II/IV B.TECH ECE (FOUR YEAR COURSE) &
II/IV B.TECH + M.TECH (SIX YEAR DUAL DEGREE COURSE)
(WITH EFFECT FORM 2020-2021 ADMITTED BATCH ONWARDS)
B.Tech & B.Tech+M.Tech
II Year - I Semester

Course code	Category	Course Title	Hours per week			Internal Marks	External Marks	Total Marks	Credits C
			L	T	P				
EC-2101	BS	Mathematics III	3	0	0	30	70	100	3
EC-2102	PC	Analog Electronic Circuits	3	0	0	30	70	100	3
EC-2103	PC	Electrical Machines	3	0	0	30	70	100	3
EC-2104	PC	Signals & Systems	3	0	0	30	70	100	3
EC-2105	HSS	Managerial Economics	3	0	0	30	70	100	3
EC-2106	PC	Networks and Machine Lab	0	0	3	50	50	100	1.5
EC-2107	PC	Analog Electronics and Circuits Lab with Simulation	0	0	3	50	50	100	1.5
EC-2108	PC	Digital ICs and HDL Lab	0	0	3	50	50	100	1.5
EC-2109	SC	Programming skills for problem solving	1	0	2	50	50	100	2
EC-2110	MC	Professional Ethics& Universal Human values	0	0	0	----	100	100	0
EC-2111	MC	NCC/NSS	0	0	2	----	----	-----	0
Total Credits									**21.5**

B.Tech & B.Tech+M.Tech
II Year - II Semester

Course code	Category	Course Title	Hours per week			Internal Marks	External Marks	Total Marks	Credits C
			L	T	P				
EC-2201	ES	MIV	3	0	0	30	70	100	3
EC-2202	BS/PC	Electromagnetic Field Theory and Transmission Lines	3	0	0	30	70	100	3
EC-2203	PC	Microprocessors and Microcontrollers	3	0	0	30	70	100	3
EC-2204	PC	Probability theory and Random Process	3	0	0	30	70	100	3
EC-2205	PC	Analog Communications	3	0	0	30	70	100	3
EC-2206	PC	Microprocessors & Microcontrollers Lab	0	0	3	50	50	100	1.5
EC-2207	PC	Analog Communications Lab	0	0	3	50	50	100	1.5
EC-2208	SC	Python Programming	1	0	2	50	50	100	2
EC-2209	MC	Environmental Science	0	0	0	------	100	100	0
Total Credits									**20**
Summer Internship(Community Service)									

EC-2101
MATHEMATICS-III
B.Tech & B.Tech+M.Tech
II Year - I Semester

(With effect from the admitted batch of 2020-2021)

Subject Code: **External Examination - Max. Marks: 70**
No. of Credits: 3 **Internal Examination - Max. Marks: 30**
No. of Periods/ Week: 3 **Total Marks: 100**

OBJECTIVES:

In general, the students are introduced with a knowledge on the topics: Vector Calculus, Partial differential equations, their applications and Integral Transforms (Fourier transforms, FST, FCT) so as to facilitate them to use these concepts in core subjects.

The objectives, in particular are to learn:

- the basic knowledge and applications of Vector Calculus used in Engineering problems.
- About the gradient, divergence and curl under the differentiation of scalar and vector point functions, also on Line-, Surface- and Volume integrals under the integration of point functions along with their applications in Engineering issues.
- Transformation theorems such as **Green's** theorem in the plane, **Stoke's** theorem, **Gauss Divergence** theorem and their applications.
- How to formulate the Partial Differential Equations from the relation between the dependent and independent variables, the methods of solving first order first degree linear, non-linear P**artial Differential Equations**, Homogeneous and Non homogeneous linear partial differential equations with constant coefficients .
- The procedure to find out the solutions of Partial Differential Equations by using the method of separation of variables (product method) about the formulation of one dimensional wave (string equation), one-and two-dimensional **Heat flow equations**, **Laplace's equation** in Cartesian and polar coordinates, and how to solve these equations using the method of separation of variables.
- The concept of integral transforms, namely, **Fourier transforms**, **Fourier Sine, Cosine and related inverse transforms, and** their applications in solving several Physical and Engineering problems.

Unit-I
(VECTOR CALCULUS-DIFFERENTIATION)

Differentiation of vectors, curves in space, velocity and acceleration, relative velocity and relative acceleration, scalar and vector point functions, vector operator ∇ applied to scalar point functions- gradient, ∇ applied to vector point functions- divergence and curl. Physical interpretation of gradient, divergence and culrl (i.e., ∇f, $\nabla.\overline{F}$, $\nabla\times\overline{F}$), Irrotational and Solenoidal fields, the relations obtained after ∇ applied twice to point functions, ∇ applied to products of two functions.

Unit-II
(VECTOR INTEGRATION)

Integration of vectors, line integral, circulation, work done, surface integral-flux, Green's theorem in the plane, Stoke's theorem, volume integral, Gauss Divergence theorem. (All theorems without proofs)
Introduction of orthogonal curvilinear coordinates, cylindrical and spherical polar coordinates

Unit-III
(PARTIAL DIFFERENTIAL EQUATIONS)

Formation of partial differential equations, solutions of partial differential equations- equations solvable by direct integration, linear equations of first order: Lagrange's Linear equation, non-linear equations of first order, Charpit's method. Homogeneous linear equations with constant coefficients- rules for finding the complementary function, rules for finding the particular integral (working procedure), non-homogeneous linear equations.

Unit-IV
(APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS)

Method of separation of variables, One dimensional wave equation-vibrations of a stretched string, one dimensional Heat flow equation, Two dimensional heat flow in steady state - solution of Laplace's equation in Cartesian and polar coordinates (two dimensional).

Unit-V
(INTEGRAL TRANSFORMS (Fourier Transform)

Introduction, definition, Fourier integral, Sine and Cosine integrals, Complex form of Fourier integral, Fourier transform, Fourier Sine and Cosine transforms, Finite Fourier Sine and Cosine transforms, properties of Fourier transforms.

Convolution theorem for Fourier transforms, Parseval's identity for Fourier transforms, Fourier transforms of the derivatives of a function, simple applications to Boundary value problems.

TEXT BOOKS:

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 publications
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. Mathematical Methods of Science & Engineering aided with MATLAB by Kanti B.Dutta, Cengage Learning India Pvt. Ltd.
5. Higher Engineering Mathematics by B. V. Ramana, Tata McGraw Hill Company.
6. Advanced Engineering Mathematics by H.K.Dass. S.Chand Company.

OUTCOMES: After going through this course , the students would be able to:

- operate the differential operator 'del' to the scalar and vector point functions, Calculate the Gradient, Divergence and Curl, Vector normal to a surface, maximum rate of change of a scalar field, test whether two surfaces are to cut orthogonally or not .
- find the rate per unit volume at which the physical quantity is issuing from a point, the rate of inflow minus out flow using the Divergence and the angular velocity of rotation at any point of the vector field using the Curl.
- **test** whether the given motion is irrotational or rotational, whether a vector force acting on a particle is conservative or not
- find out the potential function from a given vector field.
- obtain the well known Laplace and poisson equations from an irrotational field
- understand to determine the work done by a force field and circulation using a Line integral
- find out the Line, Surface and Volume integrals, find flux using surface integral and volumes using the volume integral.

- apply the vector integral theorems (Green's theorem in the plane, Stoke's and Divergence theorems) for evaluating the double and triple integrals as these are used to find areas and volumes.
- know the methods of solving Linear and Non linear first order and first degree partial differential equations.
- solve the Linear Partial Differential Equations with constant coefficients (homogeneous and non homogeneous) and know the procedure for finding the complementary function and particular integrals
- apply the method of separation of variables to obtain solutions to the boundary value problems involving Linear partial differential equations occurred in engineering studies
- solve wave equation, heat flow equation and the Laplace's equations in Cartesian and polar coordinates using the method of separation of variables.
- apply and extend the knowledge of Fourier transform techniques in solving several Initial and Boundary value problems of Engineering, such as in Conduction of heat / Thermodynamics, Hydraulics transverse vibrations of a string, oscillations of an elastic beam, bending of beams, electrical circuits, free and forced vibrations of a membrane and transmission lines , etc.

EC - 2102
ANALOG ELECTRONICS CIRCUITS

Course Objectives:

- To prepare students to perform the analysis of any Analog electronics circuit.
- To empower students to understand the design and working of BJT / FET.
- To empower students to understand the design and working of amplifiers and oscillators.
- To empower students to understand the design and working of Operational Amplifier.
- To prepare the students for advanced courses in Communication system Circuit Design.

Course Outcomes:

- Acquire basic knowledge of physical and electrical conducting properties of semiconductors.
- Develop the Ability to understand the design and working of BJT / FET amplifiers and Operational Amplifier.
- Develop the Ability to understand the design and working of BJT / FET oscillators.
- Develop the Ability to understand the design and working of Communication system Circuit Design.

SYLLABUS

Small Signal High Frequency Transistor Amplifier models

BJT: Transistor at high frequencies, Hybrid- common emitter transistor model, Hybrid- conductance's, Hybrid-capacitances, validity of Hybrid- 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: Analysis of common source and common drain amplifier circuits at high frequencies.

Multistage Amplifiers

BJT and FET RC Coupled Amplifiers – Frequency Response. Cascaded Amplifiers. Calculation of Band Width of Single and Multistage Amplifiers. Concept of Gain Bandwidth Product.

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.

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.

Power 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, Derating Factor – Heat Sinks.

Tuned Voltage Amplifiers

Single Tuned and Stagger Tuned Amplifiers – Analysis – Double Tuned Amplifier – Bandwidth Calculation.

Text Books :

1. Integrated Electronics, Analog Digital Circuits and systems, **Jacob Millman** and **D. Halkias**, McGraw Hill, 1972

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.RajaRajeswari et.al**, Pearson Publishers

References:

1. Electronic Devices and Circuits, **G.S.N. Raju**, IK International Publications, New Delhi, 2006.
2. Electronic Devices and Circuits – **G.K.Mithal**, Khanna Publishers, 23rd Edition, 2004.

EC- 2103
ELECTRICAL MACHINES

Course Objectives:

- Study of DC machines.
- Study of Transformers
- To introduce the concepts of ideal synchronous machines and poly-phase induction machines.
- Applications which will be utilized in the electrical machines with its performance and theory of operation.

Course Outcomes:

- Explain the theory of ideal synchronous machines and, basic machine relation.
- Analyze and apply the concept of steady state analysis and electrical transients in single phase and poly phase machines.
- Evaluate the basic operation and performance of special machines and can select special machines for different purpose

SYLLABUS

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, Losses and Efficiency, Efficiency by Direct Loading, Swinburne's Test and Hopkin's Test, Applications of DC Machines.

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.

THREE – PHASE INDUCTION MACHINES
Construction, Rotating Magnetic Field and 3ph Induction Motor, Power Flow Diagram, Torque and Torque-slip Characteristics, Condition for Max. Torque and its Value, Starting and Speed Control, Losses and Efficiency, Equivalent Circuit and Circle Diagram of Induction Motor, No – Load and Rotor – Blocked Tests and Efficiency and Torque – Speed Characteristics.

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.

SINGLE – PHASE MOTORS
Double Revolving Field Theory, Methods of Starting Single Phase Induction Motors, Universal Motor, Stepper Motor.

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.

EC-2104

Signals & Systems

Course Objectives:

- To explain signals and systems representations/classifications and also describe the time and frequency domain analysis of continuous time signals with Fourier series.
- Fourier transforms and Laplace transforms.
- To understand Sampling theorem, with time and frequency domain analysis of discrete time signals with DTFS, DTFT and Z-Transform.
- To present the concepts of convolution and correlation integrals and also understand the properties in the context of signals/systems and lay down the foundation for advanced courses.

Course Outcomes:

- Analyze the discrete time signals and system using different transform domain techniques.
- Design and implement LTI filters for filtering different real world signals.
- Develop different signal processing applications using DSP processor.

SYLLABUS

Introduction to signals and linear time Invariant systems

Continuous –Time and Discrete –Time signals, Signal Energy and Power, Periodic Signals, Even and odd Signals, continuous- Time complex Exponential and Sinusoidal Signals, Discrete –Time complex Exponential and Sinusoidal Signals, Periodicity Properties of Discrete –Time Complex Exponentials, The Unit Impulse and Unit step Functions, The Discrete- Time Unit Step and Unit Impulse Functions, The Continuous-Time Unit impulse and Unit step Sequence, Continuous –Time and Discrete –Time Systems, Interconnections of Systems, Basic System Properties, Discrete –Time LTI Systems: The Convolution Sum, The Representation of Continuous –Time Signals in terms of Impulses, The Commutative property, Casual LTI Systems Described by Differential and Difference Equations, Singularity Functions.

Fourier Series Representation of Periodic Signals

Introduction, Fourier Series Representation of continuous time Periodic Signals, convergence of the Fourier Series, Properties of continuous time Fourier Series, Fourier Series representation of discrete time periodic signals, Properties of discrete time Fourier Series.

Continuous and Discrete time Fourier Transform

Introduction, Representation of Aperiodic signals, The continuous time Fourier Transform, The Fourier Transform for periodic signals, Properties of the continuous time Fourier Transform, The convolution Property, Multiplication property, Systems characterized by linear constant-coefficient differential equations. Discrete time Fourier Transform, Representation of Aperiodic signals discrete time Fourier Transform, Fourier Transform for periodic signals, Properties of the Discrete time Fourier Transform, The convolution property, The multiplication property, Duality, Systems characterized by linear constant co-efficient differential equations.

Convolution and correlation of signals

System analysis by Convolution, Convolution as a superposition of impulse response, some Convolution relationships, Graphical interpretation of Convolution, Convolution of a function with a unit impulse, Signal comparison, Correlation and Convolution, Some properties of correlation functions, Correlation functions for nonfinite energy signals, Detection of periodic signals in the presence of Noise by correlation, Determination of the waveform of a periodic signal masked by Noise, Extraction of a signal from Noise by filtering.

Laplace Transform

Introduction, The Laplace Transform, the region of convergence for Laplace Transforms, The Inverse Laplace Transform, Geometrical evaluation of the Fourier 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.

Sampling Theorem and Z-transform

Introduction, reconstruction of a signal from its samples using interpolation, The effect of Undersampling: aliasing, Discrete time processing of continuous time signals, sampling of Discrete time signals. The ZTransform, The Inverse Z-Transform, Geometrical evaluation of the Z-Transform from the Pole-Zero plot, Properties of Z-Transform, The initial 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.Signals and Systems, Alan V. Oppenheim, Alan S. Willsky and Ian T. Young, PHI, 2ndEdn.
2. Signals Systems and Communication, B. P. Lathi, BS Publication
3. Signals and Systems, K. Raja Rajeswari and B. V. Rao, Prentice Hall of India.

References:

1. Signals and Systems- Simon Haykin and Van Veen, Wiley 2ndEdn.
2. Signals and Systems – P.RameshBabu and R.AnandaNatarajan 3rdEdn.

EC-2105

Managerial Economics

Course Objectives:

- To integrate the concept of price and output decisions of firms under various market structure.
- The objective of this course is to impart the knowledge of economics as a subject and its importance while business.
- The business decisions are made scientifically on the basis of all available information.
- 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:

- To understand the concepts of cost, nature of production and its relationship to Business operations.
- To apply marginal analysis to the "firm" under different market conditions.
- To analyze the causes and consequences of different market conditions.
- To integrate the concept of price and output decisions of firms under various market structure.

SYLLABUS

Significance of Economics and Managerial Economics:

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.

Demand Analysis : Demand - Definition, Meaning, Nature and types of demand, Demand function, Law of demand - Assumptions and limitations. Exceptional demand curve.
(Two periods)

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.

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**.**

Theory of Production and Cost analysis:
Production - 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. Postponable costs, Escapable vs. unavoidable costs, Economies and Diseconomies of scale.

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.

Business cycles, Inflation and Deflation:
Business cycles - Definition , Characteristics , Phases, Causes and Consequences; Measures to solve problems arising from Business cycles.

Inflation -Meaning, Types, Demand- pull and Cost push inflation, Effects of Inflation, Anti- inflationary measures.

Deflation- Meaning, Effects of Deflation, Control of Deflation, Choice between Inflation and Deflation.

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.

EC-2106

Networks and Machine Lab

Course Objectives:

- To verify Superposition Theorem
- To verify Reciprocity Theorem
- To verify Thevenin's Theorem
- To verify Ohm's law
- To verify Kirchhoff's law
- To verify no load and blocked rotor tests on 3-phase squirrel cage Induction motor
- To verify Open circuit test and short circuit test on 1-phase transformer

Course Outcomes:

- Understand the concepts of various theorems and open circuit and no load tests practically.

SYLLABUS

LIST OF EXPERIMENTS

I. NETWORK LAB EXPERIMENTS

1. Verification of Superposition Theorem
2. Verification of Reciprocity Theorem
3. Verification of Thevenin's Theorem
4. Calibration of UPF Wattmeter
5. Verification of Ohm's law
6. Verification of Kirchhoff's law

II. 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. Swin burner's test
11. No load and load characteristics of self-excited Shunt generator

EC-2107
Analog Electronics and Circuits Lab with Simulation

Course Objectives:

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

Course Outcomes:

- To understand the concepts of various feedback Amplifier, oscillators practically
- To understand the concepts of various feedback Amplifier, oscillators through software simulations.

SYLLABUS

LIST OF EXPERIMENTS

1. Current series feedback Amplifier
2. Colpitts oscillator
3. RC-Phase shift oscillator
4. Two stage RC-Coupled Amplifier
5. Wein bridge oscillator
6. Hartley Oscillator
7. Class-B Push pull Amplifier
8. Voltage series feedback Amplifier
9. Common source FET Amplifier
10. Tuned Voltage Amplifier
11. Applications of Operational Amplifier
12. Frequency response of Op-amp

(Software Simulation)

13. Common emitter and common source Amplifier
14. Two stage RC coupled Amplifier
15. RC Phase shift oscillator using transistors
16. Class-A Power Amplifier (transformer less)
17. Class-B complementary symmetry Amplifier
18. High frequency common base (BJT) and common gate (JFET) Amplifier

EC-2108

Digital ICs and HDL Lab

Course Objectives:

- To study logic gates, realization of Gates by using universal building blocks practically.
- To study flip-flops, registers and counters practically.
- To study logic gates, realization of Gates by using universal building blocks through software simulations.

Course Outcomes:

- To understand the concepts of logic gates, realization of Gates by using universal building blocks practically.
- To understand the concepts of flip-flops, registers and counters practically.
- To understand the concepts of logic gates, realization of Gates by using universal building blocks through software simulations.

