ACADEMIC REGULATIONS COURSE STRUCTURE

AND

DETAILED SYLLABUS

ELECTRONICS AND COMMUNICATION ENGINEERING

FOR

B. TECH FOUR YEAR DEGREECOURSE

(Applicableforthebatchesadmittedfrom2020-2021)

ACE

Engineering College

Ankushapur(V), Ghatkesar(M) - 501 301

(An Autonomous Institution, Affiliated to JNTUH ,Hyderabad)

III Year			I Semester				
S. No.	Course Type	Course Code	Course Title	Periods Per Week			Credits
				L	T	P	
1	PCC	EC501PC	Microprocessors & Microcontrollers	3	1	0	4
2	ESC	CS502ES	Data Communications and Networks	3	1	0	4
3	ESC	EE503ES	Control Systems	3	1	0	4
4	HSMC	SM504MS	Business Economics & Financial Analysis	3	0	0	3
5	PEC		Professional Elective - I	3	0	0	3
6	PCC	EC505PC	Microprocessors &Microcontrollers Lab	0	0	3	1.5
7	PCC	EC506PC	Data Communications and Networks Lab	0	0	3	1.5
8	HSMC	EN508HS	Advanced English Communication Skills Lab	0	0	2	1
9	MC	MC509	Intellectual Property Rights	3	0	0	0
10	MC	MC510EC	Fundamentals of Cyber Security	3	0	0	0
11	MC	MC511EC	Internship in industry	0	0	0	0
Total				**21**	**3**	**8**	**22**

III Year			II Semester				
S. No.	Course Type	Course Code	Course Title	Periods Per Week			Credits
				L	T	P	
1	PCC	EC601PC	Antennas and Propagation	3	1	0	4
2	PCC	EC602PC	Digital Signal Processing	3	1	0	4
3	PCC	EC603PC	VLSI Design	3	1	0	4
4	PEC		Professional Elective - II	3	0	0	3
5	OEC		Open Elective - I	3	0	0	3
6	PCC	EC604PC	Digital Signal Processing Lab	0	0	3	1.5
7	PCC	EC605PC	e – CAD Lab	0	0	3	1.5
8	PCC	EC606PC	Scripting Languages Lab	0	0	2	1
9	MC	MC601EC	Numerical Ability & Reasoning	3	0	0	0
10	MC	MC602EC	Fundamentals of Artificial Intelligence	3	0	0	0
Total				**21**	**3**	**8**	**22**

Note: *MC =Satisfactory/Unsatisfactory

***Open Elective –** Students should take Open Electives from List of Open Electives Offered by Other Departments / Branches Only.

These are the list of open electives offered by our branch to other branches

EC501PC: MICROPROCESSORSANDMICROCONTROLLERS

B. Tech. III Year I Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
EC501PC	PCC	3	1	-	4	30	70	100

Prerequisite: Nil

Course Objectives:

- To develop an understanding of the functionality of microprocessors; Assembly language programming and interfacing techniques.
- To provide knowledge on functionality of microcontrollers; Assembly language programming and interfacing techniques.
- To develop an understanding of the operations and Programming of ARM Processor
- To study the basic concepts of Advanced ARM processors (A, R, M profile) and their applications.

- **Course Outcomes:** Upon completing this course, the student will be able to
- Understand the 8086µp architecture, its operation and apply the knowledge of instruction set & assembler directives to write Programs using MASM.
- Understand the 8051µc architecture, its operation and apply the knowledge of instruction set to design applications.
- Apply the knowledge of 8051µc and Communication protocols to interface I/O devices.
- Understand the ARM processor internal architecture, apply the knowledge of instruction settodesign applications.
- Understand the ARM CORTEX and OMAP Processor architecture and their applications.

Unit: I — 8086Architecture

8086Architecture:8086Architecture-Functional diagram, Register Organization, Memory Segmentation, Programming Model, Memory addresses, Physical Memory Organization, rchitectureof8086,Signal descriptionsof8086,interruptsof8086.
Instruction Set and Assembly Language Programming of 8086: Instruction formats, Addressing modes, Instruction Set,AssemblerDirectives,Macros,andSimpleProgramsinvolvingLogical,BranchandCall Instructions, Sorting, String Manipulations.

Unit: II — Introduction to Microcontrollers & 8051 Real Time Control

Introduction to Microcontrollers: Overview of 8051 Microcontroller, Architecture, I/O Ports, Memory Organization, Addressing Modes and Instructionsetof8051.

8051 Real Time Control: Programming Timer Interrupts, Programming External Hardware Interrupts, Programming the Serial Communication Interrupts,Programming8051TimersandCounters

Unit: III — I/O And Memory Interface, Serial Communication and Bus Interface

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 CommunicationInterfaces-RS232,USB.

Unit: IV — ARM Architecture

ARM Architecture: ARM Processor fundamentals, ARM Architecture – Register, CPSR, Pipeline, exceptions and interrupts interrupt vectortable,ARMinstructionset–
Dataprocessing,Branchinstructions,loadstoreinstructions,Softwareinterruptinstructions,Programstatusregisterinstructions,loadingconstants,Conditionalexecution,Introductionto Thumb instructions.

Unit: V — Advanced ARM Processors

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

Text Books:

1. AdvancedMicroprocessorsandPeripherals–A.K.RayandK.M.Bhurchandani,TMH,2nd Edition2006.
2. ARMSystemDevelopersguide,AndrewNSLOSS,DominicSYMES,ChrisWRIGHT,Elsevier,2012

Reference Books:

1. The8051Microcontroller, Kenneth. J. Ayala, Cengage Learning, 3rd Ed,2004.
2. Microprocessors and Interfacing, D.V. Hall, TMGH, 2nd Edition2006.
3. The8051Microcontrollers, Architecture and Programming and Applications-K. Uma Rao, Andhe Pallavi, Pearson,2009.
4. Digital Signal Processing and Applications withtheOMAP-L138Experimenter,Donald Reay,WILEY2012.

Web References:

1. https://www.arm.com/
2. https://www.intel.com/content/www/us/en/homepage.html
3. https://onlinecourses.nptel.ac.in/noc20_ee42/preview
4. https://ict.iitk.ac.in/courses/microprocessors-and-microcontrollers/
5. https://en.wikipedia.org/wiki/Microcontroller
   https://nptel.ac.in/courses/108/105/108105102/

E-Text Books:

1. https://nptel.ac.in/courses/108/103/108103157/
2. https://nptel.ac.in/courses/106/105/106105193/
   https://www.pdfdrive.com/arm-microprocessor-systems-cortex-m-architecture-programming-and-interfacing-e157100364.html

CS502ES: DATACOMMUNICATIONSANDNETWORKS

B. Tech. III Year I Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
EC501PC	PC	3	1	-	4	30	70	100

Prerequisite: 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

- Know the Categories and functions of various Data communication Networks
- Design and analyze various err or detection techniques.
- Demonstrate them echanism of routing the data in network layer
- Know the significance of various Flow control and Congestion control Mechanisms
- Know the Functioning of various Application layer Protocols.

Unit: I — Introduction to Data Communications

Introduction to Data Communications: Components, Data Representation, Data Flow, Networks-Distributed Processing, Network Criteria, Physical Structures, Network Models, CategoriesofNetworksInterconnectionofNetworks,TheInternet-ABriefHistory,TheInternetToday,ProtocolandStandards- 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,WiFi:802.11WirelessLANs-The 802.11 Architecture,

Unit: II — Data Link Layer

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 err or 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 802.11Frame

Unit: III — The Network Layer

TheNetworkLayer: Introduction,ForwardingandRouting,NetworkServiceModels,VirtualCircuitandDatagramNetworks-Virtual-CircuitNetworks,DatagramNetworks,OriginsofVCandDatagramNetworks, 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,Ipv4Addressing,InternetControl Message Protocol(ICMP),IPv6

Unit: IV — Transport Layer

Transport Layer: Introduction and Transport Layer Services : Relationship Between Transport and Network Layers, Overview of the Transport Layerin the Internet, Multiplexing and Demultiplexing,ConnectionlessTransport:UDP-UDPSegmentStructure,UDPChecksum,Principlesof 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, FlowControl,TCPConnectionManagement,PrinciplesofCongestionControl-TheCauseandtheCostsofCongestion,Approachesto Congestion Control

Unit: V — Application Layer

Application Layer:

PrinciplesofNetworkingApplications–NetworkApplicationArchitectures,ProcessesCommunicating,Transport Services Available to Applications, Transport Services Provided by the File Transfer: FTP,-FTPCommandsandReplies,ElectronicMailintheInternet-STMP,ComparisonwithHTTP,DNS-The

Internet's Directory Service–Service Provided by DNS, Overview of How DNS Works, DNS Records and messages.

Text Books:

1. Computer Networking A Top-Down Approach–Kurose James F, Keith W, 6th Edition,Pearson.
2. DataCommunicationsandNetworkingBehrouzA.Forouzan4thEditionMcGraw-HillEducation

Reference Books:

1. DatacommunicationandNetworks-BhusanTrivedi,Oxforduniversitypress,2016
2. Computer Networks-- AndrewSTanenbaum,4thEdition,PearsonEducation

UnderstandingCommunicationsandNetworks,3rdEdition,W.A.Shay,CengageLearning

EE503ES: CONTROLSYSTEMS

B. Tech. III Year I Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
EE503ES	ESC	3	1	-	4	30	70	100

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

Course Objectives:

- TounderstandthedifferentwaysofsystemrepresentationssuchasTransferfunctionrepresentationandstatespacerepresentationsandtoassessthesystemdynamicresponse
- To assess the system performance using time domain analysis and methods for improving it
- Toassessthesystemperformanceusingfrequencydomainanalysisandtechniquesforimprovingthe performance
- To design various controllers and compensators to improve system performance

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

- Understandthemodelingoflinear-time-invariantsystemsusingtransferfunctionandstate-spacerepresentations.
- Understand the concept of stability and its assessment for line ar-time invariant systems.
- Design simple feedback controllers.

