



SANTHIRAM ENGINEERING COLLEGE :: NANDYAL

(AUTONOMOUS)

Approved by A.I.C.T.E., New Delhi, Permanently Affiliated to JNT University, Ananthapuramu
Accredited by NAAC with Grade-A, Accredited by NBA (ECE & CSE)
An ISO 9001:2015 Certified Institution, 2(f) & 12(B) recognition by UGC Act, 1956
NH-40, NANDYAL-518501 (Dist), A.P.



Learn-Grow-Empower

ACADEMIC REGULATIONS, COURSE STRUCTURE AND DETAILED SYLLABI

M.TECH (ECE-EMBEDDED SYSTEMS)

REGULAR TWO YEAR PG DEGREE COURSE

(Applicable for the Admitted Batch 2025-26)

REGULATIONS:

R-25



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SANTHIRAM ENGINEERING COLLEGE

(AUTONOMOUS)

DEPARTMENT OF ECE - EMBEDDED SYSTEMS

M.Tech
I-Semester Course Structure



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DEPARTMENT OF ECE - EMBEDDED SYSTEMS

M.Tech. I Sem. - Course Structure

S.No	Subject Code	Course Category	Name of the Subject	Hours/Week			Credits	Marks		
				Lecture	Tutorial	Practical		Internal	External	Total
1	25D55101	PC	EMBEDDED SYSTEM DESIGN	3	0	0	3	40	60	100
2	25D55102	PC	EMBEDDED PROGRAMMING	3	0	0	3	40	60	100
3	25D55103A	PE	WIRELESS SENSOR NETWORKS (PE-I)	3	0	0	3	40	60	100
4	25D55103B	PE	EMBEDDED SYSTEMS FOR ROBOTICS (PE-I)	3	0	0	3	40	60	100
5	25D55103C	PE	PATTERN RECOGNITION AND MACHINE LEARNING (PE-I)	3	0	0	3	40	60	100
6	25D55104A	PE	COMMUNICATIONS BUSES & INTERFACES (PE-II)	3	0	0	3	40	60	100
7	25D58103A	PE	ADVANCED COMPUTER ARCHITECTURE	3	0	0	3	40	60	100
8	25D55104C	PE	EMBEDDED SYSTEMS FOR AUTOMOBILE APPLICATIONS	3	0	0	3	40	60	100
9	25D55105	PC	EMBEDDED SYSTEM DESIGN LAB	2	0	0	2	40	60	100
10	25D55106	PC	EMBEDDED PROGRAMMING LAB	0	0	4	2	40	60	100
11	25D57107	MC(C)	RESEARCH METHODOLOGY AND IPR	2	0	0	2	40	60	100
12	25D55107	SC	EMBEDDED LINUX	0	1	2	2	40	60	100
13	25D57109A	MC(NC)	ENGLISH FOR RESEARCH PAPER WRITING	2	0	0	0	40	0	40
14	25D57109C	MC(NC)	DISASTER MANAGEMENT	2	0	0	0	40	0	40

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M.Tech. I Sem.

L	T	P	C
3	0	0	3

(25D55101) EMBEDDED SYSTEM DESIGN

Course Category	Professional Core course (PC)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

UNIT-I INTRODUCTION TO EMBEDDED SYSTEMS

Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded Systems.

UNIT-II TYPICAL EMBEDDED SYSTEM

Core of the Embedded System: General Purpose and Domain Specific Processors, ASICs, PLDs, Commercial Off-The-Shelf Components (COTS), Memory: ROM, RAM, Memory according to the type of Interface, Memory Shadowing, Memory selection for Embedded Systems, Sensors and Actuators. Onboard communication interfaces-I2C, SPI, CAN, parallel interface; External communication interfaces-RS232 and RS485, USB, infrared, Bluetooth, Wi-Fi, ZigBee, GPRS, GSM.

UNIT-III EMBEDDED FIRMWARE

Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, Real Time Clock, Watchdog Timer, Embedded Firmware Design Approaches and Development Languages.

UNIT-IV RTOS BASED EMBEDDED SYSTEM DESIGN

Operating System Basics, Types of Operating Systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling

UNIT-V TASK COMMUNICATION

Shared Memory, Message Passing, Remote Procedure Call and Sockets, Task Synchronization: Task Communication/Synchronization Issues, Task Synchronization Techniques, Device Drivers, Device Drivers, How to Choose an RTOS.

TEXT BOOKS:

1. Introduction to Embedded Systems - Shibu K.V, Mc Graw Hill.
2. Computers as Components ???Wayne Wolf, Morgan Kaufmann (second edition)

REFERENCE BOOKS:

1. Embedded Systems - Raj Kamal, TMH.
2. Embedded System Design - Frank Vahid, Tony Givargis, John Wiley.
3. Embedded Systems, Lyla, Pearson, 2013.



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DEPARTMENT OF ECE - EMBEDDED SYSTEMS

e-Resources and Digital Material:

1. Pattern Recognition - JNTU - Studocu

COURSE OUTCOMES:

1. Familiar the basics of pattern classes and functionality.
2. Construct the various linear models.
3. Use the different kernel methods
4. Design the Markov and Mixed models.
5. Apply and analyze mixture models and the EM algorithm for probabilistic clustering and data modelling.



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(25D55102) EMBEDDED PROGRAMMING

Course Category	Professional Core course (PC)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

UNIT-I BASIC C PROGRAMMING

Typical C Program Development Environment - Introduction to C Programming - Structured Program Development in C - Data Types and Operators - C Program Control - C Functions - Introduction to Arrays.

UNIT-II EMBEDDED C

Adding Structure to C Code: Object-oriented programming with C, Header files for Project and Port, Examples. Meeting Real-time constraints: Creating hardware delays- Need for timeout mechanism - Creating loop timeouts - Creating hardware timeouts.

UNIT-III 8051 PROGRAMMING IN C

Data types and time delay in 8051, I/O programming in 8051, Logic operations in 8051, Data conversion program in 8051 Accessing code ROM space in 8051, Data serialization using 8051

UNIT-IV 8051 SERIAL PORT AND INTERRUPT PROGRAMMING IN C

Basics of serial communication, 8051 interface to RS232- serial port programming in 8051. 8051 interrupts and programming, Programming for timer configuration.

UNIT-V 8051 INTERFACING

8051: ADC interfacing, DAC interfacing, Sensor interfacing, LCD interfacing, Stepper motor interfacing.

TEXT BOOKS:

1. Paul Deitel and Harvey Deitel, "C How to Program", 9th Edition, Pearson Education Limited, 2022, 1st edition.
2. Michael J Pont, "Embedded C", Addison-Wesley, An imprint of Pearson Education, 2002.
3. William von Hagen, "The Definitive Guide to GCC", 2nd Edition, Apress Inc., 2006.
4. Gowrishankar S and Veena A, "Introduction to Python Programming", CRC Press, Taylor & Francis Group, 2019.

REFERENCE BOOKS:

1. oel Kalicharan, "Learn to Program with C", Apress Inc., 2015, 1st edition



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2. Steve Oualline, "Practical C programming", O'Reilly Media, 1997, 3rd editio
3. Muhammad Ali Mazidi, Janice G. Mazidi and Rolin D. McKinlay, ???The 8051 Microcontroller and Embedded Systems??? Prentice Hall, 2nd Edition 2007.
4. Myke Predko, Programming and customizing the 8051 microcontrollers, McGraww Hill 2000, 1st edition.

e-Resources and Digital Material:

1. <https://www.hackerrank.com/>
2. <https://www.cprogramming.com/>
3. <https://www.allaboutcircuits.com/technical-articles/introduction-to-the-c-programminglanguage-for-embedded-applications/>
4. <https://www.circuitstoday.com/getting-started-with-keil-uvision>
5. <https://microcontrollerslab.com/8051-microcontroller-tutorials-c/>

COURSE OUTCOMES:

1. Understand basic C programming concepts, including data types, operators, and control structures.
2. Develop embedded C programs with structured code and real-time constraint management techniques.
3. Implement 8051 microcontroller programming in C, including I/O operations and data manipulation.
4. Program 8051 for serial communication, interrupts, and timer configurations in embedded systems.
5. Interface 8051 with various peripherals like ADC, DAC, sensors, LCD, and stepper motors.



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(25D55103A) WIRELESS SENSOR NETWORKS (PE-I)

Course Category	Professional Elective (PE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

UNIT-I INTRODUCTION

Fundamentals of wireless communication technology, the electromagnetic spectrum radio propagation, characteristics of wireless channels, modulation techniques, multiple access techniques, wireless LANs, PANs, WANs, and MANs, Wireless Internet.

UNIT-II INTRODUCTION TO ADHOC/SENSOR NETWORKS

Introduction to adhoc/sensor networks: Key definitions of adhoc/ sensor networks, unique constraints and challenges, advantages of ad-hoc/sensor network, driving applications, issues in adhoc wireless networks, issues in design of sensor network, sensor network architecture, data dissemination and gathering.

UNIT-III MAC PROTOCOLS

Issues in designing MAC protocols for adhoc wireless networks, design goals, classification of MAC protocols, MAC protocols for sensor network, location discovery, quality, other issues, S-MAC, IEEE 802.15.4.

UNIT-IV ROUTING PROTOCOLS

Issues in designing a routing protocol, classification of routing protocols, table-driven, on-demand, hybrid, flooding, hierarchical, and power aware routing protocols.

UNIT-V QOS AND ENERGY MANAGEMENT

Issues and Challenges in providing QoS, classifications, MAC, network layer solutions, QoS frameworks, need for energy management, classification, battery, transmission power, and system power management schemes.

