ADIKAVI NANNAYA UNIVERSITY

UNIVERSITY COLLEGE OF ENGINEERING
RAJAMAHENDRAVARAM

Department of
Electronics and Communication Engineering

B Tech(ECE)
Syllabus &
Model Question Papers

II, III &IV YEAR
(For the admitted batch of 2019-2020)

Board of Studies
University College of Engineering

ADIKAVI NANNAYA UNIVERSITY: RAJAMAHENDRAVARAM
UNIVERSITY COLLEGE OF ENGINEERING
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

B. Tech, II Year Degree Course

(From the admitted batch of 2019 – 2020 under CBCS Scheme)

II B. Tech I Semester ECE w.e.f 2019-20(III Semester)

Course Code	Title of the Course	Hours/weeks			Max Marks		Total Marks	Credits
		L	T	P	Internal	External		
BSC-EC301	Probability Theory and Stochastic Processes	3	0	0	25	75	100	3
PCC-EC302	Electronic Devices and Circuits	3	0	0	25	75	100	3
PCC-EC303	Signals and Systems	3	0	0	25	75	100	3
PCC-EC304	Switching Theory and Logic Design	3	0	0	25	75	100	3
PCC-EC305	Electromagnetic field theory and Transmission Lines	3	0	0	25	75	100	3
LC-EC 306	Electronic Devices and Circuits Lab	0	0	3	50	50	100	1.5
LC-EC 307	Switching Theory and Logic Design Lab	0	0	3	50	50	100	1.5
LC-EC 308	Electronic Workshop Practice Lab	0	0	3	50	50	100	1.5
SDC-EC309	Skill Development Course	1	0	2	50	50	100	2
MC-EC310	Essence of Indian Traditional Knowledge	2	0	0	25	75	100	0
TOTAL CREDITS		18	0	11	350	650	1000	21.5

Note: 2 lab Hrs./Week and 1 Theory Hrs./Week for SKILL DEVELOPMENT COURSE or 2 Theory Hrs./ Week

II B. Tech II Semester ECE w.e.f 2019-20(IV Semester)

Course Code	Title of the Course	Hours/weeks			Max Marks		Total Marks	Credits
		L	T	P	Internal	External		
ESC-EC401	Network Analysis	3	0	0	25	75	100	3
BSC-EC402	Control Systems	3	0	0	25	75	100	3
PCC-EC403	Analog and Digital Circuits	3	0	0	25	75	100	3
PCC-EC404	Analog Communications	3	0	0	25	75	100	3
HSMC-EC405	Managerial Economics and Financial Analysis	3	0	0	25	75	100	3
LC-EC 406	Network Analysis and ET Lab	0	0	3	50	50	100	1.5
LC-EC 407	Analog Communications Lab	0	0	3	50	50	100	1.5
LC-EC 408	Analog & Digital Circuits Lab	0	0	3	50	50	100	1.5
SDC-EC409	Skill Development Course	1	0	2	50	50	100	2
TOTAL CREDITS		16	0	11	325	575	900	21.5

Note: 2 lab Hrs./Week and 1 Theory Hrs./Week for SKILL DEVELOPMENT COURSE or 2 Theory Hrs./ Week. Two months Summer Internship/Technical Course mandatory after second year which can be evaluated during V Semester.

III B. Tech I Semester ECE w.e.f 2019-20(V Semester)

Course Code	Title of the Course	Hours/weeks			Max Marks		Total Marks	Credits
		L	T	P	Internal	External		
PCC-EC501	Linear IC Applications	3	0	0	25	75	100	3
PCC-EC502	Antennas and Wave Propagation	3	0	0	25	75	100	3
PCC-EC503	Digital Communications	3	0	0	25	75	100	3
OEC-EC504	**Open Elective Course-I** A. Computer Organization B. Networks and Protocols C. Data Mining and Ware Housing	2	0	2	25	75	100	3
PEC-EC505	**Professional Elective - I** A. VLSI Design B. Digital IC Design C. Optoelectronics.	3	0	0	25	75	100	3
LC-EC506	Digital Communications Lab	0	0	3	50	50	100	1.5
LC-EC507	Linear IC Applications Lab	0	0	3	50	50	100	1.5
SDC-EC508	Skill Development Course	1	0	2	50	50	100	2
MC-EC509	Constitution of India	2	0	0	25	75	100	0
Summer Internship 2 Months (Mandatory) after Second year (to be evaluated during V Semester		0	0	0	100	-	100	1.5
TOTAL CREDITS		17	0	10	400	600	1000	21.5

Note: 2 lab Hrs/Week and 1 Theory Hrs/Week for SKILL DEVELOPMENT COURSE or 2 Theory Hrs/ Week.

III B. Tech II Semester ECE w.e.f 2019-20(VI Semester)

Course Code	Title of the Course	Hours/weeks			Max Marks		Total Marks	Credits
		L	T	P	Internal	External		
PCC-EC601	Microprocessors and Microcontrollers	3	0	0	25	75	100	3
PCC-EC602	Microwave Engineering	3	0	0	25	75	100	3
PCC-EC603	Digital Signal Processing	3	0	0	25	75	100	3
PEC-EC604	**Professional Elective Course - II** A. Computer Networks Engineering. B. Artificial Neural Networks and Fuzzy Logic. C. Bio-Medical Engineering.	3	0	0	25	75	100	3
OEC-EC605	**Open Elective Course - II** A. Python Programming B. Object Oriented Programming Through Java. C. Machine Learning.	2	0	0	25	75	100	3
LC-EC606	Microprocessors and Microcontrollers Lab	0	0	3	50	50	100	1.5
LC-EC607	Microwave Engineering Lab	0	0	3	50	50	100	1.5
LC-EC608	Digital Signal Processing Lab	0	0	3	50	50	100	1.5
SDC-EC609	Skill Development Course	1	0	2	50	50	100	2
TOTAL CREDITS		15	0	11	325	575	900	21.5

Note: 2 lab Hrs./Week and 1 Theory Hrs./Week for SKILL DEVELOPMENT COURSE or 2 Theory Hrs./ Week. Two months Summer Internship/Technical Course mandatory after Third year which can be evaluated during VII Semester.

IV B. Tech I Semester ECE w.e.f 2019-20(VII Semester)

Course Code	Title of the Course	Hours/weeks			Max Marks		Total Marks	Credits
		L	T	P	Internal	External		
PEC-EC701	**Professional Elective Course-III** A. Radar Engineering. B. Satellite Engineering. C. Analog IC Design.	3	0	0	25	75	100	3
PEC-EC702	**Professional Elective Course -IV** A. Electronic Measurements and Instrumentations B. Fibre optics and wireless optical Communications. C. Information Theory and Coding	3	0	0	25	75	100	3
PEC-EC703	**Professional Elective Course -V** A. Mobile Cellular Communications. B. Wireless Communication. C. ASIC Design .	3	0	0	25	75	100	3
OEC-EC704	**Open Elective Course - III** A. Digital Image Processing. B. Software Defined Radio. C. Television Engineering.	2	0	2	25	75	100	3
OEC-EC705	**Open Elective Course - IV** A. Embedded System. B. Global Positioning Systems. C. Smart Antenna Systems .	2	0	2	25	75	100	3
HSMC-EC706	Management Science	3	0	0	25	75	100	3
SDC-EC707	Skill Development Course	1	0	2	50	50	100	2
Summer Internship 2 Months (Mandatory) after Second year (to be evaluated during V Semester		0	0	0	100	--	100	1.5
TOTAL CREDITS		17	0	06	300	500	800	21.5

Note: 2 lab Hrs./Week and 1 Theory Hrs./Week for SKILL DEVELOPMENT COURSE or 2 Theory Hrs./ Week.

IV B. Tech II Semester ECE w.e.f 2019-20 (VIII Semester)

Course Code	Title of the Course	Hours/weeks			Max Marks		Total Marks	Credits
		L	T	P	Internal	External		
Project	Project Work				250	250	500	14
TOTAL CREDITS					250	250	500	14

CONTENTS

ADIKAVI NANNAYA UNIVERSITY: RAJAMAHENDRAVARAM
UNIVRSITY COLLEGE OF ENGINEERING
Department of ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE STRUCTURE & SYLLABUS
II B TECH I SEMESTER

(With effect from 2019-2020 Admitted Batch)
Under Choice Based Credit System(CBCS)

II B. Tech I Semester ECE w.e.f 2019-20 (III Semester)

Course Code	Title of the Course	Hours/weeks			Max Marks		Total Marks	Credits
		L	T	P	Internal	External		
BSC-EC301	Probability Theory and Stochastic Processes	3	0	0	25	75	100	3
PCC-EC302	Electronic Devices and Circuits	3	0	0	25	75	100	3
PCC-EC303	Signals and Systems	3	0	0	25	75	100	3
PCC-EC304	Switching Theory and Logic Design	3	0	0	25	75	100	3
PCC-EC305	Electromagnetic field theory and Transmission Lines	3	0	0	25	75	100	3
LC-EC 306	Electronic Devices and Circuits Lab	0	0	3	50	50	100	1.5
LC-EC 307	Switching Theory and Logic Design Lab	0	0	3	50	50	100	1.5
LC-EC 308	Electronic Workshop Practice Lab	0	0	3	50	50	100	1.5
SDC-EC309	Skill Development Course	1	0	2	50	50	100	2
MC-EC310	Essence of Indian Traditional Knowledge	2	0	0	25	75	100	0
TOTAL CREDITS		18	0	11	350	650	1000	21.5

Note: 2 lab Hrs./Week and 1 Theory Hrs./Week for SKILL DEVELOPMENT COURSE or 2 Theory Hrs./ Week.

II Year-I Semester		Basic Science courses	L	T	P	C
Internal:25	**External:75**	**BSC-EC301 Probability Theory and Stochastic Processes**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:

The main objectives of this course are:

- To give students an introduction to elementary probability theory, in preparation to learn the concepts of statistical analysis, random variables and stochastic processes.
- To mathematically model the random phenomena with the help of probability theory Concepts.
- To introduce the important concepts of random variables and stochastic processes.
- To analyze the LTI systems with stationary random process as input.

COURSE OUTCOMES:

- After completion of the course, the student will be able to
- Mathematically model the random phenomena and solve simple probabilistic problems.
- Identify different types of random variables and compute statistical averages of these random variables.
- Characterize the random processes in the time and frequency domains.
- Analyze the LTI systems with random inputs

UNIT-I:

PROBABILITY THEORY: Sample spaces, Events, Probability definition and Axioms, Mathematical model of experiments, Probability as relative frequency, Joint and conditional probability, Properties of joint probability and conditional probability, Total probability, Bayes' theorem, Independent events: Two events and multiple events, properties of independent events.

THE RANDOM VARIABLE: Introduction, Review of Probability Theory, Definition of a Random Variable, Conditions for a Function to be a Random Variable, Discrete, Continuous and Mixed Random Variables, Distribution and Density functions, Properties, Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh, Conditional Distribution, Conditional Density, Properties.

UNIT II

OPERATION ON ONE RANDOM VARIABLE - EXPECTATIONS: Introduction, Expected Value of a Random Variable, Function of a Random Variable, Moments about the Origin, Central Moments, Variance and Skew, Chebychev's Inequality, Characteristic Function, Moment Generating Function, Transformations of a Random Variable: Monotonic Transformations for a Continuous Random Variable, Non-monotonic Transformations of Continuous Random Variable

MULTIPLE RANDOM VARIABLES: Vector Random Variables, Joint Distribution Function, Properties of Joint Distribution, Marginal Distribution Functions, Conditional Distribution and Density, Statistical Independence, Sum of Two Random Variables, Sum of Several Random Variables, Central Limit Theorem: Unequal Distribution, Equal Distributions.

UNIT III

OPERATIONS ON MULTIPLE RANDOM VARIABLES: Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions, Jointly Gaussian Random Variables: Two Random Variables case, N Random Variables case, Properties, Transformations of Multiple Random Variables, Linear Transformations of Gaussian Random Variables.

RANDOM PROCESSES – TEMPORAL CHARACTERISTICS: The Random Process Concept, Classification of Processes, Deterministic and Nondeterministic Processes, Distribution and Density Functions, Concept of Stationarity and Statistical Independence. First-Order Stationary Processes, Second-order and Wide-Sense Stationarity, Nth -order and Strict-Sense Stationarity, Time Averages and Ergodicity, Autocorrelation Function and its Properties, Cross Correlation Function and its Properties, Covariance Functions, Gaussian Random Processes, Poisson Random Process

UNIT IV

RANDOM PROCESSES - SPECTRAL CHARACTERISTICS: The Power Density Spectrum: Properties, Relationship between Power Density Spectrum and Autocorrelation Function, The Cross-Power Density Spectrum, Properties, Relationship between Cross-Power Density Spectrum and Cross-Correlation Function.

LINEAR SYSTEMS WITH RANDOM INPUTS: Random Signal Response of Linear Systems: System Response – Convolution, Mean and Mean-squared Value of System Response, Autocorrelation Function of Response, Cross-Correlation Functions of Input and Output, Spectral Characteristics of System Response: Power Density Spectrum of Response, Cross Power Density Spectra of Input and Output, Band pass, Band-Limited and Narrowband Processes, Properties.

TEXT BOOKS:

1. Probability, Random Variables & Random Signal Principles, Peyton Z. Peebles, TMH, 4th Edition,2001.
2. Probability, Random Variables and Stochastic Processes, Athanasios Papoulis and S. Unnikrisha, PHI, 4th Edition,2002.
3. Probability and Random Processes with Applications to Signal Processing, Henry Stark and John W. Woods, Pearson Education, 3rdEdition,2001.

REFERANCE BOOKS:

1. Schaum's Outline of Probability, Random Variables, and Random Processes,1997.
2. An Introduction to Random Signals and Communication Theory, B.P.Lathi, International Textbook,1968.
3. Probability Theory and Random Processes, P. Ramesh Babu, McGrawHill,2015.

II Year-I Semester		Professional Core Course	L	T	P	C
Internal:25	**External:75**	**PCC-EC302 Electronic Devices and Circuits**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:

The main objectives of this course are:

- Study the physical phenomena such as conduction, transport mechanism and electrical characteristics of different diodes.
- To learn and understand the application of diodes as rectifiers with their operation and characteristics with and without filters are discussed.
- Acquire knowledge about the principle of working and operation of Bipolar Junction Transistor and Field Effect Transistor and their characteristics.
- To learn and understand the purpose of transistor biasing and its significance.
- Small signal equivalent circuit analysis of BJT and FET transistor amplifiers and compare different configurations.

COURSE OUTCOMES:

At the end of this course the student will be able to:

- Understand the formation of p-n junction and how it can be used as a p-n junction as diode in different modes of operation.
- Know the construction, working principle of rectifiers with and without filters with relevant expressions and necessary comparisons.
- Understand the principle of operation of transistors, BJT and FET with their V-I characteristics in different configurations and stabilization.
- Perform the analysis of small signal low frequency transistor amplifier circuits using BJT and FET in different configurations.
- Understand the concepts of feedback amplifiers and its applications.

UNIT I:

JUNCTION DIODE CHARACTERISTICS: energy band diagram of PN junction Diode, Open circuited PN junction, Biased p-n junction, p-n junction diode, current components in PN junction Diode, diode equation, V-I Characteristics, temperature dependence on V-I characteristics, Diode resistance, Diode capacitance. Zener Diode, Breakdown mechanisms, Zener diode applications, LED, Varactor Diode, Photodiode, Tunnel Diode, UJT, PN-PN Diode, SCR. Construction, operation and V-I characteristics

RECTIFIERS AND FILTERS: Basic Rectifier setup, half wave rectifier, full wave rectifier, bridge rectifier, derivations of characteristics of rectifiers, rectifier circuits-operation, input and output waveforms, Filters, Inductor filter (Series inductor), Capacitor filter (Stunt inductor), π-Filter, comparison of various filter circuits in terms of ripple factors.

UNIT II:

BIPOLAR JUNCTION TRANSISTOR (BJT): Bipolar Junction transistors NPN and PNP transistors, current components, transistor equation, V-I Characteristics of BJT, transistor configurations (CB CE, CC), Transistor as an amplifier.

BIASING AND STABILIZATION: Need for biasing, operating point, load line analysis, BJT biasing-methods, basic stability, Stabilization against variations in VBE, IC, and β, Stability factors, Bias compensation, Thermal runaway, Thermal stability.

JFET: JFET and its characteristics, Pinch off Voltage, Drain Saturation Current, JFET biasing, MOSFET –Enhancement and Depletion Modes, Small signal models of FET.

UNIT III:

SMALL SIGNAL – LOW FREQUENCY TRANSISTOR AMPLIFIER CIRCUITS: Transistor as an Amplifier, h – parameter model, Analysis of Transistor Amplifier Circuits using h –parameters, CB, CE and CC Amplifier configurations and performance factors, Analysis of Single Stage Amplifier, RC Coupled Amplifiers, Frequency Response of CE Amplifier.

FET: Generalized analysis of small signal model, Analysis of CG, CS and CD amplifiers, comparison of FET amplifiers

UNIT IV:

FEEDBACK AMPLIFIERS: Principle and Concept of Feedback, Types of Feedback, Classification of Feedback Amplifiers, Feedback Topologies,

OSCILLATORS: Introduction, Principle and Condition for Oscillator, RC –Phase shift and Wein Bridge Oscillators using BJT/FET with Analysis, Colpitts and Hartley Oscillators with analysis, Crystal Oscillator.

TEXT BOOKS:

1. Electronic Devices and Circuits- J. Millman, C. Halkias, Tata Mc-Graw Hill, 4thEdition,2010.
2. Electronic Devices and Circuits-K. Lal Kishore, BS Publications, FourthEdition,2016.
3. Integrated Electronics-Jacob Millman, C. Halkies, C.D.Parikh, Tata Mc-Graw Hill, 2009.

REFERENCES BOOKS:

1. Electronic Devices and Circuits, R.L. Boylestad and Louis Nashelsky, Pearson Publications, 9th Edition,2009.
2. Salivahanan, Kumar, Vallavaraj, "Electronic Devices and Circuits", Tata Mc-Graw Hill, Second Edition.
3. Electronic Devices and Circuits- BV Rao, KBR Murty, K Raja Rajeswari, PCR Pantulu, Pearson, 2nd edition.

II Year-I Semester		Professional Core Course	L	T	P	C
Internal:25	External:75	PCC-EC303 Signals and Systems	3	0	0	3

COURSE OBJECTIVES:
The main objectives of this course are given below:

- To study about signals and systems.
- To analyze the spectral characteristics of signal using Fourier series and Fourier transforms.
- To understand the characteristics of systems.
- To introduce the concept of sampling process
- To know various transform techniques to analyze the signals and systems.

COURSE OUTCOMES:

- At the end of this course the student will able to:
- Differentiate the various classifications of signals and systems
- Analyze the frequency domain representation of signals using Fourier concepts
- Classify the systems based on their properties and determine the response of LTI Systems.
- Know the sampling process and various types of sampling techniques.
- Apply Laplace and z-transforms to analyze signals and Systems (continuous &discrete)

UNIT- I

INTRODUCTION: Definition of Signals and Systems, Classification of Signals, Classification of Systems, Operations on signals: time-shifting, time-scaling, amplitude shifting, amplitude-scaling. Problems on classification and characteristics of Signals and Systems. Complex exponential and sinusoidal signals, Singularity functions and related functions: impulse function, step function signum function and ramp function. Analogy between vectors and signals, orthogonal signal space, Signal approximation using orthogonal functions, mean square error, closed or complete set of orthogonal functions, Orthogonality in complex functions. Related Problems.

UNIT –II

FOURIER SERIES AND FOURIER TRANSFORM: Fourier series representation of continuous time periodic signals, properties of Fourier series, Dirichlet's conditions, Trigonometric Fourier series and Exponential Fourier series, Relation between Trigonometric and Exponential Fourier series, Complex Fourier spectrum. Deriving Fourier transform from Fourier series, Fourier transform of arbitrary signal, Fourier transform of standard signals, Fourier transform of periodic signals, properties of Fourier transforms, Fourier transforms involving impulse function and Signum function. Introduction to Hilbert Transform. Related Problems.

SAMPLING THEOREM – For Band Limited Signals, impulse sampling, Natural and Flat Top Sampling, Reconstruction of signal from its samples, effect of under sampling – Aliasing. Introduction to Band Pass sampling, Related problems.

UNIT-III

ANALYSIS OF LINEAR SYSTEMS: Introduction, Linear system, impulse response, Response of a linear system, Linear time invariant (LTI) system, Linear time variant (LTV) system, Concept of convolution in time domain and frequency domain, Graphical representation of convolution, Transfer function of a LTI system, Related problems. Filter characteristics of linear systems. Distortion less transmission through a system, Signal bandwidth, system bandwidth, Ideal LPF, HPF and BPF characteristics, Causality and Poly-Wiener criterion for physical realization, relationship between bandwidth and rise time.

CORRELATION: Auto-correlation and cross-correlation of functions, properties of correlation function, Energy density spectrum, Parseval's theorem, Power density spectrum, Relation between Convolution and correlation, Detection of periodic signals in the presence of noise by correlation, Extraction of signal from noise by filtering

UNIT –IV

LAPLACE TRANSFORMS: Introduction, Concept of region of convergence (ROC) for Laplace transforms, constraints on ROC for various classes of signals, Properties of L. T's, Inverse Laplace transform, Relation between L. T's, and F.T. of a signal. Laplace transform of certain signals using waveform synthesis.

Z–TRANSFORMS: Concept of Z- Transform of a discrete sequence. Region of convergence in Z-Transform, constraints on ROC for various classes of signals, Inverse Z Transform, properties of Z-transforms. Distinction between Laplace, Fourier and Z transforms.

TEXT BOOKS:

1. Signals, Systems & Communications - B.P. Lathi, BS Publications,2003.
2. Signals and Systems - A.V. Oppenheim, A.S. Willsky and S.H. Nawab, PHI,2nd Edn,1997
3. Signals & Systems - Simon Haykin and Van Veen, Wiley, 2ndEdition,2007

REFERENCE BOOKS:

1. Principles of Linear Systems and Signals – BP Lathi, Oxford University Press,2015
2. Signals and Systems – T K Rawat, Oxford University press,2011

II Year-I Semester		Professional Core Course	L	T	P	C
Internal:25	External:75	PCC-EC304 Switching Theory and Logic Design	3	0	0	3

COURSE OBJECTIVES:

At the end of this course the student will able to:

- To solve a typical number base conversion and analyze new error coding techniques.
- Theorems and functions of Boolean algebra and behaviour of logic gates.
- To optimize logic gates for digital circuits using various techniques.
- Boolean function simplification using Karnaugh maps and Quine-McCluskey methods.
- To understand concepts of combinational circuits.
- To develop advanced sequential circuits.

COURSE OUTCOMES:

The main objectives of this course are given below:

- Classify different number systems and apply to generate various codes.
- Use the concept of Boolean algebra in minimization of switching functions.
- Design different types of combinational logic circuits.
- Apply knowledge of flip-flops in designing of Registers and counters.
- The operation and design methodology for synchronous sequential circuits.

UNIT I:

REVIEW OF NUMBER SYSTEMS & CODES:

Representation of numbers of different radix, conversation from one radix to another radix, r-1's compliments and r's compliments of signed members. Arithmetic Operation, Gray code ,4 bit codes; BCD, Excess-3, 2421, 84-2-1 code etc. Error detection & correction codes: parity checking, even parity, odd parity, Hamming code.

BOOLEAN THEOREMS AND LOGIC OPERATIONS:

Boolean theorems, principle of complementation & duality, De-Morgan theorems. Logic operations; Basic logic operations -NOT, OR, AND, Universal Logic operations, EX-OR, EX- NOR operations. Standard SOP and POS Forms, NAND-NAND and NOR-NOR realizations, Realization of three level logic circuits. Study the pin diagram and obtain truth table for the following relevant ICs 7400,7402,7404,7408,7432,7486.

UNIT II:

MINIMIZATION TECHNIQUES:

Minimization and realization of switching functions using Boolean theorems, K-Map (up to 5 variables) and tabular method (Quine-Mc-Cluskey method) with only four variables and single function.

COMBINATIONAL LOGIC CIRCUITS DESIGN:

Design of Half adder, full adder, half subtractor, full subtractor, applications of full adders; 4-bit adder-subtractor circuit, BCD adder circuit, Excess 3 adder circuit and carry look-a-head adder circuit, Design code converts using Karnaugh method and draw the complete circuit diagrams.

UNIT III:

COMBINATIONAL LOGIC CIRCUITS DESIGN USING MSI &LSI:

Design of encoder, decoder, multiplexer and de-multiplexers, Implementation of higher order circuits using lower order circuits. Realization of Boolean functions using decoders and multiplexers. Design of Priority encoder, 4-bit digital comparator and seven segment decoder. Study the relevant ICs pin diagrams and their functions 7442,7447,7485,74154.

UNIT IV:

SEQUENTIAL CIRCUITS:

Classification of sequential circuits, operation of NAND & NOR Latches and flip-flops; truth tables and excitation tables of RS flip-flop, JK flip-flop, T flip-flop, D flip-flop with reset and clear terminals. Conversion from one flip-flop to another flip- flop. Design of 5ripple counters, design of synchronous counters, Johnson counter, ring counter. Design of registers - Buffer register, control buffer register, shift register, bi-directional shift register, universal shift, register. Study the following relevant ICs and their relevant functions 7474,7475,7476,7490,7 493,74121.

TEXT BOOKS:

1. Switching and finite automata theory Zvi.KOHAVI, Niraj.K.Jha 3rdEdition,Cambridge UniversityPress,2009.
2. Digital Design by M.Morris Mano,Michael D Ciletti,4th edition PHIpublication,2008.
3. Switching theory and logic design by Hill and Peterson**,** Mc-Graw Hill TMH edition, 2012.

REFERENCES BOOKS:

1. Fundamentals of Logic Design by Charles H. Roth Jr, JaicoPublishers,2006.
2. Digital electronics by R S Sedha. S.Chand & companylimited,2010.
3. Switching Theory and Logic Design by A. Anand Kumar,PHI Learning pvtltd,2016.
4. Digital logic applications and design by John M Yarbough, Cengage learning,2006.

II Year-I Semester		Professional Core Course	L	T	P	C
Internal:25	**External:75**	**PCC-EC305 Electromagnetic field theory and Transmission Lines**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:

The main objectives of this course are to understand:

- Fundamentals of steady electric and magnetic fields using various laws.
- Apply the concept of static and time varying Maxwell equations and power flow using pointing theorem.
- Wave characteristics in different media for normal and oblique incidence.
- Implement various concepts of transmission lines and impedance measurements.

COURSE OUTCOMES:

At the end of this course the student can able to:

- Determine E and H using various laws and applications of electric & magnetic fields.
- Apply the Maxwell equations to analyze the time varying behavior of EM waves.
- Gain the knowledge in uniform plane wave concept and characteristics of uniform plane wave in various media.
- Calculate Brewster angle, critical angle and total internal reflection.
- Derive and Calculate the expressions for input impedance of transmission lines, reflection coefficient, VSWR etc. using smith-chart

UNIT -I

ELECTROSTATICS: Coulomb's Law, Electric Field Intensity – Fields due to Different Charge Distributions, Electric Flux Density, Gauss Law and Applications, Electric Potential, Maxwell's Two Equations for Electrostatic Fields, Energy density, Convection and Conduction Currents, Continuity Equation, Relaxation Time, Poisson's and Laplace's Equations; Capacitance.

MAGNETO STATICS: Biot-Savart Law, Ampere's Circuital Law and Applications, Magnetic Flux Density, Maxwell's Two Equations for Magneto static Fields, Magnetic Scalar and Vector Potentials, Forces due to Magnetic Fields, Inductances and Magnetic Energy.

UNIT -II

MAXWELL'S EQUATIONS: Faraday's Law and Transformer EMF, Inconsistency of Ampere's Law and Displacement Current Density, Maxwell's Equations in Different Final Forms and Word Statements. Conditions at a Boundary Surface: Dielectric-Dielectric and Dielectric-Conductor Interfaces. Related Problems.

UNIT -III

ELECTROMAGNETIC WAVES: Wave Equations for Conducting and Perfect Dielectric Media, Uniform Plane Waves, Wave Propagation in Lossless and Conducting Media, Conductors & Dielectrics – Characterization, Polarization, Reflection and Refraction of Plane Waves – Normal and Oblique Incidences for both Perfect Conductor and Perfect Dielectrics, Brewster Angle, Critical Angle and Total Internal Reflection, Surface Impedance. Poynting Vector and Poynting Theorem

TRANSMISSION LINES: Introduction to Transmission line equations, Primary & Secondary constants Expressions for Characteristic Impedance, Propagation Constant, Phase and Group Velocities, Listlessness /Low Loss Characterization, Distortion, Loading, SC and OC Lines, Reflection Coefficient, VSWR, $\lambda/8$, $\lambda/4$, $\lambda/2$-line impedance Transformations, Smith Chart – Configuration and Applications.

UNIT -IV

WAVEGUIDES: Introduction, Rectangular Waveguides, electric and magnetic field patterns in TE10 and TE11 mode configuration, modes of TE wave in rectangular waveguide, field equations, impossibility of TEM wave propagation in waveguides, cutoff frequency of rectangular waveguide, propagation constant, wave impedance, phase velocity, group velocity, dominant mode and degenerate modes, related problems.

TEXT BOOKS:

1. Electromagnetic Field Theory and Transmission Lines, Gottapu Sasibhushana Rao, Wiley India Pvt. Ltd., New Delhi, 1st Ed.,2012.
2. Electromagnetics with Applications, Kraus and Fleisch, McGraw Hill, 1999.
3. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, PHI,2nd Edition,2000.

REFERENCES BOOKS:

1. Elements of Electromagnetic – Matthew N.O. Sadiku, Oxford Univ. Press, 3rd ed., 2001.
2. Engineering Electromagnetics, W. H. Hayt Jr., McGraw Hill – New York.
3. Networks, Lines and Fields John D. Ryder, Second Edition, PearsonEducation,2015.

II Year-I Semester		Professional Core courses (LAB)	L	T	P	C
Internal:50	**External:50**	**LC-EC306 Electronic Devices and Circuits Lab**	**0**	**0**	**3**	**1.5**

List of Experiments: (Minimum of Twelve Experiments has to be performed)

1. P-N Junction Diode Characteristics

   Part A: Germanium Diode (Forward bias& Reverse bias).

   Part B: Silicon Diode (Forward Bias only).

2. Zener Diode Characteristics.

   Part A: V-I Characteristics.

   Part B: Zener Diode as Voltage Regulator.

3. Rectifiers (without filter).

   Part A: Half-wave Rectifier.

   Part B: Full-wave Rectifier.

4. Rectifiers (with C-filter).

   Part A: Half-wave Rectifier.

   Part B: Full-wave Rectifier.

5. BJT Characteristics (CE Configuration).

   Part A: Input Characteristics.

   Part B: Output Characteristics.

6. FET Characteristics (CS Configuration).

   Part A: Drain Characteristics.

   Part B: Transfer Characteristics.

7. UJT Characteristics.
8. FET-CS Amplifier.
9. RC Phase Shift Oscillator.
10. Wien Bridge Oscillator.
11. Hartley Oscillator.
12. Colpitts Oscillator.

II Year-I Semester		Professional Core courses (LAB)	L	T	P	C
Internal:50	**External:50**	**LC-EC307 Switching Theory and Logic Design Lab**	**0**	**0**	**3**	**1.5**

List of Experiments: (Minimum of 10 Experiments has to be performed):

1. Verification of truth tables of Logic gates.

   Two input (i) OR (ii) AND (iii) NOR (iv) NAND (v) Exclusive OR (vi) Exclusive NOR

2. Verification of functional table of 3 to 8-line Decoder.

3. Verification of functional table of 8 to 1 and 2 to 1 multiplexer/De-Mux.

4. Design full adder circuit and verify its functional table.

5. Study of Flip-Flops.

6. Verify the output of Decade counter using Flip – Flops /IC7490.

7. Verify the output of four-bit counter using Flip-Flops / IC7490.

8. Verify the output of Shift Register using IC.

9. Verify the operation of 4-bit Universal Shift Register for different Modes of operation.

10. Verify the operation of a four-bit comparator using IC.

11. Ram (16x4) Using IC 74189 (Read and Write Operations).

Additional Experiments:

1. Design BCD Adder Circuit and Test the Same using Relevant IC.

2. Design Excess-3 to 9-Complement convertor using only four Full Adders and test the Circuit.

3. Design an Experimental model to demonstrate the operation of74154 De-Multiplexer using LEDs for outputs.

II Year-I Semester		Professional Core courses (LAB)	L	T	P	C
Internal:50	**External:50**	**LC-EC308 Electronic Workshop Practice Lab**	**0**	**0**	**3**	**1.5**

ELECTRONIC WORKSHOP PRACTICE LAB:

1. Information about Basic Tools used in Electronics.

1.1 Identification and familiarization with the following tools used in electronic shop: Such as Tweezers, Screw drivers (different sizes), Insulated Pliers, Cutter, Sniper, Philips Screw Driver (Star Screw Driver), L- Keys, Soldering Iron, soldering wire, flux. Their demonstration and uses.

1.2 Identification and familiarization with Multimeter (analog and digital) Job I Practice in the use of above mentioned tools and instruments. For this a small experimental set up may be done.,

1.3 Various types of protective devices such as: wire fuse, cartridge fuse etc.,

1.4 Identification and familiarization with soldering and desoldering practice.

2. Laboratory Experiences.

2.1 Identification of components and Draw the symbols of various electronic devices.

2.2 Practice for color coding of resistance.

2.3 Understand the use of data book for transistors, Diodes, SCR and triac.

3. Use of electronic instruments.

3.1 Practice the use of multi-meter, to study digital multimeter and perform testing of various components.

3.2 Practice for the use of signal generator and perform measurements.

3.3 Practice for the use of power supply and perform measurements.

3.4 Practice for the use of oscilloscope and to study cathode ray oscilloscope and perform measurements.

4. Study of PCB AND PCB layout.

4.1 Assembling electronic components on bread board.

4.2 Identifying the components and its location on the PCB, soldering of active and passive components, Testing the assembled circuit for correct functionality.

