# List of Open Electives to be Offered in the Odd Semester (MIT Campus)

## Faculty of Mechanical Engineering
### Department of Aerospace Engineering

<table>
<thead>
<tr>
<th>Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Theory</th>
<th>Practical</th>
<th>Total</th>
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<tbody>
<tr>
<td>AE5791</td>
<td>Introduction to Space System</td>
<td>OE</td>
<td>3</td>
<td>0</td>
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<tr>
<td>AE5792</td>
<td>Introduction to Avionics System</td>
<td>OE</td>
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<tr>
<td>AE5793</td>
<td>Composite Materials and Applications</td>
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<td>AE5794</td>
<td>Wind Tunnel Applications</td>
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<td>AE5795</td>
<td>Introduction to Drone Technology</td>
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<td>AE5796</td>
<td>Launch Vehicle Technology</td>
<td>OE</td>
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## B.E. Automobile Engineering

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<td>AU5791</td>
<td>Vehicle Safety Systems</td>
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<td>Vehicle Technology</td>
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## B.E. Production Technology

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<td>PR5791</td>
<td>Design Concept Optimization and Rapid Prototyping</td>
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## Faculty of Information and Communication Engineering
### Department of Information Technology

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<tr>
<td>IT5794</td>
<td>Introduction to OOPS Concepts</td>
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## Department of Electronics Engineering
### B.E. Electronics and Communication Engineering

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## Faculty of Electrical Engineering
### Department of Instrumentation Engineering

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FACULTY OF SCIENCE AND HUMANITIES

B.E./B.Tech. students can take these electives.

<table>
<thead>
<tr>
<th>DEPARTMENT OF ENGLISH</th>
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<td>3. HS5793</td>
<td>Reading Fiction</td>
<td>OE</td>
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</table>
INTRODUCTION TO SPACE SYSTEM

UNIT I INTRODUCTION

UNIT II SOLAR SYSTEM
Nebular theory of formation of Solar System - Solar wind and nuclear reaction as the source of energy - Brief description about shape size of Sun and Planets - Kepler's Laws of planetary motion - correction of Kepler's third law - Brief description of Asteroids - Satellites and Comets.

UNIT III BASICS OF SPACE DYNAMICS
Overview of astronomy - reference coordinate system in space, telescopes, flux, magnitudes - Satellite Missions and introduction to orbital mechanics - Elliptic, parabolic and hyperbolic orbits and their characteristics - orbit transfer.

UNIT IV SPACE MISSIONS AND SPACECRAFT
Types of spacecraft and spacecraft used for different missions - Types of orbits needed for different missions - space station, Moon mission, and Mars missions - Salient features of space shuttle mission.

UNIT V BASICS OF SPACECRAFT SUBSYSTEMS
Spacecraft Subsystems involving Space Operations - Spacecraft Architecture, Attitude Determination and Control - Power Systems - Spacecraft Bus electronics - Subsystems involving Command, Control, and Communications Architecture - Spacecraft life time.

TOTAL : 45 PERIODS

TEXT BOOKS

INTRODUCTION TO AVIONICS SYSTEMS

COURSE OBJECTIVES:
- To introduce the role of avionics and its need for civil and military aircrafts and to impart
- Knowledge about the avionic architecture and various avionics data buses.
- To understand the trends in display technology and cockpit displays.
- To study gyroscope and its purposes and air data instruments.
- To gain knowledge in field of navigation systems.
- To impart knowledge on various guidance and control systems.

UNIT I INTRODUCTION TO AVIONICS
Role for Avionics in Civil and Military Aircraft and Space systems - Integrated avionics and weapon systems - Avionics sub-systems and design, defining avionics System/subsystem requirements - importance of 'ilities' - Avionics system architecture - Avionics Data buses.

UNIT II FLIGHT DECKS AND COCKPITS
Control and display technologies: CRT, LED, LCD, EL and plasma panel - Touch screen - Civil and Military aircraft cockpits, MFDs, MFK, HUD, HDD, HMD, DVI, HOTAS - Virtual cockpit.
UNIT III  GYROSCOPIC INSTRUMENTS AND AIR DATA SYSTEMS
Gyroscope and its properties, gyro system, Gyro horizon Direction gyro-direction indicator, Rate gyro-rate of turn and slip indicator, Turn coordinator - Air data quantities – Altitude, Air speed, Vertical speed, Mach number,

UNIT IV  INTRODUCTION TO NAVIGATION SYSTEMS

UNIT V  GUIDANCE AND CONTROL SYSTEMS
Introduction to Guidance System. - Primary and secondary Control surfaces - Auto pilot – Basic principles, Longitudinal and lateral auto pilot – Attitude control – DFBW control

