GLOBAL INSTITUTE OF ENGINEERING AND TECHNOLOGY (AUTONOMOUS)
COURSE CATALOGUE
REGULATIONS B.TECH – GR - 24
ELECTRONICS AND COMMUNICATION ENGINEERING
III YEAR I SEMESTER

Course Code	Course Name	Subject Area	Category	Periods Per Week			Credits	Scheme of Examination Max Marks		
				L	T	P		CIA	SEE	Total
THEORY										
EC501PC	Microcontrollers	PCC	CORE	3	1	0	4	40	60	100
EC502PC	IoT Architectures and Protocols	PCC	CORE	3	0	0	3	40	60	100
EC503PC	Control Systems	PCC	CORE	3	1	0	4	40	60	100
SM504MS	Business Economics & Financial Analysis	HSMC	Foundation	3	0	0	3	40	60	100
	Professional Elective – I	PEC	Elective	3	0	0	3	40	60	100
PRACTICAL										
EC505PC	Microcontrollers Laboratory	PCC	CORE	0	0	2	1	40	60	100
EN506HS	Advanced English Communication Skills Laboratory	HSMC	Foundation	0	0	2	1	40	60	100
EC507PC	IoT Architectures and Protocols Laboratory	PCC	CORE	0	0	2	1	40	60	100
			Total Credits	**15**	**2**	**6**	**20**			

Professional Elective – I

EC511PE	Computer Organization & Operating Systems
EC512PE	Multimedia Database Management Systems
EC513PE	Electronic Measurements and Instrumentation

COURSE CONTENT

MICROCONTROLLERS								
III Year - I Semester: ECE								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
EC501PC	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		3	**1**	**-**	**4**	**40**	**60**	**100**
Contact Classes: 48	Tutorial Classes: 16	Practical Classes: Nil				**Total Classes: 64**		
Prerequisite: Nil								

1. COURSE OVERVIEW

This course will start with a discussion on a simple microprocessor, 8086. Understanding this architecture is the basis to follow any other complex CPU architecture. It will be followed by a complete overview of a range of microcontrollers covering 8051 and ARM. The hardware intricacies of these processors and their programming will be covered. Different system design examples built around these processors will also be elaborated.

2. COURSE OBJECTIVE

The students will try to Learn:

1) To familiarize the architecture of microprocessors and micro controllers.
2) To provide the knowledge about interfacing techniques of bus & memory.
3) To understand the concepts of ARM architecture.
4) To study the basic concepts of Advanced ARM processors.

3. COURSE OUTCOMES

After successful completion of the course, students should be able to:

CO 1	Known the internal architecture, organization and assembly language programming of 8086 processors.
CO 2	Known the internal architecture, organization and assembly language programming of 8051/controllers
CO 3	Learn the interfacing techniques to 8086 and 8051 based systems.
CO 4	Known the internal architecture of ARM processors and basic concepts of advanced ARM processors.

4. COURSE CONTENT

UNIT-I:

8086 Architecture: 8086 Architecture-Functional diagram, Register Organization, Memory Segmentation, Programming Model, Memory addresses, Physical Memory Organization, Architecture of 8086, Signal descriptions of 8086, interrupts of 8086.

Instruction Set and Assembly Language Programming of 8086: Instruction formats, Addressing modes, Instruction Set, Assembler Directives, Macros, and Simple Programs involving Logical, Branch and Call Instructions, Sorting, String Manipulations

UNIT - II:

Introduction to Microcontrollers: Overview of 8051 Microcontroller, Architecture, I/O Ports, Memory Organization, Addressing Modes and Instruction set of 8051. 8051 Real Time Control: Programming Timer Interrupts, Programming External Hardware Interrupts, Programming the Serial Communication Interrupts, Programming 8051

UNIT - III:

I/O And Memory Interface: LCD, Keyboard, External Memory RAM, ROM Interface, ADC, DAC Interface to 8051. Serial Communication and Bus Interface: Serial Communication Standards, Serial Data Transfer Scheme, On board Communication Interfaces-I2C Bus, SPI Bus, UART; External Communication Interfaces-RS232, USB.

UNIT - IV:

ARM Architecture: ARM Processor fundamentals, ARM Architecture – Register, CPSR, Pipeline, exceptions and interrupts interrupt vector table, ARM instruction set – Data processing, Branchinstructions, load store instructions, Software interrupt instructions, Program status register instructions,
loading constants, Conditional execution, Introduction to Thumb instructions.

UNIT - V:

Advanced ARM Processors: Introduction to CORTEX Processor and its architecture, OMAPProcessor and its Architecture

5. TEXT BOOKS

1) K. Ray and K. M. Bhurchandani -Advanced Microprocessors and Peripherals, TMH, 2nd Edition 2006.
2) Andrew N SLOSS, Dominic SYMES, Chris WRIGHT -ARM System Developers guide, Elsevier, 2012.

6. REFERENCE BOOKS

1) Kenneth. J. Ayala-The 8051 Microcontroller, Cengage Learning, 3rd Ed, 2004.
2) D. V. Hall -Microprocessors and Interfacing, TMGH, 2nd Edition, 2006.
3) K. Uma Rao, Andhe Pallavi-The 8051 Microcontrollers, Architecture and Programming and Applications, Pearson, 2009.
4) Donald Reay-Digital Signal Processing and Applications with the OMAP- L138 Experimenter, WILEY 2012.

