GAYATRI VIDYA PARISHAD COLLEGE FOR DEGREE & P.G. COURSES (A)

RUSHIKONDA, VISAKHAPATANAM 530045 | website: www.gvpcdpgc.edu.in

(Approved by A.I.C.T.E | Affiliated to Andhra University | An ISO 9001:2015 Certified Institute)

ENGINEERING & TECHNOLOGY PROGRAM

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

4 Years B.TECH

Scheme of Instruction and Examination with effect from 2020-21 admitted batches onwards

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ENGINEERING AND TECHNOLOGY PROGRAM

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

ADMITTED BATCH 2020-21 (R-20 Regulation)

B. Tech I Year - I Semester

Course code	Category	Course Title	Hours per week			Internal Marks	External Marks	Total Marks	Credits
			L	T	P				
20091101	BSC	Engineering Mathematics – I	3	0	0	30	70	100	3
20091104	BSC	Engineering Physics	3	0	0	30	70	100	3
20091106	ESC	Engineering Graphics	3	0	0	30	70	100	3
20851807	PCC	Electronic Devices and Circuits (EDC)	3	0	0	30	70	100	3
20851808	PCC	Network Theory And Analysis (NTA)	3	0	0	30	70	100	3
20091104P	BSC	Engineering Physics Lab	0	0	3	50	50	100	1.5
20091110P	ESC	Workshop Lab	0	0	3	50	50	100	1.5
20851807P	PCC	Electronic Devices and Circuits Lab	0	0	3	50	50	100	1.5
		Total	**15**	**0**	**9**	**300**	**500**	**800**	**19.5**

B. Tech I Year - II Semester

Course code	Category	Course Title	Hours per week			Internal Marks	External Marks	Total Marks	Credits
			L	T	P				
20092101	BSC	Engineering Mathematics – II	3	0	0	30	70	100	3
20092103	BSC	Engineering Chemistry	3	0	0	30	70	100	3
20092109	HSMC	English	3	0	0	30	70	100	3
20092105	ESC	Computer Programming with C and Numerical Methods (CPNM)	3	0	0	30	70	100	3
20852802	PCC	Switching Theory And Logic Design(STLD)	3	0	0	30	70	100	3
20092103P	BSC	Engineering Chemistry Lab	0	0	3	50	50	100	1.5
20092109P	HSMC	English Language Lab	0	0	3	50	50	100	1.5
20092105P	ESC	Computer Programming with C and Numerical Methods Lab	0	0	3	50	50	100	1.5
		Total	**15**	**0**	**9**	**300**	**500**	**800**	**19.5**

ENGINEERING MATHEMATICS - I

(Common for Civil Engineering, Computer Science and Engineering, Electronics and Communication Engineering and Mechanical Engineering)
(Effective from the admitted batch of 2020-21)

Description	Subject Teaching Methodology	L	T	P	C
Course Code	**ENGINEERING MATHEMATICS -I**	**3**	**0**	**0**	**3**
	Total Marks : 100	**Ses.**		**Ext.**	
		30		**70**	
20091101		**Ext. Exam Time 3 Hrs.**			

L: Lectures; T: Tutorial; P: Practical; Ses: Sessionals; Ext: External; C: Credits

Course Objectives:

- To transmit the knowledge of Partial differentiation.
- To know of getting maxima and minima of function of two variables and finding errors and approximations.
- To expand a periodical function as Fourier series and half-range Fourier series.
- To evaluate double and triple integrals, volumes of solids and area of curved surfaces.

Course Outcomes:

CO 1: Find the partial derivatives of functions of two or more variables.
CO 2: Evaluate maxima and minima, errors and approximations.
CO 3: To expand a periodical function as Fourier series and half-range Fourier series.
CO 4: Have a fundamental understanding of Fourier series and be able to give Fourier expansions of a given function.
CO 5: Evaluate double and triple integrals, volumes of solids and area of curved surfaces.

SYLLABUS

UNIT-I
(Partial Differentiation)

Introduction - Functions of two or more variables - Partial derivatives - Homogeneous functions – Euler's theorem - Total derivative - Change of variables – Jacobins. Mean value Theorems (without proofs)

UNIT-II
(Applications of Partial Differentiation)

Geometrical interpretation -Tangent plane and Normal to a surface -Taylor's theorem for functions of two variables - Errors and approximations -Total differential. Maxima and Minima of functions of two variables - Lagrange's method of undetermined multipliers - Differentiation under the integral Sign - Leibnitz's rule.

UNIT-III
(Fourier Series)

Introduction - Euler's Formulae - Conditions for a Fourier Expansion - Functions having points of discontinuity - Change of Interval - Odd and Even Functions - Expansions of Odd or Even Periodic Functions, Half-Range Series - Parseval's Formula. Practical Harmonic analysis.

UNIT-IV

(Multiple Integrals)

Introduction - Double Integrals - Change of Order of Integration - Double Integrals in Polar Coordinates - Triple Integrals - Change of Variables.

UNIT-V

(Multiple Integrals-Applications)

Area enclosed by plane curves - Volumes of solids - Area of a curved surface - Calculation of Mass - Center of gravity - Moment of inertia - product of inertia – principal axes- Beta Function - Gamma Function - Relation between Beta and Gamma Functions.

TEXT BOOK:

Scope and Treatment as in "Higher Engineering Mathematics", by Dr. B.S. Grewal, 43rd Edition, Khanna publishers.

REFERENCE BOOKS:

1. Graduate Engineering Mathematics by V B Kumar Vatti., I.K.International publishing house Pvt. Ltd.
2. Advanced Engineering Mathematics by Erwin Kreyszig.
3. A text book of Engineering Mathematics, by N.P. Bali and Dr. Manish Goyal, Lakshmi Publications.
4. Advanced Engineering Mathematics by H.K. Dass. S. Chand Company.
5. Higher Engineering Mathematics by B.V. Ramana, Tata Mc Graw Hill Company.
6. Higher Engineering Mathematics by Dr. M.K.Venkataraman.

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ENGINEERING PHYSICS

(Common for CE, CSE, ECE and ME)

(Effective from the admitted batch of 2020-2021)

Description	Subject Teaching Methodology		L	T	P	C
Course Code **20091104**	**ENGINEERING PHYSICS**		**3**	**1**	**0**	**3**
Teaching	**Total Contact Hours : 60**	**Total Marks : 100**	**Ses. 30**		**Ext. 70**	
Prerequisite (s)	Knowledge of theoretical and experimental Physics from +2 Level. Application of Physics theory and calculations to required course		**Ext. Exam Time 3 Hrs.**			

Course Objectives:

The fundamentals of sciences are essential to learn as the application of science in solving problems is technology. The physics curriculum is designed in such a way that all branches of engineering will study the basic fundamentals of technology from where it is originated. The course objectives are

1. To impart knowledge in basic concept of physics of Thermodynamics relevant to engineering applications.
2. To grasp the concepts of physics for electromagnetism and its application to engineering. Learn production of Ultrasonics and their applications in engineering.
3. To Develop understanding of interference, diffraction and polarization: connect it to a few engineering applications.
4. To learn basics of lasers and optical fibers and their use in some applications.
5. To understand concepts and principles in quantum mechanics and Nanopahse Materials. Relate them to some applications.

Course Outcomes:

By the end of this course, student would have

CO.1. Understand the fundamentals of Thermodynamics and Laws of thermodynamics. Understand the working of Carnot cycle and concept of entropy.

CO.2. Gain Knowledge on the basic concepts of electric and magnetic fields. Understand the concept of the nature of magnetic materials. Gain knowledge on electromagnetic induction and its applications.

CO.3. Understand the Theory of Superposition of waves. Understand the formation of Newton's rings and the working of Michelson's interferometer. Remember the basics of diffraction, Evaluate the path difference. Analysis of Fraunhofer Diffraction due to a single slit

CO.4. Understand the interaction of matter with radiation, Characteristics of Lasers, Principle, working schemes of Laser and Principle of Optical Fiber. Realize their role in optical fiber communication.

CO.5. Understand the intuitive ideas of the Quantum physics and understand dual nature of matter. Compute Eigen values, Eigen functions, momentum of Atomic and subatomic particles using Time independent one Dimensional Schrodinger's wave equation.

SYLLABUS

THERMODYNAMICS

Introduction, Heat and Work, First law of thermodynamics and applications, Reversible and Irreversible process, Carnot cycle and Efficiency, Second law of thermodynamics, Carnot's Theorem, Entropy, Second law in terms of entropy, Entropy and disorder, Third law of thermodynamics (statement only).

ELECTROMAGNETISM

Concept of electric flux, Gauss's law - some applications, Magnetic field - Magnetic force on current, torque on current loop, The Biot-Savart's Law, B near a long wire, B for a circular Current loop, Ampere's law, B for a solenoid, Hall effect, Faraday's law of induction, Lenz's law, Induced magnetic fields, Displacement current, Maxwell's equations (no derivation), Magnetic materials: Classification of magnetic materials and properties.

OPTICS

Interference: Principles of superposition – Young's Experiment – Coherence - Interference in thin films (reflected light), Newton's Rings, Michelson Interferometer and its applications.

Diffraction: Introduction, Differences between interference and diffraction, Fresnel and Fraunhofer diffraction, Fraunhofer diffraction at a single slit **(**Qualitative and quantitative treatment**)**.

Polarisation: Polarisation by reflection, refraction and double refraction in uniaxial crystals, Nicol prism, Quarter and Half wave plate, circular and elliptical polarization.

LASERS and FIBRE OPTICS

Introduction, characteristics of a laser beam, spontaneous and stimulated emission of radiation, population inversion, Ruby laser, He-Ne laser, Semiconductor laser, applications of lasers

Introduction to optical fibers, principle of propagation of light in optical fibers, Acceptance Angle and cone of a fibre, Numerical aperture, Modes of propagations, classification of fibers, Fibre optics in communications, Application of optical fibers.

MODERN PHYSICS

Introduction, De Broglie concept of matter waves, Heisenberg uncertainty principle, Schrodinger time independent wave equation, application to a particle in a box. Free electron theory of metals, Kronig - Penney model (qualitative treatment), Origin of energy band formation in solids, Classification of materials into conductors, semiconductors and insulators.

Nanophase Materials : Introduction, properties, Top-down and bottom up approaches, Synthesis - Ball milling, Chemical vapour deposition method , sol-gel methods, Applications of nano materials.

TEXT BOOKS:

1. Physics by David Halliday and Robert Resnick – Part I and Part II - Wiley.
2. A textbook of Engineering Physics, Dr. M. N. Avadhanulu, Dr. P.G. Kshirsagar - S. Chand
3. Engineering Physics by R.K. Gaur and S.L. Gupta –Dhanpat Rai

Reference Books:

1. Modern Engineering Physics by A.S. Vadudeva
2. University Physics by Young and Freedman

ENGINEERING GRAPHICS (20091106)

(Common for CE, CSE, ECE and ME)

(Effective from the admitted batch of 2020-2021)

Credits	*Periods*			*Total*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	***Tutorial***	***Lab***	*Contact Hrs/Week*			
3	2	-	4	6	30	70	100

COURSE OBJECTIVES

COB 1 The course is aimed at developing Basic Graphic skills.

COB 2 Develop Skills in Preparation of Basic Drawings

COB 3 Skills in Reading and Interpretation of Engineering Drawings

COURSE OUTCOMES

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

CO 1	Graphically construct and understand, the importance of mathematical curves in Engineering applications
CO 2	Graphically visualize and construct orthographic projection of points and lines
CO 3	Visualize and construct different views of planes and solids in different orientations
CO 4	Construct and develop the sectioned surfaces of geometrical solids
CO 5	Interpret and draw the Orthographic and Isometric views of different solids.

SYLLABUS

UNIT-I

Introduction: Lines, Lettering and Dimensioning, Geometrical Constructions.

Curves: Construction of Conic sections, cycloids and involutes - Normal and tangent to the curves.

UNIT – II

Projections of Points and Straight Lines: Principal or Reference Planes - Projections of a point lying in any one of the four quadrants. Projections of straight lines parallel to both reference planes - perpendicular to one reference plane and parallel to other reference plane - inclined to one plane and parallel to the other - Projections of straight line inclined to both the reference planes - Traces.

UNIT – III

Projections of Planes: Projection of Perpendicular planes: Perpendicular to both reference planes, perpendicular to one reference plane and parallel to other - perpendicular to one reference plane and inclined to other plane - Projection of Oblique planes. Introduction to Auxiliary Planes.

Projections of Solids: Types of solids: Polyhedral and Solids of revolution. Projections of solids in simple positions: Axis perpendicular to horizontal plane - vertical plane -parallel to both the reference planes - Projection of Solids with axis inclined to one reference plane and parallel to other - inclined to both the reference planes.

UNIT – IV

Sections of Solids: Perpendicular and inclined section planes, Sectional views and True shape of section - Sections of solids (Prism, Pyramid, Cylinder and Cone) in simple positions only. Development of Surfaces: Methods of Development: Parallel line development and radial line development - Development of a cube, prism, cylinder, pyramid and cone.

UNIT – V

Isometric Views: Isometric projection - Isometric scale and Isometric view. Isometric view of Prisms, Pyramids, cylinder, cone, sphere and their combinations.

TEXT BOOK

Elementary Engineering Drawing by N.D. Bhatt, Charotar Publishing House.

REFERENCE BOOK

Engineering Graphics by K.L. Narayana and P. Kannaiah, Tata Mc-Graw Hill.

ELECTRONIC DEVICES AND CIRCUITS (20851807)

(Effective from the admitted batch of 2020-2021)

Course code	Title of the course	Contact periods for delivering the course	Credits
	ELECTRONIC DEVICES AND CIRCUITS	**L T P** **3 0 0**	**Credits: 3**

Course Objectives:

1. To give a comprehensive exposure to Semiconductors and understand the V-I characteristics of semiconductor diodes.
2. To give a comprehensive exposure to Rectifiers.
3. To give a comprehensive exposure to Fundamentals of BJT.
4. To give a comprehensive exposure to Fundamentals of FET and MOSFET.
5. To give a comprehensive exposure to low frequency analysis of transistor amplifier.

Course Outcomes:

By the end of the course the student would be able to

CO1: **Understand** properties of conductors, insulators and semiconductor materials as well as characteristics and applications of different types of semiconductor diodes. (Level2)

CO2: **Analyze** the current, voltage components, efficiency and ripple factor of different rectifier circuits. (Level4)

CO3: **Understand** the construction, operation and characteristics of BJT. (Level2)

CO4: **Understand** the construction, operation and characteristics of JFET and MOSFET. (Level2)

CO5: **Analyze** the different parameters in transistor amplifier. (Level4)

SYLLABUS

UNIT-I: Energy band theory of solids and transport phenomenon in semiconductors and Junction diode characteristics

Energy Band Theory of Solids Intrinsic and Extrinsic Semiconductors Doping, Doping Materials, Carrier Mobility, Conductivity, Diffusion and continuity equation, Hall – Effect and its Application.
Semiconductor Diodes Band structure of PN Junction, Quantitative Theory of PN Diode, Volt – Amp. Characteristics, Temperature Dependence, Transition and Diffusion Capacitance of PN Junction, Zener and Avalanche Breakdowns, Tunnel Diode, LED, Schottky Barrier Diode, Varactor Diode, Photo Diode, PIN Diode.

UNIT-II: Rectifier Circuits

Diode Rectifiers Half-wave, Full-wave and Bridge Rectifiers with and without Filters, Ripple Factor and Regulation Characteristics.

UNIT-III: Transistor characteristics and transistor biasing

Bipolar Junction Transistor NPN and PNP junction Transistor, Characteristics of Current Flow across the Base Regions, Minority and Majority Carrier Profiles, CB, CE and CC Configurations and their Input and Output Characteristics. Comparison of CE, CB and CC Configurations. Junction Biasing for Saturation, Cutoff and Active Region, α and β Parameters and the relation between them, Photo Transistor, various Biasing circuits, stabilizations, thermal runaway, thermal stability, Transistor series and shunt voltage

regulators.

UNIT-IV: Field effect transistors

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

UNIT-V: The transistor at low frequencies

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. Effects of Bypass and Coupling Capacitors. Frequency Response of CE Amplifier, Emitter – Follower, Cascaded Amplifier.

Text Books:

1. Electronic Devices and Circuits By Sanjeev Gupta, Dhanpat Rai Publications.
2. Integrated Electronics, Analog Digital Circuits and systems, Jacob Millman and D. Halkias, McGraw Hill.
3. Electronic Devices and Circuits Theory, Boylsted and Nashelsky, Prentice Hall Publications.

Reference Books:

1. Electronic Devices and Circuits 2nd Edition, B. V. Rao and K. Raja Rajeswari, Pearson Education.
2. Electronic Devices and Circuits, G.S.N. Raju, I.K. International Publications, New Delhi, 2006.

Web Resources:

1. https://nptel.ac.in/courses/108/108/108108122/
2. https://nptel.ac.in/courses/117/103/117103063/

NETWORK THEORY AND ANALYSIS (20851808)

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
3	3	-	-	3	30	70	100

COURSE OBJECTIVES:

To make the students capable of

1. Analyzing any given linear DC and AC electrical network.
2. Determining the stability of any given linear electrical network.

COURSE OUTCOMES:

By the end of the course a student would be able to

CO 1: Solve linear DC network by **applying** Kirchhoff's laws and Network Theorems. (Level3)

CO 2: **Analyze** transient and steady-state behavior of linear RL, RC and RLC network (series and parallel) with DC excitation. (Level4)

CO 3: **Analyze** steady-state behavior of a linear network excited by sinusoidal forcing function using concept of phasors. (Level4)

CO 4: **Evaluate** stability of single-port networks using pole- zero plot, and **analyze** Two-Port networks using Two-Port parameters. (Level5)

CO 5: **Evaluate** a given function for its positive realness. (Level5)

SYLLABUS

UNIT-I: Analysis of DC Circuits

Active elements, Passive elements, Reference directions for current and voltage, Kirchhoff's Laws, Voltage and Current Division Nodal Analysis, Mesh analysis, Linearity and Superposition, Thevenin's theorem and Norton's theorem, Maximum power transfer theorem and Reciprocity theorem.

UNIT-II: DC transients

Inductor, Capacitor, source free RL, RC and RLC response, Evaluation of Initial conditions, Application of unit-step function to series RL, RC and RLC circuits, concepts of Natural, Forced and Complete response.

UNIT-III: Sinusoidal Steady State Analysis

The sinusoidal forcing function, Phasor Concept, Average and Effective value of Voltage and Current, instantaneous and Average Power, Complex Power, Steady State Analysis using mesh and node analysis, application of network theorems to AC circuits, resonance, Concept of Duality.

UNIT-IV: Network functions and Two-Port Parameters

Network functions for single port and two port, Calculation of Network functions for Ladder and General Networks, Poles and Zeroes, Restriction of Poles and Zeroes for Driving point and Transfer functions, Time Domain Behavior from Pole and Zero plot, Stability of a System from it's Pole Zero Plot, Necessary Conditions of stability of a Network Function, Relationship of Two-Port Variables, and Two-Port Parameters:Z, Y, h and T.

UNIT-V: Positive Real Functions

Herwitz polynomials, Even and Odd functions, Positive real function and other properties,test for Positive Real Functions.

Text Books:

1. Engineering Circuit Analysis, William H.Hayt Jr., Jack E. Kemmerley and Steven M Durbin, 8th Edition, McGraw Hill.
2. Network Analysis, M. E. Van Valkenburg, 3rd Edition, PHI.
3. Circuit Theory Analysis and Synthesis, Abhijit Chakrabarti, Dhanpat Rai & Co.

References:

1. Modern Network Synthesis, M. E. Van Valkenburg, Wiley Eastern.

Web Resources:

1. https://nptel.ac.in/courses/108/105/108105159/
2. https://www.youtube.com/watch?v=NEhH6C7Fzw4&list=PLBlnK6fEyqRgLR-hMp7wem-bdVN1iEhsh

ENGINEERING PHYSICS LABORATORY (20091106P)

(Common for CE, CSE, ECE and ME)

(Effective from the admitted batch of 2020-2021)

Description	Subject Teaching Methodology		L	T	P	C
Course Code	**ENGINEERING PHYSICS LABORATORY**		**0**	**0**	**3**	**1.5**
Teaching	**Total Contact Hours : 30**	**Total Marks : 100**	**Int. 50**		**Ext. 50**	
Prerequisite (s)	Knowledge of theoretical and experimental Physics from +2 Level. Application of Physics theory and calculations to required course		**Ext. Exam Time 3 Hrs.**			

Course Objectives:

To train the student in acquiring skills, techniques of using instruments to observe the physical phenomena, to measure certain physical quantities and constants.

Course Outcomes:

By the end of the course

CO. 1. Experiment and evaluate basic principles of physics by observing and analyzing the data, plotting graphs and interpreting the results.

List of Laboratory Experiments:

1. Determination of Radius of Curvature of a given Convex Lens By forming Newton‘s Rings.
2. Determination of Wavelength of Spectral Lines in the Mercury Spectrum by Normal Incidence method.
3. Study the Intensity Variation of the Magnetic Field along axis of Current Carrying Circular Coil.
4. Determination of Cauchy‘s Constants of a Given Material of the Prism using Spectrometer.
5. Determination of Refractive Index of Ordinary ray μo and Extraordinary μe ray.
6. Determination of Thickness Given Paper Strip by Wedge Method.
7. Calibration of Low Range Voltmeter.
8. Calibration of Low Range Ammeter.
9. Determination of Magnetic Moment and Horizontal Component of Earth‘s Magnetic Field.
10. Lees Method - Coefficient of thermal Conductivity of a Bad Conductor.
11. Carey Foster‘s Bridge – Verification of laws of Resistance and Determination of Specific Resistance.
12. Melde‘s Apparatus – Frequency of electrically maintained Tuning Fork.
13. Photoelectric cell-Characteristics.
14. Planks Constants.
15. Determination of energy band gap of a given semiconductor.

WORKSHOP LAB (20091110P)
(Common for CE, CSE, ECE and ME)
(Effective from the admitted batch of 2020-2021)

Course Code	Title of the Course	Contact Periods for delivering the course			Credits	Sessional Marks	External Marks
	WORKSHOP	L 0	T 0	P 3	1.5	50	50

COURSE OUTCOMES

CO 1 Identify and use various tools required for performing operations in Carpentry for making various components

CO 2 Identify and use various tools required for performing operations in Fitting for making various components

CO 3 Identify and use various tools required for performing operations in Tin-smithy for making various components

CO 4 Identify and Usage of House Wiring applications.

LIST OF EXPERIMENTS:

S.No	Trade	Job
1.	Carpentry	(a) Cross Lap Joint (b) Corner Dovetail Joint (c) Mortise and Tenon Joint (d) Bridle Joint
2.	Fitting	(a) V-Fit (b) Square Fit (c) Half Round Fit (d) Dovetail Fit
3.	Tin Smithy	(a) Taper Tray (b) Square Tray (c) 90^{o} Elbow (d) Funnel
4.	House Wiring	(a)Wiring of two bulbs in Parallel (b)Wiring of two bulbs in Series (c) Wiring to control a lamp with two-way switches (d) Wiring to control a fluorescent tube light with one-way switch

REFERENCE

1. Elements of workshop technology, Vol.1 by S. K. and H. K. Choudary.
2. A course in Workshop Technology,Vol.1 by B.S.Raghuwanshi, Danpat Rain and M.S. Krishnan (NPTEL).

ELECTRONIC DEVICES AND CIRCUITS LAB (20091809P)

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
1.5	-	-	3	3	50	50	101

Course Objectives:

1. Generate sine, square and triangular waveforms with required frequency and amplitude using function generator and Measure voltage, frequency and phase of any waveform using CRO.
2. Measure the V-I characteristics of various semiconductor diodes, verify their characteristics and applications of diodes as regulators, rectifiers.
3. Verify functionality through V-I characteristics of active devices like BJT and JFET their applications.

Course Outcomes:

By the end of the course the student would be able to

CO1: **Verify** the V-I characteristics of various semiconductor diodes and applications of diodes as regulators, rectifiers. (Level4)

CO2: **Verify** the V-I characteristics of BJT and JFET their applications. (Level2)

LIST OF EXPERIMENTS

1. Study of CRO and Applications
2. V-I Characteristics of PN Junction Diode
3. V-I Characteristics of Zener Diode and Zener regulator characteristics.
4. V-I Characteristics of LED
5. V-I characteristics of Photo diode
6. Half-wave and full-wave rectifiers
7. Half-wave and full-wave rectifiers with capacitor filter
8. CE characteristics of BJT, h-parameters
9. CB characteristics of BJT, h-parameters
10. Voltage gain, input impedance and output impedance of emitter follower
11. Drain and transfer characteristics of JFET
12. Frequency response of CE amplifier

B. Tech I Year - II Semester

Course code	Category	Course Title	Hours per week			Internal Marks	External Marks	Total Marks	Credits
			L	T	P				
20092101	BSC	Engineering Mathematics – II	3	0	0	30	70	100	3
20092103	BSC	Engineering Chemistry	3	0	0	30	70	100	3
20092109	HSMC	English	3	0	0	30	70	100	3
20092105	ESC	Computer Programming with C and Numerical Methods	3	0	0	30	70	100	3
20852802	PCC	Switching Theory And Logic Design(STLD)	3	0	0	30	70	100	3
20092103P	BSC	Engineering Chemistry Lab	0	0	3	50	50	100	1.5
20092109P	HSMC	English Language Lab	0	0	3	50	50	100	1.5
20092105P	ESC	Computer Programming with C and Numerical Methods Lab	0	0	3	50	50	100	1.5
Total			**15**	**0**	**9**	**300**	**500**	**800**	**19.5**

ENGINEERING MATHEMATICS - II

(Common for Civil Engineering, Computer Science and Engineering, Electronics and Communication Engineering and Mechanical Engineering)
(Effective from the admitted batch of 2020-21)

Description	Subject Name	L	T	P	C	Ext. Exam Time
Course Code 20092101	**ENGINEERING MATHEMATICS -II**	**3**	**0**	**0**	**3**	3 Hrs.
	Total Marks : 100	**Ses.**		**Ext.**		
		30		**70**		

L: Lectures; T: Tutorial; P: Practical; Ses: Sessionals; Ext: External; C: Credits

Course Objectives:

- The way of obtaining rank, Eigen values and Eigen vectors of a matrix.
- To know the importance of Cayley-Hamilton theorem and getting canonical form from a given quadratic form.
- To solve the system of equations by using direct and indirect methods.
- To solve first order and higher order differential equations by various methods.
- To obtain the Laplace transforms and inverse Laplace transforms for a given functions and their applications.