TOTAL: 45 PERIODS

COURSE OUTCOMES:
Upon completion of this course, Students will be able to
CO1:  Apply the basics of avionics subsystems architecture.
CO2:  Distinguish between the needs of civil and military avionics systems.
CO3:  Acquire knowledge on display technologies.
CO4:  Design navigation system and ability to design and perform analysis on air data system.
CO5:  Know about the various guidance schemes and principle of stability and flight control systems

TEXTBOOKS:

REFERENCES:

AE5793  COMPOSITE MATERIALS AND APPLICATIONS  L T P C
3 0 0 3

OBJECTIVES:
- Summarize the characteristics of composite materials and effect of reinforcement in composite materials.
- Identify the various reinforcements used in composite materials.
- Compare the manufacturing process of metal matrix composites.
- Understand the manufacturing processes of polymer matrix composites.
- Analyze the strength of composite materials.

UNIT I  INTRODUCTION
Definition – Classification and characteristics of Composite materials - Advantages and application of composites - Functional requirements of reinforcement and matrix - Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance.
UNIT II  REINFORCEMENTS  9
Preparation-layup, curing, properties and applications of glass fibers, carbon fibers, Kevlar fiber and Boron fibers - Properties and applications of whiskers, particle reinforcements – Mechanical Behavior of composites: Rule of mixtures, Inverse rule of mixtures - Isostrain and Isostress conditions.

UNIT III  MANUFACTURING OF METAL MATRIX COMPOSITES  9

UNIT IV  MANUFACTURING OF POLYMER MATRIX COMPOSITES  9

UNIT V  FAILURE CRITERIA IN LAMINATE  9
Laminar Failure Criteria-strength ratio, maximum stress criteria, maximum strain criteria, interacting failure criteria, hygrothermal failure. Laminate first play failure-insight strength; Laminate strength-ply discount truncated maximum strain criterion; strength design using caplet plots; stress concentrations.

OUTCOMES:
- CO1 - Know the characteristics of composite materials and effect of reinforcement in composite materials.
- CO2 – Know the various reinforcements used in composite materials.
- CO3 – Understand the manufacturing processes of metal matrix composites.
- CO4 – Understand the manufacturing processes of polymer matrix composites.
- CO5 – Analyze the strength of composite materials.

REFERENCES:

TOTAL: 45 PERIODS

AE5794  WIND TUNNEL APPLICATIONS  L T P C
3003

OBJECTIVES:
01 To introduce the basic concepts of Fluids, model studies and layout of wind tunnel.
02 To make the student understand the applications of wind tunnels for various Aerospace applications.
03 To introduce usage of Wind tunnels for various road vehicle designs.
04 To make the student understand the applications of wind tunnels for civil and Environmental applications.
05 To make the student understand the usage of wind tunnels for Marine applications.
UNIT I  BASICS OF WIND TUNNELS  9
Fluids - Properties - Non dimensional numbers – Scale effect – Geometric, Kinematic and Dynamic similarities - Wind tunnels and its classification.

UNIT II  AEROSPACE APPLICATIONS  9

UNIT III  ROAD VEHICLE APPLICATIONS  9

UNIT IV  CIVIL AND WIND ENGINEERING APPLICATIONS  9

UNIT V  MARINE APPLICATIONS  9

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course students will be able

CO1: To familiarize themselves with the fundamental concepts of fluid, model design and wind tunnel.

CO2: To acquire knowledge about ideal of using wind tunnels for Aerospace applications.

CO3: To acquire knowledge on usage of road vehicle applications and design.

CO4: Acquire knowledge on the practical elements of wind tunnel usage in civil and wind engineering applications.

CO5: To acquire knowledge on usage of Marine vehicle applications.

TEXT BOOKS:

REFERENCES:
INTRODUCTION TO DRONE TECHNOLOGY

COURSE OBJECTIVES:
1. To introduce the basic concepts of unmanned aerial vehicles and its classification.
2. To impart knowledge on the hardware components and their selection
3. To impart knowledge on the component integration with airframe.
4. To impart knowledge on transmitter receiver and telemetry selection.
5. To impart knowledge on control and testing of drones.

UNIT I INTRODUCTION TO DRONES

UNIT II COMPONENT SELECTION
Selection of the System components: Flight Controller, Sensors, Power plant, Propeller, ESC, Control surface Actuators, Battery- Ground control software- Integration, Installation, Tx-Rx Pairing and Configuration

UNIT III AIRFRAME SELECTION AND INTEGRATION
Airframe Selection requirements - Integration of Motors, controllers and payloads with airframe - Motor configuration for multirotor

UNIT IV TRANSMITTER RECEIVER AND TELEMETRY SELECTION
Transmitter selection - Frequency Hopping Spread Spectrum - Pairing of transmitter and receiver - Telemetry selection and configuration

UNIT V CONTROL AND TESTING
Drone control: Altitude, Pitch, Roll and Heading control - Tuning of controls- System Ground Testing- System In-flight Testing- Trouble shooting -Case Studies

TOTAL: 45 PERIODS

COURSE OUTCOMES:
Upon completion of this course, Students will be able to
- CO1: Explain the importance of UAVs, classification and their applications.
- CO2: Select suitable drone component based on design requirements.
- CO3: Perform integration of drone components
- CO4: Select transmitter, receiver and telemetry system and its configuration
- CO5: Demonstrate basic control of drone and perform ground test and troubleshooting with respect to drone operation.