CO-PO-PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	**3**	**3**	**3**	**2**	**2**	**2**	**1**	**-**	**-**	**-**	**1**	**1**	**2**	**2**
CO 2	**3**	**3**	**3**	**2**	**2**	**2**	**1**	**-**	**-**	**-**	**1**	**1**	**2**	**2**
CO 3	**3**	**3**	**3**	**2**	**2**	**2**	**1**	**-**	**-**	**-**	**1**	**1**	**2**	**2**
CO 4	**3**	**3**	**3**	**2**	**2**	**2**	**1**	**-**	**-**	**-**	**2**	**2**	**2**	**2**

COURSE CONTENT

IOT ARCHITECTURES AND PROTOCOLS								
III Year - I Semester: ECE								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
EC502PC	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		3	**-**	**-**	**3**	**40**	**60**	**100**
Contact Classes: 48	Tutorial Classes: Nil	Practical Classes: Nil				**Total Classes: 48**		
Prerequisite: Nil								

1. COURSE OVERVIEW

Internet of Things (IoT) is presently a hot technology worldwide. Government, academia, and industry are involved in different aspects of research, implementation, and business with IoT. IoT cuts across different application domain verticals ranging from civilian to defence sectors. These domains include agriculture, space, healthcare, manufacturing, construction, water, and mining, which are presently transitioning their legacy infrastructure to support IoT. Today it is possible to envision pervasive connectivity, storage, and computation, which, in turn, gives rise to building different IoT solutions. IoT-based applications such as innovative shopping system, infrastructure management in both urban and rural areas, remote health monitoring and emergency notification systems, and transportation systems, are gradually relying on IoT based systems. Therefore, it is very important to learn the fundamentals of this emerging technology.

2. COURSE OBJECTIVE

The students will try to Learn:

1) To provide the basic knowledge on IoT.
2) To explain the different components and Architectures from M2M to IoT.
3) To provide knowledge on different protocols of IoT.
4) To impart knowledge on implementations of different protocols of IoT.

3. COURSE OUTCOMES

After successful completion of the course, students should be able to:

CO 1	Explore the Evolution of IoT, its Growth and Applications.
CO 2	Know the components of IoT and Compare the various architectures of IoT.
CO 3	Acquire the knowledge on data management of IoT.
CO 4	Establish the knowledge on various IoT protocols like Data link, Network, Transport, Session, Service layers.

4. COURSE CONTENT

UNIT-I:

IOT introduction: Introduction and definition of IoT, Evolution of IoT, IoT growth, Application areas of IoT, Characteristics of IoT, IoT stack, Enabling technologies, IoT levels, IoT sensing and actuation, Sensing types, Actuator types.

UNIT - II:

IOT and M2M:
M2M to IoT – A Basic Perspective– Introduction, Differences and similarities between M2Mand IoT, SDN and NFV for IoT, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, international driven global value chain and global information monopolies.

IOT Architecture:
IoT Architecture components, Comparing IoT Architectures, A simplified IoT Architecture, core IoT functional stack, IoT data management and compute stack**.**

UNIT - III:

IOT Data link layer and Network layer protocols: PHY/MAC Layer (3GPP MTC, IEEE 802.11, IEEE 802.15), Wireless HART, Z Wave, Bluetooth Low Energy, Zigbee Smart Energy, DASH7 - Network Layer-IPv4, IPv6, 6LoWPAN, 6TiSCH, ND, DHCP, ICMP, RPL, CORPL, CARP

UNIT - IV:

Transport and Session layer protocols: Transport Layer (TCP, MPTCP, UDP, DCCP, SCTP)-(TLS, DTLS) – Session Layer HTTP, CoAP, XMPP, AMQP, MQTT

UNIT - V:

Service layer protocols and Security: Service Layer -oneM2M, ETSI M2M, OMA, BBF– Security in IoT Protocols – MAC 802.15.4 6LoWPAN, RPL, Application Layer.

5. TEXT BOOKS

1) Sudip Misra, Anandarup Mukherjee, Arijit Roy -Introduction to IOT, Cambridge University Press.
2) David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob barton, Jerome henry-IoT Fundamentals Networking Technologies, Protocols and Use cases for IoT", Cisco Press.

6. REFERENCE BOOKS

1) Cunopfister-Getting started with the internet of things, O Reilly Media, 2011
2) Francis daCosta,-Rethinking the Internet of Things: A Scalable Approach to Connecting
3) Everything", 1st Edition, A press Publications.
4) Arshdeep Bahga, Vijay Madisetti -Internet of Things a Hands-on approach, Universities Press
5) Shriram K Vasudevan, RMD Sundaram, Abhishek S Nagarajan-Internet of things, John Wiley and Sons.
6) Massimo Banzi, Michael Shiloh Make: Getting Started with the Arduino, Shroff Publisher/Maker Media Publishers

CO-PO-PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	**3**	**1**	**3**	**2**	**2**	**2**	**1**	**-**	**-**	**-**	**1**	**1**	**2**	**2**
CO 2	**3**	**1**	**3**	**2**	**2**	**2**	**1**	**-**	**-**	**-**	**1**	**1**	**2**	**2**
CO 3	**3**	**1**	**3**	**2**	**2**	**2**	**1**	**-**	**-**	**-**	**1**	**1**	**2**	**2**
CO 4	**3**	**1**	**3**	**2**	**2**	**2**	**1**	**-**	**-**	**-**	**2**	**2**	**2**	**2**

COURSE CONTENT

CONTROL SYSTEMS								
III Year - I Semester: ECE								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
EC503PC	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		3	**1**	**-**	**4**	**40**	**60**	**100**
Contact Classes: 48	Tutorial Classes: 16	Practical Classes: Nil				**Total Classes: 64**		
Prerequisite: Nil								

1. COURSE OVERVIEW

A Control Systems course provides fundamental knowledge for designing, analyzing, and optimizing dynamic systems, essential for engineering fields like robotics, automotive, and aerospace. It covers mathematical modeling (transfer functions), stability analysis (Routh-Hurwitz, Bode, Nyquist), and controller design (PID) to regulate system behavior.

2. COURSE OBJECTIVE

The students will try to Learn:

1) To understand the different ways of system representations such as Transfer function representation and state space representations and to assess the system dynamic response
2) To assess the system performance using time domain analysis and methods for improving it
3) To assess the system performance using frequency domain analysis and techniques for improving the performance
4) To design various controllers and compensators to improve

3. COURSE OUTCOMES

After successful completion of the course, students should be able to:

CO 1	Model the linear-time-invariant systems using transfer function and state-space representations.
CO 2	Understand the concept of stability and its assessment for linear-time invariant systems.
CO 3	Design simple feedback controllers.