Course Outcomes:

- Find rank, Eigen values and Eigen vectors of a matrix and understand the importance of Cayley-Hamilton theorem.
- Reduce quadratic form to canonical forms and solving linear systems by direct and indirect methods.
- Demonstrate solutions to first order differential equations by various methods and solve basic applications problems related to electrical circuits, orthogonal trajectories and Newton's law of cooling
- Discriminate among the structure and procedure of solving higher order differential equations with constant and variable coefficients.
- Understand Laplace transforms and its properties and finding the solution of ordinary differential equations.

SYLLABUS

UNIT-I

(Linear Algebra)

Rank of a matrix- Echelon form, Normal Form - Solution of Linear System of Equations - Consistency of Linear System of Equations - Gauss elimination method, LU Factorization method, Complex Matrices: Hermitian, Skew-Hermitian and Unitary Matrices and their Properties.

UNIT-II

(Eigen Values and Eigen Vectors)

Eigen Values and Eigen Vectors of a Matrix - Cayley-Hamilton theorem - Inverse and Powers of a Matrix using Cayley-Hamilton's theorem and its applications. Diagonalization of a Matrix - Quadratic Forms - Reduction of Quadratic Form to Canonical Form - Nature of a Quadratic Form.

UNIT-III

(Ordinary Differential Equations of First Order and its Applications)

Formation of ordinary differential equations (ODEs) - Solution of an ordinary differential equation - Equations of the first order and first degree - Linear differential equation - Bernoulli's equation - Exact differential equations - Equations reducible to exact equations - Orthogonal Trajectories - Simple Electric (LR & CR) Circuits - Newton's Law of Cooling - Law of Natural growth and decay.

UNIT-IV

(Differential Equations of Higher Order)

Solutions of Linear Ordinary Differential Equations with Constant Coefficients - Rules for finding the complimentary function - Rules for finding the particular integral - Method of variation of parameters - Cauchy's linear equation - Legendre's linear equation - Simultaneous linear differential equations.

UNIT-V

(Laplace Transforms and it's Application to ODE)

Introduction - Existence Conditions - Transforms of Elementary Functions - Properties of Laplace Transforms - Transforms of Derivatives - Transforms of Integrals - Multiplication by t^n - Division by t – Evaluation of integrals by Laplace Transforms - Inverse Laplace Transform - Applications of Laplace Transforms to Ordinary Differential Equations - Simultaneous Linear Differential Equations with Constant Coefficients - Second Shifting Theorem - Laplace Transforms of Unit Step Function, Unit Impulse Function and Laplace Transforms of Periodic Functions.

TEXT BOOK:

Scope and Treatment as in "Higher Engineering Mathematics", by Dr. B.S. Grewal, 43r^{d} edition, Khanna publishers.

REFERENCE BOOKS:

1. Graduate Engineering Mathematics by V B Kumar Vatti., I.K. International publishing house Pvt. Ltd.
2. Advanced Engineering Mathematics by Erwin Kreyszig.
3. A text book of Engineering Mathematics, by N.P. Bali and Dr. Manish Goyal. Lakshmi Publications.
4. Advanced Engineering Mathematics by H.K. Dass. S. Chand Company.
5. Higher Engineering Mathematics by B.V. Ramana, Tata Mc Graw Hill Company.

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ENGINEERING CHEMISTRY

(Common for CSE, ECE and ME)
(Effective from the admitted batch of 2020-2021)

Description	Subject Teaching Methodology	L	T	P	C
Course Code **20092103**	**ENGINEERING CHEMISTRY**	**3**	**1**	**0**	**3**
	Total Marks : 100	**Ses.**		**Ext.**	
		30		**70**	
Prerequisite (s)	Knowledge of theoretical and experimental chemistry from +2 Level.	**Ext. Exam Time 3 Hrs.**			

Course Objectives

1. To apply the basic knowledge of chemistry to the engineering discipline.
2. To develop knowledge about water and its treatment for industrial and potable purposes.
3. To develop understanding in the areas of polymers, mechanism of corrosion of metals and corrosion control methods, fuels, lubricants and nanomaterials, conducting polymers, bio-degradable polymers and fiber reinforced plastics and apply the knowledge for solving existing challenges faced in various engineering and societal areas.

Course Outcomes

CO.1: Analyze and determine the water quality and prescribe the remedial measures for domestic as well as industrial usage.

CO.2: Student will differentiate the moulding techniques of plastic materials & classify the polymers and can apply to specific purposes.

CO.3: Student can able to design the metallic materials to prevent corrosion.

CO.4: Student will apply suitable lubrication mechanisms for various machinery parts.

CO.5: Will be familiar with the fundamentals of nano materials.

Chapter – 1: Water chemistry (8 Hrs)
Sources of water – impurities and their influence of living systems – WHO Limits – Hardness and its determination – boiler troubles and their removal – Water softening methods – Lime-soda, zeolite and ion-exchange - Municipal water treatment - break point chlorination – desalination of sea water – reverse osmosis method. **(CO1)**

Chapter – 2: Polymers and plastics (8 Hrs)
Polymers: Definition – Types of polymerization (addition- polythene, polyvinylchloride, polystyrene & condensation) – mechanisms of addition polymerization – radical and ionic polymerization- Styrene monomer – storage and biological effects.

Plastics: Thermosetting and thermoplastics – effect of polymer structure on properties of cellulose derivatives – vinyl resins – nylon (6, 6) - reinforced plastics – conducting polymers. **(CO2)**

Chapter – 3: Corrosion (8 Hrs)

Corrosion: Origin and theory – types of corrosion - chemical and electrochemical, pitting, inter granular, waterline, stress – galvanic series – factors effecting corrosion.

Corrosion Controlling Methods: Protective coatings: metallic coatings, electroplating and electroless plating – chemical conversion coatings – phosphate, chromate, anodized, organic coatings – paints and special paints. **(CO3)**

Chapter – 4: Fuels and Lubricants (8 Hrs)

Solid Fuels: Wood and coal, ranking of coal – analysis (proximate and ultimate) - coke manufacture – Otto Hoffmann's process – applications.

Liquid Fuels: Petroleum refining – motor fuels – petrol and diesel oil – knocking – octane number – cetane number.

Gaseous Fuels: Biogas, LPG and CNG – characteristics – applications.

Lubricants: Classification – mechanism – properties of lubricating oils – selection of lubricants for engineering applications. **(CO4)**

Chapter – 5: Nanomaterials (8 Hrs)

Nanomaterials - properties and application of fullerenes, fullerols, carbon nanotubes and nanowires - synthesis - top-down and bottom-up approaches - nanocomposites - nanoelectronics- applications of nanomaterials in catalysis, telecommunication and medicine. **(CO5)**

Text Books

- Engineering Chemistry – P.C. Jain and M. Jain, 16th Ed., Dhanpath Rai and Sons, New Delhi.
- A Text book of Engineering Chemistry, S.S. Dara, 12th Ed., S. Chand & Co. New Delhi.
- Introduction to Nanoscience - S. M. Lindsay, 1st Ed., - Oxford University Press.

Reference Books

- Engineering Chemistry, B.K. Sharma, Krishna Prakashan, 6th Ed., Meerut.

Engineering Chemistry - B.L. Tembe, Kamaluddi

ENGLISH
(Common for all Branches)
(Effective from 2020-2021 Admitted Batches)

Code	Title	L	T	P	Allotment of Marks		Total Marks	Ext. Exam Time	Credits
					Ses.	**Ext.**			
20092109	**ENGLISH**	**3**	**0**	**0**	**30**	**70**	**100**	**3hrs**	**3**

Objectives:

- To make students understand the explicit and implicit meanings of a text/topic;
- To give exposure to new words and phrases, and aid to use them in different contexts;
- To apply relevant writing formats to draft essays, letters, emails and presentations; and
- To adapt oneself to a given situation and develop a functional approach to finding solutions: adaptability and problem solving.

Outcomes:

- Students will be able to analyse a given text and discover the various aspects related to language and literature;
- Learn the various language structures, parts of speech and figures of speech;
- Develop one's reading and writing abilities for enhanced communication; and
- Learn to apply the topics in real-life situations for creative and critical use.

Textbook:

Language and Life: A Skills Approach Board of Editors, Orient Blackswan Publishers, India. 2018.

Topics:

On the conduct of life: William Hazlitt
Life skills: Values and Ethics
If: Rudyard Kipling

The Brook: Alfred Tennyson
Life skills: Self-Improvement
How I Became a Public Speaker: George Bernard Shaw

The Death Trap: Saki
Life skills: Time Management
On saving Time: Seneca

Chindu Yellama
Life skills: Innovation
Muhammad Yunus

Politics and the English Language: George Orwell
Life skills: Motivation
Dancer with a White Parasol: Ranjana Dave

Grammar:

Prepositions – Articles – Noun-Pronoun Agreement, Subject-Verb Agreement – Misplaced Modifiers – Clichés, Redundancies.

Vocabulary:

Introduction to Word Formation – Root Words from other Languages – Prefixes and Suffixes – Synonyms, Antonyms – Common Abbreviations

Writing:

Clauses and Sentences – Punctuation – Principals of Good Writing – Essay Writing – Writing a Summary

Reference Books:

- *Practical English Usage*, Michael Swan. OUP. 1995.
- *Remedial English Grammar*, F.T. Wood. Macmillan.2007
- *On Writing Well*, William Zinsser. Harper Resource Book. 2001
- *Study Writing*, Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.
- *Communication Skills*, Sanjay Kumar and PushpLata. Oxford University Press. 2011.
- *Exercises in Spoken English*, Parts. I-III. CIEFL, Hyderabad. Oxford University Press.

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COMPUTER PROGRAMMING WITH C & NUMERICAL METHODS
(Effective from 2020-2021 Admitted Batches) (20092105)

COMPUTER PROGRAMMING WITH C & NUMERICAL METHODS (Common for ECE and ME)		
Instruction: 3 Hours /week		Credits: 3
Internal: 30 Marks	External Exam: 70 Marks	Total: 100 Marks

COURSE OBJECTIVES:

1. Aims to provide exposure to problem-solving through C programming.
2. Aims to train the student to the basic concepts of the C-programming language and Numerical Methods

COURSE OUTCOMES:

CO1. Student will be able to write code using control structures & arrays.
CO2. Student will be able to write code using strings & functions.
CO3. Student will be able to write code using user defined data types.
CO4. Student will be able to write code using Pointers for operations on files.
CO5. Student will be able to write code for Numerical & Integral Methods.

UNIT-I

Introduction to C, Decision Making, Branching, Looping, Arrays: Basic structure of C program, Constants, Variables and data types, Operators and Expressions,Arithmetic Precedence and associativity, Type Conversions. Managing Input and Output Operations, Formatted Input, Formatted Output, Decision making with if statement, Simple if statement, the if…else statement, Nesting of if…else statement, the else if ladder, switch statement, the (? :) operator, the GOTO statement., The while statement, The do statement, The for statement, Jumps in Loops, One, Two-dimensional Arrays.

UNIT-II

Functions & Strings: Definition of Functions, Return Values and their Types, Function Calls, Function Declaration, Category of Functions: No Arguments and no Return Values, Arguments but no Return Values, Arguments with Return Values, No Argument but Returns a Value, Functions that Return Multiple Values. Nesting of functions, recursion, passing arrays to functions, passing strings to functions, The scope, visibility and lifetime of variables, Character Arrays. Declaration and initialization of Strings, reading and writing of strings, String handling functions, Table of strings.

UNIT-III

Structure and Unions: Defining a structure, declaring structure variables, accessing structure members, structure initialization, copying and comparing structure variables, arrays of structures, arrays within

structures, structures within structures, structures and functions and unions, size of structures and bit-fields- Program applications.

UNIT-IV

Pointers & File handling: Accessing the address of a variable, declaring pointer variables, initializing of pointer variables, accessing variables using pointers, chain of pointers, pointer expressions, pointers and arrays, pointers and character strings, array of pointes, pointers as function arguments, functions returning pointers, pointers to functions, pointers to structures-Program Applications, File handling: Defining and opening a file, closing a file, Input/ Output operations on files, Error handling during I/O operations, random access to files and Command Line Arguments-Program Applications.

UNIT-V

Solutions of Algebraic and Transcendental Equations: Bisection Method, Newton Raphson Method. Interpolation: Newton's forward and backward Interpolation, Lagrange's Interpolation in unequal intervals, Trapezoidal rule, Simpson's 1/3 rule. Solutions of OrdinaryFirst Order Differential Equations: Euler's Method, Modified Euler's Method and Runge-Kutta Method.

Text Books:

1. Programming in ANSI C, E Balagurusamy, 6th Edition. McGraw Hill Education (India)Private Limited.
2. Introduction to Numerical Methods, SS Sastry, Prentice Hall.

Reference Books:

1. Let Us C, YashwantKanetkar, BPB Publications, 5th Edition.
2. Computer Science, A structured programming approach using C", B.A.Forouzan andR.F.Gilberg, 3rd Edition, Thomson, 2007.
3. The C –Programming Language' B.W. Kernighan, Dennis M. Ritchie, PHI
4. Scientific Programming: C-Language, Algorithms and Models in Science, Luciano M.Barone (Author), Enzo Marinari (Author), Giovanni Organtini, World cientific.

SWITCHING THEORY AND LOGIC DESIGN
(Effective from 2020-2021 Admitted Batches)

Course code	Title of the course	Contact periods for delivering the course	Credits
20852802	**SWITCHING THEORY AND LOGIC DESIGN**	**L T P** **3 0 0**	**Credits: 3**

Course Objective:

1. To understand common forms of number representation in digital electronic circuits, to study various logic and switching devices and their realization.
2. To understand the concepts of basic theorems and K-map.
3. To Study the concept of Combinational circuits and Programmable Logic Devices.
4. To study the sequential logic circuits design both in synchronous and Asynchronous modes.
5. To impart the concepts of sequential circuits, enabling them to analyze sequential systems in terms of state machines.

Course Outcomes:

After successful completion of this course, the students will be able to

CO1: Implement logic circuits using basic Logic gates and universal gates. (Level 3)
CO2: Simplify logic expressions using basic theorems, K-map and Tabular method. (Level 4)
CO3: Design Combinational logic circuits and also realize logic expressions using Multiplexers, Decoders and PLDs. (Level 6)
CO4: Design Sequential logic circuits using flip-flops. (Level 6)
CO5: Design Finite State machines. (Level 6)

SYLLABUS

Unit-I: Number systems and codes

Number systems, Base conversion methods, Complement of numbers,
Codes: Binary, Non binary**,** Decimal, Alphanumeric, Gray, Error detecting and error correcting codes.
Logic Gates: AND, OR, NOT, NAND, NOR, XOR, EX-NOR and Universal Gates.

Unit- II: Minimization of Boolean Functions

Fundamental postulates of Boolean algebra, Basic theorems, Simplification of Boolean equations, Min terms, Max terms, Standard form of Boolean functions.
Simplification of functions: Karnaugh map method and Quine-McClusky methods (up to six variables), incomplete specified functions**.**

Unit-III: Combinational Logic-Circuit Design

Logic design of combinational circuits: Adders and Subtractors: Binary, BCD, Excess -3 and Look – ahead-carry adder, Code converters, Multiplexers, De multiplexers, Encoders, Decoders and priority encoders, Realization of Boolean functions using multiplexers, De multiplexers and Decoders. Design of 4-bit comparator, Parity checker/Generator, Seven segment decoders, Hazards in combinational circuits, Hazard free realizations.
Basics of PLDs: Basic structure of PROM, PAL, PLA, CPLD, FPGAs.

Unit-IV: Sequential circuits

Classification of sequential circuits, SR-latch, Gated latches, Flip flops: RS, JK, D, T and Master slave flip flops, Excitation tables, flip flop conversion from one type to another.
Design of counters: Ripple counters, Synchronous counters, asynchronous counters, up-down counters, Johnson counter, ring counter.
Design of registers: Buffer registers, Shift registers, Bi directional shift registers, Universal shift register.

Unit-V: Analysis and design of finite state machines
Mealy and Moore Machines, State assignment, State tables, State diagram, Equivalent states, Elimination of Redundant states, Determination of state equivalence, Reduction using implication table, reducing incompletely specified state tables.

Text Books:
1. Zvi Kohavi "Switching and finite Automatic theory",3 rd Edition, Tata McGrew Hill Publishers.
2. A Anand Kumar "Switching theory and logic design", PHI. 2016.
3. Frederick.J.Hill and Gerald.R.Peterson "Introduction to Switching theory and logic design", 3rd Ed,John Wiley & Sons Inc.

Reference Books:
1. R.P.Jain "Modern Digital Electronics", 15th Reprint, , TMH.
2. Charles.H.Roth. and Larry L Kinney "Fundamentals of Logic Design"7 th Edition.
3. Morris Mono "Digital Design", 5th Edition, PHI.
4. Digital Fundamentals – A Systems Approach – Thomas L. Floyd, Pearson, 2013.

Web Resources:
https://onlinecourses.nptel.ac.in/noc19_cs74/preview

ENGINEERING CHEMISTRYLABORATORY

(Common for Civil Engineering, Computer Science and Engineering, Electronics and Communication Engineering and Mechanical Engineering)
(Effective from the admitted batch of 2020-2021)

Description	Subject Teaching Methodology	L	T	P	C
Course Code **20092103P**	**ENGINEERING CHEMISTRY LABORATORY**	**0**	**0**	**3**	**1.5**
	Total Marks : 100	**Int.**		**Ext.**	
		50		**50**	
Prerequisite (s)	Knowledge of theoretical and experimental chemistry from +2 Level.	**Ext. Exam Time 3 Hrs.**			

Course Objectives

1. To develop the fine skills of quantitative determination of various chemical components through titrimetric analysis.

Course Outcomes

At the end of the course student will be able to

CO.1 Quantitatively determine the amount of various chemical species in solutions by titrations.
CO.2 Conduct the quantitative determinations with accuracy.

List of Laboratory Experiments

1. Determination of sodium hydroxide with HCl (with Na_2CO_3 as primary standard)
2. Determination of alkalinity (carbonate and hydroxide) of water sample
3. Determination of Fe (II)/Mohr's salt by permanganometry
4. Determination of oxalic acid by permanganometry
5. Determination of chromium (VI) by Mohr's salt solution
6. Determination of zinc by EDTA method
7. Determination of hardness of water sample by EDTA method
8. Determination of chlorine in water by iodometric titration

Reference Books

- Vogel's Quantitative Chemical Analysis – V Edition – Longman

Experiments in Applied Chemistry (For Engineering Students) – Sinita Rattan – S. K. Kataria & Sons, New Delhi.

ENGLISH LANGUAGE LAB

(Common for all branches)

(Effective from 2020-2021 Admitted Batches)

Subject Code	Subject Name/ Title	L	T	P	Allotment of Marks		Total Marks	Credits
					Internal Examination	**External Examination**		
20092109P	**English Language lab**	**0**	**0**	**2**	**50**	**50**	**100**	**1.5**

Objectives:

- To make students recognize the sounds of English through Audio-Visual aids;
- To help students build their confidence and help them to overcome their inhibitions and self-consciousness while speaking in English;
- To familiarize the students with stress and intonation and enable them to speak English effectively; and
- To give learners exposure to and practice in speaking in both formal and informal contexts.

Outcomes:

- Students will be sensitized towards recognition of English sound patterns and the fluency in their speech will be enhanced;
- Students will be able to participate in group activities like roleplays, group discussions and debates; and
- Students will be able to express themselves fluently and accurately in social as well professional context.

Topics:

Introduction to Phonetics: The Sounds of English (Speech sound – vowels and consonants) - Stress and Intonation - Accent and Rhythm.

Listening Skills: Listening for gist and specific information - listening for Note taking, summarizing and for opinions - Listening to the speeches of eminent personalities.

Speaking Skills: Self-introduction - Conversation Skills (Introducing and taking leave) - Giving and asking for information - Role Play - Just A Minute (JAM) session - Telephone etiquette.

Reading and Writing skills: Reading Comprehension – Précis Writing - E-Mail writing - Punctuation.

Presentation skills: Verbal and non-verbal communication - Body Language - Making a Presentation.

DISTRIBUTION AND WEIGHTAGE OF MARKS

- The practical examinations for the English Language Lab shall be conducted as per the University norms prescribed for the core Engineering practical sessions.
- For the Language lab sessions, there shall be a continuous evaluation during the semester for 50 sessional marks and 50 semester-end Examination marks.
- For the 50 sessional (Internal) marks, 30 marks shall be awarded for day-to-day performance and for completing activities in the lab manual, 20 marks to be awarded by conducting Internal Lab Test(s).

- For the 50 Semester- end (External) marks, 30 marks shall be awarded for written examination (dialogues, the sounds of English and stress) and 20 marks for External Examiner viva-voce.

Reference Books:

- Ashraf Rizvi. *Effective Technical Communication*. Tata McGraw Hill Education Private Limited, New Delhi.
- *Speak Well*. Orient Blackswan Publishers, Hyderabad.
- Allan Pease. *Body Language*. Manjul Publishing House, New Delhi.

COMPUTER PROGRAMMING WITH C & NUMERICAL METHODS LAB-ECE (20092105P)		
Instruction: 3 Hours/week		**Credits: 1.5**
Internal: 50 Marks	**External Exam: 50 Marks**	**Total: 100 Marks**

COURSE OBJECTIVES:

1. To provide complete knowledge of C language.
2. To develop logics which will help them to create programs, applications in C.
3. To learn the basic programming constructs they can easily switch over to any other language in future.

COURSE OUTCOMES:

CO1: Ability to implement the programs using control structures & arrays.
CO2: Ability to implement the programs using strings & functions.
CO3: Ability to implement the programs using user defined datatypes.
CO4: Ability to implement the programs using pointers and operations on files.
CO5: Ability to implement the programs using numerical & integral methods.

2. a. Write a C program to find the roots of a quadratic equation
   b. Write a C program, which takes two integer operands and one operator from the user performs the operation and then prints the result. (Consider the operators +, -, *, /, % and use Switch statement.
   c. Write a C program to find the sum of individual digits of that number and also print and save it in reverse order.

2. Write a program to read x, y coordinates of 3 points and then calculate the area of a triangle formed by them and print the coordinates of the three points and the area of the triangle. What will be the output from your program if the three given points are in a straight line?

3. Write a program which generates 100 random real numbers in the range of 10.0 to 20.0 and sort them in descending order.

1. Write a function for transporting a square matrix in place (in place means that you are not allowed to have full temporary matrix).
2. Write a program to add two matrices with the dimension of the matrix specified by the user at the time of executing the program.
3. Write a program e.g., for getting a sub-string from a given position, copying one string to another, reversing a string and adding one string to another with and without using string manipulation functions.
4. Write a program to read the data of four students, each students has a name (string), roll number (string), age (integer), use an array of structure. Later find the average age of the students.
5. Write a program to demonstrate the difference between pointer to an array and array of pointers.
   a) Store your name, address and phone number in a 2-D character array and display the same using pointer notations.
   b) Use pointer to an array and array of pointers.

6. First use an editor to create a file with some integer numbers. Now write a program, which reads these numbers and determines their mean and standard deviation.
7. Implement bisection method to find the square root of a given number to a given accuracy.
8. Given a table of x and corresponding f(x) values, write a program which will determine f(x) value at an intermediate x value using Lagrange Interpolation.
9. Implement Simpson's 1/3rd rule for numerical integration.

10. Write a program to solve a differential equation using Runge-Kutta Method.
11. Write a C program to tabulate Diode current for given input values.

$$I = I_0\left(e^{\frac{qV}{kT}} - 1\right)$$

12. Write a C program to generate Sinusoidal wave for given frequency?

SCHEME FOR II/IV B.TECH I SEMESTER

Category	Course Code	Course	Hours Per Week			Maximum Marks			Credits
			Theory	Tutorial	Lab	Exam	Sessionals	Total	
BSC		Engineering Mathematics-III	3	0	0	70	30	100	3
PCC		Analog Electronic Circuits	3	0	0	70	30	100	3
ESC		Electrical Machines	3	0	0	70	30	100	3
HSS		Managerial Economics	3	0	0	70	30	100	3
PCC		Signals & Systems	3	0	0	70	30	100	3
PCC		Analog Electronics and Circuits Lab with Simulation	0	0	3	50	50	100	1.5
PCC		Network and Machines Lab	0	0	3	50	50	100	1.5
PCC		Digital Logic Design Lab	0	0	3	50	50	100	1.5
SC		Graphical Programming	1	0	2	50	50	100	2
MC		Professional Ethics& Universal Human values	2	0	0	100	0	100	0
MC		NCC/NSS	0	0	2	----	----	-----	0
		Total	**18**		**13**	**650**	**350**	**1000**	**21.5**

ANALOG ELECTRONIC CIRCUITS

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
3	3	-	-	3	30	70	100

COURSE OBJECTIVES

1. To prepare students to perform the analysis of any Analog electronics circuit
2. To empower students to understand the design and working of BJT
3. To empower students to understand the design and working of amplifiers and oscillators

COURSE OUTCOMES

After successful completion of this course, the students will be able to

CO1 Acquire basic knowledge of physical and electrical conducting properties of semi-conductors at high frequencies. **(L3)**

CO2 Develop the Ability to understand the design and working of Multi stage amplifiers **(L6)**

CO3 Develop the Ability to understand the design and working of BJT Feedback Amplifiers (**L6)**

CO4 Develop the Ability to understand the design and working of BJT oscillators **(L6)**

CO5 Develop the Ability to understand the design and working of Power amplifiers and Tuned Amplifier **(L6)**

SYLLABUS

UNIT-I: SMALL SIGNAL HIGH FREQUENCY TRANSISTOR AMPLIFIER MODELS:

BJT: Transistor at high frequencies, Hybrid-π common emitter transistor model, Hybrid-π conductances, Hybrid-π capacitances, validity of Hybrid-π model, determination of high frequency parameters in terms of low frequency parameters, CE short circuit current gain, current gain with resistive load, cut-off frequencies, frequency response and gain bandwidth product. **FET:** common source and common drain amplifier circuits at high frequencies (*Elementary concepts).*

UNIT-II: MULTISTAGEAMPLIFIERS

High frequency transistor models, Miller's Theorem, Concept of Multi Stage Amplifiers: Methods of Inter Stage Coupling, n–Stage Cascaded Amplifiers, Cascode Configurations, Darlington pair, Frequency response of RC Coupled Amplifiers using BJT, Gain Bandwidth Product.