TEXT BOOKS:

1. C. Siva Ram Murthy, and B. S. Manoj, "AdHoc Wireless networks ", Pearson Education - 2008.

e-Resources and Digital Material:

1. https://onlinecourses.nptel.ac.in/noc20_ee98/preview
2. <https://www.nrtec.in/wp-content/uploads/2023/09/EMBEDDED-SYSTEMS.pdf>

COURSE OUTCOMES:

1. Understand wireless communication fundamentals, including modulation techniques, channel characteristics, and wireless LANs/PANs.



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2. Analyze the architecture, challenges, and applications of ad-hoc and sensor networks.
3. Evaluate design goals and protocols for MAC layers in wireless and sensor networks
4. Classify and compare routing protocols for wireless networks, focusing on power-aware and hybrid techniques
5. Address QoS and energy management challenges, exploring power management schemes for wireless systems



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M.Tech. I Sem.

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(25D55103B) EMBEDDED SYSTEMS FOR ROBOTICS (PE-I)

Course Category	Professional Elective (PE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

UNIT-I INTRODUCTION TO ROBOTICS & AUTOMATION

Overview of Robotics & Automation-Principles and Strategies of Automation System - Hardware and software for Automation- Embedded Processors for Automation-Different Types of Robots -Various Generations of Robots - Asimov's Laws Of Robotics -Key components of a robot - Design Criteria for Selection of a Robot -Role of embedded system in Robotics and Automation - Recent trends.

UNIT-II SENSORS AND DRIVE SYSTEMS

Hydraulic, Pneumatic and Electric Drive Systems - Understanding how motor power, current torque, friction co-efficient affect the design of a Robot - Determination of Motor HP and Gearing Ratio - Variable Speed Arrangements. Sensors - Classification based on sensing type (including Optical, Acoustic, Magnetic) - Proximity Sensors -Ranging Sensors - Speed & Displacement Sensing - Tactile Sensors - Vision Sensing - Smart Sensors - MEMS sensors

UNIT-III MANIPULATORS AND GRIPPERS

Introduction to Manipulators - Joints and Degrees of Freedom - Construction of Manipulators - Manipulator Dynamics and Force Control - Electronic and Pneumatic Manipulator Control Circuits - End Effectors - Various Types Of Grippers- Design Considerations

UNIT-IV KINEMATICS AND PATH PLANNING

Kinematic Equations - Forward and Inverse Kinematics - Solution Of Inverse Kinematics Problem - Jacobian based Velocity Kinematics- Various Path Planning Algorithms - Hill Climbing Techniques - Robot Operating System - Simulation and modelling of a simple Path Planning application.

UNIT-V ROBOT CONTROL

Basics of control: Transfer functions, Control laws: P, PD, PID Non-linear and advanced controls. CASE STUDIES: Robot Cell Design - Humanoid Robot - Robots in healthcare applications - Robot Machine Interface -Robots in Manufacturing and Non-Manufacturing Applications.

TEXT BOOKS:

1. Mikell P. Weiss G.M., Nagel R.N., Odraj N.G., ???Industrial Robotics???, Mc Graw-Hill Singapore, 1996.



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2. Ghosh, Control in Robotics and Automation: Sensor Based Integration, Allied Publishers, Chennai, 1998.
3. Saha, S.K., Introduction to Robotics, 2nd Edition, McGraw-Hill Higher Education, New Delhi, 2014.
4. Deb. S.R., Robotics Technology And Flexible Automation, John Wiley, USA 1992.

REFERENCE BOOKS:

1. Klafter R.D., Chimielewski T.A., Negin M., Robotic Engineering ,An Integrated Approach, PHI. 2.n Wesley, USA, 1991.
2. Mc Kerrow P.J. Introduction to Robotics, Addiso
3. Issac Asimov Robot, Ballantine Books, New York, 1986.

e-Resources and Digital Material:

1. https://nptel.ac.in/domains/discipline/115?course=115_9

COURSE OUTCOMES:

1. Understand robotics and automation principles, robot components, and embedded processors' roles.
2. Analyze motor and sensor systems, determining power, torque, and sensor types for robots.
3. Design manipulators and grippers, considering dynamics, force control, and end effectors.
4. Apply kinematic equations, inverse kinematics, and path planning algorithms for robotic motion.
5. Implement P, PD, PID control laws for robotic systems, exploring healthcare and manufacturing applications.



M.Tech. I Sem.

L	T	P	C
3	0	0	3

(25D55103C) PATTERN RECOGNITION AND MACHINE LEARNING (PE-I)

Course Category	Professional Elective (PE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

UNIT-I INTRODUCTION TO PATTERN RECOGNITION

Mathematical Formulation and Basic Functional Equation, Reduction of Dimensionality, Experiments in Pattern Classification, Backward Procedure for Both Feature Ordering- and Pattern Classification, Suboptimal Sequential Pattern Recognition, Nonparametric Design of Sequential Pattern Classifiers, Analysis of Optimal Performance and a Multiclass Generalization

UNIT-II LINEAR MODELS

Linear Basis Function Models -Maximum likelihood and least squares, Geometry of least squares, Sequential learning, Regularized least squares, Multiple outputs, The Bias-Variance Decomposition, Bayesian Linear Regression -Parameter distribution, Predictive, Equivalent, Bayesian Model Comparison, Probabilistic Generative Models-Continuous inputs, Maximum likelihood solution, Discrete features, Exponential family, Probabilistic Discriminative Models -Fixed basis functions, Logistic regression, Iterative reweighted least squares, Multiclass logistic regression, Probit regression, Canonical link functions

UNIT-III KERNEL METHODS

Constructing Kernels, Radial Basis Function Networks - Nadaraya-Watson model, Gaussian Processes -Linear regression revisited, Gaussian processes for regression, Learning the hyper parameters, Automatic relevance determination, Gaussian processes for classification, Laplace approximation, Connection to neural networks, Sparse Kernel Machines- Maximum Margin Classifiers, Overlapping class distributions, Relation to logistic regression, Multiclass SVMs, SVMs for regression, Computational learning theory, Relevance Vector Machines- RVM for regression, Analysis of sparsity, RVM for classification

UNIT-IV GRAPHICAL MODELS

Bayesian Networks, Example: Polynomial regression, Generative models, Discrete variables, Linear-Gaussian models, Conditional Independence- Three example graphs, D-separation, Markov Random Fields -Conditional independence properties, Factorization properties, Illustration: Image de-noising, Relation to directed graphs, Inference in Graphical Models- Inference on a chain, Trees, Factor graphs, The sum-product algorithm, The max-sum algorithm, Exact inference in general graphs, Loopy belief propagation, Learning the graph structure.



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UNIT-V MIXTURE MODELS AND EM ALGORITHM

K-means Clustering-Image segmentation and compression, Mixtures of Gaussians- Maximum likelihood, EM for Gaussian mixtures, An Alternative View of EM- Gaussian mixtures revisited, Relation to K-means, Mixtures of Bernoulli distributions, EM for Bayesian linear regression, The EM Algorithm in General, Combining Models- Tree-based Mixture Models, Conditional Mixture Models- Mixtures of linear regression models, Mixtures of logistic models, Mixtures of experts.

TEXT BOOKS:

1. Sequential methods in Pattern Recognition and Machine Learning-K.S.Fu, Academic Press, volume no.52.
2. Pattern Recognition and Machine Learning- C. Bishop-Springer,2006.

REFERENCE BOOKS:

1. Pattern Classification- Richard o. Duda, Peter E. hart, David G. Stork, John Wiley& Sons, 2nd Ed., 2001.
2. .The elements of Statistical Learning- Trevor Hastie, Robert Tibshirani, Jerome H. Friedman, Springer, 2nd Ed., 2009.

e-Resources and Digital Material:

1. Pattern Recognition - JNTU - Studocu

COURSE OUTCOMES:

1. Familiar the basics of pattern classes and functionality.
2. Construct the various linear models.
3. Use the different kernel methods.
4. Design the Markov and Mixed models.
5. Apply and analyze mixture models and the EM algorithm for probabilistic clustering and data modelling.



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(25D55104A) COMMUNICATIONS BUSES & INTERFACES (PE-II)

Course Category	Professional Elective (PE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

UNIT-I BUSSES

Serial Busses - Physical interface, Data and Control signals, features, limitations and applications of RS232, RS485, I2C, SPI

UNIT-II CAN

CAN - Architecture, Data transmission, Layers, Frame formats, applications

UNIT-III INTRODUCTION

PCIe - Revisions, Configuration space, Hardware protocols, applications

UNIT-IV USB

USB - Transfer types, enumeration, Descriptor types and contents, Device driver

UNIT-V PROTOCOLS

Data Streaming Serial Communication Protocol - Serial Front Panel Data Port (SFPDP) using fiber optic and copper cable

TEXT BOOKS:

1. Jan Axelson, "Serial Port Complete - COM Ports, USB Virtual Com Ports, and Ports for Embedded Systems", Lakeview Research, 2nd Edition
2. Jan Axelson, "USB Complete", Penram Publications
3. Mike Jackson, Ravi Budruk, "PCI Express Technology", Mindshare Press

REFERENCE BOOKS:

1. Wilfried Voss, "A Comprehensible Guide to Controller Area Network", Copperhill Media Corporation, 2nd Edition, 2005.
2. .Serial Front Panel Draft Standard VITA 17.1 -200x

e-Resources and Digital Material:

1. <http://www.pcisig.com/www.pcisig.com>, <http://www.usb.org/www.usb.org>

COURSE OUTCOMES:

1. Select a particular serial bus suitable for a particular application.
2. Develop APIs for configuration, reading and writing data onto serial bus.
3. Design and develop peripherals that can be interfaced to desired serial bus.