REFERENCES:
COURSE OBJECTIVES:
1. To understand history of launch vehicles
2. To impart knowledge regarding the requirements of launch vehicles
3. To provide basic knowledge of the working of launch vehicles
4. To understand the basic requirements of propulsion and structures for a launch vehicle
5. To understand the basic requirements of thermal design for a launch vehicle

UNIT I HISTORICAL BACKGROUND
- Inception – Early Developments
- Missions During 1960 To 2000
- Last Two Decades and Future

UNIT II REQUIREMENTS FOR LAUNCHING
- Space transportation functional requirements
- Selection of launch site
- Mission Definition for space transportation systems

UNIT III WORKING OF LAUNCH VEHICLES
- Ascent mission concept

UNIT IV PROPULSION AND STRUCTURAL REQUIREMENTS
- Propulsion System Requirements
- Propulsion System Selection Criteria
- Overall Design Guidelines
- Structural Design Requirements
- Materials for structures

UNIT V THERMAL DESIGN REQUIREMENTS
- Thermal Design Requirements
- Heating Problems in Launch Vehicles
- Approach for Thermal Design
- Thermal Protection System Selection

TOTAL: 45 PERIODS

Course Outcomes
Upon completion of the course, students will be able to

CO1 Describe the history of launch vehicles
CO2 Describe the requirements of launch vehicles
CO3 Demonstrate the basic working of launch vehicles
CO4 Explain the basic propulsion and structural requirements for a launch vehicle
CO5 Explain the basic requirements of thermal design for a launch vehicle

REFERENCES:
OBJECTIVES:
The course should enable the students to:
1. Know about the basics about the vehicle.
2. Understand the safety aspects in the vehicle.
3. Perceive the various safety aspects.
4. Acquire knowledge about sensors in the vehicle to avoid the crash and to detect the defects within the vehicle.
5. Apprehend about the comfort and convenience system.

UNIT I  INTRODUCTION
9

UNIT II  PASSIVE SAFETY CONCEPTS
9

UNIT III  PASSIVE SAFETY EQUIPMENTS AND CONVENIENCE SYSTEM
9
Seat belt, Seat belt tightener system and its importance, collapsible steering column. Air bags and their activation. Designing aspects of automotive bumpers and materials for bumpers. Adaptive front lighting, central locking system, Tire pressure control system, rain sensor system with automated wiper system.

UNIT IV  ACTIVE SAFETY
9
Antilock braking system, Stability Control. Adaptive cruise control, Lane Keep Assist System, Collision warning, avoidance system, Blind Spot Detection system, Driver alertness detection System. Driving Assistance Technology(DAT), Advanced driver-assistance systems (ADAS).

UNIT V  VEHICLE INTEGRATION AND NAVIGATION SYSTEM
9

TOTAL: 45 PERIODS

OUTCOMES:
The students should be able to:
- Infer the concept of crumble zone and can calculate the amount of energy absorbed and transferred during a crash.
- Illustrate about various object detection system and working of various comfort, convenience system and environment information system
- Classify the various types of safety aspects such as active and passive safety
- Design and validate the vehicle structure with respect to crash worthiness
- Design a bumper with respect to safety.

TEXT BOOKS:
REFERENCES:
3) AIS Safety standards
4) “Surface Vehicle Recommended Practice” - SAE J 3016-2018, SAE International, 2018

AU5792

VEHICLE TECHNOLOGY

OBJECTIVES

1. Identify various Engine layout and Chassis for vehicles.
2. To recognize the construction and working principle of drive line, final drive and differential systems.
3. To review the knowledge about the constructional feature and working principle of Steering Systems, Conventional and Independent Suspension Systems.
4. To demonstrate working principle of braking system and wheels used in automobile.
5. To understand the need for electrical systems in the vehicle and working of modern vehicle

UNIT I

VEHICLE STRUCTURE AND ENGINE


UNIT II

TRANSMISSION SYSTEM


UNIT III

STEERING AND SUSPENSION SYSTEMS

Steering Geometry- Ackermann And Davis Steering Principle, Steering- Hydraulic and Electronic, Suspension System- Types – Conventional and Independent suspension.