UNIT-III: FEEDBACK AMPLIFIERS

Concept of Feedback Amplifiers – Effect of Negative feedback on the amplifier Characteristics. Four Feedback Amplifier Topologies. Method of Analysis of Voltage Series, Current Series, Voltage Shunt and Current Shunt feedback Amplifiers (*BJT version only*).

UNIT-IV: SINUSOIDAL OSCILLATORS

Condition for oscillations–LC Oscillators–Hartley, Colpitts, Clapp and Tuned Collector Oscillators–Frequency and amplitude Stability of Oscillators–Crystal Oscillators–RC Oscillators --RC Phase Shift and Weinbridge Oscillators. (*BJT version only*).

UNIT-V: POWER AMPLIFIERS AND TUNED VOLTAGE AMPLIFIERS

Classification of Power Amplifiers – Class A, Class B and Class AB power Amplifiers. Series Fed, Single Ended Transformer Coupled and Push Pull Class A and Class B Power Amplifiers. Cross-over Distortion in Pure Class B Power Amplifier, Class AB Power Amplifier–Complementary Push Pull Amplifier.

Tuned Amplifier: Capacitive, Inductive and Transformer coupling; Analysis of Capacitive coupled single stage tuned amplifier.

TEXT BOOKS

1. Integrated Electronics, Analog Digital Circuits and systems, **Jacob Millman** and **D. Halkias**, McGraw Hill, 1972
2. Electronic Devices and Circuits – **G.K.Mithal**, Khanna Publishers, 23rd Edition, 2004.

REFERENCES

1. Electronic Devices and Circuits, G.S.N. Raju, IK International Publications, New Delhi, 2006.
2. Electronic Devices and Circuits by **Salivahanan, N. Suresh Kumar** and **A. Vallava Raj** TMH, 2nd Edition, 1998.
3. Electronic Circuit Analysis, **B.V.Rao**, **K.Raja Rajeswari et.al**, Pearson Publishers

ELECTRICAL MACHINES

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
3	3	-	-	3	30	70	100

COURSE OBJECTIVES

1. To learn about basic concepts and principles of direct current machine characteristics and its applications.
2. To impart the knowledge of basic concepts of transformer and its behavior and its applications.
3. To understand the behavior of 3 phase induction motor and analyze the working and its performance characteristics.
4. To impart the knowledge of synchronous machines and analyze the working under loaded conditions.
5. To learn about the basic knowledge of single phase motor and analyze the operation and its applications.

COURSE OUTCOMES

After successful completion of this course, the students will be able to

CO1 **Understand** the behavior of direct current machines and its operation under no load and loaded conditions**.(L2)**

CO2 **Analyze** basic concepts of transformer and its operation under loaded and unloaded conditions**.(L4)**

CO3 **Analyze** the working of 3-phase induction motor and its performance characteristics. **(L4)**

CO4 **Distinguish** the operation of synchronous machines under loaded and unloaded conditions. **(L4)**

CO5 **Explain** the concepts of single phase motors and its applications. **(L2)**

SYLLABUS

UNIT-I: DC MACHINES

Constructional Features, Function of Commutator, Induced EMF and Torque Expressions, Relationship between Terminal Voltage and Induced EMF for Generator and Motoring Action, Different Types of Excitation and Performance Characteristics of Different Types of DC Machines, Starting and Speed Control of DC Motors (only for DC Shunt Motor), Losses and Efficiency, Efficiency by Direct Loading, Swinburne's Test, Applications of DC Machines. (*Elementary concepts)*

UNIT-II: SINGLE PHASE TRANSFORMERS

Constructional Details, EMF Equation, Equivalent Circuit, Voltage Regulation, Losses and Efficiency, Auto –Transformers, Instrument Transformers, Open/Short – Circuit Tests and Determination of Efficiency and Regulation, conditions for maximum voltage regulation. (*Elementary concepts)*

UNIT-III: THREE – PHASE INDUCTION MOTORS

Construction, Rotating Magnetic Field and 3phase Induction Motor, Power Flow Diagram, Torque and Torque-slip Characteristics, Condition for Max. Torque and its Value, Losses and Efficiency, Equivalent Circuit and Circle Diagram of Induction Motor, No – Load and Rotor – Blocked Tests and Efficiency and Torque – Speed Characteristics. (*Elementary concepts)*

UNIT-IV: THREE – PHASE SYNCHRONOUS MACHINES

Generation of EMF, Constructional Details, Induced EMF, Synchronous Generator on No –Load and Load, Synchronous Impedance and Voltage Regulation. V – Curves and Inverted V – Curves, Synchronous Condenser, Starting of Synchronous Motors, Applications of Synchronous Machines. (*Elementary concepts)*

UNIT-V: SINGLE – PHASE MOTORS

Double Revolving Field Theory, Torque-speed characteristics of Single Phase Induction motor, Split phase Induction motor, Capacitor start motor, capacitor start capacitor run motor, shaded pole motor, equivalent circuit of single phase induction motor, Stepper Motor. (*Elementary concepts)*

TEXT BOOKS

1. Electrical Machines, S. K. Bhattacharya, TMH Publications N. Delhi.
2. A First Course in Electrical Engineering, S. M. Tiwari, A. S. Binsaroor, Wheeler Publication.
3. A Textbook on Electrical Technology by B.L THERAJA, A.K THEREJA, Volume-II,S.Chand publishers.

MANAGERIAL ECONOMICS

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
3	3	-	-	3	30	70	100

COURSE OBJECTIVES

- To familiarize the students with the basic concept of microeconomics.
- To understand the demand and supply analysis in business applications
- To familiarize with the production and cost structure under different stages of production.
- To understand the pricing and output decisions under various market structure.
- To understand and apply the various decision tools to understand the market structure.

COURSE OUTCOMES

At the end of the course students will be able to

CO1: Understand the concepts of cost, nature of production and its relationship to Business operations.
CO2: Apply marginal analysis to the "firm" under different market conditions.
CO3: Analyze the causes and consequences of different market conditions.
CO4: Integrate the concept of price and output decisions of firms under various market structure.
CO5: Implement various market structures and cope up with inflation and deflation.

SYLLABUS

Unit-1: Introduction to Economics: Definitions of Economics- Wealth, Welfare and Scarcity definition Classification of Economics- Micro and Micro Economics. **Managerial Economics:** Definition, Nature and Scope of Managerial Economics, Differences between Economics and Managerial Economics, Main areas of Managerial Economics, Managerial Economics with other disciplines.

Unit-II: Demand Analysis: Demand - Definition, Meaning, Nature and types of demand, Demand function, Law of demand - Assumptions and limitations. Exceptional demand curve. **Elasticity of demand** - Definition, Measurement of elasticity, Types of Elasticity (Price, Income, Cross and Advertisement), Practical importance of Price elasticity of demand, Role of income elasticity in business decisions, Factors governing Price Elasticity of demand. **Demand Forecasting -** Need for Demand forecasting, Factors governing demand forecasting, Methods of demand forecasting: Survey methods- Experts' opinion survey method and consumers Survey methods.

Unit-III: Utility Analysis: Utility- Meaning, Types of Economic Utilities, Cardinal and Ordinal Utility, Total Utility, Marginal Utility, the law of Diminishing Marginal Utility and its Limitations**. Business cycles** - Definition, Characteristics, Phases, Causes and Consequences; Measures to solve problems arising from Business cycles. Inflation and Deflation.

Unit-IV: Production and cost analysis - Meaning, Production function and its assumptions, use of production function in decision making; Law of Variable Proportions: three stages of the law. cost analysis - Nature of cost, Classification of costs - Fixed vs. Variable costs, Marginal cost, Controllable vs. Non - Controllable costs, Opportunity cost, Incremental vs. Sunk costs, Explicit vs. Implicit costs, Replacement costs, Historical costs, Urgent vs. Postponeble costs, Escapable vs. unavoidable costs, Economies and Diseconomies of scale.

Unit-V: Market Structures: Definition of Market, Classification of markets; Salient features or conditions of different markets - Perfect Competition, Monopoly, Duopoly, Oligopoly, Importance of kinked demand curve; Monopolistic Competition. **Pricing Analysis: Pricing** - Significance: Different Pricing methods- Cost plus pricing, Target pricing, Marginal cost pricing, Going -rate pricing, Average cost pricing, Peak load pricing, Pricing of joint Products, Pricing over the life cycle of a Product, Skimming pricing Penetration pricing, Mark- up and Mark- down pricing of retailers.

TEXT BOOKS

1.Sankaran, S., **Managerial Economics,** Marghan Publications, 2015, Chennai.
2.Aryasri, A.R., **Managerial Economics and Financial Analysis,** MC Graw Hill Education, New Delhi,2015.

REFERENCE BOOKS

1.Dwivedi, D.N., **Managerial Economics,** Vikhas Publishing House Pvt. Ltd. 6th Edition, New Delhi,2004.
2. Dewett, K.K., **Modern Economic Theory**, S.Chand & Company Ltd., New Delhi, 2005

SIGNALS AND SYSTEMS

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
3	3	-	-	3	30	70	100

COURSE OBJECTIVES

1. To understand the properties of CT and DT signals and systems
2. To understand spectral characteristics of signals using Fourier analysis.
3. To analyze Convolution.
4. To understand Laplace transforms for analyzing CT systems

COURSE OUTCOMES

After successful completion of this course, the students will be able to

CO1 **Classify** the signals as Continuous time and Discrete time**.(L2)**

CO2 **Analyze** the spectral characteristics of signals using Fourier analysis.**(L4)**

CO3 **Illustrate** linear systems in time domain. **(L4)**

CO4 **Apply** Laplace transform techniques to analyze continuous-time signals and systems**(L4)**

CO5 **Interpret** Sampling theorem and to apply Z transform techniques to analyze discrete-time signals and systems**.(L2)**

SYLLABUS

UNIT- I: INTRODUCTION TO SIGNALS AND SYSTEMS

Continuous –Time and Discrete –Time signals: The Impulse function, step function, ramp function, complex Exponential and Sinusoidal Signals, Classification of Signals, Basic operations on Signals, Continuous –Time and Discrete –Time Systems, Classification of Systems.

UNIT-II: FOURIER SERIES AND FOURIER TRANSFORM

Fourier series representation of continuous time periodic signals, properties of Fourier series, Dirichlet's conditions, Trigonometric and Exponential Fourier series, Complex Fourier spectrum, Deriving Fourier transform from Fourier series, Fourier transform of arbitrary signal, standard signals and periodic signals, properties of Fourier transforms, Fourier transforms involving impulse and Signum functions, Introduction to Hilbert Transform.

UNIT-III: ANALYSIS OF LINEAR SYSTEMS

System analysis by Convolution, Convolution Theorems, Graphical interpretation of Convolution, Transfer function of a LTI system, Distortion less transmission through a system, Signal bandwidth, system bandwidth, Causality and Poly-Wiener criterion for physical realization, Relationship between bandwidth and rise time.

UNIT-IV: LAPLACE TRANSFORM

Introduction, The Laplace transform, the region of convergence for Laplace transforms, The Inverse Laplace transform, Geometrical evaluation of the Laplace transform from the Pole-Zero plot, properties of Laplace transforms, the initial and Final value theorems, Analysis and characterization of LTI systems using the Laplace Transforms.

UNIT-V: SAMPLING THEOREM AND Z-TRANSFORM

Introduction, Reconstruction of a signal from its samples using interpolation, the effect of Under sampling: aliasing, Discrete time processing of continuous time signals, sampling of Discrete time signals. The Z Transform, The Inverse Z-Transform, Geometrical evaluation of the Z-Transform from the Pole-Zero plot, Properties of Z-Transform, The initial value and final value theorems, some common Z-transform pairs, Analysis and characterization of LTI systems using the Z-Transforms, System function algebra and block diagram representation, The unilateral Z-Transform.

TEXTBOOKS

1. Alan V. Oppenheim, Alan S. Willsky and Ian T. Young, "Signals and Systems", 5th Edition,PHI.
2. B. P. Lathi "Signals Systems and Communication", 4th Edition, BS Publication

REFERENCES

1. Simon Haykin and Van Veen "Signals and Systems", 2nd Edition, Wiley
2. Rodger E Ziemer,D Ronald Fannin, "Signals and Systems Continuous and Discrete" Pearson Publication.

ANALOG ELECTRONICS & CIRCUITS LAB WITH SIMULATION

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
1.5	-	-	3	3	50	50	100

COURSE OBJECTIVES

1. To study various feedback Amplifiers, oscillators practically
2. To study various feedback Amplifiers, oscillators through software simulations.

COURSE OUTCOMES

After successful completion of this course, the students will be able to

CO1 Design and test various types of oscillators **(L6)**

CO2 Design and verify Frequency response characteristics of single stage, Multistage Amplifiers and Feedback Amplifiers. **(L6)**

CO3 Simulate and analyze the characteristics of Amplifiers **(L4)**

CO4 Simulate and analyze the characteristics of Oscillators. **(L4)**

LIST OF EXPERIMENTS

Hardware Experiments

1. Current series feedback Amplifier
2. Colpitts oscillator
3. Wein bridge oscillator
4. Class-B Push pull Amplifier
5. Common source FET Amplifier
6. Tuned Voltage Amplifier

Software Simulation Experiments

Tools Used: NI MultiSim 2014

7. Common emitter and common source Amplifier
8. Two stage RC coupled Amplifier
9. RC Phase shift oscillator using transistors
10. Class-A Power Amplifier (transformer less)
11. Class-B complementary symmetry Amplifier
12. High Frequency Common Base (BJT) and Common Gate (JFET) Amplifier

Networks and Machines Lab

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
1.5	-	-	3	3	50	50	100

COURSE OBJECTIVES

This course enables the students to:

1. Design and verify various electrical circuits by applying theorems.
2. Verify various electrical circuits by applying basic laws (Ohm's law & Kirchoff's laws)
3. Evaluate the performance of DC machines by conducting no-load and on-load tests.
4. Learn how to regulate the speed control of DC machine using various methods.
5. Understand the performance of various types of Transformers, induction motors, alternators.

COURSE OUTCOMES

After successful completion of this course, the students will be able to

CO1 Analyze various basic laws (Ohm's law, Kirchoff's laws) & theorems for linear electrical circuits. **(L4)**

CO2 Apply the practical methods to find the performance of various types of DC machines (**L4)**

CO3 Apply the speed control techniques of DC motors. **(L4)**

CO4 Investigate the efficiencies of single phase transformer and induction motors through various tests **(L5)**

LIST OF EXPERIMENTS

NETWORK LAB EXPERIMENTS

1. Verification of Superposition Theorem.
2. Verification of Reciprocity Theorem.
3. Verification of Thevenin's Theorem
4. Verification of Two-port network parameters.
5. Verification of Ohm's law.
6. Verification of Kirchhoff's law.

ELECTRICAL MACHINES LAB EXPERIMENTS

7. No load and blocked rotor tests on 3-phase squirrel cage Induction motor
8. Regulation of alternator by synchronous Impedance method
9. Open circuit test and short circuit test on 1-phase transformer
10. Swinburne's test on a D.C Shunt machine.
11. Speed control of a D.C shunt motor.

Digital Logic Design Lab

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
1.5	-	-	3	3	50	50	100

COURSE OBJECTIVES

1. Provide hands-on experience in digital circuits, which can be constructed by using standard integrated circuits (ICs).
2. Investigate the operation of several digital circuits combinational and sequential.

COURSEOUTCOMES

CO1 Analyze the operation of logic gates and its applications **(L4)**

CO2 Analyze the operation of medium complexity standard combinational circuits like the encoder, decoder, multiplexer, demultiplexer, adder **(L4)**

CO3 Analyze the operation of a flip-flop and examine relevant timing diagrams **(L4)**

CO4 Analyze the operation of counters and shift registers **(L4)**

HARDWARE EXPERIMENTS

1. Logic Gates
2. Realization of Gates by using universal building blocks
3. Realization of SOP and POS
4. Verification of Demorgan's Laws and duality.
5. Half Adder & Full adder
6. Function generation by using Decoders & Multiplexers.
7. Realization of Flip – flops
8. Flip – flop Conversions
9. 4-bit Ripple counter
10. Mod-8 Synchronous counter.
11. 4 - bit Shift-register
12. Seven segment display
13. Design and implementation of 16 bit odd/even parity checker
14. Binary to Excess-3 and Binary to BCD converter.

SKILL COURSE-1
GRAPHICAL PROGRAMMING

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
2	1	-	2	3	50	50	100

COURSE OBJECTIVES

1. To impart the knowledge for the generation of signals, generation of different Modulation signals, Design of Antennas and simulation of images.

COURSE OUTCOMES

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

CO1: Generate signals and **apply** various operations on signal.
CO2: **Perform** analog modulation schemes and multiplexing techniques.
CO3: **Identify** Antenna parameters from radiation pattern.
CO4: **Implement** various operations on images.

EXPERIMENTS

Module 1 (Signals and Systems)

1. Study of various basic operations on Matrices.
2. Perform the amplitude-scaling, time-scaling and time-shifting on a given signal.
3. Obtain cross correlation of sequence x(n) and y(n) & autocorrelation of a sequence x (n) of the given sequences & verify the property.
4. Generation of Fourier series of a Square Wave.

Module 2 (Communication systems)

5. Generation of Amplitude modulation signals
6. Generation of Frequency modulation signals
7. Time Division Multiplexing
8. Frequency division multiplexing and de-multiplexing

Module 3 (Antennas)

9. Radiation pattern of antenna
10. Design micro strip patch antenna
11. Obtain Radiation pattern of uniform linear array and find side lobe ratio

Module 4 (Digital Image Processing)

12. Generate components of given color Image and its Negative. (Binary & Gray Scale)
13. Implementation of Relationships between Pixels
14. Implementation of Transformations of an Image

SCHEME FOR II/IV B.TECH II SEMESTER

Category	Course Code	Course	Hours Per Week			Maximum Marks			Credits
			Theory	Tutorial	Lab	Exam	Sessionals	Total	
BSC		Engineering Mathematics IV	3	0	0	70	30	100	3
PCC		Electromagnetic Field Theory & Transmission Lines	3	0	0	70	30	100	3
PCC		Microprocessors and Microcontrollers	3	0	0	70	30	100	3
PCC		Probability Theory & Random Process	3	0	0	70	30	100	3
PCC		Analog and Digital Communications	3	0	0	70	30	100	3
PCC		Microprocessors & Microcontrollers Lab	0	0	3	50	50	100	1.5
PCC		Analog and Digital Communications Lab	0	0	3	50	50	100	1.5
SC		Problem Solving Using Python	1	0	2	50	50	100	2
MC		Environmental Science	2	0	0	100	0	100	0
		Total	**18**	**0**	**8**	**600**	**300**	**900**	**20**
Honors/Minor courses (The hours distribution can be 3-0-2 or 3-1-0)			3	1	0	70	30	100	4

Summer Internship (Community Service Project)

ELECTROMAGNETIC FIELD THEORY & TRANSMISSION LINES

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
3	3	-	-	3	30	70	100

COURSE OBJECTIVES

1. To introduce students with different coordinate systems.
2. To familiarize the students with the different concepts of electrostatic, magneto static and time varying electromagnetic systems.
3. To expose the students to the ideas of electromagnetic waves and structure of transmission line

COURSE OUTCOMES

After successful completion of this course, the students will be able to

CO1 Describe static electric fields and their behavior in different media, associated laws. **(L2)**

CO2 Describe magnetic fields, their behavior in different media, associated laws. **(L2)**

CO3 Apply integral and point form of Maxwell`s equations for solving the problems of electromagnetic field theory. **(L3)**

CO4 Explain the concept of Electromagnetic wave and its characteristics in different Propagation media. **(L2)**

CO5 Evaluate the basic transmission line parameters and transmission line systems using Smith Chart. **(L5)**

SYLLABUS

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-Parallel plate, Co-axial and Spherical capacitors, Illustrative Problems.

UNIT –II: MAGNETOSTATICS

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, Illustrative Problems.

UNIT –III: 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. Illustrative Problems.

UNIT –IV: 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, Illustrative Problems.

UNIT –V: TRANSMISSION LINES

Introduction to Transmission line equations, Primary & Secondary constants Expressions for Characteristic Impedance, Propagation Constant, Phase and Group Velocities, Losslessness /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, Single and Double Stub Matching, Illustrative Problems

TEXTBOOKS

1. Matthew N.O. Sadiku "Elements of Electromagnetic", 3rd Edition, Oxford Univ. Press, 2001.
2. Gottapu Sasibhushana Rao "Electromagnetic Field Theory and Transmission Lines", 1st Ed. Wiley India Pvt. Ltd., New Delhi, 2012.
3. Transmission lines and Networks- Umesh Sinha, Satya Prakashan, 2001, (Tech, India Publications), New Delhi.

REFERENCE BOOKS:

1. William H. Hayt, Jr. John A. Buck "Engineering Electromagnetics", Sixth Edition, McGraw Hill.
2. G.S.N. Raju "Electromagnetic Field Theory and Transmission Lines", Pearson Education (Pvt., Ltd., New Delhi, 2009.
3. Kraus and Fleisch "Electromagnetics with Applications", McGraw Hill, 1999.
4. Electromagnetic waves and Radiating Systems- E.C. Jordan and K.G. Balmain, 2nd Ed. 2000, PHI.

WEB RESOURCES:

1. https://nptel.ac.in/courses/108/104/108104087/
2. https://nptel.ac.in/courses/117/101/117101056/
3. https://nptel.ac.in/courses/117/101/117101057/

MICROPROCESSORS & MICROCONTROLLERS

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
3	3	-	-	3	30	70	100

COURSE OBJECTIVES

1. To provide an in-depth understanding of the operations of microprocessors, assembly language programming and interfacing.
2. To provide an in-depth understanding of the operations of microcontrollers and its applications.

COURSE OUTCOMES

After successful completion of this course, the students will be able to

CO1 Analyze the architecture of 8086 microprocessors. **(L4)**
CO2 Implement assembly language programs using instructions related to I/O, MEMORY and ISR. **(L3)**.
CO3 Illustrate how peripherals are interfaced with Microprocessor. **(L4)**
CO4 Differentiate 8086 processor and advanced processors. **(L4)**
CO5 Develop Small systems using Microcontrollers. **(L6)**

SYLLABUS

UNIT1-I: 8086/8088 MICROPROCESSORS

Register organization of 8086, Architecture, signal description of 8086, physical memory organization, general bus operation, I/O addressing capability, special purpose activities, Minimum mode, maximum mode of 8086 system and timings, the processor 8088, machine language instruction formats, addressing mode of 8086, instruction set off 8086, assembler directives and operators.

UNIT-II: PROGRAMMING WITH 8086 MICROPROCESSOR

Machine level programs, programming with an assembler, Assembly language programs, introduction to stack, stack structure of 8086/8088, interrupts and interrupt service routines, interrupt cycle of 8086, non-mask able interrupt and mask able interrupts, interrupt programming.

UNIT-III: BASIC AND SPECIAL PURPOSE PROGRAMMABLE PERIPHERALS AND THEIR INTERFACING WITH 8086/8088

Semiconductor memory interfacing, dynamic RAM interfacing, interfacing i/o ports, PIO 8255 modes of operation of 8255, interfacing to D/A and A/D converters, stepper motor interfacing, control of high power devices using 8255.Programmable interrupt controller 8259A, the keyboard /display controller8279, programmable communication interface 8251 USART, DMA Controller 8257.

UNIT-IV: ADVANCED MICRO PROCESSORS

Salient features of 80386DX, architecture and signal description of 80386, register organization of 80386 and addressing modes, data types of 80386, real address mode of 80386, protected mode of 80386, segmentation and Paging, virtual 8086 mode and enhanced mode. Instruction set of 80386. The coprocessor 80387.

UNIT-V: 8051 MICROCONTROLLER AND ARM 32-BIT MICROCONTROLLER

Introduction to microcontrollers, 8051Microcontrollers, 8051pin description, connections, I/O ports and memory organization, MCS51addressing modes and instructions, assembly language programming tools. ARM architecture and organization, ARM / Thumb programming model, ARM / Thumb instruction set.

TEXT BOOKS

1. A.K.Ray, K.M.Bhurchandi,"Advanced Microprocessors and Peripherals", Tata McGraw Hill Publications, 2000.
2. N.Sentil Kumar, M.Saravanan, S.Jeevananthan, "Microprocessors and Microcontrollers", Oxford University Press, 2010.

REFERENCES

1. Douglas V Hall, "Microprocessors and Interfacing" Tata McGraw Hill Publications, 2005.
2. Ajay V Deshmukh," Microcontrollers", TATA McGraw Hill publications, 2012.
3. Krishna Kant, "Microprocessors and Microcontrollers", PHI Publications, 2010.
4. M. A. Mazidi, Sarmad Naimi "The AVR Microcontroller and Embedded Systems Using Assembly and C: Using Arduino Uno and Atmel Studio", 2nd Edition, Micro Digital Edition.

PROBABILITY THEORY & RANDOM PROCESS

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
3	3	-	-	3	30	70	100

COURSE OBJECTIVES

1. To understand the fundamentals of Probability Theory and concept of random variables and probability density and distribution functions.
2. To know some important operations that can be performed on a random variable or multiple random variables.
3. To understand the mathematical concepts and analysis related to random processes and its basic applications to the signal processing in the communication system.