SYLLABUS

LIST OF EXPERIMENTS

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
5. Half Adder & Full adder
6. Function generation by using Decoders & Multiplexers.
7. Realization of Flip - flops
8. 4-bit Ripple counter
9. Mod-8 Synchronous counter.
10. 4 - bit Shift-register
11. Seven segment display

SIMULATION EXPERIMENTS

1. Simulation of Logic gates
2. Simulation of Full adder
3. Simulation of Multiplexer & De-Multiplexer
4. Simulation of Decoder & Encoder
5. Simulation of Flip flops (SR & D)
6. Simulation of Up-down counter& Shift register

EC-2109

SKILL ORIENTED COURSE

PROGRAMMING SKILLS FOR PROBLEM SOLVING

List of Programs:

1. Write a program to implement basic operations on multidimensional arrays and vectors.
2. Write a program to perform different operations and manipulations on Matrices.
3. Write a program to generate various Signals and Sequences (Periodic and Aperiodic), such as Unit Impulse, Unit Step, Square, Saw tooth, Triangular, Sinusoidal, Ramp, Sinc.
4. Write a program to perform operations on Signals and Sequences such as Addition, Multiplication, Scaling, Shifting, Folding, Computation of Energy and Average Power.
5. Write a program to plot the voltage across capacitor during charging $(v_C = v_0[1 - e^{-t/RC}])$
6. Write a program for solving the linear system of equations.
7. Write a program to integrate and differentiate sinusoidal signals and plot the results with different colours.
8. Write a program to compute mean, median, standard deviation and variance of a set of data using formulae and verify using built-in functions.
9. Write a program to compare the results of the built-in and user-defined function to compute cos(x) and sin(x) series.
10. Write a program to find the Even & Odd and Real & Imaginary parts of a Signal/Sequence.
11. Write a program to find trigonometric and exponential Fourier series coefficients of a rectangular periodic signal.
12. Write a program to find the Fourier transform of a given signal and plot its amplitude and phase spectrum.
13. Write a program to verify the Linearity and Time Invariance Properties of a given Continuous/Discrete System.
14. Write a program to read, display an image and calculate its RGB components.
15. Write a program to convert colour image to grey scale and plot its histogram.
16. Write a program to generate a vector of 100 uniformly and normal distributed random numbers. Plot a histogram of the distribution. Do the same for 1000 and 10,000 uniformly distributed random numbers.
17. Write a program to Factorize the given matrices using different factorizations (LU, QR, CHOLESKY, SVD).

Textbooks:

1. Getting Started with MATLAB: A Quick Introduction for Scientists & Engineers by Rudra Pratap, Oxford University press, Inc.,
2. MATLAB and its applications in Engineering second edition by Raj Kumar Bansal, Ashok. k. Goel and Manoj Kumar Sharma, PEARSON publishers.

EC-2110

MANDATARY COURSE

Professional Ethics and Universal Human Values
(Effective from 2020-2021 Admitted Batches)
(Common for all Branches)

Course Objectives:

The objective of the course is Six fold:

- Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
- This course will illuminate the students in the concepts of laws and its applicability to engineers
- Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
- Strengthening of self-reflection, Development of commitment and courage to act and also enable the students to imbibe and internalize the Values and Ethical Behaviour in the personal and professional lives
- To enable the students to imbibe the Values and Ethical Behavior in the personal and Professional lives
- The students will learn the rights and responsibilities Individual, employee, team member and a global citizen

Course Outcomes:

By the end of the course Student will be able to:

- Grasp the meaning of the concept – Law and also Get an overview of the laws relating to Engineers and also Apprehend the importance of being a law abiding person and They would have better critical ability
- Self-explore by using different techniques to live in harmony at various levels
- Analyze themselves and understand their position with respect to the moral and ethical character needed for a successful and satisfactory work life
- Students are expected to become more aware of themselves and their surroundings (family, society, nature)
- They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
- They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society

SYLLABUS

Need, Basic Guidelines, Content and Process for Value Education

•,Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation - as the process for self-exploration, Continuous Happiness and Prosperity - A look at basic Human Aspirations, Right understanding, Relationship and Physical Facility - the basic requirements for fulfillment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfill the above human aspirations: understanding and living in harmony at various levels. Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking, Include practice sessions and case studies.

Understanding Harmony in the Human Being - Harmony in Myself!

- Understanding human being as: a co-existence of the sentient 'I' and the material 'Body', the needs of Self ('I') and 'Body' - happiness and physical facility, the Body as an instrument of 'I' (I being the doer, seer and enjoyer), the characteristics and activities of 'I' and harmony in 'I', the harmony of I with the

Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail, P to ensure Sanyam and Health, Include practice sessions and case studies.

Understanding Harmony in the Family and Society - Harmony in Human – Human Relationship

- Understanding values in human-human relationship: meaning of Justice (nine universal values in relationships) and program for its fulfillment to ensure mutual happiness; Trust and Respect as the foundational values of relationship, the meaning of Trust; Difference between intention and competence, the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship, the harmony in the society (society being an extension of family), Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals, Visualizing a universal harmonious order in society- Undivided Society, Universal Order from family to world family, Include practice sessions and case studies.

Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

- Understanding the harmony in the Nature, Interconnectedness and mutual fulfillment among the four orders of nature recyclability and self-regulation in nature, Understanding Existence as Co-existence of mutually interacting units in all – pervasive space, Holistic perception of harmony at all levels of existence, Include practice sessions and case studies.

Concept of Law and Law of Torts

- Understanding Essentials of a Valid Contract and the basics of contract law protecting rights and obligations, Introduction to the Law of Torts and the basics to protect oneself and the company Law affecting the Workplace Employers Responsibilities/Duties Hiring Practices, Introduction to Intellectual Property Law, Professional Code of Conduct for Engineers, Relationship between Law and Ethics, Include practice sessions and case studies.

Implications of the above Holistic Understanding of Harmony on Professional Ethics

- Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems, Case studies of typical holistic technologies, management models and production systems, Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations, Include practice sessions and case studies.

Text Books

1. R R Gaur, R Asthana, G P Bagaria, "A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
2. R R Gaur, R Asthana, G P Bagaria, "Teachers' Manual for A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2
3. R. Subramanian, "Professional Ethics", Oxford University Press.
4. S.B. Srivasthva, "Professional Ethics & Human Values", SciTech Publications (India) Pvt. Ltd. New Delhi.
5. D.R. Kiran, "Professional Ethics & Human Values", TATA Mc Graw Hill Education.
6. Saroj Kumar, "Business Law" and Avtar Singh, "Law of Contract"

Reference Books

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amar kantak, 1999.
2. A. N. Tripathi, "Human Values", New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book), Mohandas Karamchand Gandhi "The Story of My Experiments with Truth", E. FSchumacher. "Small is Beautiful", Slow is Beautiful –Cecile Andrews, J C Kumarappa

"Economy of Permanence", Pandit Sunderlal "Bharat Mein Angreji Raj" and Dharampal, "Rediscovering India
4. G K Kapoor, "Business Law" and Sen & Mitra, "Business & Commercial Laws" and Calvin Frank Allen, "Business law for Engineers"
5. Hilgard, E. R.; Atkinson, R. C. & Atkinson, R.L. (1975). *Introduction to Psychology*. 6th Edition. New Delhi: Oxford and IBH Publishing Co. Pvt. Ltd.
6. Govindarajan, M; Natarajan, G. M. & Senthilkumar, V.S. (2013). *Professional Ethics & Human Values*. Prentice Hall: New Delhi
7. Gogate, S. B. (2011). Human Values & Professional Ethics. Vikas Publishing: New Delhi.
8. Charles E Harris Jr., Michael S Pritchard, Michael J Rabins, "Engineering Ethics, Concepts Cases: 4e, Cengage learning, 2015.
9. Caroline Whitbec, " Ethics in Engineering Practice & Research: 2e, Cambridge University Press 2015.

EC-2201
MATHEMATICS-IV

II/IV B.Tech. (Four Year Degree Course) & II/VI B.Tech.(Six Year Double Degree Course)
Semester-II
Mathematics – IV
(With effect from the admitted batch of 2020-2021)

Subject Code: **External Examination - Max. Marks: 70**
No. of Credits: 3 **Internal Examination - Max. Marks: 30**
No. of Periods/ Week: 3 **Total Marks: 100**

Objectives: The student should be able to use the concepts of difference equations, z-transforms, Numerical differentiation and Sampling theory. The student should know the applications of the difference equations in the deflection of a loaded string. The student should be able to estimate unknown parameters of population and apply the tests of hypothesis. They should be able to evaluate z-transform, inverse z-transforms and apply these transforms to solve difference equations. The student should be able to know the techniques in the evaluation of numerical solution of ordinary differential equations.

UNIT-I
(Functions of Complex Variables)

Introduction-Limit and continuity of f(z)- Derivative of f(z), Cauchy-Reimann Equations, Analytic Functions, Harmonic functions, Orthogonal systems, Applications to flow problems, Geometrical representation of f(z).
Integration of complex functions, Cauchy's theorem, Cauchy's integral formula and their applications.

Unit-II
(Conformal Mappings and Contour Integration)

Introduction to Conformal transformation, Bilinear transformation $w = \frac{az+b}{cz+d}$, Series of complex terms - Taylor's and Laurent's series (without proofs), Zero's and Singularities of analytic functions.
Residues and Calculations of residues, Cauchy's Residue Theorem, Evaluation of real definite integrals: Integration around unit circle, semi circle.

UNIT-III
(Difference Equations & Z-transforms)

Introduction - Formation of difference equations - Linear difference equations - Rules for finding complementary function - Rules for finding particular integral - simultaneous difference equations with constant coefficients - Applications to deflection of a loaded string.

Introduction to Z-Transforms - Some standard Z-transforms - Linear Property - Damping Rule - Shifting U_n to the right and to the left-multiplication by n-Two basic theorems - Some useful Z-transforms - Inverse Z-transformation - Convolution theorem - Convergence of Z-transform - Two sided Z-transform - Evaluation of inverse Z-transform - Application to Difference equations.

UNIT-IV
(Correlation, Regression and Distributions)

Introduction - correlation - coefficient of correlation -Lines of regression.
Introduction to Discrete and Continuous Random Variables - Distributions: binomial distribution, Poisson distribution, exponential distribution, normal distribution.

UNIT-V

(Sampling Theory)

Introduction - Testing of hypothesis - Level of significance - Confidence limits - Test of significance of large samples - comparison of large samples- Test of significance for means of two large samples.

Student t-distribution - Significance test of sample mean - Significance test of difference between sample means - Chisquare test - Goodness of fit - F-distribution.

TEXT BOOK:

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

REFERENCE BOOKS:

1. Graduate Engineering Mathematics by V B Kumar Vatti, I.K.International publications
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. Engineering Mathematics series by Chandrica Prasad.

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EC-2202

Electromagnetic Field Theory and Transmission Lines

Course Objectives:

- Define the Basic Electrostatic and Magneto static Law Derive the Maxwell's Equation and apply to the basic electromagnetic problem.
- Analyze the boundary conditions, at the interface of two different media and also time varying electric and magnetic fields.
- Explain the wave propagation in different types of mediums and also transmission line fundamentals.
- Demonstrate the smith chart-configuration

Course Outcomes:

- To evaluate the design and problem solving skills
- Able to define electrostatic and magneto static laws
- Able to derive the Maxwell's equations in static and dynamic fields
- Able to describe energy density on electric/magnetic fields' and poynting theorem.
- Able to analyze the EM wave propagation in different mediums
- Able to relate the wave propagation through transmission lines and compute the impedance using smith chart for matching the load impedance.

SYLLABUS

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 ensity, Convection and Conduction Currents, Continuity Equation, Relaxation Time, Poisson's and Laplace's Equations; Capacitance.

Magneto statics

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

Maxwell's Equations

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

Electromagnetic Waves

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

Transmission Lines

Introduction to Transmission line equations, Primary & Secondary constants Expressions for Characteristic Impedance, Propagation Constant, Phase and Group Velocities, Losslessness /Low Loss

Characterization, Distortion , Loading, SC and OC Lines, Reflection Coefficient, VSWR, λ/8, λ/4, λ/2 line impedance Transformations, Smith Chart – Configuration and Applications.

Waveguides

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

Textbooks

1. Electromagnetic Field Theory and Transmission Lines, GottapuSasibhushanaRao, Wiley India Pvt. Ltd. , New Delhi, 1st Ed.,2012.
2. Electromagnetics with Applications, Kraus and Fleisch, McGraw Hill, 1999.
3. Electromagnetic Field Theory and Transmission Lines, G.S.N. Raju, Pearson Education (Pvt., Ltd., New Delhi, 2005.

References:

1.Elements of Electromagnetic – Matthew N.O. Sadiku, Oxford Univ. Press, 3rd ed., 2001.
2. Engineering Electromagnetics, W. H. Hayt Jr., McGraw Hill – New York.
3. EM Waves and Radiating Systems, E. C. Jordan, PHI, 1997.

EC-2203
Microprocessors and Microcontrollers

Course Objectives:

- To introduce the architecture and operation of typical microprocessors and microcontrollers.
- To familiarize with the programming and interfacing of microprocessors and microcontrollers.
- To provide strong foundation for designing real world applications using microprocessors and microcontrollers.

Course Outcomes:

- Assess and solve basic binary math operations using the microprocessor and explain the microprocessor's and Microcontroller's internal architecture and its operation within the area of manufacturing and performance.
- Apply knowledge and demonstrate programming proficiency using various addressing modes and data transfer instructions of the target microprocessor and microcontroller.
- Design electrical circuitry to the Microprocessor I/O ports in order to interface the processor to external devices.
- Evaluate assembly language programs and download the machine code that will provide solutions real-world control problems.

SYLLABUS

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.

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.

BASIC AND SPECIAL PURPOSE PROGRAMMABLE PERIPHERALS AND THEIR INTERFACING WITH 8086/88
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.

ADVANCED MICRO PROCESSORS
Salient features of 0386DX, 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.

8051 MICROCONTROLLER
Introduction to microcontrollers, 8051Microcontrollers, 8051pin description, connections, I/O ports and memory organization, MCS51addressing modes and instructions, assembly language programming tools.

PIC MICROCONTROLLERS AND ARM 32-BIT MICROCONTROLLER

Overview and features, PIC16Cx/7X instructions, interrupts in PIC 16C61/71, PIC 16F8XX Flash controllers, I/O ports and timers. Introduction to 16/32 Bit processors, 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", OxfordUniversity Press, 2010.

REFERENCES:

1. Ajay V Deshmukh, "Microcontrollers", TATA McGraw Hill publications, 2012.
2. Krishna Kant, "Microprocessors and Microcontrollers", PHI Publications, 2010.

EC- 2204

Probability theory and Random Process

Course Objectives:

- Understand concepts of probability, conditional probability and independence.
- Understand random variables and probability distributions.
- Be familiar with some of the commonly encountered random variables, in particular the Gaussian random variable.
- Be able to obtain the distributions of functions of random variables.
- Be able to relate probability theory to real statistical analysis.
- Understand moment generating and characteristic functions.

Course Outcomes:

- To the axiomatic formulation of modern Probability Theory and think of random variables as an intrinsic need for the analysis of random phenomena.
- To obtain the concept of random processes and determine covariance and spectral density of stationary random processes.

SYLLABUS

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.

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.

Multiple random variables
Vector random variables, Joint distribution and its properties, Joint density and its properties, Conditional distribution and density, statistical independence, Distribution anddensity of a sum of random variables, Central limit theorem.

Operations on multiple random variables
Expected values of a function of random variables: Joint moments about the Origin, joint central moments, Joint characteristic functions, Jointly 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.

Random Processes
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, Weiner-Kinchine Theorem ,Gaussian Random Processes, Poisson Random Process.

Linear Systems with Random Inputs

System Response – Convolution, Mean and Mean-squared Value of System Response, autocorrelation Function of Response, Cross-Correlation Functions of Input and Output, Power Density Spectrum of Response, Cross-Power Density Spectrums of Input and Output, Band pass, Band-Limited and Narrowband Processes.

Textbook:

1. Probability Theory and Random Signal Principles, Peyton Z. Peebles,Jr, 4th edition Tata McGrew Hill Publishers,2002.
2. Probability Theory and Random Processes, S. P. Eugene Xavier, S. Chand and Co. New Delhi, 1998 (2nd Edition).

References:

1. Fundamentals of Applied Probability and Radom processes, Oliver C.Ibe, Elsevier Publications, 2007.
2. Probability, Random Variables and Stochastic Processes – Athanasios Papoulis and S. UnnikrishnaPillai, PHI, 4th Edition, 2002.

3. Probability theory and Stochastic Processes, B.PrabhakaraRao, T.S.R.Murthy, BS Publications, Hyderabad, 2012.

EC 2205

Analog Communication

Course Objectives:

- To introduce the concepts of analog communication systems.
- To equip students with various issues related to analog communication such as modulation, demodulation, transmitters and receivers and noise performance.

Course Outcomes:

- Gain the knowledge of components of analogue communication system.
- To analyze various methods of baseband/band pass Analog transmission and detection.
- Analyze and allocate performance objectives to components of an analog communication system and to design analogue communication systems.
- To evaluate the performance of analog communications in the presence of noise

SYLLABUS

Linear Modulation 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.

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.

Noise in AM and FM Systems:
Sources of Noise, Resistor Noise, Shot Noise, Calculation of Noise in a Linear System, Frequency Domain representation of Noise, The effect of Filtering on the Probability density of Gaussian Noise, Effect of filter on the power spectral Density of Noise, Narrow Bandwidth, Quadrature components of Noise, Power spectral density of Noise, Probability Density of Noise and their time derivatives, representation of Noise using Orthonormal coordinates, Noise in AM Systems, Noise in Angle Modulation Systems, Comparison between AM and FM with respect to Noise, Threshold Improvement in Discriminators, Comparisons between AM and FM.

Radio Transmitters:
Classification of Radio Transmitters, Principle of a Radio Transmitters, AM and FM Transmitters, Radio Telegraph and Radio Telephone Transmitters, SSB Transmitters.

Radio Receivers:
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, Extensions of the Super-heterodyne Principles, Additional Circuits.

Pulse Analog Modulation methods:

Pulse Modulation techniques, Sampling, Types of Sampling and its analysis, Time division Multiplexing, Pulse Amplitude Modulation, Pulse Width Modulation, Pulse position modulation, Pulse Code Modulation.

Text Books:

Principles of Communication Systems, H. Taub , D. L. Schilling and GouthamSahe, TMH 3rd edition, 2007.
2. Principle of Communication Systems, Simon Haykins (2nd Edition).
3. 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.

