# LIST OF OPEN ELECTIVES
**TO BE OFFERED IN THE ODD SEMESTER (MIT CAMPUS)**

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INTRODUCTION TO MEMS AND NANOTECHNOLOGY

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COURSE OBJECTIVES
- To increase student awareness on emerging trends in micro and nanotechnology.
- To understand the fundamentals of micro and nanotechnology.
- To impart basic knowledge on various synthesis, design and characterization techniques involved in micro and nanotechnology.
- To make the learner familiarize with the potential applications of nanotechnology.
- To understand the fundamentals of Micro and Nano-sensing.

UNIT I INTRODUCTION TO MICRO AND NANOTECHNOLOGY

UNIT II SYNTHESIS OF NANOMATERIALS
Bottom up and Top down approaches: Physical vapour deposition – Inert gas condensation, Laser ablation, wire explosion techniques - Chemical vapour deposition - Self-assembly - Mechanical milling.

UNIT III FABRICATION TECHNIQUES

UNIT IV CHARACTERIZATION TECHNIQUES

UNIT V MICRO AND NANOSENSING TECHNIQUES

TOTAL : 45 PERIODS

COURSE OUTCOMES
- Knowledge of contemporary technologies in MEMS and nanotechnology.
- Ability to function on multidisciplinary teams.
- Ability to design micro and Nano systems.
- Ability to transfer interdisciplinary engineering approaches to the field of micro and nanotechnology.

TEXT BOOKS
REFERENCE BOOKS

EI7792 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
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
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
Ladder Logic Programming: - Relay Logic Instructions, Timer, Counter, Math and Program Control instructions - Function Block Diagram – Examples.

UNIT V CASE STUDIES

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.
REFERENCE BOOKS

PR7791 INDUSTRIAL OPERATIONS RESEARCH

OBJECTIVE:
To introduce the various optimization techniques and quantitative techniques and to make the students apply these techniques for modeling and solving many engineering situations in general and manufacturing situations in particular.

UNIT I LINEAR PROGRAMMING 9

UNIT II REPLACEMENT MODELS AND GAME THEORY 9

UNIT III QUEUING MODELS AND SIMULATION 9

UNIT IV FORECASTING, SEQUENCING AND LINE BALANCING 9

UNIT V PROJECT NETWORK ANALYSIS AND DECISION TREE ANALYSIS 9
Network – CPM/PERT – Project time estimation – critical path – crashing of network, Decision tree analysis – applications

TOTAL: 45 PERIODS

OUTCOME:
The students shall able to select and apply techniques for typical engineering and industrial situations.

TEXT BOOKS:
REFERENCES:

PR7792 OPTIMIZATION TECHNIQUES IN MANAGEMENT

AIM: To introduce the various optimization techniques and their advancements.

OBJECTIVES:
- To make use of the above techniques while modeling and solving the engineering problems of different fields.

UNIT I INTRODUCTION

UNIT II QUEUING MODELS AND SIMULATION

UNIT III REPLACEMENT MODELS AND GAME THEORY

UNIT IV FORECASTING, SEQUENCING AND LINE BALANCING

UNIT V ADVANCES IN SIMULATION
Genetic algorithms – simulated annealing – Neural Network and Fuzzy systems

TOTAL: 45 PERIODS

OUTCOMES:
- The students will be able to study a given problem, formulate and model it suitably, select an appropriate optimisation technique, solve, find and implement the optimal solution.

REFERENCES:
OBJECTIVE:
To understand the basics of vehicle transmission system and impart comprehensive knowledge on vehicle clutch, gear box, automatic transmission and final drive units.

UNIT I INTRODUCTION
Layout with reference to power plant, steering location and drive. Layout and function of steering system, drive system, braking system and suspension system.

UNIT II CLUTCH

UNIT III GEAR BOX
Purpose of gear box, requirement of gear box. Construction and working principle of sliding mesh and constant mesh gear boxes. Principle of Synchronisers, Construction of different synchronisers. Construction and operation of synchronmesh gear boxes.

UNIT IV AUTOMATIC TRANSMISSION

UNIT V FINAL DRIVE AND DIFFERENTIAL

TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES:

AU7792 INTRODUCTION TO TWO-WHEELERS

OBJECTIVES:
• Expose to evolution of two wheelers
• Selection of power plants
• Identify various engine and chassis subsystems
• Analyze the need of various running systems
• Evaluate the current two wheeler technological advancements
UNIT I    POWER PLANT
Two stroke and four stroke SI engine Construction and Working, limitations of CI engines in two wheelers, Valve & port timing diagrams. Scavenging in engines, Rotary valve engine.