Unit: I — Introduction to Control Problem

Introduction to Control Problem: Industrial Control examples. Mathematical models of physicalsystems.Controlhardwareandtheirmodels.Transferfunctionmodelsoflineartime-invariantsystems.FeedbackControl: Open-LoopandClosed-loopsystems.BenefitsofFeedback.Blockdiagramalgebra.

Unit: II — Time Response Analysis of Standard Test Signals

Time Response Analysis of Standard Test Signals: Time response of first and second or dersystems 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. RelativeStabilityanalysis.Root-Locustechnique.ConstructionofRoot-loci.

Unit: III — Frequency-Response Analysis

Frequency-Response Analysis: Relationship between time and frequency response, Polar plots, Bodeplots. Nyquiststability criterion. RelativestabilityusingNyquistcriterion–gainandphasemargin.Closed-loopfrequencyresponse.

Unit: IV — Introduction to Controller Design

Introduction to Controller Design: Stability, steady-state accuracy, transient accuracy, disturb ancerejection, 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, LeadandLagcompensationindesigns.AnalogandDigitalimplementationofcontrollers.

Unit: V — State Variable Analysis and Concepts of State Variables

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 control ability and observeability. Pole-placement by state feedback. Discrete-time systems. Difference Equations. State-space model so flinear discrete-time systems. Stability oflinear discrete-time systems

Text Books:

1. M.Gopal,“ControlSystems:PrinciplesandDesign”,McGrawHillEducation, 1997.
2. B. C.Kuo,“AutomaticControlSystem”,PrenticeHall,1995.

Reference Books:

1. K.Ogata,“ModernControlEngineering”,PrenticeHall,1991.
2. I.J.NagrathandM.Gopal,“ControlSystemsEngineering”,NewAgeInternational,2009.

SM504MS: BUSINESSECONOMICSANDFINANCIAL ANALYSIS

B. Tech. III Year I Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
SM504MS	HSMC	3	-	-	3	30	70	100

Prerequisite: Nil

Course Objectives:

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

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

- The students will understand the various Forms of Business and the impact of economic variables on the Business. The Demand, Supply, Production, Cost, Market Structure, Pricing aspects are learnt. The Students can study the firm's financial position by analysing the Financial Statements of a Company.

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: SignificanceofEconomics,MicroandMacroEconomicConcepts,ConceptsandImportance 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 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 and Law of Supply.

Unit: III Production, Cost, Market Structures & Pricing

Production Analysis: Factors of Production, Production Function, Production Function with one variableinput, 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**

Financial Accounting: Accounting concepts and Conventions, Accounting Equation, Double-Entry system of Accounting, Rules for maintaining Books of Accounts, Journal, Posting toLedger,PreparationofTrialBalance,ElementsofFinancialStatements,PreparationofFinalAccounts.

Unit: V **Financial Analysis through Ratios**

FinancialAnalysisthroughRatios: ConceptofRatioAnalysis,Importance,LiquidityRatios,Turnover Ratios, Profitability Ratios, Proprietary Ratios, Solvency, Leverage Ratios – Analysis and Interpretation(simple problems).

Text Books:

1. D.D.Chaturvedi,S.L.Gupta,BusinessEconomics-TheoryandApplications,InternationalBookHouse Pvt.Ltd.2013.
2. Dhanesh K Khatri, Financial Accounting, Tata Mc–GrawHill,2011.
3. Geethika Ghosh, Piyali Gosh, PurbaRoyChoudhury,ManagerialEconomics,2e,TataMcGrawHill Education Pvt.Ltd.2012.

Reference Books:

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

EC512PE: ERROR CORRECTING CODES

B. Tech. III Year I Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
EC511PE	PEC	3	-	-	3	30	70	100

Prerequisite: Digital Communications

Course Objectives:

- To acquire the knowledge in measurement of information and errors.
- To study the generation of various code methods used in communications.
- To study the various application of codes.

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

- Abletotransmitandstorereliabledataanddetecterrorsindatathroughcoding.
- Able to understand the designing of various codes like block codes, cyclic codes, convolution codes, turbo code sand space codes.

Unit: I — **Coding for Reliable Digital Transmission and storage, Linear Block Codes**

Coding for Reliable Digital Transmission and storage: Mathematical model of Information, ALogarithmic Measure of Information, Average and Mutual Information and Entropy, Types of Errors, Error Control Strategies.

Linear Block Codes: Introduction to Linear Block Codes, Syndrome and Error Detection, Minimum Distance of a Block code, Error-Detecting and Error-correcting Capabilities of a Block code, Standard array and Syndrome Decoding, Probability of an undetected error for Linear Codes over a BSC, Hamming Codes. Applications of Block codes for Error control in data storage system

Unit: II — **Cyclic Codes**

Cyclic Codes: Description, Generator and Parity-check Matrices, Encoding, Syndrome Computation and Error Detection, Decoding, CyclicHammingCodes,Shortenedcycliccodes,Error-trappingdecodingforcycliccodes,Majoritylogicdecodingforcycliccodes.

Unit: III — **Convolutional Codes**

Convolutional Codes: Encoding of Convolutional Codes, Structural and Distance Properties, maximum likelihood decoding, Sequential decoding, Majority- logic decoding of Convolution codes. Application of Viterbi Decoding and Sequential Decoding, Applications of Convolutional codes in ARQ system.

Unit: IV — **Turbo Codes**

Turbo Codes: LDPC Codes- Codes based on sparse graphs, Decoding for binary erasure channel,Log-likelihoodalgebra,Briefpropagation,Productcodes,Iterativedecodingofproductcodes,Concatenatedconvolutionalcodes-Parallelconcatenation,TheUMTSTurbocode,Serialconcatenation,Parallel concatenation, Turbo decoding

Unit: V — **Space-Time Codes**

Space-Time Codes: Introduction, Digital modulation schemes, Diversity, Orthogonal space- Time Block codes, Alamouti's schemes, Extension to more than Two Transmit Antennas, Simulation Results, Spatial Multiplexing: General Concept, Iterative APP Preprocessing and Per-layer Decoding, Linear Multilayer Detection, Original BLAST Detection, QLDecomposition and Interface Cancellation, Performance of Multi–Layer Detection Schemes, Unified Description by Linear DispersionCodes.

Text Books:

1. Error Control Coding-Fundamentals and Applications–ShuLin, DanielJ. Costello, Jr, Prentice Hall, Inc.
2. Error Correcting Coding Theory-Man Young Rhee- 1989,McGraw-Hill

Reference Books:

1. Error CorrectingCodingTheory-ManYoungRhee-1989,McGraw– HillPublishing,19
2. Digital Communications-Fundamental and Application-Bernard Sklar, PE.
3. Digital Communications-John G. Proakis, 5thed., 2008, TMH.
4. Introduction to Error Control Codes-Salvatore Gravano-oxford
5. ErrorCorrectionCoding–MathematicalMethodsandAlgorithms–ToddK.Moon,2006, Wiley India.
6. Information Theory, Coding and Cryptography–RanjanBose,2nd Edition,2009,TMH.

EC512PE: MOBILE COMMUNICATIONSANDNETWORKS

B. Tech. III Year II Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
EC512PE	PE	3	-	-	3	30	70	100

Prerequisite: Analog and Digital Communications

Course Objectives:

1. Toprovidethestudentwithanunderstandingofthecellularconcept,frequencyreuse, hand-off strategies.
2. ToprovidethestudentwithanunderstandingofCo-channelandNon-Co-Channelinterferences.
3. Togivethestudentanunderstandingofcellcoverageforsignalandtraffic,diversitytechniquesandchannelassignment
4. To give the student an understanding types of handoff.
5. To understand challenges and application of Adhocwireless Networks.

Course Outcomes: Uponcompletingthis course, the student will be able to

1. Known the evolution of cellular and mobile communication system.
2. ThestudentwillbeabletounderstandCo-ChannelandNon-Co-Channelinterferences.
3. Understand impairments due to multipath fading channe land how to overcome the different of a dingeffects.
4. Familiar with cell coverage for signal and traffic, diversity, techniques, frequency management, Channelas signment and types of handoff.
5. KnowthedifferencebetweencellularandAdhocNetworksanddesigngoalsofMACLayerprotocol.

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Unit: I — Introduction to Cellular Mobile Radio Systems, Fundamentals of Cellular Radio System Design

Introduction to Cellular Mobile Radio Systems: Limitations of Conventional Mobile Telephone Systems. Basic Cellular Mobile System, First, Second, Third and Fourth Generation Cellular Wireless Systems. Uniqueness of Mobile Radio Environment-Fading-Tie Dispersion Parameters, Coherence Bandwidth, Doppler Spread and Coherence Time.
FundamentalsofCellularRadioSystemDesign: ConceptofFrequencyReuse,Co-ChannelInterference, Co-Channel Interference Reduction Factor, Desired C/I from a Normal Case in a Omni Directional Antenna System, System Capacity Improving Coverage and Capacity in Cellular Systems-Cell Splitting, Sectoring, Microcell Zone Concept.

Unit: II — Co-Channel Interference, Non Co-Channel Interference

Co-Channel Interference: Measurement of Real Time Co-Channel Interference, Design of Antenna System, Antenna Parameter sand their effects, diversitytechniques-spacediversity,polarizationdiversity,frequencydiversity,time diversity.
Non Co-Channel Interference: Adjacent Channel Interference, Near end far end interference, crosstalk, effects on coverage and interference by power decrease, antenna height decrease, effects of cell site components.

Unit: III — Cell Coverage for Signal and Traffic, Frequency Management and Channel Assignment

Cell Coverage for Signal and Traffic: Signal Reflections in flat and Hilly Terrain, effects of Human Made Structures, phase difference between direct and reflected paths, constant standard deviation,straightlinepathlossslope,generalformulaformobilepropagationoverwaterandflatopenarea,nearand long-distance propagation, path loss from a point to point prediction model in different conditions, meritsofleemodel.
Frequency Management and Channel Assignment: Numbering and Grouping, Setup Access and Paging Channels, Channel Assignments to Cell Sites and Mobile Units.