COURSE OUTCOMES

After successful completion of this course, the students will be able to

CO1 **Apply** the basic theorems and concepts of probability. **(L4)**

CO2 Apprehend a single random variable and its operations to **estimate** statistical properties of a distribution function **(L2)**

CO3 Extend the concepts of single random variable to multiple random variables to **estimate** the statistical properties of a distribution function. **(L2)**

CO4 **Analyze** the temporal characteristics of a random process to estimate correlation and covariance. **(L4)**

CO5 **Analyze** the spectral characteristics of a random process to estimate power spectral density (L4)

SYLLABUS

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.

UNIT-II: RANDOM VARIABLES AND OPERATIONS ON ONE RANDOM VARIABLE

Random variable concept, Distribution function, Density function, Gaussian random variable, Conditional distribution and density function, Expectation, Moments, Functions that give moment, Transformations of a random variable.

UNIT-III: MULTIPLE RANDOM VARIABLES AND OPERATIONS

Vector random variables, Joint distribution and its properties, Joint density and its properties, Conditional distribution and density, statistical independence, Distribution and density of a sum of random variables, Central limit theorem. Expected values of a function of random variables: Joint moments about the Origin, joint central moments, Joint characteristic functions, Joint Gaussian random variables: Two random variables, n-random variables, properties of Gaussian random variables, Transformations of multiple random variables: One function, Multiple functions, Inequalities of Chebyshev and Schwartz.

UNIT-IV: 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, (N- Order) and Strict-Sense Stationarity, Time Averages and Ergodicity, Mean-Ergodic Processes, Autocorrelation Function and Its Properties, Cross-Correlation Function and Its Properties, Covariance Function and their properties, Gaussian Random Processes, Poisson Random Process.

UNIT-V: RANDOM PROCESSES – SPECTRAL CHARACTERISTICS

The Power Density Spectrum and its Properties, Relationship between Power Spectrum and Autocorrelation Function, Cross-Power Density Spectrum and its Properties, Relationship between Cross-Power Spectrum and Cross-Correlation Function, Linear system fundamentals Random signal response of Linear systems, System evaluation using random noise, Noise bandwidth

TEXT BOOKS

1. Athanasios Papoulis and S. Unnikrishna Pillai "Probability, Random Variables and
2. Stochastic Processes", 4th Edition, PHI, 2002.
3. Peyton Z. Peebles, Jr "Probability Theory and Random Signal Principles", 4th edition Tata McGrew Hill Publishers, 2002.

REFERENCE BOOKS

1. Oliver C.Ibe Fundamentals of Applied Probability and Radom processes Elsevier Publications, 2007.
2. B.Prabhakara Rao, T.S.R.Murthy Probability theory and Stochastic Processes , BS Publications, Hyderabad, 2012.
3. S. P. Eugene Xavier" Probability Theory and Random Processes", S. Chand and Co. New Delhi, 1998(2nd Edition).

WEB RESOURCES

1. https://nptel.ac.in/courses/117105085/
2. https://nptel.ac.in/courses/117104117/

ANALOG AND DIGITAL COMMUNICATIONS

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
4	3	1	-	3	30	70	100

COURSE OBJECTIVES:

1. To develop ability to analyze analog modulation systems.
2. To develop ability to analyze pulse analog and digital modulation systems.
3. To develop ability to analyze digital modulation systems.
4. To develop ability to analyze spread spectrum systems

COURSE OUTCOMES:

After successful completion of this course, the students will be able to

CO1 Analyze generation of amplitude modulated signals and their demodulation **(L4).**
CO2 Analyze generation of angle modulated signals and their demodulation **(L4).**
CO3 Understand transmission and reception of amplitude and angle modulated Signals **(L2).**
CO4Analyze process of analog to digital conversion and pulse analog & digital modulation techniques **(L4).**
CO5 Analyze generation of digital modulated signals and their demodulation **(L4).**

SYLLABUS

UNIT-I: AMPLITUDE MODULATION SYSTEMS

Introduction to Communication Systems: Need for Modulation, Frequency Translation, Method of Frequency Translation, Amplitude Modulation, Modulation Index, Spectrum of AM Signal, Modulators and Demodulators (Diode detector), DSB-SC Signal and its Spectrum, Balanced Modulator, Synchronous Detectors, SSB Signal, SSB Generation Methods, Power Calculations in AM Systems, Application of AM Systems. Principle of Vestigial side band modulation. Noise: Source of Noise, External Noise, Internal Noise.

UNIT-II: ANGLE MODULATION SYSTEMS

Angle Modulation, Phase and Frequency Modulation and their Relationship, Phase and Frequency Deviation, Spectrum of an FM Signal, Bandwidth of Sinusoidally Modulated FM Signal, Effect of the Modulation Index on Bandwidth, Spectrum of Constant Bandwidth FM, Phasor Diagram for FM Signals, FM Generation: Parameter variation method, Indirect method of Frequency Modulation (Armstrong Method), Frequency Multiplication, PLL FM Demodulator, Pre – emphasis and De – emphasis, Comparison of FM and AM.

UNIT-III: TRANSMITTERS AND RECEIVERS

Classification of Radio Transmitters, Principle of a Radio Transmitters, AM and FM Transmitters, Radio receiver Types, AM Receivers, RF Section, Frequency Changing and Tracking, Intermediate Frequency and IF Amplifiers, Automatic Gain Control (AGC); FM Receivers, Amplitude Limiting, FM Demodulators, Ratio Detectors, ISB Receiver, Comparison with AM Receivers

UNIT-IV: PULSE MODULATION METHODS

Sampling and its types, Quantization and its types, Quantization Noise, Pulse Analog Modulation: PAM, PWM and PPM. Comparison of FDM and TDM. Pulse Code Modulation: PCM Generation and Reconstruction, Companding, DPCM, Adaptive DPCM, DM and Adaptive DM

UNIT-V: Digital Modulation Techniques and Spread Spectrum Modulation

ASK Modulator, Coherent ASK Detector, FSK- Modulator, Coherent FSK Detector, BPSK Modulator, Coherent BPSK Detection. Similarity of BFSK and BPSK, Principles of QPSK, M-ary PSK, M-ary, FSK, Minimum Shift Keying (MSK), Duo-binary Encoding.

TEXT BOOKS:

1. An introduction to Analog and Digital Communications, Simon Haykin, John Wiley, 2005
2. Principles of Communication Systems, H. Taub , D. L. Schilling and Goutham Sahe, TMH 3rd edition, 2007.
3. Principle of Communication Systems, Simon Haykins (2nd Edition).
4. Electronic Communication Systems, G. Kennedy, McGraw Hill, 1977 (2nd Edition).

REFERENCES:

1. Modern Digital and Analog Communication Systems, B. P. Lathi (2nd Edition).
2. Communication systems, R.P.Singh and S.D.Sapre 2nd edition TMH 2008
3. Electronic Communications Modulation and Transmission, Robert J. Schoenbeck, PHI N. Delhi, 1999.
4. Analog and Digital Communication – K. Sam Shanmugam, Willey, 2005.

MICROPROCESSORS & MICROCONTROLLERS LABORATORY

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
1.5	-	-	3	3	50	50	100

COURSE OBJECTIVES:

The main objectives of this course is to:

1. Understand programming for 8086 microprocessors using 8086 Kit
2. Learn 8086 programming using TASM Assembler.
3. Interface 8086 with I/O and other devices.
4. Study programming for Arduino UNO and its interfacing.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to

CO1 Write programs using Assembly language for small applications using 8086. **(L2)**

CO2 Write programs using Assembly language for small applications using 8051 in Keil Software. **(L2)**

CO3 Acquire skills in peripheral interfacing to both processor and Arduino UNO. **(L3)**

CO4 Implement mini projects for real time applications. **(L2)**

LIST OF PROGRAMS

8086 ESA-86/88 KIT PROGRAMMING

1. Write a program to add two 16 bit numbers stored in two memory locations 2000H and 2002H and store the result in another memory location 2004H.
2. Write a program to subtract two 16 bit numbers stored in two memory locations 2000H and 2002H and store the result in another memory location 2004H.
3. Write a program to multiply two 16 bit numbers stored in two memory locations 2000H and 2002H and store the result in another memory location 2004H.
4. Write a program to divide two 16 bit numbers stored in two memory locations 2000H and 2002H and store the result in another memory location 2004H.
5. Write a program to add two 32 bit numbers stored in two memory locations 2000H and 2004H and store the result in another memory location 2008H.
6. Write a program to find Factorial of a given number.
7. Write a program to find Fibonacci Series of a given number.

8086 PROGRAMMING USING TASM ASSEMBLER

8. Write a program to perform addition operation on two multi-byte numbers.
9. Write a program to perform subtraction operation on two multi-byte numbers.
10. Write a program to sort a given set of hexadecimal numbers.
11. Write a program to find whether the given string is Palindrome or not.
12. Write a program for inserting an element at a specified location in a given string.
13. Write a program to reverse a string.
14. Write a program to convert BCD numbers into equivalent binary value.

8086 INTERFACING

15. Interface Stepper Motor to 8086 and write a program to rotate the stepper motor both in clockwise and anti-clockwise direction.
16. Interface 8279 keyboard display controller to 8086 and write a program to display the message “Welcome to MP Lab”.

8051 PROGRAMMING USING KEIL SIMULATOR

17. Write a program to generate a square wave of 50% duty cycle at pin P2.1 using timer 0 in mode1.Assume XTAL=11.0592 MHz.
18. Write a program to send a message “WELCOME” serially at 9600 baud rate Continuously through serial port of 8051.

INTERFACING USING ARDUINO UNO

19. Interface LEDs to Arduino UNO and write a program for blinking LED.
20. Write a program for measuring light intensity using LDR and Arduino UNO.
21. Interface LM35 temperature sensor to Arduino UNO and write a program to measure the room temperature.

ANALOG AND DIGITAL COMMUNICATIONS LAB

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
1.5	-	-	3	3	50	50	100

COURSE OBJECTIVES

1. To be able to observe different Analog Modulation and Demodulation techniques
2. To be able to determine frequency response of filters
3. To be able to perform Pulse Analog and Digital Modulation and Demodulation
4. To be able to observe different Digital Modulation and Demodulation techniques

COURSE OUTCOMES

At the end of the course the students will be able to

CO1 Analyze the operation of various Amplitude modulation and Demodulation Systems **(L4).**

CO2 Analyze various Filtering techniques **(L4).**

CO3 Implement various Pulse Modulation techniques **(L3)**

CO4 Demonstrate various Digital modulation & demodulation systems **(L3)**

LIST OF EXPERIMENTS

1. Generation and Detection of Amplitude Modulation Signal.
2. Generation and Detection of frequency Modulation signal.
3. SSB-SC modulation and demodulation.
4. Low Pass Filter using passive components.
5. High Pass Filter using passive components
6. Sampling and reconstruction.
7. Generation and Detection of PAM signal.
8. Generation and Detection of PWM signal.
9. Generation and Detection of PPM signal.
10. Verify the operation of PCM.
11. Generation and Detection of ASK signal.
12. Generation and Detection of FSK signal.
13. Generation and Detection of PSK signal.

SKILL COURSE-2

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
2	1	-	2	3	50	50	100

PROBLEM SOLVING USING PYTHON

COURSE OBJECTIVES

1. Learn basic programming of Python.
2. To develop programs using Python packages.

COURSE OUTCOMES

At the end of the course student will be able to

CO1 Develop the Python programs using operators, conditional and looping statements and strings.

CO2 Implement programs using functions and different types of Data structures.

CO3 Develop the programs using Python Packages, OOP concepts.

MODULE-I

Week 1: Introduction:

History of Python, Need of Python Programming, Python Installation, Python basics.

Week 2: Operators in python, conditional statements

1. Accept two numbers from the user and calculate Addition, Subtraction, multiplication and Division.
2. Write a Program for checking whether the given number is an even number or not.
3. Given a two integer numbers return their product and if the product is greater than 1000, then return their sum.
4. A student will not be allowed to sit in exam if his/her attendance is less than 75%. Take following input from user - Number of classes held, Number of classes attended, and print percentage of class attended Is student is allowed to sit in exam or not.

Week 3: Iterations, continue and break statements.

1. Print the following pattern

```
1

1 2

1 2 3

1 2 3 4

1 2 3 4 5
```

2. Accept number from user and calculate the sum of all number between 1 and given number
3. Given a number count the total number of digits in a number
4.

Week 4: Strings, string functions, string slicing

1. Given 2 strings, s1 and s2, create a new string by appending s2 in the middle of s1.
2. Given a string input Count all lower case, upper case, digits, and special symbols.
3. Given an input string, count occurrences of all characters within a string.

MODULE-II

Week 5: Lists and Tuples

1. Write a Python program to get the largest number and smallest number from a list.
2. Write a Python program to remove duplicates from a list.
3. Write a Python program to find the length of a tuple.
4. Write a Python program to convert a list to a tuple.

Week 6: Sets and Dictionaries

1. Dictionaries and dictionary methods, Sets and set methods.
2. Write a Python script to merge two Python dictionaries
3. Write a Python program to sort a dictionary by key
4. Return a set of identical items from a given two Python set

Week 7: Functions:

(Defining Functions, Calling Functions, Passing Arguments, Anonymous Functions, Fruitful Functions (Function Returning Values)

1. Write a Python program to reverse a string using functions

2. Write a Python function to check whether a number is perfect or not
3. Write a function unique to find all the unique elements of a list.

Week 8: Recursion

1. Write a Python program to get the factorial of a non-negative integer using Recursion
2. Write a Python program to solve the Fibonacci sequence using recursion.

Week 9: Regular expressions: Metacharacters, Special Sequences, Sets, RegEx Function. File handling: modes, reading files, writing and closing files, Iterators, Generators, Filters and Lambda.

1. Write a Python program to find the substrings within a string
2. Write a Python program to Email id validation
3. Write a Python program to write a list to a file
4. Write a Python program to copy the contents of a file to another file

MODULE-III

Week 10:

Creating modules, import statement, from. Import statement, name spacing.

Python packages: Introduction to PIP, Installing Packages via PIP, Using Python Packages.

1. Install packages requests, flask and explore them. using (pip)
2. Write a script that imports requests and fetch content from the page. Eg. (Wiki)
3. Write a simple script that serves a simple HTTP Response and a simple HTML Page

Week 11: Basics of NumPy and Pandas packages, Basics of Matplotlib library.

1. Add the following two NumPy arrays and modify a result array by calculating the square of each element.
2. Write a Python program to convert a dictionary to a Pandas series

Week 12: OOP

a) Class variables and instance variable
i) Robot
ii) ATM Machine.

REFERENCE BOOKS:

1. Head-First Python: A Brain-Friendly Guide (2nd Edition).
2. Python Programming: An Introduction to Computer Science (3rd Edition)
3. Fluent Python: Clear, Concise, and Effective Programming (1st Edition)
4. Programming Python: Powerful Object-Oriented Programming (4th Edition)

ENVIRONMENTAL SCIENCE

Credits	Periods			Exam Hrs	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
0	3	0	0	3	30	70	100

COURSE OBJECTIVES

1. The students learn about the scope and importance of Environmental studies. The students understand about different kinds of ecosystems.
2. The students learn about biodiversity and its conservation. They also learn about types of biodiversity, values of biodiversity and threats to biodiversity.
3. The students understand about the types of natural resources and problems associated with them.
4. The students gain knowledge about different types of environmental pollution- causes, effects and control measures.
5. The students gain knowledge about characteristics of human population growth and its impact on environment. The students develop deep understanding about the environmental legislation.

COURSE OUTCOMES

CO1 Familiarize the fundamental aspects of environment and the environmental management'
CO2 Make realize the importance of natural resources management for the sustenance of the life and the society.
CO3 Apprise the impact of pollution getting generated through the anthropogenic activities on the environment
CO4 Provide the concept of Sustainable Development, energy and environment.
CO5 Impart knowledge on the new generation waste like e-waste and plastic waste

SYLLABUS

UNIT-I: Introduction to Environmental studies and Ecosystems

Definition, Scope and importance of environmental studies. Concept of an Eco system ,Biotic and Abiotic components of ecosystem, structure and function of an ecosystem. Food Chains, Food web and Ecological Pyramids. Forest ecosystem, Grassland ecosystem, Desert ecosystem, Pond ecosystem and Marine ecosystem.

UNIT – II: Bio-Diversity and its Conservation

Introduction – Definition and types of biodiversity – value of biodiversity - India as mega diversity nation – Hot spots of biodiversity – Threats to biodiversity – Conservation methods of biodiversity – In-situ & Ex – situ methods of conservation - Concept of sustainable development.

UNIT – III: Environment and Natural Resources Management

Soil erosion and desertification, Effects of modern agriculture, fertilizer-pesticide problems, Forest Resources: Use and over-exploitation, Mining and dams – their effects on forest and tribal

people, Water resources : Use and over-utilization of surface and ground water, Floods, droughts, Water logging and salinity, Dams – benefits and costs, Conflicts over water, Energy Resources : Energy needs, Renewable and non-renewable energy sources.

UNIT - IV: Environmental Pollution – climate change and environmental problems

Definition, causes, effects and control measures of (a) air pollution (b) water pollution (c) soil pollution (d) noise pollution. Global Warming – Acid Rain – Ozone depletion – Photochemical smog.

Drinking water, Sanitation and public health, Effect of Human activities of the quality of environment- Urbanization, transportation, Industrialization. Water scarcity and ground water depletion, Controversies on major dams –resettlement and rehabilitation of people problems and concerns. concept of plastic waste and e-waste

UNIT - V : Human Population and Environmental legislations

Population Explosion – characteristics of population explosion. Impact of population growth on Environment – Role of Information technology in Environment and Human Health. Environmental Ethics. Environmental acts: Water (Prevention and control of pollution) act, air (Prevention and control of pollution) act, Environmental Protection Act, Wild life protection act, Forest conservation act.

TEXT BOOKS:

1. Anubha Kaushik and C.P.Kaushik.Environmental Science by New age International Publishers.
2. Bharucha,Erach (2004). Textbook for Environmental Studies for Undergraduate Courses of all Branches of Higher Education, University Grants Commission, New Delhi.
3. Basu, M., Xavier, S. (2016). Fundamentals of Environmental Studies, Cambridge University Press, India
4. Masters, G. M., &Ela, W. P. (1991). Introduction to environmental engineering and science. Englewood Cliffs, NJ: Prentice Hall.
5. Enger, E. and Smith, B., Environmental Science: A Study of Interrelationships, Publisher: McGraw-Hill Higher Education; 12th edition, 2010.

REFERENCE BOOKS:

1. Sharma, P. D., & Sharma, P. D. (2005). Ecology and environment. Rastogi Publications.
2. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
3. Clark R.S. (2001). Marine Pollution, Clanderson Press Oxford (TB)
4. Jadhav, H & Bhosale, V.M. (1995). Environmental Protection and Laws. Himalaya Pub. House, Delhi 284 p.
5. MoEF&CC, Govt. of India, CPCB: E-waste management rules, 2016 and its amendments 2018.
6. MoEF&CC, Govt. of India, CPCB: Plastic waste management rules, 2016.

Proposed Scheme for III/IV B.Tech I Semester

Category	Course Code	Course	Hours Per Week			Maximum Marks			Credits
			Theory	Tutorial	Lab	Exam	Sessionals	Total	
PCC		Linear ICs & Applications	3	0	0	70	30	100	3
PCC		Digital Signal Processing	3	0	0	70	30	100	3
PCC		Antenna & Wave Propagation	3	0	0	70	30	100	3
PCC		Pulse and Digital Circuits	3	0	0	70	30	100	3
PEC		Professional Elective-I	3	0	0	70	30	100	3
PCC		Digital Signal Processing Lab	0	0	3	50	50	100	1.5
PCC		Linear ICs and Pulse Circuits Lab	0	0	3	50	50	100	1.5
SC		Soft Skills	0	0	3	50	50	100	2
PROJECT		Summer Internship	1	0	2	50	50	100	1.5
		Total	**16**	**0**	**11**	**550**	**350**	**900**	**21.5**
Honors/Minor courses (The hours distribution can be 3-0-2 or 3-1-0 also)			3	1	0	70	30	100	4

Professional Elective-I	1. OOPS Through JAVA
	2. TSSN
	3. Internet & Web Technology
	4. Software Engineering

Proposed Scheme for III/IV B.Tech II Semester

Category	Course Code	Course	Hours Per Week			Maximum Marks			Credits
			Theory	Tutorial	Lab	Exam	Sessionals	Total	
PCC		Information Theory and coding	3	0	0	70	30	100	3
PCC		Control Systems	3	0	0	70	30	100	3
PCC		Microwave Engineering	3	0	0	70	30	100	3
PEC		Professional Elective-II	3	0	0	70	30	100	3
OEC		Open elective-I	3	0	0	70	30	100	3
PCC		Digital design through Verilog	0	0	3	50	50	100	3
PCC		Verilog HDL Lab	0	0	3	50	50	100	1.5
PCC		Microwave Engineering Lab	0	0	3	50	50	100	1.5
SC		Professional communication skills	1	0	2	50	50	100	2
		Total	**16**	**0**	**11**	**550**	**350**	**900**	**23**
Honors/Minor courses (The hours distribution can be 3-0-2 or 3-1-0 also)			3	1	0	70	30	100	4

Professional Elective-II	1.Digital Image Processing
	2.Computer Network Engineering
	3.Electronic Measurements and Instrumentation
	4.EMI/EMC
Open Elective-I	1.Offered by Department of CSE
	2. Offered by Department of Mechanical
	3. Offered by Department of Civil Engineering

Proposed Scheme for IV/IV B.Tech I Semester

Category	Course Code	Course	Hours Per Week			Maximum Marks			Credits
			Theory	Tutorial	Lab	Exam	Sessionals	Total	
PCC		Radar Engineering	3	0	0	70	30	100	3
PEC		Professional Elective-III	3	0	0	70	30	100	3
PEC		Professional Elective-IV	3	0	0	70	30	100	3
PEC		Professional Elective-V	3	0	0	70	30	100	3
OEC		Open elective-II	3	0	0	70	30	100	3
HSS		Humanities and Social Science Elective	0	0	3	50	50	100	3
SC		PCB Designing	1	0	2	50	50	100	2
PROJECT		Industrial/Research Internship	0	0	3	50	50	100	3
		Total	**16**	**0**	**8**	**400**	**400**	**800**	**23**
Honors/Minor courses (The hours distribution can be 3-0-2 or 3-1-0 also)			3	1	0	70	30	100	4

****Industrial/Research Internship 2 Months (Mandatory) after third year (to be evaluated during VII semester**

Professional Elective-III	1. Cellular and Mobile Communications
	2. Smart Antenna Systems
	3.Satellite Communication
	4.Artificial Neural Networks
Professional Elective-IV	1. DSP Processors & Architectures
	2.VLSI Design
	3. Internet of Things
	4. Radar Signal Processing
Professional Elective-V	1. Fiber Optic Communications
	2. Embedded Systems
	3. Global Positioning System
	4. Machine Learning
Open Elective-II	1. Offered by Department of CSE
	2. Offered by Department of Mechanical
	3. Offered by Department of Civil Engineering

Proposed Scheme for IV/IV B.Tech II Semester

Category	Course Code	Course	Hours Per Week			Maximum Marks			Credits
			Theory	Tutorial	Lab	Exam	Sessionals	Total	
PROJECT	Major Project	Project work	0	0	0	50	50	100	12
		Total							**12**

COMPARATIVE ANALYSIS OF STRUCTURE OF THE UNDERGRADUATE ENGINEERING PROGRAM

S.No.	Category	Code	Suggested break up of credits as per AICTE	Suggested break up of credits as per APSCHE	Break up of credits as per GVPCDPGC (A)
1	Humanities and Social Science including management courses		12	10.5	10.5
2	Basic Science courses	BSC	25	21	21
3	Engineering Science course	ESC	24	24	24
4	Professional Core course	PCC	48	51	57
5	Open Elective course	OEC	18	12	6
6	Professional elective course	PEC	18	15	15
7	Internship, Seminar, Project Work	PROJ	15	16.5	16.5
8	Mandatory Course	MC	Non-credit	Non-credit	--
9	Skill Oriented Course	SC	-----	10	10
Total credits			**160**	**160**	**160**

Curricular Framework for Honors Programme

1. Students of a Department/Discipline are eligible to opt for Honors Programme offered by the same Department/Discipline.

2. A student shall be permitted to register for Honors program at the beginning of 4th semester provided that the student must have acquired a minimum of 8.0 SGPA upto the end of 2nd semester without any backlogs. In case of the declaration of the 3rd semester results after the commencement of the 4th semester and if a student fails to score the required minimum of 8 SGPA, his/her registration for Honors Programme stands cancelled and he/she shall continue with the regular Programme.

3. Students can select the additional and advanced courses from their respective branch in which they are pursuing the degree and get an honors degree in the same. e.g. If a Electronics and communication Engineering student completes the selected advanced courses from same branch under this scheme, he/she will be awarded B.Tech. (Honors) in Electronics and communication Engineering.

4. In addition to fulfilling all the requisites of a Regular B. Tech Programme, a student shall earn 20 additional credits to be eligible for the award of B. Tech (Honors) degree. This is in addition to the credits essential for obtaining the Under Graduate Degree in Major Discipline (i.e. 160 credits).

5. Of the 20 additional Credits to be acquired, 16 credits shall be earned by undergoing specified courses listed as a pool, with four courses, each carrying 4 credits. The remaining 4 credits must be acquired through two MOOCs, which shall be domain specific, each with 2 credits and with a minimum duration of 8/12 weeks as recommended by the Board of studies.

6. It is the responsibility of the student to acquire/complete prerequisite before taking the respective course.

7. MOOC courses is of minimum 8 weeks in duration. Attendance will not be monitored for MOOC courses. Students have to acquire a certificate from the agencies approved by the BOS with grading or marks or pass/fail in order to earn 4 credits. If the MOOC course is a pass/fail course without any grades, the grade to be assigned will be as decided by the university/academic council.