4.3 Soldering of simple circuits on PCB.

II Year-I Semester		Skill Development Course	**L**	**T**	**P**	**C**
Internal:50	**External:50**	**SDC-EC309** Skill Development Course **-Soft Skill Lab**	1	0	2	2

PART I:

SOFT SKILLS I

1. Self-Introduction
2. SWOT and SWOC Analysis
3. Presentation Skills
4. JAM Session
5. Group Discussion
6. Debate

PART II:

SOFT SKILLS II

1. Motivation – self-image – goal setting
2. Managing changes – time management – Stress management
3. Leadership traits – team work
4. Career and life planning.
5. Multiple intelligences – emotional intelligence – spiritual quotient (ethics)
6. Intercultural communication
7. Creative and critical thinking
8. Learning styles and strategies.

PART III:

ACADEMIC/ SCIENTIFIC WRITING

1. ABC of Technical Communication
2. Style and Objectivity
3. Report Writing
4. Referencing

PART IV:

INTERVIEW SKILLS

1. Types of Resumes
2. Writing Resume
3. Job application letter
4. Joining Report writing
5. Pre-interview preparation
6. Types of interview questions
7. Body Language and Dress Code
8. Technical Interview

II Year-I Semester		Mandatory course (AICTE suggested)	L	T	P	C
Internal:25	**External:75**	**MC-EC310 Essence of Indian Traditional Knowledge**	**2**	**0**	**0**	**0**

COURSE OBJECTIVES:

To facilitate the students with the concepts of Indian traditional knowledge and to make them understand the Importance of roots of knowledge system

- Learn about Introduction to traditional knowledge, Indigenous Knowledge.
- To understand the legal framework and traditional knowledge and biological diversity act 2002 and geographical indication act2003.
- Learn about Traditional knowledge and intellectual property, global legal FORA.
- To know the student traditional knowledge in different sector.

COURSE OUTCOMES:

After completion **of** the course, students will be able to:

- Understand the concept of Traditional knowledge and its importance.
- Know the need and importance of protecting traditional knowledge.
- Know the various enactments related to the protection of traditional knowledge.
- Understand the concepts of Intellectual property to protect the traditional knowledge.

UNIT I:

INTRODUCTION TO TRADITIONAL KNOWLEDGE: Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, the physical and social contexts in which traditional knowledge develop, the historical impact of social change on traditional knowledge systems. Indigenous Knowledge (IK), characteristics, traditional knowledge vis-à-vis indigenous knowledge, traditional knowledge Vs western knowledge traditional knowledge vis-à-vis formal knowledge.

UNIT II:

PROTECTION OF TRADITIONAL KNOWLEDGE: the need for protecting traditional knowledge Significance of TK Protection, value of TK in global economy, Role of Government to harness TK. The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016. Geographical indicators act 2003.

UNIT III:

TRADITIONAL KNOWLEDGE AND INTELLECTUAL PROPERTY: Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Certain non IPR mechanisms of traditional knowledge protection, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge, global legal FORA for increasing protection of Indian Traditional Knowledge.

UNIT IV:

TRADITIONAL KNOWLEDGE IN DIFFERENT SECTORS: Traditional knowledge and engineering, Traditional medicine system, TK and biotechnology, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK.

TEXT BOOKS:

1. Traditional Knowledge System in India, by Amit Jha, 2009.
2. Traditional Knowledge System and Technology in India by Basanta Kumar Mohanta and Vipin Kumar Singh, Pratibha Prakashan 2012.

REFERENCE BOOKS:

1. Traditional Knowledge System in India by Amit Jha Atlantic publishers, 2002.
2. “Knowledge Traditions and Practices of India" Kapil Kapoor, Michel Danino

ADIKAVI NANNAYA UNIVERSITY: RAJAMAHENDRAVARAM
UNIVRSITY COLLEGE OF ENGINEERING
Department of ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE STRUCTURE &SYLLABUS
II B TECH II SEMESTER

(With effect from 2019-2020 Admitted Batch)
Under Choice Based Credit System(CBCS)

II B. Tech II Semester ECE w.e.f 2019-20(IV Semester)

Course Code	Title of the Course	Hours/weeks			Max Marks		Total Marks	Credits
		L	T	P	Internal	External		
ESC-EC401	Network Analysis	3	0	0	25	75	100	3
BSC-EC402	Control Systems	3	0	0	25	75	100	3
PCC-EC403	Analog and Digital Circuits	3	0	0	25	75	100	3
PCC-EC404	Analog Communications	3	0	0	25	75	100	3
HSMC-EC405	Managerial Economics and Financial Analysis	3	0	0	25	75	100	3
LC-EC 406	Network Analysis and ET Lab	0	0	3	50	50	100	1.5
LC-EC 407	Analog Communications Lab	0	0	3	50	50	100	1.5
LC-EC 408	Analog & Digital Circuits Lab	0	0	3	50	50	100	1.5
SDC-EC409	Skill Development Course	1	0	2	50	50	100	2
TOTAL CREDITS		16	0	11	325	575	900	21.5

Note: 2 lab Hrs./Week and 1 Theory Hrs./Week for SKILL DEVELOPMENT COURSE or 2 Theory Hrs./ Week. Two months Summer Internship/Technical Course mandatory after second year which can be evaluated during V Semester.

II Year-II Semester		Engineering Science Courses	L	T	P	C
Internal:25	External:75	ESC-EC401 Network Analysis	3	0	0	3

COURSE OBJECTIVES:

- To understand the basic concepts on RLC circuits.
- To know the behavior of the steady states and transient's states in RLC circuits.
- To know the basic Laplace transforms techniques in periods 'waveforms.
- To understand the two port network parameters.
- To understand the properties of LC networks and filters.

COURSE OUTCOME:

- Gain the knowledge on basic network elements.
- Will analyze the RLC circuits behavior in detailed
- Analyze the performance of periodic waveforms.
- Gain the knowledge in characteristics of two port network parameters (Z, Y, ABCD, h & g).
- Analyze the filter design concepts in real world applications

UNIT – I

Introduction to Electrical Circuits: Network elements classification, Electric charge and current, Electric energy and potential, Resistance parameter – series and parallel combination, Inductance parameter – series and parallel combination, Capacitance parameter – series and parallel combination. Energy Sources: Ideal, Non-ideal, Independent and dependent sources, Source transformation, Kirchhoff's laws, Mesh analysis and Nodal analysis problem solving with resistances only including dependent sources also.

Fundamentals of Network Topology: Definitions of terms associated with periodic functions: Time period, Angular velocity and frequency, RMS value, Average value, Form factor and peak factor- problem solving, Phase angle, Phasor representation, Addition and subtraction of phasors, mathematical representation of sinusoidal quantities, explanation with relevant theory, problem solving. Principal of Duality with examples.

Network Topology: Definitions of branch, node, tree, planar, non-planar graph, incidence matrix, basic tie set schedule, basic cut set schedule.

UNIT – II

Transients: First order differential equations, Definition of time constants, R-L circuit, R-C circuit with DC excitation, evaluating initial conditions procedure, second order differential equations, homogeneous, non-homogenous, problem solving using R-L-C elements with DC excitation and AC excitation, Response as related to s-plane rotation of roots. Solutions using Laplace transform method.

Steady State Analysis of A.C Circuits: Impedance concept, phase angle, series R-L, R-C, R-L- C circuits problem solving. Complex impedance and phasor notation for R-L, R-C, R-L-C problem solving using mesh and nodal analysis, Star-Delta conversion, problem solving

UNIT – III

Coupled Circuits: Coupled Circuits: Self-inductance, Mutual inductance, Coefficient of coupling, analysis of coupled circuits, Natural current, Dot rule of coupled circuits, conductively coupled equivalent circuits- problem solving.

Resonance: Introduction, Definition of Q, Series resonance, Bandwidth of series resonance, Parallel resonance, Condition for maximum impedance, current in anti-resonance, Bandwidth of parallel resonance, general case-resistance present in both branches, anti-resonance at all frequencies.

UNIT – IV

Network Theorems: Thevinin's, Norton's, Milliman's, Reciprocity, Compensation, Substitution, Super position, Max Power Transfer, Tellegens- problem solving using dependent sources also.

Two-port Networks: Relationship of two port networks, Z-parameters, Y-parameters, Transmission line parameters, h-parameters, Inverse h-parameters, Inverse Transmission line parameters, Relationship between parameter sets, Parallel connection of two port networks, cascading of two port networks, series connection of two port networks, problem solving including dependent sources also.

TEXT BOOKS:

1. Network Analysis – ME Van Valkenburg, Prentice Hall of India, 3rd Edition,2000.
2. Network Analysis by K.Satya Prasad and S Sivanagaraju, Cengage Learning
3. Electric Circuit Analysis by Hayt and Kimmarle,TMH

REFERENCES BOOKS:

1. Network lines and Fields by John. D. Ryder 2nd edition, Asia publishing house.
2. Basic Circuit Analysis by DR Cunninghan, Jaico Publishers.
3. Network Analysis and Filter Design by Chadha, Umesh Publications

II Year-II Semester		Professional Core courses	L	T	P	C
Internal:25	External:75	BSC-EC402 Control Systems	3	0	0	3

COURSE OBJECTIVES:

- To introduce the concepts of open loop and closed loop systems, mathematical models of mechanical and electrical systems, and concepts of feedback
- To study the characteristics of the given system in terms of the transfer function and introducing various approaches to reduce the overall system for necessary analysis
- To develop the acquaintance in analysing the system response in time-domain and frequency domain in terms of various performance indices
- To analyse the system in terms of absolute stability and relative stability by different approaches
- To design different control systems for different applications as per given specifications
- To introduce the concepts of state variable analysis, design and also the concepts of controllability and observability.

COURSE OUTCOMES:

- This course introduces the concepts of feedback and its advantages to various control systems
- The performance metrics to design the control system in time-domain and frequency domain are introduced.
- Control systems for various applications can be designed using time-domain and frequency domain analysis.
- In addition to the conventional approach, the state space approach for the analysis of control systems is also introduced.

UNIT I

INTRODUCTION: Concepts of System, Control Systems: Open Loop and closed loop control systems and their differences. Different examples of control systems, Feed-Back Characteristics, Effects of feedback. Mathematical models, Differential equations, Impulse Response and transfer functions. Translational and Rotational mechanical systems

UNIT II

TRANSFER FUNCTION REPRESENTATION: Transfer Function of DC Servo motor - AC Servo motor-Synchro-transmitter and Receiver, Block diagram representation of systems considering electrical systems as examples -Block diagram algebra– Representation by Signal flow graph - Reduction using mason's gain formula.
TIME RESPONSE ANALYSIS: Standard test signals - Time response of first order systems – Characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications – Steady state response - Steady state errors and error constants.

UNIT III

STABILITY ANALYSIS IN S-DOMAIN: The concept of stability – Routh's stability criterion – qualitative stability and conditional stability – limitations of Routh's stability100
ROOT LOCUS TECHNIQUE: The root locus concept - construction of root loci-effects of adding poles and zeros to G(s)H(s) on the root loci. stability analysis

UNIT IV

FREQUENCY RESPONSE ANALYSIS: Introduction, Correlation between time and frequency response, Polar Plots, Bode Plots, Nyquist Stability Criterion
CLASSICAL CONTROL DESIGN TECHNIQUES: Compensation techniques – Lag, Lead, Lead-Lag Controllers design infrequency Domain, PID Controllers. State Space Analysis of Continuous Systems Concepts of state, state variables and state model, derivation of state models from block diagrams, Diagonalization-Solving the Time invariant state Equations- State Transition Matrix and its Properties –Concepts of Controllability and Observability.

TEXT BOOKS:

1. Automatic Control Systems 8th edition– by B. C. Kuo–John wiley andson's,2003.
2. Control Systems Engineering – by I. J. Nagrath and M. Gopal, New Age International(P) Limited, Publishers, 2nd edition,2007
3. Modern Control Engineering–by Katsuhiko Ogata – Pearson Publications, 5th edition,2015.

REFERENCE BOOKS:

1. Control Systems by A.Nagoorkani, RBA publications,3 edition,2017.
2. Control Systems by A.Anandkumar, PHI, 2 Edition,2014.

II Year-II Semester		Professional Core courses	L	T	P	C
Internal:25	External:75	PCC-EC403 Analog and Digital Circuits	3	0	0	3

COURSE OBJECTIVES:

- To learn hybrid-pi parameters at high frequency and compare with low frequency parameters.
- Understand the purpose of cascading of single stage amplifiers and derive the overall voltage gain.
- Analyze the effect of negative feedback on amplifier characteristics and derive the characteristics.
- Learn the basic principle of multivibrator circuits and perform the analysis of different multivibrator circuits.

COURSE OUTCOMES:

- Design and analysis of small signal high frequency transistor amplifier using BJT and FET.
- Design and analysis of multistage amplifiers using BJT and FET and Cascaded amplifier using BJT.
- Know the classification of the power and tuned amplifiers and their analysis with performance comparison.
- Design and analysis of switching times of a transistor and applications
- Design linear and non-linear wave shaping circuits.
- Design different multivibrators and time base generators.

UNIT I:

SMALL SIGNAL HIGH FREQUENCY TRANSISTOR AMPLIFIER MODELS: Transistor at High frequencies – Hybrid Common Emitter Transistor Model, Hybrid Conductance's and Resistances, Validity of Hybrid –π model, Determination of High frequency Parameters in terms of Low frequency Parameters, CE Short Circuit Gain, Current gain with resistive load, Cutoff Frequencies, Frequency response and Gain Bandwidth Product, FET Model at High Frequency.

UNIT II:

MULTISTAGE AMPLIFIERS: Introduction, Classification of Amplifiers, Methods of Coupling, Cascaded Transistor amplifier and its analysis, Analysis of Two stage RC Coupled Amplifier, Cascade Amplifier: Darlington Amplifier, Emitter Follower.

POWER AMPLIFERS: Introduction, Classification of Power Amplifiers, CLASS-A power amplifier with analysis, Harmonic Distortion, CLASS –B Push-Pull and Complementary symmetry power amplifier with Analysis, Efficiency of Class B Amplifiers, Class AB and Class C Power amplifiers, Thermal stability and Heat sinks, Q-Factor, Small Signal Tuned Amplifier.

UNIT III:

LINEAR WAVESHAPING: High pass, low pass RC circuits, their response for sinusoidal, step, pulse, square, ramp and exponential inputs. RC network as differentiator and integrator; Attenuators, its applications in CRO probe, RL and RLC circuits and their response for step input, Ringing circuit.

NON-LINEAR WAVE SHAPING: Diode clippers, Transistor clippers, clipping at two independent levels, transfer characteristics of clippers, Emitter coupled clipper; Clamping operation, clamping circuits using diode with different inputs, clamping circuit theorem, practical clamping circuits, effect of diode characteristics on clamping voltage, Transfer characteristics of clampers

UNIT IV:

MULTIVIBRATORS: Transistor as a Switch, Switching times of a Transistor, Schmitt Trigger and its Operation, Types of Multivibrators, Design and analysis of Monostable, Bistable, Astable Multivibrators, Expression for the gate width and its waveforms, General features of time base Signal, Methods of generating time base waveform, Miller and Bootstrap Time Base Generator.

TEXT BOOKS:

1. Integrated Electronics- J. Millman and C.C. Halkias, Tata Mc Graw-Hill, 1972.
2. Electronic Circuit Analysis-B.V.Rao,K.R.Rajeswari, P.C.R.Pantulu,K.B.R.Murthy, Pearson Publications
3. Pulse, Digital and Switching Waveforms - J. Millman and H. Taub, McGraw-Hill
4. Pulse and Digital Circuits – A. Anand Kumar, PHI, 2005

REFERENCE BOOKS:

1. Electronic Circuit Analysis and Design – Donald A. Neaman, Mc Graw Hill.
2. Electronic Circuits-I-Ravish R Singh-Peason Publications.
3. Pulse, Digital and Switching Waveforms - J. Millman and H. Taub, Mothiki S Prakash Rao McGraw-Hill,Second Edition, 2007
4. Pulse & Digital Circuits by Venkata Rao,K,Ramasudha K, Manmadha Rao,G., Pearson,2010

II Year-II Semester		Professional Core courses	L	T	P	C
Internal:25	**External:75**	**PCC-EC404 Analog Communications**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:

Students undergoing this course are expected to

- Familiarize with the fundamentals of analog communication systems.
- Familiarize with various techniques for analog modulation and demodulation of signals.
- Distinguish the figure of merits of various angle modulation and pulse modulated signals methods.
- Develop the ability to classify and understand various functional blocks of radio transmitters and receivers.

COURSE OUTCOMES:

After undergoing the course, students will be able to

- Differentiate various Analog modulation and demodulation schemes and their spectral characteristics
- Analyse noise characteristics of various analog modulation methods
- Analyse various functional blocks of radio transmitters and receivers
- Design simple analog systems for various modulation techniques.

UNIT I

AMPLITUDE MODULATION: Introduction to communication system, need for modulation, Frequency Division Multiplexing, Amplitude Modulation, Definition, Time domain and frequency domain description, single tone modulation, power relations in AM waves, Generation of AM waves, square law Modulator, Switching modulator, Detection of AM Waves; Square law detector, Envelope detector.

UNIT II

DSB & SSB MODULATION: Double side band suppressed carrier modulators, time domain and frequency domain description, Generation of DSBSC Waves, Balanced Modulators, Ring Modulator, Coherent detection of DSB-SC Modulated waves, COSTAS Loop. Frequency discrimination method for generation of AM SSB Modulated Wave, Phase discrimination method for generating AM SSB Modulated waves. Demodulation of SSB Waves.

VESTIGIAL SIDE BAND MODULATION: Generation of VSB Modulated wave, Envelope detection of a VSB Wave pulse Carrier, Comparison of AM Techniques, Applications of different AM Systems, FDM.

UNIT III

ANGLE MODULATION: Basic concepts, Frequency Modulation: Single tone frequency modulation, Spectrum Analysis of Sinusoidal FM Wave, Narrow band FM, Wide band FM, Constant Average Power, Transmission bandwidth of FM Wave - Generation of FM Waves, Detection of FM Waves: Balanced Frequency discriminator, zero crossing detector, Phase locked loop. Comparison of FM & AM.

PULSE MODULATION: Types of Pulse modulation, PAM, PWM: Generation & demodulation of PWM, PPM, Generation and demodulation of PPM, Time Division Multiplexing, TDM Vs FDM

UNIT IV

NOISE: Review of noise and noise sources, noise figure**,** Noise in DSB& SSB, Noise in AM System, Noise in Angle Modulation Systems, Pre-emphasis & de-emphasis

TRANSMITTERS & RECEIVERS: Classification of Transmitter, AM Transmitter, FM Transmitter – Variable reactance type and phase modulated FM Transmitter, Receiver Types - Tuned radio frequency receiver, Super heterodyne receiver, RF section and Characteristics - Frequency changing and tracking, Intermediate frequency, AGC, FM Receiver, Comparison with AM Receiver, Amplitude limiting. Communication Receivers, extensions of super heterodyne principle and additional circuits

TEXT BOOKS:

1. Principles of Communication Systems – H Taub & D. Schilling, Gautam Sahe,TMH, 3rd Edition,2007.
2. Principles of Communication Systems - Simon Haykin, John Wiley, 2nd Edition,2007.
3. Modern Digital and Analog Communication Systems –B.P.Lathi,Zhi Ding,Hari Mohan Gupta, Oxford University Press,4th Edition,2017

REFERENCES BOOKS:

1. Electronics & Communication System – George Kennedy and Bernard Davis,TMH 2004.
2. Communication Systems– R.P. Singh, SP Sapre, Second Edition TMH,2007.
3. Electronic Communication systems – Tomasi, Pearson, fourth Edition,2007.

II Year-II Semester		Humanities and Social Sciences	L	T	P	C
Internal:25	**External:75**	**HSMC-EC405 Managerial Economics and Financial Analysis**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:

Students undergoing this course are expected to

- The Learning objectives of this paper are to understand the concept and nature of Managerial Economics and its relationship with other disciplines and also to understand the Concept of Demand and Demand forecasting.
- To familiarize about the Production function, Input Output relationship, Cost-Output relationship and Cost-Volume-Profit Analysis.
- To understand the nature of markets, Methods of Pricing in the different market structures and to know the different forms of Business organization and the concept of Business Cycles.
- To learn different Accounting Systems, preparation of Financial Statement and uses of different tools for performance evaluation.

COURSE OUTCOMES:

After undergoing the course, students will be able to

- The Learning objectives of this paper are to understand the concept and nature of Managerial Economics and its relationship with other disciplines and also to understand the Concept of Demand and Demand forecasting.
- To familiarize about the Production function, Input Output relationship, Cost-Output relationship and Cost-Volume-Profit Analysis.
- To understand the nature of markets, Methods of Pricing in the different market structures and to know the different forms of Business organization and the concept of Business Cycles.
- To learn different Accounting Systems, preparation of Financial Statement and uses of different tools for performance evaluation.

UNIT I

INTRODUCTION TO MANAGERIAL ECONOMICS: Definition, Nature and Scope of Managerial Economics–Demand Analysis: Demand Determinants, Law of Demand and its exceptions. Elasticity of Demand: Definition, Types, Measurement and Significance of Elasticity of Demand. Demand Forecasting, Factors governing demand forecasting, methods of demand forecasting (survey methods, statistical methods, expert opinion method, test marketing, controlled experiments, judgmental approach to demand forecasting)

UNIT II

THEORY OF PRODUCTION AND COST ANALYSIS: Production Function – Isoquants and Iso costs, MRTS, Least Cost Combination of Inputs, Cobb-Douglas Production function, Laws of Returns, Internal and External Economies of Scale. Cost Analysis: Cost concepts, Opportunity cost, Fixed vs. Variable costs, Explicit costs Vs. Implicit costs, Out of pocket costs vs. Imputed costs. Break-even Analysis (BEA)-Determination of Break-Even Point (simple problems)- Managerial Significance and limitations of BEA.

UNIT III

MARKETS STRUCTURES AND PRICING STRATEGIES: Market structures: Types of competition, Features of Perfect competition, Monopoly and Monopolistic Competition. Price-Output Determination in case of Perfect Competition and Monopoly. Objectives and Policies of Pricing- Methods of Pricing: Business and New Economic Environment: Characteristic features of Business, Features and evaluation of Sole Proprietorship, Partnership, Joint Stock Company, Public Enterprises and their types, Changing Business Environment in Post-liberalization scenario.

UNIT IV

FINANCIAL ACCOUNTING: Double-Entry Book Keeping, Journal, Ledger, Trial Balance- Final Accounts. Financial Analysis through ratios: Computation, Analysis and Interpretation of Liquidity Ratios. (Current Ratio and quick ratio), Activity Ratios (Inventory turnover ratio and Debtor Turnover ratio), Capital structure Ratios (Debt- Equity ratio, Interest Coverage ratio), and Profitability ratios (Gross Profit Ratio, Net Profit ratio, Operating Ratio, P/E Ratio and EPS).

TEXT BOOKS:

1. Aryasri: Managerial Economics and Financial Analysis, 2/e, TMH, 2005.
2. Varshney & Maheswari: Managerial Economics, Sultan Chand, 2007.

REFERENCES BOOKS:

1. Ambrish Gupta, Financial Accounting for Management, Pearson Education, New Delhi.
2. Suma Damodaran, Managerial Economics, Oxford University Press.
3. Lipsey & Chrystel, Economics, Oxford University Press.
4. S.N.Maheswari & S.K. Maheswari, Financial Accounting, Vikas publishing house.
5. Dwivedi:Managerial Economics, 6th Ed., Vikas.

II Year-II Semester		Engineering Science Courses Lab	L	T	P	C
Internal:50	**External:50**	**LC-EC406 Network Analysis and ET Lab**	**0**	**0**	**3**	**1.5**

Course Description: Practical investigations on DC, single phase AC circuits, circuit theorems, transient circuits and Two-Port networks.

PART-A: List of Experiments: Minimum SIX Experiments are to be done.

1. Verification of KVL and KCL.
2. Series and Parallel Resonance – Timing, Resonant frequency, Bandwidth and factor determination for RLC network.
3. Time response of first order RC/RL network for periodic non-sinusoidal inputs time constant and steady state error determination.
4. Two port network parameters –Z and Y-parameters.
5. Two port network parameters – ABCD and h-parameters.
6. Verification of Superposition and Reciprocity theorems.
7. Verification of maximum power transfer theorem. Verification on DC and AC Excitation with Resistive and Reactive loads.
8. Experimental determination of Thevenin's and Norton's equivalent circuits and verification by Direct test.

PART- B: List of Experiments: Minimum SIX Experiments are to be done.

1. Magnetization characteristics of D.C Shunt generator, Determination of critical field résistance.
2. Swinburne's Test on Dc shunt machine. (Predetermination of efficiency of a given**.**
3. Dc Shunt machine working as motor and generator).
4. Brake test on DC shunt motor. Determination of Performance Characteristics**.**
5. OC and SC tests on Single-phase transformer (Predetermination of Efficiency and Regulation at given power factors and determination of equivalent circuit)**.**
6. Load Test on single Phase Transformer.
7. Speed Control of DC shunt Motor – flux and armature voltage control methods.

II Year-II Semester		Professional Core courses Lab	L	T	P	C
Internal:50	**External:50**	**LC-EC407 Analog Communications Lab**	**0**	**0**	**3**	**1.5**

COURSE DESCRIPTION:
Simulation and study experiments are to be executed/completed using hardware boards and also to be simulated on Mat lab.

List of Experiments: Any **Twelve** experiments to be done.

1. Amplitude Modulation - Modulation &Demodulation.
2. AM - DSB SC - Modulation &Demodulation.
3. AM - SSB SC - Modulation &Demodulation.
4. Balance Modulator.
5. Diode Detector.
6. Pre-emphasis &De-emphasis.
7. Frequency Modulation - Modulation &Demodulation.
8. Digital Phase Detector.
9. Synchronous Detector.
10. AGC Circuits.
11. Characteristics of Mixer.
12. Verification of Sampling Theorem.
13. Pulse Amplitude Modulation &Demodulation.
14. PWM, PPM –Modulation &Demodulation.
15. PLL IC-565 as FM Demodulator.
16. Radio receiver characteristics.

II Year-II Semester		Professional Core courses Lab	L	T	P	C
Internal:50	**External:50**	**LC-EC408 Analog &Digital Circuits Lab**	**0**	**0**	**3**	**1.5**

COURSE DESCRIPTION: The students are required to design the circuit and observe the functionality of the circuits. Further they are required to verify the result using necessary hardware equipment.

List of Experiments: Minimum of Ten Experiments has to be performed.

1. Two stage RC-Coupled Amplifier.
2. Voltage-Series Feedback Amplifier.
3. Current-Shunt Feedback Amplifier.
4. RC Phase Shift/Wien Bridge Oscillator.
5. Transformer-coupled Class A Power Amplifier.
6. Class B Push-Pull Power Amplifier.
7. Tuned Voltage Amplifier.
8. Linear wave shaping.
9. Non-linear wave shaping.
10. Schmitt trigger.
11. Bi-Stable Multi vibrator using trainer Kit.
12. Monostable Multi vibrator using trainer Kit.
13. Monostable Multi vibrator using trainer Kit.
14. Astable Multi vibrator using trainer Kit.

ADIKAVI NANNAYA UNIVERSITY: RAJAMAHENDRAVARAM
UNIVRSITY COLLEGE OF ENGINEERING
Dept of ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE STRUCTURE &SYLLABUS
III B TECH I SEMESTER

(With effect from 2019-2020 Admitted Batch)
Under Choice Based Credit System(CBCS)

III B. Tech I Semester ECE w.e.f 2019-20(V Semester)

Course Code	Title of the Course	Hours/weeks			Max Marks		Total Marks	Credits
		L	T	P	Internal	External		
PCC-EC501	Linear IC Applications	3	0	0	25	75	100	3
PCC-EC502	Antennas and Wave Propagation	3	0	0	25	75	100	3
PCC-EC503	Digital Communications	3	0	0	25	75	100	3
OEC-EC504	**Open Elective Course-I** A. Computer Organization B. Networks and Protocols C. Data Mining and Ware Housing	2	0	2	25	75	100	3
PEC-EC505	**Professional Elective - I** A. VLSI Design B. Digital IC Design C. Optoelectronics.	3	0	0	25	75	100	3
LC-EC506	Digital Communications Lab	0	0	3	50	50	100	1.5
LC-EC507	Linear IC Applications Lab	0	0	3	50	50	100	1.5
SDC-EC508	Skill Development Course	1	0	2	50	50	100	2
MC-EC509	Constitution of India	2	0	0	25	75	100	0
Summer Internship 2 Months (Mandatory) after Second year (to be evaluated during V Semester		0	0	0	100	--	100	1.5
TOTAL CREDITS		17	0	10	400	600	1000	21.5

Note: 2 lab Hrs/Week and 1 Theory Hrs/Week for SKILL DEVELOPMENT COURSE or 2 Theory Hrs/ Week.

III Year-I Semester		Professional Core courses	L	T	P	C
Internal:25	External:75	PCC-EC501 Linear IC Applications	3	0	0	3

COURSE OBJECTIVES:

- To understand the basic operation &performance parameters of differential amplifiers.
- To understand & learn the measuring techniques of performance parameters of Op-Amp
- To learn the linear and non-linear applications of operational amplifiers.
- To understand the analysis & design of different types of active filters using op-amps
- To learn the internal structure, operation and applications of different analog ICs
- To Acquire skills required for designing and testing integrated circuits

COURSE OUTCOMES:

- Design circuits using operational amplifiers for various applications.
- Analyze and design amplifiers and active filters using Op-amp.
- Diagnose and trouble-shoot linear electronic circuits.
- Understand the gain-bandwidth concept and frequency response of the amplifier configurations.
- Understand thoroughly the operational amplifiers with linear integrated circuits.

UNIT I

INTRODUCTION: Internal Block Diagram of various stages of Op-Amp and Roll of each Stage. Differential Amplifier using BJTs and with RE DC and AC Analysis, Basic Current Mirror Circuit, Improved Version of current mirror circuit, current repeated circuit, Wilson current source.

OP-AMP: OP-Amp Block Diagram (Symbolic Representation), Characteristics of Op-Amp, Ideal and Practical Op-Amp specifications, DC and AC Characteristics, Definitions of Input and Output Off-set voltage and currents slow rate, CMRR, PSRR. Measurements of Op-Amp Parameters.3-Terminal Voltage Regulators 78xx& 79xx Series, current Booster, adjustable voltage, Dual Power Supply with 78xx &79xx.

UNIT II

LINEAR and NON-LINEAR APPLICATIONS OF OP-AMPS: Inverting and Non-inverting amplifier, Integrator and differentiator, Difference amplifier, Instrumentation amplifier, AC amplifier, V to I, I to V converters, Buffers. Non- Linear function generation, Comparators, Multivibrators, Triangular and Square wave generators, Log and Anti Log Amplifiers, Precision rectifiers.

ACTIVE FILTERS, ANALOG MULTIPLIERS AND MODULATORS: Design & Analysis of Butterworth active filters – 1st order, 2nd order LPF, HPF filters. Band pass, Band reject and all pass filters. Four Quadrant Multiplier, IC 1496, Sample & Hold circuits.

UNIT III

TIMERS & PHASE LOCKED LOOPS: Introduction to 555 timers, functional diagram, Monostable and Astable operations and applications, Schmitt Trigger; PLL - introduction, block schematic, principles and description of individual blocks, 565 PLL, Applications of PLL – frequency multiplication, frequency translation, AM, FM & FSK demodulators. Applications of VCO (566).

UNIT IV

DIGITAL TO ANALOG AND ANALOG TO DIGITAL CONVERTERS: Introduction, basic DAC techniques, weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, and IC 1408 DAC, Different types of ADCs – parallel Comparator type ADC, counter type ADC, successive approximation ADC and dual slope ADC.DAC and ADC Specifications, Specifications AD 574 (12-bit ADC).

TEXT BOOKS:

1. Linear Integrated Circuits – D. Roy Choudhury, New Age International (p)Ltd, 2nd Edition,2003.
2. Op-Amps & Linear ICs - Ramakanth A. Gayakwad, PHI,1987.
3. Linear Integrated Circuits by Salivahan-3rd-Edition, McGrawHill,2018

REFERENCES BOOKS:

1. Operational Amplifiers & Linear Integrated Circuits –Sanjay Sharma; SK Kataria& Sons; 2nd Edition,2010.
2. Operational Amplifiers & Linear Integrated Circuits–R.F.Coughlin& Fredrick Driscoll, PHI, 6th Edition,2000.
3. Operational Amplifiers & Linear ICs – David A Bell, Oxford Uni. Press, 3rd Edition,2011.
4. Linear Integrated Circuits, by Ganesh Babu T.Rand Suseela B.Scitech, 5th-Editon, 2014.

III Year-I Semester		Professional Core courses	L	T	P	C
Internal:25	External:75	PCC-EC502 Antennas and Wave Propagation	3	0	0	3

COURSE OBJECTIVES:

The student will be able to

- understand the applications of the electromagnetic waves in free space.
- introduce the working principles of various types of antennas
- discuss the major applications of antennas with an emphasis on how antennas are employed to meet electronic system requirements.
- understand the concepts of radio wave propagation in the atmosphere.

COURSE OUTCOMES:

After undergoing the course, students will be able to

- Understand the basic parameters and analyse the fields radiated by various types of antennas.
- Understand and analyse antenna arrays and Analyse antenna measurements to assess antenna's performance.
- Describe and analyse wire antennas, loop antennas, reflector antennas, lens antennas, horn antennas.
- Understand the characteristics of radio wave propagation and Compare the intricacies involved in various modes of wave propagation.

UNIT I

RADIATION AND ANTENNAS: Antenna definition and Functions, Network theorems, Properties of antennas, Antenna parameters , Polarization, Basic antenna elements , Radiation mechanism, Radiation fields of alternating current element, Radiated power and radiation resistance of current element, Radiation, induction and electrostatic fields, Hertzian dipole, Different current distributions in linear antennas, Radiation from half-wave dipole, Radiation from quarter wave monopole , Radiation characteristics of dipoles.