Unit: IV — Handoffs and Dropped Calls

Handoffs and Dropped Calls: Handoff Initiation, types of Handoff, Delaying Handoff, advantages offhand off, Power Difference Handoff, Forced Handoff, Mobile Assisted and Soft Handoff, Intersystem hand off, Introductionto Dropped Call Rates and their Evaluation.

Unit: V	Ad Hoc Wireless Networks

Ad Hoc Wireless Networks: Introduction, Cellular and Ad Hoc wireless Networks, Applications and Ad Hoc Wireless Networks, Issues in Ad Hoc Wireless Networks, Ad Hoc Wireless Internet, MAC Protocols for Ad Hoc Wireless, Introduction, issues in designing AMAC Protocol for Ad Hoc wireless Networks, Design Goals of AMAC protocol for Ad Hoc Wireless Networks, Classification of MAC Protocols.

Text Books:

1. Mobile Cellular Telecommunications-W.C.Y. Lee, McGraw Hill,2nd Edn.,1989.
2. Wireless Communications-Theodore.S. Rapport, Pearson Education, 2ndEdn., 2002.

Reference Books:

1. AdHoc Wireless Networks: Architectures and Protocols- C.Sivaram Murthy and B.S.Manoj, 2004,PHI.
2. Modern Wireless Communications- Simon Haykin, Michael Moher, PearsonEducation,2005.
3. Wireless Communications and Networking, Vijay Garg, ElsevierPublications,2007.
4. Wireless Communications-Andrea Goldsmith, Cambridge UniversityPress,2005.

EC513PE: ELECTRONICMEASUREMENTSANDINSTRUMENTATION

B. Tech. III Year I Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
EC513PE	PEC	3	-	-	3	30	70	100

Prerequisite: Basic Electrical and Electronics Engineering

Course Objectives:

1. Itprovidesanunderstandingofvariousmeasuringsystemfunctioningandmetricsforperformanceanalysis.
2. Provides understanding of principle of operation, working of different electronicinstrumentsviz. Signal generators, signal analyzers, recordersandmeasuring equipment.
3. Understanding the concepts of various measuring bridge sand their balancing conditions.
4. Providesunderstandingofuseofvariousmeasuringtechniquesformeasurementofdifferentphysicalparametersusingdifferentclassesoftransducers.

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

1. Measureelectricalparameterswithdifferentmetersandunderstandthebasicdefinitionofmeasuringparameters.
2. Use various types of signal generators, signal analyzers for generating and analyzing variousreal-time signals.
3. Operate an Oscilloscope tome asurevarious signals.
4. Measurevariousphysicalparametersbyappropriatelyselectingthetransducers.

Unit: I — Block Schematics of Measuring Systems

Block Schematics of Measuring Systems: Performance Characteristics, Static Characteristics,Accuracy,Precision,Resolution,TypesofErrors,GaussianError,RootSumSquaresformula,DynamicCharacteristics,Repeatability,Reproducibility,Fidelity,Lag;MeasuringInstruments:DCVoltmeters,D'ArsonvalMovement,DCCurrentMeters,ACVoltmetersandCurrentMeters,Ohmmeters,Multimeters,MeterProtection,ExtensionofRange,TrueRMSRespondingVoltmeters,SpecificationsofInstruments.

Unit: II — Signal Analyzers

Signal Analyzers: AF, HF Wave Analyzers, Harmonic Distortion, Heterodyne wave Analyzers, Spectrum Analyzers, Power Analyzers, Capacitance-Voltage Meters, Oscillators. Signal Generators:AF,RFSignalGenerators,SweepFrequencyGenerators,PulseandSquarewave Generators, Function Generators, Arbitrary Waveform Generator, Video Signal Generators, and Specifications

Unit: III — Oscilloscopes, Special Purpose Oscilloscopes

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:

Transducers: Classification,StrainGauges,Bounded,unbounded;ForceandDisplacementTransducers, Resistance Thermometers, Hotwire Anemometers, LVDT, Thermocouples, Synchros, Special Resistance Thermometers, Digital Temperature sensing system, Piezoelectric Transducers,VariableCapacitanceTransducers,MagnetoStrictiveTransducers,gyroscopes,accelerometers.

Unit: V — Bridges, Measurement of Physical Parameters

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.Helbincs,W.D.Cooper:PHI5th Edition 2003.
2. Electronic Instrumentation: H. S.Kalsi–TMH,2nd Edition2004.

Reference Books:

1. ElectricalandElectronicMeasurementandMeasuringInstruments–AKSawhney, Dhanpat Rai&Sons,2013.
2. Electronic Instrumentation and Measurements–David A. Bell, Oxford Univ. Press,1997.
3. Industrial Instrumentation: T.R. PadmanabhamSpringer2009.
4. ElectronicMeasurementsandInstrumentation–K.LalKishore,PearsonEducation2010

EC505PC: MICROPROCESSORS AND MICROCONTROLLERS LAB

B. Tech. III Year I Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
EC505PC	PC	-	-	3	1.5	30	70	100

Prerequisite:

Course Objectives:

1. To develop an understanding of the Assembly language programming on an 8086 Microprocessor.
2. To develop an understanding of the interfacing techniques with 8086 Microprocessor.
3. To develop an understanding of Assembly language programming using Keil IDE on 8051µc.
4. To develop an understanding of the interfacing techniques with 8051 Microcontroller.

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

- Understand and apply the knowledge of addressing modes, instruction set & assembler directives of 8086 to perform arithmetic operations, sorting String programs using MASM.
- Design & test the function of Stepper motor and 8255 by interfacing with 8086.
- Understand and apply the knowledge of addressing modes, instruction set of 8051 to perform arithmetic, logical & bit manipulation programs using Keil.
- Able to verify the operation of timer/counter/UART/interrupt handler in 8051.

List of Experiments:

Cycle 1: Using 8086 Processor Kits and/or Assembler (6 Weeks)

1. Assembly Language Programs to perform Arithmetic, Logical, and String Operations.
2. Assembly Language Programs to perform Rotate, Shift, Swap and Branch Operations.
3. Interfacing stepper motor, ADC & DAC to 8086.

Cycle 2: Using Keil IDE- **(5 weeks)-**

1. Assembly Language Programs to Perform Arithmetic, Logical Operations.
2. Assembly Language Programs to perform Rotate, Shift, Swap and Branch Instructions
3. Time delay Generation Using Timers of 8051.
4. UART operation (Serial communication) in 8051.
5. Program and verify interrupt handling in 8051.

Cycle 3: Interfacing I/O Devices to 8051 (5 Weeks)

1. Interfacing LCD to 8051
2. Interfacing Matrix Keyboard to 8051
3. Interfacing 8-bit ADC to 8051.
4. Interfacing DAC to 8051.

List of Equipment Required:

1. Computer Systems(Intel) with Windows 7 or higher Operating System
2. MASM611 Software (Open source)
3. Keil µVision IDE Software (Open Source)
4. 8086 µp kits, stepper motor interfacing module,8051µc kits, LCD interfacing module, Matrix Keyboard interfacing module, ADC interfacing module, DAC interfacing module.

Text Books:

1. Advanced Microprocessors and Peripherals – A. K. Ray and K.M. Bhurchandani, MHE, 2nd Edition 2006.
2. The 8051 Microcontroller, Kenneth. J. Ayala, Cengage Learning, 3rd Ed.
3. ARM System Developer's guide, Andrew N SLOSS, Dominic SYMES, Chris WRIGHT, Elsevier, 2012

Reference Books:

1. Microprocessors and Interfacing, D. V. Hall, MGH, 2nd Edition 2006.2. Introduction to Embedded Systems, Shibu K.V, MHE, 2009
2. The 8051 Microcontrollers, Architecture and Programming and Applications -K.UmaRao, Andhe Pallavi, Pearson, 2009.

Web References:

1.https://www.arm.com/
2.https://www.intel.com/content/www/us/en/homepage.html
3.https://online courses.nptel.ac.in/noc20_ee42/preview
4.https://ict.iitk.ac.in/courses/microprocessors-and-microcontrollers/
5.https://en.wikipedia.org/wiki/Microcontroller
6.https://nptel.ac.in/courses/108/103/108103157/
7.https://nptel.ac.in/courses/106/105/106105193/

E-Text Books:

1. https://nptel.ac.in/courses/108/103/108103157/
2. https://nptel.ac.in/courses/106/105/106105193/

https://www.pdfdrive.com/arm-microprocessor-systems-cortex-m-architecture-programming-and-interfacing-e157100364.html

EC506PC: DATA COMMUNICATIONS AND NETWORKS LAB

B. Tech. III Year I Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
EC506PC	PC	-	-	3	1.5	30	70	100

Note:

A. Minimumof12Experimentshavetobeconducted
B. All the Experiments maybe Conducted using Network SimulationsoftwarelikeNS-2,NSG-2.1andWireSHARK/equivalentsoftware.

Note:ForExperiments2to10Performancemaybeevaluatedthroughsimulationbyusingtheparameters Throughput, Packet Delivery Ratio, Delay etc

List of Experiments:

1. Writing a TCL Script to create two nodes and links between nodes
2. Writing a TCL Script to transmit data between nodes
3. Evaluate the performance of various LANT opologies
4. Evaluate the performance of Drop Tail and RED queue management schemes
5. Evaluate the performance of CBQ and FQ Scheduling Mechanisms
6. Evaluate the performance of TCP and UDP Protocols
7. Evaluate the performance of TCP, New Reno and Vegas
8. Evaluate the performance of AODV and DSR routing protocols
9. Evaluate the performance of AODV and DSDV routing protocols
10. EvaluatetheperformanceofIEEE802.11andIEEE 802.15.4
11. Evaluate the performance ofIEEE802.11and SMAC
12. Capturing and Analysis of TCP and IP Packets
13. Simulation and Analysis of ICMP and IGMP Packets
14. Analyze the Protocols SCTP, ARP, Net BIOS,IPXVINES
15. Analysis of HTTP,DNS and HCP Protocols

EN508HS: ADVANCED ENGLISH COMMUNICATION SKILLS LAB

C. Tech. III Year I Semester								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
EN508HS	**HSMC**	-	-	2	1	30	70	100

1. INTRODUCTION:

TheintroductionoftheAdvancedCommunicationSkillsLabisconsideredessentialat3rdyearlevel.Atthis stage, the students need to prepare themselves for their careers 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 'good' English and perform the following:

- Gathering ideas and information to organizeideasrelevantly and coherently.
- Engagingindebates.
- Participating in group discussions.
- Facing inter views.
- Writing project/ research reports / technical reports.
- Making or alpresentations.
- Writing form alletters.
- Transferring information from non-verbal toverbaltextsandvice-versa.
- Taking partinsocialandprofessionalcommunication.