EC- 2206

Microprocessors and Microcontrollers Lab

Course Objectives:

- To study programming of 8086 ESA-86/88 kit for various operations like addition subtraction, multiplication etc
- To study 8086 programming using MASM 32 assembler.
- To study 8051 programming using KEIL software simulator

Course Outcomes:

- To understand the concepts of programming of 8086 ESA-86/88 kit for various operations like addition subtraction, multiplication etc
- To understand the concepts of programming of 8086 using MASM 32 assembler
- To understand the concepts of programming of 8051 using KEIL software simulator

SYLLABUS

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 divide 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 add two 32 bit numbers stored in two memory locations 2000h and 2004h and store the result in another memory location 2008h.
5. Write a program to find factorial of a given number.

8086 PROGRAMMING USING MASM32 ASSEMBLER

6. Write a program to perform addition operation on two multi byte numbers.
7. Write a program to perform subtraction operation on two multi byte numbers.
8. Write a program to sort a given set of hexadecimal numbers.
9. Write a program to find whether the given string is a palindrome or not.
10. Write a program for inserting an element at a specified location in a given string.
11. Write a program to convert BCD numbers into equivalent binary value. Write a subroutine for the conversion.
12. Write a program to read a keyboard and display the characters on the PC screen using DOS/BIOS commands.

8051 PROGRAMMING USING KEIL SIMULATOR

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

8086 INTERFACING

15. Write a program to interface stepper motor.
16. Write a program to interface keyboard with 8279 display controller

EC- 2207

Analog Communications Lab

Course Objectives:

- To study various analog modulation and demodulation concepts practically.

Course Outcomes:

- To understand the concepts of analog modulation and demodulation concepts practically

SYLLABUS

LIST OF EXPERIMENTS

1. AM M Modulation and Demodulation
2. Low Pass Filter using passive components
3. High Pass Filter using passive components
4. Active Notch Filter
5. Frequency Modulation and Demodulation
6. Pre-emphasis and De-emphasis
7. T – Type attenuator
8. Band pass filter using passive components
9. Mixer characteristics
10. SSB-SC modulation and demodulation.

EC-2208

SKILL ORIENTED COURSE/SOFT SKILL COURSE

Python Programming

Course Objectives:

The Objectives of Python Programming are

- To learn about Python programming language syntax, semantics, and the runtime environment
- To be familiarized with universal computer programming concepts like data types, containers
- To be familiarized with general computer programming concepts like conditional execution, loops & functions
- To be familiarized with general coding techniques and object-oriented programming

Course Outcomes:

- Develop essential programming skills in computer programming concepts like data types, containers
- Apply the basics of programming in the Python language
- Solve coding tasks related conditional execution, loops
- Solve coding tasks related to the fundamental notions and techniques used in objectoriented programming

Unit-1

Introduction: Introduction to Python, Program Development Cycle, Input, Processing, and Output, Displaying Output with the Print Function, Comments, Variables, Reading Input from the Keyboard, Performing Calculations, Operators. Type conversions, Expressions, More about Data Output.
Data Types, and Expression: Strings Assignment, and Comment, Numeric Data Types and Character Sets, Using functions and Modules.

Decision Structures and Boolean Logic: if, if-else, if-elif-else Statements, Nested Decision Structures, Comparing Strings, Logical Operators, Boolean Variables. Repetition Structures: Introduction, while loop, for loop, Calculating a Running Total, Input Validation Loops, Nested Loops.

UNIT-2

Control Statement: Definite iteration for Loop Formatting Text for output, Selection if and if else Statement Conditional Iteration The While Loop
Strings and Text Files: Accessing Character and Substring in Strings, Data Encryption, Strings and Number Systems, String Methods Text Files.

UNIT-3

List and Dictionaries: Lists, Defining Simple Functions, Dictionaries Design with Function: Functions as Abstraction Mechanisms, Problem Solving with Top Down Design, Design with Recursive Functions

UNIT-4

Modules: Modules, Standard Modules, Packages.

UNIT-5

File Operations: Reading config files in python, Writing log files in python, Understanding read functions, read(), readline() and readlines(), Understanding write functions, write() and writelines(), Manipulating file pointer using seek, Programming using file operations

Text Books:

1) Fundamentals of Python First Programs, Kenneth. A. Lambert, Cengage.

2) Python Programming: A Modern Approach, Vamsi Kurama, Pearson.

Reference Books:

1) Introduction to Python Programming, Gowrishankar.S, Veena A, CRC Press.

2) Introduction to Programming Using Python, Y. Daniel Liang, Pearson.

EC-2209
MADATARY COURSE
ENVIRONMENTAL SCIENCE
(Effective from 2020-2021 Admitted Batches)
(Common for all Branches)

Course Objectives

The objectives of the Environmental Science course are to

- Familiarize the fundamental aspects of environment and the environmental management'
- Provide information of some of the important international conventions which will be useful during the future endeavors after graduation.
- Make realize the importance of natural resources management for the sustenance of the life and the society.
- Apprise the impact of pollution getting generated through the anthropogenic activities on the environment
- Provide the concept of Sustainable Development, energy and environmental management
- Impart knowledge on the new generation waste like e-waste and plastic waste.

Course Outcomes

After completion of the course the students will have

- Knowledge on the fundamental aspects of environment and the environmental management
- The knowledge on the salient features of the important international conventions
- Understanding of the importance of natural resources management for the sustenance of the life and the society.
- Familiarity on various forms of pollution and its impact on the environment.
- Understand the elements of Sustainable Development, energy and environmental management
- Knowledge on the new generation waste like e-waste and plastic waste.

SYLLABUS

Introduction: Structure and functions of Ecosystems-Ecosystems and its Dynamics-Value of Biodiversity-impact of loss of biodiversity, Conservation of bio-diversity. Environmental indicators - Global environmental issues and their impact on the ecosystems.
Salient features of International conventions on Environment: Montreal Protocol, Kyoto protocol, Ramsar Convention on Wetlands, Stockholm Convention on Persistent Organic Pollutants, United Nations Framework Convention on Climate Change (UNFCCC),

Natural Resources Management: Importance of natural resources management-Land as resource, Land degradation, Soil erosion and desertification, Effects of usage of fertilizer, herbicides and pesticide-watershed management.

Forest resources: Use and over-exploitation, Mining and dams – their effects on forest ecosystems and the living beings.

Water resources: Exploitation of surface and groundwater, Floods, droughts, Dams:benefits and costs.

Mineral Resources: Impact of mining on the environment and possible environmental management options in mining and processing of the minerals.
Sustainable resource management (land, water, and energy), and resilient design under the changing environment.
Environmental Pollution: Local and Global Issues. Causes, effects and control measures. Engineering aspects of environmental pollution control systems.

Air pollution: impacts of ambient and indoor air pollution on human health. Water pollution: impacts water pollution on human health and loss of fresh water resources. Soil pollution and its impact on environment. Marine pollution and its impact on blue economy. Noise pollution.

Solid waste management: Important elements in solid waste management- Waste to energy concepts. Air (prevention and control of pollution) Act, Water (prevention and control of pollution) Act and their amendments. Salient features of Environmental protection Act, 1986.

Sustainable Development: Fundamentals of Sustainable Development– Sustainability Strategies and Barriers – Industrialization and sustainable development. Circular economy concepts in waste (solid and fluid) management.

Energy and Environment: Environmental Benefits and challenges, Availability and need of conventional energy resources, major environmental problems related to the conventional energy resources, future possibilities of energy need and availability. Solar Energy: process of photovoltaic energy conversion, solar energy conversion technologies and devices, their principles, working and applications, disposal of solar panel after their usage. Biomass energy: Concept of biomass energy utilization, types of biomass energy, conversion processes, Wind Energy, energy conversion technologies, their principles, equipment and suitability in context of India.

Management of plastic waste and E-waste: Sources, generation and characteristics of various e- and plastic wastes generated from various industrial and commercial activities; Waste management practices including onsite handling, storage, collection and transfer. E-waste and plastic waste processing alternatives. E-Waste management rules and Plastic waste management rules, 2016 and their subsequent amendments.

Text Books:

1. Bharucha,Erach (2004). Textbook for Environmental Studies for Undergraduate Courses of all Branches of Higher Education, University Grants Commission, New Delhi.
2. Basu, M., Xavier, S. (2016). Fundamentals of Environmental Studies, Cambridge University Press, India
3. Masters, G. M., &Ela, W. P. (1991). Introduction to environmental engineering and science. Englewood Cliffs, NJ: Prentice Hall.
4. 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.

III/IV B. TECH ECE (FOUR YEAR COURSE) &
III/IV B. TECH + M. TECH (SIX YEAR DUAL DEGREE COURSE)
(WITH EFFECT FORM 2020-2021 ADMITTED BATCH ONWARDS)
B. Tech & B.Tech+M.Tech
III Year - I Semester

Course code	Category	Course Title	Hours per week			Internal Marks	External Marks	Total Marks	Credits
			L	T	P				
EC-3101	PC	Linear ICs & Applications	3	0	0	30	70	100	3
EC-3102	PC	Digital Communications	3	0	0	30	70	100	3
EC-3103	PC	Pulse and Digital Circuits	3	0	0	30	70	100	3
EC-3104	PE	Professional Elective-I	3	0	0	30	70	100	3
EC-3105	OE	Open Elective-I	3	0	0	30	70	100	3
EC-3106	PC	Linear ICs & Pulse Circuits Lab	0	0	3	50	50	100	1.5
EC-3107	PC	Digital Communication Lab	0	0	3	50	50	100	1.5
EC-3108	SC	Object Oriented Programming through JAVA	1	0	2	50	50	100	2
EC-3109	INT	Internship-I				50	50	100	2
								Total Credits	**22**

B.Tech & B.Tech+M.Tech
III Year - II Semester

Course code	Category	Course Title	Hours per week			Internal Marks	External Marks	Total Marks	Credits
			L	T	P				
EC-3201	PC	Antennas and Wave Propagation	3	0	0	30	70	100	3
EC-3202	PC	Digital Signal Processing	3	0	0	30	70	100	3
EC-3203	PC	Microwave Engineering	3	0	0	30	70	100	3
EC-3204	PE	Professional Elective-II	3	0	0	30	70	100	3
EC-3205	OE	Open Elective-II	3	0	0	30	70	100	3
EC-3206	PC	Antenna Simulation Laboratory	0	0	3	50	50	100	1.5
EC-3207	PC	Digital Signal Processing Lab	0	0	3	50	50	100	1.5
EC-3208	PC	Microwave Engineering Lab	0	0	3	50	50	100	1.5
EC-3209	SC	Soft Skills	1	0	2	50	50	100	2
								Total Credits	**21.5**
Internship-II									

IV/IV B.TECH ECE (FOUR YEAR COURSE) &
IV/IV B.TECH + M.TECH (SIX YEAR DUAL DEGREE COURSE)
(WITH EFFECT FORM 2020-2021 ADMITTED BATCH ONWARDS)
B.Tech & B.Tech+M.Tech
IV Year - I Semester

Course code	Category	Course Title	Hours per week			Internal Marks	External Marks	Total Marks	Credits
			L	T	P				
EC-4101	PE	Professional Elective-III	3	0	0	30	70	100	3
EC-4102	PE	Professional Elective-IV	3	0	0	30	70	100	3
EC-4103	PE	Professional Elective-V	3	0	0	30	70	100	3
EC-4104	OE	Open Elective-III	2	0	0	30	70	100	3
EC-4105	OE	Open Elective-IV	2	0	0	30	70	100	3
EC-4106	HSSE	HSS-Elective	3	0	0	30	70	100	3
EC-4107	SC	Internet of Things Lab	1	0	2	50	50	100	2
EC-4108	INT	Internship-II				50	50	100	2
								Total Credits	**22**

B.Tech & B.Tech+M.Tech
IV Year - II Semester

Course code	Category	Course Title	Internal Marks	External Marks	Total Marks	Credits
EC-4201	PROJ	Project work	100	100	200	14
					Total Credits	**14**

PROFESSIONAL ELECTIVES

1. Global Positioning System
2. Radar Engineering
3. Cellular Mobile Communication
4. Electronic Measurements and Instrumentation
5. Micro Electronics
6. EMI/EMC
7. Internet and Web Technology
8. Information Theory and Coding
9. Smart Antenna Systems
10. TV and Satellite Communication System
11. Transducers and Signal Conditioning
12. Low Power VLSI Design
13. Digital Image Processing
14. Fiber Optic Communication
15. Advanced Microprocessors

OPEN ELECTIVES

1. VLSI Design
2. Wireless Sensor Networks
3. Computer Networks
4. DSP Processors and Architectures
5. Embedded System Design
6. Bio-Medical Instrumentation
7. Mobile Communications
8. FPGA Design
9. Speech Processing
10. System on Chip Design
11. Internet of Things and Applications
12. Artificial Neural Networks

HSS ELECTIVES

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

EC-3101 LINEAR ICS & APPLICATIONS

Course Objectives: The objectives of this course are

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

Course Outcomes: At the end of the course the student will be able to

- Outline the fundamental concepts of an operational amplifier.
- Make use of an op-amp to design linear and non-linear circuits.
- Analyze and design Signal Conditioning Circuits using op-amp.
- Analyze and design active filters using op-amp.
- Develop timers and PLL's by making use of 555 and 565 linear IC's.
- Differentiate various types of DAC's and ADC's using op-amp.

SYLLABUS

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.

Applications of Op-Amps: Inverting and Non-inverting Amplifiers, Integrator, Differentiator, Comparator, Logarithmic Amplifiers, Instrumentation Amplifiers, Op-Amp Phase Shift, Wein-bridge and Quadrature Oscillator, Voltage Controlled Oscillators, Voltage to Current and Current to Voltage Converters., Analog Multiplexers.

Signal Conditioning Circuits: Rectifiers, Peak Detection and, Wave form Generators, Sample and Hold Circuits, Multivibrators, Square Wave Generators, Schmitt trigger.

Active Filters: LPF, HPF, BPF, BEF, All-pass Filters, Higher Order Filters and their Comparison, Switched Capacitance Filters.

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, Voltage to Frequency and Frequency to Voltage Converters.

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, Integrated ADC and DACs.

Text Books:

1. Op-Amps and Linear ICs- Ramakanth Gayakwad, PHI, 1987.
2. Linear Integrated Circuits- D. Roy Chowdhury, New Age International(p) Ltd,2nd Edition ,2003.

Reference Books:

1. Integrated Circuits- Botkar, Khanna Publications.
2. Applications of Linear ICs- Clayton.
3. Microelectronics-Jacob Millman.

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EC – 3102 DIGITAL COMMUNICATIONS

Course Objectives: The objectives of this course are

- To understand different pulse digital modulation techniques and their comparison.
- To familiarize various digital modulation techniques and calculation of their error probabilities.
- To analyze error performance of a digital communication system in presence of noise and other interferences.
- To understand concept of spread spectrum communication system.

Course Outcomes: At the end of the course the student will be able to

- Differentiate the various types of pulse digital modulation techniques.
- Outline the band pass digital modulation and demodulation techniques.
- Evaluate the performance of digital communication system in the presence of noise.
- Analyze various receivers and determine the probability of error for various digital modulation techniques.
- Perform the time and frequency domain analysis of the signals in a digital communication system
- Classify the different spread spectrum modulation techniques.

SYLLABUS

Analog-to-Digital Conversion: Pulse modulation techniques, Sampling, Time Division Multiplexing, Pulse Amplitude Modulation, Pulse Width Modulation, Pulse Position Modulation, Digital Modulation Techniques: Pulse Code Modulation, Differential Pulse Code Modulation, Delta Modulation, Adaptive Delta Modulation, Continuously Variable Slope Delta Modulation, Companding, Noise in Pulse-Code and Delta-Modulation Systems.

Binary Phase-Shift Keying, Differential Phase-Shift Keying, Differentially-Encoded PSK (DEPSK), Quadrature Phase-Shift Keying (QPSK), M-ary PSK, Quadrature Amplitude Shift Keying (QASK), Binary Frequency Shift-Keying, Similarity of BFSK and BPSK, M-ary FSK, Minimum Shift Keying (MSK), Duo-binary Encoding.

Mathematical Representation of Noise: Some Sources of Noise, Frequency-Domain Representation of Noise, The Effect of Filtering on the Probability Density of Gaussian Noise, Spectral Components of Noise Response of a Narrowband Filter to Noise, Effect of a Filter on the Power Spectral Density of Noise, Superposition of Noises, Mixing Involving Noise, Linear Filtering, Noise Bandwidth, Quadrature Components of Noise, Power Spectral Density of n(t) and n(t), Probability Density of n(t), n(t), and their Time Derivatives, Representation of Noise Using Orthonormal Coordinates, Irrelevant Noise Components

Data Transmission: A Base-band Signal Receiver, Probability of Error, The Optimum Filter, White Noise: The Matched Filter, Probability of Error of the Matched Filter, Coherent Reception: Correlation, Phase-Shift Keying, Frequency-Shift Keying, Non-coherent Detection of FSK, Differential PSK, Four Phase PSK (QPSK), Error Probability for QPSK, Probability of Error of Minimum Shift Keying (MSK), Comparison of Modulation Systems.

Spread Spectrum Modulation: Direct Sequence (DS) Spread Spectrum, Use of Spread Spectrum with Code Division, Multiple Access (CDMA), Ranging using DS Spread Spectrum, Frequency Hopping (FH) Spread Spectrum, Generation and Characteristics of PN Sequences, Acquisition (Coarse Synchronization) of a FH Signal, Tracking (Fine Synchronization) of a FH Signal, Acquisition (Coarse Synchronization) of a DS Signal, Tracking of a DS Signal.

Text Books:

1. Analog and Digital Communication Systems by Martin S. Roden, 3rd edition, Prentice Hall, 1994;
2. Principles of Communications by Taub and Schilling.

Reference Books:

1. Modern Analog and Digital Communications by B.P.Lathi, Oxford reprint, 3rd Edition, 2004
2. Digital and Analog Communication systems by Samshanmugam, John Wiley, 2005.
3. Principles of Digital Communications- J.Das, SK.Mullick, P.K.Chatterjee.

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EC – 3103 PULSE AND DIGITAL CIRCUITS

Course Objectives: The objectives of this course are

- To understand the concept of wave shaping circuits, Switching Characteristics of diode and transistor.
- To study the design and analysis of various Multivibrators.
- To understand the functioning of different types of time-base Generators.
- To learn the working of logic families.

Course Outcomes: At the end of the course the student will be able to

- Outline the response of linear wave shaping circuits for the standard inputs.
- Extend the applications of diodes and transistors to non-linear wave shaping.
- Understand the operation, analysis and design of Bistable multivibrators using BJTs.
- Make use of basic electronic components to design monostable and astable multivibrators.
- Categorize the operation of various time base generators.
- Realization of logic gates using different logic families.

