



VIGNAN'S INSTITUTE OF MANAGEMENT AND TECHNOLOGY FOR WOMEN

(An Autonomous Institution)

[Sponsored by Lavu Educational Society, Affiliated to JNTUH & Approved by AICTE, New Delhi]
Kondapur (V), Ghatkesar (M), Medchal - Malkajgiri (D) - 501 301. Phone: 96529 10002/3



ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE STRUCTURE-VR24

III B.Tech.-I Semester

S.No.	Course Code	Course	L	T	P	Credits
1	EC501PC	Microcontrollers	3	1	0	4
2	EC502PC	IoT Architectures and Protocols	3	0	0	3
3	EC503PC	Control Systems	3	1	0	4
4	MS504BS	Business Economics & Financial Analysis	3	0	0	3
5		Professional Elective – I	3	0	0	3
6	EC505PC	Microcontrollers Laboratory	0	0	2	1
7	EN506BS	Advanced English Communication Skills Laboratory	0	0	2	1
8	EC507PC	IoT Architectures and Protocols Laboratory	0	0	2	1
9	MC508BS	Intellectual Property Rights	3	0	0	0
		Total	18	2	6	20

III B.Tech.-II Semester

S.No.	Course Code	Course	L	T	P	Credits
1	EC601PC	Antennas and Wave Propagation	3	0	0	3
2	EC602PC	Digital Signal Processing	3	0	0	3
3	EC603PC	CMOS VLSI Design	3	0	0	3
4		Professional Elective - II	3	0	0	3
5		Open Elective – I	3	0	0	3
6	EC604PC	Digital Signal Processing Laboratory	0	0	2	1
7	EC605PC	CMOS VLSI Design Laboratory	0	0	2	1
8	EC606PC	Advanced Communication Laboratory	0	0	2	1
9	EC607PC	Industry Oriented Mini Project/ Internship	0	0	4	2
10	MC608BS	Environmental Science	3	0	0	0
		Total	18	0	10	20

Note: L-Theory

T-Tutorial

P-Practical

C-Credits



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ELECTRONICS AND COMMUNICATION ENGINEERING

Professional Elective-I

S.No.	Course Code	Course	L	T	P	Credits
1	DS511PE	Computer Organization & Operating Systems	3	0	0	3
2	IT512PE	Data Communications and Computer Networks	3	0	0	3
3	EC513PE	Electronic Measurements and Instrumentation	3	0	0	3
4	EC514PE	Signal Engineering & Automatic Train Protection-Kavach	3	0	0	3

Professional Elective-II

S.No.	Course Code	Course	L	T	P	Credits
1	EC621PE	Digital Image Processing	3	0	0	3
2	EC622PE	Mobile Communications and Networks	3	0	0	3
3	EC623PE	Embedded System Design	3	0	0	3

Open Elective-I

S.No.	Course Code	Course	L	T	P	Credits
1	EC621OE	Fundamentals of Internet of Things	3	0	0	3
2	EC622OE	Principles of Signal Processing	3	0	0	3
3	EC623OE	Digital Electronics for Engineering	3	0	0	3

B.Tech.ECE

L T P C

III Year-I Semester

3 1 0 4

MICROCONTROLLERS**Prerequisite:** Nil**Course Objectives:** To learn

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

Course Outcomes: Upon completing this course, the student will be able to

- Understand the architecture, instruction set, and addressing modes of 8086 microprocessor and 8051 micro controllers.
- Develop assembly language programs for solving arithmetic, logical, and control-based problems on 8086/8051
- Interface microprocessors and microcontrollers with peripherals such as ADC, DAC, timers, and serial communication modules.
- Analyze real-time embedded system requirements and apply microcontroller concepts for practical applications
- Use modern tools and hardware kits to design, debug, and evaluate microprocessor/microcontroller-based systems.

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 Timers and Counters

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, Branch instructions, 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, OMAP Processor and its Architecture.

Text Books:

1. A. 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.

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.