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4. Analyze and evaluate advanced high-speed serial communication standards such as CAN, PCIe, USB, and SFPDP for real-time embedded system applications.
5. Develop and troubleshoot device drivers and data-streaming interfaces for efficient and reliable communication over modern serial bus architectures.

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M.Tech. I Sem.

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(25D58103A) ADVANCED COMPUTER ARCHITECTURE

Course Category	Professional Elective (PE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:**UNIT-I FUNDAMENTALS OF COMPUTER DESIGN**

Fundamentals of Computer design, Changing faces of computing and task of computer designer, Technology trends, Cost price and their trends, measuring and reporting performance, quantitative principles of computer design, Amdahl's law. Instruction set principles and examples- Introduction, classifying instruction set- memory addressing-type and size of operands, operations in the instruction set.

UNIT-II PIPELINES& MEMORY HIERARCHY DESIGN

Introduction, basic RISC instruction set, Simple implementation of RISC instruction set, Classic five stage pipe line for RISC processor, Basic performance issues in pipelining, Pipeline hazards, Reducing pipeline branch penalties. Memory Hierarchy Design: Introduction, review of ABC of cache, Cache performance, Reducing cache miss penalty, Virtual memory.

UNIT-III INSTRUCTION LEVEL PARALLELISM THE HARDWARE APPROACH& ILP SOFTWARE APPROACH

Instruction Level Parallelism the Hardware Approach: Instruction-Level parallelism, Dynamic scheduling, Dynamic scheduling using Tomasulo's approach, Branch prediction, high performance instruction delivery- hardware based speculation. ILP Software Approach: Basic compiler level techniques, static branch prediction, VLIW approach, Exploiting ILP, Parallelism at compile time, Cross cutting issues -Hardware verses Software.

UNIT-IV MULTI PROCESSORS AND THREAD LEVEL PARALLELISM

Multi Processors and Thread level Parallelism- Introduction, Characteristics of application domain, Systematic shared memory architecture, Distributed shared - memory architecture, Synchronization.

UNIT-V INTER CONNECTION AND NETWORKS

Introduction, Interconnection network media, Practical issues in interconnecting networks, Examples of inter connection, Cluster, Designing of clusters. Intel Architecture: Intel IA- 64 ILP in embedded and mobile markets Fallacies and pit falls

TEXT BOOKS:

1. John L. Hennessy, David A. Patterson, "Computer Architecture: A Quantitative Approach", 3rd Edition, Elsevier.



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REFERENCE BOOKS:

1. John P. Shen and Miikko H. Lipasti, "Modern Processor Design: Fundamentals of Super Scalar Processors", 2002, Beta Edition, McGraw-Hill
2. Kai Hwang, Faye A.Brigs., "Computer Architecture and Parallel Processing", McGraw Hill.
3. Dezsó Sima, Terence Fountain, Peter Kacsuk, "Advanced Computer Architecture - A Design Space Approach", Pearson Education.

e-Resources and Digital Material:

1. Advanced Computer Architecture - BEC001 - KTU - Studocu

COURSE OUTCOMES:

1. Familiarize the instruction set, memory addressing of Computer
2. Handle the issues in pipelining and parallelism
3. Familiarize the practical issues in inter network
4. Analyze multiprocessor architectures and thread-level parallelism for high-performance computing.
5. Evaluate interconnection networks and cluster architectures for scalable computing systems.



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(25D55104C) EMBEDDED SYSTEMS FOR AUTOMOBILE APPLICATIONS

Course Category	Professional Elective (PE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

UNIT-I ELECTRONICS IN AUTOMOTIVE

Introduction Body and convenience electronics: vehicle power supply controllers and lighting modules, door control modules, Safety electronics: active safety systems: ABS, ASR, ESP passive safety systems: Restraint systems and their associated sensors in an automobile.

UNIT-II POWER TRAIN ELECTRONICS

Gasoline engine management, Infotainment electronics: Dashboard/instrument cluster, car audio, telematic systems, navigation systems, multimedia systems, cross application technologies. 42V vehicle power supply system.

UNIT-III DRIVE BY WIRE

Challenges and opportunities of X-by-wire: system & design requirements steer-by-wire, brake-by-wire, suspension-by-wire, gas by-wire, power-by wire, shift by-wire. Future of Automotive Electronics.

UNIT-IV HARDWARE MODULES

MC9S12XD family features-Modes of operation-functional block diagram overview-programming model. Memory Map Overview Pulse Width Modulator (PWM)-On-chip ADC Serial Communication Protocol: SCI, SPI,IIC, CAN

UNIT-V SOFTWARE DEVELOPMENT TOOLS

Introduction to HCS12XDT512 Student Learning Kit & PBMCU (Project Board), Introduction to Code Warrior IDE-Editing Debugging-Simulating simple programs. Flashing code into HCS12XDT512 SLK board and testing. Integration of Software and Hardware-Downloading the Software from Host Machine to Target Machine.

TEXT BOOKS:

1. Werner Klingenstein; Semiconductors-Technical Information Technologies and characteristic data Publicis Corporate Publishing, 2 nd revised edition 2004.
2. Ronald K Jurgen, Automotive Electronics Handbook; McGraw Hill, 2nd edition 1999.

REFERENCE BOOKS:



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1. Werner Klingenstein & Team, Technical Information, Technologies and Characteristic Data- Publicis Corporate Publishing 2nd edition 2004.
2. LjuboVlacic, Michel Parent &Furnio Harshima, Intelligent Vehicle Technologies: Theory and Applications Butterworth-Heinemann publications200.

e-Resources and Digital Material:

1. <https://www.vturesource.com/vtu-m-tech-yllabus/MAU/2020/3/20MAU321>

COURSE OUTCOMES:

1. Explain basics of Automotive Embedded system concepts
2. Understanding the system and design requirements
3. Select embedded system in automobiles
4. Use hardware and usage software in Automotive Embedded System
5. Use different software development tools



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DEPARTMENT OF ECE - EMBEDDED SYSTEMS

M.Tech. I Sem.

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(25D55105) EMBEDDED SYSTEM DESIGN LAB

Course Category	Professional Core course (PC)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

PART A

Using Embedded C

Note: Any 6 Programs form the following

1. Write a simple program to print "hello world"
2. Write a simple program to show a delay.
3. Write a loop application to copy values from P1 to P2
4. Write a c program for counting the no of times that a switch is pressed & released.
5. Use of port header file (port M) using an interface consisting of a keypad and liquid crystal display.
6. Write a program to create a portable hardware delay.
7. Write a c program to test loop time outs.
8. Write a c program to test hardware-based timeout loops.
9. Develop a simple EOS showing traffic light sequencing.

Write a program to display elapsed time over RS-232 link

PART B

Note. Any 6 Programs from the following (Experiment 1 is Mandatory)

1. A Study of Code Composer Studio (CC Studio Latest Version)
2. Flashing a light by a software delay.



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3. Displaying Characters on LCD.
4. Serial Communication using UART.
5. Basic Input and Output using MSP430 UART.
6. Interrupt Handling using MSP430.
7. Analog to Digital Conversion using MSP430.
8. Interfacing external Devices to GPIO Ports

Equipment Required:

1. Computer with latest configurations
2. Code Composer Studio v6.1 (Preferably Latest version)
3. MSP430/ARM based Hardware kits and add-on boards

COURSE OUTCOMES:

1. Familiarize with embedded systems programming concepts
2. Implement different embedded communication and interfacing protocols



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L T P C
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(25D55106) EMBEDDED PROGRAMMING LAB

Course Category	Professional Core course (PC)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

LIST OF EXPERIMENTS

Embedded C programming and testing using 8051 advanced development board and KEIL tools.

Program to perform

- i. Arithmetic operations.
- ii. Sorting of numbers.
 - a. Program to shift LEDs Left and right.
 - b. Program for DIP switch interface.
 - c. Program to display message in LCD 8-bit mode.
 - d. Program to display picture in GLCD 128X64.
 - e. Program to send data serially through serial port.
 - f. Program to display I2C RTC(DS1307) to Hyper terminal window.
 - g. Program to display digital temperature sensor output.
 - h. Program for 4X4 matrix keyboard with LCD.
 - i. Program to interface stepper motor.
 - j. Program to interface relay.

Embedded C programming and testing using LPC2148 development kit (Real time environment)

1. Program to interface LED and implement multi-tasking.



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2. Program to display RTC-ADC on LCD.

Program to display message on GLCD
Software Requirements: Keil for C51, Keil for ARM
Hardware Requirements: 8051 Development boards, LPC2148 Development boards.

COURSE OUTCOMES:

1. Understand the concepts of Embedded C programming
2. Implement given program on 8051 microcontrollers
3. Implement given program on LPC2148 microcontroller

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M.Tech. I Sem.