8. If a student drops or is terminated from the Honors program, the additional credits so far earned cannot be converted into free or core electives; they will remain extra. These additional courses will find mention in the transcript (but not in the degree certificate). In such cases, the student may choose between the actual grade or a “pass (P)” grade and also choose to omit the mention of the course as for the following: All the courses done under the dropped Minors will be shown in the transcript. None of the courses done under the dropped Minor will be shown in the transcript.

9. In case a student fails to meet the CGPA requirement for Degree with Honors at any point after registration, he/she will be dropped from the list of students eligible for Degree with Honors and they will receive regular B. Tech degree only. However, such students will receive a separate grade sheet mentioning the additional courses completed by them.

10. Honors must be completed simultaneously with a major degree program. A student cannot earn Honors after he/she has already earned bachelor's degree.

HONORS COURSES

Note

1. The subjects opted for Honors should be Advanced type which are not covered in regular curriculum

2. Students has to acquire 16 credits with minimum one subject from each pool.

3. Concerned BoS can add or delete the subjects as per the decision of the board.

4. Pre-requisites to be defined by the board for each course.

5. Compulsory MOOC/NPTEL Courses for 04 credits (02 courses@ 2 credits each)

HONORS in VLSI	
1	Microelectronics
2	VLSI Testing & Testability
3	Physical Design and Automation
4	Low power VLSI Design

MOOC COURSES

1. CMOS Digital VLSI Design
   Duration:8 weeks
2. VLSI Signal Processing
   Duration:8 weeks

Curricular Framework for Minor Programme

1. a) Students who are desirous of pursuing their special interest areas other than the chosen discipline of Engineering may opt for additional courses in minor specialization groups offered by a department other than their parent department. For example, If Electronics and communication Engineering student selects subjects from Civil Engineering under this scheme, he/she will get Major degree of Electronics and communication Engineering Engineering with minor degree of Civil Engineering

b) Student can also opt for Industry relevant tracks of any branch to obtain the Minor Degree, for example, a B.Tech Electronics and communication Engineering student can opt for the industry relevant tracks like Data Mining track, IOT track, Machine learning track etc.

2. The BOS concerned shall identify as many tracks as possible in the areas of emerging technologies and industrial relevance / demand. For example, the minor tracks can be the fundamental courses in CSE, ECE, EEE, CE, ME etc or industry tracks such as Artificial Intelligence (AI), Machine Learning (ML), Data Science (DS), Robotics, Electric vehicles, Robotics, VLSI etc.

3. A student shall be permitted to register for Minors program at the beginning of 4th semester subject to a maximum of two additional courses per semester, provided that the student must have acquired 8 SGPA (Semester Grade point average) upto the end of 2nd semester without any history of backlogs. It is expected that the 3rd semester results may be announced after the commencement of the 4th semester. If a student fails to acquire 8 SGPA upto 3rd semester or failed in any of the courses, his registration for Minors program shall stand cancelled. An SGPA of 8 has to be maintained in the subsequent semesters without any backlog in order to keep the Minors registration active.

4. A student shall earn additional 20 credits in the specified area to be eligible for the award of B. Tech degree with Minor. This is in addition to the credits essential for obtaining the Under Graduate Degree in Major Discipline (i.e. 160 credits).

5. It is the responsibility of the student to acquire/complete prerequisite before taking the respective course. If a course comes with a lab component, that component has to be cleared separately. A student shall be permitted to choose only those courses that he/she has not studied in any form during the Programme.

6. In addition to the 16 credits, students must pursue at least 2 courses through MOOCs. The courses must be of minimum 8 weeks in duration. Attendance will not be monitored for MOOC courses. Student has to acquire a certificate from the agencies approved by the BOS with grading or marks or pass/fail in order to earn 4 credits. If the MOOC course is a pass/fail course without any grades, the grade to be assigned as decided by the university/academic council.

7. If a student drops (or terminated) from the Minor program, they cannot convert the earned credits into free or core electives; they will remain extra. These additional courses will find mention in the transcript (but not in the degree certificate). In such cases, the student may choose

between the actual grade or a "pass (P)" grade and also choose to omit the mention of the course as for the following: All the courses done under the dropped Minors will be shown in the transcript. None of the courses done under the dropped Minor will be shown in the transcript.

8. In case a student fails to meet the CGPA requirement for B.Tech degree with Minor at any point after registration, he/she will be dropped from the list of students eligible for degree with Minors and they will receive B. Tech degree only. However, such students will receive a separate grade sheet mentioning the additional courses completed by them.
9. Minor must be completed simultaneously with a major degree program. A student cannot earn the Minor after he/she has already earned bachelor's degree.

GENERAL AND INDUSTRIAL MINOR TRACKS
Note
1. The student can opt any 4 subjects from each pool.
2. Concerned BoS can add or delete the subjects as per the decision of the board.
3. Pre-requisites to be defined by the board for each course.
4. Compulsory MOOC/NPTEL Courses for 04 credits (02 courses@ 2 credits each)

MINORS in Electronic Communications	
1	Radiation Systems
2	RADAR and Navigational Aids
3	Cellular Communications
4	Introduction to Global Positioning system

MOOC COURSES

1. Fundamentals of semiconductor devices (12 Weeks)
2. Communication Networks (12 Weeks)

COMMUNITY SERVICE PROJECT

……Experiential learning through community engagement

As per the decision of the decision of the concerned department BoS

Introduction

- Community Service Project is an experiential learning strategy that integrates meaningful community service with instruction, participation, learning and community development
- Community Service Project involves students in community development and service activities and applies the experience to personal and academic development.
- Community Service Project is meant to link the community with the college for mutual benefit. The community will be benefited with the focused contribution of the college students for the village/ local development. The college finds an opportunity to develop social sensibility and responsibility among students and also emerge as a socially responsible institution.

Objective

Community Service Project should be an integral part of the curriculum, as an alternative to the 2 months of Summer Internships / Apprenticeships / On the Job Training, whenever there is an exigency when students cannot pursue their summer internships. The specific objectives are;

- To sensitize the students to the living conditions of the people who are around them,
- To help students to realize the stark realities of the society.
- To bring about an attitudinal change in the students and help them to develop societal consciousness, sensibility, responsibility and accountability
- To make students aware of their inner strength and help them to find new /out of box solutions to the social problems.
- To make students socially responsible citizens who are sensitive to the needs of the disadvantaged sections.
- To help students to initiate developmental activities in the community in coordination with public and government authorities.
- To develop a holistic life perspective among the students by making them study culture, traditions, habits, lifestyles, resource utilization, wastages and its management, social problems, public administration system and the roles and responsibilities of different persons across different social systems.

Implementation of Community Service Project

- Every student should put in a minimum of 180 hours for the Community Service Project during the summer vacation. Each class/section should be assigned with a mentor.

- Specific Departments could concentrate on their major areas of concern. For example, Dept. of Computer Science can take up activities related to Computer Literacy to different sections of people like - youth, women, house-wives, etc
- A log book has to be maintained by each of the student, where the activities undertaken/involved to be recorded.
- The log book has to be countersigned by the concerned mentor/faculty in charge.
- Evaluation to be done based on the active participation of the student and grade could be awarded by the mentor/faculty member.
- The final evaluation to be reflected in the grade memo of the student.
- The Community Service Project should be different from the regular programs of NSS/NCC/Green Corps/Red Ribbon Club, etc.
- Minor project report should be submitted by each student. An internal Viva shall also be conducted by a committee constituted by the principal of the college.
- Award of marks shall be made as per the guidelines of Internship/apprentice/ on the job training

Procedure

- A group of students or even a single student could be assigned for a particular habitation or village or municipal ward, as far as possible, in the near vicinity of their place of stay, so as to enable them to commute from their residence and return back by evening or so.

The Community Service Project is a twofold one –

- First, the student/s could conduct a survey of the habitation, if necessary, in terms of their own domain or subject area. Or it can even be a general survey, incorporating all the different areas. A common survey format could be designed. This should not be viewed as a duplication of work by the Village or Ward volunteers, rather, it could be another primary source of data.
- Secondly, the student/s could take up a social activity, concerning their domain or subject area.

The different areas, could be like –

1. Agriculture
2. Health
3. Marketing and Cooperation
4. Animal Husbandry
5. Horticulture
6. Fisheries

7. Sericulture
8. Revenue and Survey
9. Natural Disaster Management
10. Irrigation
11. Law & Order
12. Excise and Prohibition
13. Mines and Geology
14. Energy
15. Internet, Free Electricity, Drinking Water

SYLLABUS FOR III/IV B. TECH I SEM (5th Semester), (R-20)

Category	Course code	Course Title	Hours per week			Internal Marks	External Marks	Total Marks	Credits
			L	T	P				
PCC		Linear ICs & Applications	3	0	0	30	70	100	3
PCC		Control Systems	3	0	0	30	70	100	3
PCC		Pulse and Digital Circuits	3	0	0	30	70	100	3
PCC		Antenna & Wave Propagation	3	0	0	30	70	100	3
OEC		Open elective-1	3	0	0	30	70	100	3
PEC		Professional Electives-I	3	0	0	30	70	100	3
PCC		Linear ICs and Pulse Circuits Lab	0	0	3	50	50	100	1.5
SC		Digital design through Verilog	0	1	2	50	50	100	2
PROJ		Internship-I/Community service Project				0	100	100	1.5
							Total Credits		**23**

Professional Elective-I

1. OOPS Through JAVA
2. COMPUTER NETWORK ENGINEERING
3. Electronic Measurements and Instrumentation

Open Elective-1(Offered to Non ECE Students)

1. Basic Electronics Engineering (offered by department of ECE)

LINEAR ICs AND APPLICATIONS

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
3	3	-	-	3	30	70	100

COURSE OBJECTIVES:

1. To design and analyze different linear, non-linear and mathematical application circuits using operational amplifier.
2. To design and analyze different filters using operational Amplifier.
3. To introduce the operation and applications of timers and PLL.
4. To discuss the concept and applications of ADC and DAC

COURSE OUTCOMES:

After successful completion of this course, the students will be able to

CO1:Understand the characteristics ofop-amp **(L2)**.

CO2:Analyze linear applications using op-amps **(L4)**.

CO3:Analyze non-linear applications and filters using op-amps **(L4)**.

CO4:Design Timers and PLL using functional ICs **(L4)**.

CO5:Design A/D and D/A converters using Op-amp **(L4).**

SYLLABUS

UNIT-I: OPERATIONAL AMPLIFIERS

Design Aspects of Monolithic Op-Amps, Ideal Characteristics, AC and DC Characteristics, Data sheet Specifications, Offset Voltages and Currents, Frequency Compensation Techniques, Measurement of Op-Amp Parameters.

UNIT-II: LINEAR APPLICATIONS OF OP-AMPS

Inverting and Non-Inverting Amplifiers, adder, Subtractor, Instrumentation Amplifiers, Voltage to Current and Current to Voltage Converters, Integrator, Differentiator, Oscillators, RC phase shift Oscillator, Wein-bridge Oscillator.

UNIT-III: NON-LINEAR APPLICATIONS OF OP-AMPS

SIGNAL CONDITIONING CIRCUITS: Rectifiers, Peak Detection, Logarithmic Amplifier, Wave form Generators, Multi vibrators, Square Wave Generators, Comparators and Schmitt trigger, Analog Multiplexers, Sample and Hold Circuit.

ACTIVE FILTERS: Low pass filter, High pass filter, Band pass filter, Band elimination filter, All-pass Filters, Higher Order Filters and their Comparison.

UNIT-IV: SPECIAL ICs

555 Timers, 556 Function Generator ICs and their Applications, Three Terminal IC Regulators, IC 1496 (Balanced Modulator), IC 565 PLL and its Applications, Function Generators.

UNIT-V: DIGITAL TO ANALOG AND ANALOG TO DIGITAL CONVERTERS

DAC techniques, weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, Different types of ADCs-parallel Comparator type ADC, Counter type ADC, Successive approximation ADC and dual type ADC, DAC and ADC specifications.

TEXT BOOKS:

1. RamakantA.Gayakward, "Op-Amps and Linear Integrated Circuits", 4th Edition, PHI, 2010.
2. Choudhary D. Roy, Shail B. Jain "Linear Integrated Circuits", 5th Edition New Age International Publishers,2018.
3. G B Clayton, "Operational Amplifiers", 5th Edition, Elsevier science, 2003.

REFERENCES:

1. K.R. Botkar, "Integrated Circuits", 5th Edition, Khanna Publications 2010.
2. Jacob Millman, Arvin Grabel, "Microelectronics" 2nd Edition, McGraw Hill,2017.

WEB RESOURCES:

1. http://nptel.ac.in/courses/117108038/
2.http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-01sc-introduction-to-electrical-engineering-and-computer-science-i-spring-2011/unit-3-circuits/op-amps/

CONTROL SYSTEMS

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
3	3	1	-	3	30	70	100

COURSE OBJECTIVES:

1. To introduce different types of systems and to interpret different physical and mechanical systems in terms of electrical system, to construct equivalent electrical models for analysis.
2. To employ time domain analysis and diagnose transient performance parameters of the system for standard input functions.
3. To formulate expressions in frequency domain to explain the nature of stability of the system.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to

CO1: **Interpret** different physical and mechanical systems in terms of electrical system to construct equivalent electrical models for analysis **(L2)**

CO2: Analyze Block Diagram systems and Signal Flow graphs modelling **(L4)**

CO3: Examine time domain analysis to predict and diagnose transient performance parameters of the system for standard input functions **(L3)**

CO4: Analyze stability of system by using RH Criteria and Root Locus. **(L4)**

CO5: Correlate different types of analysis in frequency domain to explain the nature of stability of the system**. (L4)**

SYLLABUS

UNIT-I: INTRODUCTION TO CONTROL SYSTEMS

Control system, Comparison between open loop and closed loop systems, Introduction to Mathematical Modeling of Physical Systems, Equations of Electrical Networks, Modeling of Mechanical Systems, Equations of Mechanical Systems, Analogous Systems.

UNIT-II: TRANSFER FUNCTIONS OF LINEAR SYSTEMS

Block Diagrams of Control Systems, Reduction Techniques for Complex Block Diagrams, Signal Flow Graphs, conversion of Block diagram to signal flow graph, Signal Flow Graphs reduction (Simple Examples)

UNIT-III: TIME DOMAIN ANALYSIS

Time Response, Test Signals, Order and Type number of a system, Response of First order system for unit step input, Second Order System response with step and impulse Input Signals, Time domain specifications, Response with P, PI, PD and PID controllers, Steady State Error Constants, (Simple Problems to understand theory)

UNIT-IV: STABILITY ANALYSIS

Concepts of stability, Necessary conditions for Stability, Routh-Hurwitz Criterion, the Concept and Construction of Root Loci, Analysis of Control Systems with Root Locus (Simple Problems to understand theory).

UNIT-V: FREQUENCY DOMAIN ANALYSIS AND STABILITY

Frequency domain specifications, Frequency Response Plots, Bode Plot, Polar Plot, Nyquist Stability Criterion, Constant M and N Circles.

TEXT BOOKS:

1. Control Systems Engineering, I. J. Nagrath and M. Gopal, Wiley Eastern Ltd.,2021
2. Control Systems by A. NagoorKani, RBA Publications, 2017

REFERENCES:

1. Modern Control Engineering, Ogata, PHI, 2015
2. Control Systems Principles and Design, M.Gopal, McGrawHill, 2012

WEB RESOURCES:

1. http://nptel.ac.in/courses/108101037/
2. http://ocw.mit.edu/courses/aeronautics-and-astronautics/16-30-feedback-control-systems-fall-2010/

PULSE AND DIGITAL CIRCUITS

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
3	3	-	-	3	30	70	100

COURSE OBJECTIVES:

1. To impart basic knowledge on linear non-linear wave shaping circuits.
2. To enable the students to know non-linear wave shaping circuits.
3. To make the students to design different types of Multivibrators using transistors
4. To make the students to acquire knowledge on basic concept of time base generators.
5. To make the students to know the working of voltage time base generators and sampling gates.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to

CO 1:Analyze the linear wave shaping circuits **(L4)**.

CO 2:Analyze the non-linear wave shaping circuits **(L4)**.

CO 3: Design Bi-stable Multivibrator using transistors **(L4).**

CO 4: **Design** Multivibrator using Mono-stable and Astable circuits **(L4).**

CO 5:Examine the voltage time base generators, sampling gates and logic families **(L4)**.

SYLLABUS

UNIT-I: LINEAR WAVE SHAPING

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 application in CRO probe, RL and RLC circuits and their response for step input, Ringing circuit.

UNIT-II: **NON-LINEAR WAVE SHAPING**

Diode clippers, Shunt Clippers, Series Clippers clipping at two independent levels, Clamping operation, Negative clamper, Positive Clamper, Biased Clamping , Clamping circuit theorem, practical clamping circuits, effect of diode characteristics on clamping voltage. Designing of Clamping Circuit.

UNIT-III: BISTABLE MULTIVIBRATOR

Analysis and Design of Fixed Bias, Self-Bias Bistable Multi Vibrator, Collector Catching Diodes, Commutating Capacitors, Triggering of Binary Circuits, Emitter Coupled BistableMultivibrator (Schmitt Trigger).

UNIT-IV: MONOSTABLE AND ASTABLE MULTIVIBRATOR

Analysis and Design of Collector Coupled Mono-stable Multi vibrator, Triggering of Mono-stable Multivibrator, Applications of Mono-stable Multivibrator. AstableMultivibrator: Analysis and Design of Collector Coupled AstableMultivibrator, Application of AstableMultivibrator as a Voltage to Frequency Converter.

UNIT-V: VOLTAGE TIME BASE GENERATORS

Basic principles in Miller and Bootstrap time base generators, Transistor Miller time base generator, Transistor Bootstrap time base generator.

Sampling Gates: Basic Operating Principles of Sampling Gates, Diode Unidirectional Sampling Gate and Two-Diode Bi-Directional Sampling Gate, Four-Diode gates, Six- Diode Gates, Applications of Sampling Gates. Logic Families: Diode Logic, Transistor Logic, Diode-Transistor Logic, Transistor- Transistor Logic, Emitter Coupled Logic, CMOS Logic, Comparison of Logic Families.

TEXT BOOKS:

1. Pulse, Digital and Switching Waveforms, J. Millman and H. Taub, Mothiki, S. Prakash Rao, Mc Graw Hill, 2nd Edition, 2008.
2. Pulse and Digital Circuits, A. Anand Kumar, PHI, 2nd Edition, 2008.
3. Pulse & Digital Circuits, VenkataRao.K, Ramasudha.K, Manmadha Rao G, Pearson, 1st Edition, 2010.

REFERENCES:

1. Solid State Pulse circuits, David A. Bell, PHI, 4th Edition, 2002.
2. Digital Principles and Applications, Leach &Malvino, SIE, 5th Edition, 1994.

WEB LINKS:

1 https://www.smartzworld.com/notes/pdc-pulse-and-digital-circuits/
2 http://nptel.ac.in/courses/117103064/22
3 http://www.electronics-tutorials.ws/filter/filter_1.html
4 https://electronicspost.com/v-i-characteristics-of-pn-junction-diode/

ANTENNAS AND WAVE PROPAGATION

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
3	3	-	-	3	30	70	100

COURSE OBJECTIVES:

1. To understand various parameters of Antenna and its principle of operation.
2. To understand point sources, array of two isotropic sources and Uniform Linear Array and to understand the principle of operation of V-antenna, rhombic antenna, helical antenna and their practical usage.
3. To understand the concept of Micro strip antennas, Reflector antennas, lens and horn antennas and their features, characteristics and design relations and to understand the concept of measurement of various antenna parameters.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to

CO1: Identify the importance of antenna parameters and mechanism of radiation**(L1)**.

CO2: Analyze the characteristics of wire and loop antennas**(L4)**.

CO3: Analyze radiation patterns of antenna arrays**(L4)**.

CO4: Design HF, VHF, UHF antennas and microwave antennas for given specifications. Illustrate techniques to measure antenna parameters **(L4)**.

CO5: Understand the concepts of radio wave propagation**(L2)**

SYLLABUS

UNIT-I: ANTENNA FUNDAMENTALS AND RADIATION

Introduction, Radiation mechanism, Current distribution on a thin wire antenna, Isotropic antenna, Directional antenna, Omni directional antenna, Antenna parameters –Antenna impedance, Radiation resistance, Radiation pattern, Radiation patterns of a centre-fed vertical dipole, Principle pattern, Main lobe and side lobes, Beam widths, Beam area, Beam efficiency, Bandwidth, Front to back ratio, Resolution, Radiation intensity, Gain, Directivity, Antenna efficiency, Antenna effective aperture, Aperture efficiency, Effective length, Relation between effective length and aperture, Antenna equivalent circuit, Polarization, Antenna theorems and properties, Methods of excitation, Transmission loss between transmitting and receiving antennas - FRIIS formula, Antenna temperature and signal-to-noise ratio.

UNIT-II: LINEAR WIRE ANTENNAS

Retarded potentials, Basic antenna elements, 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, Radiated power and radiation resistance of half-wave dipole and quarter wave monopole, Loop antennas - Small loop, Radiation resistances and directivities of small loops (Qualitative Treatment).

UNIT-III:ANTENNA ARRAYS

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, Binomial arrays, Effect of earth on vertical patterns, Effect of earth on radiation resistance.

HF, VHF AND UHF ANTENNAS

Introduction, 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, Helical antenna, Whip antenna, Ferrite rod antenna, Turnstile antennas, Discone antennas, Notch antenna.

UNIT-IV: MICROWAVE ANTENNAS AND ANTENNA MEASUREMENTS

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 Slot antenna, Babinet's principle, Lens antennas, Microstrip antennas, Antenna impedance measurements, Measurement of radiation pattern, Measurement of beam width and side lobe ratio, Measurement of Gain and radiation resistance, Measurement of Antenna radiation efficiency, Measurement of antenna aperture efficiency, Measurement of Directivity, Measurement of polarization of antenna.

UNIT-V: 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, Mechanism of Ionospheric propagation, reflection and refraction, Characteristic parameters of Ionospheric propagation, Sky wave field strength, Fading and diversity techniques, Ionospheric abnormalities.

TEXT BOOKS:

1. G.S.N. Raju, “Antennas and Wave Propagation”, Pearson Education (Singapore) Pvt. Ltd., New Delhi, 2007
2. John D. Kraus, Antennas, 2nd Edition, McGraw Hill, 1988.

REFERENCES:

1. E. C. Jordan and K. G. Balmain “EM Waves and Radiation Systems”, PHI – N. Delhi, 1997.
2. C.A. Balanis, “Antenna theory”, 3rd Edition, John Wiley & Sons, 2009.
3. K.D.Prasad, Satya Prakashan,“Antennas and Wave Propagation”, Tech Publications, 3rd Edition, 2001.

WEB RESOURCES:

1. http://nptel.ac.in/courses/117107035/

PROFESSIONAL ELECTIVE-I

OOPS Through JAVA

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
3	3	-	-	3	30	70	100

COURSE OBJECTIVES:

1. To understand the significance of object-orientation in designing a s/w.
2. To design object-oriented applications using C++ and Java.
3. To understand the importance of Unified Modeling Language in s/w design.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to

CO1:Understand the importance of object-oriented concepts, UML and C++ programming basics **(L2)**.

CO2:Design applications using inheritance and polymorphism in C++ **(L4)**.

CO3:Explain how exception handling, File I/O are handled in C++ **(L2)**.

CO4:Familiarize with Object-Orientation using Java **(L2)**.

CO5:Understand how to design applications using packages, interfaces and multithreading in Java **(L2).**

SYLLABUS

UNIT-I: OBJECT ORIENTED PARADIGM

Procedural Paradigms, Introductions to OOPs, Concept of Data Abstraction Encapsulation, Inheritance and Polymorphism, Introduction to U.M.L, Description of various U.M.L. Diagrams with examples. C++ Programming Basics: data types, declarations, expressions and operator precedence, functions, scope of variables.

UNIT-II: OBJECT ORIENTATION USING C++

Classes and objects, Constructors & Destructors, Operator overloading & type conversions. Inheritance: Derived classes, syntax of derived classes, making private members inheritable, single, multilevel, multiple, hierarchical, hybrid. Polymorphism: Pointers, virtual functions and polymorphism-pointers to objects, this pointer, pointers to derived classes, virtual and pure virtual functions.

UNIT-III: TEMPLATES, EXCEPTION HANDLING, CONSOLE I/O AND FILE I/O

Class templates, Function templates, member function templates, exception handling, managing console I/O operations, working with files.

UNIT-IV: INTRODUCTION TO JAVA

Introduction, Classes and Objects, Arrays, strings and Vectors, Exception Handling, Managing I/O files in Java.

UNIT-V: PACKAGES AND INTERFACE, AND MULTI-THREADING

Packages, Interfaces, creating, extending, stopping, blocking threads, thread states, thread methods, exceptions, priority in threads, synchronization, Runnable interface.

TEXT BOOKS:

1. Herbert Schildt and F. Naughton, “JAVA 2.0- Complete Reference”.
2. Y.Daniel Liang, “Introduction to JAVA PROGRAMMING”, PHI, 11e,2017.
3. E. Balagurusamy, “Object oriented Programming using C++”, PHI,6E,2013.
4. E. Balagurusamy, Programming with Java a Primer, TMH, Fourth Edition, 2010

REFERENCES:

1. Barkakati N, “Object Oriented Programming in C++”, PHI, 1995
2. Object Oriented Analysis and Design; Andrew Haigh; Tata McGraw Hill; 2001.