Course Objectives:

1. OBJECTIVES:

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

- To improve the students' fluency in English, through a well-developed vocabulary and enablethemtolistentoEnglishspokenatnormalconversationalspeedbyeducatedEnglishspeakersandrespondappropriatelyindifferentsocio-culturalandprofessionalcontexts.
- Further, theywouldberequiredtocommunicatetheirideasrelevantlyandcoherentlyinwriting.
- To prepare all the students for their placements.

Thefollowingcoursecontenttoconducttheactivitiesisprescribedfortheadvanced EnglishCommunicationSkills(AECS)Lab :

1. **Activities on Fundamentals of Inter-personal Communication and Building Vocabulary** –Startinga conversation–responding appropriately and relevantly –using the right body language –RolePlayindifferentsituations&DiscourseSkills-usingvisuals-Synonymsandantonyms,wordroots, one-word substitutes, prefixes and suffixes, study of word origin, business vocabulary, analogy, idioms and phrases, collocations &usage of vocabulary.
2. **Activities on Reading Comprehension** –General Vs Local comprehension, reading for facts, guessing meanings from context, scanning, skimming, inferringmeaning, criticalreading & effective googling.
3. **Activities on Writing Skills** – Structure and presentation of different types of writing – *letterwriting/Resumewriting/e-correspondence/Technicalreportwriting/*–planningforwriting– improvingone'swriting.
4. **Activities on Presentation Skills**–Oral presentations (individualandgroup) throughJAMsessions/seminars/**PPTs**andwrittenpresentationsthroughposters/projects/reports/e-mails/assignmentsetc.
5. **ActivitiesonGroupDiscussionandInterviewSkills**– Dynamicsofgroupdiscussion,intervention,summarizing,modulationofvoice,bodylanguage,relevance,fluencyand organizationofideasandrubricsforevaluation-Conceptandprocess,pre-interviewplanning,openingstrategies, answering strategies, interview through tele-conference & video-conference and Mock Interviews.

List of Equipment Required:

TheAdvancedEnglishCommunicationSkills(AECS)Laboratoryshallhavethefollowinginfrastructuralfacilitiesto accommodateatleast35 students in the lab:

- Spacious room with appropriate coustics.
- Round Table swithmovablechairs
- Audio-visualaids
- LCD Projector
- Public Address system
- P –IV Processor, HardDisk –80GB,RAM–512MB Minimum,Speed–2.8GHZ
- T.V, a digital stereo &Camcorder

Headphones of High quality

5. SUGGESTEDSOFTWARE:

Thesoftwareconsistingoftheprescribedtopicselaboratedaboveshouldbeprocuredandused.

- OxfordAdvancedLearner'sCompass,7th Edition
- DELTA' skey to the Next Generation TOEFL Test: Advanced Skill Practice.
- Lingua TOEFL CBT Insider, by Dreamtech
- TOEFL&GRE(KAPLAN, AARCO&BARRONS, USA, Cracking GRE by CLIFFS)

Text Books:

1. Effective Technical Communication by M Asharaf Rizvi. McGraw Hill Education (India) Pvt. Ltd.2nd Edition

AcademicWriting:AHandbookforInternationalStudentsbyStephenBailey,Routledge,5th Edition

Reference Books:

1. LearnCorrectEnglish– ABookofGrammar,UsageandCompositionbyShivK.KumarandHemalathaNagarajan.Pearson 2007
2. ProfessionalCommunicationbyArunaKoneru,McGrawHillEducation(India)Pvt.Ltd,2016.
3. Technical Communication by Meenakshi Raman & Sangeeta Sharma, OxfordUniversityPress2009.
4. TechnicalCommunicationbyPaulV.Anderson.2007.CengageLearningpvt.Ltd.NewDelhi.
5. English Vocabulary in Use series, Cambridge UniversityPress2008.
6. HandbookforTechnicalCommunicationbyDavidA.McMurrey&JoanneBuckley.2012.CengageLearning.
7. Communication Skillsby LeenaSen,PHIL earning PvtLtd.,NewDelhi,2009.
8. Job Hunting by Colm Downes, CambridgeUniversityPress2008.
9. English for Technical Communication for Engineering Students, Aysha Vishwamohan,TataMcGraw-Hill2009.

MC509: INTELLECTUAL PROPERTY RIGHTS

B. Tech. III Year I Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
MC509	MC	3	-	-	-	30	70	100

Unit: I Introduction to Intellectual property

UNIT–I

Introduction to Intellectual property: Introduction, types of intellectual property, international organizations, a gencies and treaties, importance of intellectual property rights.

Unit: II Trade Marks

Trade Marks: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting, and evaluating trademark , trademark registration processes.

Unit: III Law of copy rights, Law of patents

Law of copy rights: Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copyright law.
Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer

Unit: IV Trade Secrets, Unfair competition

Trade Secrets: Trade secrete law, determination of trade secrete status, liability for misappropriation so ftrade secrets, protection for submission, trade secrete litigation.
Unfair competition: Misappropriation right of publicity, false advertising.

Unit: V New development of intellectual property, International over view on intellectual property

New development of intellectual property: new developments in trade mark law; copy right law, patent law, intellectual property audits.
International over view on intellectual property, international–trademark law, copyright law, international patentlaw, and international development in trade secrets law.

Text Books:

1. Intellectual property right, Deborah. E. Bouchoux, Cengagelearning.
2. Intellectual property right–Unleashing the knowledge economy, prabuddhaganguli, Tata McGraw Hill Publishing company ltd.

MC510EC: FUNDAMENTALS OF CYBER SECURITY

B. Tech. III Year I Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
MC510EC	MC	3	-	-	-	30	70	100

Prerequisite:

Course Objectives:

To familiarize various types of cyber-attacks and cyber-crimes • To give an overview of the cyber laws • To study the defensive techniques against these attacks

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

- Understand cyber-attacks, types of cybercrimes, cyber laws and also how to protect them self and ultimately the entire Internet community from such attacks.

Unit: I Introduction to Cyber Security

Introduction to Cyber Security: Basic Cyber Security Concepts, layers of security, Vulnerability, threat, Harmful acts, Internet Governance – Challenges and Constraints, Computer Criminals, CIA Triad, Assets and Threat, motive of attackers, active attacks, passive attacks, Software attacks, hardware attacks, Spectrum of attacks, Taxonomy of various attacks, IP spoofing, Methods of defense, Security Models, risk management, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, etc., Comprehensive Cyber Security Policy.

Unit: II Cyberspace and the Law & Cyber Forensics

Cyberspace and the Law & Cyber Forensics: Introduction, Cyber Security Regulations, Roles of International Law. The INDIAN Cyberspace, National Cyber Security Policy. Introduction, Historical background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Forensics Investigation, Challenges in Computer Forensics, Special Techniques for Forensics Auditing.

Unit: III Cybercrime: Mobile and Wireless Devices

Cybercrime: Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.

Unit: IV Cyber Security: Organizational Implications, Cybercrime and Cyber terrorism

Cyber Security: Organizational Implications: Introduction, cost of cybercrimes and IPR issues, web threats for organizations, security and privacy implications, social media marketing: security risks and perils for organizations, social computing and the associated challenges for organizations. Cybercrime and Cyber terrorism: Introduction, intellectual property in the cyberspace, the ethical dimension of cybercrimes the psychology, mindset and skills of hackers and other cyber criminals

Unit: V Privacy Issues: Basic Data Privacy Concepts, Cybercrime: Examples and Mini-Cases

Privacy Issues: Basic Data Privacy Concepts: Fundamental Concepts, Data Privacy Attacks, Data linking and profiling, privacy policies and their specifications, privacy policy languages, privacy in different domains- medical, financial, etc.
Examples: Official Website of Maharashtra Government Hacked, Indian Banks Lose Millions of Rupees, Parliament Attack, Pune City Police Bust Nigerian Racket, e-mail spoofing instances. Mini-Cases: The Indian Case of online Gambling, An Indian Case of Intellectual Property Crime, Financial Frauds in Cyber Domain.

Text Books:

1.Nina Godbole and SunitBelpure, Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley

2. B. B. Gupta, D. P. Agrawal, Haoxiang Wang, Computer and Cyber Security: Principles, Algorithm, Applications, and Perspectives, CRC Press, ISBN 9780815371335, 2018.

Reference Books:

1.Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.

2. Introduction to Cyber Security, Chwan-Hwa(john) Wu,J. David Irwin, CRC Press T&F Group.

EC601PC: ANTENNAS AND PROPAGATION

B. Tech. III Year II Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
EC601PC	PC	3	1	-	4	30	70	100

Prerequisite: Electromagnetic Theory and Transmission Lines

Course Objectives:

1. To understand the concept of radiation, antenna definitions and significance of antenna parameters, to derive and analyze the radiation characteristics of thin wire dipole antenna sand solve numerical problems.
2. To analyze the characteristics and design relations of UHF, VHF and Microwave Antennas.
3. To identify the antenna array requirements, to determine the characteristics of ULA sand estimate the patterns of BSA, EFA, and Binomial Arrays.
4. To understand the concepts and set-up requirements for microwave measurements, and familiarize with the procedure to enable antenna measurements.
5. To define and distinguish between different phenomenon of wave propagation(ground wave, space wave and sky wave), their frequency dependence, and estimate their characteristics, identifying heir profile sand parameters involved.

Course Outcomes: Upon completing this course, the student will be able to explain the mechanism of radiation, definitions of different antenna characteristic parameters and establish their mathematical relations.