UNIT II

ANALYSIS OF LINEAR ARRAYS : Directional characteristics of dipole antennas, Radiation pattern of alternating current element, Radiation pattern expressions of centre-fed vertical dipoles of finite length, Radiation patterns of centre-fed vertical dipoles, Radiation patterns of centre-fed horizontal dipoles, Radiation patterns of vertical dipoles, Two-element uniform array, Uniform linear arrays, Field strength of a uniform linear array, First side lobe ratio (SLR), Broadside and End-fire arrays, Patterns of array of non-isotropic radiators, Multiplication of patterns, Generalized expression for principle of pattern multiplication, Radiation pattern characteristics, Binomial arrays, Effect of earth on vertical patterns, Effect of earth on radiation resistance, Methods of excitation, Impedance matching techniques, Transmission loss between transmitting and receiving antennas - FRIIS formula, Antenna temperature and signal-to-noise ratio.

UNIT III

HF, VHF AND UHF ANTENNAS: Introduction, Isotropic radiators, Directional antennas, Omni-directional antennas, Resonant antennas, Non resonant antennas, LF antennas, Antennas for HF, VHF and UHF, Dipole arrays, Folded dipole, V-Antennas, Inverted V-antennas, Rhombic antenna, Yagi-Uda antenna, Log-periodic antennas, Loop antenna, Helical antenna, Whip antenna, Ferrite rod antenna, Turnstile antennas, Discone antennas, Notch antenna.

MICROWAVE ANTENNAS: Introduction, Rod reflector, Plane reflector, Corner reflector, Parabolic reflector, Types of parabolic reflectors, Feed systems for parabolic reflectors, Shaped beam antennas, Horn antennas, Corrugated horns, Slot antennas, Impedance of a few typical dipoles, Slots in the walls of rectangular waveguides, Babinet's principle, Lens antennas, Micro strip antennas.

UNIT IV

ANTENNA MEASUREMENTS: Measurement ranges, Indoor and outdoor ranges, Antenna impedance measurements, Measurement of radiation resistance, Gain measurements, Measurement of antenna bandwidth, Directivity measurement, Measurement of side lobe ratio, Measurement of radiation efficiency, Measurement of antenna aperture efficiency, Measurement of polarization of antenna, Phase measurement.

WAVE PROPAGATION : Propagation characteristics of EM Waves, Factors involved in the propagation of radio waves, Ground wave propagation, Ground wave field strength by Maxwell's equations, Reflection of radio waves by the surface of the earth, Roughness of earth, Reflection factors of earth, Wave tilt of the ground wave, Tropospheric wave propagation, Atmospheric effects in space wave propagation, Duct propagation, Radio horizon, Troposcatter, Fading of EM waves in Troposphere, Line of sight (LOS), Ionospheric propagation, Characteristics of ionosphere, Refractive index of ionosphere, Phase and group velocities, Mechanism of Ionospheric propagation, reflection and refraction, Characteristic parameters of Ionospheric propagation, Sky wave field strength, Fading and diversity techniques, Faraday's rotation, Effect of earth's magnetic field.

TEXT BOOKS

1. John D. Kraus and Ronald J. Marhefka and Ahmad S.Khan, Antennas and wave propagation, 4th Edition (Special Indian Edition), TMH, New Delhi, 2010.
2. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, PHI, 2nd Edition, 2000.

REFERENCE BOOKS:

1. Antenna Theory - C.A. Balanis, John Wiley and Sons, 2nd Edition, 2001.
2. Antennas and Wave Propagation – K.D. Prasad, Satya Prakashan, Tech India Publications, New Delhi, 2001.
3. Transmission and Propagation – E.V.D. Glazier and H.R.L. Lamont, The Services Text Book of Radio, vol. 5, Standard Publishers Distributors, Delhi
4. Electronic and Radio Engineering – F.E. Terman, McGraw-Hill, 4th Edition, 1955.

III Year-I Semester		Professional Core courses	L	T	P	C
Internal:25	External:75	PCC-EC503 Digital Communications	3	0	0	3

COURSE OBJECTIVES:

The student will be able to

- Understand pulse digital modulation systems such as PCM, DPCM and DM.
- Understand various digital modulation techniques and able to analyze various systems for their performance in terms of probability of error.
- Study the concepts of information theory and need for source coding.
- Study Block codes, cyclic codes and convolution codes.

COURSE OUTCOMES:

After going through this course the student will be able to

- Analyze the performance of a Digital Communication System for probability of error and are able to design a digital communication system.
- Analyze various source coding techniques.
- Compute and analyze Block codes, cyclic codes and convolution codes.
- Design a coded communication system.

UNIT I:

PULSE DIGITAL MODULATION: Elements of digital communication systems, advantages of digital communication systems, Elements of PCM: Sampling, Quantization & Coding, Quantization error, Companding in PCM systems. Differential PCM systems(DPCM). Delta modulation, its draw backs, adaptive delta modulation, comparison of PCM and DM systems, noise in PCM and DM systems.

UNIT II:

DIGITAL MODULATION TECHNIQUES: Introduction, ASK, FSK, PSK, DPSK, DEPSK, QPSK, Mary PSK, ASK, FSK, similarity of BFSK and BPSK.

DATA TRANSMISSION: Base band signal receiver, probability of error, the optimum filter, matched filter, probability of error using matched filter, coherent reception, non-coherent detection of FSK, calculation of error probability of ASK, BPSK, BFSK, QPSK.

UNIT III:

INFORMATION THEORY: Discrete messages, concept of amount of information and its properties. Average information, Entropy and its properties. Information rate, Mutual information and its properties.

SOURCE CODING: Introductions, Advantages, Shannon's theorem, Shanon-Fano coding, Huffman coding, efficiency calculations, channel capacity of discrete and analog Channels, capacity of a Gaussian channel, bandwidth –S/N trade off.

UNIT IV:

LINEAR BLOCK CODES: Introduction, Matrix description of Linear Block codes, Error detection and error correction capabilities of Linear block codes, Hamming codes, Binary cyclic codes, Algebraic structure, encoding, syndrome calculation, BCH Codes.

CONVOLUTION CODES: Introduction, encoding of convolution codes, time domain approach, transform domain approach. Graphical approach: state, tree and trellis diagram decoding using Viterbi algorithm.

TEXT BOOKS:

1. Digital communications - Simon Haykin, John Wiley, 2005.
2. Digital and Analog Communication Systems - Sam Shanmugam, John Wiley, 2005.
3. Principles of Communication Systems – H. Taub and D. Schilling, TMH, 2003.

REFERENCES BOOKS:

1. Digital Communications – John Proakis, TMH, 1983.
2. Communication Systems Analog & Digital – Singh &Sapre, TMH, 2004.
3. Modern Digital and Analog Communication Systems –B.P.Lathi, Zhi Ding, Hari Mohan Gupta, Oxford University Press,4th Edition,2017.

III Year-I Semester		Open Elective Course - I	L	T	P	C
Internal:25	**External:75**	**OEC-EC504A Computer Organization**	**2**	**0**	**2**	**3**

Course Objectives:
The student will be able to
- To identify Basic Computer Organization and its applications.
- To understand the input and output interfacing and organisation.
- To Understand the various instructions, addressing modes.
- To Understand the concept of Intel architecture.

Course Outcomes:
After going through this course the student will be able to
- Students can understand the architecture of modern computer.
- They can analyze the Performance of a computer using performance equation.
- Understand about Input Output Organization, Asynchronous Data Transfer, Direct Memory Access, Input Output Processor.
- Understand the concepts of I/O Organization and Memory systems.
- Understand about 8085 Microprocessor Architecture, Instructions, Addressing Modes.

UNIT I:
BASIC COMPUTER ORGANIZATION: basic computer organisation: instruction codes-stored program organisation, indirect address, computer register, computer instructions, timing and control, instruction cycle, memory reference instructions, design of accumulator logic, general register origination, stack originations, instruction formats, addressing modes.

UNIT II:
INPUT-OUTPUT ORGANIZATIONS: Input-output organisation: I/O Interface, asynchronous data transfer-strobe control, hand shaking, asynchronous communication interface, modes of transfer, direct memory access(DMA)-DMA- controller, DMA transfer, input-output processor(IOP).

UNIT III:
MEMORY ORGANIZATIONS: Memory Hierarchy, Main Memory, RAM, ROM Chips, Memory Address Map, Memory Connection to CPU, Associate Memory, Cache Memory, Miss and Hit Ratio, Access Time, Associative, Set Associative Mapping, Introduction to Virtual Memory.

UNIT IV:
8085 CPU: Introduction to Intel 8085 microprocessor architecture –ALU, Timing and control Unit, register, data &address Bus, 8085 pin configuration, Instruction set of Intel 8085-Data transfer group, architecture group, logical group, branch &control group, addressing modes of 8085, assembly language programs involving evaluation of architecture Expressions.

TEXT BOOKS:
1. M.Morris Mano," Computer System Architecture," Pearson Publishers, Third Edition
2. Fundamentals of microprocessor and microcomputer: B.ram-DhanapatRai publications.
3. Computer Organization, Carl Hamacher, ZvonksVranesic, SafeaZaky, 5thEdition, McGrawHill,2011.

REFERENCE BOOKS:
1. Computer Organization and Architecture – William Stallings Sixth Edition, Pearson/PHI.
2. Structured Computer Organization and Design - Andrew S. Tanenbaum, 4th Edition PHI/Pearson.
3. Fundamentals or Computer Organization and Design – Sivaraama D andamudi Springer Int. Edition,2003.
4. Computer Architecture a quantitive approach, Jhon L. Hennessy and David A. Patterson, Fourth Edition Elsevier.

III Year-I Semester		Open Elective Course - I	L	T	P	C
Internal:25	**External:75**	**OEC-EC504B Network and protocols**	**2**	**0**	**2**	**3**

COURSE OBJECTIVES:

The student will be able to

- To Study about the ISO network Architecture and Architecture Models models.
- Student able to learn the various protocols layers.
- To study about the network management and monitoring system.
- To understand the data encryption system and secured routing protocols.
- To understand about the Ethernet protocols and Virtual and wireless LAN protocols.

COURSE OUTCOMES:

After going through this course the student will be able to

- Understand the concept of TCP/IP protocols.
- To understand the routing protocols and the network management protocols.
- To understand about the various protocols methods.
- Student learn various network protocols.

UNIT I:

FUNDAMENTALS OF NETWORKING STANDARDS AND PROTOCOLS: Network Communication Architecture and Protocols - OSI Network Architecture Seven Layers Model - Definition and Overview of TCP/IP Protocols -TCP/IP Four Layers Architecture Model - Other Network Architecture Models: IBM SNA.

UNIT II:

ROUTED AND ROUTING PROTOCOLS: Application Layer Protocols-Presentation Layer Protocols-Session Layer Protocols - Transport Layer Protocols - Network Layer Protocols - Data Link Layer Protocols - Routing Protocols - Multicasting Protocols - MPLS.

ISDN AND NETWORK MANAGEMENT PROTOCOLS: Overview of ISDN − Channels − User access – Protocols Network management requirements – Network monitoring − Network control − SNMP V1, V2 and V3 − Concepts, MIBs − Implementation issues-RMON. 58

UNIT III:

SECURITY AND TELEPHONY PROTOCOLS:

Network Security Technologies and Protocols - AAA Protocols - Tunnelling Protocols - Security Protocols-rivate key encryption − Data encryption system, public key encryption − RSA − Elliptic curve cryptography − Authentication mechanisms− Web security -Secured Routing Protocols - IP telephony -Voice over IP and VOIP Protocols –Signalling Protocols- Media/CODEC.

UNIT IV:

NETWORK ENVIRONMENTS AND PROTOCOLS:

Wide Area Network and WAN Protocols - Frame relay - ATM - Broadband Access Protocols -PPP Protocols - Local Area Network and LAN Protocols - Ethernet Protocols - Virtual LAN Protocols - Wireless LAN Protocols - Metropolitan Area Network and MAN Protocol - Storage Area Network and SAN Protocols.

TEXT BOOKS:

1. Javvin, “Network Protocols” , Javvin Technologies Inc , second edition, 2005.
2. William Stallings, “Cryptography and Network Security”, PHI, 2000.
3. Mani Subramanian, “Network Management−Principles and Practices”, Addison Wesley, 2000.

REFERENCES BOOKS:

1. William Stallings, “SNMP, SNMPV2, SNMPV3 and RMON1 and 2”, 3rd Edition, Addison Wesley, 1999.
2. William Stallings, “Data and Computer Communications” 5th Edition, PHI, 1997.

III Year-I Semester		Open Elective Course - I	L	T	P	C
Internal:25	**External:75**	**OEC-EC504C Data Mining and Ware Housing**	**2**	**0**	**2**	**3**

COURSE OBJECTIVES:

The main objectives of this course are:

- Students will be enabled to understand and Data Warehouse Modelling and pre-processing.
- They will learn the various concepts to analyze the data and choose the relevant models.
- To understand the correlations and mining methods.
- To study the different methods and concepts.

COURSE OUTCOMES:

After going through this course the student will be able to

- Understand about Data Warehouse and OLAP Technology, Data Preprocessing.
- Understand Data Mining Principles
- Understand about Concept Description, Mining Frequent Pattern, Association and Correlations.
- Understand about Classification Basic Concepts, Cluster Analysis.

UNIT I:

DATA WAREHOUSE AND OLAP TECHNOLOGY: An overview Data Warehouse Basic Concepts, Data Warehouse Modelling: Data Cube and OLAP, Data Warehouse Architecture Data Warehouse Implementation, Data Pre-processing: An Overview, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization, from Data Warehousing to Data Mining.

UNIT II:

INTRODUCTION TO DATA MINING: Motivation and importance, what is Data Mining, Data Mining on what kind of data, what kinds of patterns can be mined, which technologies are used, integration of data mining system with a database or DWH system, Major issues in Data Mining. Getting to know your Data: Data Objects and Attribute Types, Basic Statistical Descriptions of Data, Data Visualization, Measuring data Similarity and Dissimilarity.

UNIT III:

CONCEPT DESCRIPTION: Characterization and comparison What is Concept Description, Data Generalization by Attribute-Oriented Induction(AOI), AOI for Data Characterization, Efficient Implementation of AOI, AOI for Class comparisons. Mining Frequent Patterns, Associations and Correlations: Basic Concepts, Frequent Itemset Mining Methods: Apriori method, generating Association Rules, Improving the Efficiency of Apriori, Pattern-Growth Approach for mining Frequent Item sets, Mining Frequent Itemsets using vertical data format, Mining Closed.

UNIT IV:

CLASSIFICATION BASIC CONCEPTS: Basic Concepts, Decision Tree Induction: Decision Tree Induction, Attribute Selection Measures, Tree Pruning, Bayes Classification Methods, Classification by Back Propagation, Suport Vector Machines. Cluster Analysis: Cluster Analysis, Partitioning Methods, Hierarchal methods, Density based methods-DBSCAN.

TEXT BOOK:

1. Data Mining Concepts and Techniques—JiaweiHan, Micheline Kamber and Jian Pei,Morgan Kaufman Publications 3rd edition.

REFERENCE BOOKS:

1. Introduction to Data Mining –Pang-Ning Tan, Michael Steinbach, Vipin Kumar.
2. Introduction to Data Mining, Adriaan, Addison Wesley Publication.
3. Data Mining Techniques, A.K.Pujari, University Press.

III Year-I Semester		Professional Elective - I	L	T	P	C
Internal:25	External:75	PEC-EC505A VLSI Design	3	0	0	3

COURSE OBJECTIVES:

The main objectives of this course are:

- To learn the MOS Process Technology.
- To learn the design Rules and draw layout of a given logic circuit.
- Understand and learn the characteristics of CMOS circuit construction.
- To study and know the concepts of FPGA and the different types FPGA Families

COURSE OUTCOMES:

After going through this course the student will be able to

- Understand the electrical properties of MOS circuits and fabrication process.
- Understand and design various methodologies of CMOS.
- To Know the various electrical properties of MOS transistors.
- To understand and design propagation delays of various MOS circuits.
- Understand the concepts of FPGA and to Know the different types FPGA Families.

Unit-I:

INTRODUCTION: Introduction to IC Technology, MOS and related VLSI Technology, Basic MOS Transistors, Enhancement and Depletion modes of transistor action, IC production process, MOS and CMOS Fabrication processes, BiCMOS Technology, Comparison between CMOS and Bipolar technologies.

BASIC ELECTRICAL PROPERTIES OF MOS AND BI-CMOS CIRCUITS: Ids versus Vds Relationships, Aspects of MOS transistor Threshold Voltage, MOS transistor Trans, Output Conductance and Figure of Merit. The Pass transistor, NMOS Inverter, Pull-up to Pull-down Ratio for NMOS inverter driven by another NMOS inverter. Alternative forms of pull-up, The CMOS Inverter, MOS transistor circuit model, Bi-CMOS Inverter, Latch-up in CMOS
circuits and BiCMOS Latch-up Susceptibility.

UNIT-II:

MOS AND BI-CMOS CIRCUIT DESIGN PROCESSES: MOS Layers, Stick Diagrams, Design Rules and Layout, General observations on the Design rules, 2μm Double Metal, Double Poly, CMOS/BiCMOS rules,1.2μm Double Metal, Double Poly CMOS rules, Layout Diagrams of NAND and NOR gates and CMOS inverter, Symbolic Diagrams- Translation to Mask Form.

UNIT-III:

BASIC CIRCUIT CONCEPTS: Sheet Resistance, Sheet Resistance concept applied to MOS transistors and Inverters, Area Capacitance of Layers, Standard unit of capacitance, The Delay Unit, Inverter Delays, Propagation Delays, Wiring Capacitances, Fan-in and fan-out characteristics, Choice of layers, Transistor switches, Realization of gates using NMOS, PMOS and CMOS technologies.

SCALING OF MOS CIRCUITS: Scaling models, Scaling factors for device parameters, Limits due to sub threshold currents, current density limits on logic levels and supply voltage due to noise.

SUBSYSTEM DESIGN: Architectural issues, switch logic, Gate logic, examples of structured design, clocked sequential circuits, system considerations, general considerations of subsystem design processes, an illustration of design processes.

UNIT-IV:

VLSI DESIGN ISSUES: VLSI Design issues and design trends, design process, design for testability, technology options, power calculations, package selection, clock mechanisms, mixed signal design, ASIC design flow, FPGA design flow, introduction to SoC design.

FPGA DESIGN: Basic FPGA architecture, FPGA configuration, configuration modes, FPGA design process-FPGA design flow, FPGA families, FPGA design examples-stack, queue and shift register implementation using VHDL, step-by-step approach of FPGA design process on Xilinx environment.

TEXT BOOKS:

1. Essentials of VLSI Circuits and Systems - Kamran Eshraghian, Douglas and A. Pucknell andSholeh Eshraghian, Prentice-Hall of India Private Limited, 2005 Edition.
2. VLSI Design-Black Book by Dr. K.V.K.K. Prasad, Kattula Shyamala, Kogent Learning Solutions Inc.2012 Edition.
3. CMOS Digital Integrated Circuits Analysis and Design- Sung-Mo Kang, Yusuf Leblebici, TataMcGraw-Hill Education, 2003.

REFERENCES BOOKS:

1. VLSI Design By A.Albert Raj & T.Latha,PHI Learning Private Limited,2010
2. VLSI Design-A.Shanthi and A.Kavita, New Age International Private Limited, 2006 First Edition.

III Year-I Semester		Professional Elective - I	L	T	P	C
Internal:25	External:75	PEC-EC505B Digital IC Design	3	0	0	3

COURSE OBJECTIVES:

The main objectives of this course are:

- The student will be able to understand the MOS Design.
- In this course, students can study Combinational MOS Logic Circuits and Sequential MOS Logic Circuits.
- Another main object of this course is to motivate the graduate students to design and to develop the Digital Integrated Circuits for different Applications.
- The concepts of Semiconductor Memories, Flash Memory, RAM array organization.

COURSE OUTCOMES:

At the end of this course the student will be able to:

- Understand the concepts of MOS Design.
- Design and analysis of Combinational and Sequential MOS Circuits.
- Extend the Digital IC Design to Different Applications.
- Understand the Concepts of Semiconductor Memories, Flash Memory, RAM array organization.

UNIT I:

MOS DESIGN: Pseudo NMOS Logic – Inverter, Inverter threshold voltage, output high voltage, Output Low voltage, gain at gate threshold voltage, Transient response, Rise time, Fall time, Pseudo NMOS logic gates, Transistor equivalency, CMOS Inverter logic.

UNIT II:

COMBINATIONAL MOS LOGIC CIRCUITS: MOS logic circuits with NMOS loads, Primitive CMOS logic gates – NOR & NAND gate, Complex Logic circuits design – Realizing Boolean expressions using NMOS gates and CMOS gates, AOI and OIA gates, CMOS full adder, CMOS transmission gates, Designing with Transmission gates.

UNIT III:

SEQUENTIAL MOS LOGIC CIRCUITS: Behaviour of bistable elements, SR Latch, clocked latch and flip flop circuits, CMOS D latch and edge triggered flip-flop.

DYNAMIC LOGIC CIRCUITS: Basic principle, Voltage Bootstrapping, Synchronous dynamic pass transistor circuits, Dynamic CMOS transmission gate logic, High performance Dynamic CMOS circuits.

UNIT IV:

INTERCONNECT: Capacitive Parasitic, Resistive Parasitic, Inductive Parasitic, Advanced Interconnect Techniques.

SEMICONDUCTOR MEMORIES: Memory Types, RAM array organization, DRAM – Types, Operation, Leakage currents in DRAM cell and refresh operation, SRAM operation Leakage currents in SRAM cells, Flash Memory- NOR flash and NAND flash.

TEXT BOOKS:

1. Digital Integrated Circuits – A Design Perspective, Jan M. Rabaey, Anantha Chandrakasan, Borivoje Nikolic,2ndEd., PHI,2016.
2. Digital Integrated Circuit Design – Ken Martin, Oxford UniversityPress,2011.

REFERENCES BOOKS:

1. CMOS Digital Integrated Circuits Analysis and Design – Sung-Mo Kang, Yusuf Leblebici, TMH, 3rd Ed.,2011.
2. CMOS VLSI Design – Neil H.E Weste, David harris, Ayan Banerjee 3rdEdition, Pearson,2006.

III Year-I Semester		Professional Elective - I	L	T	P	C
Internal:25	**External:75**	**PEC-EC505C Optoelectronics**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:

The main objectives of this course are:

- To review basic semiconductor theory.
- To introduce the concepts of LED.
- To teach the principle of stimulated emission and devices based on it.
- To equip the student with the knowledge of Photovoltaic and display devices.
- To introduce the knowledge of optoelectronics modulators.

COURSE OUTCOMES:

At the end of this course the student will be able to:

- Understand various kinds of semiconductor materials used in optoelectronics.
- Understand the mechanisms of light absorption and emission in p-n junctions.
- Use photodiodes, LEDs, and laser diodes for various applications

UNIT I:

SEMICONDUCTOR THEORY: Basic quantum mechanics, semiconductor statistics, carrier transport, optical processes, and junction theory, Properties of simple and compound semiconductors, Optical absorption, Optical recombination, Recombination and carrier lifetime.

UNIT II:

LIGHT EMITTING DIODES: Energy Bands. Direct and Indirect Band Gap Semiconductors: E-k Diagrams. pn Junction Principles. The pn Junction Band Diagram. Light Emitting Diodes. LED Materials. Heterojunction High Intensity LEDs. LED Characteristics. LEDs for Optical Fiber Communications, White LED for display and lighting applications.

UNIT III:

STIMULATED EMISSION DEVICES: Stimulated Emission and Photon Amplification. Stimulated Emission Rate and Einstein Coefficients. Optical Fiber Amplifiers. LASER Oscillation Conditions. Principle of the Laser Diode. Hetero structure Laser Diodes. Rate Equation- Characteristics. Light Emitters for Optical Fiber Communications. Quantum Well and Quantum dot Devices. Vertical Cavity Surface Emitting Lasers (VCSELs). Optical Laser Amplifiers.

UNITIV:

PHOTOVOLTAICS AND DISPLAY DEVICES: Photovoltaic Device Principles. pn Junction Photovoltaic I-V Characteristics. Solar Cells Materials, Devices and Efficiencies. Liquid crystal displays, Reflective and Trans reflective types, TFT displays, Plasma displays, LED TV

TEXT BOOKS:

1. S. O. Kasap, "Optoelectronics and Photonics: Principles and Practices", Pearson, 2013.
2. Michael Parker, "Physics of optoelectronics", CRC press, 2018.

REFERENCES BOOKS:

1. P. N. Prasad, "Nano photonics", John Wiley & Sons, 2004.
2. Deng-Ke Yang, Shin Tson Wu, "Fundamentals of Liquid Crystal Devices", Revised edition, John Wiley and sons, 2015.
3. Saleh and Teich, "Fundamentals of Photonics", Wiley Inter science, 2nd Edition, 2013.
4. J. Singh, "Electronic and Optoelectronic Properties of Semiconductor Structures Cambridge university press, 2007.

III Year-I Semester		Professional Core courses Lab	L	T	P	C
Internal:50	**External:50**	**LC-EC506 Digital Communications Lab.**	**0**	**0**	**3**	**1.5**

COURSE DESCRIPTION: The students are required to design the circuit and observe the functionality of different modulation and frequency modulation techniques. Further they are required to verify the result using necessary hardware equipment.

List of Experiments: Minimum Ten Experiments to be done:

1. Time division multiplexing and Demultiplexing.
2. Pulse code modulation.
3. Differential pulse code modulation.
4. Delta modulation.
5. Frequency shift keying.
6. Phase shift keying.
7. Differential phase shift keying.
8. Companding and Expanding.
9. Source Encoder and Decoder.
10. Linear Block Code-Encoder and Decoder.
11. Binary Cyclic Code - Encoder and Decoder.
12. Convolution Code - Encoder and Decoder.

III Year-I Semester		Professional Core courses Lab	L	T	P	C
Internal:50	**External:50**	**LC-EC507 Linear IC Applications Lab**	**0**	**0**	**3**	**1.5**

COURSE DESCRIPTION: The students are required to design the circuit and observe the functionality of the circuits. Further they are required to verify the result using necessary hardware equipment.

List of Experiments: Minimum Ten Experiments to be conducted

PART -A (ANY 6 EXPERIMENTS SHOULD BE DONE)

1. Study of Op-Amp.
2. OP AMP Applications – Adder, Sub tractor, Comparator Circuits.
3. Integrator and Differentiator Using IC 741.
4. Active Filters – LPF & HPF Using IC 741.
5. RC Phase Shift Oscillator Using IC 741.
6. Wein Bridge Oscillator Using IC 741.
7. D/A Conversion Using IC 741.
8. Monostable Multivibrator Using 555 Timer.
9. Astable Multivibrator Using 555 Timer.
10. Schmitt Trigger Using 555 Timer.
11. Phase Locked Loop Using 555 Timer.
12. Sampling gates.

III Year-I Semester		Mandatory Course	L	T	P	C
Internal:25	**External:75**	**MC-EC509 Constitution of India**	**2**	**0**	**0**	**0**

COURSE OBJECTIVES:

At the end of this course the student will be able to:

- To Enable the student to understand the importance of constitution.
- To understand the structure of executive, legislature and judiciary.
- To understand philosophy of fundamental rights and duties.
- To understand the autonomous nature of constitutional bodies like Supreme Court and high court controller and auditor general of India and election commission of India.
- To understand the central and state relation financial and administrative.

COURSE OUTCOMES:

At the end of the semester/course, the student will be able to have a clear knowledge on the following:

- Understand historical background of the constitution making and its importance for building a democratic India.
- Understand the functioning of three wings of the government ie., executive, legislative and judiciary.
- Understand the value of the fundamental rights and duties for becoming good citizen of India.
- Analyze the decentralization of power between central, state and local self-government.
- Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.

UNIT I:

INTRODUCTION TO INDIAN CONSTITUTION: Constitution meaning of the term, Indian Constitution - Sources and constitutional history, Features - Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.

UNIT II:

UNION GOVERNMENT AND ITS ADMINISTRATION STRUCTURE OF THE INDIAN UNION: Federalism, Centre- State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha, The Supreme Court and High Court: Powers and Functions; State Government and its Administration Governor - Role and Position - CM and Council of ministers, State Secretariat: Organization, Structure and Functions.

UNIT III:

LOCAL ADMINISTRATION - District's Administration Head - Role and Importance, Municipalities - Mayor and role of Elected Representative - CEO of Municipal Corporation.

PACHAYATIRAJ: Functions PRI: Zilla Panchayat, Elected officials and their roles, CEO Zilla Panchayat: Block level Organizational Hierarchy - (Different departments), Village level - Role of Elected and Appointed officials - Importance of grass root democracy.

UNIT IV:

ELECTION COMMISSION: Election Commission- Role of Chief Election Commissioner and Election Commissioner ate State Election Commission: Functions of Commissions for the welfare of SC/ST/OBC and women.

TEXT BOOKS:

1. Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt. Ltd. NewDelhi.
2. SubashKashyap, Indian Constitution, National Book Trust .

REFERENCES BOOKS:

1. J.A. Siwach, Dynamics of Indian Government &Politics.
2. D.C. Gupta, Indian Government and Politics

ADIKAVI NANNAYA UNIVERSITY:: RAJAMAHENDRAVARAM
UNIVRSITY COLLEGE OF ENGINEERING
Dept of ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE STRUCTURE &SYLLABUS
III B TECH II SEMESTER

(With effect from 2019-2020 Admitted Batch)
Under Choice Based Credit System(CBCS)

III B. Tech II Semester ECE w.e.f 2019-20(VI Semester)

Course Code	Title of the Course	Hours/weeks			Max Marks		Total Marks	Credits
		L	T	P	Internal	External		
PCC-EC601	Microprocessors and Microcontrollers	3	0	0	25	75	100	3
PCC-EC602	Microwave Engineering	3	0	0	25	75	100	3
PCC-EC603	Digital Signal Processing	3	0	0	25	75	100	3
PEC-EC604	**Professional Elective Course - II** A. Computer Networks Engineering. B. Artificial Neural Networks and Fuzzy Logic. C. Bio-Medical Engineering.	3	0	0	25	75	100	3
OEC-EC605	**Open Elective Course - II** A. Python Programming B. Object Oriented Programming Through Java. C. Machine Learning.	2	0	0	25	75	100	3
LC-EC606	Microprocessors and Microcontrollers Lab	0	0	3	50	50	100	1.5
LC-EC607	Microwave Engineering Lab	0	0	3	50	50	100	1.5
LC-EC608	Digital Signal Processing Lab	0	0	3	50	50	100	1.5
SDC-EC609	Skill Development Course	1	0	2	50	50	100	2
TOTAL CREDITS		15	0	11	325	575	900	21.5

Note: 2 lab Hrs./Week and 1 Theory Hrs./Week for SKILL DEVELOPMENT COURSE or 2 Theory Hrs./ Week. Two months Summer Internship/Technical Course mandatory after Third year which can be evaluated during VII Semester.

III Year-II Semester		Professional Core Courses	L	T	P	C
Internal:25	**External:75**	**PCC-EC601 Microprocessors and Microcontrollers.**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:
The main objectives of this course are

- To acquire knowledge on microprocessors and microcontrollers.
- To select processors based on requirements.
- To acquire the knowledge on interfacing various peripherals, configure and develop programs to interface peripherals/sensors.
- To develop programs efficiently on ARM Cortex processors and debug.

COURSE OUTCOMES:
At the end of this course the student will be able to:

- Understand the architecture of microprocessor/ microcontroller and their operation.
- Demonstrate programming skills in assembly language for processors and Controllers.
- Analyze various interfacing techniques and apply them for the design of processor/Controller based systems.
- Understand the Architecture of 8051 and its programming.
- To understand the programs efficiently on ARM Cortex processors and debug.

UNIT I:
INTRODUCTION: Basic Microprocessor architecture, Harvard and Von Neumann architectures with examples, Microprocessor Unit versus Microcontroller Unit, CISC and RISC architectures.
8086 ARCHITECTURE: Main features, pin diagram/description, 8086 microprocessor family, internal architecture, bus interfacing unit, execution unit, interrupts and interrupt response, 8086 system timing, minimum mode and maximum mode configuration.
8086 PROGRAMMING: Program development steps, instructions, addressing modes, assembler directives, writing simple programs with an assembler, assembly language program development tools.

UNIT II:
8086 Interfacing: Semiconductor memories interfacing (RAM, ROM), Intel 8255 programmable peripheral interface, interfacing switches and LEDS, interfacing seven segment displays, software and hardware interrupt applications, Intel 8251 USART architecture and interfacing, Intel 8237a DMA controller, stepper motor, A/D and D/A converters, Need for 8259 programmable interrupt controllers.

UNIT III:
INTEL 8051 MICROCONTROLLER
Architecture, Hardware concepts, Input/output ports and circuits, external memory, counters/timers, serial data input/output, interrupts. Assembly language programming: Instructions, addressing modes, simple programs. Interfacing to 8051: A/D and D/A Convertors, Stepper motor interface, keyboard, LCD Interfacing, Traffic light control.

UNIT IV:
ARM ARCHITECTURES AND PROCESSORS: ARM Architecture, ARM Processors Families, ARM Cortex-M Series Family, ARM Cortex-M3 Processor Functional Description, functions and interfaces. Programmers Model – Modes of operation and execution, Instruction set summary, System address map, write buffer, bit-banding, processor core register summary, exceptions. ARM Cortext-M3 programming – Software delay, Programming techniques, Loops, Stack and Stack pointer, subroutines and parameter passing, parallel I/O, Nested Vectored Interrupt Controller – functional description and NVIC programmers' model.