UNIT IV

BRAKE AND WHEELS


UNIT V

AUTOMOTIVE ELECTRICAL AND MODERN VEHICLES


TOTAL: 45 PERIODS

OUTCOMES:

After completing the course, the student will able to
1. Assess and critically evaluate various Engine concepts, determine their characteristics, advantages and limitations
2. Interpret different types of drive lines and drives used in Automotive.
3. Examine the working principle of steering systems, conventional and independent suspension systems.
4. Apply knowledge on working principles of brake and its subsystems.
5. Demonstrate understanding of Hybrid and Electric vehicle architectures and their technologies.
TEXT BOOKS:
1. Kirpal Singh, Automobile Engineering, Standard Publisher, New Delhi, 2017

REFERENCES:

PR5791 DESIGN CONCEPT OPTIMIZATION AND RAPID PROTOTYPING

COURSE OBJECTIVES:
The main objectives of this course are to:
1. Applying the design processes to develop a successful product.
2. Applying scientific approaches to provide design solutions.
3. Apply Taguchi and Response surface method for parameter Optimization
4. To introduce the development of Additive Manufacturing (AM), various business opportunities
   and applications
5. To familiarize various software tools, processes and techniques to create physical objects that
   satisfy product development / prototyping requirements, using AM.

UNIT I INTRODUCTION TO DESIGN PROCESSES
Basic modules in design process-scientific method and design method-Need identification, importance of problem definition-structured problem, real life problem- information gathering -customer requirements- Quality Function Deployment (QFD)- product design specifications-generation of alternative solutions- Analysis and selection-Detail design and drawings-Prototype, modelling, simulation, testing and evaluation

UNIT II CREATIVITY IN DESIGN
Creativity and problem solving-vertical and lateral thinking-invention-psychological view, mental blocks-Creativity methods-brainstorming, synectics, force fitting methods, mind map, concept map-Theory of innovative problem solving (TRIZ) - conceptual decomposition creating design concepts.

UNIT III TAGUCHI METHODS AND RESPONSE SURFACE METHODOLOGY
Design of experiments using Orthogonal Arrays, Data analysis from Orthogonal experiments- Robust design- case studies. Response surface methodology, parameter – optimization - case studies.

UNIT IV RAPID PROTOTYPING

UNIT V DESIGN FOR ADDITIVE MANUFACTURING

TOTAL: 45 PERIODS
COURSE OUTCOMES:
On completion of this course student should be able to:
CO1 Apply the design processes to develop a successful product.
CO2 Apply scientific approaches to provide design solutions.
CO3 Understand and apply the design concept and analyse the importance of response surface methodology in design of experiments
CO4 Recognize the development of Additive Manufacturing technology
CO5 Acquire knowledge on process of transforming a concept into the final product in Additive Manufacturing technology.

TEXT BOOKS:

REFERENCE BOOKS

PR5792 MICRO AND NANO MANUFACTURING L T P C 3 0 0 3

COURSE OBJECTIVES:
The main objectives of this course are to:
1. To acquaint the students with the principles, basic machine tools, and developments in the micro/nano manufacturing process and research trends in the area of micro and nano manufacturing process.
2. To give awareness of different techniques used in micro and nano manufacturing
3. To give in-depth idea of the techniques used in micro manufacturing
4. To introduce micro-nano deposition techniques
5. To introduce Laser based Nanofabrication Techniques and other processing routes in Micro and nano manufacturing

UNIT – I PRINCIPLES OF MICRO AND NANO MANUFACTURING
UNIT – II MACRO, MICRO, BULK MACHINING AND NANO FINISHING

UNIT – III ENERGY BASED MICRO MACHINING
Introduction to Micro-energy and chemical system (MECS), Space Micro-propulsion, e-Beam Nanolithography – important techniques, Micro instrumentation – applications, Micro Mechatronics.

UNIT – IV MECHANICAL MICROMACHINING PROCESSES

UNIT – V LASER BASED MICRO AND NANO MANUFACTURING

TOTAL : 45 PERIODS

TEXT BOOK:

REFERENCE BOOKS:

COURSE OUTCOMES:
Upon successful completion of the course the students will
CO1 Gain awareness of different techniques used in micro and nano manufacturing.
CO2 Obtain in-depth idea of the macro, micro, bulk machining and nano finishing Processes.
CO3 Acquire the knowledge in energy based micro machining.
CO4 Acquire the knowledge in mechanical micromachining processes.
CO5 Acquire the knowledge in micro and nano manufacturing with laser based Equipment.
COURSE OBJECTIVES:

- To expose the students to the basics of green manufacturing
- To incorporate knowledge about the green energy and sustainable manufacturing systems.
- To enlighten the students with knowledge about air and noise pollution and its effects on the environment.
- To impart the knowledge of fire safety and its production.
- To impart the knowledge about the need, procedure and benefits of Green-Co rating

UNIT I   INTRODUCTION TO GREEN MANUFACTURING       9

UNIT II   GREEN ENERGY AND SUSTAINABLE MANUFACTURING     9
Introduction to green energy concepts – Green house effect – Global warming – Climate change - Environmental degradation- Pollution due to manufacturing industries - Remedies. Definition of sustainable manufacturing – Environmental, Economical and Social dimensions of sustainability – Sustainable Development Models – Strong and Weak Sustainability.