1. Characterize the antennas based on frequency, configure the geometry and establish the radiation atterns of VHF, UHF and Microwave antennas and also antenna arrays.
2. Specifytherequirementsformicrowavemeasurementsandarrangeasetuptocarryouttheantenna farzone pattern and gain measurements in the laboratory.
3. Classify the different wave propagation mechanisms, determinethecharacteristicfeaturesofdifferentwavepropagations,and estimate the parameters involved.

Unit: I — Antenna Basics, Thin Linear Wire Antennas

Antenna Basics: Basic Antenna Parameters – Patterns, Beam Area, Radiation Intensity, Beam Efficiency, Directivity-Gain-Resolution, Antenna Apertures, Effective Height.
Fields from Oscillating Dipole, Field Zones, Front - to-back Ratio, Antenna Theorems, Radiation, Retarded Potentials–Helmholtz Theorem

Thin Linear Wire Antennas–Radiation from Small Electric Dipole, Quarter Wave Monopole and Half Wave Dipole–Current Distributions, Field Components, Radiated Power, Radiation Resistance, Beam Width, Directivity, Effective Area and Effective Height, Natural Current Distributions, Far Fields and Patterns of Thin Linear Centre-fed Antennas of Different Lengths. Loop Antennas - Small Loop, Comparison of Far Fields of Small Loop and Short Dipole, Radiation Resistances and Directivities of Small Loops (Qualitative Treatment).

Unit: II — Antenna Arrays, Antenna Measurements

Antenna Arrays: Point Sources–Definition, Patterns**,** arrays of 2IsotropicSources-DifferentCases,Principle of Pattern Multiplication, Uniform Linear Arrays – Broadside Arrays, End fire Arrays, EFA with Increased Directivity, Derivation of their Characteristics and Comparison, BSAs with Non-uniform Amplitude Distributions– General Considerations and Binomial Arrays.

Antenna Measurements: Introduction, Concepts - Reciprocity, Near and Far Fields, Coordinate System, Sources of Errors. Patterns to be Measured, Directivity Measurement, Gain Measurements(by Comparison, Absolute and 3-AntennaMethods)

Unit: III — VHF, UHF and Microwave Antennas - I

VHF, UHF and Microwave Antennas - I:Arrays with Parasitic Elements, Yagi-Uda Array, Folded Dipoles and their Characteristics, Helical Antennas – Helical Geometry, Helix Modes, Practical Design Considerations for Monofilar Helical Antenna in Axial and Normal Modes, Horn Antennas – Types, Fermat's Principle, Optimum Horns, Design Considerations of Pyramidal Horns

Unit: IV	VHF, UHF and Microwave Antennas - II

VHF, UHF and Microwave Antennas - II:Microstrip Antennas – Introduction, Features, AdvantagesandLimitations,RectangularPatchAntennas–GeometryandParameters,CharacteristicsofMicrostrip Antennas.ReflectorAntennas–Introduction,FlatSheetandCornerReflectors,ParaboloidalReflectors– Geometry,PatternCharacteristics,FeedMethods,ReflectorTypes–RelatedFeatures

Unit: V	Wave Propagation, Ground Wave Propagation, Space Wave Propagation AND Sky Wave Propagation

WavePropagation-Definitions,CategorizationsandGeneralClassifications,DifferentModesofWavePropagation,Ray/Mode Concepts,

Ground Wave Propagation –Plane Earth Reflections, Space and Surface Waves, Wave Tilt, Curved Earth Reflections.

Space Wave Propagation –Field Strength Variation with Distance and Height, Effect of Earth's Curvature, Absorption, Super Refraction, M-Curves and Duct Propagation, Scattering Phenomena, Troposphere Propagation.

SkyWavePropagation–StructureofIonosphere,RefractionandReflectionofSkyWavesbyIonosphere, Ray Path, Critical Frequency, MUF, LUF, OF, Virtual Height and Skip Distance, Relation between MUF and Skip Distance, Multi-hop Propagation

Text Books:

1. Antennas and Wave Propagation–J.D. Kraus, R.J. MarhefkaandAhmadS.Khan,TMH,NewDelhi,4th ed.,(Special Indian Edition),2010.
2. ElectromagneticWavesandRadiatingSystems–E.C.JordanandK.G.Balmain,PHI,2nded.,2000.

Reference Books:

1. Antenna Theory- C. A. Balanis, John Wiley&Sons,3rdEd.,2005.
2. Antennas and Wave Propagation–K.D.Prasad, SatyaPrakashan,TechIndiaPublications,NewDelhi,2001.
3. Radio Engineering Handbook- Keithhenney,3rd edition TMH.
4. Antenna Engineering Handbook–John Leonidas Volakis, 3rdedition, 2007

EC602PC: DIGITALSIGNALPROCESSING

B. Tech. III Year II Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
EC513PC	PC	3	1	-	4	30	70	100

Prerequisite: Signals and Systems

Course Objectives:

1. Toprovidebackgroundandfundamentalmaterialfortheanalysisandprocessingofdigitalsignals.
2. To understand the fast computation of DFT and appreciate the FFT processing.
3. To study the designs and structures of digital (IIR and FIR) fil ters and analyze and synthesize for a given specifications.
4. ToacquaintinMulti-ratesignalprocessingtechniquesandfinitewordlengtheffects**.**

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

1. Apply time, frequency, and Z -transform domain analysis on Discrete time signals and systems.
2. Analyze the inter-relationship between DFT and various transforms
3. Implement various filter structures and understand the effects of round off errors.
4. Design a digital filter for a given specification
5. Examine the computation of DFT and appreciate the FFT processing
6. Compare the tradeoffs between normal and multi rate DSP techniques and finite length word effects

Unit: I — Introduction, Multirate Digital Signal Processing

Introduction: IntroductiontoDigitalSignalProcessing:DiscreteTimeSignals&Sequences,conversionofcontinuoustodiscretesignal,NormalizedFrequency**,**LinearShiftInvariantSystems,Stability,andCausality, lineardifferentialequationtodifferenceequation**,**LinearConstantCoefficientDifference Equations, Frequency Domain Representation of Discrete Time Signals and Systems

Multirate Digital Signal Processing: Introduction, Down Sampling, Decimation, Upsampling, Interpolation, Sampling Rate Conversion.

Unit: II — Discrete Fourier series, Fast Fourier Transforms

Discrete Fourier series: Fourier Series, Fourier Transform, Laplace Transform and Z-Transformrelation**,** DFS Representation of Periodic Sequences, Properties of Discrete Fourier Series, Discrete Fourier Transforms: Properties of DFT, Linear Convolution of Sequences using DFT, Computation of DFT: Over-Lap Add Method, Over-Lap Save Method, Relation between DTFT, DFS, DFT and Z-Transform.

FastFourierTransforms: FastFourierTransforms(FFT)-Radix-2Decimation-in-TimeandDecimation-in-FrequencyFFTAlgorithms,Inverse FFT

Unit: III — IIR Digital Filters

IIR Digital Filters: Analog filter approximations – Butterworth and Chebyshev, Design of IIR Digital Filters from Analog Filters, Step and Impulse Invariant Techniques, Bilinear Transformation Method, Spectral Transformations.

Unit: IV — FIR Digital Filters

FIR Digital Filters: Characteristics of FIR Digital Filters, Frequency Response. Design of FIR Filters: Fourier Method, Digital FiltersusingWindowTechniques,FrequencySamplingTechnique,ComparisonofIIR &FIR filters.

Unit: V — Realization of Digital Filters, Finite Word Length Effects

Realization of Digital Filters: Applications of Z – Transforms, Solution of Difference Equations ofDigitalFilters,SystemFunction,StabilityCriterion,FrequencyResponseofStableSystems,RealizationofDigital Filters– Direct, Canonic, Cascade and Parallel Forms.

Finite Word Length Effects: Limit cycles, Overflow Oscillations, Round-off Noise in IIR Digital Filters, Computational Output Round Off Noise, Methods to Prevent Overflow, Trade Off Between Round Off and Overflow Noise, Measurement of

Coefficient Quantization Effects through Pole-Zero Movement, Dead Band Effects.

Text Books:

1. Discrete Time Signal Processing–A.V. Oppenheim andR.W.Schaffer,PHI,2009
2. Digital Signal Processing, Principles, Algorithms, and Applications: John G.Proakis, Dimitris G.Manolakis, Pearson Education /PHI,2007.

Reference Books:

1. DigitalSignalProcessing–FundamentalsandApplications–LiTan,Elsevier,2008
2. FundamentalsofDigitalSignalProcessingusingMATLAB–RobertJ.Schilling,SandraL.Harris,Thomson,2007
3. DigitalSignalProcessing–S.Salivahanan,A.VallavarajandC.Gnanapriya,TMH,2009
4. DigitalSignalProcessing-APracticalapproach,EmmanuelC.IfeachorandBarrieW.Jervis,2nd Edition, Pearson Education,2009

Web References: 1. https://nptel.ac.in/courses/108/106/108106151/
2. https://nptel.ac.in/courses/108/101/108101174/

E-Text Books: 1.Digital signal processing Second Edition by Steven W. Smith

EC603PC: VLSI DESIGN

B. Tech. III Year II Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
EC603PC	PC	3	1	-	4	30	70	100

Prerequisite: Electronic Circuit Analysis; Switching Theory and Logic Design

Course Objectives:

1. Give exposure to different steps involved in the fabrication of ICs.
2. Explain electrical properties of MOS and Bi CMOS devices to analyze the behavior of inverters design edwithvarious loads.
3. Give exposure to the design rules to be followed to draw the layout of any logic circuit.
4. Provide design concepts to design building blocks of data path of anysys temusing gates.
5. Underst and basic programmable logic devices and testing of CMOS circuits.

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

- Acquire qualitative knowledge about the fabrication process of integrated circuits using MOS transistors.
- Draw the layout of any logic circuit which helps to understand and estimate parasitic of any logic circuit
- Design different types of logic gates using CMOS inverter and analyze their transfer characteristics
- Design building blocks of data path subsystems and memories using basic digital logic devices.
- Design simple logic circuits using PLA,PAL, FPGA and CPLD
- Understand different types of faults that can occur in a system and learn the concept of testing.