TEXT BOOKS:

1. N. Sentil Kumar, M. Saravanan, S. Jeevananthan, "Microprocessors and Microcontrollers", Oxford University Press, 2010.
2. Microprocessors and Interfacing – Programming and Hardware by Douglas V Hall, SSSP Rao, Tata McGraw Hill Education Private Limited, 3rdEdition,1994.
3. A.K.Ray, K.M.Bhurchandi ,"Advanced Microprocessors and Peripherals", Tata McGraw Hill Publications, 2000.

REFERENCES BOOKS:

1. Ajay V Deshmukh," Microcontrollers", TATA McGraw Hill publications, 2012.
2. The 8051 Microcontrollers and Embedded Systems Using Assembly and C, Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. McKinlay; Pearson 2-Edition, 2011.
3. Krishna Kant, "Microprocessors and Microcontrollers", PHI Publications, 2010.

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III Year-II Semester		Professional Core Courses	L	T	P	C
Internal:25	**External:75**	**PCC-EC602 Microwave Engineering.**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:

The main objectives of this course are

- To study the Performance of Microwave components and Microwave Tubes.
- Understand Design microwave components such as hybrid junctions, ferrite devices, and phase shifters.
- Use appropriate resources to solve the problems related to microwave communication systems.
- To understand the various antennas.

COURSE OUTCOMES:

At the end of this course the student will be able to:

- To understand different modes in transmission lines.
- Understand and Calculate S-matrix for various waveguide components and splitting the microwave energy in a desired direction.
- Measure various microwave parameters using a Microwave test bench.

UNIT I

MICROWAVE COMPONENTS:

Introduction to Microwaves and their applications, Coaxial Line Components, Wave-guide Components, Directional Couplers, Hybrid Tee Junction, Magic Tee, Attenuators, Ferrite Devices, Isolators, Circulators, Cavity Resonators, Re-entrant Cavities, Wave-meters, Microwave Filters, Detectors, Mixers

UNIT II.

MICROWAVE SIGNAL GENERATORS AND AMPLIFIERS:

Vacuum Tube Triodes, Resonant Cavity Devices, Reflex Klystron, two – Cavity Klystron, Multi – Cavity Klystron, Slow – Wave Devices, TWT, Crossed Field Devices, Magnetrons, Semiconductor Devices, Microwave BJTs, FETs, Tunnel Diodes, Gunn Diode, IMPATT, TRAPATT Diodes.

UNIT III

MICROWAVE CIRCUITS: Scattering Matrix and its Properties, Scattering Matrix of directional coupler, circulator, E Plane Tee, H plane Tee and Magic Tee.

MICROWAVE INTEGRATED CIRCUITS:

Materials, Substrate, Conductor, Dielectric and Resistive Materials, MMIC Growth, Fabrication Techniques, MOSFET Fabrication, NMOS Growth and CMOS Development, Thin Film Formation.

UNIT IV

MICROWAVE MEASUREMENTS:

Guide Wavelength, Coupling and Directivity measurements. Description of Microwave Bench – Different Blocks and their features, Precautions; Microwave Power Measurement – Bolometer Method, Measurement of Attenuation, Frequency, VSWR, and Impedance Measurement.

TEXT BOOKS:

1. M. Kulkarni, “Microwave and Radar Engineering”, Umesh publications, 1998.
2. Microwave and Radar Engineering – G Sasibhushana Rao Pearson
3. Microwave Communications – Components and Circuits, E. Hund, McGraw Hil
4. Microwave Devices and Circuits, S. Y. Liao, PHI.

REFERENCES BOOKS:

1. Annapurna Das and Sisir K. Das, “Microwave Engineering” Tata Mc Graw-Hill, 2000.
2. Foundations for Microwave Engineering, R. R. Collin, McGraw Hill.
3. Microwave Engineering, R. Chatarjee, East – West Press Pvt. Ltd.

III Year-II Semester		Professional Core Courses	L	T	P	C
Internal:25	**External:75**	**PCC-EC603 Digital Signal Processing.**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:

The student will be able to

- To Analyze the discrete-time signals and systems in time and frequency domains.
- Able to Know the importance of FFT algorithm for computation of Discrete Fourier Transform.
- Understand the various implementations of digital filter structures.
- To Learn the FIR and IIR Filter design procedures.
- To Learn the concepts of DSP Processors

COURSE OUTCOMES:

At the end of this course the student will be able to:

- Analyze and process signals in the time-domain and transform domain.
- Use the FFT algorithm for solving the DFT of a given signal.
- Design a Digital filter (FIR&IIR) from the given specifications and Realize the FIR and IIR structures from the designed digital filter.
- Realize the FIR and IIR structures from the designed digital filter.
- Understand the signal processing concepts on DSP Processor.

UNIT I:

INTRODUCTION: Introduction to Digital Signal Processing: Discrete-time signals & sequences, Classification of discrete-time systems, stability and causality of LTI systems, Response of LTI systems to arbitrary inputs. Solution of linear constant coefficient difference equations. Discrete-time Fourier Transform (DTFT), Frequency domain representation of discrete-time signals and systems. Review of Z-transforms, solution of difference equations using Z-transforms, System function.

UNIT II:

DISCRETE FOURIER SERIES & FOURIER TRANSFORMS: Properties of discrete Fourier series, DFS representation of periodic sequences, Discrete Fourier transforms: Properties of DFT, linear filtering methods based on DFT, Fast Fourier transforms (FFT)-Radix-2 decimation-in-time and decimation-in-frequency FFT Algorithms, Inverse FFT, Circular convolution and linear convolution using DFT.

UNIT III:

DESIGNOF IIR DIGITAL FILTERS& REALIZATIONS: Analog filter approximations – Butterworth and Chebyshev, Design of IIR Digital filters from analog filters, Design Examples, Analog and Digital frequency transformations. Basic structures of IIR systems, Transposed forms.

DESIGN OF FIR DIGITAL FILTERS & REALIZATIONS: Characteristics of FIR Digital Filters, Frequency response. Design of FIR Digital Filters using Window technique and Frequency Sampling technique, Comparison of IIR & FIR filters. Basic structures of FIR systems.

UNIT IV:

INTRODUCTION TO DSP PROCESSORS: Introduction to programmable DSPs: Multiplier and Multiplier Accumulator, Modified bus structures and memory access schemes in P-DSPs, Multiple Access Memory, Multi ported memory, VLIW architecture, Pipelining, Special addressing modes, On-Chip Peripherals. Architecture of TMS320C5X: Introduction, Bus Structure, Central Arithmetic Logic Unit, Auxiliary Register ALU, Index Register, Block Move Address Register, Parallel Logic Unit, Memory mapped registers, program controller, some flags in the status registers, On- chip memory, On-chip peripherals.

TEXT BOOKS:

1. Digital Signal Processing, Principles, Algorithms and Applications: John G. Proakis, Dimitris G. Manolakis, Pearson Education/PHI,2007.
2. Discrete Time Signal Processing, A. V. Oppenheim and R. W. Schaffer, PHI,2010.
3. Digital Signal Processors, Architecture, Programming andApplications, B.Venkataramani, M. Bhaskar, TMH,2002.

REFERENCE BOOKS:

1. Digital Signal Processing: Andreas Antoniou, TATA McGraw Hill, 2006
2. Digital Signal Processing: MH Hayes, Schaum's Outlines, TATA Mc-Graw Hill, 2007.
3. Fundamentals of Digital Signal Processing using Matlab – Robert J. Schilling, Sandra L. Harris,Thomson, 2007.
4. Digital Signal Processing – Alan V. Oppenheim, Ronald W. Schafer, PHI Ed., 2006.

III Year-II Semester		Professional Elective Course - II	L	T	P	C
Internal:25	External:75	PEC-EC604A Computer Networks Engineering.	3	0	0	3

COURSE OBJECTIVES:

The student will be able to

- To study the different types of layers and the computer network.
- To know the various media and interfacing networks.
- Understand the different routing techniques.
- Understand about Application Layer.

COURSE OUTCOMES:

At the end of this course the student will be able to:

- Understand about introduction of Computer Networks, Reference Models, Brief review of Physical Layer and Data Link Layer, Medium Access Control Sub Layer, Network Layer.
- Understand about Internetworking, IPv4, IPv6, IP Address, other Protocols.
- Understand about Transport Layer, UDP, TCP.
- Understand about Application Layer, DNS, Email, WWW, HTTP, FTP.

UNIT –I

INTRODUCTION: Uses of Computer Networks, Local Area Networks, Metropolitan Area Networks, Wide Area Networks, Protocol Hierarchies, Design |Issues for the layers, Connection –Oriented and Connection Less – Services, Service Primitives, The relationship to services to Protocols, OSI Reference Model, TCP/'IP reference Model, Comparison of OSI and TCP/IP Reference Model, OSI Model protocols,

UNIT II

PHYSICAL LAYER: Theoretical basis for Data Communication: Fourier Analysis, Bandwidth Limited Signals, the Maximum Data Rate of a Channel, Guided Transmission Media: Magnetic Media, Twisted Pair, Coaxial Cable, Fiber Optics

DATA LINK LAYER: Data Link Layer Design issues: Services Provided to the Network layer, Framing, Error Control, Flow Control, Error Correcting Codes, Error Detecting Codes, Elementary Data Link Protocols: An Un restricted Simplex Protocols, A Simplex stop and wait protocol Multiple Access Controls: ALOHA, Carrier Sense Multiple Access Protocols, Collision Free Protocols, Wavelength Division Multiple Access Protocols, Ethernet, Bluetooth

UNIT III

NETWORK LAYER: Network layer Design issues: Store and Forward Packet Switching, Services provided to the Transport |Layer, Implementation of Connection less and Connection Oriented Services, Routing Algorithms: the optimality Principle, Shortest Path Routing, Flooding, Distance Vector Routing, Link State Routing, Hierarchical Routing, Broadcast Routing, Multitask Routing, Routing to Ad-hoc Networks, Node looking in Peer to Peer Networks Internet Working.

TRANSPORT LAYER: The Transport service: Service provided to the Upper Layers, Transport Layer Primitives, Elements of Transport Protocols: Addressing, Connection Establishment and release, Flow Control and Buffering

UNIT IV

APPLICATION LAYER: Domain Name System: The DNS name Space, Resource records, Name Servers, E-Mail: Architecture and Services, the User Agent, Message Formats and Transfer, Final Delivery, World Wide Web: Architectural Overview, Static WEB Documents, Dynamic WEB Documents, HTTP, Performance Enhancements, The Wireless WEB

TEXT BOOKS:

1. Computer Networks, Andrews S. Tenenbaum, Edition 5, PHI, ISBN:81-203-1165-5 .
2. Data Communications and Networking, Behrouz A Forouzan, TMH, 2nd Edition, ISBN: 0-07-049935-7

REFERENCE BOOKS:

1. Computer Networks, mayank Dev, CENGAGE.
2. Computer Networks, A system Approach, 5th Edition, Larry L Perterson & Bruce S Davie, Elsevier.
3. An Engineering Approach to Computer Networks – S. Keshav, 2nd Edition, Pearson Education.
4. Understanding Communications & Networks, 3rdedition, W.A. Shay, Thomson.

III Year-II Semester		Professional Elective Course - II	L	T	P	C
Internal:25	External:75	PEC-EC604B Artificial Neural Networks And Fuzzy Logic.	3	0	0	3

COURSE OBJECTIVES:

The main objectives of this course are:

- To provide an introduction to the field of artificial neural networks and machine learning.
- To teach students how to solve practical problems via implementation of these techniques via simulation.
- To promote further independent learning on the topics of artificial neural networks and machine learning.
- To know different types fuzzy logic networks and its applications.

COURSE OUTCOMES:

At the end of this course the student will be able to:

- The concept of Artificial Neural Networks, Characteristics, Models of Neuron, Learning Rules, Learning Methods, Stability and Convergence.
- Understand the basics of Pattern Recognition and Feed Forward Neural Networks.
- Understand the basics of Feedback neural networks and Boltzmann machine.
- Understand and use of component learning networks.

UNIT I:

INTRODUCTION TO NEURAL NETWORKS: Introduction, Humans and Computers, Organization of the Brain, Biological Neuron, Biological and Artificial Neuron Models, Hodgkin-Huxley Neuron Model, Integrate-and-Fire Neuron Model, Spiking Neuron Model, Characteristics of ANN, McCulloch-Pitts Model, Historical Developments, Potential Applications of ANN.

UNIT II:

ESSENTIALS OF ARTIFICIAL NEURAL NETWORKS: Artificial Neuron Model, Operations of Artificial Neuron, Types of Neuron Activation Function, ANN Architectures, Classification Taxonomy of ANN – Connectivity, Neural Dynamics (Activation and Synaptic), Learning Strategy (Supervised, Unsupervised, Reinforcement), Learning Rules, Types of Application.

UNIT III:

FORWARD NEURAL SINGLE LAYER FEED NETWORKS: Introduction, Perception Models: Discrete, Continuous and Multi-Category, Training Algorithms: Discrete and Continuous Perception Networks, Perception Convergence theorem, Limitations of the Perception Model, Applications.

UNIT IV:

FUZZY LOGIC SYSTEM COMPONENTS: Fuzzification, Membership value assignment, development of rule base and decision making system, Defuzzification to crisp sets, Defuzzification methods. **Neural network applications:** Process identification, control, fault diagnosis and load forecasting. **Fuzzy logic applications:** Fuzzy logic control and Fuzzy classification.

TEXT BOOKS:

1. Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications by Rajasekharan and Rai – PHI Publication.
2. Introduction to Neural Networks using MATLAB 6.0 - S.N.Sivanandam, S.Sumathi, S.N.Deepa, TMH, 2006..

REFERENCE BOOKS:

1. Neural Networks – James A Freeman and Davis Skapura, Pearson Education, 2002.
2. Neural Networks – Simon Hakins, Pearson Education.
3. Neural Engineering by C.Eliasmith and CH.Anderson, PHI.

III Year-II Semester		Professional Elective Course - II	L	T	P	C
Internal:25	External:75	PEC-EC604C Bio-Medical Engineering.	3	0	0	3

COURSE OBJECTIVES:

The main objectives of this course are:

- To about man instrumentation system and its components.
- To Study about electrodes and transducers related to biomedical engineering
- To analyze the cardiovascular waveforms and respiratory parameters.
- To understand patient care monitoring system.
- To study diagnostics techniques in biomedical engineering.

COURSE OUTCOMES:

At the end of this course the student will be able to:

- To about the fizziology of human system and man instrumentation system and its components.
- To understand about electrode theory, cardiovascular and repertory measurements.
- To understand about elements of patient care monitoring system.
- To understand about diagnostics techniques in the field of biomedical engineering.

UNIT I:

INTRODUCTION TO BIOMEDICAL INSTRUMENTATION: Age of Biomedical Engineering, Development of Biomedical Instrumentation, Man Instrumentation System, Components of the Man-Instrument System, Physiological System of the Body, Problems Encountered in Measuring a Living System, Sources of Bioelectric Potentials, Muscle, Bioelectric Potentials, Sources of Bioelectric Potentials, Resting and Action Potentials, Propagation of Action Potential, Bioelectric Potentials-ECG, EEG and EMG, Envoked Responses.

UNIT II:

ELECTRODES AND TRANSDUCERS: Introduction, Electrode Theory, Bio-potential Electrodes, Examples of Electrodes, Basic Transducer Principles, Biochemical Transducers, The Transducer and Transduction Principles, Active Transducers, Passive Transducers, Transducers for Biomedical Applications, Pulse Sensors, Respiration Sensor, Transducers with Digital Output.

CARDIOVASCULAR SYSTEM AND MEASUREMENTS: The Heart and Cardiovascular System, Electro Cardiograph, Blood Pressure Measurement, Measurement of Blood Flow and Cardiac Output, Measurement of Heart Sound, Plethysmography.

UNIT III:

PATIENT CARE AND MONITORING: Elements of Intensive-Care Monitoring, Patient Monitoring Displays, Diagnosis, Calibration and Repair ability of Patient-Monitoring Equipment, Other Instrumentation for Monitoring Patients, Organization of the Hospital for Patient-Care Monitoring, Pacemakers, Defibrillators, Radio Frequency Applications of Therapeutic use.

THERAPEUTIC AND PROSTHETIC DEVICES: Audiometers and Hearing Aids, Myoelectric Arm, Laparoscope, Ophthalmology Instruments, Anatomy of Vision, Electrophysiological Tests, Ophthalmoscope, Tonometer for Eye Pressure Measurement, Diathermy, Clinical Laboratory Instruments, Biomaterials, Stimulators.

UNIT IV:

DIAGNOSTIC TECHNIQUES AND BIO-TELEMETRY: Principles of Ultrasonic Measurement, Ultrasonic Imaging, Ultrasonic Applications of Therapeutic Uses, Ultrasonic Diagnosis, X-Ray and Radio-Isotope Instrumentations, CAT Scan, Emission Computerized Tomography, MRI, Introduction to Biotelemetry, Physiological Parameters Adaptable to Biotelemetry, The Components of Biotelemetry System, Implantable Units, Telemetry for ECG Measurements during Exercise, Telemetry for Emergency Patient Monitoring. Monitors, Recorders and Shock Hazards**:** Bio-potential Amplifiers, Monitors, Recorders.

MONITORS, RECORDERS AND SHOCK HAZARDS: Bio potential Amplifiers, Monitors, Recorders, Shock Hazards and Prevention, Physiological Effects and Electrical Current, Shock Hazards from Electrical Equipment, Methods of Accident Prevention, Isolated Power Distribution System.

TEXT BOOKS:

1. "Bio-Medical Electronics and Instrumentation", Onkar N. Pandey, Rakesh Kumar, Katson Books.
2. "Bio-Medical Instrumentation", Cromewell , Wiebell, Pfeiffer.

REFERENCE BOOKS:

1. "Introduction to Bio-Medical Equipment Technology", 4th Edition, Joseph J. Carr, John M. Brown, Pearson Publications.
2. Hand Book of Bio-Medical Instrumentation – R.S. Khandpur, (TMH).
3. "Hand Book of Bio-Medical Instrumentation", Instrumentation", Kandahar. Mc GrawHill

III Year-II Semester		Open Elective Course - II	L	T	P	C
Internal:25	**External:75**	**OEC-EC605A Python Programming.**	**2**	**0**	**0**	**3**

COURSE OBJECTIVES:

The objectives of this course include:

- To learn about Introduction to Python, Syntax and Semantics, Control Flow Statements, Sequences and Dictionaries, Functions and lambda expressions.
- To learn about Iterations and Comprehensions, Classes.
- To learn about the Network and Web Programming.
- To learn about the GUI Programming and Database Connectivity.

COURSE OUTCOMES:

The students should be able to:

- Able to understand about the Introduction to Python, Syntax and Semantics, Control Flow Statements, Sequences and Dictionaries, Functions and lambda expressions.
- Able to understand about Iterations and Comprehensions, Classes and OOP, Exception Handling, Strings and Regular Expressions.
- Able to understand the Network and Web Programming.
- Able to understand about the GUI Programming and Database Connectivity.

UNIT I:

CORE PYTHON BASICS: Introduction to Python, Python Interpreter and its working, Syntax and Semantics, Data Types, Assignments and Expressions, Control Flow Statements, Sequences and Dictionaries, Functions and lambda expressions.

UNIT II:

CORE PYTHON ADVANCED FEATURES: Iterations and Comprehensions, Handling text files, Modules, Classes and OOP, Exception Handling, Strings and Regular Expressions.

UNIT III:

NETWORK AND WEB PROGRAMMING: Socket Programming: Handling Multiple Clients, Client side scripting, urlib, Server Side Scripting: CGI Scripts with User Interaction, Passing Parameters.

UNIT IV:

GUI PROGRAMMING AND DATABASE CONNECTIVITY: Introduction to tkinter, Top Level Windows, Dialogs, Message and Entry, Event Handling, Menus, List boxes and Scrollbars, Text, SQL Database interfaces with sqlite3: Basic operations and table load scripts.

TEXT BOOKS:

1. Mark Lutz," Learning Python", O Reily, 4thEdition,2009.
2. Mark Lutz," Programming Python ", O Reily, 4thEdition,2010

REFERENCES BOOKS:

1. Tim Hall and J-P Stacey," Python 3 for Absolute Beginners" ,2009.
2. Magnus Lie Hetland , "Beginning Python: From Novice to Professional", 2nd Edition,2009.

III Year-II Semester		Open Elective Course - II	L	T	P	C
Internal:25	**External:75**	**OEC-EC605B Object Oriented Programming Through Java.**	**2**	**0**	**0**	**3**

COURSE OBJECTIVES:

The main objectives of this course are:

- To understand the various data types and its operations and also to know the class techniques.
- To know the different types of Inheritance concepts.
- Understand the web applets and different threading concepts.
- Overall development of problem solving and critical analysis.
- To know Applet Programming, HTML, Graphics Programming, Managing Input/ Output files.

COURSE OUTCOMES:

At the end of this course the student will be able to:

- Understand about Fundamentals of Object Oriented Programming, Java Evolution, Overview of Java Language, Constants, Variables and Data Types.
- Understand about Operators and Expressions, Decision Making and Branching, Decision Making and Looping, Classes, Objects and Methods.
- Understand about Arrays, Strings and Vectors, Interfaces, Packages, Multi-Threaded Programming.
- Understand about Managing Errors and Exception, Applet Programming, HTML, Graphics Programming, Managing Input/Output files in Java.

UNIT I:

INTRODUCTION TO OOP: Introduction, Need of Object Oriented Programming, Principles of Object Oriented Languages, Procedural languages Vs OOP, Applications of OOP, History of JAVA, Java Virtual Machine, Java Features, Program structures, Installation of JDK1.6, Programming Constructs: Variables, Primitive Data types, Identifiers- Naming Conventions, Keywords, Literals, Operators-Binary, Unary and ternary, Expressions, Precedence rules and Associativity, Primitive Type Conversion and Casting, Flow of control-Branching, Conditional, loops. Classes and Objects- classes, Objects, Creating Objects, Methods, Constructors-Constructor overloading, cleaning up unused Objects-Garbage collector, Class variable and Methods-Static keyword, this keyword, Arrays, Command line arguments.

UNIT II:

INHERITANCE: Types of Inheritance, deriving classes using extends keyword, Method overloading, super keyword, final keyword, Abstract class. Interfaces, Packages and Enumeration: Interface-Extending interface, Interface Vs Abstract classes, Packages-Creating packages, using Packages, Access protection, java. lang package. Exceptions& Assertions – Introduction, Exception handling techniques- try… catch, throw, throws, finally block, user defined exception, Exception Encapsulation and Enrichment, Assertions.

UNIT III:

MULTITHREADING: java.lang.Thread, The main Thread, Creation of new threads, Thread priority, Multithreading-Using is Alive () and join (), Synchronization, suspending and Resuming threads, Communication between Threads Input /Output: reading and writing data, java.io package.

UNIT IV:

Applets– Applet class, Applet structure, An Example Applet Program, Applet: Life Cycle, paint (), update () and repaint () Event Handling -Introduction, Event Delegation Model, java.awt.event Description, Sources of Events, Event Listeners, Adapter classes, Inner classes.

TEXT BOOKS

1. The Complete Refernce Java, 8ed, Herbert Schildt, TMH.
2. JAVA for Beginners, 4e, Joyce Farrell, Ankit R. Bhavsar, Cengage Learning.
3. Object oriented programming with JAVA, Essentials and Applications, Raj Kumar Bhuyya, Selvi, Chu TMH.

REFERENCE BOOKS

1. Introduction to Java rogramming, 7th ed, Y Daniel Liang, Pearson.
2. JAVA Programming, K. Rajkumar. Pearson.
3. Core JAVA, Black Book, Nageswara Rao, Wiley, Dream Tech.
4. Core JAVA for Beginners, Rashmi Kanta Das, Vikas.
5. Object Oriented Programming through JAVA, P Radha Krishna, University Press.

III Year-II Semester		Open Elective Course - II	L	T	P	C
Internal:25	**External:75**	**OEC-EC605C Machine Learning.**	**2**	**0**	**0**	**3**

COURSE OBJECTIVES:

The objectives of this course include:

- To familiarize student's introduction with basic concepts.
- To learn about theories and advancements in ML and AI.
- Understanding the basics of text processing and various models.
- Able learn the graphical methods and learning interfaces.

COURSE OUTCOMES:

The student should be able to:

- Understand the concept of clustering methods.
- Understand the classifications and classify data points.
- To know the various processing methods.
- Understand how graphical models are used for supervised and unsupervised learning.

UNIT I:

INTRODUCTION: ML/AI - AI Foundation, history of AI, latest advancements and applications Machine Learning – I: Linear Regression - Learn to implement linear regression and predict continuous data values, Clustering - Learn how to create segments based on similarities using K-Means and Hierarchical clustering.

UNIT II:

MACHINE LEARNING – II: Naïve Bayes and Logistic regression - Understand how supervised learning is used for classification, Support vector machines - Learn to classify data points using support vectors, decision trees - Tree-based model that is simple and easy to use. Learn the fundamentals on how to implement them, Multilayer feed forward networks and the back propagation algorithm.

UNIT III:

NATURAL LANGUAGE PROCESSING: Basics of text processing, lexical processing - Learn to extract features from unstructured text and build machine learning models on text data, syntax and semantics - Conduct sentiment analysis, learn to parse English sentences and extract meaning from them.

UNIT IV:

GRAPHICAL MODELS: Introduction to Bayesian methods, Graphical models - Study probabilistic way of modelling systems - Markov properties, Factor Graphs and Bayesian belief networks, Learning and Inference - Learn how graphics models are used for supervised and unsupervised Learning.

TEXTBOOKS:

1. Machine Learning, by Tom M Mitchell, Indian Edition, McGraw Hill, first Edition2017.
2. Deep Learning by Goodfellow, Bengio, Courville. The MIT Press,2016.
3. Elaine Rich and Kevin Knight, “Artificial Intelligence”, Tata McGraw Hill,3rd Edition2008.

REFERENCE BOOKS:

1. Understanding Machine Learning: From Theory to Algorithms, by Shai Shalev-Shwartz and Shai Ben-David, 1st Edition, Cambridge UniversityPress,2014.
2. Artificial Intelligence - A Modern Approach by Stuart Russell & Peter Nerving, PrenticeHall,3rdEdition,2009.

III Year-II Semester		Professional Core courses Lab	L	T	P	C
Internal:50	**External:50**	**LC-EC606 Microprocessors and Microcontrollers Lab.**	**0**	**0**	**3**	**1.5**

LIST OF EXPERIMENTS:

PART- A: 8086 Assembly Language Programming using Assembler Directives (Minimum of 5 Experiments has to be performed)

1. Sorting.
2. Multi byte addition/subtraction.
3. Sum of squares/cubes of a given n-numbers.
4. Addition of n-BCD numbers.
5. Factorial of given n-numbers.
6. Multiplication and Division operations.
7. Stack operations.
8. BCD to Seven segment display codes.

PART- B: 8086 interfacing (Minimum of 3 Experiments has to be performed) Hardware/Software Interrupt Application

1. A/D Interface through Intel 8255.
2. D/A Interface through Intel 8255.
3. Keyboard and Display Interface through Intel 8279.
4. Generation of waveforms using Intel 8253/8254.

PART- C: 8051 Assembly Language Programs (Minimum of 3 Experiments has to be performed)

1. Finding number of 1's and number of 0's in a given 8-bit number.
2. Addition of even numbers from a given array.
3. Ascending / Descending order.
4. Average of n-numbers.

PART-D: 8051 Interfacing (Minimum of 3 Experiments has to be performed)

1. Switches and LEDs.
2. 7-Segment display (multiplexed).
3. Stepper Motor Interface.
4. Traffic Light Controller.

III Year-II Semester		Professional Core Courses Lab	L	T	P	C
Internal:50	**External:50**	**LC-EC607 Microwave Engineering Lab.**	**0**	**0**	**3**	**1.5**

Minimum Twelve Experiments to be conducted:
Part – A: Experiments Based on Microwave Engineering
(Any 7 Experiments)

1. Reflex Klystron Characteristics.
2. Gunn Diode Characteristics.
3. Attenuation Measurement.
4. Directional Coupler Characteristics.
5. Impedance and Frequency Measurement.
6. Scattering parameters of Circulator.
7. Scattering parameters of Magic Tee.
8. Radiation Pattern of Horn and Parabolic Antennas.
9. Synthesis of Microstip antennas (Rectangular Structure) Using HFSS.

Part – B: Experiments Based on Optical Communication (Any 5 Experiments)

1. Characterization of LED.
2. Characterization of Laser Diode.
3. Intensity modulation of Laser output through an optical fiber.
4. Measurement of Data rate for Digital Optical link.
5. Measurement of NA.
6. Measurement of losses for Analog Optical link.

III Year-II Semester		Professional Core Courses Lab	L	T	P	C
Internal:50	**External:50**	**LC-EC608 Digital Signal Processing Lab.**	**0**	**0**	**3**	**1.5**

LIST OF THE EXPERIMENTS: Any 10 Experiments Should Be Done

1. Generation of Discrete Time signals for discrete Signals Using MATLAB & CC Studio.
2. To verify Linear Convolution Using MATLAB & CC Studio.
3. To verify Circular Convolution Using MATLAB & CC Studio.
4. To find Addition of sinusoidal signals Using MATLAB & CC Studio.
5. To verify DFT and IDFT sinusoidal signals Using MATLAB & CC Studio.
6. Transfer Function Stability Analysis Using Pole-Zero Plot,bode-plot,Nyquist Plot, Z-Plane Plot
7. Frequency Response of IIR low pass Butterworth filter.
8. Frequency Response of IIR High pass Butterworth filter.
9. Frequency Response of IIR low pass Chebyshev filter.
10. Frequency Response of IIR High pass Chebyshev filter.
11. Frequency Response of FIR low pass using Rectangle Window.
12. Frequency Response of FIR low pass Using Triangle Window.

ADIKAVI NANNAYA UNIVERSITY: RAJAMAHENDRAVARAM
UNIVRSITY COLLEGE OF ENGINEERING
Dept of ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE STRUCTURE &SYLLABUS
IV B TECH I SEMESTER
(With effect from 2019-2020 Admitted Batch)
Under Choice Based Credit System(CBCS)

IV B. Tech I Semester ECE w.e.f 2019-20(VII Semester)

Course Code	Title of the Course	Hours/weeks			Max Marks		Total Marks	Credits
		L	T	P	Internal	External		
PEC-EC701	**Professional Elective Course-III** A. Radar Engineering. B. Satellite Engineering. C. Analog IC Design.	3	0	0	25	75	100	3
PEC-EC702	**Professional Elective Course -IV** A. Electronic Measurements and Instrumentations B. Fibre optics and wireless optical Communications. C. Information Theory and Coding	3	0	0	25	75	100	3
PEC-EC703	**Professional Elective Course -V** A. Mobile Cellular Communications. B. Wireless Communication. C. ASIC Design .	3	0	0	25	75	100	3
OEC-EC704	**Open Elective Course - III** A. Digital Image Processing. B. Software Defined Radio. C. Television Engineering.	2	0	2	25	75	100	3
OEC-EC705	**Open Elective Course - IV** A. Embedded System. B. Global Positioning Systems. C. Smart Antenna Systems .	2	0	2	25	75	100	3
HSMC-EC706	Management Science	3	0	0	25	75	100	3
SDC-EC707	Skill Development Course	1	0	2	50	50	100	2
Summer Internship 2 Months (Mandatory) after Second year (to be evaluated during V Semester		0	0	0	100	--	100	1.5
TOTAL CREDITS		17	0	06	300	500	800	21.5

Note: 2 lab Hrs./Week and 1 Theory Hrs./Week for SKILL DEVELOPMENT COURSE or 2 Theory Hrs./ Week.

IV Year-I Semester		Professional Elective Course-III	L	T	P	C
Internal:25	**External:75**	**PEC-EC701A Radar Engineering.**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:

The objectives of this course include:

- The knowledge of different Antennas systems and communication equipment required for the operation of RADAR.
- Different parameters of Transmitter and Receiver of RADAR
- The concept of Doppler Effect to measure parameters of RADAR.
- Different types of RADARS and applications based on the type of Transmitters, Receivers, and their functions.

COURSE OUTCOMES:

At the end of this course the student will be able to

- Acquire the knowledge to apply and to design required parameters for a RADAR system.
- Apply the techniques learned to choose suitable RADAR from the available for the required application.
- Acquire the knowledge to identify the Noise and parameters required to reduce the Noise.

UNIT I:

BASICS OF RADAR: Introduction, Maximum Unambiguous Range, simple Radar Range Equation, Radar Block Diagram and Operation, Radar Frequencies and Applications. Prediction of Range Performance, Minimum Detectable Signal, Receiver Noise, Illustrative Problems.

RADAR EQUATION: Modified Radar Range Equation, SNR, probability of detection, probability of False Alarm, Integration of Radar Pulses, Radar Cross Section of Targets (simple targets - sphere, cone-sphere), Creeping Wave, Transmitter Power, PRF and Range Ambiguities, System Losses (qualitative treatment) Illustrative Problems.

UNIT II:

CW AND FREQUENCY MODULATED RADAR: Doppler Effect, CW Radar – Block Diagram, Isolation between Transmitter and Receiver, Non-zero IF Receiver, Receiver Bandwidth Requirements, Applications of CW radar. Illustrative Problems.

FM-CW Radar: Range and Doppler Measurement, Block Diagram and Characteristics, FM-CW altimeter.

UNIT III:

MTI and Pulse Doppler Radar: Introduction, Principle, MTI Radar with - Power Amplifier Transmitter and Power Oscillator Transmitter, Delay Line Cancellers – Filter Characteristics, Blind Speeds, Double Cancellation, Nth Cancellation Staggered PRFs. MTI Radar Parameters, Limitations to MTI Performance.

TRACKING RADAR: Tracking with Radar, Sequential Lobing, Conical Scan, Mono pulse Tracking Radar – Amplitude Comparison Mono pulse (one- and two- coordinates), Phase Comparison Mono pulse, Tracking in Range, Acquisition and Scanning Patterns, Comparison of Trackers.

UNIT IV:

DETECTION OF RADAR SIGNALS IN NOISE: Matched Filter Receiver – Response Characteristics and Derivation, Correlation detection and Cross Correlation Receiver, Efficiency of Non-Matched Filters, Matched Filter with Non-white Noise, Noise Figure and Noise Temperature.