B.Tech.ECE

L T P C

III Year-I Semester

3 1 0 3

IOT ARCHITECTURES AND PROTOCOLS**Prerequisite:** Nil**Course Objectives:**

- To provide basic knowledge on IOT.
- To explain the different components and Architectures from M2M to IOT.
- To provide knowledge on different protocols of IoT.
- To impart knowledge on implementations of different protocols of IOT.

Course Outcomes: After completion of this course the student will be able to

- Explore the Evolution of IoT, its Growth and Applications.
- Know the components of IoT and Compare the various architectures of IoT
- Acquire knowledge on data management of IoT.
- Establish the knowledge on various IoT protocols like Data link, Network, Transport, Session, Service layers
- Understand the different components and Architectures from M2M to IoT.

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 M2M and 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 Layers

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

Text Books:

1. Sudip Misra, Ananda up 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.

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”, 1 st Edition, Apress Publications
3. Arshdeep Bahga, Vijay Madisetti -Internet of Things A Hands-on approach, Universities
4. Press 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

B.Tech.ECE	L	T	P	C
III Year-I Semester	3	1	0	4

CONTROL SYSTEMS

Prerequisite: Linear Algebra and Calculus, Ordinary Differential Equations and Multivariable Calculus Laplace Transforms, Numerical Methods and Complex variables

Course Objectives:

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

Course Outcomes: At the end of this course, students will demonstrate the ability to

- Model the linear-time-invariant systems using transfer function and state-space representations
- Understand the concept of stability and its assessment for linear-time invariant systems
- Design simple feedback controllers.
- Estimate the system performance using time domain analysis and methods for improving it
- Estimate the system performance using frequency domain analysis and techniques for improving the performance

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

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 value 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.

Text Books:

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

Reference Books:

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

B.Tech.ECE

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III Year-I Semester

3 0 0 3

BUSINESS ECONOMICS AND FINANCIAL ANALYSIS**Course Objectives:**

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

Course Outcomes: The students will understand

- The students will understand the various Forms of Business and the impact of economic variables on the Business.
- Understand the elasticity of the demand of the product, different types, and measurement of elasticity of demand and factors influencing elasticity of demand and supply
- Recognize the Production function, features of Iso-Quants and Iso-Costs, Market Structure, Pricing aspects are learnt.
- The students can study the firm's financial position by analyzing the Financial Statements of a Company
- Evaluate different types of financial ratios knowing liquidity, solvency and profitability position of business.

UNIT-I: 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 in 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: 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 & Law of Supply

UNIT-III: Production, Cost, Market Structures & Pricing: Production Analysis

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: 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.

UNIT-V: Financial Analysis through Ratios

Concept of Ratio Analysis, Liquidity Ratios, Turnover Ratios, Profitability Ratios, Proprietary Ratios, Solvency, Leverage Ratios (simple problems). Introduction to Fund Flow and Cash Flow Analysis (simple problems).

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 McGraw Hill, 2011.
3. Geethika Ghosh, Piyali Gosh, Purba Roy Choudhury, Managerial Economics, 2e, Tata McGraw Hill Education Pvt. Ltd. 2012.

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.

B.Tech.ECE	L	T	P
III Year-I Semester	3	0	0

COMPUTER ORGANIZATION & OPERATING SYSTEMS (PE-I)**Course Objectives:**

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

Course Outcomes: After completion of this course the student will be able to

- Visualize the organization of different blocks in a computer.
- Utilize the micro-level operations to control different units in a computer.
- Understanding the concepts of I/O and memory organization and operating systems
- Implement Operating systems in a computer.
- Understand how to communicate with I/O devices and the organization of I/O systems

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, Micro program 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.

Text Books:

1. Carl Hamacher, Zvonks Vranesic, Safea Zaky - Computer Organization, 5th Edition, McGraw Hill.
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.

Reference Books:

1. William Stallings- Computer Organization and Architecture, 6th Edition, Pearson
2. Andrew S. Tanenbaum -Structured Computer Organization, 4th Edition, PHI
3. Sivaraman 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..