L	T	P	C
2	0	0	2

(25D57107) RESEARCH METHODOLOGY AND IPR

Course Category	Mandatory Course (credit)
Course Enrichment Relevance	Professional Ethics

COURSE OBJECTIVES:**UNIT-I FUNDAMENTALS OF RESEARCH METHODOLOGY**

Overview of research process and design - Types of Research - Approaches to Research (Qualitative vs Quantitative) - Observation studies, Experiments and Surveys - Use of Secondary and exploratory data to answer the research question - Importance of Reasoning in Research and Research ethics - Documentation Styles (APA/IEEE etc.) - Plagiarism and its consequences

UNIT-II DATA COLLECTION AND SOURCES

Importance of Data Collection - Types of Data - Data Collection Methods - Data Sources - primary, secondary and Big Data sources - Data Quality & Ethics - Tools and Technology for Data Collection

UNIT-III DATA ANALYSIS AND REPORTING

Overview of Multivariate analysis - Experimental research, cause-effect relationship, and development of hypotheses- Measurement systems analysis, error propagation, and validity of experiments - Guidelines for writing abstracts, introductions, methodologies, results, and discussions - Writing Research Papers & proposals

UNIT-IV UNDERSTANDING INTELLECTUAL PROPERTY RIGHTS

Intellectual Property - The concept of IPR, Evolution and development of concept of IPR, IPR development process, Trade secrets, utility Models, IPR & Bio diversity, Role of WIPO and WTO in IPR establishments, Right of Property, Common rules of IPR practices, Types and Features of IPR Agreement, Trademark, Functions of UNESCO in IPR maintenance

UNIT-V PATENTS

Patents - objectives and benefits of patent, Concept, features of patent, Inventive step, Specification - Types of patent application, process E-filing, Examination of patent, Grant of patent, Revocation, Equitable Assignments, Licenses, Licensing of related patents, patent agents, Registration of patent agents

TEXT BOOKS:

1. Stuart Melville and Wayne Goddard, Research Methodology: An introduction for Science & Engineering students, Juta and Company Ltd, 2004
2. Catherine J. Holland, Intellectual property: Patents, Trademarks, Copyrights, Trade Secrets, Entrepreneur Press, 2007.



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REFERENCE BOOKS:

1. Cooper Donald R, Schindler Pamela S and Sharma JK, "Business Research Methods", Tata McGraw Hill Education 11e (2012).
2. Ranjit Kumar , Resea David Hunt, Long Nguyen, Matthew Rodgers, "Patent searching: tools & techniques", Wiley, 2007.
3. Deborah E. Bouchoux , Intellectual Property: The Law of Trademarks, Copyrights, Patents, and Trade Secrets, 6th Edition, Cengage 2024
4. Wayne C. Booth, Gregory G. Colomb, Joseph M. Williams, The Craft of Research, 5th Edition, University of Chicago Press, 2024
5. The Institute of Company Secretaries of India, Statutory body under an Act of parliament, "Professional Programme Intellectual Property Rights, Law and practice", September 2013.
6. Peter Elbow, Writing With Power, Oxford University Press, 1998.

e-Resources and Digital Material:

1. Coursera / edX - Research Methodology and Data Analysis courses
2. Springer Link & ScienceDirect - Latest journals on research design and statistics
3. Google Scholar - Free access to research papers
4. NCBI Bookshelf - Open-access research methodology resources
5. Khan Academy (Statistics & Probability) - For fundamentals of hypothesis testing, regression, and ANOVA.

COURSE OUTCOMES:

1. Recall key concepts and terminology related to research design, data collection, and intellectual property rights.
2. Explain the importance of research design and data analysis in research studies, and describe the concept of intellectual property rights.
3. Design a research study, including data collection and analysis methods, and apply intellectual property rights principles to protect research findings.
4. Analyze research studies to identify strengths and limitations, and evaluate the effectiveness of data collection and analysis methods.
5. Assess the impact of intellectual property rights on research and innovation, and evaluate the effectiveness of research designs and methods.
6. Develop a comprehensive research plan, including a detailed research design, data collection and analysis methods, and a plan for protecting intellectual property.



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DEPARTMENT OF ECE - EMBEDDED SYSTEMS

M.Tech. I Sem.

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(25D55107) EMBEDDED LINUX

Course Category	Skill Oriented Course (SC)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

COURSE OUTCOMES:

1. Midterm short answers, quizzes, lecture-based assignments.
2. Lab assignments (Buildroot/Yocto exercise), a submitted cross-build (rootfs + app).
3. Driver implementation lab + demo; graded by functionality, code quality, documentation.
4. Debugging lab tasks with logs and a written troubleshooting report.
5. Mini-project showing real-time behavior and system-level integration.



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M.Tech. I Sem.

L	T	P	C
2	0	0	0

(25D57109A) ENGLISH FOR RESEARCH PAPER WRITING

Course Category	Mandatory Course (Non-credit)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. Understand the essentials of writing skills and their level of readability
2. Learn about what to write in each section
3. Ensure qualitative presentation with linguistic accuracy

UNIT-I OVERVIEW OF A RESEARCH PAPER

Overview of a Research Paper- Planning and Preparation- Word Order- Useful Phrases - Breaking up Long Sentences-Structuring Paragraphs and Sentences-Being Concise and Removing Redundancy -Avoiding Ambiguity

UNIT-II ESSENTIAL COMPONENTS OF A RESEARCH PAPER

Essential Components of a Research Paper- Abstracts- Building Hypothesis-Research Problem - Highlight Findings- Hedging and Criticizing, Paraphrasing and Plagiarism, Cauterization

UNIT-III INTRODUCING REVIEW OF THE LITERATURE

Introducing Review of the Literature? Methodology - Analysis of the Data-Findings - Discussion-Conclusions-Recommendations.

UNIT-IV SKILLS FOR WRITING PAPER

Key skills needed for writing a Title, Abstract, and Introduction.

UNIT-V APPROPRIATE LANGUAGE TO FORMULATE METHODOLOGY

Appropriate language to formulate Methodology, incorporate Results, put forth Arguments and draw Conclusions.

TEXT BOOKS:

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books) Model Curriculum of Engineering & Technology PG Courses [Volume-I]
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman"sbook
4. Adrian Wallwork, English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

COURSE OUTCOMES:



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1. Understand the significance of writing skills and the level of readability
2. Analyze and write title, abstract, different sections in research paper
3. Develop the skills needed while writing a research paper



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DEPARTMENT OF ECE - EMBEDDED SYSTEMS

M.Tech. I Sem.

L T P C
2 0 0 0

(25D57109C) DISASTER MANAGEMENT

Course Category	Mandatory Course (Non-credit)
Course Enrichment Relevance	Skill Development

COURSE OBJECTIVES:

1. Learn to demonstrate critical understanding of key concepts in disaster risk reduction and humanitarian response
2. Critically evaluate disaster risk reduction and humanitarian response policy and practice from Multiple perspectives
3. Develop and understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations
4. Critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in

UNIT-I INTRODUCTION & DISASTER PRONE AREAS IN INDIA

Disaster: Definition, Factors and Significance; Difference Between Hazard and Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude. Study of Seismic Zones; Areas Prone to Floods and Droughts, Landslides and Avalanches; Areas Prone to Cyclonic and Coastal Hazards with Special Reference to Tsunami; Post- Disaster Diseases and Epidemics

UNIT-II REPERCUSSIONS OF DISASTERS AND HAZARDS

Economic Damage, Loss of Human and Animal Life, Destruction of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts and Famines, Landslides and Avalanches, Man-made disaster: Nuclear Reactor Meltdown

UNIT-III DISASTER PREPAREDNESS AND MANAGEMENT

Preparedness: Monitoring of Phenomena Triggering, A Disaster Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological and Other Agencies, Media Reports: Governmental and Community Preparedness

UNIT-IV RISK ASSESSMENT DISASTER RISK

Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation in Risk Assessment and Warning, People? Participation in Risk Assessment. Strategies for Survival.

UNIT-V DISASTER MITIGATION

Meaning, Concept and Strategies of Disaster Mitigation, Emerging Trends in Mitigation. Structural Mitigation and Non-Structural Mitigation, Programs of Disaster Mitigation in India



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TEXT BOOKS:

1. R. Nishith, SinghAK, Disaster Management in India: Perspectives, issues and strategies
2. New Royal book Company. Sahni, PardeepEt.Al. (Eds.), Disaster Mitigation Experiences And Reflections, Prentice Hall Of India, New Delhi.
3. Goel S. L., Disaster Administration and Management Text And Case Studies, Deep & Deep Publication Pvt. Ltd., New Delhi.

COURSE OUTCOMES:

1. Students will be able to define and differentiate between hazards and disasters, understand their causes, types, and magnitudes, and recognize disaster-prone areas in India.
2. Learners will be able to assess the economic, environmental, and social repercussions of both natural and man-made disasters, including their effects on ecosystems and human/animal life.
3. Students will gain knowledge on disaster preparedness techniques, including monitoring, risk evaluation, and the use of technologies such as remote sensing and meteorological data for early warning and management
4. Learners will be equipped to analyze disaster risk components, apply risk assessment methodologies, and understand global and national efforts toward disaster risk reduction with community participation.
5. Students will be able to design and apply structural and non-structural mitigation measures, understand ongoing mitigation programs in India, and propose effective strategies for sustainable disaster management.

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DEPARTMENT OF ECE - EMBEDDED SYSTEMS

M.Tech
II-Semester Course Structure



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DEPARTMENT OF ECE - EMBEDDED SYSTEMS

M.Tech. II Sem. - Course Structure

S.No	Subject Code	Course Category	Name of the Subject	Hours/Week			Credits	Marks		
				Lecture	Tutorial	Practical		Internal	External	Total
1	25D55201	PC	ARM MICROCONTROLLER ARCHITECTURE AND PROGRAMMING	3	0	0	3	40	60	100
2	25D55202	PC	ADVANCED IOT AND ITS APPLICATIONS	3	0	0	3	40	60	100
3	25D55203A	PE	EMBEDDED NETWORKS (PE-III)	3	0	0	3	40	60	100
4	25D55203B	PE	FPGA BASED SYSTEM DESIGN (PE-III)	3	0	0	3	40	60	100
5	25D57203E	PE	MEMS AND NEMS (PE-III)	3	0	0	3	40	60	100
6	25D55204A	PE	HARDWARE AND SOFTWARE CO-DESIGN (PE-IV)	3	0	0	3	40	60	100
7	25D55204B	PE	EMBEDDED SENSING, ACTUATION AND INTERFACING SYSTEMS (PE-IV)	3	0	0	3	40	60	100
8	25D55204C	PE	EMBEDDED OS & RTOS (PE-IV)	3	0	0	3	40	60	100
9	25D55205	PC	ARM MICROCONTROLLERS LAB	3	0	0	3	40	60	100
10	25D57207		QUANTUM TECHNOLOGIES AND APPLICATIONS	2	0	0	2	40	60	100
11	25D57209A	MC(NC)	ENTREPRENEURSHIP ESSENTIALS (AC-II)	2	0	0	0	40	0	40
12	25D57209B	PE	PEDAGOGY STUDIES (AC-II)	2	0	0	0	40	0	40
13	25D57209C	PE	YOGA FOR STRESS MANAGEMENT (AC-II)	2	0	0	0	40	0	40
14	25D57209D	MC(NC)	CONSTITUTION OF INDIA (AC-II)	2	0	0	0	40	0	40

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DEPARTMENT OF ECE - EMBEDDED SYSTEMS

M.Tech
II -Semester Syllabus

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M.Tech. II Sem.