RADAR RECEIVERS: Displays – types. Duplexers – Branch type and Balanced type, Circulators as Duplexers. Introduction to Phased Array Antennas – Basic Concepts, Advantages and Limitations. Radomes.

TEXT BOOKS:

1. Introduction to Radar Systems – Merrill I. Skolnik, TMH Special Indian Edition, 2nd Ed., 2007.
2. Microwave and Radar engineering, Gottapu Sasi Bhushan Rao, Pearson.

REFERENCE BOOKS:

1. Introduction to Radar Systems, 3rd edition – M.I. Skolnik, TMH Ed., 2005.
2. Radar: Principles, Technology, Applications – Byron Edde, Pearson Education, 2004.
3. Radar Principles – Peebles, Jr., P.Z., Wiley, New York, 1998.
4. Principles of Modern Radar: Basic Principles – Mark A. Richards, James A. Scheer, William A. Holm, Yesdee.

IV Year-I Semester		Professional Elective Course-III	L	T	P	C
Internal:25	**External:75**	**PEC-EC701B Satellite Engineering.**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:
The student will be introduced to:

- Understand the basic concepts, applications, frequencies used and types of satellite Engineering.
- Understand the various satellite subsystems and its functionality
- Understand the concepts of satellite link design and calculation of C/N ratio.
- Understand the concepts of satellite navigation, architecture and applications of GPS.

COURSE OUTCOMES:
At the end of this course the student will be able to

- Students will understand the historical background, basic concepts and frequency allocations for satellite communication
- Students will demonstrate orbital mechanics, launch vehicles and launchers
- Students will demonstrate the design of satellite links for specified C/N with system design examples.

UNIT I:
INTRODUCTION: Origin of Satellite Engineering, Historical Back-ground, Basic Concepts of Satellite Communications, Frequency allocations for Satellite Services, Applications, Future Trends of Satellite Communications.
ORBITAL MECHANICS AND LAUNCHERS: Orbital Mechanics, Look Angle determination, Orbital perturbations, Orbit determination, launches and launch vehicles, Orbital effects in communication Systems performance.

UNIT II:
SATELLITE SUBSYSTEMS: Attitude and orbit control system, telemetry, tracking, Command and monitoring, power systems, communication subsystems, Satellite antenna Equipment reliability and Space qualification.
SATELLITE LINK DESIGN: Basic transmission theory, system noise temperature and G/T ratio, Design of down links, up link design, Design of satellite links for specified C/N, System design example.

UNIT III:
MULTIPLE ACCESS: Frequency division multiple access (FDMA) Intermodulation, Calculation of C/N. Time division Multiple Access (TDMA) Frame structure, Examples. Satellite Switched TDMA Onboard processing, DAMA, Code Division Multiple access (CDMA), Spread spectrum transmission and reception.
EARTH STATION TECHNOLOGY: Introduction, Transmitters, Receivers, Antennas, Tracking Systems, Terrestrial interface, Primary power test methods.

UNIT IV:
LOW EARTH ORBIT AND GEO-STATIONARY SATELLITE SYSTEMS: Orbit consideration, Coverage and frequency considerations, Delay & Throughput considerations, System considerations, Operational NGSO constellation Designs
SATELLITE NAVIGATION & THE GLOBAL POSITIONING SYSTEM: Radio and Satellite Navigation, GPS Position Location principles, GPS Receivers and codes, Satellite signal acquisition, GPS Navigation Message, GPS signal levels, GPS receiver operation, GPS C/A code accuracy, Differential GPS.

TEXT BOOKS:

1. Satellite Communications – Timothy Pratt, Charles Bostian and Jeremy Allnutt, WSE, WileyPublications, 2nd Edition, 2003.
2. Satellite Communications Engineering – Wilbur L. Pritchard, Robert A Nelson and HenriG.Suyderhoud, 2nd Edition, Pearson Publications, 2003

REFERENCES BOOKS:

1. Satellite Communications: Design Principles – M. Richharia, BS Publications, 2nd Edition, 2003
2. Fundamentals of Satellite Communications – K.N. Raja Rao, PHI, 2004
3. Satellite Communication - D.C Agarwal, Khanna Publications, 5th Ed.

IV Year-I Semester		Professional Elective Course-III	L	T	P	C
Internal:25	External:75	PEC-EC701C Analog IC Design.	3	0	0	3

COURSE OBJECTIVES:

The student will be able to:

- Understand the behavior of MOS Devices and Small-Signal & Large-Signal Modeling of MOS Transistor and Analog Sub-Circuits.
- Learn and understand CMOS Amplifiers like Differential Amplifiers, Cascode Amplifiers, Output Amplifiers, and Operational Amplifiers.
- Design and Develop the Analog CMOS Circuits for different Analog operations.
- Learn and understand the concepts of Open-Loop Comparators and Different Types of Oscillators like Ring Oscillator, LC Oscillator etc.

COURSE OUTCOMES:

At the end of this course the student will be able to

- Model and simulate different MOS Devices using small signal Model.
- Design and analyze any Analog Circuits in real time applications.
- Apply the concepts Analog Circuit Design to develop various Applications in Real Time.
- Analyze and compare different Open-Loop Comparators and Oscillators.

UNIT -I:

MOS Devices and Modelling: The MOS Transistor, Passive Components- Capacitor & Resistor, Integrated circuit Layout, CMOS Device Modelling - Simple MOS Large-Signal Model, Other Model Parameters, Small-Signal Model for the MOS Transistor, Computer Simulation Models, Sub-threshold MOS Model.

UNIT -II:

Analog CMOS Sub-Circuits: MOS Switch, MOS Diode, MOS Active Resistor, Current Sinks and Sources, Current Mirrors-Current mirror with Beta Helper, Degeneration, Cascode current Mirror and Wilson Current Mirror, Current and Voltage References, Band gap Reference.

UNIT -III:

CMOS Amplifiers: Inverters, Differential Amplifiers, Cascode Amplifiers, Current Amplifiers, Output Amplifiers, High Gain Amplifiers Architectures.

CMOS Operational Amplifiers: Design of CMOS Op Amps, Compensation of Op Amps, Design of Two-Stage Op Amps, Power- Supply Rejection Ratio of Two-Stage Op Amps, Cascode Op Amps, Measurement Techniques of OP Amp.

UNIT -IV:

Comparators: Characterization of Comparator, Two-Stage, Open-Loop Comparators, Other Open-Loop Comparators, Improving the Performance of Open-Loop Comparators, Discrete- Time Comparators.

Oscillators & Phase-Locked Loops: General Considerations, Ring Oscillators, LC Oscillators, Voltage Controlled Oscillators.

Simple PLL, Charge Pump PLLs, Non-Ideal Effects in PLLs, Delay Locked Loops, Applications.

TEXT BOOKS:

1. Design of Analog CMOS Integrated Circuits- Behzad Razavi, TMH Edition, Second Edition.
2. CMOS Analog Circuit Design - Philip E. Allen and Douglas R. Holberg, Oxford University Press, International Second Edition/Indian Edition,2010.

REFERENCES BOOKS:

1. Analysis and Design of Analog Integrated Circuits- Paul R. Gray, Paul J. Hurst, S. Lewis and R. G. Meyer, Wiley India, Fifth Edition,2010.
2. Analog Integrated Circuit Design- David A. Johns, Ken Martin, Wiley Student Edn, 2013.

IV Year-I Semester		Professional Elective Course -IV	L	T	P	C
Internal:25	**External:75**	**PEC-EC702A Electronic Measurements and Instrumentations.**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:

The student will able to:

- Learn and understand functioning of various measuring system and metrics for performance analysis.
- Acquire knowledge of principle of operation, working of different electronic
- Instruments viz. signal generators, signal analyzers, recorders and measuring equipment.

COURSE OUTCOMES:

At the end of this course the student will be able to

- Identify the various electronic instruments based on their specifications for carrying out a particular task of measurement.
- Measure various physical parameters by appropriately selecting the transducers.
- Use various types of signal generators, signal analyzers for generating and analyzing various real-time signals.

UNIT I

Performance characteristics of instruments, Static characteristics; Accuracy, Resolution, Precision, Expected value, Error, Sensitivity. Dynamic Characteristics; speed of response, Fidelity, Lag and Dynamic error. Types of errors in measurements and their analysis. Design of multi-range AC, DC meters (voltmeter &ammeter) and ohmmeter (series &shunt type) using D'arsonval movement. True rms meter.

UNIT II

Specifications and designing aspects of Signal Generators – AF sine and square wave signal generators, Function Generators, Random noise generators, Arbitrary waveform generators. Wave Analyzers, Harmonic Distortion Analyzers, Spectrum Analyzers, Digital Fourier Analyzers.

Oscilloscopes- general purpose CROs; block diagram, functions and implementation of various blocks, specifications, various controls and their functions, types of probes used in CROs. Measurement of frequency and phase difference using Lissajous patterns. Special purpose CROs; sampling oscilloscope, analog storage oscilloscope, digital storage oscilloscope.

UNIT III

Bridge circuits- Wheat stone bridge, measurement of very low resistance, Measurement of inductance- Maxwell's bridge, Anderson bridge. Measurement of capacitance- Shearing Bridge. Wien Bridge, Errors and precautions in using bridges**. Q-meter:** principle of operation, measurement methods and sources of errors**.**

UNIT IV

Counters: Principle of operation -modes of operation- totalizing mode, frequency mode and time period mode- sources of errors.

Transducers- active & passive transducers: Resistance, Capacitance, inductance; Strain gauges, LVDT, Piezo Electric transducers. Measurement of physical parameters temperature, force, pressure, velocity, acceleration and displacement.

TEXTBOOKS:

1. Electronic instrumentation, second edition - H.S. Kalsi, Tata McGrawHill,2004.
2. Modern Electronic Instrumentation and Measurement Techniques – A.D. Helfrickand W.D. Cooper, PHI, 5th Edition, 2002.

REFERENCES BOOKS:

1. Electronic Instrumentation & Measurements - David A. Bell, PHI, 3rd Edition,2013.
2. Electrical and Electronic Measurement and Instrumentation A.K. Sawhney. Dhanpat Rai & Co, 12thEdition,2002.

IV Year-I Semester		Professional Elective Course -IV	L	T	P	C
Internal:25	**External:75**	**PEC-EC702B Fibre Optics & Wireless Optical Communications.**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:

The student will able to

- The functionality of each of the components that comprise a fiber-optic communication system
- The properties of optical fiber that affect the performance of a communication link and types of fiber materials with their properties and the losses occur in fibers.
- The principles of single and multi-mode optical fibers and their characteristics

COURSE OUTCOMES:

At the end of this course the student will be able to

- Understand and analyze the constructional parameters of optical fibres.
- Be able to design an optical system.
- Estimate the losses due to attenuation, absorption, scattering and bending.
- Compare various optical detectors and choose suitable one for different applications.

UNIT I:

OVERVIEW OF OPTICAL FIBER COMMUNICATION: Historical development, The general system, advantages of optical fiber communications. Optical fiber wave guides- Introduction, Ray theory transmission, Total Internal Reflection, Acceptance angle, Numerical Aperture, Skew rays, Cylindrical fibers- Modes, V number, Mode coupling, Step Index fibers, Graded Index fibers, Single mode fibers- Cut off wavelength, Mode Field Diameter, Effective Refractive Index, Related problems.

UNIT II:

FIBER MATERIALS: Glass, Halide, Active glass, Chalgenide glass, Plastic optical fibers. Signal distortion in optical fibers-Attenuation, Absorption, Scattering and Bending losses, Core and Cladding losses, Information capacity determination, Group delay, Types of Dispersion: - Material dispersion, Wave-guide Dispersion, Polarization-Mode dispersion, Intermodal dispersion, Pulse broadening in Graded index fiber, Related problems.

UNIT III:

OPTICAL FIBER CONNECTORS-Connector types, Single mode fiber connectors, Connector return loss, Fiber Splicing- Splicing techniques, Splicing single mode fibers, Fiber alignment and joint loss- Multimode fiber joints, single mode fiber joints.

OPTICAL SOURCES- LEDs, Structures, Materials, Quantum efficiency, Power, Modulation, Power bandwidth product. Injection Laser Diodes- Modes, Threshold conditions, External quantum efficiency, Laser diode rate equations, Resonant frequencies, Reliability of LED&ILD, Optical detectors- Physical principles of PIN and APD, Detector response time, Temperature effect on Avalanche gain, Comparison of Photo detectors, Related problems.

UNIT IV:

SOURCE TO FIBER POWER LAUNCHING - Output patterns, Power coupling, Power launching, Equilibrium Numerical Aperture, Laser diode to fiber coupling, Optical receiver operation- Fundamental receiver operation, Digital signal transmission, error sources, Receiver configuration, Digital receiver performance, Probability of Error, Quantum limit, Analog receivers.

OPTICAL SYSTEM DESIGN - Point-to- point links- Component choice and considerations, Link power budget, Rise time budget with Examples, Line coding in Optical links, WDM, Necessity, Principles, Measurement of Attenuation and Dispersion, Eye pattern.

TEXT BOOKS:

1. Optical Fiber Communications – Gerd Keiser, Mc Graw-Hill International edition, 3rd Edition, 2000.
2. Optical Fiber Communications – John M. Senior, PHI, 2nd Edition, 2002.

RERFERENCE BOOKS:

1. Fiber Optic Communications – D.K. Mynbaev, S.C. Gupta and Lowell L. Scheiner, Pearson Education, 2005.
2. Text Book on Optical Fibre Communication and its Applications – S.C.Gupta, PHI, 2005.
3. Fiber Optic Communication Systems – Govind P. Agarwal, John Wiley, 3rd Ediition, 2004.
4. Fiber Optic Communications – Joseph C. Palais, 4th Edition, Pearson Education, 2004.

IV Year-I Semester		Professional Elective Course -IV	L	T	P	C
Internal:25	**External:75**	**PEC-EC702C Information Theory and Coding**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:

The student will able to

- Understand the concept of Entropy and source coding.
- Understand the concept of channel and its capacity.
- Encoding and Decoding of Digital Data Streams.
- Be Aware of Compression and Decompression Techniques.
- Learn the Concepts of Multimedia Communication.

COURSE OUTCOMES:

At the end of this course the student will be able to

- Design an Application with Error-Control coding
- Use Compression and Decompression Techniques
- Perform source coding and channel coding

UNIT I

INFORMATION THEORY AND SOURCE CODING: Uncertainty, information, entropy and its properties, entropy of binary memory less source and its extension to discrete memory less source, source coding theorem, data compression, prefix coding, Huffman coding, Lempel-Ziv coding, Source with memory and its entropy.

UNIT II

DISCRETE CHANNELS: Binary Symmetric Channel, mutual information & its properties, Channel capacity, channel coding theorem and its application to BSC, Shannon's theorem on channel capacity, capacity of a channel of infinite bandwidth, bandwidth - S/N trade off, practical communication systems in light of Shannon's theorem, Fading channel, channels with memory.

UNIT III

GROUPS, FIELDS AND LINEAR BLOCK CODES: Galois field and its construction in GF(2m) and its basic properties, vector spaces and matrices in GF (2), Linear block codes, systematic codes and its encoding circuit, syndrome and error detection, minimum distance, error detecting and correcting capabilities of block code, decoding circuit, probability of undetected error for linear block code in BSC, Hamming code and their applications.

UNIT IV

CYCLIC CODES AND BCH CODES: Basic properties of Cyclic codes, Generator and parity check matrix of cyclic codes, encoding and decoding circuits, syndrome computation and error detection, cyclic Hamming codes, encoding and decoding of BCH codes, error location and correction.

CONVOLUTION ALCODES: Introduction to convolution code, its construction and Viterbi algorithm for maximum likelihood decoding. Automatic repeat request strategies and their throughput efficiency considerations.

TEXT BOOKS:

1. Sklar, Digital Communication, Pearson Education Asia, 2nd Edition,2001.
2. Shu Lin and Costello, Error Control Coding: Fundamentals and Applications, 2ndEdition, Pearson,2004.

REFERENCE BOOKS:

1. Haykin Simon, Digital Communication, Wiley Publications,2013.
2. Information theory and coding, Muralidhar Kulkarni, KS AShiva prakash,2015.
3. JS Chithode, Information theory and coding, Technical publishers, 1st Edition,2014.

IV Year-I Semester		Professional Elective Course -V	L	T	P	C
Internal:25	**External:75**	**PEC-EC703A Mobile Cellular Communications.**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:

The student will be introduced to:

- Understand the basic cellular concepts like frequency reuse, cell splitting, cell sectoring etc., and various cellular systems.
- Understand the concepts of handoff and types of handoffs. Understand the architectures of GSM and 3G cellular systems.

COURSE OUTCOMES:

At the end of this course the student will be able to

- The student will be able to analyze and design wireless and mobile cellular systems.
- The student will be able to understand impairments due to multipath fading channel.
- The student will be able understand the fundamental techniques to overcome the different fading effects.

UNIT I:

CELLULAR MOBILE RADIO SYSTEMS: Introduction to Cellular Mobile System, uniqueness of mobile radio environment, operation of cellular systems, consideration of the components of Cellular system, Hexagonal shaped cells, Analog and Digital Cellular systems.

CELLULAR CONCEPTS: Evolution of Cellular systems, Concept of frequency reuse, frequency reuse ratio, Number of channels in a cellular system, Cellular traffic: trunking and blocking, Grade of Service; Cellular structures: macro, micro, pico and femto cells; Cell splitting, Cell sectoring.

UNIT II:

INTERFERENCE: Types of interferences, Introduction to Co-Channel Interference, real time Co-Channel interference, Co-Channel measurement, Co-channel Interference Reduction Factor, desired C/I from a normal case in a omni directional Antenna system, design of Antenna system, antenna parameters and their effects, diversity receiver, non-co channel interference-different types.

FREQUENCY MANAGEMENT AND CHANNEL ASSIGNMENT: Numbering and grouping, setup access and paging channels, channel assignments to cell sites and mobile units: fixed channel and non-fixed channel assignment, channel sharing and borrowing, overlaid cells.

UNIT III:

CELL COVERAGE FOR SIGNAL AND TRAFFIC: Signal reflections in flat and hilly terrain, effect of human made structures, phase difference between direct and reflected paths, straight line path loss slope, general formula for mobile propagation over water and flat open area, near and long distance propagation, antenna height gain, form of a point to point model.

CELL SITE AND MOBILE ANTENNAS: Sum and difference patterns and their synthesis, omni directional antennas, directional antennas for interference reduction, space diversity antennas, umbrella pattern antennas, minimum separation of cell site antennas, high gain antennas.

UNIT IV:

HANDOFF STRATEGIES

Concept of Handoff, types of handoff, handoff initiation, delaying handoff, forced handoff, mobile assigned handoff, intersystem handoff, vehicle locating methods, dropped call rates and their evaluation.

DIGITAL CELLULAR NETWORKS: GSM architecture, GSM channels, multiple access schemes; TDMA, CDMA, OFDMA; architecture of 3G cellular systems.

TEXT BOOKS:

1. Mobile Cellular Telecommunications – W.C.Y. Lee, Tata McGraw Hill, 2rd Edn., 2006.
2. Principles of Mobile Communications – Gordon L. Stuber, Springer International 2nd Edition,2007

REFERENCES BOOKS:

1. Wireless Communications – Theodore. S. Rapport, Pearson education, 2nd Edn., 2002.
2. Wireless and Mobile Communications – Lee McGraw Hills, 3rd Edition, 2006

IV Year-I Semester		Professional Elective Course -V	L	T	P	C
Internal:25	**External:75**	**PEC-EC703B Wireless Communications.**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:

The student will be introduced to:

- The Aim of this course is to introduce the fundamental technologies for wireless Communication and networking
- Introducing the concepts of Multiple Access Schemes
- Introducing the comprehensive exposure to the fast-evolving high-tech fields of Wireless communications
- It introduces the latest technologies such as CDMA, OFDM, and MIMO, which form the bedrock of 3G/4G wireless networks

COURSE OUTCOMES:

After going through this course, the student will be able to

- Know about the Wireless systems and Standards (1G/2G/3Gsystems).
- Concept and analysis of CDMA-based wireless networks.
- Understand the concepts of Multiple-Input Multiple-Output(MIMO).
- Understand the modern wireless systems using OFDM.
- Analysis of Satellite-Based Wireless systems.

UNIT I

Introduction to 3G/4G Wireless Communications: Introduction, 2G Wireless Standards, 3GWireless Standards, 4G Wireless Standards, Overview of Cellular Service Progression Principles of Wireless Communications: The Wireless Communication Environment, Modeling of Wireless Systems, System Model for Narrowband Signals, Rayleigh Fading Wireless Channel, BER Performance of Wireless Systems: SNR in a Wireless System, BER in Wireless Communication System, Rayleigh BER at High SNR. Intuition for BER in a Fading Channel. Channel Estimation in Wireless Systems, Diversity in Wireless Communication.

UNIT II

Code Division for Multiple Access (CDMA): Introduction to CDMA, Basic CDMA Mechanism, Fundamentals of CDMA Codes, Spreading Codes based on Pseudo-Noise (PN)Sequences, Correlation Properties of Random CDMA Spreading Sequences, Multi-User CDMA, Advantages of CDMA. Multiple-Input Multiple-Output Wireless Communications: Introduction to MIMO Wireless Communications, MIMO System Model, MIMO Zero-forcing (ZF) Receiver, MIMOMMSE Receiver, Singular Value Decomposition (SVD) of the MIMO Channel, Singular Value Decomposition (SVD) and MIMO Capacity

UNIT III

Orthogonal Frequency-Division Multiplexing: Introduction, Motivation and Multicarrier Basics, OFDM Example, Bit-Error Rate (BER) for OFDM, MIMO-OFDM, Effect of Frequency Offset in OFDM, OFDM – Peak-to-Average Power Ratio (PAPR), SC-FDMA.

UNIT IV

Satellite-Based Wireless Systems: Introduction, Satellite Orbits, Use of Satellites for Communication, Satellites and Transponders, Signal and Noise Calculations, Systems Using Geostationary Satellites, Systems Using Low-Earth-Orbit Satellites, Systems Using Medium Earth-Orbit Satellites.

TEXT BOOKS:

1. Principles of Modern Wireless Communication Systems – Aditya K Jagannathan,Mc Graw Hill publishers,2017

2. Wireless Communication Technology – Blake,Delmar/Cengage Learning India, first Edition,2012

REFERENCES BOOKS:

1. Wireless Communications and Networking – Vijay K. Garg, MorganKaufmann,2007

IV Year-I Semester		Professional Elective Course -V	L	T	P	C
Internal:25	**External:75**	**PEC-EC703C ASIC Design**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:

The student will able to:

- To prepare the student to be an entry-level industrial standard ASIC or FPGA designer.
- To give the student an understanding of issues and tools related to ASIC/FPGA design and implementation.
- To give the student an understanding of basics of System on Chip and Platform based design.

COURSE OUTCOMES:

After going through this course, the student will be able to:

- Demonstrate VLSI tool-flow and appreciate FPGA architecture.
- understand the issues involved in ASIC design, including technology choice, design management, tool-flow, verification, debug and test, as well as the impact of technology scaling on ASIC design.
- understand the algorithms used for ASIC construction
- understand the basics of System on Chip, on chip communication architectures like AMBA, AXI and utilizing Platform based design.
- appreciate high performance algorithms available for ASICs

UNIT I

Types of ASICs, VLSI Design flow, Programmable ASICs - Antifuse, SRAM, EPROM, EEPROM based ASICs. Programmable ASIC logic cells and I/O cells. Programmable interconnects. Latest Version - FPGAs and CPLDs and Soft-core processors.

UNIT II

Trade off issues at System Level: Optimization with regard to speed, area and power, asynchronous and low power system design. ASIC physical design issues, System Partitioning, Power Dissipation, Partitioning Methods.

ASIC floor planning, Placement and Routing.

UNIT III

System-On-Chip Design - SoC Design Flow, Platform-based and IP based SoC Designs, Basic Concepts of Bus-Based Communication Architectures, On-Chip Communication Architecture Standards, Low-Power SoC Design

UNIT IV

High performance algorithms for ASICS/ SoCs as case studies – Canonic Signed Digit Arithmetic, KCM, Distributed Arithmetic, High performance digital filters for sigma-delta ADC, USB controllers, OMAP.

TEXT BOOK:

1. *M.J.S. Smith,"Application Specific Integrated Circuits", Pearson, 2003*

REFERENCE BOOKS:

1. Algorithms for VLSI Design Automation, H.Gerez, John Wiley, 1999
2. Digital Integrated Circuit Design Perspective (2/e)", J..M.Rabaey,A.Chandrakasan, and B.Nikolic, PHI 2003
3. Analysis and Design of Digital Integrated Circuits (3/e), D. A.Hodges, MGH 2004.

IV Year-I Semester		Open Elective Course - III	L	T	P	C
Internal:25	**External:75**	**OEC-EC704A Digital Image Processing.**	**2**	**0**	**2**	**3**

COURSE OBJECTIVES:

The student will able to:

- Familiarize with basic concepts of digital image processing and different image transforms.
- Learn various image processing techniques like image enhancement, restoration, segmentation and compression.

COURSE OUTCOMES:

- Perform image manipulations and different digital image processing techniques
- Perform basic operations like – Enhancement, segmentation, compression, Image transforms and restoration techniques on image.

UNIT-I

INTRODUCTION: Introduction to Image Processing, Fundamental steps in digital image processing, components of an image processing system, image sensing and acquisition, image sampling and quantization, some basic relationships between pixels, an introduction to the mathematical tools used in digital image processing. **Image Transforms:** Need for image transforms, Discrete Fourier transform (DFT) of one variable, Extension to functions of two variables, some properties of the 2-D Discrete Fourier transform, Importance of Phase, Walsh Transform. Hadamard transform, Haar Transform, Slant transform, Discrete Cosine transform, KL Transform, SVD and Radon Transform, Comparison of different image transforms.

UNIT-II

INTENSITY TRANSFORMATIONS AND SPATIAL FILTERING: Background, some basic intensity transformation functions, histogram processing, fundamentals of spatial filtering, smoothing spatial filters, sharpening spatial filters, combining spatial enhancement methods **Filtering in the Frequency Domain:** Preliminary concepts, The Basics of filtering in the frequency domain, image smoothing using frequency domain filters, Image Sharpening using frequency domain filters, Selective filtering.

UNIT-III

IMAGE RESTORATION AND RECONSTRUCTION: A model of the image degradation / Restoration process, Noise models, restoration in the presence of noise only-Spatial Filtering, Periodic Noise Reduction by frequency domain filtering, Linear, Position –Invariant Degradations, Estimating the degradation function, Inverse filtering, Minimum mean square error (Wiener) filtering, constrained least squares filtering ,geometric mean filter ,image reconstruction from projections **Image compression:** Fundamentals, Basic compression methods: Huffman coding, Golomb coding, Arithmetic coding, LZW coding, Run-Length coding, Symbol-Based coding, Bit-Plane coding, Block Transform coding, Predictive coding

UNIT-IV

IMAGE SEGMENTATION: Fundamentals, point, line, edge detection, thresholding, region –based segmentation. **Morphological Image Processing:** Preliminaries, Erosion and dilation, opening and closing, basic morphological algorithms for boundary extraction, thinning, gray-scale morphology, Segmentation using morphological watersheds. **Color image processing:** color fundamentals, color models, pseudo color image processing, basics of full color image processing, color transformations, smoothing and sharpening. Image segmentation based on color, noise in color images, color image compression.

TEXT BOOKS:

1. R. C. Gonzalez and R. E. Woods, Digital Image Processing, 3rd edition, Prentice Hall, 2008.
2. Jayaraman, S. Esakkirajan, and T. Veerakumar," Digital Image Processing", Tata McGraw- Hill Education, 2011.

REFERENCE BOOKS:

1. Anil K. Jain, "Fundamentals of Digital Image Processing", Prentice Hall of India, 9th Edition Indian Reprint, 2002.

IV Year-I Semester		Open Elective Course - III	L	T	P	C
Internal:25	**External:75**	**OEC-EC704B Software Defined Radio.**	**2**	**0**	**2**	**3**

COURSE OBJECTIVES:

The student will able to

- Understand the basic components of software defined radio.
- Understand the distortion parameters and nonlinear Distortion in Transmitted Signals.
- Calculate power requirement in power amplifier for SDR.
- Understand Digital Pre-Distortion Techniques for Linear/Nonlinear Distortion.
- Appraise Digital Pre-Distortion Techniques.

COURSE OUTCOMES:

- Able to analyze the basic components of software defined radio.
- Demonstrate understanding about distortion parameters and nonlinear Distortion in Transmitted Signals.
- Able to calculate power requirement in power amplifier for SDR
- Demonstrate understanding about Digital Pre-Distortion Techniques for Linear/Nonlinear Distortion

UNIT I:

BASIC COMPONENTS: software defined radios, Software defined radio architectures Part A, Software defined radio architectures- Part B.

UNIT II:

DISTORTION PARAMETERS: Sources and metrics of distortion in a transceiver, Nonlinear distortion and nonlinearity specifications, Power amplifiers: Nonlinear Distortion in Transmitted Signals.

UNIT III:

POWER AMPLIFIER: Line-up for linearity & power requirement calculations, Linearization Techniques for nonlinear distortion in SDR.

UNIT IV:

DISTORTION TECHNIQUES: Pre distortion Techniques for Nonlinear distortion in SDR. Digital Pre distortion Techniques for Linear/Nonlinear Distortion.

TEXTBOOK:

1. Jeffrey H. Reed "Software Radio: A Modern Approach to radio Engineering", Pearson Education Asia, 2002.

REFERENCES BOOKS:

1. Sanjay Kumar, "Wireless Communication the Fundamental and Advanced Concepts" River Publishers, Denmark, 2015 (Indian reprint).

IV Year-I Semester		Open Elective Course - III	L	T	P	C
Internal:25	External:75	OEC-EC704C Television Engineering	2	0	2	3

COURSE OBJECTIVES:

The student will able to

- To understand about the basic steps of image processing.
- To understand about the various image processing techniques.
- To study about the 3D model, analog and digital video processing.
- To study about the 2D and various motion of estimations.

COURSE OUTCOMES:

After going through this course, the student will be able to

- Analyze the basic image processing and sampling and quantization of an Image.
- Analyze selective filtering image segmentation and compression models**.**
- Understand the image motion estimation methods.

UNIT I:

INTRODUCTION: TV transmitter and receivers, synchronization. Television Pictures: Geometric form and aspect ratio, image continuity, interlaced scanning, picture resolution, Composite video signal: Horizontal and vertical sync, scanning sequence, Colour signal generation and Encoding: Perception of brightness and colours, additive colour mixing, video signals for colours, luminance signal, colour difference signals, encoding of colour difference signals, formation of chrominance signals, PAL encoder.

UNIT II:

MONOCHROME TV RECEIVER: RF tuner, IF subsystem, video amplifier, sound section, sync separation and processing, deflection circuits, scanning circuits.PAL–D colour receiver: Electron tuners, IF subsystem, Y-signal channel, chroma decoder, separation of U & V Colour phasors, synchronous demodulators, subcarrier generation, raster circuits. **VISION IF SUBSYSTEM:** AGC, noise cancellation, video and inter carrier sound signal detection, Colour receiver IF subsystem, Receiver sound system: FM detection, FM Sound detectors, typical applications.

UNIT III:

COLOUR SIGNAL DECODING:PAL-D decoder, chroma signal amplifiers, separation of U and V signals, Color burst separation, Burst phase discriminator, Reference oscillator, Indent and color killer circuits, RO phase shift and 180 degrees PAL-SWITCH circuitry, U & V demodulators, Colour signal mixing**,** Analog and Digital TV Compared, Going HD, Broadcast Engineering and Information Technology, The Road to HDTV, The Grand Alliance, A DTV Standard at Last, Producing HDTV, HD Goes Coast-to-Coast, DTV Conversion.

UNIT-IV:

DTV TRANSMITTER AND RECIEVER: Engineering Basics, Presentation, Transmission, Reception and Demodulation, Transport Stream DE multiplexing, Decoding and Decompression, Program Assembly and Presentation, Receiver Issues, Presentation Concerns. HDTV AND DTV STANDARDS: Standards Bodies, The ATSC Standards, SMPTE Standards, The Audio Engineering Society, Cable DTV Standards, Institute of Electronic and Electrical Engineers, The Consumer Electronics Association, Other Societies and Organizations.

TEXT BOOKS:

1. Modern Television Practice – Principles, Technology and Service – R.R.Gulati, New Age International Publication, 2002
2. Television and Video Engineering – A.M.Dhake, 2nd

REFERENCES BOOKS:

1. Basic Television and Video Systems – B.Grob and C.E.Herndon, McGrawHill,1999
2. 2. “Newnes Guide to Television and Video Technology” by Ibrahim.K. F, Newnes Publishers, 4th edition, 2007.

IV Year-I Semester		Open Elective Course - IV	L	T	P	C
Internal:25	External:75	OEC-EC705A Embedded System.	2	0	2	3

COURSE OBJECTIVES:

The student will able to

- Understand the basic concepts of an embedded system are introduced.
- The various elements of embedded hardware and their design principles are explained.
- Internals of Real-Time operating system and the fundamentals of RTOS based embedded firmware design is discussed.

COURSE OUTCOMES:

At the end of this course the student can able to:

- Understand the basic concepts of an embedded system and able to know an embedded system design approach to perform a specific function.
- The hardware components required for an embedded system and the design approach of an embedded hardware.

UNIT-I

INTRODUCTION: Embedded System-Definition, history of embedded systems, classification of embedded systems, major application areas of embedded systems, purpose of embedded systems, the typical embedded system-core of the embedded system, Memory, Sensors and Actuators, Communication Interface, Embedded firmware, Characteristics of an embedded system, Quality attributes of embedded systems, Application-specific and Domain-Specific examples of an embedded system.