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DATA COMMUNICATIONS AND COMPUTER NETWORKS (PE-I)**Pre-requisite:** Digital Communications**Course Objectives:**

- To introduce the Fundamentals of data communication networks
- To demonstrate the Functions of various protocols of Data link layer.
- To demonstrate Functioning of various Routing protocols.
- To introduce the Functions of various Transport layer protocols.
- To understand the significance of application layer protocols.

Course Outcomes: Upon completing this course, the student will be able to

- Explain the fundamental concepts of data communication, transmission media, and network models.
- Analyze error detection/correction techniques and apply channel access protocols for efficient data transmission.
- Demonstrate the working principles of switching techniques, routing algorithms, and congestion control mechanisms
- Explain transport layer protocols, connection management, and flow control mechanisms in computer networks.
- Evaluate network performance, quality-of-service metrics, and compare various wired/wireless network architectures.

UNIT-I: Introduction to Data Communications

Components, Data Representation, Data Flow, Networks Distributed Processing, Network Criteria, Physical Structures, Network Models, Categories of Networks Interconnection of Networks, The Internet - A Brief History, The Internet Today, Protocol and Standards - Protocols, Standards, Standards Organizations, Internet Standards. Network Models, Layered Tasks, OSI model, Layers in OSI model, TCP/IP Protocol Suite, Addressing Introduction, Wireless Links and Network Characteristics, Wi-Fi: 802.11 Wireless LANs -The 802.11 Architecture.

UNIT-II: Data Link Layer

Links, Access Networks, and LANs- Introduction to the Link Layer, The Services Provided by the Link Layer, Types of errors, Redundancy, Detection vs Correction, Forward error correction Versus Retransmission Error-Detection and Correction Techniques, Parity Checks, Check summing Methods, Cyclic Redundancy Check (CRC) , Framing, Flow Control and Error Control protocols , Noisy less Channels and Noisy Channels, HDLC, Multiple Access Protocols, Random Access ,ALOHA, Controlled access, Channelization Protocols. 802.11 MAC Protocol, IEEE 802.11 Frame

UNIT-III: The Network Layer

Introduction, Forwarding and Routing, Network Service Models, Virtual Circuit and Datagram Networks-Virtual-Circuit Networks, Datagram Networks, Origins of VC and Datagram Networks, Inside a Router-Input Processing, Switching, Output Processing, Queuing, The Routing Control Plane, The Internet Protocol (IP): Forwarding and Addressing in the Internet-Datagram format, Ipv4 Addressing, Internet Control Message Protocol (ICMP), IPv6

UNIT-IV: Transport Layer

Introduction and Transport Layer Services : Relationship Between Transport and Network Layers, Overview of the Transport Layer in the Internet, Multiplexing and Demultiplexing, Connectionless Transport: UDP -UDP Segment Structure, UDP Checksum, Principles of Reliable Data Transfer-Building a Reliable Data Transfer Protocol, Pipelined Reliable Data Transfer Protocols, Go Back-N(GBN), Selective Repeat(SR), Connection Oriented Transport: TCP - The TCP Connection, TCP Segment Structure, Round-Trip Time Estimation and Timeout, Reliable Data Transfer, Flow Control, TCP Connection Management, Principles of Congestion Control - The Cause and the Costs of Congestion, Approaches to Congestion Control

UNIT - V: Application Layer

Principles of Networking Applications – Network Application Architectures, Processes Communicating, Transport Services Available to Applications, Transport Services Provided by the File Transfer: FTP, - FTP Commands and Replies, Electronic Mail in the Internet- STMP, Comparison with HTTP, DNS-The Internet's Directory Service – Service Provided by DNS, Overview of How DNS Works, DNS Records and messages

Text Books:

1. Kurose James F, Keith W- Computer Networking A Top-Down Approach, 6th Edition, Pearson.
2. Behrouz A. Forouzan - Data Communications and Networking, 4th Edition, McGraw-Hill Education. M. Moris Mano -Computer Systems Architecture, 3rd Edition, Pearson

Reference Books:

1. Bhushan Trivedi - Data communication and Networks, Oxford university press, 2016
2. Andrew S Tanenbaum - Computer Networks, 4th Edition, Pearson Education
3. W. A. Shay - Understanding Communications and Networks, 3rd Edition, Cengage Learning.