Unit: I — Introduction, Basic Electrical Properties

Introduction: IntroductiontoICTechnology–MOS,PMOS,NMOS,CMOS&BiCMOS

Basic Electrical Properties: Basic Electrical Properties of MOS and BiCMOS Circuits: I_{ds}-V_{ds}relationships, MOS transistor threshold Voltage, g_m,g_{ds}, Figureofmerit; Passtransistor, NMOSInverter, Variouspull ups,CMOS Inverteranalysis and design, Bi-CMOSInverters.

Unit: II — VLSI Circuit Design Processes

VLSI Circuit Design Processes: VLSI Design Flow, MOS Layers, Stick Diagrams, Design Rules and Layout, Transistors Layout Diagrams for NMOS and CMOS Inverters and Gates, Scaling of MOS circuits.

Unit: III — Gate Level Design

Gate Level Design: Logic Gates and Other complex gates, Switch logic, Alternate gate circuits, Time delays, Driving large capacitive loads, Wiring capacitance, Fan–in, Fan– out, Choice of Layers.

Unit: IV — Data Path Subsystems, Array Subsystems

Data Path Subsystems: Subsystem Design, Shifters, Adders, ALUs, Multipliers, Parity generators, Comparators, Zero/ One Detectors, Counters.

Array Subsystems: SRAM,DRAM, ROM, Serial Access Memories.

Unit: V — Programmable Logic Devices, CMOS Testing

Programmable Logic Devices: Design Approach–PLA, PAL, Standard Cells FPGAs, CPLDs.

CMOSTesting: CMOSTesting, Test Principles, Design Strategies for test, Chiplevel Test Techniques.

Text Books:

1. EssentialsofVLSIcircuitsandsystems–KamranEshraghian,EshraghianDouglesandA.Pucknell,PHI,2005 Edition
2. CMOSVLSIDesign– ACircuitsandSystemsPerspective,NeilH.EWeste,DavidHarris,AyanBanerjee,3rdEd,Pearson,2009.

Reference Books:

1. IntroductiontoVLSISystems:ALogic,CircuitandSystemPerspective–Ming-BOLin,CRCPress,2011
2. CMOS logic circuitDesign-John.P.Uyemura,Springer,2007.
3. Modern VLSI Design –Wayne Wolf, Pearson Education,3rd Edition,1997.
4. VLSIDesign-K.LalKishore,V.S.V.Prabhakar,I.KInternational,2009.

Web References:

1.https://nptel.ac.in/courses/117/101/117101058/

2.https://nptel.ac.in/courses/108/107/108107129/

3. http://www.vlsi-expert.com/p/vlsi-basic.html

E-Text Books:

1. https://www.phindia.com/Books/ShoweBooks/MTMzMA/MTE2NA/VLSI-Design
2. http://www.cmosvlsi.com/
3. https://www.springer.com/gp/book/9781402084461
4. https://books.google.co.in/books?id=CO8zq6_vcr8C&printsec=frontcover

EC611PE: SPEECH PROCESSING

B. Tech. III Year II Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
EC611PE	PEC	3	-	-	3	30	70	100

Prerequisite: Signals and Systems and Probability Theory and Stochastic Processes

Course Objectives: The objectives of this course are to make the student

1.Understand the anatomy and Physiology of Speech Production system and perception model and to design an electrical equivalent of Acoustic model for Speech Production.

2. To analyze the speech in time domain and extract various time domain parameters which can be used for various applications like pitch extraction, end point detection, Speech Compression, Speech Synthesis etc.,

3. To study the concept of Homomorphic system and its use in extracting the vocal tract information from speech using Cepstrum which is a bye product of Homomorphic processing of Speech.

4. To study various Speech Signal Processing applications viz: Speech Enhancement, Speech Recognition, Speaker Recognition.

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

1. Model an electrical equivalent of Speech Production system.
2. Extract the LPC coefficients that can be used to Synthesize or compress the speech.
3. Design a Homomorphic Vocoder for coding and decoding of speech.
4. Enhance the speech and can design an Isolated word recognition system using HMM.
5. Extract the features for Automatic speaker recognition system which can used for classification.

Unit: I **Fundamentals of Digital Speech Processing**

Anatomy & Physiology of Speech Organs, The process of Speech Production, The Acoustic Theory of Speech Production – Uniform lossless tube model, effect of losses in vocal tract, effect if radiation at lips, Digital models for speech signals.

Unit: II **Time Domain Models for Speech Processing**

Introduction- Window considerations, Short time energy and average magnitude Short time average zero crossing rate, Speech vs Silence discrimination using energy and zero crossing, Pitch period estimation using a parallel processing approach. The short time autocorrelation function, The short time average magnitude difference function, Pitch period estimation using the autocorrelation function.

Unit: III **Linear predictive Coding (LPC) Analysis**

Basic principles of Linear Predictive Analysis : The Autocorrelation Method, The Covariance Method, Solution of LPC Equations: Cholesky Decomposition Solution for Covariance Method, Durbin's Recursive Solution for the Autocorrelation Equation, comparison between the Method of Solution of the LPC Parameters: Pitch Detection using LPC Parameters, Formant Analysis using LPC Parameters.

Unit: IV **Homomorphic Speech Processing** & **Speech Enhancement**

Homomorphic Speech Processing Introduction Homomrphic Systems for Convolution: Properties of the Complex Cepstrum, Computational Considerations, The Complex Cepstrum of Speech, pitch Detection, Formant Estimation, and The Homomorphic Vocoder.

Speech Enhancement-Nature of interfering sounds, Speech enhancement techniques: Single microphone Approach: spectral subtraction, Enhancement by re-synthesis, Comb filter, Wiener filter, Multi microphone Approach.

Unit: V **Automatic Speech & Speaker Recognition, Hidden Markov Model (HMM) for Speech , Speaker Recognition**

Automatic Speech & Speaker Recognition

Basic pattern recognition approaches, parametric representation of speech, evaluating the similarity of speech patterns, isolated digit Recognition System, Continuous digit Recognition System

Hidden Markov Model (HMM) for Speech

Hidden Markov Model (HMM) for speech recognition, Viterbi algorithm, Training and testing using HMMS.

Speaker Recognition

Recognition techniques, Features that distinguish speakers, Speaker Recognition Systems: Speaker Verification Systems, Speaker identification Systems.

Text Books:

1.Digital Processing of Speech Signals – L.R. Rabiner S. W. Schafer. Pearson Education.
2. Speech Communication : Human & Machine – Douglas O' Shaughnessy, 2nd Ed., EEE Press.
3. Digital Processing of Speech Signals L.R Rabinar and RW Jhaung, 1978, PHI

Reference Books:

1.Discrete Time Speech Signal Processing: Principles and Practice – Thomas F. Quateri, 1st Ed., PE.
2. Speech & Audio Signal Processing – Ben Gold & Nelson Morgan, 1st Ed., Wiley.

EC612PE: ELECTRO MAGNETIC INTERFERNCE & ELECTROMAGNETIC COMPATIBILITY (EMI / EMC)

B. Tech. III Year II Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
EC612PE	PEC	3	-	-	3	30	70	100

Prerequisite: Electromagnetic Theory and Transmission Lines

Course Objectives:

1. To introduce important system concepts such as Electromagnetic interference and Electromagnetic compatibility (EMI&EMC).
2. To familiarize with unavoidable and naturally happening sources of EMI and problems to ensure EMC.
3. To study various techniques to reduce EMI from systems and to improve EMC of electronic systems.

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

1. Gain basic knowledge of problems associated with EMI and EMC from electronic circuits and systems.
2. Analyze various sources of EMI and various possibilities to provide EMC.
3. Understand and analyze possible EMI prevention techniques such as grounding, shielding, filtering and use of proper coupling mechanisms to improve compatibility of electronic circuits and systems in a given electromagnetic environment.

Unit: I — Sources of EMI &EMI/EMC Standards

Sources of EMI

Definition of EMI and EMC, Classification, Natural and Man-Made EMI Sources, Switching Transients, Electrostatic Discharge, Nuclear Electromagnetic Pulse and High Power Electromagnetics.

EMI/EMC Standards

Introduction, Standards for EMI/EMC – MIL –STD 461/462 – IEEE/ANSI Standards – CISPR/IEC, Standards – FCC Regulations.

Unit: II — EMI Coupling Modes

EMI Coupling Modes

Penetration: Introduction, Shielding Theory - Shielding Effectiveness, The Circuit Approach, The Wave Approach, Aperture Theory, Calculation of Effectiveness of a Conducting Box with an Aperture, Introduction to Propagation and Cross Talk – Introduction, Basic Principles, Determination of EM Field from Transmission Lines.

Unit: III — EMI Controlling Techniques-1

EMI Controlling Techniques-1

Grounding, Principles and Practice of Earthing, Precautions in Earthing, Measurements of Ground Resistance, System Grounding for EMC, Cable Shielding Grounding. Shielding, Theory and Effectiveness, Materials, Integrity at Discontinuities, Conductive Coatings, Cable Shielding, Effectiveness Measurements, Electrical Bonding.

Unit: IV — EMI Controlling Techniques-2

EMI Controlling Techniques-2

Characteristics and Types of Filters – Impedance Mismatch, Lumped Element Low-Pass, High Pass, Band-Pass and Band-Reject Filters, Power Line Filter Design - Common Mode, Differential Mode, Combined CM and DM Filters, Design Example. EMC Gaskets – Knitted Wire-Mesh Gaskets, Wire-Screen Gaskets, Oriented Wire Mesh, Conductive Elastomer, Transparent Conductive Windows, Conductive Adhesive, Conductive Grease, Conductive Coatings, Isolation Transformers, Opto-Isolators.

Unit: V — EMI Measurements

EMI Measurements

Introduction to Open Area Test Site Measurements – Measurement Precautions – Open Area Test Site – Terrain Roughness – NSA – Measurement of Test Site Imperfections – Antenna Factor Measurement – Measurement Errors. Radiated Interference Measurements – Anechoic Chamber – TEM Cell – Reverberating Chamber – Ghz TEM Cell – Comparison of Test Facilities – Measurement Uncertainties Conducted Interference Measurements – Characterization – Conducted EM Noise on Power Supply Lines – Conducted EMI from Equipment – Immunity – Detectors and Measurement – Pulsed EMI Immunity – Electrostatic Discharge.