L	T	P	C
3	0	0	3

(25D55201) ARM MICROCONTROLLER ARCHITECTURE AND PROGRAMMING

Course Category	Professional Core course (PC)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:**UNIT-I ARM EMBEDDED SYSTEMS**

ARM Embedded Systems: RISC design philosophy, ARM design philosophy, Embedded system hardware, Embedded system software. ARM Processor Fundamentals: Registers, Current Program Status Register, Pipeline, Exceptions, Interrupts and Vector Table, Core Extensions, Architecture Revisions, ARM Families.

UNIT-II ARCHITECTURE OF ARM PROCESSORS

Architecture of ARM Processors: Introduction to the architecture, Programmer's model-operation modes and states, registers, special registers, floating point registers, Behaviour of the application program status register(APSR)-Integer status flags, Q status flag, GE bits, Memory system-Memory system features, memory map, stack memory, memory protection unit (MPU), Exceptions and Interrupts-what are exceptions, nested vectored interrupt controller(NVIC), vector table, Fault handling, System control block (SCB), Debug, Reset and reset sequence.

UNIT-III INTRODUCTION TO THE ARM INSTRUCTION SET

Introduction to the Arm Instruction Set: Data processing instructions, branch instructions, load-store instructions, software interrupt instructions, program status register instructions, loading constants, ARMv5E extensions, Conditional execution. Introduction to the Thumb Instruction Set: Thumb Register Usage, ARM \square Thumb Interworking, Other Branch Instructions, Data Processing Instructions, Single-Register Load-Store Instructions, Multiple Register Load-Store Instructions, Stack Instructions, Software Interrupt Instruction.

UNIT-IV TECHNICAL DETAILS OF ARM CORTEX M PROCESSORS

Technical Details of ARM Cortex M Processors General information about Cortex-M3 and cortex M4 processors-Processor type, processor architecture, instruction set, block diagram, memory system, interrupt and exception support, Features of the cortex-M3 and Cortex-M4 Processors- Performance, code density, low power, memory system, memory protection unit, interrupt handling, OS support and system level features, Cortex-M4 specific features, Ease of use, Debug support, Scalability, Compatibility.



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UNIT-V INSTRUCTION SET OF ARM CORTEX M

Instruction SET of ARM Cortex M Background to the instruction set in ARM Cortex-M Processors, Comparison of the instruction set in ARM Cortex-M Processors, understanding the assembly language syntax, Use of a suffix in instructions, Unified assembly Language (UAL), Instruction set, Cortex-M4- specific instructions, Barrel shifter, Accessing special instructions and special registers in Programming.

TEXT BOOKS:

1. Andrew N. SLOSS, Dominic SYMES, Chris WRIGHT- ARM System Developers Guide Designing and Optimizing System Software, Elsevier Publications, 2004
2. Joseph Yiu, The Definitive Guide to ARM Cortex-M3 and Cortex-M4 Processors by Elsevier Publications, 3rd Ed.

COURSE OUTCOMES:

1. Understand the fundamentals of ARM embedded systems, including RISC design philosophy, processor fundamentals, and core extensions.
2. Analyze the architecture of ARM processors, including the programmer's model, memory system, exceptions, interrupts, and system control features
3. Implement assembly-level programming using the ARM instruction set and Thumb instruction set, exploring data processing, branching, and load-store instructions
4. Evaluate the technical details of ARM Cortex-M processors, including performance, memory systems, interrupt handling, and system-level features.
5. Develop programs using the ARM Cortex-M instruction set, including special instructions, barrel shifter, and unified assembly language (UAL).



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DEPARTMENT OF ECE - EMBEDDED SYSTEMS

M.Tech. II Sem.

L	T	P	C
3	0	0	3

(25D55202) ADVANCED IOT AND ITS APPLICATIONS

Course Category	Professional Core course (PC)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

UNIT-I IOT& WEB TECHNOLOGY

Fundamentals of IoT-The Internet of Things Today, Time for Convergence, towards the IoT Universe, Internet of Things Vision, IoT Strategic Research and Innovation Directions, IoT Applications, Future Internet Technologies, Infrastructure, Networks and Communication, Processes, Data Management, Security, Privacy & Trust, Device Level Energy Issues, IoT Related Standardization, Recommendations on Research Topics.

UNIT-II M2M TO IOT

IoT PROTOCOLS-A Basic Perspective- Introduction, Some Definitions, M2M Value Chains, IoT Value Chains, an emerging industrial structure for IoT, M2M to IoT-An Architectural Overview- Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations.

UNIT-III IMPLEMENTATION OF IOT

Introduction to Arduino Programming, Integration of Sensors and Actuators with Arduino, introduction to Python programming, Introduction to Raspberry Pi, Implementation of IoT with Raspberry Pi, Introduction to SDN, SDN for IoT, Data Handling and Analytics, Cloud Computing.

UNIT-IV IOT APPLICATIONS

cloud computing, sensor-cloud, Fog computing, smart cities and smart homes, connected vehicles, smart Grid, industrial IoT, case study: agriculture, healthcare activity Monitoring.

UNIT-V INTERNET OF THINGS PRIVACY, SECURITY AND GOVERNANCE

Introduction, Overview of Governance, Privacy and Security Issues.Security, Privacy and Trust in IoT-Data-Platforms for Smart Cities, First Steps Towards a Secure Platform, Smartie Approach. Data Aggregation for the IoT in Smart Cities, Security.

TEXT BOOKS:

1. Vijay Madiseti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)", 1st Ed, VPT, 2014.
2. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1stEdition, Apress Publications, 2013.

REFERENCE BOOKS:



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1. The Internet of Things - Key applications and Protocols, Olivier Hersent, David Boswarthick, Wiley.
2. Cuno P fister, "Getting Started with the Internet of Things", O Reilly Media, 2011.

COURSE OUTCOMES:

1. Understand the fundamentals of IoT, including web technologies, infrastructure, communication networks, security, privacy, and IoT standardisation.
2. Analyze the transition from M2M to IoT, understand IoT protocols, and design IoT architectures based on industrial standards
3. Implement IoT applications using Arduino and Raspberry Pi, integrating sensors and actuators, and exploring SDN, data analytics, and cloud computing.
4. Evaluate various IoT applications, including cloud computing, smart cities, smart homes, industrial IoT, and case studies in agriculture and healthcare.
5. Assess privacy, security, and governance challenges in IoT, ensuring data protection, trust, and secure platform development for smart city applications.

**SANTHIRAM ENGINEERING COLLEGE****(AUTONOMOUS)****DEPARTMENT OF ECE - EMBEDDED SYSTEMS**

M.Tech. II Sem.

L	T	P	C
3	0	0	3

(25D55203A) EMBEDDED NETWORKS (PE-III)

Course Category	Professional Elective (PE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:**UNIT-I EMBEDDED COMMUNICATION PROTOCOLS**

Embedded Networking: Introduction -Serial/Parallel Communication -Serial communication protocols -RS232 standard - RS485 - Synchronous Serial Protocols - Serial Peripheral Interface (SPI) Inter-Integrated Circuits (I2C) -PC Parallel port programming - ISA/PCI Bus protocols - Firewire

UNIT-II USB AND CAN-BUS

USB bus -Introduction - Speed Identification on the bus - USB States - USB bus communication Packets -Data flow types -Enumeration -Descriptors -PIC 18 Microcontroller USB Interface -C Programs -CAN Bus -Introduction - Frames -Bit stuffing -Types of errors -Nominal Bit Timing - PIC microcontroller CAN Interface -A simple application with CAN.

UNIT-III ETHERNET BASICS AND EMBEDDED ETHERNET

Elements of a network Inside Ethernet, Building a Network: Hardware options Cables, Connections and network speed, Design choices:Selecting components, Ethernet Controllers, Using the internet in local and internet communications Inside the Internet protocol. Exchanging messages using UDP and TCP, Serving web pages with Dynamic Data Serving web pages that respond to user Input, Email for Embedded Systems Using FTP Keeping Devices and Network secure.

UNIT-IV WIRELESS EMBEDDED NETWORKING

Wireless sensor networks - Introduction -Applications - Network Topology - Localization - Time Synchronization - Energy efficient MAC protocols -SMAC - Energy efficient and robust routing - Data Centric routing

UNIT-V MODELS

Computation models, Introduction, Sequential program model, State machine model, Concurrent process model, Other models.