SYLLABUS

Linear Wave Shaping: High pass and Low pass RC circuits, Response of High pass and Low pass RC circuits to sinusoidal, step, pulse, square, exponential and Ramp inputs, High pass RC circuit as a differentiator, Low pass RC circuit as an integrator. Attenuators and its application as CRO probe, RL and RLC Circuits and their response for step input, Ringing Circuit.

Nonlinear Wave Shaping: Diode clippers, Transistor Clippers, clipping at two independent levels, Comparator, Applications of voltage Comparators, Diode Comparator, Clamping Operation, Clamping Circuits using Diode with Different Inputs, Clamping Circuit Theorem, Practical Clamping circuits, Effect of diode Characteristics on Clamping Voltage.

Bistable Multivibrators: Transistor as a switch, switching times of a transistor, Design and Analysis of Fixed-bias and self-bias transistor binary, commutating capacitors, Triggering schemes of Binary, Transistor Schmitt trigger and its applications.

Monostable and Astable Multivibrators: Design and analysis of Collector coupled Monostable Multivibrator, Expression for the gate width and its waveforms. Design and analysis of Collector coupled Astable Multivibrator, expression for the Time period and its waveforms, The Astable Multivibrator as a voltage to frequency convertor.

Time Base Generators: General features of a time-base signal, Methods of Generating time base waveform, Exponential voltage sweep circuit, Basic principles of Miller and Bootstrap time base generators, transistor Miller sweep generator, transistor Bootstrap sweep generator, Current Sweep circuit, Linearity correction through adjustment of driving Waveform.

Synchronization And Frequency Division: Principles of Synchronization, Frequency division in sweep circuit, Synchronization of A stable Multivibrators, Synchronization of a sweep circuit with symmetrical signals, Sine wave frequency division with a sweep circuit.
LOGIC GATES: Realization of gates using diodes and Transistors, RTL, DTL.

Text Books:

1. Pulse Digital and Switching Waveforms, J. Millman and H. Taub, McGraw-Hill, 2nd Edition 1991.
2. Pulse switching and digital circuits – David A. Bell, PHI ,5thEdn., oxford university press.

References Books:

1. Pulse and Digital Circuits, K. VenkatRao, Pearson Education India, 2nd Edition, 2010.
2. Pulse and Digital Circuits, A. Anand Kumar, PHI, second edition, 2005.

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EC – 3104 Professional Elective-I

(Refer Annexure-I for Syllabus details)

EC – 3105 Open Elective-I

(Refer Annexure-II for Syllabus details)

EC-3106 LINEAR ICS & PULSE CIRCUITS LAB

Course Objectives: The objectives of this course are

- To apply operational amplifiers in linear and nonlinear applications.
- To acquire the basic knowledge of special function ICs.
- To Gain the practical hands-on experience on 555 Timer applications.
- To Gain the practical hands-on experience on 723 Voltage Regulator and Three terminal voltage regulators.

Course Outcomes:

- Design various linear & non-linear wave shaping circuits.
- Basic characteristics of op-amp parameters and its measurements, design compensating circuits.
- Develop applications using linear and nonlinear characterization of OPAMP.
- Understand the functionality of IC723 and determine the load and line regulations
- Design the Multivibrator circuits using IC555.

SYLLABUS

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 Astable Multi vibrator
9. Study of Instrumentation Amplifier
10. Voltage regulator using IC-723
11. Monostable Multi vibrator using IC-555.

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EC-3107 DIGITAL COMMUNICATIONS LAB

Course Objectives: The objectives of this course are

- A/D and D/A Converters.
- Continuously Variable Slope Delta Modulation
- Phase Shift Keying (PSK) Modulator
- Frequency Shift Keying (PSK) Modulator.
- Encoder and Decoder

Course Outcomes: At the end of the course the student will be able to

- A/D and D/A Converters.
- Continuously Variable Slope Delta Modulation
- Phase Shift Keying (PSK) Modulator
- Frequency Shift Keying (PSK) Modulator.
- Understand encoding and decoding techniques for digital communication systems

SYLLABUS

List of Experiments:

1. Sample the given input signal for different sampling rates and recover the signal by means of appropriate low – pass filter.
2. Study the Pulse – Width Modulation for both AC and DC Modulating Signals and obtain the corresponding waveforms.
3. Study the Pulse – Position Modulation for both AC and DC Modulating Signals and obtain the corresponding waveforms.
4. Study the functioning of a given Analog to Digital Converter.
5. Study the functioning of a given Digital to Analog Converter.
6. Encode the given 4-Bit Data Word into 16-Bit Orthogonal Encoded Word using Hadamard Code.
7. Decode the 16-Bit Orthogonal Encoded Word to 4-Bit Data Word.

8. Study the performance of the given Continuously Variable Slope Delta Modulation (CVSD).

9. Obtain the characteristics of the Phase Shift Keying (PSK) Modulator.

10. Obtain the characteristics of the Frequency Shift Keying (FSK) Modulator.

*****

EC-3108 OBJECT ORIENTED PROGRAMMING THROUGH JAVA

Course Objectives: The objectives of this course are

- To write programs using abstract classes.
- To write programs for solving real world problems using java collection frame work.
- To write multithreaded programs.
- To write GUI programs using swing controls in Java.
- To introduce java compiler and eclipse platform.
- To impart hands on experience with java programming.

Course Outcomes: At the end of the course the student will be able to

- Able to write programs for solving real world problems using java collection framework.
- Able to write programs using abstract classes.
- Able to write multithreaded programs.
- Able to write GUI programs using swing controls in Java.

SYLLABUS

List of Programs:

1. Use Eclipse or Net bean platform and acquaint with the various menus. Create a test project, add a test class, and run it. See how you can use auto suggestions, auto fill. Try code formatter and code refactoring like renaming variables, methods, and classes. Try debug step by step with a small program of about 10 to 15 lines which contains at least one if else condition and afor loop.
2. Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -,*, % operations. Add a text field to display the result. Handle any possible exceptions like divided by zero.
3. a) Develop an applet in Java that displays a simple message.

   b) Develop an applet in Java that receives an integer in one text field, and computes its factorialValue and returns it in another text field, when the button named “Compute” is clicked.
4. Write a Java program that creates a user interface to perform integer divisions. The user enterstwo numbers in the text fields, Num1 and Num2. The division of Num1 and Num 2 is displayedin the Result field when the Divide button is clicked. If Num1 or Num2 were not an integer, theprogram would throw a

Number Format Exception. If Num2 were Zero, the program would throw an Arithmetic Exception. Display the exception in a message dialog box.

5. Write a Java program that implements a multi-thread application that has three threads. First thread generates random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print thevalue of cube of the number.

6. Write a Java program for the following:

    i) Create a doubly linked list of elements.

    ii) Delete a given element from the above list.

    iii) Display the contents of the list after deletion.

7. Write a Java program that simulates a traffic light. The program lets the user select one of threelights: red, yellow, or green with radio buttons. On selecting a button, an appropriate messagewith “Stop” or “Ready” or “Go” should appear above the buttons in selected color. Initially, thereis no message shown.

8. Write a Java program to create an abstract class named Shape that contains two integers andan empty method named print Area (). Provide three classes named Rectangle, Triangle, and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method print Area () that prints the area of the given shape.

9. Suppose that a table named Table.txt is stored in a text file. The first line in the file is the header,and the remaining lines correspond to rows in the table. The elements are separated by commas. Write a java program to display the table using Labels in Grid Layout.

10. Write a Java program that handles all mouse events and shows the event name at the center of the window when a mouse event is fired (Use Adapter classes).

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EC-3201 ANTENNAS AND WAVE PROPAGATION

Course Objectives: The objectives of this course are

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

Course Outcomes: At the end of the course the student will be able to

- Understand the radiation mechanism of an antenna.
- Identify basic antenna parameters.
- Design and Analyze various types of antenna Arrays.
- Construct and Analyze HF, VHF and UHF Antennas.
- Analyze Microwave antennas and summarize the antenna measurement techniques.
- Outline the characteristics of radio wave propagation.

SYLLABUS

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

Analysis of Linear Arrays: Directional characteristics of dipole antennas, Radiation pattern of alternating current element, Radiation pattern expressions of centre-fed vertical dipoles of finite length, Radiation patterns of centre-fed vertical dipoles, Radiation patterns of centre-fed horizontal dipoles, Radiation patterns of vertical dipoles, Two-element uniform array, Uniform linear arrays, Field strength of a uniform linear array, First sidelobe ratio (SLR), Broadside and End-fire arrays, Patterns of array of non-isotropic radiators, Multiplication of patterns, Generalized expression for principle of pattern multiplication, Radiation pattern

characteristics, Binomial arrays, Effect of earth on vertical patterns, Effect of earth on radiation resistance, Methods of excitation, Impedance matching techniques, Transmission loss between transmitting and receiving antennas - FRIIS formula, Antenna temperature and signal-to-noise ratio.

Array Synthesis: Introduction, Synthesis methods, Fourier transform method, Linear array design by Woodward-Lawson method, Dolph-chebychev method (Tschebyscheff distribution), Taylor method, Laplace transform method, Standard amplitude distributions.

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

Microwave Antennas 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 a few typical dipoles, Slots in the walls of rectangular waveguides, Babinet's principle, Lens antennas, Microstrip antennas , Measurement ranges, Indoor and outdoor ranges, Antenna impedance measurements, Measurement of radiation resistance, Gain measurements, Measurement of antenna bandwidth, Directivity measurement, Measurement of sidelobe ratio, Measurement of radiation efficiency, Measurement of antenna aperture efficiency, Measurement of polarization of antenna, Phase measurement.

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

Text Book:

1. Antennas and Wave Propagation, G.S.N. Raju, Pearson Education (Singapore) Pvt. Ltd., New Delhi, 2007.

Reference Books:

1. EM Waves and Radiation Systems, E. C. Jordan and K. G. Balmain, PHI – N. Delhi, 1997.
2. Antennas, J.D. Kraus, McGraw Hill, NY.
3. Antenna theory, C.A. Balanis, John Wiley & Sons, NY, 1982.

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EC- 3202 DIGITAL SIGNAL PROCESSING

Course Objectives: The objectives of this course are

- To Analyze the Discrete Time Signals and Systems.
- To Understand the various implementations of digital filter structures.
- To know the importance of FFT algorithm for computation of Discrete Fourier Transform.
- To learn the FIR and IIR Filter design procedures.
- To know the applications of DSP.

Course Outcomes: At the end of the course the student will be able to

- Apply the concepts of difference equations to Analyze the discrete time systems
- Realize the Digital filters along with its structures and finite word length effects.
- Make use of the FFT algorithm for solving the DFT of a given signal.
- Analyze the Digital IIR & FIR filter design for different specifications.
- Analyze the Digital FIR filter design for different specifications.
- Understand the signal Processing concepts in various applications.

SYLLABUS

Discrete - Time Signals and Systems: 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.

Applications of Z – Transforms: System Functions H(z) of Digital Systems, Stability Analysis, Structure and Realization of Digital Filters, Finite Word Length Effects.

Discrete Fourier Transform (DFT): Properties of the DFS, DFS Representation of Periodic Sequences, Properties of DFT, Convolution of Sequences.

Fast – Fourier Transforms (FFT): Radix – 2 Decimation – In – Time (DIT) and Decimation – In – Frequency (DIF), FFT Algorithms, Inverse FFT.

IIR Digital 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.

Design of FIR Filters: Fourier series Method, Window Function Techniques, Comparison of IIR and FIR Filters.

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

Text Book:

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

Reference Books:

1. Sanjit K. Mitra, Digital Signal Processing "A – Computer Based Approach", Tata Mc Graw Hill.
2. Raddar and Rabiner, Application of Digital Signal Processing.
3. S. P. Eugene Xavier, Signals, Systems and Signal Processing, S. Chand and Co. Ltd.
4. Antonio, Analysis and Design of Digital Filters, Tata Mc Graw Hill.

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EC- 3203 MICROWAVE ENGINEERING

Course Objectives: The objectives of this course are

- To understand about the microwave components
- To understand Microwave signal generators and amplifiers
- To analyze Various microwave circuits and microwave integrated circuits.
- To analyze Various microwave parameter measurements

Course Outcomes: At the end of the course the student will be able to

- Analyze the microwave components.
- Illustrate microwave signal generators and amplifiers.
- Infer various microwave circuits and microwave integrated circuits.
- Infer various microwave parameter measurements.

SYLLABUS

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

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

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

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

Microwave Measurements: VSWR, Frequency, Guide Wavelength, Coupling and Directivity measurements.

Text Books:

1. Microwave Engineering, G.S.N. Raju, IK International Publishers,
2. Microwave Communications – Components and Circuits, E. Hund, McGraw Hill.
3. Microwave Devices and Circuits, S. Y. Liao, PHI.
4. Microwave Engineering, R. Chatterjee, East – West Press Pvt. Ltd.

Reference Books:

1. Foundations For Microwave Engineering, R. R. Collin, McGraw Hill.

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EC – 3204 Professinal Elective-II
(Refer Annexure-I for Syllabus details)

EC – 3205 Open Elective-II
(Refer Annexure-II for Syllabus details)

EC – 3206 ANTENNA SIMULATION LABORATORY

Course Objectives: The objectives of this course are

- To understand the fundamental working principle of an antenna.
- To describe/explore the different antenna parameters like input impedance, far-field radiation patterns, reflection coefficient, etc.
- To apply the different feeding technique.
- To evaluate and perform the optimization to achieve a certain goal.
- To design the wire antennas, microstrip antennas, etc.

Course Outcomes: At the end of the course the student will be able to

- Understand the working principle of different antennas
- Design wire antennas and microstrip antennas using HFSS.
- Understand the different feeding technique
- Design wire antennas, Microstrip antennas, and Microstrip based filters using EM simulator.

SYLLABUS

List of Experiments:

1. Design of fundamental parameters of the antenna and an overview of HFSS to measure different antenna parameters.
2. Design of a half-wave dipole antenna.
3. Design of a quarter-wave monopole antenna.
4. Design and simulation of rectangular microstrip patch antenna with a particular operating frequency, dielectric constant and substrate thickness.
5. Design of microstrip patch antenna using a coaxial feeding technique.
6. Design and simulation of dual-band rectangular patch antenna using the inset feeding technique.
7. Design and simulation of rectangular microstrip patch antenna using CPW feeding with slot for bandwidth enhancement.
8. Design of aperture coupled rectangular microstrip patch antenna with two different substrates.
9. Design of proximity coupled rectangular microstrip patch antenna.

10. Design and simulation of Dielectric Resonator Antenna with a particular operating frequency, dielectric constant and substrate thickness.
11. Design and Simulation of MPA using MATLAB.
12. Design and Simulation of MPA using the CST Microwave Studio Suite 2020.

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EC – 3207 DIGITAL SIGNAL PROCESSING LAB

Course Objectives: The objectives of this course are

- To make familiar with practical implementation of the digital signal processing.
- To develop DSP algorithms for convolution, correlation and DFT.
- To design digital filters.
- To have hands on experience in MATLAB and DSP processor.

Course Outcomes: At the end of the course the student will be able to

- Generation and Implementation of discrete time signals and systems using MATLAB
- Analyze the Frequency analysis of discrete signals and systems using MATLAB.
- Design and simulate FIR and IIR filters with different techniques using MATLAB.
- Verification of Linear and Circular Convolution using DSP Processor.
- Implementation of FIR and IIR filters with different techniques using DSP Processor.

SYLLABUS

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
   a) Hamming window
   b) rectangular window

Hardware Experiments:

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

EC – 3208 MICROWAVE ENGINEERING LAB

Course Objectives: The objectives of this course are to determine

- VSWR
- V-I Characteristics of GUNN Diode
- Coupling Factor and Directivity of a 4-Port directional coupler.
- Microwave frequency

Course Outcomes: At the end of the course the student will be able to determine

- VSWR
- V-I Characteristics of GUNN Diode
- Coupling Factor and Directivity of a 4-Port directional coupler
- Microwave frequency

SYLLABUS

List of Experiments:

1. Measurement of VSWR
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
5. Reflex Klystron Characteristics
6. Radiation Pattern of Horn Antenna
7. Fiber Optic Analog Link
8. Fiber Optic Digital Link
9. Other four experiments from the choice either from Microwave Engineering or from Antenna Theory.

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EC-3209 SOFT SKILLS

Course Objectives: The objectives of this course are

- To develop skills to communicate clearly.
- To aid students in building interpersonal skills.
- To enhance team building and time management skills.
- To inculcate active listening and responding skills.

Course Outcomes: At the end of the course the student will be able to

- Make use of techniques for self-awareness and self-development.
- Apply the conceptual understanding of communication into everyday practice.
- Understand the importance of teamwork and group discussions skills.
- Develop time management and stress management.

SYLLABUS

Introduction to Soft Skills: Communication – Verbal and Non Verbal Communication - Personal grooming (Etiquette, Attitude, Body Language), Posture, Gestures, Facial Expressions, Eye Contact, Space Distancing, Presentation Skills, Public Speaking, Just a Minute (JAM) sessions, Adaptability.

Goal Setting and Time Management: Immediate, Short term, Long term, Smart Goals, Strategies to Achieve goals, Types of Time, Identifying Time Wasters, Time Management Skills, Stress Busters.

Leadership and Team Management: Qualities of a Good Leader, Team Dynamics, Leadership Styles, Decision Making, Problem Solving, Negotiation Skills.

Group Discussions: Purpose (Intellectual ability, Creativity, Approach to a problem, Tolerance), Group Behaviour, Analysing Performance.

Job Interviews: Identifying job openings, Covering Letter and CVs / Resumes, Interview (Opening, Body-Answer Q, Close-Ask Q), Telephone Interviews, Types of Questions.

Reference Books:

1. Krannich, Caryl, and Krannich, Ronald L. Nail the Resume! Great Tips for Creating Dynamite Resumes. United States, Impact Publications, 2005.
2. Hasson, Gill. Brilliant Communication Skills. Great Britain: Pearson Education, 2012
3. Prasad, H. M. How to Prepare for Group Discussion and Interview. New Delhi: Tata McGraw-Hill Education, 2001.
4. Pease, Allan. Body Language. Delhi: Sudha Publications, 1998.
5. Rizvi, Ashraf M. Effective Technical Communication: India, McGraw-Hill Education. 2010
6. Thorpe, Edgar &Showick Thorpe. Winning at Interviews. 2nd Edition. Delhi: Dorling Kindersley, 2006.