4. COURSE CONTENT

UNIT – I:

Introduction to Control Problem: Industrial Control examples. Mathematical models of physical systems. Control hardware and their models. Transfer function models of linear time-invariant systems. Feedback Control: Open-Loop and Closed-loop systems. Benefits of Feedback. Block diagram algebra.

UNIT – II:

Time Response Analysis of Standard Test Signals: Time response of first and second order systems for standard test inputs. Application of initial and final value theorem. Design specifications for second- order systems based on the time-response. Concept of Stability. Routh-Hurwitz Criteria. Relative Stability analysis. Root-Locus technique. Construction of Root-loci.

UNIT - III

Frequency-Response Analysis: Relationship between time and frequency response, Polar plots, Bode plots. Nyquist stability criterion. Relative stability using Nyquist criterion – gain and phase margin. Closed-loop frequency response**.**

UNIT - IV

Introduction to Controller Design: Stability, steady-state accuracy, transient accuracy, disturbance rejection, insensitivity and robustness of control systems. Root-loci method of feedback controller design. Design specifications in frequency-domain. Frequency-domain methods of design. Application of Proportional, Integral and Derivative Controllers, Lead and Lag compensation in designs. Analog and Digital implementation of controllers.

UNIT – V:

State Variable Analysis and Concepts of State Variables: State space model. Diagonalization of State Matrix. Solution of state equations. Eigen values and Stability Analysis. Concept of controllability and observability. Pole-placement by state feedback. Discrete-time systems. Difference Equations. State-space models of linear discrete-time systems. Stability of linear discrete-time systems.

5. TEXT BOOKS

1) M. Gopal, -Control Systems: Principles and Design, McGraw Hill Education, 1997.
2) B. C. Kuo, -Automatic Control System, Prentice Hall, 1995.

6. REFERENCE BOOKS

1) K. Ogata=Modern Control Engineering, Prentice Hall, 1991.
2) J. Nagrath and M. Gopal-Control Systems Engineering, New Age International, 2009.

CO-PO-PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	**3**	**3**	**3**	**2**	**-**	**2**	**1**	**-**	**-**	**-**		**1**	**2**	**2**
CO 2	**3**	**2**	**3**	**2**	**-**	**2**	**1**	**-**	**-**	**-**		**1**	**2**	**2**
CO 3	**3**	**3**	**3**	**2**	**-**	**2**	**1**	**-**	**-**	**-**		**1**	**2**	**2**

COURSE CONTENT

BUSINESS ECONOMICS & FINANCIAL ANALYSIS								
III Year - I Semester: ECE								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
SM504MS	**Foundation**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		3	**-**	**-**	**3**	**40**	**60**	**100**
Contact Classes: 48	Tutorial Classes: Nil	Practical Classes: Nil				**Total Classes: 48**		
Prerequisite: Nil								

1. COURSE OVERVIEW

This course introduces the fundamentals of **business, economics, and financial accounting**, focusing on business structures, demand and supply analysis, production and cost functions, market structures, and pricing strategies. It also covers accounting principles, preparation of financial statements, and ratio analysis, enabling students to apply economic and accounting tools for effective business decision-making.

2. COURSE OBJECTIVE

The students will try to Learn:

1) To learn the basic business types, impact of the economy on Business and Firms specifically.
2) To analyze the Business from the Financial Perspective.

3. COURSE OUTCOMES

After successful completion of the course, students should be able to:

CO 1	Understand the structure of business firms and apply economic concepts such as national income, inflation, and business cycles in analyzing business decisions.
CO 2	Apply the concepts of demand, elasticity, and supply in business decision making and forecasting.
CO 3	Analyze production and cost functions, and evaluate pricing strategies under different market structures.
CO 4	Prepare and interpret basic financial statements using accounting principles, conventions, and the double-entry system.
CO 5	Evaluate financial performance of a business through ratio analysis and interpretation.

4. COURSE CONTENT

UNIT – I (10L)

Introduction to Business and Economics Business: Structure of Business Firm, Theory of Firm, Types of Business Entities, Limited Liability Companies, Sources of Capital for a Company, Non-Conventional Sources of Finance. Economics: Significance of Economics, Micro and Macro Economic Concepts, Concepts and Importance of National Income, Inflation, Money Supply and Inflation, Business Cycle, Features and Phases of Business Cycle. Nature and Scope of Business Economics, Role of Business Economist, Multidisciplinary nature of Business Economics.

UNIT – II (10L)

Demand and Supply Analysis Elasticity of Demand: Elasticity, Types of Elasticity, Law of Demand, Measurement and Significance of Elasticity of Demand, Factors affecting Elasticity of Demand, Elasticity of Demand in decision making, Demand Forecasting: Characteristics of Good Demand Forecasting, Steps in Demand Forecasting, Methods of Demand Forecasting. Supply Analysis: Determinants of Supply, Supply Function and Law of Supply.

UNIT – III (10L)

Production, Cost, Market Structures & Pricing Production Analysis: Factors of Production, Production Function, Production Function with one variable input, two variable inputs, Returns to Scale, Different Types of Production Functions. Cost analysis: Types of Costs, Short run and Long run Cost Functions. Market Structures: Nature of Competition, Features of Perfect competition, Monopoly, Oligopoly, Monopolistic Competition. Pricing: Types of Pricing, Product Life Cycle based Pricing, Break Even Analysis, Cost Volume Profit Analysis.

UNIT – IV (9L)

Financial Accounting: Accounting concepts and Conventions, Accounting Equation, Double-Entry system of Accounting, Rules for maintaining Books of Accounts, Journal, Posting to Ledger, Preparation of Trial Balance, Elements of Financial Statements, Preparation of Final Accounts (Simple Problems).

UNIT – V (9L)

Financial Ratios Analysis: Concept of Ratio Analysis, Importance and Types of Ratios, Liquidity Ratios, Turnover Ratios, Profitability Ratios, Proprietary Ratios, Solvency, Leverage Ratios – Analysis and Interpretation (simple problems).