TEXT BOOKS:

1. Embedded Systems Design: A Unified Hardware/Software Introduction - Frank Vahid, Tony Givargis, John & Wiley Publications, 2002
2. Parallel Port Complete: Programming, interfacing and using the PCs parallel printer port - Jan Axelson, Penram Publications, 1996. Reference Books



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REFERENCE BOOKS:

1. Advanced PIC microcontroller projects in C: from USB to RTOS with the PIC18F series -Dogan Ibrahim, Elsevier
2. Embedded Ethernet and Internet Complete - Jan Axelson, Penram publications, 2003.
3. Networking Wireless Sensors - Bhaskar Krishnamachari, Cambridge press 2005

e-Resources and Digital Material:

1. [https://lp.emmem.com/lp/embedded networks-course](https://lp.emmem.com/lp/embedded-networks-course)

COURSE OUTCOMES:

1. Understand embedded communication protocols such as RS232, RS485, SPI, I2C, PCI, and Firewire for data communication.
2. Analyze the architecture and working of USB and CAN bus protocols, including their communication mechanisms and error handling techniques.
3. Implement Ethernet-based networking solutions, understand TCP/IP communication, and design embedded web-based applications
4. Evaluate wireless embedded networking concepts, including wireless sensor networks, MAC protocols, and energy-efficient routing techniques
5. Apply different computation models such as sequential, state machine, and concurrent process models in embedded network design.

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M.Tech. II Sem.

L	T	P	C
3	0	0	3

(25D55203B) FPGA BASED SYSTEM DESIGN (PE-III)

Course Category	Professional Elective (PE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:**UNIT-I INTRODUCTION TO FPGA-BASED SYSTEMS**

Introduction, basic concepts, digital design and FPGAs, FPGA-based system design, FPGA architectures, SRAM-based FPGAs, permanently programmed FPGAs, chip I/O, circuit design of FPGA fabrics, architecture of FPGA fabrics.

UNIT-II COMBINATIONAL LOGIC DESIGN IN FPGAS

Introduction, the logic design process, hardware description languages -modeling with HDLs, Verilog, Combinational network delay, power and energy optimization, arithmetic logic, logic implementation for FPGAs, physical design for FPGAs, the logic design process revisited

UNIT-III SEQUENTIAL LOGIC AND STATE MACHINES

Introduction, the sequential machine design process, sequential design styles, rules for clocking, performance analysis, power optimization

UNIT-IV DESIGN METHODOLOGIES AND BEHAVIORAL ARCHITECTURE

Introduction, behavioral design, design methodologies, design example.

UNIT-V SYSTEM-LEVEL DESIGN AND ADVANCED FPGA APPLICATIONS

Introduction, buses, platform FPGAs, multi-FPGA systems, Novel architectures

TEXT BOOKS:

1. Wolf, Wayne. FPGA-Based System Design. Pearson Education India, 2005.

REFERENCE BOOKS:

1. Maxfield, Clive. The Design Warrior's Guide to FPGAs: Devices, Tools and Flows. Newnes, 1st ed., 2004.
2. Trimberger, Stephen M. Field-Programmable Gate Array Technology. Springer Science & Business Media, 2012.
3. Kuon, Ian, Russell Tessier, and Jonathan Rose. FPGA Architecture: Survey and Challenges. Now Publishers Inc., 2007.
3. Kuon, Ian, Russell Tessier, and Jonathan Rose. FPGA Architecture: Survey and Challenges. Now Publishers Inc., 2007.

e-Resources and Digital Material:

1. <https://eeeforum.weebly.com/uploads/1/0/2/5/10254481/fpga1.pdf>



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COURSE OUTCOMES:

1. Explain the architectural features and functional components of FPGA-based systems and describe their advantages in digital design applications.
2. Design combinational logic circuits using Verilog HDL and evaluate them for delay, power, and resource utilization on FPGA platforms.
3. Develop and simulate sequential logic circuits and finite state machines using appropriate design styles and clocking rules
4. Apply behavioral design methodologies and demonstrate system modeling using HDLs in realworld case studies.
5. Analyze and propose solutions for large-scale FPGA-based systems involving busses, platform FPGAs, and multi-FPGA architectures

**SANTHIRAM ENGINEERING COLLEGE****(AUTONOMOUS)****DEPARTMENT OF ECE - EMBEDDED SYSTEMS**

M.Tech. II Sem.

L	T	P	C
3	0	0	3

(25D57203E) MEMS AND NEMS (PE-III)

Course Category	Professional Elective (PE)
Course Enrichment Relevance	Professional Ethics

COURSE OBJECTIVES:**UNIT-I INTRODUCTION TO MEMS AND NEMS**

MEMS and NEMS definitions, Taxonomy of Nano-and Microsystems-Synthesis and Design. Classification and considerations, Biomimetics, Biological analogies, and design???Biomimetics Fundamentals, Biomimetics for NEMS and MEMS, Nano-ICs and Nano computer architectures

UNIT-II MODELING OF MICRO AND NANO SCALE ELECTROMECHANICAL SYSTEMS

Introduction to modelling, analysis and simulation, basic electro-magnetic with application to MEMS and NEMS, modeling developments of micro-and nano actuators using electromagnetic-Lumped-parameter mathematical models of MEMS, energy conversion in NEMS and MEMS

UNIT-III MEMS FABRICATION TECHNOLOGIES

Microsystem fabrication processes: Photolithography, Ion Implantation, Diffusion, Oxidation. Thin film depositions: LPCVD, Sputtering, Evaporation, Electroplating; Etching techniques: Dry and wet etching, electrochemical etching.

UNIT-IV MICROMACHINING

Micromachining: Bulk Micromachining, Surface Micromachining, High Aspect-Ratio (LIGA and LIGA-like) Technology; Packaging: Microsystems packaging, Essential packaging technologies, Selection of packaging materials

UNIT-V NANOSYSTEMS AND QUANTUM MECHANICS

Atomic Structures and Quantum Mechanics, Molecular and Nanostructure Dynamics: Shrodinger Equation and Wavefunction Theory, Density Functional Theory, Nanostructures and Molecular Dynamics, Electromagnetic Fields and their quantization, Molecular Wires and Molecular Circuits.

TEXT BOOKS:

1. Sergey Edward Lyshevski, Lyshevski Edward Lyshevski, Nano-Electro Mechanical and Micro-Electro Mechanical Systems, Fundamental of Nano-and Micro-Engineering 2005, 2nd Ed., CRC Press.
2. A. S. Edelstein and Cammarata, Nanomaterials: Synthesis, Properties and Applications, 2002, Institute of Physics, Bristol, Philadelphia



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DEPARTMENT OF ECE - EMBEDDED SYSTEMS

REFERENCE BOOKS:

1. Kalantar-ZadehK, Nanotechnology Enabled Sensors, 2008, Springer.
2. Serge Luryi, Jimmy Xu, Alex Zaslavsky, Future trends in MicroElectronics, 2007, John Wiley & Sons, Inc. Hoboken, New Jersey
3. https://onlinecourses.nptel.ac.in/noc22_ee36/preview

COURSE OUTCOMES:

1. Acquire the knowledge of Nano- and Microsystems.
2. Identify the methods of modeling of micro and nano scale electromechanical
3. Ability to design the micro devices, micro systems using the MEMS fabrication process.
4. Gain a knowledge of basic approaches for micromachining
5. Develop experience on micro/nano systems for photonics.



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DEPARTMENT OF ECE - EMBEDDED SYSTEMS

M.Tech. II Sem.

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(25D55204A) HARDWARE AND SOFTWARE CO-DESIGN (PE-IV)

Course Category	Professional Elective (PE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

UNIT-I CO- DESIGN ISSUES

Co- Design Issues: Co- Design Models, Architectures, Languages, A Generic Co design Methodology. Co- Synthesis Algorithms, Hardware software synthesis algorithms: hardware ??? software partitioning distributed system co- synthesis

UNIT-II PROTOTYPING AND EMULATION

Prototyping and Emulation: Prototyping and emulation techniques, prototyping and emulation environments, future developments in emulation and prototyping architecture specialization techniques, system communication infrastructure.

UNIT-III TARGET ARCHITECTURES

Target Architectures: Architecture Specialization techniques, System Communication infrastructure, Target Architecture and Application System classes, Architecture for control dominated systems (8051-Architectures for High performance control), Architecture for Data dominated systems (ADSP21060, TMS320C60), Mixed Systems.

UNIT-IV COMPILATION TECHNIQUES AND TOOLS FOR EMBEDDED PROCESSOR ARCHITECTURES

Compilation Techniques and Tools for Embedded Processor Architectures: Modern embedded architectures, embedded software development needs, compilation technologies, practical consideration in a compiler development environment.

UNIT-V DESIGN SPECIFICATION AND VERIFICATION

Design Specification and Verification: Design, co-design, the co-design computational model, concurrency coordinating concurrent computations, interfacing components, design verification, implementation verification, verification tools, interface verification.

TEXT BOOKS:

1. Hardware / Software Co- Design Principles and Practice ??? Jorgen Staunstrup, Wayne Wolf ??? Springer, 2009.
2. Hardware / Software Co- Design - Giovanni De Micheli, Mariagiovanna Sami, Kluwer Academic Publishers, 2002.

REFERENCE BOOKS:

1. 1.A Practical Introduction to Hardware/Software Co-design -Patrick R. Schaumont, Springer, 2010



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COURSE OUTCOMES:

1. Understand the fundamental issues in hardware-software co-design, including co-design models, architectures, languages, and methodologies for partitioning and synthesis.
2. Analyze prototyping and emulation techniques, environments, and future trends in architecture specialization and system communication infrastructure.
3. Evaluate different target architectures for control-dominated, data-dominated, and mixed systems, including 8051, ADSP21060, and TMS320C60 architectures
4. Apply compilation techniques and tools for embedded processor architectures, considering modern embedded architectures and software development needs.
5. Demonstrate expertise in design specification and verification, addressing concurrency, interfacing, and verification tools for ensuring system correctness



M.Tech. II Sem.