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EC-4101 Profesional Elective-III
(Note: Refer Annexure-I for Syllabus details)

EC-4102 Professional Elective-IV
(Note: Refer Annexure-I for Syllabus details)

EC-4103 Professional Elective-V
(Note: Refer Annexure-I for Syllabus details)

EC-4104 Open Elective-III
(Note: Refer Annexure-II for Syllabus details)

EC-4105 Open Elective-IV
(Note: Refer Annexure-II for Syllabus details)

EC-4106 HSS-Elective
(Note: Refer Annexure-III for Syllabus details)

EC-4107 INTERNET OF THINGS LAB

Course Objectives: The objectives of this course are

- Interface Arduino to ZigBee module
- Interface Arduino to GSM module
- Interface sensors to Raspberry Pi module.
- Design an IoT system

Course Outcomes:

- Interface Arduino to ZigBee module and GSM modules
- Interface Arduino Bluetooth modules
- Make use of Cloud platform to upload and analyse any sensor data
- Use of Devices, Gateways and Data Management in IoT.
- Use the knowledge and skills acquired during the course to build and test a complete, working IoT system involving prototyping, programming and data analysis.

SYLLABUS

List of Experiments:

1. Introduction to Arduino platform and programming CO1
2. Interfacing Arduino to Zigbee module CO1, CO3
3. Interfacing Arduino to GSM module CO1, CO3
4. Interfacing Arduino to Bluetooth Module CO1, CO3
5. Introduction to Raspberry PI platform and python programming CO2
6. Interfacing sensors to Raspberry PI CO2
7. Communicate between Arduino and Raspberry PI using any wireless medium CO1, CO2, CO3
8. Setup a cloud platform to log the data CO4
9. Log Data using Raspberry PI and upload to the cloud platform CO5
10. Design an IOT based system CO6/

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ANNEXURE-I

PROGRAM ELECTIVES

1. Global Positioning System
2. Radar Engineering
3. Cellular Mobile Communication
4. Electronic Measurements and Instrumentation
5. Micro Electronics
6. EMI/EMC
7. Internet and Web Technology
8. Information Theory and Coding
9. Smart Antenna Systems
10. TV and Satellite Communication System
11. Transducers and Signal Conditioning
12. Low Power VLSI Design
13. Digital Image Processing
14. Fiber Optic Communication
15. Advanced Microprocessors

GLOBAL POSITIONING SYSTEM

Course Objectives: To provide an insight into the basic concepts of

- Global Position System with GPS working principle.
- other global satellite constellations.
- GPS satellite constellation and signals.
- block diagrams of Synthetic Aperture Radar (SAR), Phased array Radars and others.
- different coordinate systems

Course Outcomes: At the end of the course the student will be able to

- Understand the basic concepts of Global Position System with GPS working principle
- Understand the basic concepts of other global satellite constellations
- Analyze GPS satellite constellation and signals
- Examine using different coordinate systems

SYLLABUS

Introduction to GPS: 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.

GPS Working: Principal Trilateration, 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.

Other Global Satellite Constellation: GLONASS, GALILEO, Comparison of 3GNSS (GPS, GALILEO, GLONASS) in terms of constellation and services provided.

GPS Satellite constellation and Signal Structure: GPS system segments, Space segment, Control segment, User segment, GPS Signals, Pseudorandom noise (PRN) code, C/A code , P code Navigation data, Signal structure of GPS.

Coordinate Systems: Geoid, Ellipsoid, Coordinate Systems, Geodetic and Geo centric coordinate systems, ECEF coordinates, world geodetic 1984 system, Conversion between Cartesian and geodetic coordinate frame.

Text Books:

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

Reference Books:

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.

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RADAR ENGINEERING

Course Objectives: To provide an insight into the basic concepts of

- RADAR engineering.
- MTI and Pulse Doppler Radar.
- Tracking Radar.
- block diagrams of Synthetic Aperture Radar (SAR), Phased array Radars and others.
- different radar receiver principles of direction finders

Course Outcomes: At the end of the course the student will be able to

- Understand the basic concepts of RADAR engineering
- Understand the basic concepts of MTI and Pulse Doppler Radar
- Analyze Tracking Radar
- Examine block diagrams of Synthetic Aperture Radar (SAR), Phased array Radars and others.
- Examine different radar receiver principles of direction finders.

SYLLABUS

Introduction to RADAR: Radar Equation, Radar Block Diagram and Operation, Prediction of Range, Minimum Detectable Signal, Receiver Noise, Probability Density Functions, S/N, Integration of Radar Pulses, Radar Cross-section, Transmitter Power, PRF and Range Ambiguities, Radar Antenna Parameters, System Losses and Propagation Effects.

MTI and Pulse Doppler RADAR: Introduction, Delay line Cancellers, Moving target Detector, Limitation to MTI performance, MTI from moving platform, Pulse Doppler Radar

Tracking RADARS: Sequential Lobing, Conical Scan, Monopulse tracking Radar, Low angle tracking, Pulse compression, Block Diagrams of Synthetic Aperture Radar (SAR), Phased array Radars, MST Radar, ECM, ECCM.

Detection of Signals in Noise: Matched Filter Receiver, Detection Criteria, Constant False Alarm Rate Receivers. Information From RADAR Signals: Basic Radar Measurements, Pulse Compression, Target Recognition.

RADAR Transmitters and Receivers: Magnetron, Solid State RF Power Source, Other Aspects of Radar Transmitters, Radar Receiver, Superheterodyne Receiver, Duplexers and Receivers Protectors, Radar Displays.

Text Book:

1. Radar Engineering and Fundamentals of Navigational Aids, G S N Raju, IK International Publishers, 2008

Reference Book:

1. Introduction to Radar Systems, Skolnik, McGraw Hill, 2007.

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CELLULAR AND MOBILE COMMUNICATION

Course Objectives: The objectives of this course are

- To know the evolution of Mobile communication and cell concept to improve capacity of the system.
- Understand the basic cellular concepts like frequency reuse, cell splitting, cell sectoring etc., and various cellular systems.
- Understand the frequency management, channel assignment, various propagation effects in cellular environment and the concepts of handoff and types of handoffs.
- Understand the architectures of GSM and 3G cellular systems.

Course Outcomes: At the end of the course the student will be able to

- Explain the fundamentals of cellular radio system design and its basic elements.
- Analyze the concepts of different co-channel, non-co-channel interference and cellular coverage on signal & traffic of a designed system.
- Identify the various types of multiplexing and modulation techniques suitable for mobile communications.
- Distinguish the number of radio channels, channel assignment and frequency management used in mobile communications and analyze the different hand off & cell splitting techniques and dropped call rate at cell site area
- Analyze small scale fading
- Summarize the different types of second-generation system architectures such as GSM, TDMA and CDMA for mobile communication systems.

SYLLABUS

Introduction: Evolution of Mobile Communications, Mobile Radio Systems around the world, First, Second, Third Generation Wireless Networks, Wireless Local Loop (WLL), Wireless LANs, Bluetooth, Personal Area Networks (PANs), Examples of Wireless Communication Systems, A Simplified Reference Model, Applications.

Wireless Transmission Techniques: Frequencies for radio transmission, Signals, Antennas, Signal Propagation, Multiplexing, Modulation Techniques: ASK, PSK, FSK, Advanced ASK, Advanced PSK, Multicarrier, Spead Spectrum: Direct sequence and Frequency hopping, Medium Access control- SDMA, FDMA, TDMA, CDMA, Comparison of S/F/T/CDMA.

The Cellular Concept: Introduction, Frequency reuse, Handoff strategies, Interference and System Capacity: Co- Channel Interference, Channel Planning, Adjacent Channel Interference, Power control for reducing interference, Trunking and Grade of Service, Cell Splitting, Sectoring, Repeaters for Range extension, A microcell zone concept.

Mobile Radio Propagation: Introduction, Free space propagation model, The three basic propagation models-Reflection, Diffraction and Scattering, Two-ray model, Outdoor propagation models, Indoor propagation models, Signal Penetration into building, Small scale multipath Propagation, Parameters of Mobile multipath channels, Types of small scale fading.

Telecommunication Systems: GSM: Mobile Services, System Architecture, Radio interface, Protocols, Localization and Calling, Handover, Security, New data services, UMTS and IMT-2000: Releases and Standardization, System Architecture, Radio interface, UTRAN, Handover.

Text Books:

1. Mobile Cellular Communication by Gottapu Sasibhushana Rao, PEARSON International, 2012.

Reference Books:

1. Mobile Communications-Jochen Schiller, Pearson education, 2nd Edn, 2004.
2. Wireless Communications: Principles and Practice-Theodore. S. Rapport, Pearson education, 2nd Edn, 2002.
3. Mobile Cellular Telecommunications-W.C.Y.Lee, Tata McGraw Hill, 2nd Edn, 2006.
4. Wireless and Mobile Communications-Lee, McGraw Hill, 3rd Edition, 2006.
5. Wireless Communications and Networks-William Stallings, Pearson Education, 2004.

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ELECTRONIC MEASUREMENTS AND INSTRUMENTATION

Course Objectives: The objectives of this course are

- To introduce the fundamentals of Electronics Instruments and Measurement
- To provide an in-depth understanding of Measurement errors.
- To address the underlying concepts and methods behind Electronics measurements.
- To understand operation of different instruments.
- To know the principles of various types of transducers and sensors.

Course Outcomes: At the end of the course the student will be able to

- Understand the different characteristics of electronic measuring instruments.
- Make use of Signal generators to analyze a signal.
- Understand the design and functioning of Oscilloscopes.
- Utilize AC bridges for measurement of inductance.
- Distinguish active transducers from passive transducers.
- Develop the ability to use instruments for measurement of physical parameters.

SYLLABUS

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.

Basic Electronic Measurements: AC voltmeters using rectifiers, True RMS responding voltmeter, Electronic multimeter – Comparison of analog and digital techniques – digital voltmeter - Ramp, Stair case ramp, Integrating, Continuous balance, Successive approximation.

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.

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, Variation of self-inductance, Variation of mutual inductance, Linear variable differential transformer, Rotary variable differential transformer, Capacitive transducers, Piezo-electric transducers, Digital transducers, Shaft Encoder.

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

Reference Books:

1. H S Kalsi, Electronic instrumentation, TMH, 1995.
2. Ernest O. Doebelin, Measurement Systems- Application and Design-Tata McGraw-Hill-2004.
3. Oliver B.M. & Cage – Electronic Measurements & Instrumentation -Tata McGraw Hill
4. K Padma Raju,Y J Reddy, Instrumentation and Control Systems, McGraw Hill Education,2016.

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MICROELECTRONICS

Course Objectives: The objectives of this course are

- To explain and apply basic concepts of semiconductor physics relevant to devices.
- To describe, explain, and analyse the operation of important semiconductor devices in terms of their physical structure.
- To realize the combinational and sequential circuits using semiconductors.
- To design - confront integrated device and/or circuit design problems, identify the design issues, and develop solutions.

Course Outcomes: At the end of the course the student will be able to

- Understanding the fabrication process of BJT, FET and MOS technologies.
- Analyze the basic digital circuits.
- Make use of combinational circuits to implement combinational logic functions.
- Develop different types of counters and registers using flip-flops.

SYLLABUS

Integrated- Circuit Fabrication: Monolithic Integrated - Circuit (microelectronics) technology- The planar processes - Bipolar Transistor Fabrication - Fabrication of FETs - CMOS Technology - Monolithic Diodes - The Metal – Semiconductor Contact - IC Resistor - IC Capacitors - IC Packaging - Characteristics of IC Components – Microelectronic circuit layout.

Basic Digital circuits: MOS Technology - NMOS, CMOS, Inverters, Logic gates - ECL circuits.

Combinational Circuits: Arithmetic functions - Comparators - Multiplexers - Demultiplexers - Memory - Memory applications – PAL - PLAs.

Sequential Circuits: A1 - Bit memory - The circuits properties of biastable latch - The clocked SR Flip-Flop - J-K, T, and D-type Flip-flops. Shift-registers - Ripple Counters - synchronous counters - Applications of counters.

Text Book:

1. Microelectronic by JocobMilliman, ArbinGrabel second edition, TMH.

Reference Books:

1. Part 2 of Integrated Circuits, Design Principles and Fabrications by editors, Warner and Fordemwalt, 1965, Motorola Series, McGraw Hill.
2. MOS LSI Design and Applications by Dr. William N. Carr and Dr. Jack P. Mize, McGraw Hill, 1972.
3. Microelectronic circuits and devices second edition Horenstien, PHI.

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EMI/EMC

Course Objectives: The objectives of this course are

- To familiarize with the fundamentals that are essential for electronics industry in the field of EMI / EMC
- To understand EMI sources and its measurements
- To understand the various techniques for electromagnetic compatibility.
- Acquire broad knowledge of various EM radiation measurement techniques.
- Model a given electromagnetic environment/system so as to comply with the standards.

Course Outcomes: At the end of the course the student will be able to

- Understand the EMI sources, EMC regulations and methods of eliminating interferences.
- Identifying of EMI hotspot and various techniques like Grounding, Shielding, Cabling.
- Analyze the effect of EM noise in system environment and its sources.
- Summarize the EMC design constraints and make appropriate trade-offs that meets all requirements.
- Designing electronic systems that function without errors or problems related to electromagnetic compatibility.
- Differentiate various EMI measurement techniques.

SYLLABUS

Introduction to EMI/EMC: EMI Sources, EMI Coupling, Noise Path, Models of Noise Coupling, EMC Regulations, Designing for EMC, Compliance Tests, Elimination of EMI, EMI Testing, Compliance Test and Engineering Tests.

Grounding Techniques: Grounding Techniques, Shielding Techniques, Cabling Techniques.

Conducted EMI/EMC: Origin of Conducted EMI, Common and Normal mode Noise, Noise from Power Electronic Systems, Spectra of Pulse Noise Sources, Modeling of EMI Noise Sources, Transient Disturbance Simulation Signals, EMI Filters for Mains Noise.

Choice of Passive Components: EMC Design Components

EMI Measurement Technology: EMI Measuring Instruments, Pitfalls of EMI Measurements, Test Instrumentation Accessories and their Characteristics, Measurement of Pulsed EMF, EMI Patterns from Different List Objects, EMI Immunity Test System, Software in EMI/EMC Measurements, Recent Trends in Susceptibility Measurement, Cost Effective EMI/EMC Measurements, Setup and its Maintenance.

Text Books:

1. IMPACT Learning Material Series Modules 1 – 9, IIT New Delhi, Published by RSTE.
2. Electromagnetic Compatibility, R. C. Paul.

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INTERNET & WEB TECHNOLOGY

Course Objectives: The objectives of this course are

- To understand best technologies for solving web client/server problems.
- To analyze and design real time web applications.
- To use Java script for dynamic effects and to validate form input entry.
- To Analyze to Use appropriate client-side or Server-side applications.

Course Outcomes: At the end of the course the student will be able to

- Understand the concepts of HTML, Java scripts and Cascading Style Sheets
- Generate XML documents and Schemas and summarize Java Beans.
- Develop and deploy real time web applications in web servers and Servlets.
- Build JSP tools that assist in automating data transfer over the Internet.
- Accessing a Database from Servlets & JSP Page.

SYLLABUS

HTML Common tags- List, Tables, images, forms, Frames; Cascading Style sheets; Java Script: - Introduction to Java Scripts, Objects in Java Script**,** Dynamic HTML with Java Script

XML: Document type definition, XML Schemas, Document Object model, Presenting XML, Using XML Processors: DOM and SAX.

Java Beans: Introduction to Java Beans, Advantages of Java Beans, BDK, Introspection, Using Bound properties, Bean Info Interface, Constrained properties Persistence, Customizes, Java Beans API, Introduction to EJB's

Web Servers and Servlets: Tomcat web server, Introduction to Servlets: Lifecycle of a Server let, The Servlet API, The javax.servelet Package, Reading Servlet parameters, and Reading Initialization parameters. The javax.servelet HTTP package, Handling Http Request & Responses, Using Cookies-Session Tracking, Security Issues

JSP Application Development: Generating Dynamic Content, Using Scripting Elements Implicit JSP Objects, Conditional Processing – Displaying Values Using an Expression to Set an Attribute, Declaring Variables and Methods Error Handling and Debugging Sharing Data

between JSP pages, Requests, and Users Passing Control and Date between Pages – Sharing Session and Application Data – Memory Usage Considerations

Database Access: Database Programming using JDBC, Studying Javax.sql.* package, Accessing a Database from Servlets & JSP Page , Application – Specific Database Actions, Deploying JAVA Beans in a JSP Page, Introduction to struts framework.

Text Books:

1. Internet and World Wide Web – How to program by Dietel and Nieto
   PHI/Pearson Education Asia.
2. Advanced Java™ 2 Platform How to Program, Deitel/Deitel/Santry 3. Java Server Pages – Hans Bergsten, SPD O'Reilly

Reference Books:

1. HTML Black Book: The Programmer's Complete HTML Reference Book-by Steven Holzner
2. Core Servelets and Java Server Pages Volume2: Core Technologies by Marty Hall and Larry Brown, Pearson Education.

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INFORMATION THEORY AND CODING

Course Objectives: To provide an insight into the basic concepts of

- The concept of Error control coding
- Linear Block Codes for Error Correction.
- Convolution coding to improve the reliability of the system
- Sequential Decoding of Convolution codes

Course Outcomes: At the end of the course the student will be able to

- Understand the concept of Error control coding
- Apply Linear Block Codes for Error Correction
- Apply Convolution coding to improve the reliability of the system
- Sequential Decoding of Convolution codes

SYLLABUS

Information Theory: Information measure, Entropy and Information rate, Coding for a discrete memory less source, Predictive coding for sources with memory, Information transmission on discrete channels, Mutual information.

Information Channels: Discrete channel capacity, coding for the binary symmetric channel, Continuous channels and system comparisons, continuous information, continuous channel capacity, Ideal communication system, system comparisons.

Error Controlling Coding: Introduction, Examples of Error control coding, methods of Controlling Errors, Types of Errors, types of Codes, Linear Block Codes: matrix description of Linear Block Codes, Error detection & Correction capabilities of Linear Block Codes, Single error correction Hamming code, Table lookup Decoding using Standard Array. **Binary Cyclic Codes:** Algebraic Structure of Cyclic Codes, Encoding using an (n-k) Bit Shift register, Syndrome Calculation, Error Detection and Correction

Convolution Coding: Practical Convolution Encoder, Time Domain Approach, Transform Domain Approach, The Code Tree, Code Trellis, State Diagram, Decoding Methods of

Convolution Codes, Sequential Decoding, Burst Error Detection and Correction Codes, Concatenated Block Codes, Turbo Codes.

