19BST04: ENGINEERING MATHEMATICS – I

Credits - 4 **Sessional Marks: 30**

L: T: P:: 3: 1: 0 **University Exam Marks: 70**

Course Objectives

1. To introduce the mean value theorems and the fallouts of Rolle's Theorem that is fundamental to application of analysis to engineering problems.
2. To familiarize the students with techniques in integral calculus and introduce the idea of applying integral calculus to notations of curvature.
3. To acquaint the student with different effective mathematical tools for the solutions of differential equations that model physical processes.
4. To equip the students with standard concepts in vector calculus and its applications.

Course Outcomes

After successful completion of the course the student should be able to

CO1. Identify the extrema of a function on an interval and classify them as maxima, minima or saddle using the first derivative test.

CO2. Calculate double and triple integrals and apply to measure the area of a plane and volume of a solid.

CO3. Use the tools of Calculus to sketch the graphs of functions, Critical points, intercepts, Asymptotes etc.

CO4. Solve second and higher order linear differential equations with constant coefficients.

CO5. Analyze the methods for finding the solutions of linear differential equations.

CO6. Memorize definitions of Curl, Gradient and Divergence of vector field and compute them.

CO7. Understand the statements of Stoke's, Green's and Divergence theorem and apply them in solving Engineering problems.

UNIT I

Calculus: Roll's and Mean value theorems, Taylor's theorem, Maclaurins theorem - Maxima & minima for functions of two variables – Curve tracing.

UNIT II

Multiple integrals: Double and triple integrals, Change of order of integration, Change of variables – Simple applications – areas & volumes.

UNIT III

Differential Equations-I: Exact, Linear and Bernoulli's equations, orthogonal trajectories; Homogeneous and Non-Homogeneous linear differential equations of second and higher order with constant coefficients.

UNIT IV

Differential Equations-II: Linear equations with variable coefficients-Euler equations, Method of variation of parameters, Simultaneous equations.

UNIT V

Vector Calculus: Gradient, Divergence, Curl and related properties; Line, surface and volume integrals; Stokes, Greens and Gauss-Divergence theorems.

Text books

1. Grewal, B.S. "Higher Engineering Mathematics", Khanna Publishers, 42nd Edition.

Reference Books

1. T.K.V.Iyengar & B.Krishna Gandhi et., "Engineering Mathematics – I, II ";S. Chand & Company.

Course Outcomes – Program Outcomes (CO-PO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	H		L								
CO2	H	M		L								
CO3	H	H	M	L								
CO4	H	M	L									
CO5	H	M			L							
CO6	M	H			L							
CO7	M	H			L							

19BST02: ENGINEERING CHEMISTRY

Credits – 4 **Sessional Marks: 30**
L: T: P::3: 1: 0 **University Exam Marks: 70**

Course Objectives

1. To impart in-depth knowledge of the subject and highlight the role of chemistry in the field of engineering.
2. To strengthen the fundamentals of chemistry in Atomic Structure and then build an interface of theoretical concepts with the engineering applications.
3. To help students understand the fundamental concepts and achieve Advanced Knowledge about the interactions of Spectroscopy and solve problems related to them. An attempt has been made to logically correlate the topic with its application.
4. To Implement the concepts of chemistry in respect of Electrochemical cells, Thermodynamic process, mechanism of corrosion and factors to influence, polymers with their applications and analytical methods.
5. To understand the upcoming technologies like Fullerenes, carbonnanotubes, applications of Telecommunications in Nano materials.

Course Outcomes

After successful completion of the course the student should be able to

CO1. Explain the basic concepts of Atomic and Molecular structures and the band theory of solids.

CO2. Solve problems related to the structure , purity and to study Molecular interactions by Spectroscopic methods

CO3. Apply knowledge of Substitute metals with Conducting polymers and also produce Bio-degradable polymers to reduce Environmental Pollution

CO4. Understand the mechanism of Electro Chemical corrosion of metals ,use of appropriate design criteria and apply corrosion protection techniques.

CO5. Give idea of synthesis, characterisation of Nanomaterials and applications of latest technology on Carbon Nano wires and medicinal applications.

UNIT I

Atomic and molecular structure: Schrodinger equation. Particle in a box solutions and their applications for conjugatedmolecules and nanoparticles. Forms of the hydrogen atom wave functions and the plots ofthese functions to explore their spatial variations. Molecular orbitals of diatomic moleculesand plots of the multicentre orbitals. Equations for atomic and molecular orbitals. Energylevel diagrams of diatomics. Pi-molecular orbitals of butadiene and benzene and aromaticity. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Band structure of solids and the role of doping on band structures.

UNIT II

Spectroscopic techniques, applications and Organic reactions and synthesis of a drug molecule: Principles of spectroscopy and selection rules. Electronic spectroscopy. Fluorescence and itsapplications in medicine. Vibrational and rotational spectroscopy of diatomic molecules.Applications. Nuclear magnetic resonance and magnetic resonance imaging, surfacecharacterization techniques. Diffraction and scattering. Introduction to reactions involving substitution, addition, elimination, oxidation, reduction,cyclization and ring openings. Synthesis of a commonly used drug molecule.

UNIT III

Polymers: Mechanism of polymerization and synthesis of polymers. Molecular weight, shape andconformation of polymers. Crystallinity, melting point and glass transition.Copolymerization. Viscoelasticity. Elastomers-structure, applications and curing. Conductingpolymers and applications. Dendrimers. Solubility of polymers. Fabrication and moulding ofpolymers. Synthesis, properties and uses of PE, PVC, PMMA, formaldehyde resins,melamine-formaldehyde-urea resins. Adhesives, adhesive mechanism and applications.Composites: characteristics, types and applications. Nanocomposites. Metallic and nonmetallic fillers.

UNIT IV

Surfactants and Lubricants and Corrosion: Methods of preparation, cleaning mechanism. Critical micelle concentration and itsdetermination. Hydrophobic and hydrophilic interactions. Micelles and reverse micelles.Detergents. Fricohesity of surfactants. Lubricants-physical and chemical properties, typesand mechanism of lubrication. Additives of lubricants and freezing points of lubricants.Thermodynamic overview of electrochemical processes. Reversible and irreversible cells.Chemical and electrochemical corrosion and mechanism of corrosion. Factors affecting corrosion. Protection of corrosion and practical problems of corrosion.

UNIT V

New Materials/Nanomaterials: Nanomaterials. Properties and application of fullerenes, fullerols, carbon nanotubes andnanowires. Synthesis-top down and bottom up approaches. Nanoelectronics. Applications ofnanomaterials in catalysis, telecommunication and medicine.

Text Books

1. Jain and Jain “Engineering Chemistry”,15th Edition, Dhanapat rai publishing company.
2. K.N.Jayaveera, G.V.Subba Reddy, C.Ramachandraiah.”Engineering Chemistry”, 1st Edition, McGraw Hill Education (India) Private Limited,2013.

Reference Books

1. Jag Mohan, “Organic Spectroscopy”,2nd Edition ,Narosa Publishing house,2007.
2. V.K.Ahluwalia and Rakesh kumar Parashar.”Organic Reaction Mechanisms”,3rd Edition,Narosa Publishing House,2007.

Course Outcomes – Program Outcomes (CO-PO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**H**	**M**										
CO2		**H**	**L**		**H**							
CO3					**M**	**H**	**H**					
CO4			**H**			**H**	**L**					
CO5					**H**		**M**			**H**		

19CST01: PROGRAMMING FOR PROBLEM SOLVING

Credits – 3 **Sessional Marks: 30**

L:T:P::2:1:0 **University Exam Marks: 70**

Course Objectives

To expose the students to the following:
1. Basic concepts of computer.
2. Variables, C-Tokens and operators, functions, arrays and strings.
3. Pointers, structures, unions and files.
4. Write algorithms for solving problems with help of C programming concepts.

Course Outcomes:

After successful completion of course the student should be able to
CO1. Analyse the real time problems, develop algorithms to solve it
CO2. Use conditional branching, iteration, recursion, arrays, pointers and structures to formulate algorithms and programs in C.
CO3. Design and implement the complex problems using functions
CO4. Understanding Pointers and dynamic memory allocation
CO5. Apply the knowledge of files in different applications

UNIT I

Introduction to Problem Solving: Introduction to Computer Systems, Computer Environments, Computer Languages, Problem Solving Aspects, Top-Down Design, Bottom-Up Design, Development of Algorithms, Representation of Algorithm, Flow Chart, Pseudo Code, Coding, Testing and Debugging.