PROFESSIONAL ELECTIVE-I

COMPUTER NETWORK ENGINEERING

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
3	3	-	-	3	30	70	100

COURSE OBJECTIVES:

1. Describe how computer networks are organized with the concept of layered approach.
2. Explain the Physical layer, protocols and its functionalities.
3. Describe the Data link layer, protocols and its functionalities.
4. Explain the Network layer, protocols and its functionalities.
5. Summarize the functionalities of Transport layer and Application layer.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to

CO1: Describe the functions of each layer in OSI and TCP/IP model. **(L2)**

CO2: Explain the types of transmission media with real time applications**. (L2)**

CO3: Discuss the methods of error detection and correction. **(L2)**

CO4: Implement LAN using hubs, bridges and switches. **(L4)**

CO5: Analyze the protocols in Transport layer and application layer**. (L4)**

SYLLABUS

UNIT-I: INTRODUCTION

Uses of Computer Networks, Line Configuration: Point-Point, Multipoint; Topology, Transmission Mode: Simplex, Half- Duplex, Full-Duplex; Network Hardware: PAN, LAN, MAN, WAN, Internetworks; Network Architecture: Peer-to-Peer Network, Client/Server Network; Network Software: Protocol Hierarchies, Design Issues for the Layers, Connection-Oriented versus Connectionless Service; Reference Models: OSI and TCP/IP model, Comparison of OSI and TCP/IP Reference Models, Protocols and Standards, Standards Organization.

UNIT-II: PHYSICAL LAYER

Theoretical Basis for Data Communication: Fourier analysis, Bandwidth-Limited Signals, The Maximum Data Rate of a Channel; Transmission Media: Guided Media and Unguided Media; Switching: Circuit Switching, Packet Switching and Message Switching; Switching ISDN: Services, History, Subscriber Access to the ISDN, The ISDN Layers, Broadband ISDN.

UNIT-III: DATA LINK LAYER

Design Issues: Services Provided to the Network Layer, Framing, Error Control, Flow Control; Error Detection and Correction: Error-Correcting Codes, Error-Detecting Codes; Elementary Data Link Protocols: Utopian Simplex Control, Simplex Stop-and-Wait protocol for an error free channel, Simplex Stop-and-Wait protocol for a noisy channel; Sliding Window Protocols: A One-Bit Sliding Window Protocol, A Protocol Using Go-Back-N, A Protocol using Selective Repeat; Example Data Link Protocols: Packet over SONET, ADSL (Asymmetric Digital Subscriber Loop).

Medium Access Sub-layer:

The Channel Allocation Problem: Static Channel Allocation, Assumptions for Dynamic Channel Allocation, Multiple Access Protocols: ALOHA, Carrier Sense Multiple Access Protocols, Collision-Free Protocols, Limited-Contention Protocols, Wireless LAN Protocols; IEEE Standard for 802 for LANs: The 802.11 Architecture and Protocol Stack, The 802.11 Physical Layer, The 802.11 MAC Sublayer Protocol, The 802.11 Frame Structure, Services

UNIT-IV: NETWORK LAYER

Network Layer Design Issues: Store-and-Forward Packet Switching, Services Provided to the Transport Layer, Implementation of Connectionless Service, Implementation of Connection-Oriented Service, Comparison of Virtual-Circuit and Datagram Networks; Difference between Gateway, Ethernet Switch, Router, Hub, Repeater, Routing Algorithms: The Optimality Principle, Shortest Path Algorithm, Flooding, Distance Vector Routing, Link State Routing, Routing for Mobile Hosts, Routing in Ad Hoc Networks; Congestion Control Algorithms: Leaky Bucket Algorithm; Internetworking and Examples: How Networks Differ, How Networks Can Be Connected, Tunnelling, Internetwork Routing; Details of IP addressing schemes: The IP Version 4 Protocol, IP Addressing.

UNIT –V: TRANSPORT AND APPLICATION LAYERS

The Transport Service: Services Provided to the Upper Layers, Transport Service Primitives, Berkeley Sockets, An Example of Socket Programming: An Internet File Server; Elements of Transport Protocols: Addressing, Connection Establishment, Connection Release, Error Control and Flow Control, Multiplexing, Crash Recovery; The Internet Transport Protocols (UDP): Introduction to UDP, Remote Procedure Call, Real-Time Transport Protocols; The Internet Transport Protocols (TCP): Introduction to TCP, The TCP Service Model, The TCP Protocol, The TCP Segment Header, TCP Connection Establishment, TCP Connection Release, TCP Connection Management Modelling, TCP Sliding Window, TCP Timer Management, TCP Congestion Control, The Future of TCP.

The Application Layer:

The Domain Name System: The DNS Name Space, Domain Resource Records, Name Servers; Electronic Mail: Architecture and Services, The User Agent, Message Formats, Message Transfer, Final Delivery; The World Wide Web: Architectural Overview, Static Web Pages, Dynamic Web Pages and Web Applications, HTTP—The HyperText Transfer Protocol, The Mobile Web, Web Search.

TEXT BOOKS:

1. Computer Networks, A. S. Tannenbaum, PHI – New Delhi. 2008.
2. Data Communications and Networking by Behrouz A. Forouzan, 2nd Edition, Tata McGraw Hill,2001.

REFERENCES:

1. Computer Networking Terminology Products and Standards, R. P. Suri and J. K. Jain, Tata McGraw Hill, 1995.

PROFESSIONAL ELECTIVE-I

ELECTRONIC MEASUREMENTS AND INSTRUMENTATION

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
3	3	-	-	3	30	70	100

COURSE OBJECTIVES:

1. To enable the student to select an Instrument that can be used based on the requirements.
and to familiarize the students with the operation of AC, DC bridges.
2. To describe the usage and significance of Digital meters and instruments
3. To make the students to understand and use different signal generators and analyzers.
4. To impart the knowledge on various oscilloscopes to be used for different applications.
5. To enable the students to design various transducers for measurement of different physical quantities.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to

CO 1:Explain the fundamental characteristics of different Instruments and Working of various AC, DC bridges. **(L2)**

CO2:Describe various digital meters and instruments to measure Electronic Parameters **(L2)**

CO 3:Understand the working of signal generators and analyzers **(L3).**

CO 4:Discuss the operation of various types of Transducers **(L3)**

CO 5: **Understand** measurement of various physical parameters **(L3)**

SYLLABUS

UNIT-I: BASIC MEASUREMENT CONCEPTS

Measurement systems, Static and dynamic characteristics, error analysis, moving coil meters, DC ammeters, DC voltmeters, Series type ohmmeter, Shunt type ohmmeter, multimeter , moving iron meters , Bridge measurements , Wheatstone, Kelvin, Guarded Wheatstone, Maxwell, Hay, Schering, Anderson and Wein bridge.

UNIT-II: BASIC ELECTRONIC MEASUREMENTS

AC voltmeters using rectifiers, True RMS responding voltmeter, Electronic multi meter, Comparison of analog and digital techniques, digital voltmeter, Ramp, Stair case ramp, Integrating, Continuous balance, Successive approximation.

UNIT-III: DIGITAL INSTRUMENTS

Frequency counters, measurement of frequency and time interval, extension of frequency range, measurement errors, Cathode ray oscilloscopes, block schematic,applications,special oscilloscopes, Storage and sampling oscilloscopes, wave analyzer, distortion analyzer, spectrum analyzer ,Q meters.

UNIT-IV: TRANSDUCERS

Introduction, Classification of transducers, Analog transducers, Resistive transducers, Potentiometers, Strain gauges, Types of strain gauges, Resistance strain gauges, Semiconductor strain gauges, Resistance thermometers, Thermometers, Application of Thermistors, Thermo-couple construction, Measurement of thermocouple output, Compensating circuits, Advantages and disadvantages of thermocouples, Variable inductance type transducer, Linear variable differential transformer, Rotary variable differential transformer, Capacitive transducers, Piezo-electric transducers, Digital transducers.

UNIT-V: MEASUREMENT OF PHYSICAL PARAMETERS

Flow Measurement, Displacement Meters, Liquid level Measurement, Measurement of Humidity and Moisture, Velocity, Pressure, High Pressure, Vacuum level, Temperature, Measurements

TEXT BOOKS:

1. Albert D. Helfrick and William D .Cooper – Modern Electronic Instrumentation and Measurement Techniques, Prentice Hall of India, 2003.
2. A K Sawahney, Electrical And Electronics Measurement and Instrumentation, Dhanpat Rai, 2000

REFERENCES:

1. H S Kalsi, Electronic instrumentation, TMH, 1995.
2. Ernest O. Doebelin, Measurement Systems- Application and Design-Tata McGraw-Hill,2006

OPEN ELECTIVE-1
BASIC ELECTRONICS ENGINEERING

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
3	3	-	-	3	30	70	100

Course Objectives:

1. To give a comprehensive exposure to Passive Components and Circuit laws.
2. Introduction to PN junction diode and special semiconductor diodes.
3. To give a comprehensive exposure to Fundamentals of BJT.
4. To give a comprehensive exposure to Fundamentals of FET and MOSFET.
5. To describe Basic concepts of Power devices and Integrated Circuits.

Course Outcomes:

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

CO1: Understand the behavior of passive components and analyze electrical circuits by using circuit laws. **(L1)**

CO2: Understand the properties of conductors, insulators and semiconductor materials as well as characteristics and applications of different types of semiconductor diodes. **(L1)**

CO3: Understand the construction, operation and characteristics of BJT. **(L1)**

CO4: Understand the construction, operation and characteristics of JFET and MOSFET. **(L1)**

CO5: Understand the characteristics of power devices and basics of integrated circuits. **(L1)**

SYLLABUS

UNIT-I: PASSIVE COMPONENTS, CIRCUIT LAWS AND BASIC METERS

Types of passive components, types of resistors, resistor color code, capacitors, concept of charging and discharging, types of capacitances, inductors, KCL, KVL, Volt Meter, Ammeter, Ohm Meter.

UNIT-II: FUNDAMENTALS OF DIODES AND SPECIAL DIODES

Conductors, Insulators, Semi-Conductors, Intrinsic, Extrinsic semiconductors, conduction in semiconductors, V-I characteristics and applications of PN junction diode, Zener diode, LED and Photo diode. (Elementary concepts)

UNIT-III: FUNDAMENTALS OF BJT

Transistor construction, operation of the transistor, transistor configurations, input and output characteristics, applications of transistor. (Elementary concepts)

UNIT-IV: FUNDAMENTALS OF FET AND MOSFET

Comparison of BJT and JFET, JFET construction, operation of FET, JFET characteristics, JFET configurations and applications, concept of MOSFET, types of MOSFETs. (Elementary concepts)

UNIT-V: BASIC CONCEPTS OF POWER DEVICES AND INTEGRATED CIRCUITS (ICS)

Construction, applicationsof UJT and SCR, introduction to Integrated Circuits, classification of ICs, salient features of OP-AMP, characteristics of an ideal OP-AMP and applications. (Elementary concepts)

TEXT BOOKS:

1. Electronic Devices and Circuits by Sanjeev Gupta, Dhanapat Rai Publications,2010
2. Electronic Devices and Circuits Theory by Robert L. Boylestad& Louis Nashelsky, PHI edition,2009.
3. Electronic Devices and Circuits by G.S.N.Raju, IK International, New Delhi, 2006.

REFERENCE BOOKS:

1. Electronic Devices and Circuits by Millman and Halkias, International Student edition, McGraw Hill publishers. 4th edition, 2015.
2. Basic Electronics by Bernard Grob, 4th edition, International Student edition, MC Graw Hill publishers,1988.

LINEAR ICs & PULSE CIRCUITS LAB

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
1.5	-	-	3	3	50	50	100

COURSE OBJECTIVES:

The main objectives of this course is

1. To know the Linear and Non-Linear characteristics of Wave shaping circuits
2. To Measure the Parameters of Op-Amp
3. To Measure the frequency response of Active Filters
4. To check the working of Op-Amp in different applications

COURSE OUTCOMES:

After successful completion of the Course students able to

CO1: **Understand** the linear and Non-Linear behavior of the wave shaping circuits

CO2: Analyze and design the frequency response of active filters

CO3: Measure the parameters of Op Amp

CO4: Demonstrate the applications of Op Amp and special IC circuits

LIST OF EXPERIMENTS

1. Linear wave shaping
2. Non-linear wave shaping
3. UJT as a Relaxation oscillator
4. Measurement of parameters of Op-amp
5. Schmitt trigger
6. Frequency response of Active filters
7. Op-amp as Wave form generator
8. IC-555 as an AstableMultivibrator
9. Study of Instrumentation Amplifier
10. Voltage regulator using IC-723
11. MonostableMultivibrator using IC-555

DIGITAL DESIGN THROUGH VERILOG LAB

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
1.5	-	-	3	3	50	50	100

COURSE OBJECTIVES

1. Design and verify the functionality of combinational circuits using hardware verification language.
2. Design and verify the functionality of sequential circuits using hardware verification language.

COURSEOUTCOMES

CO1: Design and verify the functionality of logic gates and its applications **(L6)**

CO2: Design and verify the functionality of medium complexity standard combinational circuits **(L6)**

CO3: Design and verify the functionality of a flip-flop **(L6)**

CO4: Design and verify the functionality of counters and shift registers **(L6)**

HARDWARE EXPERIMENTS:

1. Verilog description for Logic Gates
2. Verilog description for half adder and full adder
3. Verilog description for Ripple carry adder
4. Verilog description for Decoder
5. Verilog description for Encoder
6. Verilog description for Multiplexer
7. Verilog description for Demultiplexer
8. Verilog description for 8-bit ALU
9. Verilog description for Flip – flops
10. Verilog description for Universal shift register
11. Verilog description for Counter
12. Verilog description for Finite state machine

COMMUNITY SERVICE PROJECT

……Experiential learning through community engagement

Introduction

- Community Service Project is an experiential learning strategy that integrates meaningful
  community service with instruction, participation, learning and community development
- Community Service Project involves students in community development and service activities and applies the experience to personal and academic development.
- Community Service Project is meant to link the community with the college for mutual benefit. The community will be benefited with the focused contribution of the college students for the village/ local development. The college finds an opportunity to develop social sensibility and responsibility among students and also emerge as a socially responsible institution.

Objective

Community Service Project should be an integral part of the curriculum, as an alternative to the 2months of Summer Internships / Apprenticeships / On the Job Training, whenever there is an exigency when students cannot pursue their summer internships. The specific objectives are;

- To sensitize the students to the living conditions of the people who are around them,
- To help students to realize the stark realities of the society.
- To bring about an attitudinal change in the students and help them to develop societal consciousness, sensibility, responsibility and accountability
- To make students aware of their inner strength and help them to find new /out of box solutions to the social problems.
- To make students socially responsible citizens who are sensitive to the needs of the disadvantaged sections.
- To help students to initiate developmental activities in the community in coordination withpublic and government authorities.
- To develop a holistic life perspective among the students by making them study culture, traditions, habits, lifestyles, resource utilization, wastages and its management, social problems, public administration system and the roles and responsibilities of different persons across different social systems.

Implementation of Community Service Project

- Every student should put in a minimum of 180 hours for the Community Service Project
- during the summer vacation.
- Each class/section should be assigned with a mentor.
- Specific Departments could concentrate on their major areas of concern. For example,

- Dept. of Computer Science can take up activities related to Computer Literacy to differentsections of people like - youth, women, house-wives, etc
- A log book has to be maintained by each of the student, where the activities undertaken/involved to be recorded.
- The log book has to be countersigned by the concerned mentor/faculty incharge.
  Evaluation to be done based on the active participation of the student and grade could be awarded by the mentor/faculty member.
- The final evaluation to be reflected in the grade memo of the student.
  TheCommunity Service Projectshould be different from the regular programmes of NSS/NCC/Green Corps/Red Ribbon Club, etc.
- Minor project report should be submitted by each student. An internal Viva shall also be conducted by a committee constituted by the principal of the college.
- Award of marks shall be made as per the guidelines of Internship/apprentice/ on the job training

Procedure

- A group of students or even a single student could be assigned for a particular habitation orvillage or municipal ward, as far as possible, in the near vicinity of their place of stay, so as to enable them to commute from their residence and return back by evening or so.
- The Community Service Project is a twofold one –
  First, the student/s could conduct a survey of the habitation, if necessary, in terms of their own domain or subject area. Or it can even be a general survey, incorporating all the different areas. A common survey format could be designed. This should not be viewed as a duplication of work by the Village or Ward volunteers, rather, it could be another primary source of data.
- Secondly, the student/s could take up a social activity, concerning their domain or subject area. The different areas, could be like –

1. Agriculture
2. Health
3. Marketing and Cooperation
4. Animal Husbandry
5. Horticulture
6. Fisheries
7. Sericulture
8. Revenue and Survey
9. Natural Disaster Management
10. Irrigation
11. Law & Order
12. Excise and Prohibition
13. Mines and Geology
14. Energy
15. Internet

16. Free Electricity
17. Drinking Water

PROPOSED SCHEME FOR III/IV BTECH- II SEM (6th Semester)

Category	Course code	Course Title	Hours per week			Internal Marks	External Marks	Total Marks	Credits
			L	T	P				
PCC		Digital Signal Processing	3	0	0	30	70	100	3
PCC		Microwave Engineering	3	0	0	30	70	100	3
PCC		VLSI Design	3	0	0	30	70	100	3
PEC		Professional Electives-II	3	0	0	30	70	100	3
OEC		Open Elective-II	3	0	0	30	70	100	3
PCC		Antenna Simulation Lab	0	0	3	50	50	100	1.5
PCC		Digital Signal Processing Lab	0	0	3	50	50	100	1.5
PCC		Microwave Engineering Lab	0	0	3	50	50	100	1.5
SC		Web Technologies	0	1	2	50	50	100	2
								Total Credits	**21.5**
Industrial/Research Internship during Summer Break									

Professional Elective-II

1.Cellular and Mobile Communications

2. Satellite Communications

3. Database Management System

Open Elective-II

1. Fundamentals of IoT (offered by department of ECE)

DIGITAL SIGNAL PROCESSING

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
3	3	-	-	3	30	70	100

COURSE OBJECTIVES:

1. To understand the basic concepts and techniques for digital signal processing.
2. To familiarize with DSP concepts by studying the design of different digital filters and transform-domain processing.

COURSE OUTCOMES:

After successful completion of this course the student will be able to

CO1:Understand the representation of discrete time signals and systems.**(L2)**

CO2:Apply the Fourier transform for signal processing.**(L3)**

CO3:Design and implement IIR filters**.(L4)**

CO4:Design and implement FIR filters. **(L4)**

CO5:Study the applications of DSP**. (L1)**

SYLLABUS

UNIT-I: DISCRETE TIME SIGNALS and SYSTEMS, Applications of Z-Transforms

Discrete Time Signals Sequences, Linear Shift Invariant Systems, Stability and Causality, Linear Constants Coefficient Difference Equations, Frequency Domain Representation of Discrete Time Signals and Systems. System Functions H(z) of Digital Systems, Stability Analysis, Structure and Realization of Digital Filters.

UNIT-II: DISCRETE AND FAST FOURIER TRANSFORMS

Properties of the DFS, DFS Representation of Periodic Sequences, Properties of DFT, Convolution of Sequences. Radix 2 Decimation in Time (DIT) and Decimation in Frequency (DIF), FFT Algorithms, Inverse FFT.

UNIT-III: IIR FILTER DESIGN TECHNIQUES

Design of IIR Filters from Analog Filters, Analog Filters Approximations (Butterworth and Chebyshev Approximations), Frequency Transformations, General Considerations in Digital Filter Design, Bilinear Transformation Method, Step and Impulse Invariance Technique.

UNIT-IV: FIR FILTER DESIGN TECHNIQUES

Introduction to characteristics of linear phase FIR filters, Frequency response, Designing FIR filters using windowing methods: Rectangular window, Hanning window, Hamming window, Generalized Hamming window, Bartlett triangular window, Comparison of IIR and FIR filters

UNIT-V: APPLICATIONS

Applications of FFT in Spectrum Analysis and Filtering, Application of DSP in Speech Processing.

TEXT BOOKS:

1.Alan V. Oppenheim and Ronald W. Schafer: Digital Signal Processing, PHI,2015.

2.John G.Proakis, Dimitris G.Manolakis, Digital Signal Processing, Principles, Algorithms and Applications , 4th Edition, Pearson Education PHI, 2013.

REFERENCES:

1. Sanjit K. Mitra, Digital Signal Processing "A – Computer Based Approach", Tata Mc Graw Hill,2007.

2. Raddar and Rabiner, Application of Digital Signal Processing,Pearson Education India,2015.

3. Antonio, Analysis and Design of Digital Filters, Tata Mc Graw Hill,1994.

WEB RESOURCES:

1. http://ww.nptel.iitm.ac.in
2. http://www.ece.cmu.edu/~ee791/
3. http://www.ee.umanitoba.ca/~moussavi/dsp815/LectureNotes/index.html
4. http://cobweb.ecn.purdue.edu/~ipollak/ee438/FALL04/notes/notes.html

MICROWAVE ENGINEERING

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
3	3	-	-	3	30	70	100

COURSE OBJECTIVES:

1. To impart knowledge on basics of microwave electron beam devices and their applications in X band frequency.
2. Understand Microwave sources and amplifiers.
3. To study Microwave semiconductor devices & applications
4. To become familiar with the concepts of Microwave Integrated Circuits.
5. To know the concepts of Microwave Measurements

COURSE OUTCOMES:

After successful completion of this course, the students will be able to

CO1: Evaluate the characteristics of Rectangular waveguides. **(L3)**

CO2: Describe the various waveguide components and s-parameter analysis of microwave components**(L2)**.

CO3: Perform mathematical **analysis** on the operation and working of various microwave tubes**(L3)**.

CO4:Describe and explain working of solid-state devices **(L2)**.

CO5:Study about Microwave Measurement Techniques **(L2).**

SYLLABUS

UNIT-I: INTRODUCTION TO WAVEGUIDES

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.

UNIT-II: MICROWAVE COMPONENTS

Introduction to Microwave Engineering- microwave spectrum bands, advantages and applications of microwaves, Wave-guide Components, Scattering Matrix and its Properties, Scattering Matrix of E-Plane Tee, H plane Tee, Magic Tee, directional coupler, Ferrite Devices, Attenuators.

UNIT-III: MICROWAVE TUBES

Limitations of conventional tubes at microwave frequencies, Resonant Cavities, Linear beam tubes, Reflex Klystron, applegate diagram and principle of working, operation and working of Two – Cavity Klystron, Multi – Cavity Klystron, Traveling Wave Tube, Crossed Field Device-Magnetron, Hull cut-off voltage Equation.

UNIT-IV: MICROWAVE SOLID STATE DEVICES

Negative resistance phenomenon, Gunn Diode, domain formation, RWH theory, Tunnel Diode principle of operation, IMPATT- principle of operation, TRAPATT, BARITT, PIN Diodes.

UNIT-V: MICROWAVE MEASUREMENTS

Microwave Bench Setup, VSWR, Frequency, Guided Wavelength, Coupling factor and Directivity measurements.

TEXT BOOKS:

1. Microwave and Radar Engineering, GottapuSasibhushana Rao, Pearson Education, New Delhi, 2014.
2. Microwave and Radar Engineering, M.Kulkarni ,Umesh Publications, 2016

REFERENCES:

1. Foundations for Microwave Engineering, R. R. Collin, McGraw Hill,2000
2. Microwave Communications – Components and Circuits, E. Hund, McGraw Hill,1989.
3. Microwave Devices, circuits and subsystems for communications engineering, Ian A Glover and Steve Pennock, Wiley Publishers, 2007.
4. Microwave Engineering, G.S.N. Raju, IK International Publishers,2013

WEB RESOURCES:

1. https://nptel.ac.in/courses/108103141
2. https://www.coursera.org/learn/microwave-antenna

VLSI DESIGN

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
4	3	1	-	3	30	70	100

COURSE OBJECTIVES:

1. Give exposure to different steps involved in the fabrication of ICs.
2. Explain electrical properties of MOS and BiCMOS devices to analyze the behavior of inverters designed with various loads.
3. Give exposure to the design rules to be followed to draw the layout of any logic circuit.
4. Provide design concepts to design building blocks of data path of any system using gates.

COURSE OUTCOMES:

At the end of the course, a student will be able to:

CO1: Acquire qualitative knowledge about the fabrication process of integrated circuits using MOS transistors. **(L2)**

CO2: Understand Basic electrical properties of MOS and Bi-CMOS circuits. **(L2)**

CO3: Design the layout and stick diagrams for MOS circuits and understand the basic circuit concepts. **(L4)**

CO4: Understand the scaling of MOSFET and structural design of combinational logic. **(L2)**

CO5: Design and analysis of subsystems. **(L4)**

SYLLABUS

UNIT-I: INTRODUCTION TO MOS TECHNOLOGY:

Introduction to IC technology, MOS and related VLSI technology, NMOS, CMOS, BiCMOS Technologies, Thermal aspects of processing, Production of E beam marks.

UNIT-II: BASIC ELECTRICAL PROPERTIES OF MOS AND BICMOS CIRCUITS:

I_{ds}–V_{ds} relationships, Aspects of MOS transistor threshold voltage, MOS Trans conductance and output conductance, MOS Transistor Figure of merit, The PMOS transistor and The NMOS inverter, Determination of pull– up to pull–down ratio for NMOS, inverter driven by another NMOS inverter, Alternative forms of pull up, The CMOS Inverter, Bi–CMOS Inverters.

UNIT-III: MOS CIRCUIT DESIGN PROCESSES:

MOS layers, Stick diagrams, Design rules, and layout, 2 & 1.2 micro meter CMOS rules, Layout diagrams, Symbolic diagram. Basic Circuit concepts: Sheet resistance, Area capacitances of layers, Delay unit, Wiring Capacitances, Choice of layers.

UNIT-IV: SCALING OF MOS CIRCUITS:

Scaling models, Scaling function for device parameters, Limitations of scaling. Sub system design and Layout: Architectural issues, Switch logic, Examples of Structural design (Combinational logic).

UNIT-V: SUB SYSTEM DESIGN PROCESS:

Design of ALU subsystem, some commonly used storage elements, Aspects of design tools, Design for testability, Practical design for test guidelines, Built in self-test, CMOS project-an incrementer / decrementer, a comparator for two n-bit numbers. Ultra-fast systems.

TEXT BOOKS:

1. Basic VLSI Design by Douglas A, Pucknell, Kamran Eshraghian, Prentice-Hall, l996, 3rdEdition.
2. Modern VLSI Design - Wayne Wolf, Pearson Education, 3rd Edition, 1997.
3. CMOS VLSI Design – A Circuits and Systems Perspective, Neil H. E Weste, David Harris, Ayan Banerjee, 3rd Ed, Pearson, 2009.