UNIT III  AIR AND NOISE POLLUTION                     9
Primary and Secondary Pollutants, Automobile Pollutants, Industrial Pollution, Ambient air quality Standards, Metrological aspects of air Pollution. Frequency and Sound Levels, Units of Noise based power radio, contours of Loudness. Effect of human, Environment and properties, Natural and Atherogenic Noise Sources, Measuring Instruments for frequency and Noise levels.

UNIT IV   FIRE SAFETY                                9

UNIT V    ASSESSMENT OF GREENCO RATING              9

TOTAL: 45 PERIODS

OUTCOMES:
Students will be able to
CO1 : understand the basic Concepts of green manufacturing and environmental impact assessment objectives
CO2 : apply suitable schemes towards design of green energy and sustainable manufacturing requirements.
CO3 : understand towards minimization or prevention of air and noise pollution.
CO4 : have some knowledge on fire safety.
CO5 : Predict the green co-rating and its benefits.

TEXT BOOKS:
REFERENCES:

IT5794 INTRODUCTION TO OOPS CONCEPTS L T P C
3 0 0 3

OBJECTIVES:
- To introduce the basic concepts of Object Oriented Programming language.
- To learn the concepts of class and object encapsulation.
- To introduce the various concepts related to inheritance.
- To learn the concepts of polymorphism.
- To understand the concepts of virtual functions and abstract classes.
- To introduce the concepts of Templates and exception Handling.

UNIT I BASIC C++ PROGRAMMING 9
Object oriented programming concepts – C++ programming: Data types, variables and arrays – Operators – Pointers - references – functions - String Handling.

UNIT II OBJECT ORIENTED PROGRAMMING CONCEPTS 9
Data Abstraction - Encapsulation - Class - Object – Constructors - Destructors - Static members – Constant members – Member functions - Friend functions- Role of this pointer – Storage classes – Copy Constructor.

UNIT III INHERITANCE 9

UNIT IV POLYMORPHISM 9
Polymorphism – compile time and run time polymorphisms – function overloading – operators overloading – Dynamic binding - Exception handling.

UNIT V ADVANCED OOPS FEATURES 9

TOTAL: 45 PERIODS

COURSE OUTCOMES:
On completion of the course, the students will be able to:
- Understand the problem specifications as per the requirements.
- Design practical applications using OOP concepts.
- Solve the given problem using object oriented programming concepts.
- Implement inheritance concepts for an application.
- Understand the concepts of polymorphism
- Use the STL libraries for implementation of an application.

TEXT BOOKS:
REFERENCES:

IT5795 INTRODUCTION TO SOFTWARE ENGINEERING METHODOLOGIES L T P C
3 0 0 3

OBJECTIVES:
- To gain knowledge about various software development life cycle (SDLC) models.
- To learn how to elicit and formulate requirements.
- To be aware of designing a software considering the various perspectives of end user.
- To analyze the software using metrics and measurement and predict the complexity and the risk associated.

UNIT I SOFTWARE PROCESS MODELS

UNIT II REQUIREMENT ENGINEERING

UNIT III ANALYSIS MODELING AND DESIGNING

UNIT IV TESTING

UNIT V QUALITY MANAGEMENT
Software Configuration And Management - Risk management - Software quality Assurance - Software review techniques

TOTAL: 45 PERIODS

COURSE OUTCOMES:
On completion of the course, the students will be able to:
- Obtain an insight into the concepts of software engineering.
- Analyze and resolve information technology problems through the application of systematic approaches and diagnostic tools for end to end solutions.
- Elicit the requirements for real-time problems.
- Estimate the cost of software, risks of handling, do software planning and configuration management.
- Maintain documentation for software engineering process.

TEXT BOOK
REFERENCES

OBJECTIVES:
- To understand the fundamentals of networking
- To understand the basics of Internet of Things.
- To apply the concept of Internet of Things in the real world scenario.
- To learn about python programming for IoT system development
- To understand the various case studies.

UNIT I NETWORK FUNDAMENTALS

UNIT II IoT BASICS

UNIT III INTERNET OF THINGS DEVELOPMENT
Introduction - M2M, Difference between M2M and IoT. IoT methodology-Purpose & Requirements specification, process specification, domain model specification, information model specification, service specification, IoT level specifications.