Text Books:

1 Engineering Electromagnetic Compatibility – V. Prasad Kodali – 2/e – IEEE Press – Wiley India Pvt. Ltd – 2001.
2. Principles and Techniques of Electromagnetic Compatibility – Christos Christopoulos – 2/e – CRC Press (Taylor & Francis Group) – 2007.

Reference Books:

1 Introduction to Electromagnetic Compatibility – Clayton R.Paul – John Wiley & Sons, 1992.
2. Electromagnetic Compatibility of Integrated Circuits – Techniques for Low Emission and Susceptibility – Edited by Sonia Ben Dhia, Mohamed Ramdani and Etienne Sicard – Springer, 2006.
3. EMI reduction in Electronic Systems – Mills – J.P – Prentice Hall Inc. 4. Noise Reduction in Electronic Systems – Henry W.Ott, 2nd Edition, Wiley Interscience, 1988.

EC613PE: EMBEDDED SYSTEM DESIGN

B. Tech. III Year II Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
EC613PE	PE	3	-	-	3	30	70	100

Prerequisite: MicroprocessorsandMicrocontrollers;ComputerOrganizationandOperatingSystems

Course Objectives:

1. To provide an over view of Design Principles of Embedded System.
2. To provide clear understanding about the role of firmware.
3. Tounderstandthenecessityofoperatingsystemsincorrelationwithhardwaresystems.
4. To learn the methods of interfacing and synchronization for tasking.

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

1. TounderstandtheselectionprocedureofProcessorsintheembeddeddomain.
2. Design Procedure for Embedded Firmware.
3. To visualize the role of Real time Operating Systems in Embedded Systems.
4. To evaluate the Correlation between ask synchronization and latency issues

Unit: I — Introduction to Embedded Systems

Introduction to Embedded Systems: Definition of Embedded System, Embedded Systems VsGeneral Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded Systems.

Unit: II — Typical Embedded System

Typical Embedded System: Core of the Embedded System: General Purpose and Domain Specific Processors, ASICs, PLDs, Commercial Off-The-Shelf Components (COTS), Memory: ROM, RAM, Memory according to the type of Interface, Memory Shadowing, Memory selection for Embedded Systems, Sensors and Actuators, Communication Interface: Onboard and External Communication Interfaces

Unit: III — Embedded Firmware

Embedded Firmware: Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, Real Time Clock,WatchdogTimer,EmbeddedFirmwareDesignApproachesandDevelopmentLanguages

Unit: IV — RTOS Based Embedded System Design

RTOS Based Embedded System Design: Operating System Basics, Types of Operating Systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling.

Unit: V — Task Communication, Synchronization

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

Text Books:

1. Introduction to Embedded Systems-ShibuK.V,McGraw Hill.

Reference Books:

1. Embedded Systems- RajKamal,TMH.
2. Embedded System Design- FrankVahid, Tony Givargis, JohnWiley.
3. EmbeddedSystems–Lyla,Pearson,2013
   An Embedded Software Primer-DavidE.Simon, Pearson Education

Web References:

1.https://link.springer.com/book/10.1007/978-3-319-56045-8

E-Text Books:

1.Introduction to Embedded Systems - Shibu K.V, Mc Graw Hill.

2.The Art of Designing Embedded Systems 2nd Edition, Kindle …

3.An Embedded Software Primer - David E. Simon

EC604PC: DIGITAL SIGNAL PROCESSING LAB

B. Tech. III Year II Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
EC604PC	PC	-	-	3	1.5	30	70	100

Prerequisite:

Course Objectives:

1. To implement DFT and FFT on a given sequence
2. Determine transfer function and predict frequency response of discrete-time systems
3. Design of digital IIR and FIR filters
4. To implement multirate signal processing operations on a given sequence

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

1. **Construct all classes of discrete time signals using MATLAB**
2. **Design and simulate Digital IIR and FIR filter using MATLAB**
3. **Design and simulate Interpolator and Decimator using MATLAB**
4. **Apply DSP algorithms for audio applications using MATLAB**
5. **Analyse frequency response for the given system**
6. **Make use of DSP algorithms on a DSP processor for real time applications.**

The Programs shall be implemented in Software (Using MATLAB Programming/Equivalent)and Hardware(Using TI/ Analog Devices/Motorola/Equivalent DSP processors).

Note: -Minimumof12experimentshastobeconducted.

List of Experiments:

1. GenerationofSinusoidalWaveform/SignalbasedonRecursiveDifferenceEquations
2. Histogram of White Gaussian Noise and Uniformly Distributed Noise.
3. To find DFT/IDFT of given DT Signal
4. TofindFrequencyResponseofagivenSystemgiveninTransferFunction/Differentialequationform.
5. Obtain Fourierseriesco efficient by formula and using FET and compareforhalfsine wave.
6. Implementation of FFT of given Sequence
7. Determination of Power Spectrum of a given Signal(s).
8. Implementation of LPFIR Filter for a given Sequence/Signal.
9. Implementation of HPIIR Filter for a given Sequence/Signal
10. Generation of Narrow Band Signal through Filtering
11. Generation of DTMF Signals
12. Implementation of Decimation Process
13. Implementation of Interpolation Process
14. Implementation of I/ D Sampling Rate Converters
15. Impulse Response of First order and Second Order Systems.

List of Equipment Required: The Programs shall be implemented in Software (Using MATLAB Programming/Equivalent)and Hardware (Using TI/ Analog Devices/Motorola/Equivalent DSP processors).

Text Books:

1. Discrete Time Signal Processing – A. V. Oppenheim and R.W. Schaffer, PHI, 2009
2. Digital Signal Processing, Principles, Algorithms, and Applications: John G. Proakis, Dimitris G. Manolakis, Pearson Education / PHI, 2007.

Reference Books:

1. Digital Signal Processing – Fundamentals and Applications – Li Tan, Elsevier, 2008
2. Fundamentals of Digital Signal Processing using MATLAB – Robert J. Schilling, Sandra L. Harris, Thomson, 2007
3. Digital Signal Processing – S. Salivahanan, A. Vallavaraj and C. Gnanapriya, TMH, 2009
4. Digital Signal Processing - A Practical approach, Emmanuel C. Ifeachor and Barrie W. Jervis, 2nd Edition, Pearson Education, 2009

Web References: 1. https://nptel.ac.in/courses/108/106/108106151/

2. https://nptel.ac.in/courses/108/101/108101174/

E-Text Books: 1.Digital signal processing Second Edition by Steven W. Smith

EC605PC: e- CADLAB

B. Tech. III Year II Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
EC604PC	PC	-	-	3	1.5	30	70	100

Prerequisite:

Course Objectives: The course should enable the students to:

1. Understand the EDA tools
2. Understand the various modeling styles in Hardware Description Language(HDL)
3. Design and analyze the various digital systems (like combinational, sequential, memories and FSM) using HDLs
4. Design and estimate various characteristics of digital integrated circuits.
5. Draw the layout of Various Logic gates using CMOS Logic
6. Draw the layout of Combinational Circuits using Pass Transistor Logic
7. Draw the layout of Combinational Circuits using CMOS Logic
8. Draw the layout of Basic Sequential Circuits using CMOS Logic and Pass Transistor Logic

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

1. Design and analyze the combinational circuits using various modeling styles of Hardware Description Language(HDL)
2. Design and analyze the sequential circuits using various modeling styles of Hardware Description Language(HDL)
3. Design and Analyze the layout of Various Logic gates using CMOS Logic
4. Design and Analyze the layout of Combinational Circuits using Pass Transistor Logic
5. Design and Analyze the layout of Combinational Circuits using CMOS Logic
6. Design and Analyze the layout of Basic Sequential Circuits using CMOS Logic and Pass Transistor Logic

Note: Any SIX of the following experiments from eachpartare to be conducted (Total12)

Part -I

All the following experiments have to be implemented using HDL

1. Realizeall the logic gates
2. Designof8-to-3encoder(without and with priority)and2-to-4decoder
3. Designof8-to-1multiplexerand1-to-8demultiplexer
4. Designof4bitbinaryto gray code converter
5. Designof4bitcomparator
6. Design of Full adder using3modelingstyles
7. Design of flipflops:S R,D,JK,T
8. Designof4-bitbinary,BCDcounters(synchronous/asynchronousreset)oranysequencecounter
9. Finite State Machine Design

Part-II

Layout,physicalverification,placement&routeforcomplexdesign,statictiminganalysis,IRdropanalysis and cross talk analysis for the following:

1. Basic logic gates
2. CMOS inverter
3. CMOS NOR/NAND gates
4. CMOSXOR and MUX gates
5. Static/Dynamic logic circuit(register cell)
6. Latch
7. Pass transistor
8. Layout of any combinational circuit (complex CMOS logic gate).

List of Equipment Required: Xilinx Vivado EDA Tool

Text Books:

1. T.R. Padmanabhan, B Bala Tripura Sundari, Design Through Verilog HDL, Wiley 2009.
2. CMOS VLSI Design – A Circuits and Systems Perspective, Neil H. E Weste, David Harris, Ayan Banerjee, 3rd Ed, Pearson, 2009
   CMOS logic circuit Design - John. P. Uyemura, Springer, 2007.