REFERENCES:

1. Mead, C.A and Conway, LA, “Introduction to VLSI Systems”, Addison-Wesley, Reading, Massachusetts, l980.
2. Introduction to VLSI Systems: A Logic, Circuit and System Perspective – Ming-BO Lin, CRC Press, 2011

PROFESSIONAL ELECTIVE-II

CELLULAR AND MOBILE COMMUNICATIONS

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
3	3	-	-	3	30	70	100

COURSE OBJECTIVES:

1. To make students familiar with various generations of mobile communications
2. To understand the concept of cellular communication
3. To understand the basics of wireless communication
4. Knowledge of CDMA, TDMA, OFDMA mobile communication standard, its architecture, logical channels, advantages and limitations.
5. To under multicarrier communication systems and Hand off Technologies.

COURSE OUTCOMES:

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

CO1: Discuss the cellular system design and technical challenges **(L2)**.

CO2: Analyze the design parameters, Sectoring, cell splitting and Different type of Antennas used in Cellular system **(L4)**.

CO3: Summarize the principles of Interference, Co channel Interference **(L2)**.

CO4: Analyze the Mobile radio propagation, fading, diversity concepts and the channel modeling **(L4)**.

CO5: Analyze Multiuser Systems, CDMA, WCDMA network planning and OFDM Concepts and Handoff Technologies **(L4).**

SYLLABUS

UNIT-I: INTRODUCTION TO MOBILE AND CELLULAR COMMUNICATION SYSTEM

Introduction, cellular geometry, introduction to cellular concept, principles of operation of a cellular mobile system, multiple access schemes, analog and digital cellular mobile systems.

UNIT II: ELEMENTS OF CELLULAR RADIO SYSTEM DESIGN

Introduction, concept of frequency reuse channels, co-channel interference, Desired C/I from normal case in an omni directional antenna system, cell splitting, sectoring, consideration of the components of the cellular system.

UNIT-III: INTERFERENCE

Introduction, types of interference, Co-channel interference, Real time Co-channel interference measurement, Diversity Receiver, Non Co-channel interference.

UNIT-IV: MOBILE RADIO PROPAGATION AND MODELLING

Introduction, basics of mobile radio propagation, free space propagation model, link budget design, propagation models, types of small scale fading. Cell Coverage for Signal and Traffic Introduction, Point - to - Point model, Propagation over water or flat open area, Foliage loss, Cell site antenna heights and signal coverage cells, Mobile - to - Mobile Propagation.

UNIT-V: MULTIPLE ACCESS TECHNIQUES

Introduction, multiple access techniques, Frequency division multiple access, Time division multiple access, Code division multiple access, space division multiple access, Orthogonal frequency division multiplexing, capacity of TDMA and CDMA systems. Handoff Technologies Introduction, Handoff, classification based on nature of handoff, handoff initiation techniques.

TEXT BOOKS:

1.GottapuSasibhushana Rao, Mobile Cellular Communication, PEARSON International, 2012.

2. Lee, Cellular and Mobile Communications, Third Edition, McGraw Hill, 2006.

REFERENCES:

1. Theodore S Rappaport, Wireless Communications: Principles and Practice, Prentice Hall, 2002.

2. KamiloFeher, Wireless Digital Communication: modulation and spread spectrum applications, PHI, 1995.

PROFESSIONAL ELECTIVE-II

SATELLITE COMMUNICATIONS

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
3	3	-	-	3	30	70	100

COURSE OBJECTIVES:

To enable student to

1. Study background of Satellite, Satellite subsystems, orbital mechanics and earth stations
2. Study Satellite Link Design and Multiple Access Techniques used in Satellite Communication

COURSE OUTCOMES:

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

CO1: **Understand** history of Satellite & applications and **Explain** Orbital Mechanics and working Satellite Launch Vehicles **(L2)**.

CO2: **Discuss** various Satellite Subsystems **(L2)**.

CO3: **Explain** Satellite Earth Station and its Subsystems (**L2**)

CO4: **Analyze** Satellite Link Design **(L4)**.

CO5: **Explain** various Multiple Access Techniques used **(L2)**.

SYLLABUS

UNIT-I: INTRODUCTION

Background, A Brief History of Satellite Communications, Frequency allocations for Satellite Services, Satellite Communications in 2000, Overview of Satellite Communications, Applications of Satellite (All Elementary Concepts)

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.

UNIT-III: SATELLITE EARTH STATION

Introduction, Earth Station Design Requirement, Earth Station Sub Systems, Monitoring and Control, Frequency Coordination, Small Earth Station, Mobile and Transportable Earth Station,

New Class of Earth Stations, TVRO Systems (Television Receive Only Systems)

(All Elementary Concepts**)**

UNIT IV: 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 V: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.

TEXT BOOKS:

1. Satellite Communications – Timothy Pratt, Charles Bostian and Jeremy Allnutt, WSE, Wiley Publications, 2nd Edition, 2003.
2. Satellite Communication – D.C Agarwal, Khanna Publications, 5th Ed,2021.
3. Satellite Communications – Dennis Roddy, McGraw Hill, 2nd Edition, 1996.

REFERENCES:

1. Satellite Communications: Design Principles – M. Richharia, BS Publications, 2nd Edition, 2003.
2. Satellite Communications Engineering – Wilbur L. Pritchard, Robert A Nelson and Henri G.Suyderhoud, 2nd Edition, Pearson Publications, 2003.

WEB RESOURCES:

1. https://www.tutorialspoint.com/satellite_communication/satellite_communication_useful_resources.htm
2. https://www.youtube.com/watch?v=dt4Ce8gQPns&list=PLAnjLC20C-XQnoowCtt-67WmyxoQPu2Fi

PROFESSIONAL ELECTIVE-II

DATABASE MANAGEMENT SYSTEMS

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
3	3	-	-	3	30	70	100

COURSE OBJECTIVES:

1. To learn the evolution of DBMS Versus File systems, data models, and layers of abstraction.
2. To understand conceptual and physical aspects of database design.
3. To learn formal and commercial query language specifications.
4. To understand concurrency control, recovery management, and other related issues.

COURSE OUTCOMES:

At the end of the course student will be able to

CO1:Understand the advantages of DBMS over traditional file system and its Characteristics **(L1)**

CO2: Design relational database and execute various queries using SQL **(L3)**

CO3: Design ER-models to represent simple database applications. **(L3)**

CO4: Understand various anomalies that can occur in databases and overcome those with the help of normal forms. **(L1)**

CO5:Describe the concepts of Transaction Management, Concurrency Control and data Recovery. **(L1)**

SYLLABUS

UNIT-I: INTRODUCTION

File system versus DBMS, Advantages of a DBMS, Describing and Storing Data in a DBMS, The Relational model, Levels of abstraction, Data Independence, Transaction management, Structure of a DBMS.

UNIT-II: RELATIONAL ALGEBRA AND SQL

Preliminaries, Relational Algebra, The form of a Basic SQL Query, UNION, INTERSECT and EXCEPT, Nested Queries, Aggregate Operators, Null Values, Complex Integrity Constraints in SQL, Triggers and Active Databases, Embedded SQL, Dynamic SQL, JDBC.

UNIT-III: INTRODUCTION TO DATABASE DESIGN AND THE RELATIONAL MODEL

Database Design and ER Diagrams, Entities, Attributes and Entity Sets, Relationships & Relationship Sets, Additional Features of the ER Model, Conceptual Design with ER Model, Introduction to the Relational Model, Integrity Constraints over Relations, Enforcing Integrity Constraints, Querying Relational Data, Logical Database Design: ER to Relational, Introduction to Views, Destroying/ Altering Tables and Views.

UNIT-IV: DATABASE DESIGN

Schema Refinement and Normal Forms, Introduction to Schema Refinement, Functional Dependencies, Reasoning about FD 's, Normal Forms, Properties of Decomposition, Normalization, Other kinds of Dependencies.

UNIT-V: TRANSACTION MANAGEMENT

The ACID Properties, Transactions & Schedules, Concurrent Execution of Transactions, Lock-Based Concurrency Control. Concurrency Control: 2PL, Serializability and Recoverability, Introduction to Lock Management Lock Conversions, Dealing with Deadlocks, Specialized Locking Techniques, Concurrency Control without Locking. Crash Recovery: Introduction to ARIES, The Log, Other Recovery-Related Structures, The Write-Ahead Log Protocol, Check pointing, recovering from a System Crash, Media Recovery.

TEXT BOOKS:

1. Database Management Systems; Raghu Ramakrishnan, Johannes Gehrke 4 th Edition, McGraw- Hill, 2002

REFERENCEBOOKS:

1. Database System Concepts; A. Silberschatz, H.Korth 5th Edition, McGraw-Hill, 2005

Open Elective-II
Fundamentals of IoT

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
3	3	-	-	3	30	70	100

COURSE OBJECTIVES:

1. To Understand the Characteristics of IoT and Applications of IoT.
2. To understand the Arduino IDE installation, Arduino programs and the prototypes using Arduino with external devices.
3. To understand the concepts of Sensors, Raspberry programming and python packages to interface Amazon web services.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to

CO1:Describe the concepts of IoT along with its applications. **(L2)**

CO2:Design a prototype using Arduino Uno. **(L4)**

CO3: Identify different types of sensors, actuators and communication Protocols. **(L2)**

CO4: Build a prototype using Raspberry pi. **(L4)**

CO5: Design an IoT application to interact with Django. **(L4)**

SYLLABUS

UNIT-I: INTRODUCTION TO IoT

Definition of IoT, Characteristics of IoT, Physical design of IoT, Logical design of IoT, IoT Enabling Technologies, IoT levels & Deployment Templates, IoT Applications. (Text Book 1,3)

UNIT-II: IOT WITH ARDUINO

Introduction to the Arduino, creating an Arduino programming Environment, Using the Arduino IDE, creating an Arduino program, Using Libraries, working with Digital Interfaces, interfacing with Analog devices, communicating with devices, using sensors, working with Motors, Using an LCD. (Text Book -2)

UNIT-III: SENSORS AND ACTUATORS

Introduction, Sensor, Types of Sensors, Actuators, classification of Actuators. Technologies used in IoT: Bluetooth, Bluetooth Low Energy (BLE), Wi-Fi, Li-fi, Z-Wave, X-10, Sigfox, ZigBee, LoRa WAN, 5-G, LPWAN, RFID and NFC, WSN. (Text Book- 3)

UNIT-IV: IoT WITH RASPBERRY PI

Raspberry Pi, About the Board, Programming Raspberry Pi with Python, Controlling LED with Raspberry Pi, interfacing an LED and Switch with Raspberry Pi, Interfacing a Light Sensor (LDR) with Raspberry Pi. (Text Book -1)

UNIT-V: IoT PHYSICAL SERVERS & CLOUD OFFERINGS:

Python Packages for IoT, WAMP – Auto Bahn for IoT, Python Web Application Framework – Django, Amazon Web Services for IoT. (Text book- 1)

TEXT BOOKS:

1. Vijay Madisetti and Arshdeep Bahga, Internet of Things (A Hands-on-Approach), 1st Edition, VPT, 2016.
2. Richard Blum, Arduino Programming in 24 Hours, Sams Teach Yourself, Pearson Education,2017. 3. Jain, Prof. Satish, Singh, Shashi, Internet of Things and its Applications, 1st Edition, BPB, 2020.

REFERENCES:

1. Donald Norris, Internet of things_ do-it-yourself projects with Arduino, Raspberry Pi, and Beagle Bone Black,1st Edition, McGraw-Hill,2015.
2. AdealJaved Lake Zurich, Illinois, Building Arduino Projects for the Internet: Experiments with RealWorld Applications, 1st Edition, USA, A press,2016.
3. YashavantKanetkar, ShrirangKorde, 21 IOT Experiments, 1st Edition, BPB Publications, 2018.
4. Dr. Rajesh Singh, Dr. Anita Gehlot, Dr. Lovi Raj Gupta, NavjotRathour, Mahendra Swain, Bhupendra Singh, IoT based Projects Realization with Raspberry Pi, Node MCU and Arduino, 1st Edition, BPB Publications, 2020.

WEB RESOURCES:

1. https://www.arduino.cc/reference/en
2. https://create.arduino.cc/projecthub
3. https://maker.pro/raspberry-pi/tutorial
4. https://projects.raspberrypi.org/en/projects
5. https://www.digikey.com/en/maker/blogs/2019/how-to-use-mqtt-with-the-raspberry-pi

ANTENNA SIMULATION LAB

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
3	3	-	-	3	50	50	100

COURSE OBJECTIVES:

1. The lab course will give a practical exposure to students to learn the characteristics and parameters of different antennas.
2. The lab course will give an exposure to students to learn and understand the design of various antennas.

COURSE OUTCOMES:

After successful completion of the course students able to

CO1 **Identify** the importance of various antenna parameters.(L2)
CO2 **Investigate** the characteristics of wire and loop antennas (L5)
CO3 **Analyze** the characteristics of antennas (L3)
CO4 **Design** of different type of Antennas.(L5)

LIST OF EXPERIMENTS

1. Introduction to Antenna Design Using Simulation Software.
2. Introduction to waveguide simulation.
3. Monopole Antenna Design.
4. Simulations of Dipole Antennas Using Antenna Software.
5. To simulate and analyze a simple rectangular Micro strip antenna.
6. Probe Feed Patch Antenna Design.
7. Micro strip Line Design.
8. Design and analysis of Horn Antenna.
9. Design and analysis of LOOP Antenna.
10. Design and analysis of Resonating Antenna.

DIGITAL SIGNAL PROCESSING LAB

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
1.5	-	-	3	3	50	50	100

COURSE OBJECTIVES:

1. To implement Linear and Circular Convolution
2. Implement FIR and IIR filters
3. Study the architecture of DSP processor

COURSE OUTCOMES:

CO1: **Understand** about the basic signal generation **(L2)**

CO2: **Describ**e Fourier Transform Concepts **(L2)**

CO3: **Design** FIR filters and IIR filters **(L4)**

CO4: **Demonstrate** their abilities towards DSP processor-based implementation of DSP systems **(L2)**

LIST OF EXPERIMENTS

MATLAB EXPERIMENTS

1. Generation of discrete –time sequences
2. Implementation of Discrete time systems
    a) Linear Convolution of two sequences
    b) Circular Convolution of two sequences
3. Frequency analysis of discrete time sequences
4. Frequency analysis of discrete time systems
5. Design of IIR digital filter
    a) Butterworth
    b) Chebyshev
6. Design of FIR digital filter
7. Design of FIR filter using
    a) Hamming window
    b) Rectangular window

HARDWARE EXPERMENTS

1. Verification of Linear Convolution using DSP Processor kit
2. Verification of Circular Convolution using DSP Processor kit
3. Implementation of IIR Filters on DSP Processor
4. Implementation of FIR Filters using Window Techniques on DSP Processor

MICROWAVE ENGINEERING LAB

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
3	3	-	-	3	50	50	100

COURSE OBJECTIVES:

1. The lab course will give a practical exposure to students to learn the characteristics ofMicrowave components.
2. To gain the practical hands on experience by exposing the students to various microwavecomponents.

COURSE OUTCOMES:

After successful completion of the Course students able to

CO1 **Demonstrate** the characteristics of Microwave sources.(L2)
CO2 **Test** the characteristics of microwave components(L4)
CO3 **Analyze** the radiation pattern of antenna (L3)
CO4 **Measure** Numerical Aperture and Losses in Optical Link.(L3)

LIST OF EXPERIMENTS

1. Reflex Klystron Characteristics
2. V-I Characteristics of GUNN Diode
3. Measurement of Coupling Factor and Directivity of a 4-Port Directional coupler
4. Measurement of Microwave frequency and wavelength
5. Radiation Pattern of Horn Antenna
6. Radiation Pattern of Parabolic Antenna
7. Attenuation measurement
8. Measurement of Scattering Parameters of Circulator
9. Measurement of Scattering Parameters of Magic Tee
10. Measurement of S-Parameters of E-Plane Tee
11. Measurement of S-Parameters of h-Plane Tee
12. Scattering parameters of Isolator.
13. Fiber Optic Analog Link design
14. VSWR Measurement

SCHEME FOR IV/IV BTECH-I SEM (7th Semester), (R-20)

Category	Course code	Course Title	Hours per week			Internal Marks	External Marks	Total Marks	Credits
			L	T	P				
PEC		Professional Elective-III	3	0	0	30	70	100	3
PEC		Professional Elective-IV	3	0	0	30	70	100	3
PEC		Professional Elective-V	3	0	0	30	70	100	3
OEC		Open Elective-III	2	0	2	30	70	100	3
OEC		Open Elective-IV	2	0	2	30	70	100	3
HSSE		HSS-Elective	3	0	0	30	70	100	3
SC		Industry Oriented Programming Skills Lab	0	1	2	50	50	100	2
PROJ		Industrial/Research Internship				0	100	100	3
								Total Credits	**23**

Professional Elective-III

1. Radar Engineering
2. Fiber Optic Communications
3. Machine Learning

Professional Elective-IV

1. Information Theory and coding
2. Embedded Systems
3. DSP Processors & Architectures

Professional Elective-V

1. Internet of Things and Applications
2. Global Positioning System
3. Digital Image Processing

Open Elective-III(Offered to Non ECE Students)

1. Fundamentals of Communication Engineering

Open Elective-IV (Offered to Non ECE Students)

1. Data Communications

HSS ELECTIVES

1. Industrial Management & Entrepreneurship
2. Organizational Behavior
3. Operations Research

SCHEME FOR IV/IV BTECH-II SEM (8th Semester)

Course code	Category	Course Title	Internal Marks	External Marks	Total Marks	Credits
	PROJ	Project work	50	50	100	12
					Total Credits	**12**

PROFESSIONAL ELECTIVE-III

RADAR ENGINEERING

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
3	3	-	-	3	30	70	100

COURSE OBJECTIVES:

1. To study the principles of operation of various blocks of Radar systems and Radar Range equation in detail.
2. To study the functions of various blocks of CW Radar, FM-CW Radar, MTI and Pulse Doppler Radars, Tracking radar and their limitations and applications
3. To study the functions of various blocks of Radar receivers and detection of Radar signals in noise in detail.
4. To study the principles and working of phased array antennas and their application to radar systems.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to

CO1: Explain the basic concepts of Radar **(L2)**.

CO2: Analyze the CW Radar and FMCW Radar system for the measurement of speed and distance **(L3)**.

CO3: Apply the techniques to remove the clutter using MTI Radar and Pulse Doppler Radar **(L3).**

CO4: Classify different techniques of tracking radars **(L2)**.

CO5: Explain various techniques employed in radar receivers for detection of signals in noise **(L2)**.

SYLLABUS

UNIT-I: INTRODUCTION TO RADARS

Introduction, History, Frequencies and applications of Radars, classification of Radars, Basic Radars, Radar Block Diagram, Pulse Radar characteristics.

UNIT-II: CW AND FMCW RADARS:

CW Radar, FMCW, Radar, and Pulse Radar: Introduction, CW Radar, Doppler Effect, FMCW Radar, FMCW altimeter, Pulse Radar.

UNIT-III:MTI AND PULSE DOPPLER RADAR

Introduction, Doppler Frequency, Doppler processing in CW, MTI and PDRs, MTI radars, Delay line Cancellers, Double Delay Line cancellers, types of MTI radars, Pulse Doppler Radar, Moving target Detector

UNIT-IV: TRACKING RADARS

Introduction, search and tracking radar system, various scanning and tracking techniques, range tracking, angle tracking, tracking accuracy, frequency agility, Track While Scan, phased array radars, radar displays.

UNIT-V:DETECTION OF SIGNALS IN NOISE AND RADAR RECEIVERS Introduction, matched filter receiver, correlation detection, detection criteria, automatic detection, CFAR receiver, Detectors, duplexer.

TEXT BOOKs:

1. Microwave and Radar Engineering, Gottapu Sasibhushana Rao, Pearson Education, New Delhi, 2014.
2. Introduction to Radar Systems, Skolnik, McGraw Hill, 3rd Edition, 2001.

REFERENCES:

1. Simon Kingsley, Shaun Quegan, Understanding Radar Systems, SciTech Publications, 1999.
2. Mark A Richards et.al, Principles of Modern Radar, SciTech Publications,2014.
3. Radar Engineering and Fundamentals of Navigational Aids, G S N Raju, IK International Publishers 2008.

WEB RESOURCES:

1. https://www.youtube.com/watch?v=toooafh-FJ4
2. https://www.youtube.com/watch?v=CDfLR8cXj_4&list=PLeQaX2aOLdF6ViCPbRRjOUFXlYZ7Ld9ME
3. https://www.youtube.com/watch?v=a1gRhIVCz7M&list=PLeQaX2aOLdF6ViCPbRRjOUFXlYZ7Ld9ME&index=4
4. https://www.youtube.com/watch?v=T3L20wl7an0&list=PLeQaX2aOLdF6ViCPbRRjOUFXlYZ7Ld9ME&index=2

PROFESSIONAL ELECTIVE-III

FIBER OPTIC COMMUNICATIONS

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
3	3	-	-	3	30	70	100

COURSE OBJECTIVES:

1. To learn the basic concepts of fiber optics communications system with various components or process for variousapplications.
2. To clarify the student with fiber materials used in optical communication and losses involved
3. Students can learn about different optical sources and receivers
4. Graduate will demonstrate the ability to design a system, component or process as per need and specification.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to

CO1: Describe the types of transmission in OFC and the development of communication and Optical fibers, the Basics requirements of a system and uses of OFC **(L2)**.

CO2:Learn the different modes of optical fiber, the types of fibers, materials different Parameters of Fiber **(L3)**.

CO3: Discuss about the connectors and their constructions, different connector losses **(L2)**.

CO4: Study the construction of Optical sources, detectors, receiver operation, and the Parameters **(L3)**.

CO5: know the design process of Fiber link and WDM concepts **(L4)**.

SYLLABUS

UNIT- I:OVERVIEW OF OPTICAL FIBER COMMUNICATION

Introduction, 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, Modes, V-number, Mode coupling, Step Index fibers, Graded Index 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, Intermodal dispersion.

UNIT -III:OPTICAL FIBER CONNECTORS AND POWER COUPLING

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.

SOURCE TO FIBER POWER LAUNCHING - Output patterns, Power coupling and launching, Equilibrium Numerical Aperture, Laser diode to fiber coupling,

UNIT- IV:OPTICAL SOURCES AND RECEIVER

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

OPTICAL RECEIVER- Fundamental receiver operation, Receiver configuration, Quantum limit

UNIT -V: OPTICAL SYSTEM DESIGN

Point-to- point links- Component choice and considerations, Link power budget, Rise time budget with examples, WDM, Necessity, Principles, Measurement of Attenuation, 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.

REFERENCES:

1. Fiber Optic Communications – D.K. Mynbaev , S.C. Gupta and Lowell L. Scheiner, Pearson Education,2005.
2. Text Book on Optical Fiber 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.

WEB RESOURCES:

1. https://youtu.be/ougKUUM3hJA
2. https://youtu.be/-ap00IUJm7k

PROFESSIONAL ELECTIVE-III

MACHINE LEARNING

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
3	3	-	-	3	30	70	100

COURSE OBJECTIVES:

1. To introduce students to the basic concepts and techniques of Machine Learning.
2. To become familiar with regression methods, classification methods, clustering Methods and understand the basic problems using Hidden Markov Models.

COURSE OUTCOMES:

At the end of the course student will be able to

CO1: Perform regression analysis using the concepts of supervised machine learning algorithms. **(L3)**

CO2: Apply different classification algorithms for real time problem solving. **(L4)**

CO3: Apply different clustering algorithms for real time problem solving **(L4)**

CO4: Solve real time problems using decision trees and regression trees. **(L4)**

CO5: Understand the applications of Hidden Markov Models. **(L2)**

SYLLABUS

UNIT-I: INTRODUCTION TO MACHINE LEARNING

Applications of Machine learning, and Supervisory Learning: Learning classes from examples, Vapnik-Charvonenkis (VC) Dimension, Probably Approximately Correct(PAC) Learning, noise, learning multiple classes, regression, model selection and generalization, dimensions of supervised machine learning algorithms.

UNIT-II: BAYESIAN DECISION THEORY

Classification, losses and risks, discriminant functions, utility theory, value of information, Bayesian networks, Influence diagrams, Association rules, Parametric Methods: Maximum likelihood estimation, evaluating an estimator with bias and variance, Bayes' estimator, parametric classification, regression, tuning model complexity: bias vs variance dilemma, model selection procedures. Multivariate methods: Multivariate data, parameter estimation, missing value imputation, univariate normal distribution and classification, discrete features, regression, Dimensionality Reduction: Subset selection, PCA, Factor Analysis, multi-dimensional scaling, LDA.

UNIT-III: CLUSTERING

Mixture densities, K-means clustering, Expectation Maximization algorithm, mixtures of Latent Variable Models, Supervised learning after clustering, Hierarchical clustering, and choosing number of clusters. Non-parametric methods: Non-parametric methods density estimation, generalization to multivariate data, nonparametric classification, condensed nearest neighbors, non-parametric regression: smoothing models, choosing smoothing parameters.

UNIT-IV: DECISION TREES AND LINEAR DISCRIMINATION

Univariate classification and regression trees, rule extraction from trees, Multivariate trees, Generalizing linear model, two class and multi-class geometry of linear discriminant, pairwise separation, gradient descent, logistic discrimination for binary and multi-class problems, Support vector machines, optimal separating hyperplane, kernel functions for non-separable spaces, SVM for regression.

UNIT-V: HIDDEN MARKOV MODELS

Discrete Markov processes, Hidden Markov Models, three basic problems of HMM, Evaluation problem, finding the state sequence, Learning model parameters, continuous observations, Model selection in HMM Assessing and comparing classification Algorithms: Cross-validation and resampling methods, measuring error, interval estimation, hypothesis testing, assessing performance of a classifier, comparing two classification algorithms, comparing multiple classification algorithms based on variance.

