the concepts of Abstract Data Types.
- To understand the concepts of linear data structure like list, stack and queue.
- To understand the concepts of non-linear data structures.

UNIT I C PROGRAMMING FUNDAMENTALS

UNIT II C PROGRAMMING - ADVANCED FEATURES
Structures – Union – Enumerated Data Types – Pointers - Variation in pointer declarations - Pointers to Variables and Arrays – Dynamic memory allocation – Preprocessor Directives.

UNIT III LINEAR DATA STRUCTURES
Abstract Data Types (ADTs) – List ADT – Array-Based Implementation – Linked list based implementation – Doubly-Linked Lists – Circular Linked lists.

UNIT IV STACKS AND QUEUES
UNIT V NON-LINEAR DATA STRUCTURES


TOTAL: 45 PERIODS

OUTCOMES:
On completion of the course, the students will be able to:
- Develop C programs for any real world/technical application.
- Apply advanced features of C in solving problems.
- Write functions to implement linear and non–linear data structure operations.
- Suggest and use appropriate linear/non–linear data structure operations for solving a given problem.
- Appropriately use stack and queue data structure for a given application.

TEXT BOOKS:

REFERENCES:

IT5696 FUNDAMENTALS OF INFORMATION SECURITY

OBJECTIVES
- To introduce the need for security in various applications
- To learn the mathematical background of cryptography
- To introduce security services and mechanisms
- To understand secure design and application of security
- To understand and appreciate hardware security

UNIT I INTRODUCTION

UNIT II SECURITY SERVICES AND MECHANISMS
UNIT III HARDWARE SECURITY
 Hardware security: Side Channel Attacks – Fault Attacks – Countermeasures – Introduction to PUFs, Designs of FPGAs, Machine Learning of PUFs – Introduction to Micro-architectural vulnerabilities - Trusted Computing- Intel SGX.

UNIT IV CYBER SECURITY AND APPLICATIONS

UNIT V APPLICATIONS OF SECURITY

OUTCOMES: On completion of the course, the students will be able to:
- Understand the goals, services and mechanisms of security
- Apply the security algorithms to real world applications.
- Design secure systems and applications.
- Identify various vulnerabilities in hardware.
- Knowledge on Cybersecurity and protecting critical infrastructure.

TEXT BOOKS:

EC5695 MICROCONTROLLER PROGRAMMING FOR INDUSTRIAL APPLICATIONS

OBJECTIVES
- To study different microcontroller architectures and interfaces.
- To program the microcontroller for real time applications.
- To architect a microcontroller system for different hardware and software.
- To familiarize the students in Microcontroller.
- To provide strong foundation for designing the real world applications.

UNIT I INTRODUCTION TO 8051 MICRO CONTROLLER
Overview of 8051 Micro Controller, Architecture, I/O ports and Memory Organization, Interrupts, Timer/Counter and Serial Communication.

UNIT II PIC MICROCONTROLLER
PIC microcontroller Architecture - Memory - Parallel ports - Interrupts - Timers/Counters - UART-A/D converter - PWM.
UNIT III  PROGRAMMING WITH C
Introduction to C - Microchip MPLAB IDE - CCS PCM C compiler - Proteus VSM - Microchip PICDEM Mechatronics board.

UNIT IV  HUMAN AND PHYSICAL INTERFACES
Human interface from switches to keypads - LED displays - LCD - interfacing to the physical world - simple sensors: micro switch, Light-dependent resistors, Optical object sensing, opto-sensor applied as a shaft encoder, Ultrasonic object sensor - Actuators: DC and stepper motors - Interfacing to actuators.

UNIT V  APPLICATIONS OF 8051 AND PIC MICROCONTROLLERS
LED Chasing circuit - Four digit LED Display interface, Interrupt driven event counter with 4-digit LED display - Simple Buzzer interface, Speaker interface - Electronic Siren - Interfacing Digital temperature sensor - Analog temperature sensor IC with A/D converter.