UNIT IV PYTHON PROGRAMMING FOR IoT
IoT systems logical design using python-pyton data types & data structures, control flow, functions or modules, remote access enablement using cloud.

UNIT V CASE STUDIES

TOTAL: 45 PERIODS

OUTCOMES:
Upon the completion of the course the student will be able to
- Understand the need for different protocols at different layers and their interworking.
- Understand IoT Basics.
- Develop an IoT application and connect to the cloud.
- Develop an IoT system with the knowledge of Python.
- Analyze real time IoT applications.
TEXTBOOKS:

REFERENCES:

EC5796 COMPUTER VISION AND MACHINE LEARNING

COURSE OBJECTIVES:
- To provide the basic understanding of computer vision concepts
- To give an exposure of algorithms related to region selection, motion estimation and recognition
- To understand the methodology behind different computer vision applications
- To familiarize with the fundamentals of machine learning concepts
- To give an exposure to selected machine learning techniques and algorithms

UNIT I INTRODUCTION TO COMPUTER VISION
- Image formation - Point operators - Linear filtering - neighborhood operators – Fourier transforms – Pyramids and wavelets – Geometric transformations - Feature detection and matching

UNIT II SEGMENTATION
- Active contours - Split and merge - Mean shift and mode finding - Normalized cuts - Graph cuts and energy-based methods

UNIT III MOTION ESTIMATION AND RECOGNITION
- Structure from motion - Translational alignment - Parametric motion - Optical flow - Layered motion - Object detection - Face recognition- Instance recognition -Category recognition - Context and scene understanding

UNIT-IV MACHINE LEARNING MODELS
- Types - Supervised and Unsupervised - Parametric and non-parametric models – discrete, continuous and joint probability distributions – Transformation of random variables - Generative models for discrete data - Gaussian models

UNIT-V LEARNING ALGORITHMS

TOTAL: 45 PERIODS

COURSE OUTCOMES:
Upon successful completion of this course, students will be able to:
- Understand the fundamentals related to computer vision and machine learning
- Work on algorithms for region extraction and motion estimation from images or videos
- Understand the methodology behind object detection and recognition tasks
- Have complete understanding of machine learning models and learning algorithms
- Have basic understanding of algorithms in relation to computer vision and machine learning applications
TEXT BOOKS:

REFERENCES:

EC5797 EMBEDDED SYSTEM DESIGN USING ARDUINO

COURSE OBJECTIVES:
- To conceptualize the fundamentals of Arduino Board and its usage in building real time Embedded Applications
- To educate the students on the programming aspects of Arduino boards
- To make the students to understand the basic principles of interfacing I/O devices with Arduino boards
- To facilitate the students with the knowledge of readily available Arduino prototyping shields
- To encourage the students in building real time embedded applications

UNIT I INTRODUCTION

UNIT II AVR MICROCONTROLLER
AT mega 2560 MCU, Architecture, Features, Memory, Packages, Ports, Pin Functions, Analog comparator, Analog to Digital Converter, Serial Interfaces – USART, SPI and TWI, Timer/Counter, Interrupts, Watchdog Timer.

UNIT III ARDUINO AND I/O DEVICES

UNIT IV ARDUINO SHIELDS
Input/output Expansion Shields, Relay Shields, Signal Routing Shields, Memory, Communication, Serial I/O and MIDI, Ethernet, Bluetooth, USB, ZigBee, CAN, Motion Control Shields, Display, Instrumentation and Adapter Shields.

UNIT V ARDUINO PROJECTS
Temperature Monitoring System using RF Modem, Accelerometer based laboratory automation system, Emergency Hooter in the case of a Disaster, 2.4 GHz RF Modem based security system for restricted area, A Programmable Signal Generator.

TOTAL: 45 PERIODS
COURSE OUTCOMES:
Upon successful completion of this course, students will be able to:
- Have complete understanding of Arduino boards and Programming methodologies
- Understand the features, architecture and functionality of ATmega 2560 MCU
- Interface peripherals with Arduino boards
- Know about the different supporting shields available for designing an embedded system
- Develop a real time embedded system for commercial applications.

TEXT BOOKS:

REFERENCES:

EI5791 INDUSTRIAL AUTOMATION SYSTEMS LT PC 3003

COURSE OBJECTIVES:
- To introduce the concept of PLC, DCS and SCADA
- To expose students to different types of transmitters, Final Control elements and actuators
- To teach students about the role of Computers in Process Industries
- To familiarize students on Programming of PLC with typical case studies
- To teach about the various sub systems of DCS

UNIT I INTRODUCTION
Need for automation systems - Architecture of Industrial Automation system. Introduction to PLC, SCADA and DCS – Introduction to Industrial Data Networks:- Foundation Field Bus and Profibus.