UNIT II

Introduction to C: History of C programming Language, Structure of a C program - Comments, pre-processor statements, function header statements, variable declaration statements and executable statements. C character set, C tokens-constants, identifiers, operators, punctuations and keywords. Basic data types, modifiers, identifiers, variables, C Scopes, Type qualifiers, Storage Class Specifiers, variable initializations and constants. Console I/O: Reading and writing characters, Formatted console I/O. Operators: Assignment, Arithmetic, Relational, Logical, Bitwise, Ternary, Address, Increment/Decrement, special Operators. Expressions: Precedence of operators and associativity. Category of Statements: Decision Making, Branching and Looping statements.

UNIT III

Functions: Declaration, Prototype definition, calling by value and address, Standard Library Functions, User Defined functions, Recursive Functions.

Arrays and strings: Declaration, Initialization, Reading and Writing, Accessing, and Passing as a parameter to functions, Types of arrays, String functions.

UNIT IV

Pointers: Pointer expressions, pointer and arrays, multiple indirection, initializing pointers, pointers to functions, Dynamic memory allocation functions.

Structures: Declaration, initialization, accessing, array of structures and passing structures to functions, structure pointers, arrays and structures within structures, Unions, Bit-fields, typedef, and enumerations.

UNIT V

Files: I/O and processing operations on Text and binary files, Pre-processor directives and Command Line Arguments.

Text Books

1. Brian W.Kernighan and Dennis M. Ritchie, "The C Programming Language", 2nd Edition, Prentice Hall of India, 2018.

Reference Books

1. Herbert Schildt, "C: The Complete Reference", 4th Edition, Tata McGraw-Hill, 2000.
2. E Balagurusamy, "Programming in ANSI C", 7th Edition, Tata McGraw-Hill, 2016.
3. YeswanthKanitkar, "Let us C", 9th Edition, BPB Publications, 2012.

Web References

1. https://nptel.ac.in/courses/106/105/106105171/

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	H	H	M	-	-	-	-	-	-	-	-	H	H	-
CO2	H	M	M	-	M	-	-	-	-	-	-	-	H	H	-
CO3	-	M	H	M	M	-	-	-	-	-	-	-	H	H	-
CO4	H	L	-	-	-	-	-	-	-	-	-	-	H	L	-
CO5	H	-	-	L	M	-	-	-	-	-	-	-	H	H	-

19EET01: BASIC ELECTRICAL ENGINEERING
(Common for CSE, ME & ECE Branches)

Credits – 4 **Sessional Marks: 30**

L:T:P::3:1:0 **University Exam Marks: 70**

UNIT-I

Dc Circuits: Active and passive elements – Ideal and practical sources – V –I Characteristics of R.L and C elements – Kirchhoff's laws, Mesh and nodal analysis – Concept of super mesh and super node.
Magnetic Circuits: Basic definitions, Analogy between electric and magnetic circuits, magnetization characteristics of ferromagnetic materials, self inductance, mutual inductance, energy in linear magnetic systems, coils connected in series attracting force of electro magnets. Concept of coupling and dot convention.

UNIT-II

Ac Circuits: Principle of AC voltages, wave forms and basic definitions, relationship between frequency, speed and number of poles, root mean square and average values of alternating current and voltage, form factor and peak factor, phasor representation of Alternating Quantities, the j operator and phasor algebra, analysis of AC circuits with single basic network element, single phase series circuits, single phase parallel circuits, single phase series parallel circuits, power in AC circuits.

UNIT-III

Network Theorems: Super position theorem,Thevinin's& Norton's theorem, Maximum power transfer theorems, Tellegan's Theorem, Millman's Theorem and problems.

UNIT-IV

Transformers: Principle of operation, constructional details, ideal transformer, and practical transformer, losses, transformer testing, efficiency, and regulation calculations (all the above topics are elementary treatment and simple problems).
Direct Current Machines: principle of operation of DC machines, armature windings, EMF equation in DC machines, torque production in a DC machine, operation of a DC machine as a generator, operation of a DC machine as a motor, losses and efficiency.

UNIT-V

A.C Machines
Single Phase Induction Motor: principle of operation, types of single phase induction motor and working.

Three Phase Induction Motor: principle of operation, production of rotating magnetic field, slip and rotor frequency, torque (simple problems), losses and efficiency.

Text Books

1. Basic Electrical Engineering-By M.S Naidu and S.Kamakshaiah-TMH, 2nd Edition, 2008
2. Basic Electrical Engineering-By T.K.Nagsarkar and M.S.Sukhija, Oxford University press, 2nd Edition, 2017

References

1. Theory and Problems of Basic Electrical Engineering-By D.P.Kothari&I.J.Nagrath-PHI, 2nd Edition, 2017
2. Principles of Electrical Engineering –By V.K.Mehta, S.Chand publications, Revised Edition, 2010
3. Essentials of Electrical and computer Engineering –By David V.Kems, JRJ.David Irwin Pearson, 1st Edition, 2005

19BST13: ESSENCE OF INDIAN KNOWLEDGE TRADITION

Credits – No credits
L:T:P::3:0:0

Course Objectives

1. To impart basic principles of thought process, reasoning and inferencing. Sustainability is at the core of Indian Traditional knowledge systems connecting society and nature.
2. To impart holistic life style of Yogic-science and wisdom capsules in Sanskrit literature are also important in modern society with rapid technological advancements and societal disruptions.
3. To focus on introduction to Indian knowledge System, Indian perspective of modern scientific world-view and basic principles of Yoga and holistic health care system.
4. To focuses on Indian Philosophical traditions , Indian linguistic Tradition and Indian artistic tradition.

Course Outcomes

After successful completion of course the student should be able to

CO1. The student will be able to understand, connect up and explain basics of Indian Traditional knowledge in modern scientific perspective.

UNIT I

The basic structures of Indian knowledge system: Vedas – vedangas, Upavedas – Ayurveda, Dhanurveda, Gandharvaveda, Vedic gods – Agni, Indra, Varuna, Vishnu, Importance of the study of the vedic hymns.

UNIT II

Modern sciences and Indian knowledge system: Vedic cosmology, Indian atomic theory, Matter life and Mind –Sri Aurobindo .

UNIT III

Yoga and Holistic Health Care: Mind and its Modes, Afflictions, Threefold pain, Dispositions, Levels of Attention ,
Astanga Yoga.

UNIT IV

Indian Philosophical Tradition: Asatika darshanas - Nyaya, Vaisesika, Sankhya, Yoga, Mimamsa, Vendanta. Nastika darshanas – Carvaka, Jaina Buddhism

UNIT V

Indian Linguistic and Aristic Tradition: Phonology - (sabda), Morphology (pada), syntax (vakya), Semantics,Vakhyartha, Chitrakala, Murthikala, vasthukala

Reference Books

1. S. Radha Krishna , Indian Philosophy ,Oxford Indian Paper backs, New Delhi.
2. V.SivaramaKrishnan (Ed.), Cultural Heritage of Indian - course material , Bharatiya Vidya Bhavan ,Mumbai. 5th Edition, 2014

3. Smami Jitatmanand , Modern Physics and Vedant , Bhartiya Vidya Bhavan.
4. Smami Jitatamanad , Holistic Science and Vedant , Bhartiya Vidya Bhavan.
5. Fritz of capra ,Tao of Physics.
6. Fritz of capra ,The Wave of Life
7. VN Jha (Eng. Trans.), Tarkasangraha of Annam Bhatta , International Chinmay Foundation ,Velliarnad,Arnakulam .
8. Yoga Sutra of Patanjali, Ramakrishna Mission, Kolkata .
9. GN Jha (Eng. Trans.), Ed. RN Jha , Yoga-darshanam with Vyasa Bhashya, Vidyanidhi Prakashan , Delhi 2016.
10. RN Jha, Science of Consciousness Psychotherapyand Yoga Practices, Vidyanidhi Prakashan ,Delhi 2016
11. PB Sharma (English translation), Shodashang Hridayan .