5. TEXT BOOKS

1) D. D. Chaturvedi, S. L. Gupta, Business Economics - Theory and Applications, International Book House Pvt. Ltd. 2013.
2) Dhanesh K Khatri, Financial Accounting, Tata Mc –Graw Hill, 2011.
3) Geethika Ghosh, Piyali Gosh, Purba Roy Choudhury, Managerial Economics, 2e, Tata Mc Graw Hill Education Pvt. Ltd. 2012

6. REFERENCE BOOKS

1) Paresh Shah, Financial Accounting for Management 2e, Oxford Press, 2015.
2) S. N. Maheshwari, Sunil K Maheshwari, Sharad K Maheshwari, Financial Accounting, 5e, Vikas Publications, 2013.

CO-PO-PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	**3**	**2**	**2**	**1**	**1**	**2**	**1**	**1**						
CO 2	**3**	**3**	**3**	**1**	**1**	**1**	**2**	**1**						
CO 3	**3**	**3**	**3**	**2**	**1**	**2**	**1**	**1**						
CO 4	**3**	**3**	**2**	**2**	**2**	**1**	**1**	**2**						
CO 5	**3**	**3**	**3**	**2**	**2**	**1**	**1**	**2**						

COURSE CONTENT

COMPUTER ORGANIZATION & OPERATING SYSTEMS (PE-I)								
III Year - I Semester: ECE								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
EC511PE	**Elective**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		3	**-**	**-**	**3**	**40**	**60**	**100**
Contact Classes: 48	Tutorial Classes: Nil	Practical Classes: Nil				**Total Classes: 48**		
Prerequisite: Nil								

1. COURSE OVERVIEW

The Computer Organization & Operating Systems (COOS) course provides a comprehensive overview of how computer hardware functions and how operating systems manage these resources. It covers CPU design, memory hierarchy, I/O systems, process management, and file systems, typically serving as a foundational course in computer science to bridge hardware, software, and systems architecture.

2. COURSE OBJECTIVE

The students will try to Learn:

1) To understand the structure of a computer and its operations.
2) To understand the RTL and Micro-level operations and control in a computer.
3) Understanding the concepts of I/O and memory organization and operating systems

3. COURSE OUTCOMES

After successful completion of the course, students should be able to:

CO 1	Visualize the organization of different blocks in a computer.
CO 2	Utilize the micro-level operations to control different units in a computer.
CO 3	Implement Operating systems in a computer.

4. COURSE CONTENT

UNIT-I:

Basic Structure of Computers: Computer Types, Functional Unit, Basic operational Concepts Bus Structures, Software, Performance, Multiprocessors and Multi Computers, Data Representation, Fixed Point Representation, Floating – Point Representation.

Register Transfer Language and Micro Operations: Register Transfer Language, Register Transfer Bus and Memory Transfers, Arithmetic Micro Operations, Logic Micro Operations, Shift Micro Operations, Arithmetic Logic Shift Unit, Instruction Codes, Computer Registers Computer Instructions– Instruction Cycle, Memory – Reference Instructions, Input – Output and Interrupt, STACK Organization, Instruction Formats, Addressing Modes, DATA Transfer and Manipulation, Program Control, Reduced Instruction Set Computer.

UNIT - II:

Micro Programmed Control: Control Memory, Address Sequencing, Microprogram Examples, Design of Control Unit, Hard Wired Control, Micro-programmed Control the Memory System: Basic Concepts of Semiconductor RAM Memories, Read-Only Memories, Cache Memories Performance Considerations, Virtual Memories Secondary Storage, Introduction to RAID

UNIT - III:

Input-Output Organization: Peripheral Devices, Input-Output Interface, Asynchronous Data Transfer Modes, Priority Interrupt, Direct Memory Access, Input –Output Processor (IOP), Serial Communication; Introduction to Peripheral Components, Interconnect (PCI) Bus, Introduction to Standard Serial Communication Protocols like RS232, USB, IEEE 1394.

UNIT - IV:

Operating Systems Overview: Overview of Computer Operating Systems Functions, Protection and Security, Distributed Systems, Special Purpose Systems, Operating Systems Structures-Operating System Services and Systems Calls, System Programs, Operating Systems Generation.

Memory Management: Swapping, Contiguous Memory Allocation, Paging, Structure of The Page Table, Segmentation, Virtual Memory, Demand Paging, Page-Replacement Algorithms, Allocation of Frames, Thrashing Case Studies - UNIX, Linux, Windows

Principles of Deadlock: System Model, Deadlock Characterization, Deadlock Prevention, Detection and Avoidance, Recovery from Deadlock

UNIT - V:

File System Interface: The Concept of a File, Access Methods, Directory Structure, File System Mounting, File Sharing, Protection. File System Implementation: File System Structure, File System Implementation, Directory Implementation, Allocation Methods, Free-Space Management.

5. TEXT BOOKS

1) Carl Hamacher, Zvonks Vranesic, Safea Zaky - Computer Organization, 5th Edition, McGrawHill.
2) M. Moris Mano -Computer Systems Architecture, 3rd Edition, Pearson
3) Abraham Silberchatz, Peter B. Galvin, Greg Gagne -Operating System Concepts, 8th Edition, John Wiley

6. REFERENCE BOOKS

1) William Stallings- Computer Organization and Architecture, 6th Edition, Pearson
2) Andrew S. Tanenbaum -Structured Computer Organization, 4th Edition, PHI
3) Sivaraama Dandamudi - Fundamentals of Computer Organization and Design, Springer Int. Edition.
4) Stallings -Operating Systems – Internals and Design Principles, 6th Edition, Pearson Education, 2009.
5) Modern Operating Systems, Andrew S Tanenbaum 2nd Edition, PHI.
6) Principles of Operating Systems, B.L. Stuart, Cengage Learning, India Edition.