UNIT-II

EMBEDDED HARDWARE DESIGN: Analog and digital electronic components, I/O types and examples, Serial communication devices, Parallel device ports, Wireless devices, Timer and counting devices, Watchdog timer, Real time clock.

EMBEDDED FIRMWARE DESIGN: Embedded Firmware design approaches, Embedded Firmware development languages, ISR concept, Interrupt sources, Interrupt servicing mechanism, Multiple interrupts, DMA, Device driver programming, Concepts of C versus Embedded C and Compiler versus Cross-compiler.

UNIT-III

REAL TIME OPERATING SYSTEM: Operating system basics, Types of operating systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling, Threads, Processes and Scheduling, Task communication, Task synchronization.

HARDWARE SOFTWARE CO-DESIGN: Fundamental Issues in Hardware Software Co- Design, Computational models in embedded design, Hardware software Trade-offs, Integration of Hardware and Firmware.

UNIT-IV:

EMBEDDED SYSTEM DEVELOPMENT, IMPLEMENTATION AND TESTING: The integrated development environment, Types of files generated on cross-compilation, Deassembler /Decompiler, Simulators, Emulators and Debugging, Target hardware debugging, Embedded Software development process and tools, Interpreters, Compilers and Linkers, Debugging tools, Quality assurance and testing of the design, Testing on host machine, Simulators, Laboratory Tools.

TEXT BOOKS:

1. Embedded Systems Architecture- By Tammy Noergaard, Elsevier Publications,2013.
2. Embedded Systems-By Shibu. K.V-Tata McGraw Hill Education Private Limited,2013.

REFERENCES BOOKS:

1. Embedded System Design, Frank Vahid, Tony Givargis, John Wiley Publications,2013.
2. Embedded Systems-Lyla B.Das-Pearson Publications, 2013

IV Year-I Semester		Open Elective Course - IV	L	T	P	C
Internal:25	**External:75**	**OEC-EC705B Global Positioning System.**	**2**	**0**	**2**	**3**

COURSE OBJECTIVES:

The student will able to

- Understand the basic concepts of Global positioning system are introduced.
- Understand the various elements of GPS and principles are explained.

COURSE OUTCOMES:

At the end of this course the student can able to:

- Demonstrate the basics of Global positioning system.
- Ability to identify the positioning system.

UNIT - I

Introduction: Basic concept, system architecture, GPS and GLONASS Overview, Satellite Navigation, Time and GPS, User position and velocity calculations, GPS, Satellite Constellation, Operation Segment, User receiving Equipment, Space Segment Phased development, GPS aided Geoaugmented navigation (GAGAN) architecture.

UNIT - II

Signal Characteristics: GPS signal components, purpose, properties and power level, signal acquisition and tracking, Navigation information extraction, pseudo orange estimation, frequency estimation, GPS satellite position calculation, Signal structure, anti-spoofing (AS), selective availability, Difference between GPS and GALILEO satellite construction.

UNIT - III

GPS Receivers & Data Errors: Receiver Architecture, receiver design options, Antenna design, GPS error sources, SA errors, propagation errors, ionosphere error, troposphere error, multipath, ionosphere error, estimation using dual frequency GPS receiver, Methods of multipath mitigation, Ephemeris data errors, clock errors.

UNIT - IV

Differential GPS: Introduction, LADGPS, WADGPS, Wide Area Augmentation systems, GEO Uplink subsystem, GEO downlink systems, Geo Orbit determination, Geometric analysis, covariance analysis, GPS /INS Integration Architectures. GPS Applications**:** GPS in surveying, Mapping and Geographical Information System, Precision approach Aircraft landing system, Military and Space application, intelligent transportation system. GPS orbital parameters, description of receiver independent exchange format (RINEX), Observation data and navigation message data parameters, GPS position determination, least squares method.

TEXT BOOKS:

1. Mohinder S.Grewal, Lawrence R.Weill, Angus P.Andrews, “Global positioning systems, Inertial Navigation and Integration”, Wiley 2007.

REFERENCES BOOKS:

1. E.D.Kaplan, Christopher J. Hegarty, “Understanding GPS Principles and Applications”, Artech House Boston 2005.

IV Year-I Semester		Open Elective Course - IV	L	T	P	C
Internal:25	**External:75**	**OEC-EC705C Smart Antenna Systems.**	**2**	**0**	**2**	**3**

COURSE OBJECTIVES:

The student will able to

- Understand the basic concepts of Smart Antenna systems are introduced.
- Understand the various elements of Antennas and principles are explained.

COURSE OUTCOMES:

At the end of this course the student can able to:

- Understand the basic concepts of Antennas and specific functions.
- Understand the **Estimation Fundamentals** required for an Antenna systems and Space Time Processing of Signal Models

UNIT I:

INTRODUCTION TO SMART ANTENNAS: Need for Smart Antennas, Smart Antenna Configurations, Switched-Beam Antennas, Adaptive Antenna Approach, Space Division Multiple Accesses (SDMA), Architecture of a Smart Antenna System, Receiver, Transmitter, Benefits and Drawbacks, Mutual Coupling Effects.

UNIT – II

DOA ESTIMATION FUNDAMENTALS: Introduction, Array Response Vector, Received Signal Model, Subspace-Based Data Model, Signal Auto covariance, Conventional DOA Estimation Methods, Conventional Beam forming Method, Capon's Minimum Variance Method, Subspace Approach to DOA Estimation, MUSIC Algorithm, ESPRIT Algorithm, Uniqueness of DOA Estimates.

UNIT – III

BEAM FORMING FUNDAMENTALS: Classical Beam former, Statistically Optimum Beam forming Weight Vectors, Maximum SNR Beam former, Multiple Side Lobe Canceller and Maximum, SINR Beam former, Minimum Mean Square Error (MMSE), Direct Matrix Inversion (DMI), Linearly Constrained Minimum Variance (LCMV), Adaptive Algorithms for Beam forming.

UNIT – IV

SPACE–TIME PROCESSING

Introduction, Discrete Space–Time Channel and Signal Models, Space–Time Beamforming, Inter symbol and Co-Channel Suppression, ISI Suppression, CCI Suppression, Joint ISI and CCI Suppression, Space–Time Processing for DS-CDMA, Capacity and Data Rates in MIMO Systems, Single-User Data Rate Limits, Multiple-Users Data Rate Limits, Data Rate Limits with in a Cellular System, MIMO in Wireless Local Area Networks.

TEXT BOOKS:

1. Constantine A. Balanis & Panayiotis I. Ioannides, "Introduction to Smart Antennas", Morgan & Claypool Publishers' series-2007.
2. Ahmed El Zooghby, Smart Antenna Engineering, Artech House.

REFERENCE BOOKS:

1. M.J. Bronzel, Smart Antennas, John Wiley, 2004
2. T.S.Rappaport&J.C.Liberti, Smart Antennas for Wireless Communication, Prentice Hall (PTR) , 1999.
3. R.Janaswamy, Radio Wave Propagation and Smart Antennas for Wireless Communication, Kluwer, 2001

IV Year-I Semester		Humanities and Social Science	L	T	P	C
Internal:25	**External:75**	**HSMC-EC706 Management Science**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:

- To study and acquire the knowledge on management functions, global leadership and organizational behavior.
- Understand the concepts of functional management project management and strategic management.
- To study the process of management and to provide basic insight into select contemporary management practices.
- To the conceptual knowledge on functional management and strategic management.

COURSE OUTCOMES:

- After completion of the Course the student will acquire the knowledge on management functions, global leadership and organizational behavior.
- Will familiarize with the concepts of functional management project management and strategic management. Familiarize the process of management and to provide basic insight into select contemporary management

UNIT I:

Introduction to Management and organizational concepts of management and organization- Nature and Importance of Management, Functions of Management, - Taylor's Scientific Management Theory, Fayol's Principles of Management, Maslow's Theory of Human Needs, Douglas McGregor's Theory X and Theory Y, Herzberg's Two-Factor Theory of Motivation. Designing Organizational Structures: Basic concepts related to Organization - Depart mentation and Decentralization.

UNIT II:

Human Resource Management (HRM): Concepts of HRM, Basic functions of HR Manager: Manpower planning, Recruitment, Selection, Training and Development, Performance Appraisal, Grievance Handling and Welfare Administration, Job Evaluation and Merit Rating – Performance Management System. **Marketing management:** Functions of Marketing, Marketing Mix, and marketing Strategies based on Product Life Cycle, Channels of Distribution, Supply Chain Management.

UNIT III:

Strategic Management: Mission, Goals, Objectives, Policy, Strategy, Programmes, Elements of Corporate Planning Process, Environmental Scanning, Value Chain Analysis, SWOT Analysis, Steps in Strategy Formulation and implementation, Generic Strategy alternatives.

Operations Management: Principles and Types of Plant Layout-Methods of production (Job, batch and Mass Production), Work Study -Basic procedure involved in Method Study and Work Measurement- Business Process Reengineering (BPR).

UNIT IV:

Inventory control: Objectives of inventory control, EOQ, ABC Analysis, (simple problems) VED Analysis, FSN Analysis, and JIT System.

Project Management: Network Analysis, Programme Evaluation and Review Technique (PERT), Critical Path Method (CPM), Identifying critical path, Probability of Completing the project within given time, Project crashing (Simple problems).

TEXT BOOK:

1. Dr. P.G. Ramanujam at.al Management Science, HPH.
2. Koontz & Weihrich: Essentials of Management, 6/e, TMH, 2007.
3. Robbins: Organizational Behaviour, Pearson publications, 2011.

REFERENCE BOOKS:

1. Kotler Philip & Keller Kevin Lane: Marketing Mangement 12/e, PHI, 2007.
2. Kanishka Bedi, Production and Operations Management, Oxford University Press, 2007.
3. Memoria & S.V.Ganker, Personnel Management, Himalaya, 25/e, 2007.

IV B. Tech II Semester ECE w.e.f 2019-20 (VIII Semester)

Course Code	Title of the Course	Hours/weeks			Max Marks		Total Marks	Credits
		L	T	P	Internal	External		
Project	Project Work				250	250	500	14
TOTAL CREDITS					250	250	500	14

ADIKAVI NANNAYA UNIVERSITY

UNIVERSITY COLLEGE OF ENGINEERING
RAJAMAHENDRAVARAM

Department of
Electronics and Communication Engineering

B Tech(ECE)
MODEL QUESTION PAPERS

II, III &IV YEAR
(For the admitted batch of 2019-2020)

Board of Studies
University College of Engineering

ADIKAVI NANNAYA UNIVERSITY: RAJAMAHENDRAVARAM
UNIVRSITY COLLEGE OF ENGINEERING
Department of ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE STRUCTURE & SYLLABUS
II B TECH I SEMESTER

(With effect from 2019-2020 Admitted Batch)
Under Choice Based Credit System(CBCS)

II B. Tech I Semester ECE w.e.f 2019-20 (III Semester)

Course Code	Title of the Course	Hours/weeks			Max Marks		Total Marks	Credits
		L	T	P	Internal	External		
BSC-EC301	Probability Theory and Stochastic Processes	3	0	0	25	75	100	3
PCC-EC302	Electronic Devices and Circuits	3	0	0	25	75	100	3
PCC-EC303	Signals and Systems	3	0	0	25	75	100	3
PCC-EC304	Switching Theory and Logic Design	3	0	0	25	75	100	3
PCC-EC305	Electromagnetic field theory and Transmission Lines	3	0	0	25	75	100	3
LC-EC 306	Electronic Devices and Circuits Lab	0	0	3	50	50	100	1.5
LC-EC 307	Switching Theory and Logic Design Lab	0	0	3	50	50	100	1.5
LC-EC 308	Electronic Workshop Practice Lab	0	0	3	50	50	100	1.5
SDC-EC309	Skill Development Course	1	0	2	50	50	100	2
MC-EC310	Essence of Indian Traditional Knowledge	2	0	0	25	75	100	0
TOTAL CREDITS		18	0	11	350	650	1000	21.5

Note: 2 lab Hrs./Week and 1 Theory Hrs./Week for SKILL DEVELOPMENT COURSE or 2 Theory Hrs./ Week.

ADIKAVI NANNAYA UNIVERSITY: RAJAMAHENDRAVARAM
B. Tech (ECE) III Semester (2019-20AB)
BSC-EC301 PROBABILITY THEORY AND STOCHASTIC PROCESSES
MODEL QUESTION PAPER

Time:3hrs **Max.Markss:75**

SECTION-A (4 X 15 = 60 M)

Answer ALL Questions

1. a) State and prove the properties of probability density function . [7M]
   b) Discuss the characteristics of Binomial, Rayleigh random variables using relevant expressions and sketches of their distribution and density functions. [8M]

   OR

   c) Explain Gaussian random variable with neat sketches? [7M]
   d) A random variable X has FX(x) = (1- (1/4) e^{-cx})u(x). Find the value of 'c' and P[2<X10]. [8M]
2. a) What is meant by expectation? State and prove its properties. [7M]
   b) Let Y=2X+3, If the random variable is uniformly distributed over [-1, 2], determine fy(y). [8M].

   OR

   c) State and prove properties of moment generating function. [8M]
   d) Write notes on monotonic transformations for a continuous random variable. [7M]
3. a) Define joint distribution function of random variables and write its properties [7M]
   b) State central limit theorem for the following cases: [8M]
   i) Equal distributions ii) Unequal distributions Determine $\mathbf{f_Z}(Z)$ in terms of $\mathbf{f_X}(X)$ and $\mathbf{f_Y}(Y)$, if Z=X+Y

   OR

   c) Write short notes on jointly Gaussian random variables [7M]
   d) Let Z is the sum of two independent random variables X and Y. Find the PDF of Z [8M]
4. Define autocorrelation function of a random process and write its properties [8M]
   a) If X(t) is a stationary process, find the power spectrum of Y(t)= A 0+ B0 X(t)in term of the power spectrum of X(t) if A0 and B0 are real constants [7M]

   OR

   b) What is random process? Explain Gaussian random process [7M]
   c) Explain with the help of relevant expressions about WSS and SSS of a random process [8M]

SECTION – B(5 X 3 =15 MARKS)

5. **Answer any FIVE of the following:**
   a. Give example for continuous random variable and discrete random variable.
   b. Show that the first central moment is zero.?
   c. If K is a constant, then for a random variable X, prove that Var(KX)=K Var(X).
   d. What is Transformation? Classify the different types Transformation of Random Variable
   e. Define marginal probability density functions?
   f. State the conditions for a WSS random process.
   g. When a random process is called SSS process? Explain
   h. Differentiate between Random Processes and Random variables with an example

ADIKAVI NANNAYA UNIVERSITY: RAJAMAHENDRAVARAM
B. Tech (ECE) III Semester (2019-20AB)
PCC-EC02: ELECTRONIC DEVICES AND CIRCUITS
MODEL QUESTION PAPER

Time: 3hrs. **Max. Marks: 75**

SECTION-A (4 X 15 = 60 M)
Answer ALL Questions

1. a) Explain in detail about the current components in a p-n junction diode. [8M]
b) Compare and contrast Zener breakdown and Avalanche breakdown [7M]

(OR)

c) Explain the working of p-n diode in forward and reverse bias conditions. [8M]
d) Explain the formation of depletion region in a PN junction [7M]

2. a) Draw and explain the circuit diagram of full wave rectifier with L-section filter [8M]
b) Derive expression for ripple factor and rms value of voltage of Halfwave rectifier with resistive load[7M]

(OR)

c) Draw and explain the circuit diagram of full wave rectifier with inductor filter [7M]
b) A zener diode shunt regulator circuit is to be designed to maintain a constant load current 400mA and voltage 40V. The input voltage is 90±5V. The zener voltage is 40V and its dynamic resistance is 2.5Ω.Find the following quantities for regulator:
(a) the series dropping resistance (b) zener power dissipation
(c)load resistance. assume the zener current to be10% of load current. [8M]

3. a) Explain input and output characteristics of a transistor in CE configuration [8M]
b) Explain the four distinct regions of the output characteristics of JFET [7M]

(OR)

c) Explain input and output characteristics of a transistor in CB configuration [8M]
d) What is thermal runaway? Derive relevant expressions to obtain thermal stability [8M]

4. a). Draw and explain the circuit diagram of RC phase shift oscillator and find the equation for frequency [15M]

(OR)

b) Discuss the concept of Feedback and explain the circuit diagram of Colpitts Oscillator [15M]

Section – B(5 X 3 =15 Marks)

5. Answer any FIVE of the following:

a) Draw the V-I Characteristics of diode and explain
b) Define peak inverse voltage
c) Define i) Ripple factor ii) % Regulation
d) What are the differences between BJT and JFET?
e) List the advantage and disadvantages of fixed bias method
f) Draw the self bias circuit for BJT and derive for the stability factor 'S'
g) Draw the small signal low frequency h-parameter model of a CB Transistor
h) Define Barkhausen criteria

ADIKAVI NANNAYA UNIVERSITY: RAJAMAHENDRAVARAM

B. Tech (ECE) III Semester(2019-20AB)

PCC-EC303: SIGNALS AND SYSTEMS

MODEL QUESTION PAPER

Time: 3 Hrs **Max Marks: 75**

SECTION-A (4 X 15 = 60 M)

Answer ALL Questions

1. a) Define orthogonal signals space and bring out clearly its applications in representing signals. **(8M)**

b) Show that x(t)=A e- α (t) u(t), α>0 is an energy signal or not**.** **(7M)**

OR

c) Determine the power and RMS value of the signals.

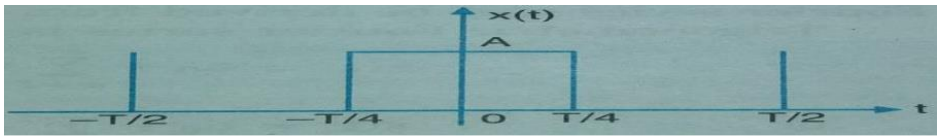
i) x(t)=5cos (50t+π/3) ii) x(t)=10 cos 5t cos 10t. **(7M)**

d)Find the even and odd components of the following signals

(i) x(t)=cos t + sin t + cos t sin t. (ii) x(n)={-2,1,**2**,-1,3}. **(8M)**

2. a) Derive the complex Fourier exponential series representation. **(8M)**

b) show the periodic rectangular waveform. Obtain its Fourier series representation (**7M)**



OR

c) Explain and derive the Fourier transform of some standard signals (**7M)**

d)Explain the importance of sampling theorem. What is aliasing and how is it avoided**.** **(8M)**

3. a) Determine whether or not the system is time-invariant.

(i)y(t)=t x(t) (ii) y(t)=x(t) cos 50πt (iii) y(n)=x(2n) **(8M)**

b) Explain causality and physical reliability of a system. **(7M)**

OR

c) Explain in detail about the properties of convolution. **(8M)**

d)Find the autocorrelation of the signal x(t)=Asin(Ω_0 t+Θ), where $\Omega_0=2\pi/T$**.** **(7M)**

4. a) state and prove the fallowing properties of Z-Transform

(i) Linearity (ii) Time shifting (iii) Differentiation. **(8M)**

b) Determine the Z-Transform of the signals

(i)x(n)={1,2,0,2} (ii) x(n)={1,2,-1,2,9}. **(7M)**

OR

c) Explain the concept of ROC in Z-Transforms and list any 2 properties of the same. **(8M)**

d) Find the inverse of Z-Transform of $X(Z)=Z/(3Z^2-4Z+1)$. **(7M)**

Section-B (5 X 3 =15 Marks)

5. Answer any FIVE of the following:

a) Define signal and systems. List the classification of signals.

b) Define orthogonal functions give some examples of orthogonal function.

c) Differentiate between Fourier series and Fourier transforms.

d) Write shorts notes on dirichlets condition.

e) Find the Laplace transforms of the signals x(t)=e-at u(t).

f) List the properties of cross correlation function.

g) Explain the time reversal property for Z-Trans form.

h) Explain the two sided Z-Transform.

ADIKAVI NANNAYA UNIVERSITY: RAJAMAHENDRAVARAM
B. Tech (ECE) III Semester (2019-20AB)
PCC-EC304: SWITCHING THEORY AND LOGIC DESIGN
MODEL QUESTION PAPER

Time: 3hrs. **Max. Marks: 75**

SECTION-A (4 X 15 = 60 M)

Answer ALL Questions

1. a) Given the 8bit data word 01011011, generate the 12-bit composite word for the hamming code that corrects and detects single errors [8M]
   b) Perform the following addition using excess-3 code i) 386+756 ii)1010 + 444 [7M]
   (OR)
   c) What is the difference between canonical form and standard form? Explain [8M]
   d) How are negative numbers represented? Represent signed numbers from +7 to -8 using different ways of representation. [7M]
2. a) Find the complement of the following Boolean functions and reduce them to minimum number of literals.
   a) (b c' +a' d) (ab' +cd') b) (b' d+ a' b c' +a c d+ a' b c) [15M]
   (OR)
   b) Simplify the following Boolean expressions using K-map and implement it by using NOR gates. [15M]
   a) F(A, B,C,D)=AB'C' +AC+A'CD'
   b) F(W, X,Y,Z)=w' x'y'z' + wxy'z' + w'x'yz + wxyz
3. a) Design a 3 input 5-bit multiplexer. Write the truth table and draw the logic diagram. [15M]
   (OR)
   b) A simple floating-point encoder converts 16-bit fixed-point data using four high order bits beginning with MSB. Design the logic circuit [15M]
4. a) Design a modulo-8 binary counter and decoder with glitch-free outputs. Explain the operation. [15M]
   (OR)
   b) Design a modulo-100 counter using two 74X163 binary counters. [15M]

Section-B (5 X 3 =15 Marks)

5. Answer any FIVE of the following:

a) Convert (97.75)10 to base
b) b) Prove that OR-AND network is equivalent to NOR-NOR network
c) c) Write and prove de-Morgan laws
d) **d)** Design 2x4 decoder using NAND gates
e) e) What are applications of Flip-Flop?
f) f) Draw the circuit to convert a D flip-flop
g) g) Draw the 16-bit comparator using 74X85 ICs.
h) h) Discuss about universal shift Register

ADIKAVI NANNAYA UNIVERSITY: RAJAMAHENDRAVARAM
B. Tech (ECE) III Semester (2019-20AB)
PCC-EC305: ELECTROMAGNETIC FIELD THEORY AND TRANSMISSION LINES
MODEL QUESTION PAPER

Time: 3hrs. **Max. Marks:75**

SECTION-A (4 X 15 = 60 M)

Answer ALL Questions

1. a). State and explain Coulomb's law. Obtain an expression in vector form. (7M)
   b) Two uniform line charges of density 8nC/m are located in a plane with y=0 at x= ± 4m. Find the Electric field at a point P (0m, 4m, 10m) (8M)

   (OR)

   c) Derive an expression for the electric field intensity due to a finite length line charge along the z-axis at an arbitrary point Q(x,y,z). (15M)

   (8M)
2. a). State Gauss's law. Using divergence theorem and Gauss's law, relate the displacement density D to the volume charge density _v. (7M)
   b) A sphere of radius "a" is filled with a uniform charge density of ' _v' C/ m3.Determine the electric field inside and outside the sphere. (8M)

   (OR)

   c) Using Gauss's law, derive the expressions for electric field intensity and electric flux density due to an infinite sheet of conductor of charge density _ C/cm. (15M)
3. A line charge _L= 400pC/m lies along the X-axis. The surface of zero potential passes through the point P(0,5,12)m. Find the potential at point (2,3,-4)m. (15M)

   (OR)

   a) Explain the concept of Magnetic vector potential (7M)
   b) Write Maxwell's equations in different final forms and in word Statements. (8M)

   (OR)

   d) Find the relations between E and H in a uniform plane wave. Find the value of intrinsic impedance of free space. (15M)
4. a).An airline has a characteristic impedance of 70 _ and a phase constant of 3 rad/m at 100MHz. Calculate the inductance per meter and the capacitance per meter of the line. (15M)

   (OR)

   c) Starting from the equivalent circuit, derive the transmission line equations for V and I, in terms of the source parameters. (15M)

Section-B (5 X 3 =15 Marks)

5. **Answer any FIVE of the following:**
   - **a)** What is the electric field intensity at a distance of 20cm from a charge of 2μC in vacuum?
   - **b)** Write the point form of continuity equation and explain its significance.?
   - **c)** Name few applications of Gauss's law in electrostatics.
   - **d)** Write down the magnetic boundary conditions
   - **e)** Write the expression for Zo in terms of primary constants.
   - **f)** Define Attenuation constant
   - **g)** For a transmission line VSWR is 4. What is the reflection coefficient?
   - **h)** The expression for instantaneous power flow in electromagnetic field and instantaneous Poynting vector.

ADIKAVI NANNAYA UNIVERSITY: RAJAMAHENDRAVARAM
II B.Tech (ECE) III SEMESTER (2019-20AB)
MC-EC310: ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE
MODEL QUESTION PAPER

Max Time: 3 Hours **Max Marks: 75M**

SECTION-A (4× 15 = 60 M)

Answer ALL questions

1.a). Define Traditional Knowledge? Explain about its nature, scope and characteristics. **(15M)**

(or)

b). Explain about the historical impact of social change on traditional knowledge system.

2.a). Explain the need of protecting the traditional knowledge significance in detail. **(15M)**

(or)

b). what do you mean by biological diversity? Explain about Biological Acts2002.

3. a). illustrate certain non IPR mechanisms of Traditional knowledge protection. **(15M)**

(or)

b. why do we need to protect Traditional knowledge? What benefits do traditional knowledge bring to the society.

4. a). Explain about Traditional Knowledge in sectors like Engineering and Agriculture. **(15M)**

(or)

b). Illustrate the importance of conservation and sustainable development of Food security of the country and protection of Tk.

SECTION-A (5×3 = 15 M)

5. **Answer Any FIVE questions**

a) Define Western knowledge.

b) What are different kinds of traditional knowledge?

c) List out the role of Government to harness in TK.

d) Illustrate different strategies to increase traditional knowledge.

e) Define bio technology

f) Write about indigenous knowledge.

g) Define intellectual property.

h) How TK related to Biodiversity.

II B. Tech II Semester ECE w.e.f 2019-20(IV Semester)

Course Code	Title of the Course	Hours/weeks			Max Marks		Total Marks	Credits
		L	T	P	Internal	External		
ESC-EC401	Network Analysis	3	0	0	25	75	100	3
BSC-EC402	Control Systems	3	0	0	25	75	100	3
PCC-EC403	Analog and Digital Circuits	3	0	0	25	75	100	3
PCC-EC404	Analog Communications	3	0	0	25	75	100	3
HSMC-EC405	Managerial Economics and Financial Analysis	3	0	0	25	75	100	3
LC-EC 406	Network Analysis and ET Lab	0	0	3	50	50	100	1.5
LC-EC 407	Analog Communications Lab	0	0	3	50	50	100	1.5
LC-EC 408	Analog & Digital Circuits Lab	0	0	3	50	50	100	1.5
SDC-EC409	Skill Development Course	1	0	2	50	50	100	2
TOTAL CREDITS		16	0	11	325	575	900	21.5

Note: 2 lab Hrs./Week and 1 Theory Hrs./Week for SKILL DEVELOPMENT COURSE or 2 Theory Hrs./ Week. Two months Summer Internship/Technical Course mandatory after second year which can be evaluated during V Semester.

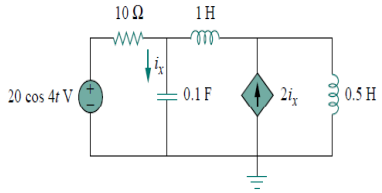
ADIKAVI NANNAYA UNIVERSITY::RAJAMAHENDRAVARAM
B. TECH (ECE) IV SEMESTER (2019-20AB)
ESC-EC401: NETWORK ANALYSIS
MODEL QUESTION PAPER

Time: 3hrs. **Max. Marks: 75**

SECTION-A (4 X 15 = 60 M)

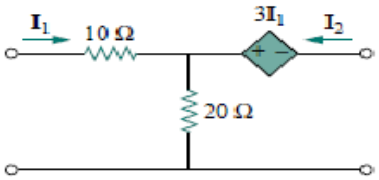
Answer ALL Questions

1. a). Prove that in a linear graph, every cut-set has an even number of branches in common with every loop. [8M]
   b) Explain the following [7M]
   i) The current through an inductor cannot change instantaneously.
   ii) The voltage across a capacitor cannot change instantaneously.
   (OR)
   c) Obtain the star connected equivalent circuit of the delta connected circuit. [8M]
   d) Show that for a network graph with P separate parts, n nodes and b branches, the number of chords C is given as C = b – n + P [7M]
2. a) Find the current i_x in the circuit shown below by using nodal analysis. [15M]

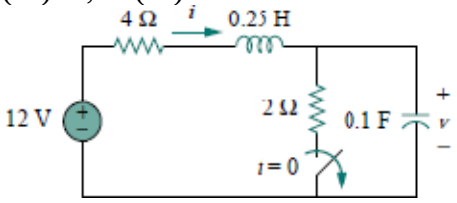


(OR)

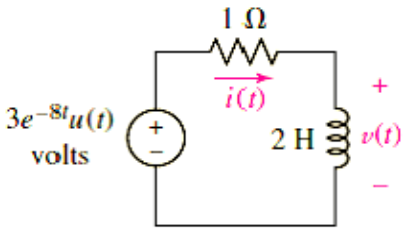
b) Find the transmission parameters of the following two port network:
[15M]



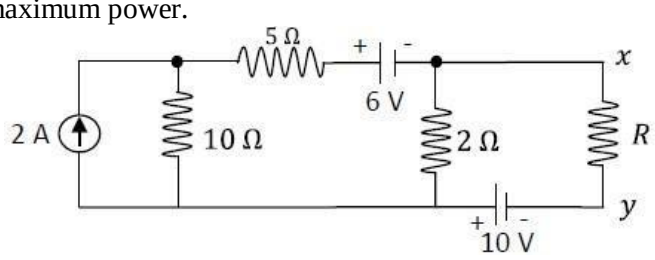
3. a) The switch in the following circuit has been closed for a long time. It is open at t = 0. Find (i) $i(0^+)$, $v(0^+)$ (ii) $di(0^+)/dt$, $dv(0^+)/dt$ [15M]



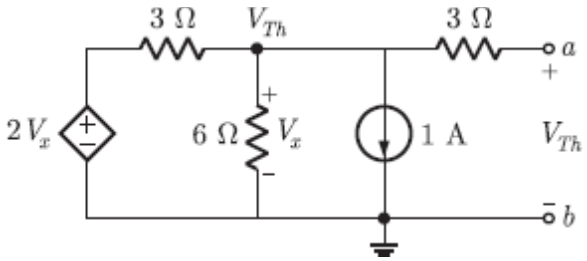
b) Calculate the voltage v(t) shown in figure, given an initial current $i(0^-)$ = 1A using Laplace transform method. [15M]



4. a) Determine the value of R to have a maximum power transfer in the circuit shown below. Also obtain the amount of maximum power. [15M]



b) Determine thevenin"s equivalent circuit across a-b terminals [15M]



Section-B (5 X 3 =15 Marks)

5. Answer any FIVE of the following:

a) Define V-shift and I-shift in the source transformation
b) Mention some salient features of Tellegen's theorem.
c) What are the inverse transmission parameters and express their relations.
d) Define natural response
e) Comment briefly on the choice between loop and node methods of analyzing a network.
f) Mention some important characteristics of an ideal capacitor
g) State and explain the substitution theorem.
h) What do you understand by a reciprocal network

ADIKAVI NANNAYA UNIVERSITY::RAJAMAHENDRAVARAM
B. TECH (ECE) IV SEMESTER (2019-20AB)
BSC-EC401: CONTROL SYSTEMS
MODEL QUESTION PAPER

Time: 3hrs. **Max. Marks: 75**

SECTION-A (4 X 15 = 60 M)

Answer ALL Questions

1. **a)** Compare the performances of closed loop and open loop control system **(7M)**
   b) Explain the effects of feedback on the system performance **(8M)**

OR

c) Write the force equations of the linear translational system shown in the figure 1 below. Draw the equivalent electrical network using force-voltage analogy, with the help of necessary mathematical equitation. **(15M)**

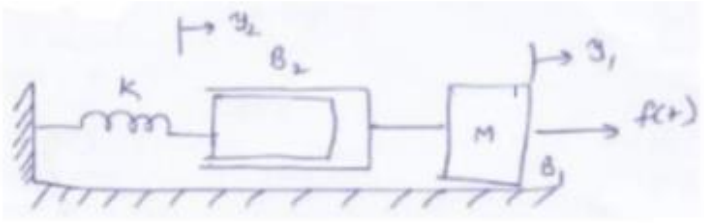


Figure:1

2. **a).** Derive an expression for the transfer function of an armature controlled DC servo motor **(15M)**

OR

b) Illustrate the effect of the value of damping ratio on the location of closed-loop poles of a standard second order system. **(8M)**

c). The forward transfer function of a unity feedback type1, second order system has a pole at -2. The nature of gain K is so adjusted that damping ratio is 0.4. The above equation is subjected to input r(t)=1+4t.Find steady state error **(7M)**

.