19BSP02: ENGINEERING CHEMISTRY LAB

Credits – 1 **Sessional Mark: 40**
L: T: P::0: 0: 2 **University Exam Marks: 60**

Course Objectives

1. To impart practical knowledge about some practical phenomena they have studied in the engineering Chemistry course.
2. To develop the experimental skills of the students.

Course Outcomes

After successful completion of the course the student should be able to
CO1. Understand the estimation of the acidity of water, Dissolved Oxygen in different water samples, estimation of chloride content of water and some ions etc.
CO2. Analyse and to measure the conductance and redox potentials of different solutions.
CO3. Develop knowledge pertaining to the appropriate selection of instruments for the successful analysis of complex mixture.
CO4. Apply the knowledge of various aspects of synthesis of drug

LIST OF EXPERIMENTS
(Minimum Seven are mandatory)

1. To determine the strength of KMnO4 solution by titrating it against a standard solution of Oxalic acid.
2. Determination of hardness of water by EDTA method.
3. Estimation of acidity of Water.
4. Estimation of Dissolved oxygen in water sample.
5. Determination of Iron by using potassium dichromate.
6. Estimation of copper by EDTA method.
7. Estimation of chloride in water sample.
8. Conductometric titration of strong acid with strong base.
9. Potentiometric titration of Iron by dichrometry method.
10. Colorimetric estimation of manganese
11. Synthesis of a polymer/ drug.
12. Thin layer chromatography.

Course Outcomes – Program Outcomes (CO-PO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H											
CO2		H										
CO3					H							
CO4						H						

19CSP01: PROGRAMMING FOR PROBLEM SOLVING LAB

Credits – 2 **Sessional Marks: 30**

L:T:P::0:0:4 **University Exam Marks: 70**

List of Experiments

1. Write a C program to display "Hello Computer" on the screen.
2. Write a C program to display Your Name, Address and City in different lines.
3. Write a C program to find the area of a circle
4. Write a C program to convert centigrade into Fahrenheit. Formula: C= (F*32)/1.8.
5. Write a C program to read in a three-digit number produce following output (assuming that the input is 347) 3 hundreds 4 tens 7 units
6. Write a C program to read in two integers and display one as a percentage of the other. Typically, your output should look like 20 is 50.00% of 40 assuming that the input numbers were 20 and 40. Display the percentage correct to 2 decimal places.
7. Write a C program to swap variable values of i and j.
8. Write the program for the simple, compound interest.
9. Write a C program to find the maximum from given three nos.
10. Write a C program to find that the accepted no is Negative, Positive or Zero.
11. Write a program which reads two integer values. If the first is lesser print the message up. If the second is lesser, print the message down if they are equal, print the message equal if there is an error reading the data, print a message containing the word Error
12. Given as input three integers representing a date as day, month, year, print the number day, month and year for the next day's date. Typical input: “28 2 1992” Typical output: “Date following 28:02:1992 is 01:03:1992”
13. Write program for students marks grading.
14. Take three coefficients (a, b, and c) of a Quadratic equation ($ax^2+bx+c=0$) as input and compute all possible roots. Implement a C program to output the possible roots for a given set of coefficients with appropriate messages.
15. Implement a C program that takes an integer number as input, check whether it is PALINDROME or NOT and output the reverse of the same with suitable messages. Ex: Num: 2014, Reverse: 4102, Not a Palindrome.
16. Implement a C program to find the square root of a given number N and execute for all possible inputs with appropriate messages. Note: Don’t use library function sqrt(n).
17. Design and develop a C program to read a year as an input and find whether it is leap year or not. Also consider end of the centuries.
18. Design and develop a C function RightShift(x, n) that takes two integers x and n as input and returns value of the integer x rotated to the right by n positions. Assume the integers are unsigned. Write a C program that invokes this function with different values for x and n and tabulate the results with suitable headings.
19. Design and develop a C function isprime (num) that accepts an integer argument and returns 1 if the argument is prime, a 0 otherwise. Write a C program that invokes this function to generate prime numbers between the given range.
20. Write a C program for the problem given below: Assume that the United States of America uses the following income tax code formula for their annual income: First US$ 5000 of income: 0% tax Next US$ 10,000 of income: 10% tax Next US$ 20,000 of income: 15% tax. An amount above US$ 35,000: 20% tax. For example, somebody earning US$ 38,000 annually would owe US$ 5000 X 0.00 + 10,000 X 0.10 + 20,000 X 0.15 + 3,000 X 0.20, which comes to US$ 4600. Write a program that uses a loop to input the income and calculate and report the owed tax amount. Make sure that your calculation is mathematically accurate and that truncation errors are eliminated.
21. Write a C program to convert decimal to binary.
22. Write a C program to convert decimal to octal.

23. Write a C program to convert decimal to hexadecimal.
24. Write a C program that reads in integers until a 0 is entered. If it encounters 0 as input, then it should display:
    a. The total number of even and odd integers
    b. Average value of even integers
    c. Average value of odd integers.

    Note: Use switch statement for selection.
25. Write an interactive program to generate the divisors of a given integer.
26. Write a program to find all Armstrong number in the range of 0 and 999 Hint: An Armstrong number of three digits is an integer such that the sum of the cubes of its digits is equal to the number itself. For example, 371 is an Armstrong number since 3**3 + 7**3 + 1**3 = 371.
27. Write a program to check whether a given number is a perfect number or not. Hint: A positive integer n is called a perfect number if it is equal to the sum of all of its positive divisors, excluding n itself. For example, 6 is a perfect number, because 1, 2 and 3 are its proper positive divisors and 1 + 2 + 3 = 6. The next perfect number is 28 = 1 + 2 + 4 + 7 + 14. The next perfect numbers are 496 and 8128.
28. Write a program to check whether given two numbers are amicable numbers or not. Hint: Amicable numbers are two numbers so related that the sum of the proper divisors of the one is equal to the other, unity being considered as a proper divisor but not the number itself. Such a pair is (220,284); for the proper divisors of 220 are 1, 2, 4, 5, 10, 11, 20, 22, 44, 55 and 110, of which the sum is 284; and the proper divisors of 284 are 1, 2, 4, 71, and 142, of which the sum is 220.
29. Write a program that will take as input a set of integers and find and display the largest and the smallest values within the input data values.
30. Write a C program that uses functions to perform the following operations: i. To insert a sub-string in to a given main string from a given position. ii. To delete n Characters from a given position in a given string.
31. Write a C program to do the following computation by providing the option using the switch statement:
    a. Add two matrices
    b. Subtract two matrices
    c. Multiply two matrices
32. Write a program to check if the given matrix is magic square or not.
33. Write a program print the upper and lower triangle of the matrix.
34. Write a program to compute transpose of a matrix.
35. Write a program to find the inverse of a matrix.
36. Using recursion, (i) Find the factorial of a number (ii) Find Greatest Common Divisor (GCD) of two numbers (iii) To generate Fibonacci sequence (iv) Reverse ‘n’ characters.
37. Write a C program to convert a Roman numeral to its decimal equivalent.
38. Write a program to convert a given lowercase string to upper case string without using the inbuilt string function.
39. Write a program to count number of vowels, consonants and spaces in a given string.
40. Define a structure that will hold the data for a complex number. Using this structure, please write a program that will input two complex numbers and output the multiple of the two complex numbers. Use double variables to represent complex number components. Note: A complex number z is a number of the form z = a + bi where a and b are real numbers. The term a is called the real part of z and b is called the imaginary part of z. The multiplication operation on complex numbers is defined as: (a + bi) * (c + di) = (ac - bd) + (ad + bc)i
41. Write a function that will return the length of a character string. You are not allowed to use the strlen C library function. Note: Use “Pointers” concept
42. Write a function that returns the minimum and the maximum value in an array of integers.
43. Write a C program to merge two files into a third file (i.e., the contents of the first file followed by those of the second are put in the third file)

44. Write a program that prompts the user the name of a file and then counts and displays the number of bytes in the file. And create a duplicate file with the word '.backup' appended to the file name. Please check whether file was successfully opened, and display an error message, if not.
45. Write a program to create a file, open it, type-in some characters and count the number of characters in a file.
46. Write a program that will input a person's first name, last name, SSN number and age and write the information to a data file. One person's information should be in a single line. Use the function fprintf to write to the data file. Accept the information and write the data within a loop. Your program should exit the loop when the word 'EXIT' is entered for the first name. Remember to close the file before terminating the program. Hint: Use the function strcmp() to compare two strings.