B.Tech.ECE**L T P C****III Year-I Semester****3 0 0 3****ELECTRONIC MEASUREMENTS AND INSTRUMENTATION (PE-I)****Pre-requisite:** Basic Electrical and Electronics Engineering**Course Objectives:**

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

Course Outcomes: Upon completing this course, the student will be able to

- Measure electrical parameters with different meters and understand the basic definition of measuring parameters.
- Use various types of signal generators, signal analyzers for generating and analyzing various real-time signals.
- Operate an Oscilloscope to measure various signals.
- Measure various physical parameters by appropriately selecting the transducers. Design and analyze various error detection techniques.
- Design and implement signal conditioning and interfacing circuits for measurement applications.

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' Arson Val 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, Synchro's, 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

Text Books:

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

Reference Books:

1. Electrical and Electronic Measurement and Measuring Instruments – A K Sawhney, Dhanpati Rai & Sons, 2013.
2. Electronic Instrumentation and Measurements – David A. Bell, Oxford Univ. Press, 1997.
3. Industrial Instrumentation: T.R. Padmanabhan Springer 2009.
4. Electronic Measurements and Instrumentation – K. Lal Kishore, Pearson Education 2010. Andrew S Tanenbaum - Computer Networks, 4th Edition, Pearson Education

B.Tech.ECE	L	T	P	C
III Year-I Semester	3	0	0	3

Signal Engineering& Automatic Train Protection-Kavach

(Professional Elective-I)

Prerequisites: Physics & Mathematics, Network Layers, TDMA/FDMA/SDMA

Course Objectives:

- To introduce the fundamental principles of railway signaling, including signaling elements, station layouts, interlocking, and systems of train working for safe train operations.
- To impart knowledge of signaling equipment and subsystems, emphasizing fail-safe concepts, safety requirements, and signaling practices in electrified railway sections.
- To introduce train protection systems and provide in-depth knowledge of the Kavach (Indian Railways ATP) system and its architecture.
- To explain the working and interaction of onboard, wayside, and stationary subsystems of Kavach.
- To train students in designing, simulating, testing, and validating Kavach system configurations using plans, control tables, and a test bench

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

- Explain and analyze railway signaling principles, elements, station layouts, and interlocking systems to ensure safe train operations.
- Apply knowledge of signaling equipment and fail-safe concepts to real-time railway scenarios with emphasis on safety and reliability.
- Explain the concepts, needs, architecture, and working of train protection systems, including Kavach and its onboard and stationary subsystems.
- Analyze Kavach operational concepts such as train positioning, movement authority, braking curves, and speed monitoring.
- Design, simulate, verify, and validate Kavach scheme plans, control tables, interface diagrams, and system configurations using a test bench

UNIT-I : Introduction to General Signaling and Railway Signaling

Opening of Railways: Signalling and Inter locking Installations, Catechism for Signalling and Interlocking Installations, for 25KV AC, Isolation, Ruling gradients, Slip, Catch sidings

General Rules: Definitions, Type of Signals; Adequate Distance, System of Working, Absolute Block system, Automatic Block System, Block Working, Level Crossings, Station Working Rules

Station Layouts: MACLS, Signal Aspects, Location of Signals; Station Layouts: Single Line, Double Line, 2-Road, 3-Road, 4-Road

Station Layouts: Track Circuits & Axle Counters, Block Instruments, Relay Inter locking; and Electronic Inter locking, Requirement of Signaling in 25KV AC Electrified Area.