Reference Books:

1. Fundamentals of Digital Logic with Verilog Design - Stephen Brown,ZvonkocVranesic, TMH, 2nd Edition
2. Verilog HDL - Samir Palnitkar, 2nd Edition, Pearson Education, 2009.
   Modern VLSI Design - Wayne Wolf, Pearson Education, 3rd Edition, 1997

Web References:

1. https://www.xilinx.com/support/documentation/university/Vivado-Teaching/HDL-Design/2013x/Nexys4/Verilog/docs-pdf/Vivado_tutorial.pdf
2. https://www.xilinx.com/support/university/vivado/vivado-teaching-material/hdl-design.html
   http://www.vlsi-expert.com/p/vlsi-basic.html

E-Text Books:

1. https://notesavior.files.wordpress.com/2018/02/stephen-brown-and-zvonko-vranesic-fundamental-of-digital-logic-with-verilog-design.pdf
2. https://drive.google.com/file/d/0BwpN8Fd0ZobvMjdhNDlkNDMtZWYyMi00YTA4LThjODMtOGFmNDU1MmY5MGE3/view?resourcekey=0-nLmkJl07k4I8NyVc3urhfQ
3. http://www.cmosvlsi.com/
4. https://www.springer.com/gp/book/9781402084461
5. https://books.google.co.in/books?id=CO8zq6_vcr8C&printsec=frontcover

EC606PC: SCRIPTING LANGUAGES LAB

B. Tech. III Year II Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
EC606PC	PC	-	-	2	1	30	70	100

Prerequisite:

Course Objectives:

- ToUnderstandtheconceptsofscriptinglanguagesfordevelopingweb-basedprojects
- To understand the applications the of Ruby, TCL, Perlscripting languages

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

- AbilitytounderstandthedifferencesbetweenScriptinglanguagesandprogramminglanguages
- Able to gain some fluency programming in Ruby, Perl, TCL

List of Experiments:

1. Write a Ruby script to create a new string which is n copies of a given string where n is a non-negative integer
2. WriteaRubyscriptwhichacceptheradiusofacirclefromtheuserandcomputetheparameterandarea.
3. Write a Ruby script which accept the user's first and last name and print them in reverse orderwitha space between them
4. Writea Rubyscript to accept a filename from the user print the extension of that
5. Write a Rubyscript to find the greatest of three numbers
6. Write a Rubyscriptto print odd numbersfrom10to1
7. Write a Ruby script to check two integers and return trueifoneofthemis20otherwisereturntheir sum
8. WriteaRubyscripttochecktwotemperaturesandreturntrueifoneislessthan0andtheotherisgreaterthan 100
9. Write a Ruby script to print the elements of a give narray
10. WriteaRubyprogramtoretrievethetotalmarkswheresubjectnameandmarksofastudentstoredin a hash
11. Write a TCL script to find the factorial of a number
12. Write aTCLscriptthatmultipliesthenumbersfrom1 to10
13. Write a TCL script for Sorting a list using a comparison function
14. WriteaTCLscriptto(i)createalist(ii)appendelementstothelist(iii)Traversethelist(iv)Concatenatethelist
15. Write a TCL script to comparing the filemo difiedtimes.
16. Write a TCL script to Copya file and trans late tonative format.
17. a)Write a Perl script to find the largest number among three numbers.
    b)WriteaPerlscript to print them ultiplicationtablesfrom 1-10usingsubroutines.
18. Write a Perl program to implement the following list of manipulating functions
    a) Shiftb)Un
    shiftc)Push
19. a) Writea Perlscriptto substitute a word, withanotherword inastring.
    b) Writea PerlscripttovalidateIPaddressandemail address.
20. Writea Perlscriptto printthefileinreverse orderusing commandline arguments

MC601EC: Numerical Ability & Reasoning

B. Tech. III Year II Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
MC601EC	MC	3	-	-	-	30	70	100

Prerequisite:

Course Objectives:

This is a foundation course and aims at enhancing employability skills in students. Students will be introduced to higher order thinking skills and problem solving on the following areas - Arithmetic ability, Numerical ability and General reasoning. Students will be trained to work systematically with speed and accuracy while problemsolving.

The major areas covered in this course include

1. Arithmetic Ability
2. Numerical Ability
3. Quantitative Aptitude
4. Verbal Reasoning
5. Logical reasoning

Visual Reasoning

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

1. Solve questions on the above mentioned areas using short cuts and smart methods
2. Understand the fundamentals concepts of Aptitude skills
3. Perform calculations with Speed & Accuracy
4. To improve Logical thinking.
5. To improve Application Knowledge

Unit: I	ARITHMETIC ABILITY FOUNDATION

ARITHMETIC ABILITY FOUNDATION: Square root, Cube roots, Speed Maths using Vedic Maths, Surds & Indices, Logarithms

Number Systems - Types of numbers, Divisibility tests, LCM and HCF, Unit digit, Number of zeroes, Factorial, No. of factors, Remainder concepts, Successive Divisors

Unit: II	COMMERCIAL ARITHMETIC&ARITHMETIC ABILITY ADVANCED

COMMERCIAL ARITHMETIC: Percentages, Profit and Loss, Discount, Simple Interest & Compound Interest

ARITHMETIC ABILITY ADVANCED: Time, Speed & Distance- Basics, Average Speed, Problems on Trains, Relative Speed, Boats & Streams, Races & Games, Circular Motion

Time and work, Work & Wages, Chain Rule, Pipes and Cisterns

Unit: III	ALGEBRA&LOGICAL REASONING

ALGEBRA: Linear Equations, Quadratic Equations and In-equations, Averages, Ratio, Proportion & Variations, Ages, Partnership

LOGICAL REASONING: Statements & Conclusions, Statements & Course of Actions, Statements & Assumptions, Cause & Effect, Coded Inequalities, Syllogism, Input Output

Unit: IV	MODERN APTITUDE

MODERN APTITUDE - I: Permutations & Combinations, Circular Permutation, Probability, Area and Volumes.

MODERN APTITUDE - II: Data Sufficiency, Data Interpretation – Line graph, Pie Charts, Bar graph

Unit: V	VERBAL REASONING&VISUAL REASONING

VERBAL REASONING: Blood relations, Directions, Coding & Decoding, Number Ranking, Venn Diagrams, Alphanumeric Symbol Test, Mathematical operations.
Series, Analogy, Classification, Analytical Reasoning - Information Ordering – Arrangements
VISUAL REASONING: Series, Analogy, Classification, Mirror & Water Images, Spotting out the Embedded figure, Pattern Incompletion, Paper Folding & Cutting, Analytical Figures, Cubes & Dice

Text Books:

1. Quantitative Aptitude for Competitive Examinations – Dr. R.S Aggarwal, S. Chand Publisher, English Medium, Revised & Enlarged Edition.

2. A Modern Approach to Verbal Reasoning (Fully Solved) – Dr R.S Aggarwal, S. Chand Publisher, English Medium.

Reference Books:

1 How to Prepare for Quantitative Aptitude for the CAT – Arun Sharma, Publisher: Mcgraw Hill TP, 8thEdition, English Medium.

2. A Modern Approach to Verbal & Non-Verbal Reasoning – Dr. R.S Aggarwal, S. Chand Publisher, English Medium, Revised Edition.

3. Quantitative Aptitude for All Competitive Examinations – Abhijit Guha, Publisher: Mcgraw Hill, 3rd Edition, English Medium.

4. Quantitative Aptitude - For Competitive Examinations – Rao U. M. Karanam,Publisher: Scitech Publications (India) Pvt. Ltd, ISBN: 9788183714631, English Medium.

5. Course in Mental Ability and Quantitative Aptitude - For Competitive Examinations – Edgar Thorpe, Publisher: Tata McGraw - Hill Education, 2nd Edition, English Medium.

MC602EC: Fundamentals of Artificial Intelligence

B. Tech. III Year II Semester

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
MC602EC	MC	3	-	-	-	30	70	100

Prerequisite:

Course Objectives:
To train the students to understand different types of AI agents, various AI search algorithms, fundamentals of knowledge representation, building of simple knowledge-based systems and to apply knowledge representation, reasoning. Study of Markov Models enable the student ready to step into applied AI.

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

1) Demonstrate fundamental understanding of the history of artificial intelligence (AI) and its foundations.
2) Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning.
3) Demonstrate awareness and a fundamental understanding of various applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models.
4) Demonstrate proficiency developing applications in an 'AI language', expert system shell, or data mining tool.
5) Demonstrate proficiency in applying scientific method to models of machine learning.
6) Demonstrate an ability to share in discussions of AI, its current scope and limitations, and societal implications.

Unit: I — Introduction, Basic Search Strategies

Introduction: AI problems, Agents and Environments, Structure of Agents, Problem Solving Agents
Basic Search Strategies: Problem Spaces, Uninformed Search (Breadth-First, Depth-First Search, Depth-first with Iterative Deepening), Heuristic Search (Hill Climbing, Generic Best-First, A*), Constraint Satisfaction (Backtracking, Local Search)

Unit: II — Advanced Search, Basic Knowledge Representation and Reasoning

Advanced Search: Constructing Search Trees, Stochastic Search, A* Search Implementation, Minimax Search, Alpha-Beta Pruning
Basic Knowledge Representation and Reasoning: Propositional Logic, First-Order Logic, Forward Chaining and Backward Chaining, Introduction to Probabilistic Reasoning, Bayes Theorem

Unit: III — Advanced Knowledge Representation and Reasoning, Reasoning Under Uncertainty

Advanced Knowledge Representation and Reasoning: Knowledge Representation Issues, Nonmonotonic Reasoning, Other Knowledge Representation Schemes
Reasoning Under Uncertainty: Basic probability, Acting Under Uncertainty, Bayes' Rule, Representing Knowledge in an Uncertain Domain, Bayesian Networks

Unit: IV — Learning

Learning: What Is Learning? Rote Learning, Learning by Taking Advice, Learning in Problem Solving, Learning from Examples, Winston's Learning Program, Decision Trees.

Unit: V — Expert Systems

Expert Systems: Representing and Using Domain Knowledge, Shell, Explanation, Knowledge Acquisition.

Text Books:

Russell, S. and Norvig, P, Artificial Intelligence: A Modern Approach, Third Edition, Prentice-Hall, 2010.

Reference Books:

1.Artificial Intelligence, Elaine Rich, Kevin Knight, Shivasankar B. Nair, The McGraw Hill publications, Third Edition, 2009.
2. George F. Luger, Artificial Intelligence: Structures and Strategies for Complex Problem Solving, Pearson Education, 6th ed., 2009.

Web References:

1. **https://nptel.ac.in/courses/112/103/112103280/**
2. **https://www.springerprofessional.de/en/fundamentals-of-artificial-intelligence/17866494**
3. **http://zsi.tech.us.edu.pl/~nowak/bien/**