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	M	H	H	L	M	-	-	L	-	-	-	-	M	H	L
CO2	H	L	L	-	-	-	-	L	-	-	-	-	M	H	L
CO3	M	L	-	M	L	-	-	L	-	L	-	-	M	H	L
CO4	-	H	L	-	L	-	-	L	-	-	-	-	M	H	L
CO5	-	-	M	-	L	-	-	L	-	-	-	-	M	H	L

19MEP01: ENGINEERING GRAPHICS LAB
(Common to all branches)

Credits – 3 **Sessional Marks: 40**
L: T: P:: 0:0:6 **University Exam Marks: 60**

Course Objectives

To expose the students to the following

1. Develop the graphic skills for communication of concepts, ideas and design of engineering products.
2. Expose them to existing national standards related to technical drawings.
3. Develop skills in three-dimensional visualization of engineering component.
4. Learn sketching and taking field dimensions.
5. Take data and transform it into graphic drawings.
6. Learn basic engineering drawing formats, basic AutoCAD skills & draw 2D drawings in Auto CAD.

Course Outcomes

After successful completion of course the student should be able to

CO1. Prepare drawings as per standards.
CO2. Solve specific geometrical problems in plane geometry involving lines, plane figures and special Curves.
CO3. Produce orthographic projection of engineering components working from pictorial drawings.
CO4. Student's ability to perform basic sketching techniques will improve.
CO5. Students will be able to draw projections and sections, ability to produce engineered drawings will improve, will become familiar with Auto-CAD two-dimensional practice and standards.
CO6. Students will develop good communication skills and teamwork.

Part A

Introduction to Engineering Drawing: Principles of Engineering Graphics and their Significance, Dimensioning principles, Conventions in Drawing.
Conics Sections: Ellipse - Eccentricity method, Arcs of circles Method, Oblong method and Four Center Method;
Parabola - Eccentricity method, Rectangular method, Tangent method.
Hyperbola - Eccentricity method, Rectangular Hyperbola.

Principles of Projections: Principles of Orthographic Projections and Conventions.
Projection of Points, Projection of Lines (first angle projection only) inclined to both planes.

Projections of Planes: Projections of regular Planes (Triangle, Square, Rectangle, Pentagon, Hexagon and Circle) in simple position, inclined to both the planes.

Part B (Using AutoCAD)

Projections of Solids: Projections of right regular solids (Cube, Prism, Pyramid) in simple position, inclined to both the planes.
Isometric Projections: Isometric projection of right regular solids (Cube, Prism, Pyramid, Sphere). Conversion of given isometric views to orthographic views of simple objects.

Text Books

1. N.D. Bhat / Charotar, "Engineering Drawing", New edition.
2. K.L. Narayana and Kannaiah, "Engineering Drawing", Scitech Publishers.

Reference Books

1. Venugopal K, “Engineering Drawing and Graphics”, New Age International.
2. P.J. Shah, “Engineering drawing’, S. Chand.
3. Johle, “Engineering Drawing’, Tata McGraw Hill.

Course Outcomes - Program Outcomes - Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	H									M			H		
CO2		H	L							M			H	M	
CO3		L	M	H						M				H	
CO4	H									M			H	M	
CO5			M	H	L					M				M	
CO6					L				H	M			H		

19BST05: ENGINEERING MATHEMATICS – II

Credits - 4 **Sessional Marks: 30**

L: T: P :: 3: 1: 0 **University Exam Marks: 70**

Course Objectives

1. Provides an introduction to Laplace Transforms
2. To Gain knowledge of matrices in a comprehensive manner and the convergence of series.
3. To Familiarize numerical methods for solving first-order IVPs
4. To introduce partial differential equations and make the student get acquainted with the basics of PDE.

Course Outcomes

After successful completion of the course the student should be able to

CO1. Define Laplace transforms, Rank, Eigen Values and Eigen vectors, absolute and Conditional convergence

CO2. Understand Convolution theorem, Linear Dependence and Independence, Convergence and Divergence of sequences and series, Basic concepts of formation of Partial differential equations.

CO3. Apply Laplace transforms to solve ordinary differential equations and use appropriate numerical method to solve algebraic, Transcendental equations, ordinary differential equations.

CO4. Determine the Laplace transforms of standard functions and evaluate a definite integral numerically and demonstrate that any square matrix satisfy its characteristic polynomial and evaluate its minimal polynomial

CO5. Derive one – dimensional wave equation, Heat equation and Laplace equation

UNIT I

Laplace Transforms: Laplace transforms of standard functions, Transform of Periodic functions, Step function, Inverse transforms of derivatives and integrals, Convolution theorem, applications to solutions of ordinary differential equations.

UNIT II

Matrices: Rank, solution of system of linear equations, Eigen values, Eigen vectors, Cayley Hamilton theorem, Quadratic forms – Diagonalization.

Sequences and Series: Convergence and Divergence, Ratio test, Comparison test, Absolute and Conditional Convergence.

UNIT III

Partial Differential Equations: Formation of PDEs by elimination of arbitrary constants and arbitrary functions, Method of separation of variables, one dimensional wave equation, heat equation, Laplace equation.

UNIT IV

Solution of Algebraic and Transcendental Equations: The Bisection Method – The Method of False Position– Newton-Raphson Method, Solution of linear simultaneous equation by Gauss elimination method, Gauss matrix and Gauss – Seidal iteration method.

Interpolation: Newton's forward and backward interpolation formulae – Lagrange's formulae.

UNIT V

Numerical Integration: Trapezoidal rule – Simpson's 1/3 Rule – Simpson's 3/8 Rule.

Numerical solution of Ordinary Differential equations

Solution by Taylor's series-Picard's Method of successive Approximations-Euler's Method, Runge-Kutta Methods, Predictor-Corrector Method-Milne's Method.

Text books

1. Grewal, B.S. Higher Engineering Mathematics, Khanna Publishers, 42nd Edition.

Reference Books

1. T.K.V.Iyengar & B.Krishna Gandhi et., "Engineering Mathematics –I, II"; S. Chand & Company.

Course Outcomes – Program Outcomes (CO-PO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M			L							
CO2	M	H			L							
CO3	H	L			M							
CO4	H	M			M							
CO5	M	H			L							

19BST03: ENGINEERING PHYSICS

Credits – 4 **Sessional Marks: 30**
L: T: P::3: 1: 0 **University Exam Marks: 70**

Course Objectives

1. To understand this course is at the end of the course the students would be exposed to fundamental knowledge in various engineering subjects and applications.
2. To know the acquaintance of basic physics principles would help engineers to understand the vital role played by science and engineering in the development of new technologies.
3. To Familiarize basic concepts of quantum mechanics, semiconductors and superconductors will lead the students to solve some basic problems in the higher levels of their respective courses.
4. To Gain Knowledge of upcoming technologies like laser technology, fiber optics and Nanotechnology.

Course Outcomes

After successful completion of the course the student should be able to

CO1. Explain the basic concepts of Quantum Mechanics and the band theory of solids.

CO2.Learn and to apply the basic concepts of properties of matter in day to day life.

CO3. Learn the types of Semiconductors and the role of carrier concentrations in conductivity. Understand the behaviour of materials at low temperatures and the applications of Super conductivity.

CO4. Understand the use of lasers in Engineering Science, Medicines & apply the concepts of optical fibre in communication systems.

CO5. Get a basic understanding of Nanotechnology. The course will give idea of synthesis, characterisation of Nano materials and electrical & optical properties, applications of Nano systems.

UNIT I

Quantum Mechanics and Conducting Material: Introduction-wave nature of particles-De-Broglie Hypothesis-Time dependent and independent Schrodinger wave equation-Physical signification of wave function-particle in one dimensional infinite potential well-Heisenberg Uncertainty principle-Classical free electron theory-quantum free electron theory-Fermi Dirac Distribution.