UNIT II FIELD DEVICES

UNIT III COMPUTER AIDED MEASUREMENT AND CONTROL SYSTEMS
Role of computers in measurement and control - Elements of computer aided measurement and control:- Man-Machine interface, computer aided process control hardware and software – Industrial Internet of things (I²oT) – Cyber Security for Industrial automation

UNIT IV PROGRAMMABLE LOGIC CONTROLLERS
Programmable Logic Controllers:- Hardware of PLC - PLC programming:-Ladder diagram with examples - PLC Communication and networking - Case studies:- Bottle filling application and Elevator control.
UNIT V DISTRIBUTED CONTROL SYSTEM

DCS: - LCU-Shared communication facility- Display Hierarchy- High Level and Low Level interfaces - Case studies: - DCS in cement plant and thermal power plant.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

- Gain knowledge on basics of Industrial Automation
- Ability to select appropriate Transmitters, Final control elements and Controllers for different application
- Gain familiarity with Computer aided measurement and control
- Students will be able to Develop Ladder programmes for PLC
- Acquire knowledge about Distributed Control System
- Will be able to recommend right choice of automation systems for a given application

REFERENCES:


MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

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EI5792 INTRODUCTION TO PROGRAMMABLE LOGIC CONTROLLER

COURSE OBJECTIVES

- To provide an overview on the role of PLC in an Industrial Automation.
- To introduce the basics of PLC Programming Languages.
- To expose the IEC 61131-3 standard for PLC Programming
- To teach the Ladder Diagram and Function Block Diagram based PLC Programming with examples.
- To teach typical applications of PLC.

UNIT I INTRODUCTION

Introduction to Hardwired Relay Logic and Solid-state Logic - Examples — Introduction to Programmable Logic - Examples - Role of PLC in an Industrial automation.
UNIT II  PLC ARCHITECTURE  9
Architecture of PLC - Input/output modules: Analog/Digital Input/output modules - Scan cycle of PLC. Introduction to PLC Programming languages: Ladder Diagram (LD), Function Block Diagram (FBD), Sequential Function Charts (SFC), Instruction List (IL), Structured Text (ST).

UNIT III  IEC 61131-3 PLC PROGRAMMING STANDARD  9
IEC 61131-3 Standard Building Blocks of IEC 61131-3 - Elements of Program Organization Unit: Variables, Data types and Common elements - Standard Functions.

UNIT IV  PLC PROGRAMMING  9
Ladder Logic Programming: - Relay Logic Instructions, Timer, Counter, Math and Program Control instructions - Function Block Diagram – Examples.

UNIT V  CASE STUDIES  9

TOTAL : 45 PERIODS

COURSE OUTCOMES
- Ability to understand the role of PLC in the Factory Automation and Process Automation
- Get exposed to different ways of Programming PLC.
- Get exposed to IEC 61131-3 standard
- Ability to develop Ladder Diagram and Functional Block Diagram for typical Industrial applications.
- Ability to apply various logic instruction for different application
- Apply the knowledge of PLC for various application

REFERENCE BOOKS

MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

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OBJECTIVES:
The Course will enable Learners with limited proficiency in English to,
- Learn the fundamental features of communicating in English.
- Develop the skills and sub skills of reading and comprehending the content read.
- Read and comprehend both short and longer texts in English.
- Listen and comprehend lectures in English.

UNIT I
9
Listening - Listening to individual phonemes in English, identification and practice of phonemes.
Reading - Reading aloud of texts - short stories/ scenes from plays.
Speaking - Self-introduction in informal contexts - (necessary expressions to be given)
Writing - Development of hints
Grammar - Use of articles - countable and uncountable nouns.

UNIT II
9
Listening - Listening to announcements in public places such as made on social media.
Reading - Short texts and answering questions.
Speaking - Asking and answering questions of a personal kind (hobbies, home, favourite sports person, ambitions,)
Writing - Using given expressions/ keywords to develop a story.
Grammar - Use of pronouns, verbs - regular & irregular, Adjectives - degrees of comparison.

UNIT III
9
Listening - Listening to lectures and summarizing information.
Speaking - Reporting flow of Events (Sequence)
Reading - Reading summaries
Writing - Writing a précis
Grammar and Vocabulary - Needs based Grammar

UNIT IV
9
Listening - Listening to description of a place/
Speaking - Role play (practicing conversations)
Reading - Newspaper Articles.
Writing - Dialogue Writing
Grammar and Vocabulary - Needs based Grammar

UNIT V
9
Listening - Listening to a process.
Speaking - Describing an experience.
Reading - Reading essays.
Writing - Short essays.
Grammar and Vocabulary - Needs based Grammar Teaching Methods:

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the Course, Learners will be able to,
- Listen and comprehend information being given in English.
- Read and comprehend English texts.
- Speak English with confidence
- Produce a well-organized essay with adequate support and details.
- Write comprehension answers in English.