3. A unity feedback control system is characterized by the open loop transfer function
   $G(s) = (s+11)/(s+5)(s+9)$ Using the Routh criterion
   i) Calculate the range of values of K for the system to be stable.
   ii) What is the marginal value of K for stability? Determine the frequency of oscillations if any **(15M)**

OR

b) A unity feedback system has an open loop function G (s) = ($2+3S+10$) make a rough sketch of root locus plot by determining the following. **(15M)**
   (i) Centroid, number and angle of asymptotes
   ii) Angle of departure of root loci from the poles,
   iii)Breakaway points if any,
   iv). points of intersection with jω axis

4. **a)** Derive the expressions for frequency domain specifications of a secondorder system **(7M)**
   b) Given damping ratio $\xi = 0.7$ and $\omega n=10$rad/sec find the resonant Peak,resonant frequency and band width **(8M)**

OR

c) Explain the procedure to determine the gain margin and phase margin of a system from its Bode plot? **(7M)**
d) A feedback system has G(s) H(s) $=100(s+4)/(s+0.5)(s+10)$Draw the Bode plot. **(8M)**

Section-B (5 X 3 =15 Marks)

5. Answer any FIVE of the following:

a) Explain Control System?
b) Define closed loop control system
c) Write Masons gain formula.
d) Define Signal flow graph.
e) Define BIBO stability. what is the necessary condition for stability?
f) Explain dominant pole
g) Define Resonant Peak.
h) Explain Gain cross-over frequency and phase cross-over frequency

ADIKAVI NANNAYA UNIVERSITY::RAJAMAHENDRAVARAM
B. TECH (ECE) IV SEMESTER (2019-20AB)
PCC-EC403: ANALOG AND DIGITAL CIRCUITS
MODEL QUESTION PAPER

Time: 3hrs. **Max. Marks: 75**

SECTION-A (4 X 15 = 60 M)

Answer ALL Questions

1. Draw the High frequency model of a Transistor. Derive the relationship between high frequency and low frequency parameters. [8M]
   b) Compare, CS, CH, and CD amplifier circuits at high frequencies. [7M]

   (OR)

   c) Draw the equivalent diagram of a single stage CE amplifier at high frequencies. Derive the expression for gain under short circuited load conditions [15M]
2. a) Derive an expression for the lower 3dB frequency of an RC coupled amplifier using BJT by taking the effect Coupling capacitor into account. [15M]

   (OR)

   b) Draw the circuit and explain the working principle of a complementary symmetry push-pull power amplifier and state its disadvantages? [15M]
3. a) Explain the response of High-pass RC circuit for square wave input. [8M]
   b) Draw the circuit diagram of emitter coupled clipper and explain its operation. [7M]

   (OR)

   c) A pulse is applied to low-pass RC circuit. Prove that area under the pulse is same as area under the output waveform across the capacitor. [8M]
   d) Explain clipping at two independent levels using diodes. [7M]
4. a) Derive the expression for gate width of a monostable multivibrator neglecting the reverse saturation current I_{CBO}. [15M]

   (OR)

   b) What is meant by time base signal? What are the general features of time base signal? Explain. [8M]
   c) Explain about transistor miller time base generator. [7M]

Section-B (5 X 3 =15 Marks)

5. Answer any FIVE of the following:

a) Explain different Hybrid-π Capacitances and derive necessary expressions.
b) Explain the why RC oscillators are not used at high frequencies.
c) Explain how a power amplifier acts as a rectifier.
d) Give the classification of tuned amplifiers.
e) What is cross over distortion?
f) What is meant by linear wave shaping?
g) What is meant by sweep time and restoration time?
h) Write the applications of Schmitt trigger.

ADIKAVI NANNAYA UNIVERSITY::RAJAMAHENDRAVARAM
B. TECH (ECE) IV SEMESTER (2019-20AB)
PCC-EC404: ANALOG COMMUNICATIONS
MODEL QUESTION PAPER

Time: 3hrs. **Max. Marks: 75**

SECTION-A (4 X 15 = 60 M)

Answer ALL Questions

1. a) With suitable diagram explain the square-law diode modulation method for AM generation? **(8M)**

b) An amplitude modulated voltage is given by

$V = 50 (1 + 0.2 \cos 100 t + 0.001 \cos 3500t) \cos 106 t.$

State all frequency components present in the voltage, and find modulation index for each modulating voltage term. What is the effective modulation index of V? **(7M)**

OR

c) Explain the generation of DSB-SC signal using balanced modulator? Derive the expression for DSBSC signal? **(8M)**

d) The peak amplitude of an amplitude modulated signal varies from 2V to 10V. Calculate the modulation index, modulation efficiency and total power? **(7M)**

2. a) Derive expression for the single tone modulated FM waves. **(8M)**

b) A carrier is frequency modulated by a sinusoidal signal of frequency 2kHz resulting in a maximum frequency deviation of 6kHz. i) Calculate the modulation index and band width ii) If the amplitude of the message signal is increased by a factor of 3and its frequency is decreased to 2 kHz. Calculate the modulation index and B.W. **(7M)**

OR

c) Explain in detail about NBFM and WBFM. Derive the expression for bandwidth of wideband FM. **(8M)**

d) List out the differences between AM and FM? **(7M)**

3. a) Explain the importance of sampling theorem. What is aliasing and how is it avoided**.** **(10M)**

b) Explain Nyquist rate if sampling. **(5M)**

OR

c) With neat sketch explain the generation of PPM from PWM. **(10M)**

d) Compare merits and demerits of TDM and FDM. **(5M)**

4. a) Discuss the noise performance of AM system using envelop detection? **(8M)**

b) Explain clearly about pre-emphasis and de-emphasis in FM wave. **(7M)**

OR

c) With the aid of the block diagram explain TRF receiver. Also explain the basic super heterodyne principle. **(8M)**

d) List out the advantages and disadvantages of TRF receiver. **(7M)**

Section-B (5 X 3 =15 Marks)

5. Answer any FIVE of the following:

a) Explain need for modulation.
b) What are the Advantages of SSB systems? List Application of SSB?
c) What are Advantages & Applications of FM?
d) Define PLL.
e) Compare PAM, PPM, and PWM.
f) List out various noise sources.
g) List the Classification of receivers.
h) Define noise figure, noise equivalent temperature.

ADIKAVI NANNAYA UNIVERSITY::RAJAMAHENDRAVARAM
B. TECH (ECE) IV SEMESTER (2019-20AB)
HSMC-EC405: MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS
MODEL QUESTION PAPER

Time: 3hrs. **Max. Marks: 75**

SECTION-A (4 X 15 = 60 M)

Answer ALL Questions

1. a) What is managerial economics? Explain its nature and significance. [15M]

OR

b) What do you understand by elasticity of Demand? Explain the factors governing it. [15M]

2. a) Discuss about different costs in cost analysis. [15M]

OR

b) A hi-tech rail can carry a maximum of 36000 passengers per annum at a fare of Rs.400. the variable cost per passenger is Rs.150 while the fixed costs are 25,00,000/- per year. Find the break-even point in terms of number of passengers and also in terms of fare collection. [15M]

3. a) Explain the advantages and disadvantages of partnership firm. [15M]

OR

b) Discuss the business challenges in the era of globalization. [15M]

4. a) What is capital budgeting? Explain the significance of capital budgeting. [15M]

OR

b) What is ratio analysis? Discuss the different types of balance sheet ratios. [15M]

Section-B (5 X 3 =15 Marks)

5. Answer any FIVE of the following

a) Explain Law of demand and types of demand
b) Write about Isoquants and Isocosts
c) Explain the objectives of pricing
d) What are the profitable ratios?
e) Write about the joint stock company
f) Explain the features of Monopoly competition.
g) How to determine the demand
h) Explain about the financial statements.

III B. Tech I Semester ECE w.e.f 2019-20(V Semester)

Course Code	Title of the Course	Hours/weeks			Max Marks		Total Marks	Credits
		L	T	P	Internal	External		
PCC-EC501	Linear IC Applications	3	0	0	25	75	100	3
PCC-EC502	Antennas and Wave Propagation	3	0	0	25	75	100	3
PCC-EC503	Digital Communications	3	0	0	25	75	100	3
OEC-EC504	**Open Elective Course-I** D. Computer Organization E. Networks and Protocols F. Data Mining and Ware Housing	2	0	2	25	75	100	3
PEC-EC505	**Professional Elective - I** D. VLSI Design E. Digital IC Design F. Optoelectronics.	3	0	0	25	75	100	3
LC-EC506	Digital Communications Lab	0	0	3	50	50	100	1.5
LC-EC507	Linear IC Applications Lab	0	0	3	50	50	100	1.5
SDC-EC508	Skill Development Course	1	0	2	50	50	100	2
MC-EC509	Constitution of India	2	0	0	25	75	100	0
Summer Internship 2 Months (Mandatory) after Second year (to be evaluated during V Semester		0	0	0	100	-	100	1.5
TOTAL CREDITS		17	0	10	400	600	1000	21.5

Note: 2 lab Hrs/Week and 1 Theory Hrs/Week for SKILL DEVELOPMENT COURSE or 2 Theory Hrs/ Week.

ADIKAVI NANNAYA UNIVERSITY::RAJAMAHENDRAVARAM
B. TECH (ECE) V SEMESTER (2019-20AB)
PCC-EC501: LINEAR IC APPLICATIONS
MODEL QUESTION PAPER

Time: 3hrs. **Max. Marks: 75**

SECTION-A (4 X 15 = 60 M)

Answer ALL Questions

1. a) Explain the application of op-amp as (1) integrator (2) differentiator. **(7M)**
b) Write short notes on classification of Integrated circuits. **(8M)**

OR

c) Discuss about multivibrator with an example. **(8M)**
d) Write brief notes on op-amp parameters. **(7M)**

2. a) Explain IC1496 balanced modulator with a neat sketch. **(15M)**

OR

b) Briefly explain about saw-tooth square wave generator. **(15M)**

3. a) Explain about mono stable and astable operations of 555 timers. **(8M)**
b) Write about phase locked loop. **(7M)**

OR

c) What are the applications of VCO. **(8M)**
d) Explain Schmitt trigger. **(7M)**

4. a) Explain about R-2R ladder DAC. **(15M)**

OR

b) What are the basic DAC techniques. **(15M)**

Section-B (5 X 3 =15 Marks)

5. Answer any FIVE of the following:

a). Explain about 741 op- amp with pin diagram.
b). Explain about instrumentation amplifier**.**
c). What are the first and second order of LPF.
d). Define band pass and band reject filters**.**
e). Draw the pin diagram of 555 timer and explain.
f). What are the applications of PLL.
g). What are the different types of ADC.
h). Explain about weighted resistors of DAC.

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ADIKAVI NANNAYA UNIVERSITY::RAJAMAHENDRAVARAM
B. TECH (ECE) V SEMESTER (2019-20AB)
PCC-EC502: ANTENNAS AND WAVE PROPAGATION
MODEL QUESTION PAPER

Time: 3hrs. **Max. Marks: 75**

SECTION-A (4 X 15 = 60 M)

Answer ALL Questions

1) **a)** Explain the radiation mechanism in short dipole. **[8M]**
b) Explain about field regions of an antenna. **[7M]**

(OR)

c) Explain about radiation intensity of an antenna. **[7M]**
d) Discuss about linear, circular and elliptical polarizations. **[8M]**

2. **a)** Define effective area and explain its significance. **[8M]**
b) State reciprocity theorem and explain its use in antennas. **[7M]**

(OR)

c) Explain about Radiation from a half-wave dipole. **[8M]**
d) Explain current distribution on linear dipoles. **[7M]**

3. a) Explain about Broad side array. **[8M]**
b) Explain about Folded dipoles and write its characteristics. **[7M]**

(OR)

c) Explain about Radiation from a Quarter-wave monopole. **[8M]**
d) Derive the expression for field strength of a uniform linear array. **[7M]**

4. a) Derive the expression for field strength due to space wave. **[8M]**
b) Write the salient features of ground wave propagation. **[7M]**

(OR)

c) Explain the mechanism of ionospheric propagation. **[8M]**
d) What is meant by Duct propagation? Explain. **[7M]**

Section-B (5 X 3 =15 Marks)

5. Answer any FIVE of the following:

a) Define polarization
b) Write short notes on characteristic impedance of patch antenna.
c) Define Gain and Resolution of an antenna
d) Define Skip distance.
e) What is meant by beam efficiency?
f) What is meant by Ground wave? Explain
g) Write the applications of Horn antenna.
h). What is meant by Duct propagation.

ADIKAVI NANNAYA UNIVERSITY::RAJAMAHENDRAVARAM
B. TECH (ECE) V SEMESTER (2019-20AB)
PCC-EC503: DIGITAL COMMUNICATIONS
MODEL QUESTION PAPER

Time: 3hrs. **Max. Marks: 75**

SECTION-A (4 X 15 = 60 M)

Answer ALL Questions

1. a) Explain the elements of Digital communication system. **(7M)**
b) Explain sampling , quantization and coding**.** **(8M)**

OR

c) Write the comparison of PCM and DM systems. **(15M)**

2. a) What are the similarity of BFSK & BPSK. **(15M)**

OR

b) Explain about ASK, FSK , PSK, DPSK, DEPSK. **(7M)**
c) Explain the calculation of error probability of ASK, BPSK. **(8M)**

3. a) Explain entropy and its properties. **(8M)**
b) Explain mutual information and its properties**.** **(7M)**

OR

c) Explain Shanon –Fano coding with example. **(8M)**
d) Explain Huffman coding with example. **(7M)**

4. a) Explain Error detection and Error correction capability of Linear block codes. **(15M)**

OR

b). what is Shanon – Fano coding and give the examples for it. What are the advantages of Shanon – Fano coding. **(15M)**

Section-B (5 X 3 =15 Marks)

5. Answer any FIVE of the following:

a) Explain about quantization.
b) Explain delta modulation and its draw back
c) Explain about QPSK.
d) Define optimum filter.
e) What is average information.
f) What are the advantages of Shanon – Fano coding.
g) What are BCH codes.
h) Explain about tree and trellis diagram decoding.

ADIKAVI NANNAYA UNIVERSITY::RAJAMAHENDRAVARAM
B. TECH (ECE) V SEMESTER (2019-20AB)
OEC-EC504A: COMPUTER ORGANIZATION
MODEL QUESTION PAPER

Time: 3hrs. **Max. Marks: 75**

SECTION-A (4 x 15=60)

Answer ALL Questions

1 (a) Explain different addressing modes with examples. **[15M]**

OR

(b) Explain Design of Accumulator logic. **[15M]**

2 (a) Write notes on asynchronous data transfer. **[15M]**

OR

(b) Explain direct memory access? **[15M]**

3 (a) Explain in brief main memory concepts? **[08M]**

(b) Expalin in brief cache memory. **[07M]**

OR

(c) Explain the concepts of virtual memory? **[15M]**

4 (a) Explain 8085 Microprocessor Architecture? **[15M]**

OR

(b) Explain Intel 8085 Microprocessor Instructions? **[15M]**

SECTION-B (5 x 3=15M)

Answer any FIVE Questions

5. Write a short notes on

a) Stack Organization?
b) Instruction cycle?
c) I/O vs memory bus?
d) Priority interrupts?
e) Associative memory?
f) Memory protection?
g) Write short notes on 8085 pin configuration?
h) Intel 8085 instructions of Arithmetic and logic group

ADIKAVI NANNAYA UNIVERSITY::RAJAMAHENDRAVARAM
B. TECH (ECE) V SEMESTER (2019-20AB)
OEC-EC504B: NETWORKS AND PROTOCOLS
MODEL QUESTION PAPER

Time: 3hrs. **Max. Marks: 75**

SECTION-A (4 x 15=60)

Answer ALL Questions

1. a) Explain briefly the design of ARQ. [15M]

(OR)

b) Write about different types of messages & general message formats of ICMP. 15M]

2 a) Explain the concept of sub-netting. [8M]

b. Explain briefly TCP design. [7M]

(OR)

c) Explain briefly UDP operation. [8M]

d) Explain TCP header option. [7M]

3 a) Explain IGMP operation is single network. [8M]

b) Write about communication in FTP. [7M]

(OR)

c) Explain connection management in TCP [15M]

4 a) Write about DNS in the internet. [8M]

b) Explain BOOTP protocol. [7M]

(OR)

c) Explain HTTP. [8M]

d) Explain client-server model. [7M]

SECTION-B (5 x 3=15M)

Answer any FIVE Questions

5. Write a short notes on

a. What is super netting?
b. Why do you use RARP?
c. What is Gateway?
d. What is MBONE?
e. Write the format of UDP.
f. Define data encryption.
g. Define the concept of sockets.

ADIKAVI NANNAYA UNIVERSITY::RAJAMAHENDRAVARAM
B. TECH (ECE) V SEMESTER (2019-20AB)
OEC-EC504C: DATA MINING AND WARE HOUSING
MODEL QUESTION PAPER

Time: 3hrs. **Max. Marks: 75**

SECTION-A (4 X 15 = 60 M)

Answer ALL Questions

1. a). Compare and contrast OLAP and OLTP. [15M]

OR

b) What are different schemas for design of a data ware house? Explain with neat sketches. [15M]

2. a) Explain how the evolution of database technology led to data mining. [15M]

OR

b) Describe any five advanced data base systems and applications. [15M]

3. a) What is association rule Mining problem? Explain Aprori algorithm for finding frequent item sets with example. [15M]

OR

b) What is the difference between mining frequent item sets with candidate generation and without candidate generation? Explain. [15M]

4. a) Briefly describe the ways to reduce the computational complexity of frequent item set generation. [15M]

OR

b) What is candidate generation? List the requirements for an effective candidate generation. [8M]

c) Briefly describe the relation among frequent, maximal frequent and closed frequent item sets. [7M]

Section-B (5 X 3 =15 Marks)

5. Answer any FIVE of the following:

a) What is data mining? Give an example.
b) Compare and contrast ROLAP versus MOLAP
c) What is data integration and why it is necessary?
d) What is classification? Explain briefly.
e) What are the time and space complexities of K-means clustering algorithm?
f) What is Apriori principle? Explain briefly.
g) Why confidence-based pruning is required?
h) Would the cosine measure be the appropriate similarity measure to use with Kmeans clustering for time series data? Why or why not?

ADIKAVI NANNAYA UNIVERSITY::RAJAMAHENDRAVARAM
B. TECH (ECE) V SEMESTER (2019-20AB)
PEC-EC504A: VLSI DESIGN

MODEL QUESTION PAPER

Time: 3hrs. **Max. Marks: 75**

SECTION-A (4 X 15 = 60 M)

Answer ALL Questions

1. a) What are the steps involved in the nMOS fabrication? Explain with neat sketches. **(7M)**
b) Explain the structures of n MOS enhancement mode, depletion mode and p-MOS enhancement mode transistors**.** **(8M)**

OR

c) Derive the expression for the ratio between Zp.u and Zp.d if an nMOS inverter is to be driven from another nMOS inverter. **(8M)**
d) Draw and explain the operation of BiCMOS inverter. **(7M)**

2. a) What is a stick diagram? Explain about different symbols used for components in stickdiagram. **(8M)**
b) Draw and Explain about the nMOS inverter design style. **(7M)**

OR

c) Explain about Lambda Based Design Rules. **(7M)**
d) Design a stick diagram for 2 input NAND gate by using CMOS Logic. **(8M)**

3. a). Explain the concept of sheet resistance and apply it to compute the ON resistance (VDD to GND) of an NMOS inverter having pull up to pull down ratio of 4:1, If n channel resistance isRsn =104 Ω per square. **(7M)**
b) What is inverter delay? How delay is calculated to for multiple stages? **(8M)**

OR

c) Realize basic gates using NMOS. **(8M)**
d) Explain the structured design approach of parity generator. **(7M)**

4. a) Explain about building block architecture of FPGA. **(8M)**
b) Write the VHDL code to implement stack. **(7M)**

OR

b) Write the VHDL code to implement four bit shift register. **(8M)**
c) Explain the design flow using FPGA. **(7M)**

Section-B (5 X 3 =15 Marks)

5. Answer any FIVE of the following:
a) Compare CMOS, Bipolor, BiCMOS technologies?
b) Define the terms figure of merit ($\omega 0$), Pass transistor, gds.
c) Explain how stick diagrams can be used for layout diagrams.
d) Design a stick diagram for inverter using CMOS.
e) Explain a four line Gray code to Binary code converter.
f) Write short notes on switch logic and its arrangements.
g) List the applications of FPGA.
h) Explain the functions of LUT based logic block.

ADIKAVI NANNAYA UNIVERSITY::RAJAMAHENDRAVARAM
B. TECH (ECE) V SEMESTER (2019-20AB)
PEC-EC504B: DIGITAL IC DESIGN
MODEL QUESTION PAPER

Time: 3hrs. **Max. Marks: 75**

SECTION-A (4 X 15 = 60 M)

Answer ALL Questions

1. a) Determine the pull-up to pull-down ratio for an NMOS inverter [15M]

(OR)

b) What are the criteria for voltage threshold for high level and low level in NMOS inverter characteristics? Explain [15M]

2. a Explain and derive the necessary DC region equations of a CMOS inverter. [15M]

(OR)

b Explain the DC noise margin of CMOS logic [15M]

3. a) Explain voltage boots trapping with an example. [15M]

(OR)

b) Explain the concept of charge storage and charge leakage associated with pass transistor logic. [15M]

4. a) Write about the leakage currents in SRAM. [15M]

b) Explain NOR flash memory [15M]

Section-B (5 X 3 =15 Marks)

5. Answer any FIVE of the following:

a) Write short notes on transmission gates with the relevant circuits.
b) Design the operation of 2 input NMOS NAND
c) Bring out the two differences between Pass Transistor logic and transmission gate logic.
d) Define voltage boots trapping
e) Write notes on pseudo NMOS logic gate
f) Differentiate any three static and dynamic latches.
g) Write short notes on Dynamic pass transistor
h) What are the types of DRAM

ADIKAVI NANNAYA UNIVERSITY::RAJAMAHENDRAVARAM
B. TECH (ECE) V SEMESTER (2019-20AB)
PEC-EC504C: OPTOELECTRONICS.
MODEL QUESTION PAPER

Time: 3hrs. **Max. Marks: 75**

SECTION-A (4 X 15 = 60 M)

Answer ALL Questions

1. a) Derive the expressions for Carrier life time [15M]

(OR)

b) Explain about optical absorption and optical recombination [15M]

2. a) Differentiate between Direct andIndirect band gap semiconductors [15M]

(OR)

b) Draw and explain about Hetro junction LEDs used in optical fiber communication [15M]

3. a) With a neat diagram explain about vertical surface emitting LASERs [15M]

(OR)

b) Explain the principle of laser diode and laser oscillator conditions [15M]

4. a) What is liquid crystal display? Explain reflection and transferrable types [15M]

(OR)

b) WhaT IS p-n JUNCTION? Explain the Photovoltaic V-I characterstics [15M]

Section-B (5 X 3 =15 Marks)

5. Answer any FIVE of the following

a) Explain theproperties of single and compound semiconductors
b) Differentiate between optical recombination and optical absorption
c) Draw the energy band diagram of the semiconductors
d) Write about LED materials and types
e) Define stimulated emission in lasers
f) Write about QuaNTUM WELL Quantum dot devices
g) Write about LED TV
h)Write about Solar cells materials and Plasma Displays

ADIKAVI NANNAYA UNIVERSITY::RAJAMAHENDRAVARAM
B. TECH (ECE) V SEMESTER (2019-20AB)
MC-EC509: CONSTITUTION OF INDIA
MODEL QUESTION PAPER

Time: 3hrs. **Max. Marks: 75**

SECTION-A (4 X 15 = 60 M)
Answer ALL Questions

1.a) What is a Constitution? Explain the importance of Preamble. **(15M)**

OR

b) Explain in detail the Fundamental Rights and Duties.

2.a) Explain Judiciary and its structure. **(8M)**

b) Explain Federalism and Centre-State relationship structure **(7M)**

OR

c) Explain the role of President and his powers. **(8M)**

d) Elucidate upon the structure of Lok Sabha. **(7M)**

3.a) Explain the Role and Importance of Municipalities **(15M)**

OR

b) Explain the significance of Panchayat Raj.

4.a) What is the role of Election Commission? Explain the powers vested to Election Commissioner. **(15M)**

OR

b) What are some of the functions taken up by the EC for the welfare of SC/ST/OBC and Women?

SECTION- B (5×3=15M)

5. Answer any FIVE Questions

Explain about the fallowing:

a) History of Indian Constitution

b) Directive Principles of State Policy

c) The Supreme Court

d) Council of Ministers

e) Structure of State Secretariat

f) Grass root Democracy

g) Zila Panchayat

h) Sources of Indian Constitution

III B. Tech II Semester ECE w.e.f 2019-20(VI Semester)

Course Code	Title of the Course	Hours/weeks			Max Marks		Total Marks	Credits
		L	T	P	Internal	External		
PCC-EC601	Microprocessors and Microcontrollers	3	0	0	25	75	100	3
PCC-EC602	Microwave Engineering	3	0	0	25	75	100	3
PCC-EC603	Digital Signal Processing	3	0	0	25	75	100	3
PEC-EC604	**Professional Elective Course - II** D. Computer Networks Engineering. E. Artificial Neural Networks and Fuzzy Logic. F. Bio-Medical Engineering.	3	0	0	25	75	100	3
OEC-EC605	**Open Elective Course - II** D. Python Programming E. Object Oriented Programming Through Java. F. Machine Learning.	2	0	0	25	75	100	3
LC-EC606	Microprocessors and Microcontrollers Lab	0	0	3	50	50	100	1.5
LC-EC607	Microwave Engineering Lab	0	0	3	50	50	100	1.5
LC-EC608	Digital Signal Processing Lab	0	0	3	50	50	100	1.5
SDC-EC609	Skill Development Course	1	0	2	50	50	100	2
TOTAL CREDITS		15	0	11	325	575	900	21.5

Note: 2 lab Hrs./Week and 1 Theory Hrs./Week for SKILL DEVELOPMENT COURSE or 2 Theory Hrs./ Week. Two months Summer Internship/Technical Course mandatory after Third year which can be evaluated during VII Semester.

ADIKAVI NANNAYA UNIVERSITY::RAJAMAHENDRAVARAM
B. TECH (ECE) VI SEMESTER (2019-20AB)
PCC-EC601: MICROPROCESSORS AND MICROCONTROLLERS
MODEL QUESTION PAPER

Time: 3hrs. **Max. Marks: 75**

SECTION-A (4 X 15 = 60 M)

Answer ALL Questions

1. a) Explain the architecture of 8086. **(15M)**

OR

b) Explain assembler directives of 8086. **(15M)**

2. a) What are assembly language program development tools. **(15M)**

OR

b) Explain 8086 Interrupts and interrupts response . **(15M)**

3. a) What are the specifications and different types of DAC and Interfacing. **(15M)**

OR

b) Explain briefly about 8251. **(15M)**

4. a) Explain the architecture of 8051. **(15M)**

OR

b) Write about instruction set of 8051. **(15M)**

Section-B (5 X 3 =15 Marks)

5. Answer any FIVE of the following:

a) What are the difference between MP & MC

b) Draw the pin configuration of 8086.

c) Explain the minimum mode system.

d) What are the ports in micro computer system.

e) Draw 8255 architecture.

f) Define DMA .

g) Draw the pin configuration of 8051 and explain.

h) What are the addressing modes of 8051.

ADIKAVI NANNAYA UNIVERSITY::RAJAMAHENDRAVARAM
B. TECH (ECE) VI SEMESTER (2019-20AB)
PCC-EC602: MICROWAVE ENGINEERING
MODEL QUESTION PAPER

Time: 3hrs. **Max. Marks: 75**

SECTION-A (4 X 15 = 60 M)

Answer ALL Questions

1. a) Explain the microwave spectrum and bands**.** **[15M]**

(OR)

b) What are the characteristics equation and cut off frequencies. **[15M]**

2. a)What are the S- matrix calculations for two port junctions , E- plane and H- plane tees. **[15M]**

(OR)

b) Explain S- matrix Calculations for Gyrator, Isolator and Circulator. **[15M]**

3. a) Explain O type and M type classifications. **[15M]**

(OR)

b) Explain velocity modulation process and applegate diagram. **[15M]**

4. a) Explain the description of Microwave bench , different blocks and their features **[15M]**

(OR)

b) Explain the measurement of Attenuation. **[15M]**

Section-B (5 X 3 =15 Marks)

5. Answer any FIVE of the following:

a). Draw the sketches of TE and TM mode fields in the cross section.
b). What are the applications of Microwaves.
c). Explain dielectric , rotary vane types.
d). Explain probe loop, aperture types.
e) Explain velocity modulation process.
f) Define Reflex klystron .
g) Define VSWR.
g) What are the impedance measurement.

ADIKAVI NANNAYA UNIVERSITY::RAJAMAHENDRAVARAM
B. TECH (ECE) VI SEMESTER (2019-20AB)
PCC-EC603: DIGITAL SIGNAL PROCESSING
MODEL QUESTION PAPER

Time: 3hrs. **Max. Marks: 75**

SECTION-A (4 X 15 = 60 M)

Answer ALL Questions

1. a) Find the solution to the following linear convolution difference equation
$(n) -3/2(n-1) +1/2(n-2) = (1/2)n \geq 0$ with initial conditions $y(-1) = 4$ and $y(-2) = 10$ (10M)
b) Explain causality and Stability of a linear time invariant system (5M)

OR

c) Determine the frequency response, Magnitude and Phase responses and time delay of the systems given by
$(n) = (n) - (n-1) + (n-2)$ (10M)
d) Derive the relationship between impulse response and frequency response of a discrete time system (5M)

2. a) Find the DFT of the Following sequence using FFT DIF $X(n) = \{1,2,3,5,5,3,2,1\}$ (10M)
b) Find the N-Point DFT for $(n) = a^n for\ 0 < a < 1$ (5M)

OR

c) Compute the DFT of the sequence $(n) = \sin[\sin n\pi/4]$, where N=8 using DIT FFT (10M)
d) Given $x(n) = \{1,2,3,4,4,3,2,1\}$, $findx(k) using DIFFFT algorithm$ (5M)

3. a) Realize the following IIR system functions in the direct form I and II and also Parallel form
$(Z) = 1/(1+az^{-1})(1-bz^{-1})$ (15M)

OR

b) What is a Keiser window? In what way is it superior to other window functions (5M)
c) Convert the analog filter to digital filter whose system function is $(s) = 1/(s+Z)2+(s+1)$ (10M)

4. a) Draw the block diagram of multistage interpolator and explain each block (10M)
b) Derive an expression for the spectrum of output signal of an decimator (5M)

OR

c) The Desired frequency of a low pass filter is $Hd(e-) = \{ e-j3w\ 0, Otherwise -3\pi 4 \leq w \leq 3\pi 4$
Determine ( ) $for M = 7$ using rectangular Window. (15M)

Section-B (5 X 3 =15 Marks)

5. Answer any FIVE of the following:

a) Find the power of the signal $[n] = (x) = \{3(-1), n \geq 00, n < 0$
b) What is BIBO stability? What are the conditions of BIBO system?
c) Show that the following systems are nonlinear and time invariant $(n) - (n)(n-1) = x(n)$
d) What are the basic building blocks of realization structures?
e) What are the Advantages of DSP processors in relation to general purpose processors?
f) State all properties of DFT?
g) Compare direct form I and direct form II realization of IIR systems?
h) What is the need for multirate signal processing?

ADIKAVI NANNAYA UNIVERSITY::RAJAMAHENDRAVARAM
B. TECH (ECE) VI SEMESTER (2019-20AB)
PEC-EC604A: COMPUTER NETWORKS ENGINEERING.
MODEL QUESTION PAPER

Time: 3hrs. **Max. Marks: 75**

SECTION-A (4 X 15 = 60 M)

Answer ALL Questions

1. a) What do you mean by computer network? Classify computer networks and Explain them in brief. (8M)
   b) Distinguish between TCP/IP and OSI Model (7M)

(OR)

   c) Explain detail about Network Hardware. How network hardware support the communication of two systems? (8M)
   d) Define Topology. Discuss in brief about computer network topologies (7M)
2. a) Define Topology. Discuss in brief about computer network topologies (8M)
   b) Explain details about ISDN. Describe the types of ISDN (7M)

(OR)

   c) Differentiate between guided and unguided transmission media. (8M)
   d) What are the advantages of Narrow brand and broad band ISDN? (7M)
3. a) What are the various types of error detection methods and explain in detail (15M)

(OR)

   b) Explain detail about the carrier sense multiple access protocols. (15M)
4. a) Describe importance of DNS in application layer (8M)
   b) What is multicasting? Briefly discuss multicasting techniques and protocols (7M)

(OR)

   c) Write a detailed note on transport services (8M)
   d) What is World Wide Web? Explain details about HTTP (7M)

Section-B (5 X 3 =15 Marks)

5. Answer any FIVE of the following:

a) Define Computer network

b) What are the advantages of MAN?

c) Discuss about unguided transmission media.

d) Write about Hamming code.

e) What is the purpose of DNS.

f) What are the advantages of transport layer.

g) What are the advantages of slotted Aloha.

h) What is the difference between broad casting and multicasting.

ADIKAVI NANNAYA UNIVERSITY::RAJAMAHENDRAVARAM
B. TECH (ECE) VI SEMESTER (2019-20AB)
PEC-EC604B: ARTIFICIAL NEURAL NETWORKS AND FUZZY LOGIC.
MODEL QUESTION PAPER

Time: 3hrs. **Max. Marks: 75**

SECTION-A (4 X 15 = 60 M)

Answer ALL Questions

1. a) Explain the biological prototype of neuron. Also explain the characteristics of neuron **(15M)**

OR

b) Explain with neat sketch the McCulloch-Pitts model of artificial neural network? **(15M)**

2. a) What are the learning strategies? Explain any two? **(15M)**

OR

b) Describe the activation dynamic models? **(15M)**

3. a) Discuss the working of single layer perceptron and multilayer perceptron with relevant algorithm and compare them **(15M)**

OR

b) Write about the applications of perceptron model? **(15M)**

4. a) Define membership? What are different types of membership functions with neatschematic? **(8M)**

b) Discuss any two membership value assignment? **(7M)**

OR

c) How do you convert a fuzzy set to single crisp value and discuss the methods to be used? **(15M)**

Section-B (5 X 3 =15 Marks)

5. Write a Short Note on any FIVE of the following

a) List out the Potential Applications of ANN.
b). Write about Neuron Activation Function.
c). What is Single Layer Feed Forward Neural Networks?
d). Explain about Kolmogorov Theorem.
e). Write about Reinforcement learning.
f). Differentiate fuzzy set from classical set and name the properties of classical (crisp) sets
g). Write the Applications of Fuzzy Logic
h). What is classical set?