UNIT II

Properties of Matter: Elasticity– Stress-strain diagram and its uses - factors affecting elastic Modulus and tensile strength – Torsion stress and deformations– twisting couple - torsion pendulum :theory and experiment -bending of beams- bending moment – cantilever: theory and experiment – uniform and non-uniform bending: theory and experiment - I-shaped girders - stress due to bending in beams.

UNIT III

Semiconductors and Superconductors: Semiconductors: Semiconducting materials: Intrinsic and extrinsic semiconductors – carrier concentration derivation – Fermi level – variation of Fermi level with temperature in intrinsic – electrical conductivity for intrinsic semiconductor –Hall Effect.

Superconductivity: Introduction - effect of magnetic field- Meissner effect- Types of superconductors - Flux quantization - Magnetic Levitation - BCS theory - Josephson Effect - Application of superconductors.

UNIT IV

Laser& Fiber Optics: Lasers: Einstein's theory of matter radiation interaction and A and B coefficients; Amplification of light by population inversion, different types of lasers: He-Ne Gas Laser, Ruby Laser - Coherence -applications in engineering science and medicine.

Fiber Optics: Light propagation through fibers –Acceptance angle – numerical aperture – types of fibers – step index, graded index – single mode, multimode – attenuation – dispersion– LED-Detector- application of fiber optics in communication

UNIT V

Nanotechnology: Origin of Nanotechnology, Nano Scale, Surface to Volume Ratio, Quantum Confinement, Bottom-up Fabrication: Sol-gel, Precipitation, Combustion Methods; Top-down Fabrication: Chemical Vapour Deposition, Physical Vapour Deposition, Pulsed Laser Vapour Deposition Methods, Characterization(TEM)-Carbon Nan tubes (OD,1D,2D and 3D) – Applications.

Text Books

1. Avadhanulu M. N., "Engineering Physics", S. Chand & Co., 2007
2. K.Thiyagarajan,"Engineering Physics" McGraw Hill Education (India) Private Limited.

Reference Books

1. Gaur R K, Gupta S L, "Engineering Physics", Dhanpat Rai Publications, 2013.
2. R.Murugesan, Kiruthiga Sivaprasath,"Modern Physics"S.Chand&Company Pvt.Ltd, 2014.
3. Pillai, S.O., "Solid State Physics", New Age International Publication, New Delhi, Seventh Edition, 2015.

Course Outcomes – Program Outcomes (CO-PO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M										
CO2			H		M							
CO3			M			H	L					
CO4					H					H		
CO5				H			M				H	

19BST01: FUNCTIONAL ENGLISH

Credits – 3 **Sessional Marks: 30**
L: T: P::3: 0: 0 **University Exam Marks: 70**

Course Objectives

1. To develop the knowledge of communicative grammar, enhance lexical capabilities by extensive practice exercises, build the vocabulary, and develop skimming and scanning skills using reading materials on different topics.
2. To enhance professional competence in reading, writing, listening and speaking.
3. To switch the approach from providing information about the language to use the language.
4. To minimize the Grammar Translation Method of ELT while trying to replace it with Direct Method.
5. To introduce Communicative Method of ELT and focusing the teaching pedagogy on the student-centered learning rather than on the teacher-centered learning.

Course Outcomes

After successful completion of the course the student should be able to

CO1. Analyze the usage of English words in different contexts and acquire considerable flair in using broad range of vocabulary.

CO2. Upgrade comprehension of technical and academic articles and recognize writings as a process rather than a product.

CO3. Identify common errors in various parts of English and give effective expression in oral and written communication.

CO4. Explore various grammatical units of English and design a language component critically and coherently to meet desired needs within the realistic constraints.

UNIT I

The Secret of Work by Swami Vivekananda: Vocabulary Building: Root words from foreign languages and their use in English;Writing: Tenses; Identifying Common Errors: Subject-Verb agreement; Reading Comprehension.

UNIT II

Reaching for the Stars: Kalpana Chawla: Vocabulary Building: Word Formation; Writing: Sentence Structures, Use of phrases and clauses in sentences; Identifying Common Errors: Noun-Pronoun Agreement; Reading Comprehension.

UNIT III

A Retrieved Reformation by O. Henry: Vocabulary Building: Acquaintance with prefix and suffix from foreign languages in English to form derivatives; Writing: Importance of proper punctuation, Creating Coherence, Describing; Identifying Common Errors: Misplaced Modifiers; Reading Comprehension.

UNIT IV

Water: The Elixir of Life by C.V. Raman: Vocabulary Building: Synonyms and antonyms; Writing: Paragraph writing, Précis Writing;Identifying Common Errors: Articles, Prepositions; Reading Comprehension.

UNIT V

The Post Office by Rabindranath Tagore: Vocabulary Building: Standard Abbreviations; Writing: Letter Writing; Identifying Common Errors: Use of Adjectives; Reading Comprehension.

Reference Books

1. Michael Swan, "Practical English Usage", OUP. 1995.
2. F.T. Wood, "Remedial English Grammar", Macmillan. 2007.
3. William Zinsser, "On Writing Well", Harper Resource Book. 2001.
4. Liz Hamp-Lyons and Ben Heasly. "Study Writing", Cambridge University Press. 2006.
5. Sanjay Kumar and PushpLata. "Communication Skills", Oxford University Press. 2011.

Course Outcomes – Program Outcomes (CO-PO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO12
CO1		H								M		L
CO2				M						H		M
CO3									M	H		L
CO4				M						H		M

19BST08: ECONOMICS AND ACCOUNTANCY

Credits – 4 **Sessional Marks: 30**
L:T:P::3:1:0 **University Exam Marks: 70**

Course Objectives

1. To impart in-depth knowledge of the subject and highlights the role of the economics, finance & accountancy in the field of engineering.
2. To strengthen the fundamentals of demand analysis & production function.
3. To estimate demand, price-output in different market structures.
4. To select the different investment alternatives
5. To know the financial position of the companies

Course Outcomes

After successful completion of the course the student should be able to

CO1. Define law of demand, assumption, production function & different types of costs
CO2. Apply demand forecasting techniques & BEP for estimation of demand & production
CO3. Identify the price-output in different competitions
CO4. Determine the feasible investment alternative.
CO5. Analyse the financial position of the company through ratio analysis.

UNIT I

Introduction to Economics: Economics – Micro & Macro Economics – Definitions - Significance & Limitations. Demand Analysis: Law of Demand, Demand Determinants. Elasticity of Demand: Definition, Types and Demand Forecasting methods.

UNIT II

Theory of Production: Firm and Industry – Production Function – Cobb Douglas Production function – Laws of returns – internal and external economies of scale. Break-Even Analysis: Concept of Break-even point (BEP) – Significance of BEP – Limitation - Assumptions - Break-even chart – Determination of BEP in volume and value (Simple problems).

UNIT III

Cost Analysis: Cost concepts, Fixed Vs Variable costs, explicit Vs implicit costs, Out-of-pocket costs Vs imputed costs and Opportunity cost. Introduction to Markets, Market structure, types of competition, features of Perfect competition, Monopoly, Monopolistic competition – Price output determination.

UNIT IV

Fundamentals of finance and Capital Budgeting: Capital and its significance – Types of Capital, Estimation of Fixed and Working Capital, requirements and methods of raising capital. Capital Budgeting Methods: Pay back method, Accounting Rate of Return (ARR) and Net Present Value (NPV) and IRR methods (Simple Problems).

UNIT V

Introduction to Financial Accounting and Financial Analysis: Double Entry Book Keeping – Journal, Ledger, Trial Balance, Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments. Ratio Analysis: Computation of Liquidity ratios (Current ratio and quick ratio), Activity

Ratios (Inventory Turnover ratio, Debtors Turnover ratio) Capital Structure Ratios (Debt-equity Ratio and Interest Coverage ratio) and Profitability Ratios (Gross Profit ratio, Net Profit Ratio, Operating Ratio, P/E Ratio and EPS) Analysis and interpretation.