CO-PO-PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	**2**	**2**	**1**	**1**	**2**	**1**	**1**	**1**	**-**	**1**	**-**	**1**	**2**	**2**
CO 2	**3**	**2**	**1**	**1**	**2**	**1**	**1**	**1**	**-**	**1**	**-**	**1**	**2**	**2**
CO 3	**3**	**2**	**1**	**1**	**2**	**1**	**1**	**1**	**-**	**1**	**-**	**1**	**2**	**2**

COURSE CONTENT

MULTIMEDIA DATABASE MANAGEMENT SYSTEMS (PE-I)								
III Year - I Semester: ECE								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
EC512PE	**Elective**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		3	**-**	**-**	**3**	**40**	**60**	**100**
Contact Classes: 48	Tutorial Classes: Nil	Practical Classes: Nil				**Total Classes: 48**		
Prerequisite: Nil								

1. COURSE OVERVIEW

A Multimedia Database Management System (MDBMS) course covers techniques for storing, indexing, and querying diverse, large-scale data formats like images, audio, and video. It focuses on modeling multimedia data, content-based retrieval, and performance optimization for streaming. Key topics include metadata management, similarity-based searching, and specialized storage structures.

2. COURSE OBJECTIVE

The students will try to Learn:

1) To understand the basic concepts and the applications of database systems.
2) To master the basics of SQL and construct queries using SQL.
3) Topics include data models, database design, relational model, relational algebra, transaction control, concurrency control, storage structures and access techniques.

3. COURSE OUTCOMES

After successful completion of the course, students should be able to:

CO 1	Gain knowledge of fundamentals of DBMS, database design and normal forms
CO 2	Master the basics of SQL for retrieval and management of data.
CO 3	Be acquainted with the basics of transaction processing and concurrency control.
CO 4	Familiarity with database storage structures and access techniques

4. COURSE CONTENT

UNIT - I

Database System Applications: A Historical Perspective, File Systems versus a DBMS, the Data Model, Levels of Abstraction in a DBMS, Data Independence, Structure of a DBMS

Introduction to Database Design: Database Design and ER Diagrams, Entities, Attributes, and Entity Sets, Relationships and Relationship Sets, Additional Features of the ER Model, Conceptual Design with the ER Model.

UNIT - II

Introduction to the Relational Model: Integrity constraint over relations, enforcing integrity constraints, querying relational data, logical data base design, introduction to views, destroying/altering tables and views. Relational Algebra, Tuple relational Calculus, Domain relational calculus.

UNIT - III

SQL: Queries, Constraints, Triggers: form of basic SQL query, UNION, INTERSECT, and EXCEPT, Nested Queries, aggregation operators, NULL values, complex integrity constraints in SQL, triggers and active data bases. Schema Refinement: Problems caused by redundancy, decompositions, problems related to decomposition, reasoning about functional dependencies, FIRST, SECOND, THIRD normal forms, BCNF, lossless join decomposition, multi-valued dependencies, FOURTH normal form, FIFTH normal form.

UNIT - IV

Transaction Concept, Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for serializability, Lock Based Protocols, Timestamp Based Protocols, Validation- Based Protocols, Multiple Granularity, Recovery and Atomicity, Log–Based Recovery, Recovery with Concurrent Transactions.

UNIT - V

Data on External Storage, File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes, Index data Structures, Hash Based Indexing, Tree base Indexing, Comparison of File Organizations, Indexes and Performance Tuning, Intuitions for tree Indexes, Indexed Sequential Access Methods (ISAM), B+ Trees: A Dynamic Index Structure.

5. TEXT BOOKS

1) Database Management Systems, Raghurama Krishnan, Johannes Gehrke, Tata Mc Graw Hill 3rd Edition.
2) Database System Concepts, Silberschatz, Korth, Mc Graw hill, V edition.

6. REFERENCE BOOKS

1) Database Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 7th Edition.
2) Fundamentals of Database Systems, Elmasri Navrate, Pearson Education.
3) Introduction to Database Systems, C. J. Date, Pearson Education.
4) Oracle for Professionals, The X Team, S.Shah and V. Shah, SPD.
5) Database Systems Using Oracle: A Simplified guide to SQL and PL/SQL, Shah, PHI.
6) Fundamentals of Database Management Systems, M. L. Gillenson, Wiley Student Edition.

CO-PO-PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	**3**	**3**	**2**	**2**	**1**	**1**	**1**	**-**	**-**	**-**	**-**	**1**	**2**	**2**
CO 2	**3**	**3**	**2**	**2**	**1**	**1**	**1**	**-**	**-**	**-**	**-**	**1**	**2**	**2**
CO 3	**3**	**3**	**2**	**2**	**3**	**1**	**1**	**-**	**-**	**-**	**-**	**1**	**2**	**2**
CO 4	**3**	**3**	**2**	**2**	**3**	**1**	**1**	**-**	**-**	**-**	**-**	**1**	**2**	**2**

COURSE CONTENT

ELECTRONIC MEASUREMENTS AND INSTRUMENTATION (PE-I)								
III Year - I Semester: ECE								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
EC513PE	**Elective**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		3	**-**	**-**	**3**	**40**	**60**	**100**
Contact Classes: 48	Tutorial Classes: Nil	Practical Classes: Nil				**Total Classes: 48**		
Prerequisite: Basic Electrical and Electronics Engineering								

1. COURSE OVERVIEW

The Electronic Measurements and Instrumentation course provides a comprehensive overview of techniques and instruments used to measure electrical and physical parameters, covering both analog and digital systems.

2. COURSE OBJECTIVE

The students will try to Learn:

1) It provides an understanding of various measuring system functioning and metrics for performance analysis.
2) Provides understanding of principle of operation, working of different electronic instruments viz. signal generators, signal analyzers, recorders and measuring equipment.
3) Understanding the concepts of various measuring bridges and their balancing conditions.
4) Provides understanding of use of various measuring techniques for measurement of different physical parameters using different classes of transducers.

3. COURSE OUTCOMES

After successful completion of the course, students should be able to:

CO 1	Measure electrical parameters with different meters and understand the basic definition of measuring parameters.
CO 2	Use various types of signal generators, signal analyzers for generating and analyzing various real-time signals.
CO 3	Operate an Oscilloscope to measure various signals.
CO 4	Measure various physical parameters by appropriately selecting the transducers.