Text Books:

1) Communication Systems,3/e, by A.B. Carlson, Mc. Graw Hill Publishers (for topic1)
2) Digital Communications by Simon Haykin, John Wiley & Sons (for topic 2).
3) Principles ofDigital Communication, J. Das, S.K.Mullick, P. K. Chatterjee, Wiley, 1986- Technology &Engineering.
4) Information Theory and Coding, HariBhat, Ganesh Rao, Cengage, 2017.

Reference Books:

1) Principles of Digital Communications, Signal representation, Detection, Estimation &Information
2) Coding by J Das, S.K. Mullick, P.K.Chatterjee, New Age Int. Ltd.
3) Principles of Communication Systems, Taub &Schilling, 2/e, TMH Publisher.

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SMART ANTENNAS SYSTEMS

Course Objectives: The objectives of this course are

- To know the basic concepts on antenna
- To know the performance of an antenna array
- Learning self-adaptive procedure to extract the desired signal
- Design of smart antenna system

Course Outcomes: By the end of the course the student will be able to

- Understand antenna theory and application of signa processing in it.
- Learn techniques of developing MIMO antennas, beam forming.
- Design practical antennas for Radar applications.
- Determine the capacity and data rate in MIMO system

Syllabus

Smart Antennas: Introduction, Need for Smart Antennas, Overview, Smart Antenna Configurations, Switched-Beam Antennas, Adaptive Antenna Approach, Space Division Multiple Access (SDMA), Architecture of a Smart Antenna System, Receiver, Transmitter, Benefits and Drawbacks, Basic Principles, Mutual Coupling Effects.

DOA Estimation Fundamentals: Introduction, Array Response Vector, Received Signal Model, Subspace-Based Data Model, Signal Autocovariance, Conventional DOA Estimation Methods, Conventional Beamforming Method, Capon's Minimum Variance Method, Subspace Approach to DOA Estimation, MUSIC Algorithm, ESPRIT Algorithm, Uniqueness of DOA Estimates.

Beam Forming Fundamentals: Classical Beam former, Statistically Optimum Beamforming Weight Vectors, Maximum SNR Beam former, Multiple Sidelobe Canceller and Maximum, SINR Beam former, Minimum Mean Square Error (MMSE), Direct Matrix Inversion (DMI), Linearly Constrained Minimum Variance (LCMV), Adaptive Algorithms for Beamforming

Integration and Simulation of Smart Antennas: Overview, Antenna Design, Mutual Coupling, Adaptive Signal Processing Algorithms, DOA, Adaptive Beam forming, Beam forming and Diversity Combining for Rayleigh-Fading, Channel, Trellis-Coded Modulation

(TCM) for Adaptive Arrays, Smart Antenna Systems for Mobile Adhoc Networks (MANETs), Protocol, Simulations, Discussion.

Space–Time Processing: Introduction, Discrete Space–Time Channel and Signal Models, Space– Time Beamforming, Inter symbol and Co-Channel Suppression, Space–Time Processing for DSCDMA, Capacity, and Data Rates in MIMO Systems, Discussion.

Text Books:

1. Constantine A. Balanis & Panayiotis I. Ioannides, "Introduction to Smart Antennas", Morgan & Claypool Publishers' series-2007
2. Joseph C. Liberti Jr., Theodore S Rappaport, "Smart Antennas for Wireless CommunicationsIS-95 and Third Generation CDMA Applications", PTR – PH publishers, 1st Edition, 1989.

Reference Books:

1. T.S Rappaport, "Smart Antennas Adaptive Arrays Algorithms and Wireless Position Location", IEEE press 1998, PTR – PH publishers 1999.
2. Lal Chand Godara, "Smart Antennas", CRC Press, LLC-20.

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TV AND SATELLITE COMMUNICATION

Course Objectives: To provide an insight into the basic concepts of

- basic television system.
- With examples of Signal Transmission and Channel Bandwidth
- Television Receiver and Colour Television
- various concepts of satellite communication.

Course Outcomes: At the end of the course the student will be able to

- Analyze the concepts of basic television system.
- Illustrate examples of Signal Transmission and Channel Bandwidth.
- Infer Television Receiver and Colour Television.
- Infer various concepts of satellite communication.

SYLLABUS

Basic Television System: Sound and Picture Transmission, the Scanning Process, Interlaced Scanning, Number of Scanning Lines, Vertical and Horizontal Resolution, Bandwidth of the Baseband Picture Signal.

Television Cameras: Principle of working and constructional details of Image Orthicon, Vidicon, Plumbicon and Silicon diode array Vidicon and Solid-state Image Scanners.

Composite - Video Signal: Video signal levels, Need for Synchronization, Details of Horizontal and Vertical Sync Pulses, Equalizing Pulses.

Signal Transmission and Channel Bandwidth: AM and FM Channel Bandwidth, VSB Transmission, Complete Channel Bandwidth, Reception of Vestigial Sideband Transmission, Television Standards, Block Schematic study of a typical TV Transmitter.

The TV Picture Tube: Monochrome Picture Tube, Picture Tube Characteristics and Picture Tube Control Circuits, Gamma Correction. **Television Receiver:** Block Schematic and Functional Requirements, VSB Correction.

Vertical and Horizontal Deflection Circuits, E.H.T. Generation, Study of Video IF Amplifier Video Detector, Sound Channel Separation, Sync Separation Circuits.

Colour Television: Principles of Additive and Subtractive Colour Mixing, Chromaticity Diagram, Compatibility and Reverse Compatibility of Colour and Monochrome TV Requirements, Colour Signal Transmission, Bandwidth for Colour Signal Transmission, Sub-carrier Modulation of Chroma Signals, NTSC Encoding (Y, I, Q signals), PAL Encoding (Y, U, V signals), NTSC and PAL Decoders, Types of Colour TV Picture Tubes (Delta-gun, PIL and Trinitron Picture Tubes), Convergence Techniques.

Satellite Communication: Orbital Aspects, Tracking and Control of Communication Satellites, Launch Vehicles, Propagation Characteristics: Attenuation and Noise, Frequency Bands, Satellite Transponders, Earth Station: Configuration, High Power Amplifiers, Antennas, LNA, Link Design, Multiple Access: FDMA, TDMA, CDMA, SPADE, INTELSATs, INSAT.

Text Books:

1. Global Navigation Satellite Systems with Essentials of Satellite Communications authored by G S Rao, Mc-Graw Hill Publication, New Delhi 2010
2. Monochrome and Colour Television, R. R. Gulati, Wiley Eastern.

Reference Books:

1. Television Engineering, A. M. Dhake, Tata - McGraw Hill.
2. Satellite Communication, D. C. Agarwal, Khanna Publishers.
3. Satellite Communication, T. Pratt and S. W. Bostian, John Wiley and Sons.

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TRANSDUCERS AND SIGNAL CONDITIONING

Course Objectives: The objectives of this course are

- To understand the necessity and advantages of transducer.
- To learn the operation and applications of various transducer.
- To design and construct different transducers.
- To measure several parameters using transducers.

Course Outcomes: At the end of the course the student will be able to

- Understand study about the concepts of measurement, error and uncertainty, transducer classification, terminology, static and dynamic characteristics of transducers.
- Gain knowledge on working principle construction, operation, characteristics and features of different transducers.
- Understand the concepts of signal conversion and signal conditioning methods for different transducers.
- Understand the selection criteria of transducer for particular application and use the same for developing the applications.

SYLLABUS

Introduction: Measurement systems, Basic electronic measuring system, Transduction principles, Classification of transducers, General transducers characteristics, Criteria for transducer selection.

Resistive Transducers: Principles of operation, construction, theory, advantages and disadvantages, applications of Potentiometers, strain gauges, (metallic and semi-conductor type), Resistance Thermometer, Thermistors.

Inductive Transducers: Types of Inductive transducer, Principles of operation, construction, Advantages & disadvantages and applications. Various variable Inductive Transducers, LVDT (Linear variable differential transformer).

Capacitive Transducers: Types of capacitive transducer, Principles of operation, construction, theory, advantages and disadvantages and applications, of capacitive transducers based upon familiar equation of capacitance.

Elastic Transducers: Spring bellows, diaphragm, bourdon tube – their special features and application.

Active Transducers: Principle of operation, construction, theory, advantages and disadvantages and applications of following transducers: Thermocouple, Piezo-electric transducer, Magneto-strictive transducer, Hall effect transducer, Photo-voltaic transducer and electrochemical transducer.

Other Transducers: Optical transducers: photo-emissive, photo-conductive and Photovoltaic cells, Digital Transducers: Optical encoder, Shaft encoder. Feedback fundamentals, introduction to Inverse transducer.

Signal Conditioning: Concept of signal conditioning, Applications of AC/DC Bridges, Application of Op-amp circuits used in instrumentation, Instrumentation amplifiers, Interference, grounding, and shielding.

Text Books:

1. Murty DVS, "Transducers & Instrumentation", Prentice Hall of India
2. Sawhney AK, "Electrical and Electronics Measurements and Instrumentation," Dhanpat Rai and Sons
3. Kalsi HS, "Electronic Instrumentation," Tata McGraw Hill
4. Patranabis D, "Sensors and Transducers," Prentice Hall of India 5. Doebelin EO, "Measurement Systems: Application and Design," Tata McGraw Hill

Reference Books:

1. H.K.P. Neubert Instrument Transducers Oxford University Press : (Second edition).

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LOW POWER VLSI DESIGN

Course Objectives: The objectives of this course are

- This course addresses a profound analysis on the development of the CMOS & Bi-CMOS digital circuits for a low voltage low power environment
- To study the concepts of device behavior and modeling
- To study the concepts of low voltage, low power logic circuits
- To understand the concepts of Low Power Latches and Flip Flops

Course Outcomes: At the end of the course the student will be able to

- Capability to recognize advanced issues in VLSI systems, specific to the deep-submicron silicon technologies.
- Students able to understand deep submicron CMOS technology and digital CMOS design styles.
- To design chips used for battery-powered systems and highperformance circuits
- Explain the equations, approximations and techniques available for deriving a device model with specified properties
- Explore and improvise on the latest techniques used for designing power-efficient logic gates, latches, and flip-flops

SYLLABUS

Low Power Design, An Over View: Introduction to low- voltage low power design, limitations, Silicon-on-Insulator.

MOS/ Bi CMOS PROCESSES: Bi CMOS processes, Integration and Isolation considerations, Integrated Analog/Digital CMOS Process. Deep submicron processes, SOI CMOS, lateral BJT on SOI, future trends and directions of CMOS/ Bi CMOS processes.

Device Behavior And Modeling: Advanced MOSFET models, limitations of MOSFET models, bipolar models. Analytical and Experimental characterization of sub-half micron MOS devices, MOSFET in a Hybrid mode environment.

CMOS and Bi-CMOS Logic Gates: Conventional CMOS and Bi CMOS logic gates. Performance evaluation.

Low- Voltage Low Power Logic Circuits: Comparison of advanced BiCMOS Digital circuits. ESD-free Bi CMOS, Digital circuit operation and comparative Evaluation.

Low Power Latches and Flip Flops: Evolution of Latches and Flip flops-quality measures for latches and Flip flops, Design perspective.

Text Books:

1. CMOS/Bi CMOS ULSI low voltage, low power by Yeo Rofail / Gohl (3 Authors)-Pearson Education Asia 1st Indian reprint,2002

Reference Books:

1. Digital Integrated circuits, J.Rabaey PH. N.J 1996
2. CMOS Digital ICs sung-moKang and yusufleblebici 3rd edition TMH2003 (chapter 11)
3. VLSI DSP systems, Parhi, John Wiley & sons, 2003 (chapter 17)
4. IEEE Trans Electron Devices, IEEE J.Solid State Circuits, and other National and International Conferences and Symposia.

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DIGITAL IMAGE PROCESSING

Course Objectives: The objectives of this course are

- To familiarize with basic concepts of digital image processing and different image transforms
- To learn various image processing techniques like image enhancement, restoration, segmentation and compression
- To understand color fundamentals and different color models.
- To understand wavelets and morphological image processing.

Course Outcomes: At the end of the course the student will be able to

- Illustrate the fundamental concepts of Digital Image Processing and different image transforms.
- Analyze the effect of spatial and frequency domain filtering of images.
- Evaluate the methodologies for image restoration and reconstruction.
- Compare the different color image processing techniques.
- Elucidate the mathematical modelling of image Multi-resolution processing and apply different image compression techniques.
- Categorize different image segmentation techniques and morphological image operations.

SYLLABUS

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 perception, 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 Transforms: 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, SVD and KL Transforms or Hotelling Transform

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.

Image restoration and Reconstruction: A model of the image degradation /Restoration process, Noise models, restoration in the presence of noise only-Spatial Filtering, Periodic Noise Reduction by frequency domain filtering, Linear, Position –Invariant Degradations, Estimation the degradation function, Inverse filtering,

Minimum mean square error (Wiener) filtering, constrained least squares filtering, geometric mean filtering, image reconstruction from projections.

Color 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.

Wavelets and Multi-resolution Processing: image pyramids, sub band coding & Haar transforms multi resolution expressions, wavelet transforms in one dimension. The fast wavelets transform, wavelet transforms in two dimensions, wavelet packets.

Image compression: Fundamentals, various compression methods-coding techniques, digital image water marking.

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, the use of motion in segmentation**.**

Text Books:

1. R. C. Gonzalez and R. E. Woods, Digital Image Processing, 3rd edition, Prentice Hall, 2008.
2. R. C. Gonzalez, R. E. Woods and Steven L. Eddins , Digital Image Processing Using MATLAB , 2rd edition, Prentice Hall, 2009.
3. Anil K.Jain, “Fundamentals of Digital Image Processing”, Prentice Hall of India, 9th Edition, Indian Reprint, 2002.
4. Jayaraman, S. Esakkirajan, and T. Veerakumar, Digital Image Processing, Tata McGraw-Hill Education.

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FIBER-OPTIC COMMUNICATIONS

Course Objectives: The objectives of this course are

- To realize the significance of optical fibre communications.
- To understand the construction and characteristics of optical fibre cable.
- To develop the knowledge of optical signal sources and power launching.
- To identify and understand the operation of various optical detectors.
- To understand the design of optical systems and WDM.

Course Outcomes: At the end of the course the student will be able to

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

SYLLABUS

Overview of Optical Fiber Communication: - Historical development, The general system, Advantages of Optical Fiber Communications, Optical Fiber Wave Guides- Introduction, Ray Theory Transmission, Total Internal Reflection, Acceptance Angle, Numerical Aperture, Skew Rays, Cylindrical Fibers- Modes, V number, Mode Coupling, Step Index Fibers, Graded Index Fibers.

Single Mode Fibers- Cut Off Wavelength, Mode Field Diameter, Effective Refractive Index, Fiber Materials Glass, Halide, Active Glass, Chalgenide Glass, Plastic Optical Fibers.

Signal Distortion in Optical Fibers: Attenuation, Absorption, Scattering and Bending Losses, Core and Cladding Losses, Information Capacity Determination, Group Delay, Types of Dispersion - Material Dispersion, Wave-Guide Dispersion, Polarization Mode Dispersion, Intermodal Dispersion, Pulse Broadening, Optical Fiber Connectors- Connector Types, Single Mode Fiber Connectors, Connector Return Loss.

Fiber Splicing: Splicing Techniques, Splicing Single Mode Fibers, Fiber Alignment and Joint Loss- Multimode Fiber Joints, Single Mode Fiber Joints. Optical Sources- LEDs, Structures, Materials, Quantum Efficiency, Power, Modulation, Power Bandwidth Product, Injection

Laser Diodes- Modes, Threshold Conditions, External Quantum Efficiency, Laser Diode Rate Equations, Resonant Frequencies, Reliability of LED & ILD.
Source to Fiber Power Launching: - Output Patterns, Power Coupling, Power Launching, Equilibrium Numerical Aperture, Laser Diode to Fiber Coupling

Optical Detectors: Physical Principles of PIN and APD, Detector Response Time, Temperature Effect on Avalanche Gain, Comparison of Photo Detectors, Optical Receiver Operation- Fundamental Receiver Operation, Digital Signal Transmission, Error Sources, Receiver Configuration, Digital Receiver Performance, Probability of Error, Quantum Limit, Analog Receivers.

Optical System Design: Considerations, Component Choice, Multiplexing, Point-to- Point Links, System Considerations, Link Power Budget with Examples, Overall Fiber Dispersion in Multi-Mode and Single Mode Fibers, Rise Time Budget with Examples. Transmission Distance, Line Coding in Optical Links, WDM, Necessity, Principles, Types of WDM, Measurement of Attenuation and Dispersion, Eye Pattern.

Text Books:

1. Optical Fiber Communications – Gerd Keiser, MC GRAW HILL EDUCATION, 4th Edition, 2008.
2. Optical Fiber Communications – John M. Senior, Pearson Education, 3rd Edition, 2009.

Reference Books:

1. Fiber Optic Communications – D.K. Mynbaev , S.C. Gupta and Lowell L. Scheiner, Pearson Education, 2005.
2. Text Book on Optical Fibre Communication and its Applications – S.C.Gupta, PHI, 2005.
3. Fiber Optic Communication Systems – Govind P. Agarwal , John Wiley, 3rd Ediition, 2004.
4. Introduction to Fiber Optics by Donald J.Sterling Jr. – Cengage learning, 2004.

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ADVANCED MICROPROCESSORS

Course Objectives: The objectives of this course are

- To describe the function of the microprocessor and detail its basic operation
- To understand the concepts of advanced architecture in the microprocessors
- To describe the function and purpose of each program-visible registers in microprocessor
- To interface memory devices with 80186,80286,80386 and 80486.

Course Outcomes: At the end of the course the student will be able to

- understand the functionality of 80186,80286,80386 and 80486 architecture to design advanced microprocessors systems
- Analyze the Performance of RISC and CISC architectures.
- Interface the advanced processors with Memory.
- Summarize the interfacing rules of different peripherals with advanced microprocessor.

SYLLABUS

80386 Architecture: Instruction set - Addressing modes - Real mode - Protected mode - 80386 Architecture - Address segmentation - Paging - Segment registers.

Basic 486 Architecture: 486 memory system and memory management - Features of Pentium memory and I/O systems - Pentium memory management - Introduction to Pentium Pro features.

High Performance CISC Architecture – Pentium: CPU Architecture- Bus Operations – Pipelining – Brach predication – floating point unit- Operating Modes –Paging – Multitasking – Exception and Interrupts – Instruction set – addressing modes – Programming the Pentium processor.

High Performancerisc RISC Architecture – ARM Arcon RISC Machine – Architectural Inheritance – Core & Architectures - Registers – Pipeline - Interrupts – ARM organization - ARM processor family – Co-processors - ARM instruction set- Thumb Instruction set -

Instruction cycle timings: The ARM Programmer's model – ARM Development tools – ARM Assembly Language Programming – Optimizing ARM Assembly Code – Optimized Primitives.