Text Books

1. Joel Dean, Managerial Economics, PHI 2001
2. James C. Van Home, Financial Management Policy
3. I.M. Pandy, Financial Management, PHI

Course Outcomes – Program Outcomes (CO-PO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			**H**								**M**	**L**
CO2				**M**	**H**							**L**
CO3			**L**								**M**	
CO4				**L**	**M**						**H**	**L**
CO5				**M**							**H**	**L**

19BSP01: COMMUNICATIVE ENGLISH LAB

Credits -1 **Sessional Marks: 40**
L: T: P::0: 0: 2 **University Exam Marks: 60**

Course Objectives

1. To enhance communicative skills of the students with emphasis on Listening, Speaking, Reading and Writing skills.
2. To develop oral communication and fluency in Group Discussions, Just a Minute and Debates.
3. To enable the student to acquire the structure of written expressions required for their profession.
4. To enable the student to communicate in English for Academic and Social purpose.

Course Outcomes

After successful completion of the course the student should be able to

CO1. Learn English speech sounds, analyze phonetic transcriptions
CO2. Understand the stress on word accent, intonation, and rhythm to acquire better pronunciation.
CO3. Acquire fluency in spoken English and neutralize mother tongue influence.
CO4. Upgrade listening skills and receive and interpret messages in the communication process.
CO5. Become active participants in the learning process and acquire proficiency in both ways of communication

UNIT I

Phonetics

i) Phonetics: Importance ii) Speech Sounds - Vowels and Consonants iii) Phonetic Transcriptions

UNIT II

Pronunciation:i) Word Stress and Rhythm ii) Intonation: Rising tone, Falling tone.

UNIT III

Oral Communication:i) Group Discussions ii) Just a minute (JAM) iii) Debate iv) Situational Dialoguesv) Oral Presentations

UNIT IV

Listening Skills

UNIT V

Resume Writing, Interview Skills

Reference Books

1. Nira Konar, "English Language Laboratories: A Comprehensive Manual". PHI Learning Pvt. Ltd., 2011.
2. Michael Swan, "Practical English Usage", OUP. 1995.
3. William Zinsser, "On Writing Well", Harper Resource Book. 2001.
4. Liz Hamp-Lyons and Ben Heasly. "Study Writing, Cambridge University Press. 2006.
5. Sanjay Kumar and Pushp Lata. "Communication Skills", Oxford University Press. 2011.
6. Central institute of English & Foreign Languages. "Exercises in Spoken English. Parts. I-III", Hyderabad. Oxford University Press.

Course Outcomes – Program Outcomes (CO-PO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		H		M						L		
CO2		L		M						H		
CO3				M						H		
CO4		M								H		
CO5				L						H		M

19BSP03: ENGINEERING PHYSICS LAB

Credits - 1 **Sessional Marks: 40**
L: T: P::0: 0: 2 **University Exam Marks: 60**

Course Objective

1. To impart practical knowledge about some practical phenomena they have studied in the engineering physics course.
2. To develop the experimental skills of the students.

Course Outcomes

After successful completion of the course the student should be able to

CO1. Apply knowledge of mathematics and physics fundamentals and an Instrumentation to arrive solution for various problems.

CO2. Understand the usage of basic laws and theories to determine various properties of the materials given.

CO3. Apply the theories learnt and the skills acquired to solve real time problems.

CO4. Carryout experiments to understand the laws and concepts of physics.

LIST OF EXPERIMENTS
(Minimum Six are mandatory)

1. Determination of Numerical aperture and bending losses of fibers of an optical fiber.
2. Young's modulus - non uniform bending – Pin and microscope
3. Calibration of voltmeter / ammeter using potentiometer
4. Spectrometer-Dispersive power of prism /grating.
5. Spectrometer- Determination of refractive index of given liquid using Hollow Prism.
6. Laser-Determination of wavelength.
7. Air Wedge- Determination of thickness of given thin wire.
8. V-I Characteristics of PN Junction diode.
9. Energy Gap Determination of a PN Junction Diode
10. Determination of surface tension of the given liquid-drop weight method.

Course Outcomes – Program Outcomes (CO-PO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H											
CO2		H										
CO3			H									
CO4	H				H					H		

19MEP03: WORKSHOP AND MANUFACTURING PRACTICES LAB
(Common for all Branches)

Credits – 2 **Sessional Marks: 40**
L:T:P ::0:0:4 **University Exam Marks: 60**

Course Objectives
To expose the students to the following
1. Understand the basic knowledge of Workshop Practice and Safety.
2. Identify and use of different hand tools and other instruments like Hand Saw, Jack Plane, Chisels etc and operations like such as Marking, Cutting etc used in manufacturing processes.
3. Get hands on practice in various machining metal joining processes such as turning, facing,fitting , Soldering, etc.
4. Gain basic knowledge on Computer hardware and Software.

Course Outcomes
After successful completion of course the student should be able to
CO1. Gain basic knowledge of Workshop Practice and Safety useful for our daily living.
CO2.Identify Instruments of a pattern shop like Hand Saw, Jack Plain, Chisels etc and Performing Operations such as Marking, Cutting etc used in manufacturing.
CO3.Gain knowledge of the various operations in the Fitting Shop using Hack Saw, various files, Scriber etc., to understand the concept of tolerances applicable in all kind of manufacturing.
CO4.Known and identify the computer hardware,assembly and disassemble the CPU.
CO5.Obtain the knowledge toinstallation of software's for different applications.

TRADE 1: CARPENTARY
Wood sizing exercise in planning, marking, sawing, chiseling and grooving to prepare
1. Cross Lap Joint.
2. Bridle Tee Joint.

TRADE 2: FITTING
Marking, cutting and filing to practice
1. Square Fitting.
2. V Fitting.

TRADE 3: ELECTRICAL & ELECTRONICS
Safety rules and practices in wiring, basic circuits common house wiring connections such as
1. Identification of basic electrical and electronic components.
2. (a) Two-switches, two-bulbsinparallel connection.
   (b)Staircase connection.
3. Soldering process.

TRADE 4: MANUFACTURING PRACTICE ON LATHE
1. Facing operation
2. Straight turning and Chamfering.

TRADE 5: INFORMATION TECHNOLOGY
1. Assembly and disassembly of CPU and component identification.
2. Software installation.

Reference Books
1. K. Venkat Reddy, Workshop Manual, BS Publications
2. P.Kannaiah, K.L.Narayana -Work shop Manual -SciTech Publishers.

3. Jeyapoovan, SaravanaPandian-Engineering Practices Lab Manual -Vikas publishers

Course Outcomes - Program Outcomes - Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H				M			L		M			H	M	
CO2	H	H	L							M			H	M	
CO3	H					M				M		L	M	M	
CO4	L	M			H					M			H	M	
CO5	H				L	M				M			H	M	

19EEP01: BASIC ELECTRICAL ENGINEERING LABORATORY

Credits – 1 **Sessional Mark: 40**
L: T: P: 0:0:2 **University Practical Exam Marks: 60**

Course Objectives:

1. To provide hands on experience to the students so that they are able to put theoretical concepts to practice.
2. To find the circuit response using KVL, KCL and various network theorems.
3. To conduct OC and SC test on single phase transformer.
4. To learn about various test conditions on DC shunt motor

Course Outcomes:

After completion of the course the student will able to

CO1. Apply suitable theorems for circuit analysis and verify the results theoretically.
CO2. Experimentally determine self inductance, mutual inductance and coefficient of coupling
CO3. Analyze the performance of DC shunt motor, single phase transformer.
CO4. Verify KVL and KCL in a series and parallel resistive network.
CO5. Draw current locus diagrams

LIST OF EXPERIMENTS

1. Verification of KVL and KCL in a series and parallel resistive network.
2. Determination of coefficient of coupling of a coupled circuit.
3. Verification of Superposition Theorem.
4. Verification of Thevenin's Theorem.
5. Verification Norton's Theorem.
6. Verification of Maximum power transfer theorem with DC source.
7. Verification of Millman's Theorem
8. OC and SC test on single phase transformer.
9. Brake test on DC shunt motor.
10. Swinburne's tests on DC shunt motor.