4. COURSE CONTENT

UNIT - I

Block Schematics of Measuring Systems: Performance Characteristics, Static Characteristics, Accuracy, Precision, Resolution, Types of Errors, Gaussian Error, Root Sum Squares formula, Dynamic Characteristics, Repeatability, Reproducibility, Fidelity, Lag; Measuring Instruments: DC Voltmeters, D' Arsonval Movement, DC Current Meters, AC Voltmeters and Current Meters, Ohmmeters, Multimeters, Meter Protection, Extension of Range, True RMS Responding Voltmeters, Specifications of Instruments.

UNIT - II

Signal Analyzers: AF, HF Wave Analyzers, Harmonic Distortion, Heterodyne wave Analyzers, Spectrum Analyzers, Power Analyzers, Capacitance-Voltage Meters, Oscillators. Signal Generators: AF, RF Signal

Generators, Sweep Frequency Generators, Pulse and Square wave Generators, Function Generators, Arbitrary Waveform Generator, Video Signal Generators, and Specifications.

UNIT - III

Oscilloscopes: CRT, Block Schematic of CRO, Time Base Circuits, Lissajous Figures, CRO Probes, High Frequency CRO Considerations, Delay lines, Applications: Measurement of Time, Period and Frequency Specifications.

Special Purpose Oscilloscopes: Dual Trace, Dual Beam CROs, Sampling Oscilloscopes, Storage Oscilloscopes, Digital Storage CROs.

UNIT - IV

Transducers: Classification, Strain Gauges, Bounded, unbounded; Force and Displacement Transducers, Resistance Thermometers, Hotwire Anemometers, LVDT, Thermocouples, Synchros, Special Resistance Thermometers, Digital Temperature sensing system, Piezoelectric Transducers, Variable Capacitance Transducers, Magneto Strictive Transducers, gyroscopes, accelerometers.

UNIT - V

Bridges: Wheat Stone Bridge, Kelvin Bridge, and Maxwell Bridge.

Measurement of Physical Parameters: Flow Measurement, Displacement Meters, Liquid level Measurement, Measurement of Humidity and Moisture, Velocity, Force, Pressure – High Pressure, Vacuum level, Temperature -Measurements, Data Acquisition Systems.

5. TEXT BOOKS

1) Modern Electronic Instrumentation and Measurement Techniques: A.D. Helbincs, W. D. Cooper: PHI 5th Edition 2003.
2) Electronic Instrumentation: H. S. Kalsi – TMH, 2nd Edition 2004.

6. REFERENCE BOOKS

1) Electrical and Electronic Measurement and Measuring Instruments – A K Sawhney, Dhanpat Rai & Sons, 2013.
2) Electronic Instrumentation and Measurements – David A. Bell, Oxford Univ. Press, 1997.
3) Industrial Instrumentation: T.R. Padmanabham Springer 2009.
4) Electronic Measurements and Instrumentation – K. Lal Kishore, Pearson Education 2010.

CO-PO-PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**2**	**2**
CO 2	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**2**	**2**
CO 3	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**2**	**2**
CO 4	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**2**	**2**

COURSE CONTENT

MICROCONTROLLERS LABORATORY								
III Year - I Semester: ECE								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
EC505PC	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		-	**-**	**2**	**1**	**40**	**60**	**100**
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 32				**Total Classes: 32**		
Prerequisite: Nil								

1. COURSE OVERVIEW

This course will start with a discussion on a simple microprocessor, 8086. Understanding this architecture is the basis to follow any other complex CPU architecture. It will be followed by a complete overview of a range of microcontrollers covering 8051 and ARM. The hardware intricacies of these processors and their programming will be covered. Different system design examples built around these processors will also be elaborated.

2. COURSE OBJECTIVE

The students will try to Learn:

1. To familiarize the architecture of microprocessors and micro controllers
2. To provide the knowledge about interfacing techniques of bus & memory.
3. To understand the concepts of ARM architecture
4. To study the basic concepts of Advanced ARM processors

3. COURSE OUTCOMES

After successful completion of the course, students should be able to:

CO 1	Write assembly language programs and implement on 8086.
CO 2	Write assembly language programs and implement on 8051
CO 3	Interface the I/O devices with 8051 micro controllers
CO 4	Perform experiments on Cortex-M3 development boards using GNU tool- chain

4. LIST OF EXPERIMENTS/DEMONSTRATIONS:

Cycle 1: Using 8086 Processor Kits and/or Assembler

□ Assembly Language Programs to 8086 to Perform

1. Arithmetic, Logical, String Operations on 16 Bit and 32-Bit Data.
2. Bit level Logical Operations, Rotate, Shift, Swap and Branch Operations.

Cycle 2: Using 8051 Microcontroller Kit

□ Introduction to IDE

1. Assembly Language Programs to Perform Arithmetic (Both Signed and Unsigned) 16 Bit Data Operations, Logical Operations (Byte and Bit Level Operations), Rotate, Shift, Swap and Branch Instructions
2. Time delay Generation Using Timers of 8051.
3. Serial Communication from / to 8051 to / from I/O devices.

4. Program Using Interrupts to Generate Square Wave 10 KHZ Frequency on P2.1 Using Timer 0 8051 in 8 bit Auto reload Mode and Connect a 1 HZ Pulse to INT1 pin and Display on Port 0. Assume Crystal Frequency as 11.0592 MHZ

Cycle 3: Interfacing I/O Devices to 8051

1. 7 Segment Display to 8051.
2. Matrix Keypad to 8051.
3. Sequence Generator Using Serial Interface in 8051.
4. 8-bit ADC Interface to 8051.
5. Triangular Wave Generator through DAC interfaces to 8051.

Cycle 4: Experiments to be carried out on Cortex-M3 development boards and using GNU toolchain

1. Blink an LED with software delay, delay generated using the SysTick timer.
2. System clock real time alteration using the PLL modules.
3. Control intensity of an LED using PWM implemented in software and hardware.
4. Control an LED using switch by polling method, by interrupt method and flash the LED once every five switch presses.