TEXT BOOK:
REFERENCE BOOKS:

Suggested evaluation methods:
Assessment-25 (Listening & speaking)
Assessment -25 (Reading &Writing)
End semester-100
Teachers can use quizzes, visual inputs etc. to get their Learners to communicate in English

HS5792 INTRODUCTION TO CRITICAL THINKING

COURSE OVERVIEW
This is an open elective course offered for B.E/B.Tech/ M.E/M.Tech students who are interested in learning 21st Century skills that will help them in their academics and career.

COURSE OBJECTIVES:
The main objectives of this course is
- To distinguish between assumptions, fact and opinions
- To identify strong and weak points, reasons and claims in an argument.
- To infer and interpret evidence, verbal and visual materials etc.
- To analyse various perspective and learn to be objective.
- To evaluate the empirical data objectively that will help in honing problem-solving skills

UNIT I INTRODUCTION TO CRITICAL THINKING
Introduction to critical thinking - Defining critical thinking –Elements of critical thinking - Distinguishing between facts and opinions –Elenctic method (asking relevant questioning)– small group discussions

UNIT II INDUCTING & INDUCTIVE REASONING
Classification of content - Interpreting & Evaluating verbal and visual content (Infographics) – Reading comprehension – Drawing inferences – Blooms Taxonomy – Deductive & Inductive Reasoning

UNIT III ANALYZING VISUAL AND VERBAL MEDIA
Critically reviewing and analysing visual media like advertisement, news reports, documentaries & movies – Critical review writing of the visual media – Identifying and analysing symbols used in the content

UNIT IV IDENTIFYING FALLACIES
Rhetorical devices – Ambiguities in argument – Expressing opinions - Types of Fallacies – Discourse rules in group discussion – Group discussion – Components of Critical Thinking - Analzying & solving problems- Case Study
UNIT V CRITICAL THINKING AND MEDIA

Critiquing an article – Electronic Media & Critical thinking – Online sources of information & critical thinking – Lateral thinking – Critical thinking in Social media - Writing an article after collecting and evaluating data

TOTAL: 45 PERIODS

LEARNING OUTCOMES:
By the end of the course students will be able to

- Accurately interpret evidence, statements, graphics, questions etc.
- Identify relevant arguments, reasons, claims, supporting arguments, pros and cons etc.
- Analyze and evaluate different perspectives and be more objective in decision making
- Distinguish between assumptions, facts and opinions and also to discern real news from fake news.
- Give importance to evidence and reason and be fair in making judgments.

REFERENCES:

HS5793 READING FICTION L T P C

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COURSE DESCRIPTION
This course is designed to give students an introduction to fiction in English from around the world.

COURSE OBJECTIVES

- To give students who are already proficient in the use of the English language some exposure to fiction from different parts of the world
- To help students appreciate the nuances of literary language.
- To help students understand the denotative and connotative meanings in literary texts.
- To provide students with the material to discuss common themes of human concern.
- To provide students with the opportunity to practice their reading skills

UNIT I HISTORICAL FICTION
Defining history and fiction and the intersection between the two - The language of historical fiction - historical truth vs literary truth - Text for study: The Diary of Anne Frank.

UNIT II FANTASY / HORROR / GOTHIC FICTION
Introduction to Gothic fiction - Different sub genres of Gothic fiction – origins and development Text for study: Edgar Allan Poe – The Pit and the Pendulum.

UNIT III WOMEN’S FICTION
Introduction to fiction by women writers – Women’s writing – characteristics - Text for study: Muriel Spark: The Driver’s Seat.
UNIT IV  MYTHOLOGICAL FICTION  9 
Introduction to mythological retellings in fiction - novel, short story, flash fiction, Drabble, 55 fiction 

UNIT V  FICTION IN TRANSLATION  9 
Translation and intertextuality – adaptation, stylistic equivalence, tranference of cultural information, literary conventions -Text for study: M.T. Vasudevan Nair: Naalukettu: The House around the Courtyard (translated by Gita Krishnankutty) 

TOTAL: 45 PERIODS

LEARNING OUTCOMES

Students will be able to

• read texts with insight into their meaning and context
• use different reading strategies to identify construction of narratives
• identify and use the literary tools and strategies used by writers to communicate their meaning
• collect, organize and present details about the writers, the historical and general contexts of the texts.
• discuss, analyse and argue about general issues related to society.

REFERENCES:

7. http://ocy.yale.edu/english/engl-300/lecture-1