Course Outcome-Program Outcome- Program Specific Outcomes (CO-PO-PSO) Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M	H	M	-	-	-	-	-	-	M	-	L	H	M	-
CO2	M	H	M	M	-	-	-	-	-	M	-	-	M	H	-
CO3	M	H	M	M	-	-	-	-	-	M	-	-	M	H	-
CO4	H	M	M	M	-	-	-	-	-	M	-	-	H	H	-
CO5	H	H	M	-	-	-	-	-	-	M	-	-	-	H	-

19ECT03: ANALOG ELECTRONICS

Credits - 4 **Sessional Marks: 30**

L: T: P::3:1:0 **University Exam Marks: 70**

Course Objectives

1. To Learn the principles, of different multistage and poweramplifiers.
2. To Familiarize with the concept of Feedback amplifiers and effects of Negative Feedback.
3. To compare the characteristics of different wave shapingcircuits.
4. To Study different types of oscillators and Multivibrators.
5. To Learn the principle and operation of different time basegenerators.

Course Outcomes

After successful completion of the course the student should be able to
CO1:.Classify different multistage, power and feedback amplifiers, oscillators, Time Base generators, Waveshaping circuits.
CO2. Analyze Feedback amplifiers, Oscillators, Astable, Bistableand Monostable circuit using BJT's.
CO3. Evaluate the conversion efficiency of Class A,B,AB Amplifiers,
CO4. Calculate Rise time andTilt of waveshapingcircuits .
CO5. Compare different power amplifiers, time base generators and wave shaping circuits.

UNIT I

Multistage Amplifiers: Types of Coupling, choice of Amplifier configuration, overall voltage gain and Bandwidth of n stage amplifier, Darlington and Bootstrapcircuits.
Power Amplifiers: Class-A large signal amplifier, Transformer coupled audio power amplifier, Push pull amplifier, Class B amplifier, Class AB operation Complementary symmetry power amplifier.

UNIT II

Feedback Amplifiers: Feedback concept, classification, Effects of negative feedback on gain, Stability, Noise, Distortion, Bandwidth, Input and Output resistances, Different types of feedback circuits without analysis .some practical circuits, voltage amplifiers, current amplifiers, Trans-resistance amplifier, Trans –conductance amplifier.

UNIT III

Wave shaping circuits : Types of waveforms, Characteristics of pulse waveforms. RC low pass and high pass circuits, their responses for step, pulse and square wave inputs, Rise time, Tilt, Diode as a switch, Diode clipper and clamper circuits.

UNIT IV

Sinusoidal oscillators: BarkHausen criterion, RC Phase shift, Wein Bridge, Hartley and Colpitts oscillators, , crystal oscillators.
Multivibrators : BJT switch and switching times, Inverter, Principle of operation of Bistable, Monostable, Astablemultivibrators and Schmitt trigger using BJTs.

UNIT V

Time Base Generators : General features of time base signal, Methods of generating time base waveform, Exponential sweep circuit, Sweep circuit using UJT,Transistor constant current sweep, Miller and Boostrap time

base generators using BJTs.

Text Books

1. Milliman and Halkias," Integrated Electronics", McGraw Hill &Co.
2. David A. Bell, "Solid State Pulse Circuits", PHI.

References Books

1. Robert L.Boylestad, Louis Nashelsky –"Electronic Devices and Circuit Theory", 9 Edition., 2008 Pearson Edition.
2. A Anand Kumar –"Pulse and Digital circuits" – 2nd edition,2008 PHI.

Course Outcomes-Program Outcomes -Program Specific Outcomes(CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	H	M		M					L	L	L		H		
CO 2	H	M	L	L					L	L	L		H	M	
CO 3	H	M		L									L	M	H
CO 4		H	M	L									H	M	
CO 5		H				M	L	L					L	M	H

19CST05: COMPUTER ARCHITECTURE AND ORGANIZATION

Credits – 3 **Sessional Marks: 30**

L:T:P::2:1:0 **University Exam Marks: 70**

Course Objectives

To expose the students to the following:

1. How Computer Systems work & the basic principles, Instruction Level Architecture and Instruction Execution, the data is represented and the operations are carried out in the computer
2. Perform memory system design
3. Access I/O devices and its principles.
4. Enhance the knowledge on Instruction Level Parallelism
5. Develop the skills on micro programming.
6. Apply the concepts of advanced pipelining techniques.

Course Outcomes

After successful completion of course the student should be able to

CO1. Understand the building blocks of computer, instruction execution cycle, I/O transfers, interrupts, and memory organization.

CO2. Identify addressing modes, and data/instruction formats, advantage of the pipelining and parallel processors.

CO3. Perform the arithmetic operations using various algorithms and number systems and design memory in various ways.

CO4. Detect errors in the transmission.

CO5. Compare various cache memory mapping techniques.

UNIT I

Functional blocks of a computer: CPU, memory, input-output subsystems, control unit. Instruction set architecture of a CPU, registers, instruction execution cycle, RTL Interpretation of instructions, addressing modes, instruction set, instruction formats.

UNIT II

Data representation: Signed number representation, fixed and floating-point representations, character representation. Algorithms for arithmetic operations: Addition, Subtraction, multiplication (Booth's, Modified Booth's) - division (restoring and non-restoring)

UNIT III

Memory Organization: Memory systems hierarchy-Main memory organization-Types of Main memory-memory interleaving and its characteristics and performance- Cache memories: address mapping-line size-replacement and write policies**,** Reliability of memory systems- error detecting and error correcting systems.

UNIT IV

Peripheral devices and their characteristics: Input-output subsystems, I/O device Interface, I/O transfers– program controlled, interrupt driven and DMA

UNIT V

Pipelining: Basic concepts of pipelining, throughput and speedup, pipeline hazards

Parallel Processors: Introduction to parallel processors, Concurrent access to memory and cache coherency

Text Books

1. William Stallings, “Computer Organization and Architecture: Designing for Performance”, 10th Edition, Pearson Education, 2016.
2. David A. Patterson and John L. Hennessy, “Computer Organization and Design: The Hardware/Software Interface”, 5th Edition, Morgan Kaufmann, Elsevier, 2011.

Reference Books

1. Carl Hamacher, “Computer Organization and Embedded Systems”, 6th Edition, McGraw Hill Higher Education, 2011.
2. Vincent P. Heuring, Harry F. Jordan, and T.G. Venkatesh, “Computer System Design and Architecture”, 2nd Edition, Pearson Education, 2008.

Web References

1. https://nptel.ac.in/courses/106/106/106106166/
2. https://nptel.ac.in/courses/106/105/106105163/

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO1	H	-	L	-	-	-	-	-	-	-	-	-	H	-	-
CO2	-	H	-	M	-	-	-	-	-	-	-	-	H	-	M
CO3	-	H	M	-	-	-	-	L	-	-	-	-	H	M	-
CO4	L	-	-	H	-	-	-	-	-	-	-	-	H	-	-
CO5	-	L	-	H	-	-	-	-	-	-	-	-	M	L	L

19ECT06 -PROBABILITY THEORY AND STOCHASTIC PROCESS

Credits - 03 **Sessional Marks: 30**

L: T: P:: 2:1:0 **University Exam Marks: 70**

Course Objectives

1. To expose the students to the basics of probability theory and random processes essential for their subsequent study of analog and digital communication theory & systems.
2. To deal with multiple random variables, conditional probability and conditional expectation, joint distribution and mean square estimation.
3. To analyze Queuing theory and applications of the theory to real world problems

Course Outcomes

After successful completion of the course the student should be able to

CO1.Understand the axiomatic formulationof modern probability theory and thinkofrandom variables as an intrinsic need for the analysis of random phenomena.

CO2.Characterize probability models and function of random variables based onSingle&multiple random variables

CO3.Understand the concept of in equalities and probabilistic limits.

CO4.Understand the concept of random processes.

CO5.Poisson and Gaussian random process and representation oflow pass and bandpass noise models.

UNIT I

Probability: Probability introduced through Sets and Relative Frequency: Experiments and Sample Spaces, Discrete and Continuous Sample Spaces, Events, Probability Definitions and Axioms, Mathematical Model of Experiments, Probability as a Relative Frequency, Joint Probability, Conditional Probability, Total Probability, Bays' Theorem, Independent Events.