Memory Interface: Memory Devices, Address Decoding, 8086, 80186,80286,80386SX Memory Interface, 80286DX and 80486 Memory Interface, Pentium through core2 Memory Interface

Reference Books:

1. The Intel Microprocessors 8086 / 8088, 80186, 80188, 80286, 80386, 80486, Pentium and Pentium – Pro Processor Architecture, Programming and Interface by Barray B. Berry, 4th Edition, PHI.
2. Microprocessors Principles and Applications by Gilmore, 2nd Edition, TMH.
3. Microprocessors and Interfacing Programming and Applications by Douglas V. Hall, Mc Graw Hill.
4. Microprocessors / Microcomputers Architecture, Software and Systems by A.J. Khambata, John Wiely & Sons.
5. Advanced Microprocessors by Daniel Tabak, Mc Graw Hill, 1995.

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ANNEXURE-II

OPEN ELECTIVES

1. VLSI Design
2. Wireless Sensor Networks
3. Computer Networks
4. DSP Processors and Architectures
5. Embedded System Design
6. Bio-Medical Instrumentation
7. Mobile Communications
8. FPGA Design
9. Speech Processing
10. System on Chip Design
11. Internet of Things and Applications
12. Artificial Neural Networks

VLSI DESIGN

Course Objectives: To provide an insight into the basic concepts of

- VLSI technology
- circuit design processes with stick diagrams and layout diagrams.
- VLSI circuit
- scaling of MOS circuits with sub system design and layout

Course Outcomes: At the end of the course the student will be able to

- Describe the basic concepts of VLSI technology.
- Demonstrate circuit design processes with stick diagrams and layout diagrams
- Demonstrate basic circuit concepts.
- Summarize scaling of MOS circuits with sub system design and layout.

SYLLABUS

Review of microelectronics and an 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.

MOS and BiCMOS 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.

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).

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, Technology development, MOSFET based design.

Introduction to Embedded Systems: Embedded Systems, Processor Embedded into a System, Embedded Hardware Units and Devices in a System, Embedded Software in a System, Examples of Embedded Systems, Embedded Systems on Chip, Complex Systems Design and Processors, Design Process in Embedded System, Formalization of System Design, Design Process and Design Examples, Classification of Embedded Systems, Skills required for an Embedded System Designer.

Embedded Software Development Process and Tools: Introduction to Embedded Software Development Process and Tools, Host and Target Machines, Linking and Locating Software, Getting Embedded Software into the Target System, Issues in Hardware-Software Design and Co-design

Text books:

1. Basic VLSI Design by Douglas A, Pucknell, Kamran Eshraghian, Prentice-Hall, l996, 3rd Edition.
2. Embedded Systems Architecture, Programming and Design, second edition by Raj Kamal, Tata McGraw Hill Publication (Chapter 1, Chapter 13)

Reference Books:

1. Mead, C.A and Conway, LA, "Introduction to VLSI Systems", Addison-Wesley, Reading, Massachusetts, l980.

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WIRELESS SENSORS & NETWORKS

Course Objectives: The objectives of this course are

- To understand the WSN node Architecture and Network Architecture.
- To identify the Wireless Sensor Network Platforms.
- To design and develop wireless sensor node.
- To learn the concepts of layered protocols for WSN.

Course Outcomes: At the end of the course the student will be able to

- Understand the fundamental Concepts, applications and architectures of wireless sensor networks
- Categorize the various network topologies.
- Realize the MAC Protocols for Wireless Sensor Networks.
- Describe routing protocols for ad hoc wireless networks with respect to TCP design issues.
- Outline the transport layer and security protocols for WSN.
- Differentiate various sensor network platforms and tools.

SYLLABUS

Overview of Wireless Sensor Networks: Key definitions of sensor networks, Advantages of sensor Networks, Unique constraints a challenge, Driving Applications, Enabling Technologies for Wireless Sensor Networks.

Architectures: Single-Node Architecture - Hardware Components, Energy Consumption of Sensor Nodes, Operating Systems and Execution Environments, Network Architecture -Sensor Network Scenarios, Optimization Goals and Figures of Merit, Gateway Concepts.

Networking Technologies: Physical Layer and Transceiver Design Considerations, Personal area networks (PANs), hidden node and exposed node problem, Topologies of PANs, MANETs, WANETs.

MAC Protocols for Wireless Sensor Networks: Issues in Designing a MAC protocol for Ad Hoc Wireless Networks, Design goals of a MAC Protocol for Ad-Hoc Wireless Networks, Classifications of MAC Protocols, Contention - Based Protocols, Contention – Based Protocols

with reservation Mechanisms, Contention – Based MAC Protocols with Scheduling Mechanisms, MAC Protocols that use Directional Antennas, Other MAC Protocols.

Routing Protocols: Introduction, Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks, Classification of Routing Protocols, Table –Driven Routing Protocols, On – Demand Routing Protocols, Hybrid Routing Protocols, Routing Protocols with Efficient Flooding Mechanisms, Hierarchical Routing Protocols, Power – Aware Routing Protocols, Proactive Routing.

Transport Layer and Security Protocols: Introduction, Issues in Designing a Transport Layer Protocol for Ad Hoc Wireless Networks, Design Goals of a Transport Layer Protocol for Ad Hoc Wireless Networks, Classification of Transport Layer Solutions, TCP Over Ad Hoc Wireless Networks, Other Transport Layer Protocol for Ad Hoc Wireless Networks.

Security in WSNs: Security in Ad Hoc Wireless Networks, Network Security Requirements, Issues and Challenges in Security Provisioning, Network Security Attacks, Key Management, Secure Routing in Ad Hoc Wireless Networks.

Sensor Network Platforms and Tools: Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node-level software platforms, Node level Simulators, State-centric programming.

Applications of WSN: Ultra-wide band radio communication, Wireless fidelity systems. Future directions, Home automation, smart metering Applications.

Text Books:

1. Ad Hoc Wireless Networks: Architectures and Protocols - C. Siva Ram Murthy and B.S.Manoj, 2004, PHI
2. Wireless Ad- hoc and Sensor Networks: Protocols, Performance and Control – Jagannathan Sarangapani, CRC Press
3. Holger Karl & Andreas Willig, “Protocols And Architectures for Wireless Sensor Networks", John Wiley, 2005.

Reference Books:

a. KazemSohraby, Daniel Minoli, &TaiebZnati, “Wireless Sensor Networks- Technology, Protocols, and Applications”, John Wiley, 2007.
2. Feng Zhao & Leonidas J. Guibas, “Wireless Sensor Networks- An Information Processing Approach", Elsevier, 2007.
3. Ad- Hoc Mobile Wireless Networks: Protocols & Systems, C.K. Toh ,1 ed. Pearson Education.
4. Wireless Sensor Networks - C. S. Raghavendra, Krishna M. Sivalingam, 2004, Springer.
5. Wireless Sensor Networks – S Anandamurugan , Lakshmi Publications.

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COMPUTER NETWORKS

Course Objectives: The objectives of this course are

- To describe how computer networks are organized with the concept of layered approach.
- To implement a simple LAN with hubs, bridges and switches.
- To analyze the contents in a given Data Link layer packet, based on the layer concept.
- To design logical sub-address blocks with a given address block.
- To describe how routing protocols work.

Course Outcomes: At the end of the course the student will be able to

- Understand the concepts of Network Topologies, structures and layers.
- Illustrate Physical layer Guided Transmission media and Multiplexing concepts.
- Understand how the Media Access control problem solved in a network using multiple access protocols.
- Detect and analyze the Datalink layer Framing, Error control Techniques and protocols in a network.
- Make use of the Network Layer routing algorithms, congestion control algorithms to perform better network communication.
- Analyze the internet Transport layer protocols and application layer services.

SYLLABUS

Introduction: Uses of Computer Networks, Network Structure, Architectures, Services, Standardization, Functions of Various Network Layers, Network examples.

Physical layer: Theoretical Basis for Data Communication, Transmission Media, Analog and Digital Transmission, Transmission and Switching ISDN.

Medium Access Sub-layer: LAN, MAN, Protocol, ALOHA, IEEE Standard for 802 for LANs, Fiber Optic Networks, Satellite Networks.

Data Link layer: Design Issues, Error Detection and Correction, Protocols and their Performance, Specifications and Examples.

Network layers: Design Considerations, Difference between Gateway, Ethernet Switch, Router, Hub, Repeater, Functions of Router, Congestion Control Internetworking and Examples, Details of IP addressing schemes, TCP/IP Protocol details.

The Transport Layer: The Transport Service, Elements of Transport Protocols, The Internet Transport Protocols; UDP, The Internet Transport Protocols; TCP.

The Application Layer: The Domain Name System, Electronic Mail, The World Wide Web.

Text Books:

1. Data Communications and Networking by Behrouz A. Forouzan, 2nd Edition, Tata McGraw Hill.

Reference Books:

1. Computer Networks, A. S. Tannenbaum, PHI – New Delhi.
2. Computer Networking Terminology Products and Standards, R. P. Suri and J. K. Jain, Tata McGraw Hill.

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DSP PROCESSORS & ARCHITECTURES

Course Objectives: The objectives of this course are

- To learn the architecture, addressing modes of DSP processors.
- To interface the serial converters to a DSP device
- To give an exposure to the various fixed point & a floating point DSP architectures and to develop applications using these processors.
- To know different basic DSP algorithms.

Course Outcomes: At the end of the course the student will be able to

- Understand the concepts of DSP and numeric representations.
- Illustrate the architectural features of DSP devices.
- Determine various addressing modes and instructions of DSP processor.
- Analyze the concepts of basic DSP algorithms.
- Analyze the interfacing serial converters to a DSP device.

SYLLABUS

Introduction to Digital Signal Processing: 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.

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.

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

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.

Implementations of Basic DSP Algorithms And FFT Algorithms: The Q-notation, FIR Filters, IIR Filters, Interpolation Filters, Decimation Filters, PID Controller, Adaptive Filters, 2-D Signal Processing, An FFT Algorithm for DFT Computation, A Butterfly Computation, Overflow and scaling, Bit-Reversed index generation, An 8-Point FFT implementation on the TMS320C54XX, Computation of the signal spectrum.

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.

Reference Books:

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.

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EMBEDDED SYSTEM DESIGN

Course Objectives: The objectives of this course are

- To provide an overview of Design Principles of Embedded System.
- To provide clear understanding about the role of firmware, operating systems incorrelation with hardware systems.
- To understand the principles of sensors and actuators
- To understand parallel processing for multitasking systems

Course Outcomes: At the end of the course the student will be able to

- Expected to understand the selection procedure of Processors in the embedded domain.
- Design Procedure for Embedded Firmware.
- Expected to visualize the role of Real time Operating Systems in Embedded Systems.
- Expected to evaluate the Correlation between task synchronization and latency issue

SYLLABUS

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

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

Embedded Firmware: Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, Real Time Clock, Watchdog Timer, Embedded Firmware Design Approaches and Development Languages.

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

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

Text Books:

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

Reference Books:

1. Embedded Systems - Raj Kamal, MC GRAW HILL EDUCATION.
2. Embedded System Design - Frank Vahid, Tony Givargis, John Wiley.
3. Embedded Systems – Lyla, Pearson, 2013
4. An Embedded Software Primer - David E. Simon, Pearson Education.

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BIO MEDICAL INSTRUMENTATION

Course Objectives: The objectives of this course are

- To know the sources of Bioelectric potentials and Electrodes.
- To analyze the cardiovascular & Respiratory systems and its related measurements.
- To understand the various techniques for electromagnetic compatibility.
- To acquire knowledge of electronics in clinical laboratory and therapeutic area.

Course Outcomes: At the end of the course the student will be able to

- Understand the origin of biopotentials and role of its electrodes.
- Elucidate the cardiovascular system and its measurements.
- Develop a thorough understanding on principles of Patient Care Monitory and Measurements in Respiratory System.
- Outline the concepts of Bio telemetry and Instrumentation for the clinical laboratory.
- Summarize the application of Electronics in diagnostics and therapeutic area.

SYLLABUS

Sources of Bioelectric potentials: Sources of Bioelectric potentials and Electrodes Resisting and Action Potentials, Propagation of Action Potentials, The Bioelectric Potentials Electrode theory, Bio Potential Electrodes, Biochemical Transducers

The Cardiovascular System: The Cardiovascular System and Cardiovascular Measurements, The Heart and Cardiovascular System, The Heart, Blood Pressure, Characteristics of Blood Flow, Heart Sounds Electrocardiography, Measurement of Blood Pressure, Measurement of Blood Flow and Cardiac output, Plethysmography, Measurement of Heart Sounds,

Patient Care and Monitoring: Patient Care & Monitory and Measurements in Respiratory System The elements of Intensive Care Monitory, Diagnosis, Calibration and repairability of Patient Monitoring equipment, other instrumentation for monitoring patients, pace makers, defibrillators The Physiology of respiratory system, tests and instrumentation for mechanics of breathing, respiratory theory equipment.

Biotelemetry: Bio telemetry and Instrumentation for the clinical laboratory Introduction to biotelemetry, physiological parameters adaptable to biotelemetry, the components of biotelemetry system, implantable units, applications of telemetry in patient care The blood,

tests on blood cells, chemical test, automation of chemical tests

X-Ray and Radioisotope Instrumentation: X – ray and radioisotope instrumentation and electrical safety of medical equipment.

Generation of Ionizing radiation, instrumentation for diagnostic X – rays, special techniques, instrumentation for the medical use of radioisotopes, radiation therapy. Physiological effects of electrical current, shock Hazards from electrical equipment, Methods of accident prevention

Text Book:

1. Biomedical Instrumentation and Measurements – C. Cromwell, F.J. Weibell, E.A. Pfeiffer Pearson education.

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MOBILE COMMUNICATIONS

Course Objectives: The objectives of this course are

- Understanding the basic principles of mobile communication systems.
- An analysis of mobile communications with the interpretation of the call prints.
- Understand the basic principles of the modern mobile and wireless communication systems.
- Understand the operation of mobile communications systems and their generation divisions.

Course Outcomes: At the end of the course the student will be

- Able to think and develop new mobile application.
- Able to take any new technical issue related to this new paradigm and come up with a solution(s).
- Able to develop new ad hoc network applications and/or algorithms/protocols.
- Able to understand & develop any existing or new protocol related to mobile environment.

SYLLABUS

Introduction: Mobile Communications, Mobile Computing – Paradigm, Promises/Novel Applications and Impediments and Architecture; Mobile and Handheld Devices, Limitations of Mobile and Handheld Devices. GSM – Services, System Architecture, Radio Interfaces, Protocols, Localization, Calling, Handover, Security, New Data Services, GPRS.

Wireless Medium Access Control (MAC): Motivation for a specialized MAC (Hidden and exposed terminals, Near and far terminals), SDMA, FDMA, TDMA, CDMA, Wireless LAN/ (IEEE 802.11)

Mobile Network Layer: IP and Mobile IP Network Layers, Packet Delivery and Handover Management, Location Management, Registration, Tunnelling and Encapsulation, Route Optimization, DHCP.

Mobile Transport Layer: Conventional TCP/IP Protocols, Indirect TCP, Snooping TCP, Mobile TCP, Other Transport Layer Protocols for Mobile Networks.

Database Issues: Database Hoarding & Caching Techniques, Client-Server Computing & Adaptation, Transactional Models, Query processing, Data Recovery Process &QoS Issues.

Data Dissemination and Synchronization: Communications Asymmetry, Classification of Data Delivery Mechanisms, Data Dissemination, Broadcast Models, Selective Tuning and Indexing Methods, Data Synchronization – Introduction, Software, and Protocols.

Mobile Ad hoc Networks (MANETs): Introduction, Applications & Challenges of a MANET, Routing, Classification of Routing Algorithms, Algorithms such as DSR, AODV,DSDV, etc., Mobile Agents, Service Discovery.

Text Books:

1. Jochen Schiller, "Mobile Communications", Addison-Wesley, Second Edition,2009.
2. Raj Kamal, "Mobile Computing", Oxford University Press, 2007, ISBN: 0195686772

Reference Books:

1. ASOKE K TALUKDER, HASAN AHMED, ROOPA R YAVAGAL, "Mobile Computing,Technology Applications and Service Creation" Second Edition, Mc Graw Hill.
2. UWE Hansmann, LotherMerk, Martin S. Nocklous, Thomas Stober, "Principles of Mobile Computing," Second Edition, Springer.

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FPGA DESIGN

Course Objectives: The objectives of this course are

- To prepare the student to be an entry-level industrial standard FPGA designer.
- To give the student an understanding of issues and tools related to FPGA desig n and implementation.
- To give the student an understanding of basics of System on Chip and Platform based design.
- To give the student the idea of FPGA routing structures

Course Outcomes: At the end of the course the student will be able to

- Understand FPGA design flow.
- Identify the building blocks of commercially available FPGA/CPLDs.
- Develop VHDL/Verilog models and synthesize targeting for Vertex, Spartan FPGAs.
- Develop parameterized library cells and implement system designs using parameterized cells.

SYLLABUS

Introduction to FPGAs: Evolution of programmable devices, FPGA Design flow, Applications of FPGA.

Design Examples Using PLDs: Design of Universal block, Memory, Floating point multiplier, Barrel shifter.

FPGAs/CPLDs: Programming Technologies, commercially available FPGAs, Xilinx's Vertex and Spartan, Actel's FPGA, Altera's FPGA/CPLD.

Building blocks of FPGAs/CPLDs: Configurable Logic block functionality, Routing structures, Input/output Block, Impact of logic block functionality on FPGA performance, Model for measuring delay.

Routing Architectures: Routing terminology, general strategy for routing in FPGAs, routing for row – based FPGAs, introduction to segmented channel routing, routing for symmetrical FPGAs, example of routing in a symmetrical FPGA, general approach to routing in symmetrical FPGAs, independence from FPGA routing architectures, FPGA routing structures. FPGA architectural assumptions, the logic block, the connection block, connection block topology, the switch block, switch block topology, architectural assumptions for the FPGA

Text Books:

1. John V. Old Field, Richrad C. Dorf, Field Programmable Gate Arrays, Wiley, 2008.

2. Data sheets of Artix-7, Kintex-7, Virtex-7 .

3. Stephen D. Brown, Robert J. Francis, Jonathan Rose, Zvonko G. Vranesic, Field Programmable Gate Arrays, 2nd Edition, Springer, 1992.

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SPEECH PROCESSING

Course Objectives: The objectives of this course are

- To understand the basic principles of sound and speech production and perception.
- To understand basic principles of speech recognition, synthesis and dialogue systems
- To obtain an introductory overview in the field.
- To Evaluate the speech pattern similarities.