ADIKAVI NANNAYA UNIVERSITY::RAJAMAHENDRAVARAM
B. TECH (ECE) VI SEMESTER (2019-20AB)
PEC-EC604C: BIO-MEDICAL ENGINEERING.
MODEL QUESTION PAPER

Time: 3hrs. **Max. Marks: 75**

SECTION-A (4 X 15 = 60 M)

Answer ALL Questions

1. a) How the bioelectric potentials are measured? Name some of the equipment using such measurement. **(7M)**

b) What is a man-instrument system? Explain. **(8M)**

OR

c) What is a man-instrument system? Explain **(8M)**

d) Discuss the Bioelectric potentials of EMG. **(7M)**

2. a) Draw different ECG lead configurations and explain recording of ECG. **(8M)**

b) Explain the electrical conduction system of a heart **(7M)**

OR

c) Explain the basic transducer principle with an example **(7M)**

d) Give the comparison of internal and external bio-potential electrodes. **(8M)**

3. a) Compare and contrast pacemakers and defibrillators. **(8M)**

b) With neat diagram explain about the calibration and repair ability of patient monitoring equipment. **(7M)**

OR

c) What are the elements of intensive-care unit? Explain. **(8M)**

d) What are the elements of intensive-care unit? Explain. **(7M)**

4. a) Explain about shock hazards of electrical equipment. **(8M)**

b) Explain the working principle of CT Scan with block diagram. **(7M)**

OR

c) What is the use of telemetry for ECG measurements? Explain. **(8M)**

d) What are the different types of recorders? Explain. **(7M)**

Section-B (5 X 3 =15 Marks)

5. Answer any FIVE of the following:

a) What is the use of bio amplifier?

b) Write the Nernst equation.

c) What are the different bio-chemical electrodes?

d) Draw reference electrode basic configuration.

e) What is the use of de- fibrillator?

f) What is macro shock?

g) Write notes on CAT

h)Applications of the CT Scan.

ADIKAVI NANNAYA UNIVERSITY::RAJAMAHENDRAVARAM
B. TECH (ECE) VI SEMESTER (2019-20AB)
OEC-EC605A: PYTHON PROGRAMMING
MODEL QUESTION PAPER

Time: 3hrs. **Max. Marks: 75**

SECTION-A (4 X 15 = 60 M)

Answer ALL Questions

1. a) Explain about Python Interpreter working and Syntax & Semantics [15M]

OR

b) Explain about Sequences and Dictionaries [15M]

2. a) Explain about Iterations and Comprehensions. [15M]

OR

b) Explain about Exception Handling with example Program [15M]

3. a) Explain about Handling Multiple Clients in Socket programming [15M]

OR

b) Explain about Client side scripting and Server Side Scripting [15M]

4. a) Explain about Event handling with examples [15M]

OR

b) Explain about SQL Database interfaces with sqlite3. [15M]

SECTION- B (5×3=15M)

5. Answer any FIVE Questions

Write short notes on

a) Control flow statements.

b) Lambda expressions.

c) Any 3 string functions.

d) Regular expressions.

e) CGI script.

f) Parameter passing.

g) tkinter.

h) urllib.

ADIKAVI NANNAYA UNIVERSITY::RAJAMAHENDRAVARAM
B. TECH (ECE) VI SEMESTER (2019-20AB)
OEC-EC605B: OBJECT ORIENTED PROGRAMMING THROUGH JAVA.
MODEL QUESTION PAPER

Time: 3hrs. **Max. Marks: 75**

SECTION-A (4 X 15 = 60 M)

Answer ALL Questions(4x15=60)

1. a) Why we need object oriented programming languages instead of structured programming languages? Explain. (7M)
   b) How can we say that java is a complete object oriented programming language? Justify your answer. (8M)

(OR)

   c) Explain the role of command line arguments in java programming (7M)
   d) Write a java program to find the individual digits of a given number. (8M)

2. a) With the help of syntax, flow chart and example program explain different conditional statements supported by java. (15M)

(OR)

   b) Write and explain bitwise, logical and special operator supported by java. (15M)

3. a) What is an array? Why we need them? list the different types of arrays supported by java? write a java program to multiply two matrices. (15M)

(OR)

   b) Define a package? write a java program to illustrate the working of packages. (8M)
   c) How can we assign the priorities to a thread? explain. (7M)
4. a) With the help of a neat sketch, explain the exception handling mechanism. (7M)
   b) Distinguish between applet and application programming. (8M)

(OR)

   c) With the help of a neat sketch explain the life cycle of an applet. (7M)
   d) Write a java program to read information from the keyboard, store it in a file and display the same. (8M)

Section-B (5 X 3 =15 Marks)

5. Answer any FIVE questions (5x3=15M)

a).Give brief information about the history of java.

b)Write a java program to find the factorial value of any given number.

c) Write about the precedence of arithmetic operators .

d) Write a java program to illustrate increment and decrement operators.

e) Decribe about the thread synchronization.

f) Describe about the naming conventions used for packages.

g) Write short notes on types of errors.

h) Write an applet program to generate cycles and ellipses.

ADIKAVI NANNAYA UNIVERSITY::RAJAMAHENDRAVARAM
B. TECH (ECE) VI SEMESTER (2019-20AB)
OEC-EC605C: MACHINE LEARNING.
MODEL QUESTION PAPER

Time: 3hrs. **Max. Marks: 75**

SECTION-A (4 X 15 = 60 M)

Answer ALL Questions

1. a) Explain about Supervised, Unsupervised Learning and Batch and Online Learning(15M)

(OR)

b) Overfitting the Training Data and Underfitting the Training Data. (15M)

2. a) Explain about Measuring Accuracy Using Cross-Validation. (15M)

(OR)

b) Explain the Random Patches and Random Subspaces. (15M)

3. a) Explain about Expressing Linear Perceptrons as Neurons. (15M)

(OR)

b) Explain about Training Feed-Forward Neural Networks. (15M)

4. a) Explain about Logging and Training the Logistic Regression Model. (15M)

(OR)

b) Explain about Building a Multilayer Model for MNIST in TensorFlow. (15M)

SECTION- B (5×3=15M)

5. Answer any FIVE of the following:

a) Types of Machine Learning Systems.

b) Training Data.

c) Confusion Matrix.

d) Voting classifier.

e) Linear neuron.

f) Gradient Descent.

g) Tensor Flow.

h) Placeholder Tensor.

IV B. Tech I Semester ECE w.e.f 2019-20(VII Semester)

Course Code	Title of the Course	Hours/weeks			Max Marks		Total Marks	Credits
		L	T	P	Internal	External		
PEC-EC701	**Professional Elective Course-III** D. Radar Engineering. E. Satellite Engineering. F. Analog IC Design.	3	0	0	25	75	100	3
PEC-EC702	**Professional Elective Course -IV** D. Electronic Measurements and Instrumentations E. Fibre optics and wireless optical Communications. F. Information Theory and Coding	3	0	0	25	75	100	3
PEC-EC703	**Professional Elective Course -V** D. Mobile Cellular Communications. E. Wireless Communication. F. ASIC Design .	3	0	0	25	75	100	3
OEC-EC704	**Open Elective Course - III** D. Digital Image Processing. E. Software Defined Radio. F. Television Engineering.	2	0	2	25	75	100	3
OEC-EC705	**Open Elective Course - IV** D. Embedded System. E. Global Positioning Systems. F. Smart Antenna Systems .	2	0	2	25	75	100	3
HSMC-EC706	Management Science	3	0	0	25	75	100	3
SDC-EC707	Skill Development Course	1	0	2	50	50	100	2
Summer Internship 2 Months (Mandatory) after Second year (to be evaluated during V Semester		0	0	0	100	--	100	1.5
TOTAL CREDITS		17	0	06	300	500	800	21.5

Note: 2 lab Hrs./Week and 1 Theory Hrs./Week for SKILL DEVELOPMENT COURSE or 2 Theory Hrs./ Week.

ADIKAVI NANNAYA UNIVERSITY::RAJAMAHENDRAVARAM
B. TECH (ECE) VII SEMESTER (2019-20AB)
PEC-EC701A: RADAR ENGINEERING.
MODEL QUESTION PAPER

Time: 3hrs. **Max. Marks: 75**

SECTION-A (4 X 15 = 60 M)

Answer ALL Questions

1. a) Draw and explain simple radar block diagram. [8M]
   b) Explain how radar cross section controls the radar performance. [7M]

(OR)

   c) Derive modified radar range equation. [8M]
   d) Explain the effect of Signal to Noise ratio in radar with suitable expressions. [7M]
2. a) Describe the operation of CW Radar with neat diagram. [8M]
   b) Explain the range and Doppler measurement of FM-CW radar. [7M]

(OR)

   c) Discuss, what are the limits effects the MTI performance. [8M]
   d) Discuss how error signal is generated from sequential lobing [7M]
3. a) Describe the operation of amplitude comparison mono pulse radar for single angular coordinate. [8M]
   b) Explain radar antenna parameters. [7M]

(OR)

   c) Draw and explain the block diagram of two-coordinate amplitude–comparison mono pulse tracking radar. [8M]
   d) Design and explain cosecant-squared antenna pattern. [7M]
4. a) Write a short note on architecture for phased arrays. [8M]
   b) Discus the relationship between matched filter characteristics and correlation function. [7M]

(OR)

   c) Write a short note on (a) Circulator as Duplexers (b) Beam steering and Beam width changes [8M]
   d) Describe the operation of digitally phase shifters. [7M]

Section-B (5 X 3 =15 Marks)

5. **Answer any FIVE of the following:**
   a) List the applications of radar.
   b) Mention salient features of FMCW radar.
   c) What is blind speed? How it can be avoided
   d) Distinguish amplitude and phase comparison mono-pulse radar.
   e) Mention the types of tracking.
   f) What is need of delay line canceller?
   g) Define noise figure.

ADIKAVI NANNAYA UNIVERSITY::RAJAMAHENDRAVARAM
B. TECH (ECE) VII SEMESTER (2019-20AB)
PEC-EC701B: SATELLITE ENGINEERING.
MODEL QUESTION PAPER

Time: 3hrs. **Max. Marks: 75**

SECTION-A (4 X 15 = 60 M)

Answer ALL Questions

1. a) Explain the architecture of a satellite communication system. [8M]
   b) Explain the various applications of satellite communications. [7M]

(OR)

   c) Explain the history of Indian satellite communications. [8M]
   d) Describe the various frequencies used for satellite communications. [7M]

2 . a) Derive the expression for the time period of satellite's orbit [7M]
   b) Define the azimuth angle and derive the expression for it [8M]

(OR)

   c) Explain the altitude and orbit control system (AOCS) with necessary diagrams. [8M]
   b) What are the various approaches used to improve the reliability of the satellite? Explain any one. [7M]

3. a) What is satellite link equation? Derive the expression for it. [8M]
   b) Derive the expression for C/N ratio in a satellite link [7M]

(OR)

   c) What are the different types of antenna mounts used at earth station? Explain [8M]
   d) Explain the delay considerations of LEO, MEO and GEO satellites [7M]

4. a) Explain the frame structure of TDMA with a neat sketch [7M]
   b) Explain the generation of GPS signals with a neat sketch [8M]

(OR)

   c) Explain the principle FDMA with a neat diagram [7M]
   d) Explain the functions of control segment in GPS [8M]

Section-B (5 X 3 =15 Marks)

5. Answer any FIVE of the following:

a) Write the Keppler's laws of planetary motion
b) Define apogee of a satellite
c) What are the various orbital elements
d) List out the main types of antennas used on satellite
e) Define Intermodulation
f) List out the disadvantages of LEO satellites
g) What are the limitations of GPS.
h) Explain the principle FDMA.

ADIKAVI NANNAYA UNIVERSITY::RAJAMAHENDRAVARAM
B. TECH (ECE) VII SEMESTER (2019-20AB)
PEC-EC701C: ANALOG IC DESIGN.
MODEL QUESTION PAPER

Time: 3hrs. **Max. Marks: 75**

SECTION-A (4 X 15 = 60 M)

Answer ALL Questions

1. a) Why is Emitter resistor R_E replaced by a constant bias circuit in differential amplifier stage of an OP-amp. [15M]

(OR)

b) Briefly explain the need for compensating networks in Op-amps? [15M]

2. a) What is a Compensator? List the important characteristics of the comparator [15M]

(OR)

b) Explain about CMOS sample and hold circuit with neat Waveforms [15M]

3. a) What is the difference between A/D and D/A converters and give one example on each and Explain. [15M]

(OR)

b) Draw and analyze cascode current mirror. [15M]

4. a) a) Discuss about non ideal effects in PLL. [15M]

(OR)

b) Explain the operation of cross coupled oscillator. [15M]

Section-B (5 X 3 =15 Marks)

5. Answer any FIVE of the following:

a) Define sheet resistance.
b) Define sensititvity of a voltage reference.
c) Classify output amplifiers.
d) Define slewrate and derive an expression for it.
e) What is autozeroing technique?
f) Explain how skew reduction is done using PLL.
g) Derive the sub threshold MOS model
h) Define Offset and gain error

ADIKAVI NANNAYA UNIVERSITY::RAJAMAHENDRAVARAM
B. TECH (ECE) VII SEMESTER (2019-20AB)
PEC-EC702A: ELECTRONIC MEASUREMENTS AND INSTRUMENTATIONS
MODEL QUESTION PAPER

Time: 3hrs. **Max. Marks: 75**

SECTION-A (4 X 15 = 60 M)

Answer ALL Questions

1. a) What is the significance of the number of significant figures in a stated quantity? Give some Examples **(7M)**

b) How the working of a potentiometer type digital voltmeter be explained **(8M)**

OR

c) Define the sensitivity of a multimeter. Explain the operation of a multimeterusing a simple block **(8M)**

d) What is the principle and operation of Thermocouple RF type Ammeter. **(7M)**

2. a) Discuss the Square wave and Pulse generator with neat block Diagrams. **(8M)**

b) Explain the significance and working of frequency selective wave analyzer **(7M)**

OR

c) Draw the circuit diagram and explain the operation of Digital spectrum analyzer **(7M)**

d) Explain the dynamic response of a second order instrument . **(8M)**

3. a) Write short notes on portable oscilloscopes . **(8M)**

b) With a neat diagram, describe the working of a triggered sweep CRO **(7M)**

OR

c) Explain the operation of vertical amplifier used in a CRO **(8M)**

d) Explain the operation of trigger pulse circuit. **(7M)**

4. a) Describe the method of measuring high impedance using Q-meter **(8M)**

b) Explain the working of capacitive transducers **(7M)**

OR

c) Explain the working of capacitive transducers. **(8M)**

d) Describe the construction and working of LVDT. **(7M)**

Section-B (5 X 3 =15 Marks)

5. Answer any FIVE of the following:

a) Define the terms Accuracy and resolution
b) Define sensitivity and precision of an instrument
c) Explain how the range of DC voltmeter is extended
d) Describe the standard specifications of a CRO
e) What are the applications of spectrum analyzer
f) What are the main elements of velocity transducer
g) Define Gauge factor for transducer and explain its significance.
h) Principal of LVDT.

ADIKAVI NANNAYA UNIVERSITY::RAJAMAHENDRAVARAM
B. TECH (ECE) VII SEMESTER (2019-20AB)
PEC-EC702B: FIBRE OPTICS AND WIRELESS OPTICAL COMMUNICATIONS.
MODEL QUESTION PAPER

Time: 3hrs. **Max. Marks: 75**

SECTION-A (4 X 15 = 60 M)

1. a) Explain the basic principal of Optical Fiber. Compare Optical Fiber with Coaxial cable as a communication channel. [7M]
   b) For a multimode step index optical fiber of glass core of refractive index 1.5 and quartz cladding of refractive index 1.46 , determine:(i) critical angle (ii) Acceptance angle (iii) Numerical aperture [8M]

(OR)

   c) Explain electromagnetic mode theory in optical fiber in detail. [8M]
   d) Explain the importance of cladding in optical fiber communication. Justify the statement: "Light travels faster in cladding than core". [7M]
2. a) Explain core and cladding losses. Explain losses due to bending [7M]
   b) Derive the equation for intermodal dispersion [8M]

(OR)

   c) Differentiate between graded index and step index also define birefringence and V number [8M]
   d) Explain the different types of methods to minimize signal distortion in optical fibers [7M]
3. a) Write a short note on different types of fiber connectors [8M]
   b) What are the different types of alignments in optical fibers [7M]

(OR)

   c) Explain Butt joint connectors with neat circuit diagrams. [8M]
   d) Explain the connector return losses in optical fibers.
[7M]
4. a) Draw the light output versus current curve and explain the operation of LASER. [8M]
   b) Explain the semiconductor injection laser diode resonating mode. [7M]

(OR)

   c) Differentiate between power coupled to step index fiber and graded index fiber [8M]
   d) Explain the fundamental receiver operation in optical fiber communication [7M]

Section-B (5 X 3 =15 Marks)

5. Answer any FIVE of the following:

a) Explain the terms : (i) Cut off wave length (ii) Mode field diameter

b) What are the requirements of optical fiber? Explain glass and plastic materials in detail.

c) What are the mechanical properties of optical fibers? Explain

d) Explain the following terms : (i) Meridional rays (ii) Skew rays

e) Explain scattering losses in optical fibers

f) Write short notes on multiplexing in fiber optic receivers

g) What are the different types of light source materials

ADIKAVI NANNAYA UNIVERSITY::RAJAMAHENDRAVARAM
B. TECH (ECE) VII SEMESTER (2019-20AB)
PEC-EC702C: INFORMATION THEORY AND CODING
MODEL QUESTION PAPER

Time: 3hrs. **Max. Marks: 75**

SECTION-A (4 X 15 = 60 M)

Answer ALL Questions:

1. A) Explain Concept of Amount Of Information And Its Properties. **(15M)**

OR

B) Explain About Entropy And Properties. **(15M)**

2. A) Explain About Shanon Fano Coding With Examples. **(15M)**

OR

B) Capacity Calculation For Band Limited Gaussian Channels. **(15M)**

3. A) Explain About Error Detection And Error Correction Capabilities Of Linear BlockCodes. **(15M)**

OR

B) Matrix Description Of Linear Block Codes. **(15M)**

4. A) Explain Encoding Of Convolution Codes With Suitable Derivations. **(15M)**

OR

B) Explain The Concept Of Viterbi Algorithm. **(15M)**

Section-B (5 X 3 =15 Marks)

5. Answer any FIVE of the following:
Give Short Notes On

a) Discrete Messages.
b) Mutual Information.
c) Shannon Theorem.
d) Channel Capacity.
e) Hamming Codes.
f) Binary Cyclic Codes.
g) Trees.
h) Trelli

ADIKAVI NANNAYA UNIVERSITY::RAJAMAHENDRAVARAM
B. TECH (ECE) VII SEMESTER (2019-20AB)
PEC-EC703A: MOBILE CELLULAR COMMUNICATIONS.
MODEL QUESTION PAPER

Time: 3hrs. **Max. Marks: 75**

SECTION-A (4 X 15 = 60 M)

Answer ALL Questions

1. a) Explain about basic cellular system with neat diagram [8M]
   b) List and explain the factors that influence the performance of cellular system [7M]

(OR)

   c) What are the parameters that define the uniqueness of mobile radio environment? Explain any two. [8M]
   d) What are the limitations of Conventional mobile telephone system [7M]
2. a)Distinguish between Signal and Co-channel interference received by the mobile unit and cell cite [8M]
   b) With neat sketch, explain the concept of frequency reuse [7M]

(OR)

   c) Explain the real time co-channel interference measure in detail [8M]
   d) Distinguish between the permanent splitting and dynamic splitting [7M]
3. a) What is the function of frequency management [8M]
   b) Explain how a handoff is initiated [7M]

(OR)

   c) Write the channel sharing scheme with a neat sketch [8M]
   d) Differentiate between fixed and non-fixed channel assignment in detail [7M]
4. a) Explain services and features of TDMA [8M]
   b) Explain the architecture of GSM [7M]

(OR)

   c) Write a short note on TDMA structure frame length & frame offset [8M]
   d) What are the services offered by GSM channels [7M]

Section-B (5 X 3 =15 Marks)

5. Answer any FIVE of the following:

a) Explain the Trunking Efficiency
b) Briefly explain about cell shape and handoff
c) Discuss about normal umbrella pattern antenna
d) Write a note on paging channels
e) What is the advantage of delayed handoffs
f) What is the significance of multiple access schemes? Explain
g) Explain briefly about long distance propagation
h) Write a short note on CDMA.

ADIKAVI NANNAYA UNIVERSITY::RAJAMAHENDRAVARAM
B. TECH (ECE) VII SEMESTER (2019-20AB)
PEC-EC703B: WIRELESS COMMUNICATION.
MODEL QUESTION PAPER

Time: 3hrs. **Max. Marks: 75**

SECTION-A (4 X 15 = 60 M)

Answer ALL Questions:

1. a) Define Wireless Sensor Networks? Explain in brief about the Applications of Wireless Sensor Networks? [15M]

(OR)

b) Define Wireless Sensor Networks? Explain in brief about the Enabling Technologies for Wireless Sensor Networks? [15M]

2. a) 2 a) Explain in brief about WSN to Internet communication [8M]
   b) Explain in brief about WSN Tunneling? [7M]

(OR)

c) Explain in brief about Requirements for WSN Service Interfaces? [8M]
d) Define Gateway? Explain in brief about the need for Gateways? [7M]

3. a) Explain in brief about the Topology of Mobile Ad hoc Networks? [15M]

(OR)

b) Explain in brief about the Topology of Wide Area Networks? [15M]

4. a) Explain in brief about Topology Control in WSN? [8M]
   b) Explain in brief about Key Management in WSN? [7M]

(OR)

c) Explain in brief about Wireless Sensor network tools? [15M]

Section-B (5 X 3 =15 Marks)

5. Answer any FIVE of the following:

a) Write any two constraints and challenges of wireless sensor networks?
b) What are different driving applications?
c) Write any three differences between PAN and MAN technologies.
d) Define energy aware protocols in WSN
e) Draw sensor network architecture
f) Define Clustering
g) What are the various types of hybrid routing protocols.
h) Define Sensor Tasking

ADIKAVI NANNAYA UNIVERSITY::RAJAMAHENDRAVARAM
B. TECH (ECE) VII SEMESTER (2019-20AB)
PEC-EC703C: ASIC DESIGN.
MODEL QUESTION PAPER

Time: 3hrs. **Max. Marks: 75**

SECTION-A (4 X 15 = 60 M)

Answer ALL Questions:

1. a) Explain the ASIC design flow with neat flowchart (15M)

(OR)

b) Discuss the economics of ASIC (15M)

2. a) What are the ASIC cell library and Explain (15M)

(OR)

b) Explain ASIC physical design issues (15M)

3. a) Draw and explain in detail about Placement and Routing (15M)

(OR)

b) Draw and Explain SoC Design Flow (15M)

4. a) Explain the On-Chip Communication Architecture Standards (15M)

(OR)

b) Explain the High performance digital filters for sigma-delta ADC (15M)

Section-B (5 X 3 =15 Marks)

5. Answer any FIVE of the following:

a) What are the Types of ASICs,
b) Compare FPGA and CPLD
c) Define Power Dissipation
d) Explain briefly asynchronous and low power system design
e) Write the Basic Concepts of Bus-Based Communication Architectures
f) Write about IP based SoC
g) Define any two SoCs as case studies
h) Write short notes on Low Power SoC Design

ADIKAVI NANNAYA UNIVERSITY::RAJAMAHENDRAVARAM
B. TECH (ECE) VII SEMESTER (2019-20AB)
OEC-EC704A: DIGITAL IMAGE PROCESSING.
MODEL QUESTION PAPER

Time: 3hrs. **Max. Marks: 75**

SECTION-A (4 X 15 = 60 M)

Answer ALL Questions

1. a) What are the components of Image processing system. Explain briefly. **(7M)**
b) What re the fundamental steps in DIP**.** **(8M)**

OR

c) Derive SVD and KL Transform. **(8M)**
d) Explain Hadamard transform and Haar transform. **(7M)**

2. a) Explain the fundamentals of spatial filtering. **(8M)**
b) What are the combining spatial enhancement methods **(7M)**

OR

c) What are the sampling and the Fourier transform of sample functions. **(7M)**
d) Explain image smoothing using frequency domain filters. **(8M)**

3. a) Explain periodic noise reduction by frequency domain filtering. **(15M)**

OR

b) Explain LZW coding. **(15M)**

4. a) What are some basic morphological algorithms. **(15M)**

OR

b) What are the colour fundamentals colour models pseudo colour image processing. **(15M)**

Section-B (5 X 3 =15 Marks)

5. Answer any FIVE of the following:

a) Explain discrete cosine transform.
b) What are some basic relationships between pixels.
c) What are sharpening spatial filters
d) What are histogram processing.
e) Explain block transform coding.
f) Explain geometric mean filter.
g) Explain colour image compression.
h) What is smoothing and sharpening.

ADIKAVI NANNAYA UNIVERSITY::RAJAMAHENDRAVARAM
B. TECH (ECE) VII SEMESTER (2019-20AB)
OEC-EC704B: SOFTWARE DEFINED RADIO.
MODEL QUESTION PAPER

Time: 3hrs. **Max. Marks: 75**

SECTION-A (4 X 15 = 60 M)

Answer ALL Questions

1. a) With the help of a practical software radio model, explain the characteristics and benefits of a software radio. [8M]
   b) Outline the modules of SCA software framework. [7M]

(OR)

   c) How would you explain the purpose of RF-Front end in the design of a software radio system? [7M]
   d) Explain the following(i) The Heterodyne receiver(ii) Dual conversion super Heterodyne receiver. [8M]

2.a) Create a Software Radio spectrum Analyser using GNU radio. [8M]
   b) Describe the software that can be used in implementing the Software radioenvironment. [7M]

(OR)

   c) Perform a case study on TMS320C54x series DSPs. [15M]

3. a) Elaborate on the Common Object Request Broker Architecture (CORBA) [15M]

(OR)

   b) Considering Transfer characteristics of ADC/ DAC. What approach would you use in order toavoid the interference of other signals that impinge upon a radio's antenna . [15M]

4. a) Discuss the impacts of the Dynamic range and its limitation in the design of software radios.Present diagrams if required. [15M]

(OR)

   b) Summarize the noise and distortion that act as limiting factors in the RF circuit performance.[8M]
   c) Considering Transfer characteristics of ADC/ DAC. What approach would you use in order toavoid the interference of other signals that impinge upon a radio's antenna? [7M]

Section-B (5 X 3 =15 Marks)

5. Answer any FIVE of the following:

a) List down the four Software Radio Acquisition Parameters

b) Outline the characteristics and benefits of SDR

c) Interpret the necessity of the phases in SPEAK Easy program

d) What is the purpose of transmitter RF section?

e) Draw the block diagram of a digital AGC system

f) Draw the block diagram of a simple base station receiver

g) State sampling rate conversion.

h) Sketch the Interpolated Nyquist Pulse.

ADIKAVI NANNAYA UNIVERSITY::RAJAMAHENDRAVARAM
B. TECH (ECE) VII SEMESTER (2019-20AB)
OEC-EC704C: TELEVISION ENGINEERING.
MODEL QUESTION PAPER

Time: 3hrs. **Max. Marks: 75**

SECTION-A (4 X 15 = 60 M)

Answer ALL Questions

1. a) What is colour temperature? How colour temperature is useful in video processing? [8M]
   b) Explain in detail about how interlaced scanning takes place. [7M]

(OR)

c) Explain in detail about colour signal generation and encoding. [15M]

2. a) Discuss in detail about PAL –D Color system. [8M]
   b) How the phase error is cancelled in the PAL system? [7M]

(OR)

c) With a neat diagram, explain the construction and working of Trinitron picture tube. [15M]

3. a) With a neat diagram, explain the various sections in UHF tuner. [15M]

(OR)

b) Explain in detail about automatic gain control. [15M]

4. a) Draw the block diagram of analogue receiver and briefly explain the blocks. [15M]

(OR)

b) Explain the concept of sampling rate / video sampling in digital/high definition television systems. [15M]

Section-B (5 X 3 =15 Marks)

5. Answer any FIVE of the following:

a) Define aspect ratio.
b) Define luminance.
c) What are the merits of SECAM system?
d) Write short notes on plasma display.
e) Why do we prefer horizontal polarization for television receiving antenna?
f) Name the essential parts of TV transmitter.
g) Write short notes on TFT LCD.
h) List out the uses of IF sections.

ADIKAVI NANNAYA UNIVERSITY::RAJAMAHENDRAVARAM
B. TECH (ECE) VII SEMESTER (2019-20AB)
OEC-EC705A: EMBEDDED SYSTEM.
MODEL QUESTION PAPER

Time: 3hrs. **Max. Marks: 75**

SECTION-A (4 X 15 = 60 M)

Answer ALL Questions:

1. a) What are the different types of memories used in Embedded System design? Explain the role of each. [15M]

(OR)

b) Discuss the concept of load store architecture and instruction pipelining. [15M]

2. a)What is non-operational quality attributes? Explain the important non-operationalquality attributes to be considered in any embedded system design. [15M]

(OR)

b) Explain the role of decoders in embedded hardware development. Draw thecircuit diagram for interfacing a 3-bit binary decoder with 8051. [15M]

3. a) Explain the high level language based embedded firmware development. [15M]

(OR)

b) What are pseudo-ops? What is the use of it in assembly language programming? [15M]

4. a) State the uses of assembler and deassembler in embedded applicationdevelopment. [15M]

(OR)

b) Explain the advantages and limitations of simulator based debugging. [15M]

Section-B (5 X 3 =15 Marks)

5. Answer any FIVE of the following:

a) List out the major application areas of embedded systems.

b) Define the role of logic gates in embedded hardware design?

c) What is the difference between big -endian and little-endian processors?

d) What is the difference between multiplexer and de-multiplexer?

e) Define task scheduling in the operating system context.

f) What is absolute object file?

g) What is a decompiler?

h) Write short notes on need of editor.

ADIKAVI NANNAYA UNIVERSITY::RAJAMAHENDRAVARAM
B. TECH (ECE) VII SEMESTER (2019-20AB)
OEC-EC705B: GLOBAL POSITIONING SYSTEMS.
MODEL QUESTION PAPER

Time: 3hrs. **Max. Marks: 75**

SECTION-A (4 X 15 = 60 M)

Answer ALL Questions:

1. a) What is Trilateration? How is user position computed in 2 D and 3D? [8M]
   b) Explain how the satellite positions and distance to each satellite are determined [7M]
   (OR)
   c) Which PRN code characteristics are important for the GPS systems and why? Explain with neat diagram how the P-code is generated? [15M]
2. a) What are the other Global Navigation Satellite systems and how does they different from the GPS system in terms of constellations and services provide by them? [15M]
   (OR)
   b) Describe the various GPS system segments. [7M]
   c) Write the basic equations for finding the user position. [8M]
3. a) What is Geodetic coordinate system and how does it different from the Geocentric coordinate system? [15M]
   (OR)
   b) Write the equation for conversions of Cartesian or ECEF coordinate to geodetic coordinate frame. [15M]
4. a) Explain Galileo signal components [15M]
   (OR)
   b) Answer any three of the following: [15M]

i) WGS Coordinate System
ii) C/A code and P code of GPS system
ii) Navigation Message System

Section-B (5 X 3 =15 Marks)

5. Answer any FIVE of the following

a) What are the sailent features of Block IIR-M GPS satellites
b) How did the NAVSTAR GPS originate?
c) Write the equation for GPS satellite transmitted signal.
d) What is GNSS? What are constituents of the GNSS system?
e) If the satellite signal travel time observed by the receiver from a particular is 70 msec.
f) What are the future constelltion of GPS system?
g) Differentiate between Geocentric and Geodetic coordinate system.
h) What are the advantages of Galileo signal structure over GPS?

ADIKAVI NANNAYA UNIVERSITY::RAJAMAHENDRAVARAM
B. TECH (ECE) VII SEMESTER (2019-20AB)
OEC-EC705C: SMART ANTENNA SYSTEMS .
MODEL QUESTION PAPER

Time: 3hrs. **Max. Marks: 75**

SECTION-A (4 X 15 = 60 M)

Answer ALL Questions:

1. a) Explain about Smart Antenna Configurations [15M]

(OR)

b) Draw and explain the Architecture of Smart Antenna System [15M]

2. a) What are the Conventional DOA estimation methods explain each of them [15M]

(OR)

b) Explain the ESPRIT Algorithm [15M]

3. a) Explain the RLS (Recursive Least-Squares) Algorithm [15M]

(OR)

b) Explain the CCI and ISI suppression [15M]

4. a) Differentiate single user data rate limits and multiple user data rate limits [15M]

(OR)

b) Explain Maximum Ratio Combing in detail [15M]

Section-B (5 X 3 =15 Marks)

5. Answer any FIVE of the following

a) Define Switched-Beam
b) Define Space Division Multiple Accesses
c) Define DOA
d) Define Space – Time Beamforming
e) Define SINR
f) Define LMS Algorithm
g) Define Maximum Ration Combining
h) Define the Combining Techniques

ADIKAVI NANNAYA UNIVERSITY::RAJAMAHENDRAVARAM
B. TECH (ECE) VII SEMESTER (2019-20AB)
HSMC-EC706: MANAGEMENT SCIENCE
MODEL QUESTION PAPER

Time: 3hrs. **Max. Marks: 75**

SECTION-A (4 X 15 = 60 M)

Answer ALL Questions 4 X 15 = 60

1. a) What is management? Explain the Taylor's scientific management. [15M]

OR

b) Explain the Maslow's theory of human needs. [15M]

2. a) What is meaning of HRM? Explain the functions of HR. [15M]

OR

b) Compare Vision, Mission, Strategies & Goals in its importance; also write model statements suitable for a Manufacturer of Electronics Components? [15M]

3. a) What is JIT Approach, how can you use JIT concepts in manufacture of electronic goods? [15M]

OR

b) Compare features, merits & demerits of Product & Process Type of Layouts? [15M]

4. a) Compare and contrast between CPM and PERT. [15M]

OR

b) What are the marketing strategies in each stage of PLC? [15M]

Section B (5×3=15M)

5. Answer any Five Questions

a) Explain about Planning.
b) What are the leadership styles?
c) Discuss merit rating.
d) Explain about welfare administration
e) What is balanced score card?
f) Explain about BPR
g) Write about PERT
h) What is marketing Mix?