Signaling Interlocking Plan: Essentials of Interlocking, Train Detection, Level Crossing Gate, Point Switching, Signal, Block Control, Aspect Control Chart

UNIT-II: Signaling Equipment

Details of Relays, Signal Cables. Signals, Control Panel & Operation-Safety features, Working, Details of Point Machines-Components, Working, Circuit Progression, Testing, Safety features, Level Crossing Gates-Working, Circuit Progression, Safety features, Details of Track Circuits, Axle Counters- Single section, Multi-section, Subsystems; Working and Application, Details about Block Instruments - Types, Working, Circuit Progression, safety features, Data Acquisition System-Interfaces, Fault logic, Details of Integrated Power Supply, CLS Panel, Lightning and Surge Protection

UNIT-III: Introduction to Train Protection Systems -Kavach

Train Protection Systems: Auxiliary Warning Systems, European Train Control Systems Communication, Spot and Continuous Relay of Information, Working of Interfaces Subsystem: Onboard Kavach: Driver Machine Interlocking, Braking Interface, Radio Equipment, On board Computer, Transponder Receiver, Odometry, GNSS, GPRS, GSM

Subsystem: Stationary Kavach: Station Kavach, Track Side Equipment, signaling Interface, Radio & Tower, GNSS, Transponders, Network Monitoring System

Concepts: Location Referencing-Train position, Modes of Onboard subsystem, Train Characteristics, Mode Transitions, Braking Curves, Speed Profiles, Communication Protocols, Key Management System(KMS), Messages & Language

UNIT-IV: Design-Kavach & Installation

Station Design: Kavach Scheme Plan, Kavach Control Table, Signaling Interface Diagram, Connectivity Plans for Remote Interface Units (RIUs), Power Supply Plan

Tower Design: Soil Testing, Foundation design, Super Structure Design

Stationary Kavach: Inter locking Interface, RFID Tags, Station Master Operation Console Indication Panel (SM_OCIP),GPS/GSM Antennas, Pre-commissioning Checklist, Testing, On board Kavach

UNIT-V: Simulation

Test bench, Preparation and deployment of Stationary Kavach Data: Configuration involving Topographical Information-Arrangement of Signals/Markers, Transponders, Inter signal Distances, Signal Routes, Gradients, Speed Restrictions ; Verification and Validation of On-board Data-Ceiling.

Text Books:

1. Indian Railway Signal Engineering Vol-1, 2008, Pramod P Goel, Bahri Publishers
2. Indian Railway Signal Engineering Vol-IV, 2010, Pramod P Goel, Bahri Publishers
3. Kavach Cab Signalling and Automatic Train Protection Systems for Digital Railways,2023, Lalit Kumar Mansukhani, Chandra Kishore Prasad, Y, Ramesh babu, BS Publications

Reference Books:

1. Fundamentals of Railway Signalling, 2016, C.R. Sengupta, Citadel
2. Electronics Interlocking on Indian Railways, 2018, V, Purna Chandra Rao, Notion Press.

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MICROCONTROLLERS LABORATORY**Course Outcomes:** Upon completing this course, the students will be able to

- Develop assembly language programs using 8086 microprocessors for arithmetic, logical, and string operations.
- Interface peripheral devices (ADC, DAC, Stepper Motor, Keyboard Display) with 8086 and verify their operation.
- Write embedded C programs for 8051 microcontrollers using timers, counters, I/O ports, and serial communication
- Design and implement real-time applications using microprocessor and microcontroller interfacing techniques
- Use simulation/debugging tools (Keil, MASM, Proteus, etc.) to analyze and test microprocessor/microcontroller programs.

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 toolchain7 Segment Display to 8051.

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.