OUTCOMES:
At the end of the course, the student will be able to:
- Use 8051 microcontroller suitable for industrial applications.
- Design hardware based on PIC microcontroller.
- Develop C Programs for Microcontroller.
- Provide Human & Physical interface for Microcontrollers.
- Apply Microcontrollers for Real Time Application.

TEXT BOOKS:

REFERENCES:

EC5696  INTRODUCTION TO COMMUNICATION SYSTEMS

OBJECTIVES:
- To introduce the concept of basic Analog and Digital Communication Systems.
- To understand the various modulation techniques for Analog and digital communication Systems.
- To perform a block-diagram design of the transmitter and receiver for a basic Analog and Digital Communications System.
- To identify the performance, in terms of bit error rate, of a Digital Communication System.
- To study the wireless channel and Mobile Communication Systems.

UNIT I  ANALOG COMMUNICATIONS
Basic concepts of Linear Modulation and Demodulation – Modulation Index -Power relation in AM wave- double and single sideband-Generation and Detection of Amplitude Modulation- Hilbert transform-analytic signal.
UNIT II ANGLE MODULATIONS 9
Frequency Modulation-comparison of frequency modulation and amplitude modulation-narrowband and wideband FM- Bessel functions-Carson's rule-bandwidth-Generation and Demodulation of frequency and phase modulation-Phase-locked loops.

UNIT III DIGITAL COMMUNICATIONS 9
Nyquist sampling theorem – Pulse amplitude modulation, Pulse code modulation – quantization noise, delta modulation, DPCM, ADPCM, Multiplexing and Multiple Access Techniques – FDM and FDMA, TDM and TDMA, CDMA.

UNIT IV DIGITAL MODULATION TECHNIQUES 9

UNIT V WIRELESS CHANNEL AND MOBILE COMMUNICATION 9
Overview of wireless systems-capacity of wireless channel- Examples of Wireless Communication Systems- Paging system, Cordless telephones systems, Cellular telephone Systems- Cellular concept- Large and small Scale Fading.

TOTAL: 45 PERIODS

OUTCOMES:
- Understand the basic concepts of Analog Communication Systems.
- Use of Angle Modulation techniques for Analog Communication.
- Identify and describe different techniques in modern Digital Communications.
- Explore various Digital Modulation Techniques.
- Analyse the performance of wireless channels for Mobile Communication.

TEXT BOOKS:

REFERENCES:
CS5693 DATA STRUCTURES AND APPLICATIONS

OBJECTIVES
- To understand arrays and applications such as vectors, matrices, polynomials
- To know about stacks, queues and their applications in handling expressions, strings, scheduling
- To understand dynamic creation of lists and knowing how to apply them for problem solving
- To understand the nonlinear data structure trees and data representation, processing using trees
- To understand sorting and searching of data values using different methodologies

UNIT I

UNIT II
2 Stacks, Queues, Maze Problem, Expressions Evaluation, String reversal, Circular Queue, Dequeue, Scheduling.

UNIT III
2 Linked Lists, Doubly Linked List, Polynomial Addition and Multiplication, Linked Stacks and Queues, Nested Lists

UNIT IV

UNIT V
3 Insertion Sort, Shell Sort, Bucket Sort, Heap Sort, Merge Sort, Quick Sort, Linear search, Binary Search, m-way search, Fibonacci Search.

TOTAL: 45 PERIODS

REFERENCES

CS5694 MACHINE LEARNING USING PYTHON

COURSE OBJECTIVES:
- To know different types of machine learning algorithms like supervised, unsupervised and semi supervised
- To differentiate between regression and classification problems
- To study applications of classification and clustering algorithms
- To learn deep learning and its applications
- To implement machine learning algorithms using Python libraries
UNIT I  INTRODUCTION TO MACHINE LEARNING AND PYTHON  

UNIT II  NEURAL NETWORKS  

UNIT III  SUPERVISED LEARNING  

UNIT IV  UNSUPERVISED LEARNING  
Clustering –Types: K-Means Clustering, Hierarchical Clustering, Density-Based Clustering- The Curse of dimensionality -Dimensionality Reduction: Principal Component Analysis