TEXT BOOKS:

1. Introduction to Machine Learning by Ethem Alpaydin, Prentice-Hall of India, 2006
2. Machine Learning by Saikat Dutt and Subramanian ChandramouliPearson Education,2017.

REFERENCES:

1. Machine Learning, Tom Mitchell , McGraw Hill,1997

PROFESSIONAL ELECTIVE-IV

INFORMATION THEORY AND CODING

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
3	3	-	-	3	30	70	100

COURSE OBJECTIVES:

The course is aimed at

1. Introducing the basics of information theory and channel capacity
2. Introduction to source and channel coding

COURSE OUTCOMES:

After successful completion of this course, the students will be able to

CO1: Compute information measure, channel capacity and perform source coding using different techniques **(L4)**

CO2:Determine channel coding using linear block codes also decoding **(L3)**

CO3: Determine channel coding using cyclic codes also decoding **(L3)**

CO4: Determine channel coding using convolutional codes and also decoding **(L3)**

CO5:Evaluate errors in codes and rectify them **(L4)**

SYLLABUS

UNIT-1: INTRODUCTION TO INFORMATION THEORY

Ideal communication system, Informationmeasure,Entropy, Information rate, conditional and joint entropy, mutual information, coding for a discrete memory less source, Predictive coding forsourceswithmemory, channel capacity, Binary symmetric channel, cascaded binary channels, source coding, Shannon-fano coding, Huffman coding.

UNIT-II: LINEAR BLOCK CODES

Channel coding, classification of Channel coding, Linear block codes, Matrix representation of linear block codes, generator matrix, parity check matrix, code vectors generation, syndrome decoding, syndrome decoder, single parity check bit code, repeated code, extended code, hadamard code, dual code.

UNIT-III: CYCLIC CODES

Cyclic Codes, generating code vectors in systematic and nonsystematic format, nonsystematic format of generator matrix, nonsystematic format of generator matrix, encoder design for cyclic codes, syndrome decoder, block diagram for cyclic code decoder, discrete memory less channel .

UNIT-IV: CONVOLUTIONAL CODES

Convolution Codes, time domain approach and transform domain approach for code vector generation, code tree, trellis diagram, state diagram, Maximum-likelihood Decoding of Convolution codes, Distance properties of convolution codes, Sequential Decoding of Convolution Codes.

UNIT-V: ERROR CORRECTING CODES

Arithmetic codes, Burst error correcting codes, single error correction in BCH codes, Reed Solomon code, Parity check bit coding for error detection, The Gram- Schmidt Procedure, Turbo Codes, Automatic repeat request.

TEXTBOOKS:

1. Communication Systems,3/e, by A.B. Carlson, Mc. Graw Hill Publishers, 2009. (for topic1)
2. An Introduction to Analog and Digital Communications, 2nd Edition, Simon Haykin, Michael Moher,2008(for topic 2)
3. Principles of Communication Systems, Taub &Schilling, 4/e, TMH Publishers,2017.

REFERENCES:

1. Principles of Digital Communications, Signal representation, Detection, Estimation & Information,J Das, S.K. Mullick, P.K.Chatterjee, New Age Int. Ltd.,1987.

PROFESSIONAL ELECTIVE-IV

EMBEDDED SYSTEMS

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
3	3	-	-	3	30	70	100

COURSE OBJECTIVES:

1. The basic concepts of an embedded system are introduced.
2. The various elements of embedded hardware and their design principles are explained
3. Different steps involved in the design and development of firmware for embedded systems is elaborated.
4. Internals of Real-Time operating system and the fundamentals of RTOS based embedded Firmware design is discussed.
5. Familiarize with the different IDEs for firmware development for different family of Processors/controllers and embedded operating systems

COURSE OUTCOMES:

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

CO1:Describe Understand the basic concepts of an embedded system and able to know an embedded system design approach to perform a specific function **(L2)**

CO2:Design the hardware components required for an embedded system and the design approach of an embedded hardware **(L4)**

CO3: Identify the various embedded firmware design approaches on embedded environment. **(L2)**

CO4: Build Understand how to integrate hardware and firmware of an embedded system using real time operating system. **(L4)**

CO5: Design an different IDEs for firmware development for different family of processors / controller**. (L4)**

SYLLABUS

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.

UNIT-III: EMBEDDE 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-IV: REAL TIME OPERATING SYSTEMS

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-V: 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:

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

WEB RESOURCES:

1. https://www.tutorialspoint.com/what-is-an-embedded-operating-system
2. https://www.javatpoint.com/embedded-operating-system

PROFESSIONAL ELECTIVE-IV

DSP PROCESSORS AND ARCHITECTURES

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
3	3	-	-	3	30	70	100

COURSE OBJECTIVES:

1. To familiarize with DSP concepts by studying the design of different digital filters and transforms.
2. To introduce the architectural features of programmable DSP Processors of Texas Instruments (TI) and Analog devices (AD).
3. To understanding the practical examples of DSP Processor architectures
4. To develop programming knowledge by using Instruction set of DSP Processors
5. To know the interfacing techniques to I/O devices and memory.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to

CO1: Analyze discrete time signals in frequency domain and Design digital filters. **(L4)**

CO2: Understand the basic concepts of Digital Signal Processing. **(L2)**

CO3: Distinguish the architectural features of General purpose processors and DSP Processors. **(L4)**

CO4: Understand the architectures of TMS320C54xx devices and ADSP 2100 DSP devices **(L2)**

CO5: Develop small systems by programming of TMS320C54xx (**L3**).

SYLLABUS

UNIT-I: INTRODUCTION TO DIGITAL SIGNAL PROCESING

Introduction, A Digital signal-processing system, the sampling process, Discrete time sequences Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT), Linear time-invariant systems, Digital filters, Decimation and interpolation, Analysis and Design tool for DSP Systems MATLAB, DSP using MATLAB.

UNIT-II: COMPUTATIONAL ACCURACY IN DSP IMPLEMENTATIONS

Number formats for signals and coefficients in DSP systems, Dynamic Range and Precision, Sources of error in DSP implementations, A/D Conversion errors, DSP Computational errors, D/A Conversion Errors, Compensating filter.

UNIT-III: ARCHITECTURES FOR PROGRAMMABLE DSP DEVICES AND EXECUTION

Basic Architectural features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities. Address Generation Unit, Programmability and Program Execution, Speed Issues, features for External interfacing, Hardware looping, Interrupts, Stacks, Relative

Branch support, Pipelining and Performance, Pipeline Depth, Interlocking, Branching effects, Interrupt effects, Pipeline Programming models

UNIT-IV: PROGRAMMABLE DIGITAL SIGNAL PROCESSORS

Commercial Digital signal-processing Devices, Data Addressing modes of TMS320C54XX DSPs, Data Addressing modes of TMS320C54XX Processors, Memory space of TMS320C54XX Processors, Program Control, TMS320C54XX instructions and Programming, On-Chip Peripherals, Interrupts of TMS320C54XX processors, Pipeline Operation of TMS320C54XX Processors.

UNIT-V: INTERFACING MEMORY AND I/O PERIPHERALS TO PROGRAMMABLE DSP DEVICES

Memory space organization, External bus interfacing signals, Memory interface, Parallel I/O interface, Programmed I/O, Interrupts and I/O, Direct memory access (DMA). A Multichannel buffered serial port (McBSP), McBSP Programming, a CODEC interface circuit, CODEC programming, A CODEC-DSP interface example.

TEXT BOOKS:

1. Digital Signal Processing – Avtar Singh and S. Srinivasan, Thomson Publications, 2004.
2. DSP Processor Fundamentals, Architectures & Features – Lapsley et al. S. Chand & Co, 2000.

REFERENCES:

1. Digital Signal Processors, Architecture, Programming and Applications – B. Venkata Ramani and M.Bhaskar, TMH, 2004.
2. Digital Signal Processing – Jonatham Stein, John Wiley, 2005.

WEB RESOURCES

1. http://nptel.iitm.ac.in
2. https://www.coursera.org/specializations/digital-signal-processing
3. https://www.youtube.com/watch?v=04UvJkki0Ig
4. https://training.ti.com/c55x-digital-signal-processors-dsp

PROFESSIONAL ELECTIVE-V

INTERNET OF THINGS AND APPLICATIONS

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
3	3	-	-	3	30	70	100

COURSE OBJECTIVES:

1. To Understand the Characteristics of IoT and Applications of IoT.

2. To understand the Arduino IDE installation, Arduino programs and the prototypes using Arduino with external devices.

3. To understand the concepts of Sensors, Raspberry programming and python packages to interface Amazon web services.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to

CO1:Describe the concepts of IoT along with its applications. **(L2)**

CO2:Design a prototype using Arduino Uno. **(L4)**

CO3: Identify different types of sensors, actuators and communication Protocols. **(L2)**

CO4: Build a prototype using Raspberry pi. **(L4)**

CO5: Design an IoT application to interact with Django. **(L4)**

SYLLABUS

UNIT-I: INTRODUCTION TO IoT

Definition of IoT, Characteristics of IoT, Physical design of IoT, Logical design of IoT, IoT Enabling Technologies, IoT levels & Deployment Templates, IoT Applications. (Text Book 1,3)

UNIT-II: IoT WITH ARDUINO

Introduction to the Arduino, creating an Arduino programming Environment, Using the Arduino IDE, creating an Arduino program, Using Libraries, working with Digital Interfaces, interfacing with Analog devices, communicating with devices, using sensors, working with Motors, Using an LCD. (Text Book -2)

UNIT-III: SENSORS AND ACTUATORS

Introduction, Sensor, Types of Sensors, Actuators, classification of Actuators. Technologies used in IoT: Bluetooth, Bluetooth Low Energy (BLE), Wi-Fi, Li-fi, Z-Wave, X-10, Sigfox, ZigBee, LoRa WAN, 5-G, LPWAN, RFID and NFC, WSN. (Text Book- 3)

UNIT-IV: IoT WITH RASPBERRY PI

Raspberry Pi, About the Board, Programming Raspberry Pi with Python, Controlling LED with Raspberry Pi, interfacing an LED and Switch with Raspberry Pi, Interfacing a Light Sensor (LDR) with Raspberry Pi. (Text Book -1)

UNIT-V: IoT PHYSICAL SERVERS & CLOUD OFFERINGS:

Python Packages for IoT, WAMP – Auto Bahn for IoT, Python Web Application Framework – Django, Amazon Web Services for IoT, Sky Net IoT messaging platform (Text book- 1)

TEXT BOOKS:

1. Vijay Madisetti and Arshdeep Bahga, Internet of Things (A Hands-on-Approach), 1st Edition, VPT, 2016.
2. Richard Blum, Arduino Programming in 24 Hours, Sams Teach Yourself, Pearson Education,2017. 3. Jain, Prof. Satish, Singh, Shashi, Internet of Things and its Applications, 1st Edition, BPB, 2020.

REFERENCES:

1. Donald Norris, Internet of things_ do-it-yourself projects with Arduino, Raspberry Pi, and Beagle Bone Black,1st Edition, McGraw-Hill,2015.
2. Adeal Javed Lake Zurich, Illinois, Building Arduino Projects for the Internet: Experiments with RealWorld Applications, 1st Edition, USA, A press,2016.
3. Yashavant Kanetkar, Shrirang Korde, 21 IOT Experiments, 1st Edition, BPB Publications, 2018.
4. Dr. Rajesh Singh, Dr. Anita Gehlot, Dr. Lovi Raj Gupta, Navjot Rathour, Mahendra Swain, Bhupendra Singh, IoT based Projects Realization with Raspberry Pi, Node MCU and Arduino, 1st Edition, BPB Publications, 2020.

WEB RESOURCES:

1. https://www.arduino.cc/reference/en
2. https://create.arduino.cc/projecthub
3. https://maker.pro/raspberry-pi/tutorial
4. https://projects.raspberrypi.org/en/projects
5. https://www.digikey.com/en/maker/blogs/2019/how-to-use-mqtt-with-the-raspberry-pi

PROFESSIONAL ELECTIVE-V

GLOBAL POSITIONING SYSTEM

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
3	3	-	-	3	30	70	100

COURSE OBJECTIVES:

The main objectives of the course is to:

1. Learn the development of GPS.
2. Describe the working principle of GPS
3. Explain the various GNSS systems.
4. Describe GPS Constellation and Signal structure.
5. Summarize the coordinate systems.

COURSE OUTCOMES:

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

CO1: **Understand** the History and evolution of Global Position System **(L2)**.
CO2: **Calculate** the user position using basic equations **(L2)**.
CO3: **Compare** GPS, GLONASS and GALILEO **(L2)**.
CO4: **Discuss** the GPS Signal Structure **(L4)**.
CO5: **Compare** various Coordinate systems **(L2)**.

SYLLABUS

UNIT-I:INTRODUCTION

Introduction to Global Position System, the History of GPS, the Evolution of GPS, Development of NAVSTAR GPS, Block I, Block II satellites, Block IIA, Block IIR and Block II R-M satellites.

UNIT-II:GPS WORKING PRINCIPLE

Trilateration method, Determination of where the satellites are, Determination of how far the satellites are, Determining the receiver position in 2D or X-Y Plane, Determining the receiver position in 3D or X-Y-Z Plane, basic equations for finding user position, user position determination with least squares estimator.

UNIT-III:OTHER GLOBAL SATELLITE CONSTELLATIONS

GLONASS, GALILEO, Comparison of 3GNSS (GPS, GALILEO, GLONASS) in terms of constellation and services provided.

UNIT-IV:GPS SATELLITE CONSTELLATION AND SIGNALS

GPS system segments, Space segment, Control segment, User segment, GPS Signals, Pseudorandom noise (PRN) code, C/A code, P code Navigation data, and Signal structure of GPS.

UNIT-V:COORDINATE SYSTEMS

Geoid, Ellipsoid, Coordinate Systems, Geodetic and Geo centric coordinate systems, ECEF coordinates, world geodetic 1984 system.

TEXTBOOKS:

1. G S RAO, Global Navigation Satellite Systems, McGraw-Hill Publications, New Delhi, 2010
2. Pratap Mishra, Global positioning system: signals, measurements, and performance, Ganga-Jamuna Press, 2006

REFERENCES:

1. Scott Gleason and Demoz Gebre-Egziabher, GNSS Applications and Methods, Artech House, 685 Canton Street, Norwood, MA 02062, 2009.
2. James Ba – Yen Tsui, 'Fundamentals of GPS receivers – A software approach', John Wiley & Sons (2001).
3. B.Hoffmann-Wellenhof, GPS theory and practice, 5th Edition, Springer 2001.

WEB RESOURCES:

1. https://nptel.ac.in/courses/105107062
2. https://www.gps.gov
3. https://www.udemy.com/topic/gps

PROFESSIONAL ELECTIVE-V

DIGITAL IMAGE PROCESSING

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
3	3	-	-	3	30	70	100

COURSE OBJECTIVES:

1. Familiarize with basic concepts of digital image processing and different image transforms
2. Learn various image processing techniques like image enhancement, restoration, segmentation and compression
3. Understand color fundamentals and different color models
4. Understand morphological image processing and segmentation

COURSE OUTCOMES:

After successful completion of this course, the students will be able to

CO 1:Analyze digital image capturing, basic relationships between pixels, mathematical tools and image transform of a binary /gray scale image. **(L4)**

CO 2:Analyze intensity transformation and filtering in spatial & frequency domain of grayscale image **(L4)**

CO 3:Explain restoration of a given noisy and/or degraded binary /gray scale image, and also its compression. **(L2)**

CO 4:Describe spatial filtering, segmentation and compression of color image belonging to models RGB/ CMY/ CMYK/ HSI. **(L2)**

CO 5:Analyze extraction and segmentation of image components in a given binary /gray scale image **(L4)**

SYLLABUS

UNIT-1: INTRODUCTION

Origins of digital image processing, uses digital image processing, fundamental steps in digital image processing, components of an image processing system, digital image fundamentals, Elements of visual percept ion, light and electromagnetic spectrum, imaging sensing and acquisition, image sampling and quantization. Some basic relationships between pixels, and introduction to the mathematical tools used in digital image processing. IMAGE RANSFORMS: Need for image transforms, Spatial Frequencies in image processing, introduction to Fourier transform, discrete Fourier transform, fast Fourier transform and its algorithm, properties of Fourier transform. Discrete sine transforms. Walsh Transform. Hadamard transform, Haar Transform. Slant transforms.

UNIT-2: 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, using fuzzy techniques for intensity transformations and spatial filtering.

FILTERING IN THE FREQUENCY DOMAIN: Preliminary concepts, Sampling and the Fourier transform of sampled functions, the discrete Fourier transform (DFT) of one variable, Extension to functions of two variables, some properties of the 2-D Discrete Fourier transform. The Basic of filtering in the frequency domain, image smoothing using frequency domain filters, Selective filtering, Implementation.

UNIT-3: IMAGE RESTORATION

A model of the image degradation /Restoration process, Noise models, restoration in the resence of noise only-Spatial Filtering, Periodic Noise Reduction by frequency domain filtering, Linear, Position–Invariant Degradations, Estimation the degradation function. Image Compression: Fundamentals, Some Basic Compression Methods: Huffman Coding, Golomb Coding, Arithmetic Coding, LZW Coding, Run-Length Coding and Symbol-Based Coding, LOSSY AND LOSSLESS predictive coding

UNIT-4: COLOUR IMAGE PROCESSING

Color fundamentals, color models, pseudo color image processing, basic of full color image processing, color transformations, smoothing and sharpening. Image segmentation based on color, noise in color images, color image compression.

UNIT- 5: MORPHOLOGICAL IMAGE PROCESSING

Preliminaries Erosion and dilation, opening and closing, the Hit-or-miss transformation, some Basic Morphological algorithms, grey–scale morphology Image segmentation: Fundamentals, point, line, edge detection thresholding, region –based segmentation, segmentation using Morphological watersheds, basic knowledge of wavelet transformation

TEXT BOOKS:

1. R. C. Gonzalez and R. E. Woods, Digital Image Processing, 4th edition, Prentice Hall, 2018.
2. Anil K. Jain, “Fundamentals of Digital Image Processing”, Pearson Edit ion 1, 2015

REFERENCES:

1. R. C. Gonzalez, R. E. Woods and Steven L. Eddins, Digital Image Processing Using MATLAB, 2nd edit ion, Prentice Hall, 2009.
2. Jayaraman, S. Esakkirajan, and T. Veerakumar, Digital Image Processing, Tata McGraw- Hill. 2017.

OPEN ELECTIVE-III

FUNDAMENTALS OF COMMUNICATION ENGINEERING

COURSEOBJECTIVES:

The objective of this subject is to:

- Introducethestudentstomodulationandvariousanalogganddigitalmodulationschemes.
- Theycanhaveabroadunderstandingofsatellite,optical,cellular,mobile and wireless concepts

COURSEOUTCOMES:

By the end of course student should be able to

- **Explain** necessity of modulation, types of modulation and advantage of multiplexing (**L2**)
- **Understand** evolution of cellular systems their features and their future (**L2**)
- **Analyze** different types of networks and internet technology (**L4**)
- **Explain** basic operation of a satellite and its navigation systems (**L2**)
- **Understand** optical fiber communication and basic wireless technologies (**L2**)

UNIT–I: Analog Modulation

Block diagram of basic Communication System, Analog Signals, Digital Signals, Need for Modulation, Introduction to Analog Modulation Techniques: AM, DSB-SC, SSB-SC and their applications, Frequency Division Multiplexing (FDM).

UNIT–II: Digital Modulation

Sampling and Quantization, Advantage of Digital Signals over Analog Signals, Introduction to Binary Digital Modulation Techniques: BASK, BPSK, BFSK, and their applications and Time Division Multiplexing (TDM).

UNIT – III: Cellular and Mobile Communications

Cellular telephone systems, A Cellular Industry, Overview, 2G and 3G Digital Cell Phone Systems, Long Term Evolution and 4G Cellular Systems (All Elementary Level Concepts)

UNIT – IV: Satellite Communication

Satellite Orbits, Satellite Communication systems, Satellite Subsystems, Ground Stations, Satellite Applications, Global Navigation Satellite Systems. (All Elementary Level Concepts)

UNIT – V: Optical Communication and Wireless Technologies

Optical Principles, Optical Communication Systems, Fiber –Optic Cables, Wavelength Division

Multiplexing. Wireless LAN, PANs and Bluetooth, ZigBee and Mesh Wireless Networks, WiMAX and Wireless Metropolitan Area Networks. (All Elementary Level Concepts)

TEXT BOOKS:

1. Principles of Electronic Communication Systems, LouisE.Frenzel, 3e, McGraw Hill Publications, 2008.
2. Electronic Communications systems, Kennedy, Davis4e,McGrawHill Education,1999.

REFERENCE BOOKS:

1. Theodore Rappport, Wireless Communications-Principles and Practice, Prentice Hall,2002.
2. Roger L.Freeman, Fundamentals of Telecommunications, 2e, Wiley Publications, 2013.
3. Introduction to Data Communications and Networking, Wayne Tomasi, Pearson Education,2005.

OPEN ELECTIVE-IV

DATA COMMUNICATIONS

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
3	3	-	-	3	30	70	100

COURSE OBJECTIVES:

1. Know the Categories and functions of various Data Communication Networks.
2. Explain the Physical layer, protocols and its functionalities.
3. Describe the Data link layer, protocols and its functionalities.
4. Explain the Network layer, protocols and its functionalities.
5. Summarize the functionalities of Transport layer and Application layer.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to

CO1: Know the Categories and functions of various Data Communication Networks. **(L2)**

CO2: Explain the types of transmission media with real time applications**. (L2)**

CO3: Design and analyze various error detection and correction techniques. **(L2)**

CO4: Implement LAN using hubs, bridges and switches. **(L4)**

CO5: Analyze the protocols in Transport layer and application layer**. (L4)**

SYLLABUS

UNIT-I: INTRODUCTION TO DATA COMMUNICATIONS:

Data Communications Components, Data Representation, Data Flow, Transmission Channel, Networks- Uses of Computer Networks, Line Configuration: Point-Point, Multipoint; Topology, Network Models: PAN, LAN, MAN, WAN, Internetworks; Network Architecture: Peer-to-Peer Network, Client/Server Network; Network Software: Protocol Hierarchies, Connection-Oriented versus Connectionless Service; Reference Models: OSI and TCP/IP model, Comparison of OSI and TCP/IP Reference Models, Protocols and Standards.

UNIT-II: PHYSICAL LAYER

Theoretical Basis for Data Communication: The Maximum Data Rate of a Channel; Transmission Media: Guided Media and Unguided Media; Switching: Circuit Switching, Packet Switching and Message Switching; Switching ISDN: Services, Broadband ISDN.

UNIT-III: DATA LINK LAYER

Services Provided to the Network Layer, Framing, Error Control, Flow Control; Error Detection and Correction: Error-Correcting Codes, Error-Detecting Codes; Elementary Data Link Protocols: Simplex Stop-and-Wait protocol for an error free channel, Sliding Window Protocols A Protocol Using Go-Back-N, A Protocol using Selective Repeat; Example Data Link Protocols:

Medium Access Sub-layer: Multiple Access Protocols: ALOHA (Pure ALOHA and Slotted ALOHA) Carrier Sense Multiple Access Protocols.

UNIT-IV: NETWORK LAYER

Store-and-Forward Packet Switching, Services provided to the Transport Layer, Implementation of Connectionless Service, Implementation of Connection-Oriented Service, Comparison of Virtual-Circuit and Datagram Networks; Difference between Gateway, Ethernet Switch, Router, Hub, Repeater, Details of IP addressing schemes: The IP Version 4 Protocol, IP Addressing.

UNIT –V: TRANSPORT AND APPLICATION LAYERS

The Transport Service: Services Provided to the Upper Layers, Elements of Transport Protocols: Addressing, Connection Establishment, Connection Release, Error Control and Flow Control, the Internet Transport Protocols (UDP): Introduction to UDP.

The Application Layer: The Domain Name System, email.

TEXT BOOKS:

1. Data Communications and Networking by Behrouz A. Forouzan, 2nd Edition, Tata McGraw Hill,2001.
2. Data Communications and Computer Networks by Prakash C. Gupta, 2nd Edition, PHI Learning private Limited,2014.

REFERENCES:

1. Computer Networks, A. S. Tannenbaum, PHI – New Delhi. 2008.
2. Computer Networking Terminology Products and Standards, R. P. Suri and J. K. Jain, Tata McGraw Hill, 1995.

INDUSTRY ORIENTED PROGRAMMING SKILLS LAB

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
3	3	-	-	3	50	50	100

COURSE OBJECTIVES:

1. To Learn Basic Programming of Python
2. To understand the Arduino IDE installation, Arduino programs, Raspberry programming.
3. To introduce students to latest software relevant to communication engineering.
4. To introduce students to latest software relevant to VLSI Design.

COURSE OUTCOMES:

By the end of course student would be able to

CO1:Design a prototype using Arduino Uno **(L4)**

CO2: Build a prototype using Raspberry pi.**(L4)**

CO2:Perform basic analog and digital Modulation techniques using Lab View Software.**(L2)**

CO3:Design and analysis performance of combinational circuits.**(L4)**

LIST OF EXPERIMENTS

MODULE 1: IOT

1. Controlling of LED using Arduino.
2. Develop Traffic light controlling system using Arduino.
3. Working of Sensors with Arduino.
4. Controlling LED with Raspberry Pi.
5. Interfacing LED and Switch with Raspberry Pi.

Module 2: LabVIEW

1. Amplitude Modulation and Demodulation
2. Frequency Modulation and Demodulation
3. Binary Amplitude Shift Keying
4. Binary Phase Shift Keying
5. Binary Frequency Shift Keying

MODULE 3: TANNER TOOL

1. Inverter, NAND and NOR Gates
2. Multiplexer
3. Half Adder
4. Full Adder

SCHEME FOR IV/IV BTECH-II SEM (8th Semester)

Course code	Category	Course Title	Internal Marks	External Marks	Total Marks	Credits
	PROJ	Project work	50	50	100	12
					Total Credits	**12**