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ADVANCED ENGLISH COMMUNICATION SKILLS LABORATORY**Course Outcomes:** Upon completing this course, the students will be able to:

- Implement basic data communication concepts such as encoding, error detection, and error correction techniques.
- Simulate and analyze network topologies, LAN protocols, routing algorithms, and congestion control mechanisms using tools like NS2/NS3/Wireshark/Cisco Packet Tracer.
- Configure networking devices such as routers, switches, DHCP, DNS, and firewalls for small network setups
- Implement socket programming for TCP and UDP communication and evaluate performance parameters like throughput and delay.
- Work in teams to design, test, and troubleshoot mini-network prototypes and document experimental results effectively

1. Introduction

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 and interpersonal communication in the globalized 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 organize 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. Objectives:

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

- To improve the students' fluency in English, with a focus on vocabulary
- To enable them to listen to English spoken at normal conversational speed by educated English speakers
- To respond appropriately in different socio-cultural and professional contexts

- To communicate their ideas relevantly and coherently in writing
- Preparing the students for placements

3. 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:** 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 - Subskills of reading - Reading for facts, negative facts and Specific Details- Guessing Meanings from Context, Inferring Meaning - Critical Reading — Reading Comprehension – Exercises for Practice.
2. **Activities on Writing Skills:** Vocabulary for Competitive Examinations - Planning for Writing – Improving Writing Skills - Structure and presentation of different types of writing – Free Writing and Structured Writing - Letter Writing – Writing a Letter of Application –Resume vs. Curriculum Vitae – Writing a Résumé – Styles of Résumé - e-Correspondence – Emails – Blog Writing - (N)etiquette – Report Writing – Importance of Reports – Types and Formats of Reports– Technical Report Writing– Exercises for Practice.
3. **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 Clarification, Making a Request, Asking for and Refusing Permission, Participating in a Small Talk – Oral presentations (individual and group) through JAM sessions- PPTs – 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
4. **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.
5. **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

4. 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

5. 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 Dream tech

6. 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 Edition). 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 Edition) Oxford University Press.
6. Anderson, Paul V. (2007). Technical Communication. Cengage Learning Pvt. Ltd. New Delhi.
7. McCarthy, 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 can it matter more than IQ. Bloomsbury Publishing

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IOT ARCHITECTURE AND PROTOCOLS LABORATORY**Course Outcomes:** Upon completing this course, the students will be able to:

- Understand the fundamentals of IoT, analyzing different architectures and protocols
- Utilize the different sensors like room temperature, DHT, Humidity etc.,
- Interface the sensors and processor for transmission of data.
- Capture the images and process it on Arduino/NodeMCU/Raspberry Pi.
- know the utilization of various protocols like I2c, UART communication etc.,

List of Experiments:

1. Demonstrate blinking of an LED every 5 seconds and control 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 uploading 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.

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INTELLECTUAL PROPERTY RIGHTS**Course Objectives:**

- Significance of intellectual property and its protection
- Introducing various forms of intellectual property

Course Outcomes:

- Explain the fundamental concepts, scope, and significance of Intellectual Property Rights in engineering and innovation.
- Differentiate among various types of IPR—Patents, Copyrights, Trademarks, Industrial Designs, and Trade Secrets
- Describe patent filing procedures, international IPR frameworks, and mechanisms for IP protection
- Apply IPR rules related to infringement, licensing, and technology transfer in real-world engineering scenarios.
- Evaluate ethical, legal, societal, and entrepreneurial implications of Intellectual Property Rights in global contexts.

UNIT-I: Introduction to Intellectual property

Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

UNIT-II: Trade Marks

Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting, and evaluating trademarks, trade mark registration processes

UNIT-III: Law of copyrights

Fundamental of copyright law, originality of material, rights of reproduction, rights to perform the work publicly, copyright ownership issues, copyright registration, notice of copyright, International copyright law.

Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer

UNIT-IV: Trade Secrets

Trade secret law, determination of trade secret status, liability for misappropriations of trade secrets, protection for submission, trade secret litigation. Unfair competition: Misappropriation of the right of publicity, false advertising.

UNIT – V: New development of intellectual property

New developments in trade mark law; copyright law, patent law, intellectual property audits. International overview on intellectual property, international – trade mark law, copyright law, international patent law, and international development in trade secrets law.

Text Books:

1. Intellectual property right, Deborah. E. Bouchoux, Cengage learning.

Reference Books:

1. Intellectual property right – Unleashing the knowledge economy, Prabuddha Ganguli, Tata McGraw Hill Publishing company ltd.