5. TEXT BOOKS

1. K. Ray and K. M. Bhurchandani -Advanced Microprocessors and Peripherals, TMH, 2nd Edition 2006.
2. Andrew N SLOSS, Dominic SYMES, Chris WRIGHT -ARM System Developers guide, Elsevier, 2012

6. REFERENCE BOOKS

1. Kenneth. J. Ayala-The 8051 Microcontroller, Cengage Learning, 3rd Ed, 2004.
2. D. V. Hall -Microprocessors and Interfacing, TMGH, 2nd Edition, 2006.
3. K. Uma Rao, Andhe Pallavi-The 8051 Microcontrollers, Architecture and Programming and Applications, Pearson, 2009.
4. Donald Reay-Digital Signal Processing and Applications with the OMAP- L138 Experimenter, WILEY 2012

7. ELECTRONICS RESOURCES

1. https://esd-iitr.vlabs.ac.in/

8. MATERIALS ONLINE

Course template
Lab manual

CO-PO-PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	**3**	**3**	**3**	**2**	**2**	**2**	**1**	**-**	**-**	**-**	**1**	**1**	**2**	**2**
CO 2	**3**	**3**	**3**	**2**	**2**	**2**	**1**	**-**	**-**	**-**	**1**	**1**	**2**	**2**
CO 3	**3**	**3**	**3**	**2**	**2**	**2**	**1**	**-**	**-**	**-**	**1**	**1**	**2**	**2**
CO 4	**3**	**3**	**3**	**2**	**2**	**2**	**1**	**-**	**-**	**-**	**2**	**2**	**2**	**2**

COURSE CONTENT

ADVANCED ENGLISH COMMUNICATION SKILLS LAB								
III Year - I Semester: ECE								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
EN506HS	**Foundation**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		-	**-**	**2**	**1**	**40**	**60**	**100**
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 32				**Total Classes: 32**		
Prerequisite: Computer with Headphones, OALD & Interactive Communication Skills Lab								

1. COURSE OVERVIEW

The introduction of the Advanced English Communication Skills Lab is considered essential at the B. Tech 3rd year level. At this stage, the students need to prepare themselves for their career which may require them to listen to, read, speak and write in English both for their professional & interpersonal communication in the globalised context.

The proposed course should be a laboratory course to enable students to use appropriate English and perform the following:

1. Gathering ideas and information to organise ideas relevantly and coherently.
2. Making oral presentations.
3. Writing formal letters.
4. Transferring information from non-verbal to verbal texts and vice-versa.
5. Writing project/research reports/technical reports.
6. Participating in group discussions.
7. Engaging in debates.
8. Facing interviews.
9. Taking part in social and professional communication.

2. COURSE OBJECTIVE

This Lab focuses on using multi-media instruction for language development to meet the following targets:

1. To improve the students' fluency in English, with a focus on vocabulary
2. To enable them to listen to English spoken at normal conversational speed by educated English speakers
3. To respond appropriately in different socio-cultural and professional contexts
4. To communicate their ideas relevantly and coherently in writing
5. To prepare the students for placements.

3. COURSE OUTCOMES

After successful completion of the course, students should be able to:

CO 1	Demonstrate the fundamentals of writing, Grammar & Vocabulary.
CO 2	Develop different types of writing.
CO 3	Analyse writing tasks and adapt style, tone, and format
CO 4	Produce academic & Professional documents like Letters, Reports, emails etc.
CO 5	Use the language in real life situations

Syllabus:

The following course content to conduct the activities is prescribed for the Advanced English Communication Skills (AECS) Lab:

1. **Activities on Listening and Reading Comprehension**

2. **For Practice:** Active Listening – Development of Listening Skills Through Audio clips – Benefits of Reading – Methods and Techniques of Reading.

   Basic steps to Effective Reading – Common Obstacles – Discourse Markers or Linkers – Sub- skills of reading - Reading for facts, negative facts and Specific Details – Guessing Meanings from Context, inferring meaning – Critical Reading – Reading Comprehension – Exercises.

3. **Activities on Writing Skills:** Vocabulary for Competitive Examinations – Planning for Writing – Improving Writing Skills- Structure and presentation of different types of writing – Structured writing – Letter writing – Writing a letter of Application – Resume vs. Curriculum Vitae – Writing a Resume – Styles of Resume – e-Correspondence – Emails – Blog Writing –(N) etiquette – Report Writing – Importance of Reports – Types of Reports – Technical Report Writing – Exercises for practice.

4. **Activities on Presentation Skills:** Starting a conversation – responding appropriately and relevantly – Using the right language and body language – Role Play in different situations including Seeking Clarifications, Making a Request, Asking for and Refusing Permission, Participating in a Small Talk – Oral Presentations (individual and group) through JAM sessions – PPT's – Importance of Presentation Skills – Planning, Preparing, Rehearsing and Making a Presentation – Dealing with Glossophobia or Stage Fear – Understanding Nuances of Delivery – Presentations through Posters/Projects/ Reports – Checklist for making a Presentation and Rubrics of Evaluation.

5. **Activities on Group Discussion (GD):** Types of GD and GD as a part of a Selection Procedure – Dynamics of Group Discussion – Myths of GD – Intervention, Summarizing – Modulation of voice, Body Language, Relevance, Fluency and Organization of ideas – Do's and Don'ts – GD Strategies – Exercises for Practice.

6. **Interview Skills:** Concept and Process – Interview Preparation Techniques – Types of Interview Questions – Pre-interview Planning, Opening Strategies, Answering Strategies – Interview Through Tele -conference & Video-conference – Mock Interviews.

5. MINIMUM REQUIREMENT:

The Advanced English Communication Skills (AECS) Laboratory shall have the following infrastructural facilities to accommodate at least 35 students in the lab:

- Spacious room with appropriate acoustics
- Round Tables with movable chairs
- Audio – visual aids
- LCD Projector
- Public Address System
- One PC with latest configuration for the teacher
- T.V. a digital stereo & Camcorder
- Headphones of High quality

6. SUGGESTED SOFTWARE:

The software consisting of the prescribed topics elaborated above should be procured and used.

- TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)
- Oxford Advanced Learner's Dictionary, 10th Edition.
- Cambridge Advanced Learner's Dictionary
- DELTA'S key to the next Generation TOEFL Test: Advanced Skill Practice.
- Lingua TOEFL CBT Insider, by Dreamtech

7. BOOKS RECOMMENDED:

1. Rizvi, M. Ashraf (2018). Effective Technical Communication. (2nd ed) McGraw Hill Education (India) Pvt. Ltd.
2. Suresh Kumar, E. (2015). Engineering English. Orient Black Swan Pvt. Ltd.
3. Bailey, Stephen. (2018) Academic Writing: A Handbook for International Students. (5th ed). Routledge.
4. Koneru, Aruna. (2016). Professional Communication. McGraw Hill Education (India) Pvt. Ltd.
5. Raman, Meenakshi & Sharma, Sangeeta. (2022). Technical Communication, Principles and Practice. (4th ed) Oxford University Press.
6. Anderson, Paul V. (2007) Technical Communication. Cengage Learning Pvt. Ltd. New Delhi.
7. Mc Carthy, Michael; O'Dell, Felicity & Redman, Stuart. (2017). English Vocabulary in use series. Cambridge University Press.
8. Sen, Leela. (2009). Communication Skills. PHI Learning Pvt. Ltd., New Delhi.
9. Elbow, Peter. (1998). Writing with Power. Oxford University Press.
10. Goleman, Daniel. (2013). Emotional Intelligence: Why it can matter more than IQ. Bloomsbury Publishing.

CO-PO-PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1									**2**	**3**		**3**		**2**
CO 2									**2**	**3**		**3**		**2**
CO 3									**2**	**3**		**3**		**2**
CO 4									**2**	**3**		**3**		**2**
CO 5									**2**	**3**		**3**		**2**

COURSE CONTENT

IOT ARCHITECTURE AND PROTOCOLS LABORATORY								
III Year - I Semester: ECE								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
EC507PC	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		-	**-**	**2**	**1**	**40**	**60**	**100**
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 32				**Total Classes: 32**		
Prerequisite: Nil								

1. COURSE OVERVIEW

This Course empowers students to explore the core components of IoT systems, experiment with embedded programming, and build functional prototypes - all within a virtual environment that minimizes hardware costs and accelerates iteration cycles.

By simulating real-world scenarios and enabling cloud connectivity, the lab fosters creativity, problem-solving, and technical fluency. Whether students are designing sensor-based systems or developing cloud-integrated applications

2. COURSE OUTCOMES

After successful completion of the course, students should be able to:

CO 1	Utilize the different sensors like room temperature, DHT, Humidity etc.,
CO 2	Interface the sensors and processor for transmission of data.
CO 3	Capture the images and process it on Arduino/NodeMCU/Raspberry Pi.
CO 4	Know the utilization of various protocols like I2c, UART communication etc.,

3. LIST OF EXPERIMENTS/DEMONSTRATIONS:

1. Demonstrate blinking of an LED at every 5 seconds and to control the brightness of an LED.
2. Read Humidity and Room Temperature using DHT sensor and display the readings.
3. Send the recorded values of Temperature/Humidity to the Internet via GSM module using Arduino/NodeMCU/Raspberry Pi.
4. Demonstrate Interfacing NodeMCU/Raspberry Pi with the Cloud using REST API and MQTT protocol.
5. Demonstrate Switching lights on /off remotely using Arduino/NodeMCU/Raspberry Pi.
6. Voice-based Home Automation for switching lights on/off using Google Assistant, IFTTT and MQTT.
7. Interfacing DHT11 sensor with Raspberry pi/equivalent and upload temperature and humidity values to the cloud.
8. Design an obstacle detection unit using ultrasonic sensor.
9. Capture images from web camera using Raspberry Pi/equivalent and apply filters in increase image quality.
10. Access a remote computer from Raspberry Pi and display the remote screen.
11. Design an automatic water sprinkler based on soil moisture using Arduino/NodeMCU/Raspberry Pi.
12. Design an RFID based attendance system using Arduino/NodeMCU/Raspberry Pi.
13. Write an arduino program to demonstrate interrupts
14. Write an arduino program to demonstrate UART communication protocol
15. Write an arduino program to demonstrate I2C communication protocol
16. Write an arduino program to demonstrate SPI communication protocol

4. TEXT BOOKS

1. Sudip Misra, Anandarup Mukherjee, Arijit Roy -Introduction to IOT, Cambridge University Press.
2. David Hanes, Gonzalo salgueiro, Patrick Grossetete, Rob barton, Jerome henry-IoT Fundamentals Networking Technologies, Protocols and Usecases for IoT", Cisco Press.

5. REFERENCE BOOKS

1. Cunopfister-Getting started with the internet of things, O Reilly Media, 2011
2. Francis daCosta,-Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, A press Publications.
3. Arshdeep Bahga, Vijay Madisetti -Internet of Things A Hands-on approach, Universities Press
4. Shriram K Vasudevan, RMD Sundaram, Abhishek S Nagarajan-Internet of things, John Wiley and Sons.
5. Massimo Banzi, Michael Shiloh Make: Getting Started with the Arduino, Shroff Publisher/Maker Media Publishers

6. ELECTRONICS RESOURCES:

https://iot-amrt.vlabs.ac.in/

7. MATERIALS ONLINE

Course template
Lab manual

CO-PO-PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	**3**	**3**	**1**	**1**	**0**	**2**	**1**	**1**	**0**	**0**	**1**	**1**	**2**	**2**
CO 2	**3**	**3**	**1**	**2**	**0**	**2**	**1**	**1**	**0**	**0**	**2**	**3**	**2**	**2**
CO 3	**3**	**2**	**1**	**2**	**0**	**2**	**1**	**1**	**0**	**0**	**3**	**2**	**2**	**2**
CO 4	**3**	**2**	**1**	**2**	**0**	**2**	**1**	**1**	**0**	**0**	**3**	**2**	**2**	**2**
CO 5	**3**	**2**	**1**	**2**	**0**	**2**	**1**	**1**	**0**	**0**	**3**	**2**	**2**	**2**