UNIT V  ADVANCED LEARNING  

TOTAL: 45 PERIODS

REFERENCES:

RP5691 POLYMER PROPERTIES L T P C 3 0 0 3

OBJECTIVES
To enable the students to
- Understand the fundamentals of polymers, structure and molecular weight
- Know about Tg and its importance
- Know about mechanical properties of polymers
- Understand the importance of electrical and optical properties of polymers

UNIT I  INTRODUCTION
UNIT II
STATES OF AGGREGATION IN POLYMERS
10
Transitions and segmental mobility in polymers – Glass transition, Tg, and flexibility – Multiple transitions in polymers - Significance of transition temperatures – Semicrystalline polymers – Effect of crystallization on properties of polymers – Factors affecting crystallization crystal nucleation and growth – relationship between Tg and Tm – Relationship between properties and crystalline structure- Melting of polymers – Rheology of Polymer melts.

UNIT III
DEFORMATION & STRENGTH PROPERTIES OF POLYMERS
10

UNIT IV
ELECTRICAL PROPERTIES OF POLYMER
7

UNIT V
OPTICAL PROPERTIES OF POLYMERS
6

TOTAL 45 PERIODS

COURSE OUTCOME
The students will be able to
- Understand the fundamentals of polymers and molecular weight
- Realize the importance of transitions in polymers
- Know about deformations in polymers
- Choose right type of polymers for electrical insulation purpose
- Know the importance of optical properties of polymer

TEXT BOOKS

REFERENCE

RP5692
POLYMERS IN ELECTRICAL AND ELECTRONICS APPLICATIONS
L T P C
3 0 0 3

OBJECTIVES
To enable the students to
- Understand the fundamentals of polymers and their structure
- Design polymers for electrical applications
- Know about electrical properties of polymers
- Understand the importance of polymers in energy storage applications
UNIT I  INTRODUCTION TO POLYMERS  
Polymers - Difference between simple organic molecule and macromolecule - classification of polymers - Molecular weight - Polymerization Types and Techniques. Requirements for polymers as insulators, semiconductors and conductors. Design of conjugated polymers for organic electronics - chemical, electrochemical and enzymatic methods - doping - general considerations

UNIT II  CONDUCTING/INSULATING POLYMERS AND PROPERTIES  
Conducting Polymers- properties and applications of PANI, Polythiophene, polyacetylene and polypyrrole. Photoconducting polymers and its applications. Insulating/Non conducting polymers used in electrical applications -PE, PVC, PF, Aminoplasts, epoxy and other flame retardant polymers. Properties - Electronic properties, electrochemical, electroluminescent properties, electrochromic and electromechanical properties

UNIT III  ENERGY HARVESTING POLYMERS  
Photovoltaic devices - working mechanism and light harvesting materials. Working mechanism and materials for thermoelectric generator, piezoelectric transducer and triboelectric generator- Dielectric Elastomer based Generating systems-energy harvesting using Magneto Rheological Elastomers and fluids

UNIT IV  POLYMERIC ENERGY STORAGE DEVICES  
Supercapacitors – Polymer based electrodes and electrolytes. Lithium ion batteries based on polymers – Polymer as active materials in electrode, polymer as separator and electrolyte.

UNIT V  APPLICATIONS  
Light emitting conjugated polymers - polymer light emitting diodes and electrochemical cells- electret -photoresist - positive and negative photoresist - wire and cable - encapsulation - polymers in optical data storage - optical fibers - corrosion and ESD protection, EMI shielding artificial muscles - electro chromic devices - electromechanical actuators - sensor devices-conductive composites, smart tyres- pressure monitoring systems-3D printing.

TOTAL 45 PERIODS

OUTCOMES
The students will be able to
- Relate the properties of polymers for electronics applications
- Select polymers for electrical applications
- Know about polymers used for harvesting solar energy
- Know about polymeric energy storage devices
- Understand various polymers for electrical applications

TEXT BOOKS

REFERENCES