Course Outcomes: At the end of the course the student will be able to

- Model an electrical equivalent of Speech Production system.
- Convey details of a range of commonly used speech feature extraction techniques.
- Provide a basic understanding of multidimensional techniques for speech representation and classification methods.
- Familiarize you with the practical aspects of speech processing, including robustness, and applications of speech processing, including speech enhancement, speaker recognition and speech recognition.
- Design a Homomorphic Vocoder for coding and decoding of speech

SYLLABUS

Fundamentals of Digital Speech Processing: Anatomy & Physiology of Speech Organs, The process of Speech Production, Acoustic Phonetics, Articulatory Phonetics, The Acoustic Theory of Speech Production- Uniform lossless tube model, effect of losses in vocal tract, effect of radiation at lips, Digital models for speech signals.

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

Linear Predictive Coding (LPC) Analysis: Basic principles of Linear Predictive Analysis: The Autocorrelation Method, The Covariance Method, Solution of LPC Equations: Cholesky Decomposition Solution for Covariance Method, Durbin's Recursive Solution for the

Autocorrelation Equations, Comparison between the Methods of Solution of the LPC Analysis Equations, Applications of LPC Parameters: Pitch Detection using LPC Parameters, Formant Analysis using LPC Parameters.

Homomorphic Speech Processing: Introduction, Homomorphic Systems for Convolution: Properties of the Complex Cepstrum, Computational Considerations, The Complex Cepstrum of Speech, Pitch Detection, Formant Estimation, The Homomorphic Vocoder. Speech Enhancement: Nature of interfering sounds, Speech enhancement techniques: Single Microphone Approach: spectral subtraction, Enhancement by re-synthesis, Comb filter, Wiener filter, Multi microphone Approach.

Automatic Speech & Speaker Recognition: Basic pattern recognition approaches, Parametric representation of speech, Evaluating the similarity of speech patterns, Isolated digit Recognition System, Continuous digit Recognition System. Hidden Markov Model (HMM) for Speech: Hidden Markov Model (HMM) for speech recognition, Viterbi algorithm, Training and testing using HMMS. Speaker Recognition: Recognition techniques, Features that distinguish speakers, Speaker Recognition Systems: Speaker Verification System, Speaker Identification System.

Text Books:

- L.R. Rabiner and S. W. Schafer, “Digital Processing of Speech Signals”, Pearson Education.
- Douglas O’Shaughnessy, “Speech Communications: Human & Machine”, 2nd Ed., Wiley India, 2000.
- L.R Rabinar and R W Jhaung, “Digital Processing of Speech Signals”, 1978, Pearson Education.

Reference Books:

- Thomas F. Quateri, “Discrete Time Speech Signal Processing: Principles and Practice”, 1st Edition., PE.
- Ben Gold & Nelson Morgan, “Speech & Audio Signal Processing”, 1st Edition, Wiley.

SYSTEM ON CHIP DESIGN

Course Objectives: The objectives of this course are

- To introduce the architectural features of system on chip.
- To imbibe the knowledge of customization using case studies.
- To Design Memory for SOC
- To Understand the Interconnect Architectures

Course Outcomes: At the end of the course the student will be able to

- Expected to understand SOC Architectural features.
- To acquire the knowledge on processor selection criteria and limitations
- To acquires the knowledge of memory architectures on SOC.
- To understands the interconnection strategies and their customization on SOC.

SYLLABUS

Introduction to the System Approach: System Architecture, Components of the system, Hardware & Software, Processor Architectures, Memory and Addressing. System level interconnection, An approach for SOC Design, System Architecture and Complexity.

Processors: Introduction, Processor Selection for SOC, Basic concepts in Processor Architecture, Basic concepts in Processor Micro Architecture, Basic elements in Instruction handling. Buffers: minimizing Pipeline Delays, Branches, More Robust Processors, Vector Processors and Vector Instructions extensions, VLIW Processors, Superscalar Processors.

Memory Design for SOC: Overview of SOC external memory, Internal Memory, Size, Scratchpads and Cache memory, Cache Organization, Cache data, Write Policies, Strategies for line replacement at miss time, Types of Cache, Split – I, and D – Caches, Multilevel Caches, Virtual to real translation, SOC Memory System, Models of Simple Processor – memory interaction.

Interconnect Customization: Inter Connect Architectures, Bus: Basic Architectures, SOC Standard Buses, Analytic Bus Models, Using the Bus model, Effects of Bus transactions and contention time. SOC Customization:

Configuration: An overview, Customizing Instruction Processor, Reconfiguration Technologies, Mapping design onto Reconfigurable devices, Instance- Specific design, Customizable Soft Processor, Reconfiguration – overhead analysis and trade-off analysis on reconfigurable Parallelism.

Text Books:

1. Computer System Design System-on-Chip by Michael J. Flynn and Wayne Luk, Wiely India Pvt. Ltd. ARM System on Chip Architecture – Steve Furber –2nd Eed., 2000, Addison Wesley Professional.

Reference Books:

1 . Design of System on a Chip: Devices and Components – Ricardo Reis, 1st Ed., 2004, Springer

2 . Co-Verification of Hardware and Software for ARM System on Chip Design (Embedded Technology) – Jason Andrews – Newnes, BK and CDROM

3 . System on Chip Verification – Methodologies and Techniques –Prakash Rashinkar, Peter Paterson and Leena Singh L, 2001, Kluwer Academic Publishers.

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INTERNET OF THINGS AND APPLICATIONS

Course Objectives: The objectives of this course are

- To introduce the terminology, technology and its applications
- To introduce the concept of M2M (machine to machine) with necessary protocols
- To introduce the Python Scripting Language which is used in many IoT devices
- To introduce the Raspberry PI platform, that is widely used in IoT applications
- To introduce the implementation of web-based services on IoT devices.

Course Outcomes: At the end of the course the student will be

- Able to understand the application areas of IOT
- Able to realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks
- Able to understand building blocks of Internet of Things and characteristics.
- Able to design and implement IOT based systems

SYLLABUS

Introduction to Internet of Things: Definition and Characteristics of IoT, Sensors, Actuators, Physical Design of IoT – IoT Protocols, IoT communication models, IoT Communication APIs, IoT enabled Technologies – Wireless Sensor Networks, Cloud Computing, Embedded Systems, IoT Levels and Templates, Domain Specific IoTs – Home, City, Environment, Energy, Agriculture and Industry.

IoT and M2M: Software defined networks, network function virtualization, difference between SDN and NFV for IoT. Basics of IoT System Management with NETCOZF, YANG-NETCONF, YANG, SNMP NETOPEER.

Introduction to Python: Language features of Python, Data types, data structures, Control of flow, functions, modules, packaging, file handling, data/time operations, classes, Exception handling. Python packages - JSON, XML, HTTP Lib, URL Lib, SMTP Lib.

IoT Physical Devices and Endpoints: Introduction to Raspberry PI - Interfaces (serial, SPI, I2C). Programming – Python program with Raspberry PI with focus of interfacing external gadgets, controlling output, reading input from pins.

Controlling Hardware: Connecting LED, Buzzer, Switching High Power devices with transistors, Controlling AC Power devices with Relays, Controlling servo motor, speed

control of DC Motor, unipolar and bipolar Stepper motors. Sensors- Light sensor, temperature sensor with thermistor, voltage sensor, ADC and DAC, Temperature and Humidity Sensor DHT11, Motion Detection Sensors, Wireless Bluetooth Sensors, Level Sensors, USB Sensors, Embedded Sensors, Distance Measurement with ultrasound sensor.

IoT Physical Servers and Cloud Offerings: Introduction to Cloud Storage models and communication APIs. Webserver – Web server for IoT, Cloud for IoT, Python web application framework. Designing a RESTful web API.

Text Books:

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti,Universities Press, 2015, ISBN: 9788173719547
2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759.

Reference Books:

1. Peter Waher, 'Learning Internet of Things', Packt Publishing, 2015 3. Editors Ovidiu Vermesan.
2. Peter Friess,'Internet of Things – From Research and Innovation to Market Deployment', River Publishers, 2014 3. N. Ida, Sensors, Actuators and Their Interfaces, SciTech Publishers, 2014.

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ARTIFICIAL NEURAL NETWORKS

Course Objectives: To provide an insight into the basic concepts of

- To understand the artificial intelligence as representation and search and its applications representation and inference.
- situations and machine learning.
- neural networks and fuzzy systems
- different neural and synaptic dynamics

Course Outcomes: At the end of the course the student will be able to

- Understand the artificial intelligence as representation and search and its applications
- Apply knowledge representation and inference
- Understand situations and machine learning
- Examine neural networks and fuzzy systems
- Examine different neural and synaptic dynamics

SYLLABUS

Artificial Intelligence as Representation and Search: Introduction to AI, Roots and Scope of AI, Definition, Turing Test, Application Areas of AI, Predicate Calculus, Structures and Strategies for State Space Search, Heuristic Search, Control and Implementation of State Space Search.

Representation and Inference: Knowledge Representation, Strong Methods for Problem Solving, Reasoning in Uncertain

Situations, Machine Learning: Symbol-Based: Framework for Symbol – Based Learning, Version Space Search, ID3 Algorithm, Un-supervised learning, Reinforcement Learning, Connectionist: Perceptron Learning, Backpropagation Learning, Competitive Learning, Hebbian Coincidence Learning, Attractor Networks

Neural Networks and Fuzzy Systems: Neural and Fuzzy machine intelligence, fuzziness as multivalence, the dynamical-systems approach to machine intelligence, intelligent behaviour as adaptive model-free estimation.

Neural Dynamics: I. Activations and signals: Neurous as functions, signal monotonicity, biological activations and signals, neuron fields, neuronal dynamical systems, common signal functions, pulse-coded signal functions.

Neuronal dynamics II : Activation Models : neuronal dynamical systems, additive neuronal dynamics, additive neuronal feedback, additive bivalent models, BAM Connection matrices, additive dynamic and the noise-saturation dilemma, general neuronal activations : Cohen-grossberg and multiplicative models

Synaptic Dynamics: I. Unsupervised Learning: Learning as encoding, change, and quantization, four unsupervised learning laws, probability spaces and random processes, stochastic unsupervised learning and stochastic equilibrium, signal hebbian learning, competitive learning, differential hebbian learning, differential competitive learning. Synaptic Dynamics II: Supervised learning : Supervised function estimation, supervised learning as operant conditioning, supervised learning as stochastic pattern learning with known class memberships, supervised learning as stochastic approximation, the back propagation algorithm.

Text Books:

1. **"**Artificial Intelligence – Structures and Strategies for Complex Problem Solving**"**, George F. Luger, Th 4 Edition, Pearson Education , 2003.
2. Neural Networks & Fuzzy Systems, Bark Kosko, PHI Published in 1994.

Reference Books:

1. Artificial Intelligence, Knight, Tata McGraw Hill

2. Artificial Intelligence **'**a Modern Approach, Russell &Norvig, second edition, Pearson Education, 2003.

3. Fundamentals of Artificial Neural Networks, Mohamad H Hassoum, PHI
4. Neural Network Design, Hagan, Demuth and Beale, Vikas Publishing House.

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ANNEXURE-III

HSS Electives

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

INDUSTRIAL MANAGEMENT AND ENTREPRENEURSHIP

Course Objectives : The objectives of this course are

- To familiarize the students with the concepts of Management.
- To relate the concepts of Management with industrial organizations.
- To explain the factors affecting productivity and how productivity can be increased in an Industrial undertaking.
- To set forth a basic framework for understanding Entrepreneurship.

Course Outcomes: At the end of the course the student will be able to

- Understand the roles, skills and functions of management.
- Distinguish the different types of business organizations.
- Identify the factors involved in Production Operations Management.
- Diagnose organizational problems and take suitable decisions
- Establish good Human Resource Management practices.
- Acquire necessary knowledge and skills required for organizing and carrying out entrepreneurial activities.

SYLLABUS

Basic Concepts of Management: Management: Definition, Nature and Importance; Functions of the Management; Levels of Management; F.W Taylor's Scientific Management; Henry Fayol's Principles of Management.

Forms of Business Organizations: Introduction,Types of Business organizations: Private Sector- Individual Ownership , Partnership, Joint stock companies and Co-Operative organizations; Public sector- Departmental Organizations, Public Corporations and Government Companies; The Joint sector Management.

Production and operations Management: Plant location- Factors to be considered in the selection of Plant location; Break - even analysis- Significance and managerial applications; Importance of Production Planning and Control and its Functions; Human Resource Management and Functions of Human Resource Manager (in brief); Functions of Marketing; Methods of Raising Finance.

Entrepreneurship: Definition, Characteristics and Skills, Types of Entrepreneurs, Entrepreneur vs. Professional Managers, Growth of Entrepreneurs, Nature and Importance of Entrepreneurs, Women Entrepreneurs, Problems of Entrepreneurship.

Entrepreneurial Development and Project Management: Institutions in aid of Entrepreneurship Development, Idea generation: Sources and Techniques, Stages in Project formulation; Steps for starting a small enterprise - Incentives for Small Scale Industries by Government.

Text Books:

1. Sharma, S.C, and Banga, T.R., Industrial Organization & Engineering Economics, Khanna Publishers, Delhi, 2000.
2. Vasant Desai, The Dynamics of Entrepreneurial Development and Management (Planning for future Sustainable growth), Himalayan Publishing House, 2018.

Reference Books:

1. Aryasri, A.R., Management Science, McGraw Hill Education (India Private Limited New Delhi 2014.
2. Sheela, P. and Jagadeswara Rao, K., Entrepreneurship, Shree Publishing House, Guntur, Andhra Pradesh, 2017.

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ORGANIZATIONAL BEHAVIOUR

Course Objectives: The objectives of this course are

- To understand the basic concepts of organizational behaviour, its foundations and importance.
- To enable students to have a basic perspective of Motivation and Motivation theories.
- To acquaint the students about group behaviour in organizations, including communication, leadership conflicts and organizational change and how these are linked to and impact organizational performance.

Course Outcomes: At the end of the course the student will be able to

- Identifying fundamental aspects of organizational dynamics.
- Evaluate main theories of motivation and formulating suitable motivational strategies.
- Analyze the behaviour of individuals and groups in organizations.
- Understanding of Leadership theories and Leadership behaviour.
- Apply relevant theories, concepts to address important Organizational Behaviour questions.

SYLLABUS

Organizational Behaviour : Concept of Organisation - Concept of Organisational Behaviour - Nature of Organisational Behaviour - Role of Organisational behaviour - Disciplines contributing to Organisational Behaviour.

Motivation: Definition - Nature of Motivation - Role of Motivation - Theories of Motivation : Maslow's Need Hierarchy Theory, Herzberg's Motivation Hygiene Theory and Mc Gregor's Theory X and Theory Y.

Group Dynamics: Meaning - Concept of Group - Types of groups -Formal and Informal groups - Group development - Group cohesiveness and factors affecting group cohesiveness.

Leadership: Concept of Leadership - Difference between Leadership and Management - Importance of Leadership - Leadership styles: Autocratic leadership, Participative leadership and Free Rein leadership.

Communication: Meaning - Communication Process - Forms of communication: Oral, Written and Non- Verbal communication - Direction of communication : Downward, Upward and Horizontal communication.

Organisational conflicts: Concept of conflict - Reasons for conflict - Types of Conflict: Intrapersonal conflict, Interpersonal conflict, Intragroup conflict, Intergroup conflict, Interorganisational conflict - Conflict management.

Organisational Change: Nature - Factors in Organisational change -Planned change: Process of planned change - Resistance to change: Factors in resistance to change - Overcoming resistance to change.

Text Books.

1. L.M.Prasad: Organisational Beaviour, Sultan Chand & Sons, New Delhi -110002
2. K. Aswathappa: Organisational Behaviour, Himalaya Publishing House, New Delhi

Reference Books.

1. Stephen Robbins: Organizational Behaviour, Pearsons Education, New Delhi.

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OPERATIONS RESEARCH

Course Objectives:

- Formulate a real world problem as a mathematical programming model.
- Provide knowledge of optimization techniques and approaches.
- Understand and study inventory problems.
- Know the network models.
- Put on knowledge in solving replacement problems and different queueing models

Course Outcomes:

- Learned to translate a real-world problem into a mathematical formulation.
- Formulate and Solve Transportation, Assignment and sequencing problems.
- Resolve inventory problems.
- Able to solve maximum flow and shortest path problems.
- Capable to solve replacement problems and analyze queueing models.

SYLLABUS

Introduction: Definitions of Operations Research; Phases of Operations Research; Types of Operations Research models; applications, merits and demerits of Operations Research.

Allocation: Linear Programming problem formulation; Basic assumptions; Graphical solution; Simplex method; Artificial variable technique; Two phase method; Big M method; Duality principle; Primal and Dual relation.

Transportation: Formulation; Solution methods; Unbalanced transportation problems - North west corner rule; Least cost entry method; Vogel's approximation method; Optimal solution; degeneracy.

Assignment: Formulation; Variations in Assignment problem; Travelling salesman problem.

Sequencing: Sequencing of - *n* jobs through two machines; *n* jobs through three machines; *n* jobs through *m* machines; 2 jobs through *m* machines.

Inventory Control: Introduction; Types of Inventory; Inventory costs; Deterministic models - Economic order quantity (EOQ) and Economic Production Quantity (EPQ) with and without shortages; Quantity discounts; P system; Q system; Inventory control Techniques.

Network Analysis: Network definitions; Time estimates in network analysis; Labeling using Fulkerson's rule; Forward pass computations; Backward pass computations; Project management using Critical Path Method(CPM) and Programme Evaluation and Review Technique(PERT).

Replacement: Introduction, Replacement of items that deteriorate with time - Value of money unchanging and changing, Replacement of items that fail completely.

Queueing models: Introduction; Single channel poisson arrivals; Exponential service times; Unrestricted queuewith infinite population and finite population models; Multi channel poisson arrivals; Exponential service times with infinite population and restricted queue.

Text Books:

1. Hamdy A Taha, "Operations Research- An Introduction" by TAHA , Prentice Hall, 2009.
2. F.S. Hiller, G.J. Liberman,B. Nag and P.Basu "Introduction To Operations Research, Mc Graw Hill Education(India), 2012.
3. S.D.Sharma, "Operations Research", Kedarnadh Ramnadh & Co.,2017

Reference Books:

1. R. Pannerselvam, "Operations Research", PHI..
2. Richard Bronson, Schaum's Series," Operations Research", Mc Graw Hill
3. N.V.S.Raju, "Operations Research- Theory and Practice" BS publications.
4. V.K. Kapoor, "Operations Research" Sultan Chand & Sons.