L	T	P	C
3	0	0	3

(25D55204B) EMBEDDED SENSING, ACTUATION AND INTERFACING SYSTEMS (PE-IV)

Course Category	Professional Elective (PE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

UNIT-I FUNDAMENTALS OF EMBEDDED SENSING AND ACTUATION SYSTEMS

Fundamentals of Embedded Sensing and Actuation Systems :

Overview of embedded system; Importance of sensors, actuators and interfacing circuits in embedded control system; Characteristics; Applications. Embedded Sensors and Actuators: Various types of important sensors, actuators and their working principles: e.g, thermal, mechanical, electrical, magnetic, optical, smart material and meta material based.

UNIT-II INTERFACING AND COMMUNICATION OF SENSORS AND ACTUATORS

Unit-II: Interfacing and Communication of Sensors and Actuators Interfacing Aspects of Sensors and Actuators to Embedded Controller and their Communication Protocols: Signal conditioning circuits; Op-Amp based interfacing circuit implementation; Various Serial Communication protocols for interfacing. Advancement in Interfacing Schemes of Resistive Sensors for Linearity Improvement and Error Reduction: Resistive sensor examples; non-idealities in basic interfacing circuits; Linearization techniques; Error reduction schemes due to environmental effects and remote communication

UNIT-III ADVANCED DIRECT INTERFACING TECHNIQUES

Advanced Techniques for Direct Interfacing of Resistive Sensors with Embedded controller: Embedded controller-based excitation system; Direct interfacing schemes of various resistive sensors topologies to microcontrollers; Interfacing scheme for sensor array. Advanced Techniques for Direct Interfacing of Capacitive Sensors with Embedded Controller: Capacitive sensor examples; Interfacing scheme for different capacitive sensor configurations; Direct interfacing schemes Advancement in Design of Interfacing Circuits for Lossy Capacitive Sensors: Lossy Capacitive sensor characteristics; Various advanced interfacing schemes for lossy capacitive sensor.

UNIT-IV MINIATURIZED AND MEMS-BASED SMART SENSORS AND ACTUATORS

Miniaturized Smart Sensors and Actuators: Miniaturized device fabrication technology; Various types of important MEMS sensors and actuators, their design and operation. Interfacing electronics for miniaturized sensors and actuators: Integration techniques; System-on-Chip integration for various MEMS sensors and actuators; Applications.??



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DEPARTMENT OF ECE - EMBEDDED SYSTEMS

UNIT-V EMERGING TRENDS AND APPLICATIONS OF EMBEDDED SENSOR/ACTUATOR SYSTEMS

Renewable Energy Harvesters to Develop Self-Powered Embedded System: Various energy harvesting techniques; Interfacing power management circuits; Recent trends towards development of self-powered smart system Application Case Studies of Embedded Sensing, Actuation and Interfacing System in Automotives System and Healthcare Domain

COURSE OUTCOMES:

1. Identify and classify various sensors and actuators used in embedded systems based on their working principles and applications.
2. . Analyze sensor and actuator characteristics to select appropriate devices for specific embedded control applications.
3. Design and implement signal conditioning and interface circuits to connect sensors and actuators with microcontrollers.
4. Evaluate the performance of smart sensors and MEMS-based devices for real-time embedded applications.
5. Develop innovative embedded control solutions incorporating energy-efficient and self-powered sensing and actuation mechanisms.



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DEPARTMENT OF ECE - EMBEDDED SYSTEMS

M.Tech. II Sem.

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(25D55204C) EMBEDDED OS & RTOS (PE-IV)

Course Category	Professional Elective (PE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

UNIT-I EMBEDDED OS (LINUX) INTERNALS

Linux internals: Process Management, File Management, Memory Management, I/O Management. Overview of POSIX APIs, Threads ??? Creation, Cancellation, POSIX Threads Inter Process Communication ??? Semaphore, Pipes, FIFO, Shared Memory

UNIT-II KERNEL

Kernel: Structure, Kernel Module Programming Schedulers and types of scheduling. Interfacing: Serial, Parallel Interrupt Handling Linux Device Drivers: Character, USB, Block & Network.

UNIT-III OPEN SOURCE RTOS

Basics of RTOS: Real-time concepts, Hard Real time and Soft Real-time, Differences between General Purpose OS & RTOS, Basic architecture of an RTOS, Scheduling Systems, Inter-process communication, Performance Matric in scheduling models, Interrupt management in RTOS environment, Memory management, File systems, I/O Systems, Advantage and disadvantage of RTOS. POSIX standards.

UNIT-IV RTOS ISSUES

RTOS Issues ??? Selecting a Real Time Operating System, RTOS comparative study. Converting a normal Linux kernel to real time kernel, Xenomai basics. Overview of Open source RTOS for Embedded systems (Free RTOS/ Chibios-RT) and application development.

UNIT-V VXWORKS / FREE RTOS

VxWorks/ Free RTOS Scheduling and Task Management ??? Realtime scheduling, Task Creation, Intertask Communication, Pipes, Semaphore, Message Queue, Signals, Sockets, Interrupts I/O Systems ??? General Architecture, Device Driver Studies, Driver Module explanation, Implementation of Device Driver for a peripheral

TEXT BOOKS:

1. Embedded Real Time Systems-Black book Dr. K.V.K.K.Prasad, 2005 edition, Dream tech press
2. Jane W.S.Liu, ???Real Time Systems???, Pearson education, 2007.
3. C.M.Krishna, KANG G.Shin, ???Real Time Systems???, McGraw Hill, 1997.

REFERENCE BOOKS:



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DEPARTMENT OF ECE - EMBEDDED SYSTEMS

COURSE OUTCOMES:

1. Understand the internals of the Linux operating system, including process, file, memory, and I/O management, as well as POSIX APIs for inter-process communication.
2. Analyze Linux kernel architecture, including kernel module programming, scheduling mechanisms, interrupt handling, and device driver development.
3. Differentiate between general-purpose OS and RTOS, understand RTOS architecture, scheduling systems, inter-process communication, and performance metrics.
4. Evaluate RTOS selection criteria, explore real-time Linux kernels such as Xenomai, and develop applications using open-source RTOS like FreeRTOS or ChibiOS-RT
5. Implement real-time scheduling, task management, inter-task communication, and device driver development using RTOS like VxWorks or FreeRTOS.



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L	T	P	C
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(25D55205) ARM MICROCONTROLLERS LAB

Course Category	Professional Core course (PC)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

COURSE OUTCOMES:

1. Install, configure and utilize tool sets for developing applications based on ARM processor core SoC.
2. Develop prototype codes using commonly available on and off chip peripherals on the Cortex M4.



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DEPARTMENT OF ECE - EMBEDDED SYSTEMS

M.Tech. II Sem.

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(25D57207) QUANTUM TECHNOLOGIES AND APPLICATIONS

Course Category	Management Elective
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

COURSE OUTCOMES:

1. Explain core quantum principles in a non-mathematical manner
2. Compare classical and quantum information systems.
3. Identify theoretical issues in building quantum computers.
4. Discuss quantum communication and computing concepts.
5. Recognize applications, industry trends, and career paths in quantum technology

**SANTHIRAM ENGINEERING COLLEGE****(AUTONOMOUS)****DEPARTMENT OF ECE - EMBEDDED SYSTEMS**

M.Tech. II Sem.

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(25D57209A) ENTREPRENEURSHIP ESSENTIALS (AC-II)

Course Category	Mandatory Course (Non-credit)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:**UNIT-I FOUNDATIONS OF ENTREPRENEURSHIP**

Introduction to Entrepreneurship, Case Studies: Dhirubhai Ambani & Sofia, Myths and Realities about Entrepreneurship, Entrepreneurial Qualities and Mindset, Mission and Vision Development, Why Start-ups Fail? ??? Common Pitfalls and Lessons Learned

UNIT-II BUSINESS MODELS AND STRATEGIC PLANNING

Planning Value Proposition and Opportunity Identification, Business Model Canvas and Business Model Generation, Competitive Advantage and Lean Start-up Methodology, Team Formation and Early Recruitment, Legal Forms of Business and Organizational Structure

UNIT-III MARKETING, FINANCE, AND BUSINESS PLANNING

Marketing Management Principles for Start-ups, Market Research: Methods, Data Analysis, and Case Studies, Financial Statements: P&L, Balance Sheet, and Cash Flow, Cost-Volume-Profit Analysis and Break-even Analysis, Capital Budgeting and Financial Decision Making, Business Plan Preparation and Pitching Techniques

UNIT-IV INNOVATION, FUNDING, AND LEGAL FRAMEWORK

Innovation Strategies: Design Thinking, TRIZ, Open Innovation, Government Incentives and Support Systems for Entrepreneurs, Incubation and Acceleration Programs, Funding Sources: Bootstrapping, Crowdfunding, Angel Investors, Venture Capital, Debt Financing, Due Diligence and Project Cost Management, Legal Aspects: IPR, GST, and Labor Laws

UNIT-V GROWTH, HUMAN RESOURCE, AND RISK MANAGEMENT

Growth Hacking and Business Scaling Strategies, Human Resource Management in Start-ups, Negotiation Skills and Leadership Development, Pivoting Strategies and Entrepreneurial Case Studies, Risk Assessment and Strategic Management for Start ups, Success and Failure Factors in Entrepreneurial Ventures

TEXT BOOKS:

1. Effective Entrepreneurial Management: Strategy, Planning, Risk Management, and Organization - Robert D. Hisrich ??? Veland Ramadani, Springer (2017)
2. Entrepreneurship- Theory, Process Practice ???by Kuratko &Hodgetts, Thompson South-Western Publication
3. Entrepreneurship ???by Robert D. Hisrich (Edition-9)



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DEPARTMENT OF ECE - EMBEDDED SYSTEMS

REFERENCE BOOKS:

COURSE OUTCOMES:

1. Explain the stages in the entrepreneurial venture life-cycle and the critical decisions involved in each stage.
2. Identify, evaluate, and select potential business opportunities using structured entrepreneurial frameworks.
3. Demonstrate the ability to prepare basic financial statements, project reports, and feasibility analyses for start-up ventures.
4. Apply management principles ??? marketing, HR, and strategic planning ??? in designing and managing small or emerging enterprises.
5. Analyze funding options, risk factors, and legal aspects to support sustainable and ethical entrepreneurial ventures.