UNIT II    FUEL SYSTEM AND IGNITION SYSTEM
Fuel system – carburetor system, fuel injection system. Types of lubrication system. Ignition systems Magneto coil and battery coil spark ignition system, Electronic ignition System. Starting system. Starting system manual starting system, self starter system.

UNIT III    STRUCTURE AND SUB – SYSTEMS
Types of frames and its layout, Transmission: Need of a transmission system, Types of clutches, Types of gear box and its controls, Chain type final drives. Front and rear suspension systems. Instrumentation and controls on handle bar, Need for freewheeling devices.

UNIT IV    BRAKES AND WHEELS
Braking system: Need for braking system, Types of brakes Construction and Working of drum brakes, disc brakes. Types of wheels – construction of wire wheel, cast wheel, disc wheel. Types of tires – tubeless tires and tubed tires, radial tyres and cross ply tyres, speed and load rating. Steering system – Types of steering systems, construction, steering geometry.

UNIT V    RECENT TRENDS IN TWO WHEELERS

TOTAL: 45 PERIODS

OUTCOMES
On successful completion of this course students will be able to:
• Explain the working of two and four stroke engines
• Illustrate the functioning of clutch and gear box
• Demonstrate the wheels, tyres, suspensions and braking systems
• Identify the latest models of two wheelers

TEXT BOOK:
2. K. K. Ramalingam, Two Wheelers, Scitech publications, Chennai

REFERENCES:

EC7791    INTERNET OF THINGS    L T P C
3 0 0 3

OBJECTIVES:
• To understand the fundamentals of Internet of Things.
• To apply the concept of Internet of Things in the real world scenario.
• To learn the various case study of IoT systems.
UNIT I  INTRODUCTION AND APPLICATIONS  9

UNIT II  M2M AND SYSTEM MANAGEMENT  9
Introduction -M2M, Difference between M2M and IoT, SDN and NFV for IoT, System Management – need, SNMP, NETCONF, YANG.

UNIT III  DEVELOPING INTERNET OF THINGS  9
IoT methodology - Purpose & Requirements specification, process specification, domain model specification, information model specification, service specification, IoT level specifications.

UNIT IV  USAGE OF PYTHON  9
IoT systems logical design using python - python data types & data structures, control flow, functions or modules, remote access enablement using cloud.

UNIT V  CASE STUDY ON IoT SYSTEM  9
Case study for weather monitoring system- modules & package of python, python packages of interest for IoT -JSON,XML,HTTP &URLLib, SMTPLib. Exemplary device - Rasberry pi, Linux on Rasberry pi.

TOTAL: 45 PERIODS

OUTCOMES:
Upon the completion of the course the student will be able to
- Design a portable IoT using Arduino/ equivalent boards and relevant protocols.
- Deploy an IoT application and connect to the cloud.
- Analyze applications of IoT in real time scenario.

TEXT BOOKS:

REFERENCES:

EC7792  VLSI SYSTEM DESIGN  L T P C  3 0 0 3

OBJECTIVES:
- To study and analyse the digital circuits with HDL
- To provide in-depth understanding of logic and system design
- To design hardware architecture systems
UNIT I  INTRODUCTION TO DIGITAL VLSI SYSTEMS DESIGN  9

UNIT II  HARDWARE DESCRIPTION LANGUAGES  9

UNIT III  COMBINATIONAL AND SEQUENTIAL CIRCUIT DESIGN  9

UNIT IV  PIPELINING  9
Digital Pipelining - Partitioning of a Design - Partition of Data Width - Partition of Functionality - Signed Adder Design - Multiplier Design.

UNIT V  ARCHITECTURAL DESIGN  9

TOTAL: 45 PERIODS

OUTCOMES:
Upon successful completion of this course, students will be able to:

- Design and optimize combinational and sequential digital circuits.
- Model digital circuits with HDL at behavioural, structural, and RTL Levels
- Realize architecture level designs.

TEXT BOOK:

REFERENCES:

IT7792  INTRODUCTION TO SOFTWARE ENGINEERING METHODOLOGIES  L T P C
3  0 0 3

UNIT I  SOFTWARE PROCESS MODELS  9
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 Reviews

TOTAL : 45 PERIODS

TEXT BOOK

REFERENCES