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M.Tech. II Sem.

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(25D57209B) PEDAGOGY STUDIES (AC-II)

Course Category	Professional Elective (PE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers.
2. Identify critical evidence gaps to guide the development.

UNIT-I INTRODUCTION AND METHODOLOGY

Aims and Rationale, Policy Background, Conceptual Framework and Terminology, Theories of Learning, Curriculum, Teacher Education, Conceptual Framework, Research Questions, Overview of Methodology, and Searching.

UNIT-II THEMATIC OVERVIEW

Pedagogical Practices being used by teachers in formal and informal classrooms in developing countries, Curriculum, and Teacher Education.

UNIT-III EVIDENCE ON THE EFFECTIVENESS OF PEDAGOGICAL PRACTICES, METHODOLOGY FOR THE IN DEPTH STAGE

Evidence on the effectiveness of pedagogical practices, Methodology for the in depth stage: quality assessment of included studies. How can teacher education (curriculum and practicum) and the echo curriculum and guidance materials best support effective pedagogy. Theory of change. Strength and nature of the body of evidence for effective pedagogical practices. Pedagogic theory and pedagogical approaches. Teachers??? attitudes and beliefs and Pedagogic strategies.

UNIT-IV PROFESSIONAL DEVELOPMENT

Alignment with classroom practices and follow-up support, Peer support, Support from the head teacher and the community. Curriculum and assessment, Barriers to learning: limited resources and large class sizes

UNIT-V RESEARCH GAPS AND FUTURE DIRECTIONS

Research design, Contexts, Pedagogy, Teacher education, Curriculum and assessment, Dissemination and research impact.

TEXT BOOKS:



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1. 1. AckersJ, HardmanF(2001)Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261.
2. 2. AgrawalM(2004)Curricular reform in schools: The importance of evaluation, Journal of 3. Curriculum Studies, 36 (3): 361-379.
3. 4. AkyeampongK(2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.
4. 5. Akyeampong K, LussierK, PryorJ, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count International Journal Educational Development, 33 (3): 272282.
5. 6. Alexander RJ(2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell. Chavan M (2003) Read India: A mass scale, rapid, learning to read campaign. 7. www.pratham.org/images/resource%20working%20paper%202.pdf.

REFERENCE BOOKS:

e-Resources and Digital Material:

COURSE OUTCOMES:

1. 1. Understand and explain the foundational aspects of education including aims, rationale, policy background, theories of learning, curriculum design, and teacher education methodologies.
2. 2. Identify and analyze various pedagogical practices adopted in formal and informal classroom settings in developing countries, and evaluate their implications for curriculum and teacher education.
3. 3. Evaluate evidence-based research on the effectiveness of pedagogical practices and examine how teacher education, curriculum, and professional materials can support effective pedagogy through a strong theoretical and methodological framework.
4. 4. Assess and apply principles of professional development, focusing on classroom alignment, peer and community support, and overcoming barriers such as limited resources and large class sizes.



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(25D57209C) YOGA FOR STRESS MANAGEMENT (AC-II)

Course Category	Professional Elective (PE)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

UNIT-I DEFINITIONS OF EIGHT PARTS OF YOGA (ASHTANGA)

Definitions and explanation of the eight parts of Yog (Ashtanga): Yama, Niyama, Asana, Pranayama, Pratyahara, Dharana, Dhyana, and Samadhi. Understanding the holistic approach of Ashtanga Yog in managing stress and achieving mental balance.??

UNIT-II YAM AND NIYAM

Detailed study of Yam and Niyam ??? their meaning, importance, and practical application in daily life. Understanding how ethical and personal disciplines help in stress reduction and personality development.??

UNIT-III DO??S AND DON??TS IN LIFE

i) Yam (Do??s): Ahimsa, Satya, Astheya, Brahmacharya, and Aparigraha. ii) Niyam (Don??ts): Shaucha, Santosha, Tapa, Swadhyaya, and Ishwar Pranidhana. Emphasis on self-discipline, moral conduct, and positive thinking as tools for peaceful living and stress control.

UNIT-IV ASAN AND PRANAYAM

Introduction to Asanas (Postures) and Pranayam (Breathing Techniques). Importance of physical postures and controlled breathing in maintaining physical fitness, mental calmness, and emotional stability.

UNIT-V VARIOUS YOGA POSES AND THEIR BENEFITS FOR MIND & BODY

i) Study of various Yog poses and their specific benefits for the mind and body. ii) Regularization of breathing techniques and their physiological and psychological effects. Types of Pranayam: Anulom Vilom, Bhastrika, Kapalbhathi, Bhramari, and others.

TEXT BOOKS:

1. Yogic Asanas for Group Training-Part-I: Janardan Swami Yoga bhyasiMandal, Nagpur
2. Rajayogaor conquering the Internal Nature by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata

REFERENCE BOOKS:

e-Resources and Digital Material:



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COURSE OUTCOMES:

1. Develop healthy mind in a healthy body thus improving social health also
2. Improve efficiency



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DEPARTMENT OF ECE - EMBEDDED SYSTEMS

M.Tech. II Sem.

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(25D57209D) CONSTITUTION OF INDIA (AC-II)

Course Category	Mandatory Course (Non-credit)
Course Enrichment Relevance	Employability

COURSE OBJECTIVES:

1. To help students understand the basic features, principles, and structure of the Indian Constitution.
2. To familiarize students with the fundamental rights, duties, and directive principles that form the foundation of Indian democracy
3. To understand the roles and responsibilities of the Union and State governments, and the functioning of the judiciary
4. To develop awareness of the constitutional provisions related to governance, policy-making, and administration
5. To inspire students to be responsible citizens by understanding their constitutional rights and duties

UNIT-I INTRODUCTION TO THE CONSTITUTION OF INDIA

Historical Background-Making of the Constitution-Preamble to the Constitution-Salient Features of the Constitution-The Union and Its Territory-Citizenship ??? Fundamental Rights and Fundamental Duties ??? Directive Principles of State Policy.

UNIT-II UNION GOVERNMENT AND ITS ADMINISTRATION STRUCTURE OF THE INDIAN UNION -

Structure of the Indian Union - Powers and Functions of the President, Vice President, Prime Minister, Council of Ministers, and Parliament - Cabinet Committees - Role and Responsibilities of the Prime Minister's Office - Lok Sabha and Rajya Sabha: Composition, Powers, and Functions.

UNIT-III STATE GOVERNMENT AND ITS ADMINISTRATION GOVERNOR ???

Governor ??? Chief Minister ??? Council of Ministers ??? State Legislature ??? High Courts and Subordinate Courts ??? Special Status of Jammu & Kashmir and other States ??? Centre-State Relations ??? Administration of Union Territories.

UNIT-IV LOCAL GOVERNANCE AND CONSTITUTIONAL BODIES

Panchayati Raj Institutions: 73rd and 74th Constitutional Amendments - Urban and Rural Local Bodies - Election Commission - Union and State Public Service Commissions - Finance Commission - Comptroller and Auditor General of India - Attorney General and Advocate General.



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UNIT-V CONSTITUTIONAL AMENDMENTS AND EMERGENCY PROVISIONS

Amendment Procedure ??? Major Amendments and Their Significance ??? Emergency Provisions: National, State, and Financial Emergencies ??? Judicial Review and Independence of Judiciary ??? Right to Information Act ??? Role of the Constitution in Nation Building and Citizen Empowerment.

TEXT BOOKS:

1. Dr. J. N. Pandey, The Constitutional Law of India, Central Law Agency, 2022.
2. D.D. Basu, Introduction to the Constitution of India, LexisNexis, 25th Edition, 2021.
3. M. Laxmikanth, Indian Polity, McGraw Hill Education, 7th Edition, 2023.
4. Granville Austin, The Indian Constitution: Cornerstone of a Nation, Oxford University Press, 2014.
5. Subhash Kashyap, Our Constitution: An Introduction to India???'s Constitution and Constitutional Law, National Book Trust, India, 2018.

REFERENCE BOOKS:

COURSE OUTCOMES:

1. Understand the key elements, philosophy, and evolution of the Indian Constitution.
2. Describe the structure and functioning of the Union, State, and Local Governments.
3. Analyze the importance of Fundamental Rights, Duties, and Directive Principles in ensuring social justice
4. Recognize the role of various constitutional bodies and their impact on governance
5. Develop a sense of civic responsibility, constitutional awareness, and commitment to national integrity and harmony.



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VISION

- ✦ To become a nucleus for pursuing technical education and pool industrial research and developmental activities with social-conscious and global standards.

MISSION



- M1:** To provide Advanced Educational Programs and prepare students to achieve success and take leading roles in their chosen fields of specialization by arising a self-sustained University.
- M2:** To establish postgraduate programs in the current and Advanced Technologies.
- M3:** To establish an R&D Consultancy through developing Industry Institute Interaction, building up exceptional infrastructure.
- M4:** To propel every individual, realize and act for the technical development of the society.

MOTTO

- ✦ Education for Peace and Progress



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