The Random Variable : Definition of a Random Variable, Conditions for a Function to be a Random Variable, Discrete and Continuous, Mixed Random Variable, Distribution and Density functions, Properties, Binomial, Poisson, Uniform, Gaussian, Exponential, Raleigh, Conditional Distribution,

UNIT II

Multiple Random Variables : Vector Random Variables, Joint Distribution Function, Properties of Joint Distribution, Marginal Distribution Functions, Conditional Distribution and Density – Point Conditioning, Conditional Distribution and Density – Interval conditioning, Statistical Independence, Sum of Two Random Variables, Sum of Several Random Variables, Central Limit Theorem, (Proof not expected). Unequal Distribution, Equal Distributions.

Operations on Multiple Random Variables: Expected Value of a Function of Random Variables, Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions and Joint Gaussian Random Variables: Two Random Variables case, N Random Variable case.

UNIT III

Stochastic Process – Temporal Characteristics: The Random Process Concept, Classification of Processes, Deterministic and Nondeterministic Processes, Distribution and Density Functions, concept of Stationary and Statistical Independence. First-Order Stationery Processes, Second- Order and Wide-Sense Stationary, (N-Order) and Strict-Sense Stationary, Time Averages and Ergodicity, Mean-Ergodic Processes, Correlation-Ergodic Processes, Autocorrelation Function & Its Properties, Cross-Correlation Function & its Properties, Covariance Functions, Gaussian Random Processes, Poisson Random Process.

UNIT IV

Random Processes – Spectral Characteristics: The Power Spectrum: Properties, Relationship between Power Spectrum and Autocorrelation Function, The Cross-Power Density Spectrum, Properties.

UNIT V

Linear Systems with Random Inputs: Random Signal Response of Linear Systems: System Response – Convolution, Mean and Mean-squared Value of System Response, autocorrelation Function of Response, Cross-Correlation Functions of Input and Output.

Text Books

1. Peyton Z. Peebles –"Probability, Random Variables & Random Signal Principles" , TMH, 4th Edition, 2001.
2. Scott Miller, Donald Childers-"Probability and Random Processes"-2Ed,Elsevier,2012.

Reference Books

1. Pradip Kumar Gosh -"Theory of probability and Stochastic Processes", University Press
2. Henry Stark and John W. Woods –"Probability and Random Processes with Application to Signal Processing", Pearson Education, 3rd Edition.
3. George R. Cooper, Clave D. MC Gillem, Oxford - "Probability Methods of Signal and System Analysis", 3rd Edition, 1999

Course outcomes-Program outcomes -Program Specific Outcomes(CO-PO-PSO) Mapping

	PO 1	PO 2	PO 3	PO 4	PO5	PO6	PO7	PO8	PO 9	PO10	PO11	PO1 2	PSO 1	PSO 2	PSO 3
CO 1		H	L	M								L	H		
CO 2		H	H	L					M				H		
CO 3	H	M	L										H	M	
CO 4	M	L		H									M	H	
CO 5	M	H	M	L									L	M	H

19ECT07- ELECTROMAGNETIC THEORY & TRANSMISSION LINES

Credits - 3 **Sessional Marks: 30**

L: T: P::2:1:0 **University Exam Marks: 70**

Course Objectives

1. To determine E and H using various basiclaws
2. To Study thetime varying behaviour of EM waves by using Maxwell's equations and Boundary conditions.
3. To Know the characteristics of uniform planewave in variousmedia
4. To Know the difference between Normal and Oblique incidences and learn concepts of Brewster's angle, critical angle, Total internal reflection and Poynting theorem
5. To Understand various concepts of transmission lines and its applications and Wave propagation in metallic waveguides .

Course Outcomes

After successful completion of the course the student should be able to
CO1. Define Coulomb's and Gauss Laws, **E&D**
CO2.Analyze fieldsand laws related to Magnetostatics
CO3.DeriveMaxell's equations for Static and Timevarying fields
CO4. Study and analyze parallel and perpendicular polarizations and reflection of plane waves by normal and oblique incidence
CO5.Apply EM field theory in Transmission lines, Waveguides and Antennas and its applications.

UNIT I

Electrostatics: Co-ordinate system, Review of Vector algebra and Vector calculus, Coulomb's Law, Electric Field Intensity, Electric Flux Density, Gauss Law and Applications, Electric Potential, Relations Between E and V, Maxwell's two equations for electrostatic fields, energy density, Poisson's and Laplace's Equations. Capacitance, illustrative problems.

UNIT II

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, Ampere's force law, Illustrative Problems.

UNIT III

Maxwell's Equations (for Time Varying Fields): Faraday's Law and Transformer e.m.f,,Inconsistency of Ampere's Law and Displacement Current Density, Maxwell's Equations in Different Final Forms and Word Statements. Boundary Conditions of Electromagnetic fields: Dielectric-Dielectric and Dielectric-Conductor Interfaces, Illustrative Problems.

UNIT IV

(a) EM waves in a homogeneous medium: Solutions for free space-conditions, uniform plane wave, wave equations for a conducting medium, conductors and dielectrics, depth of penetration, polarization.
(b) Reflection and Refraction of Plane waves - by perfect conductor- normal incidence, oblique incidence, reflection by perfect dielectric-normal incidence,oblique incidence, brewster angle, Critical Angle, Total Internal Reflection, Surface Impedance, Poynting Vectorand Poynting Theorem.

UNIT V

(a)Transmission Lines: Primary constants of the line, Distributed parameter equivalent circuit, Transmission line equations and solutions, Propagation constant, Characteristic impedance. distortion less line. Input impedance of transmission line, Reflection coefficient. Standing waves open circuit and

short circuited and matched lines, VSWR, relation between Reflection coefficient and VSWR. **(b)Impedance Matching**: Methods of impedance matching, Quarter wave transformer, Smith chart. Features of smith chart, Impedance matching using Smith chart – Single stub and Double stub matching.

Text Books

1. Matthew N.O. Sadiku, "Elements of Electromagnetics," Oxford Univ. Press, 4th ed.,2008
2. E.C. Jorden and K.G. Balmain, "Electromagnetic Waves and Radiating Systems " PHI, 2nd ed., 2000

Reference Books

1. R.K. Shevgoankar, "Electromagnetic Waves", Tata McGraw Hill India, 2005.
2. Clayton R. Paul , "Introduction to Electromagnetic Fields**",** McGraw Hill,3rd Ed.,1997.
3. John D, Ryder, "Networks , Lines and Fileds" PHI 2nd Ed., 1999.

Course Outcomes-Program Outcomes -Program Specific Outcomes(CO-PO-PSO) Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO 1	**H**	**M**	**L**										**H**		
CO 2	**L**	**H**	**M**									**L**	**H**		
CO 3	**H**	**M**	**L**	**L**	**L**				**L**			**H**	**H**	**M**	
CO 4	**H**	**H**	**M**	**H**	**L**							**L**	**L**	**H**	
CO 5		**H**	**L**	**H**	**H**	**L**	**L**		**L**	**L**	**L**	**L**		**M**	**H**

19ECT10: ANALOG COMMUNICATIONS

Credits - 3 **Sessional Marks: 30**

L: T: P::2:1:0 **University Exam Marks: 70**

Course Objectives

1. The fundamentals of basic communication system, types of noise affecting communication system and noise parameters.
2. Need for modulation, amplitude, frequency modulation and demodulation techniques.
3. Various radio receivers withtheir parameters.
4. Need of sampling and different sampling techniques.
5. Generation and detection of pulse modulation techniques andmultiplexing.

Course Outcomes

After successful completion of the course the student should be able to
CO1. Analyse and compare different analog modulation schemes for their efficiency and bandwidth.
CO2.Understand different frequency and phase modulations and comparing theirefficiencies with amplitude modulations.
CO3. Evaluate various AM and FM transmitters and Receivers.
CO4.Interpret the behaviour of a communication system in presence of noise.
CO5. Investigate pulse modulation techniques and analyze their system performance.

UNIT I

Review of signals and systems, Frequency domain representation of signals, Elements of Electrical communication systems – Modulation and its needs and types – Fundamental physical limitations – Electromagnetic spectrum and Areas of Applications. Amplitude modulation – Full AM, DSBSC and SSB – Generation and detection methods – VSB – Frequency translation – FDM – Nonlinear distortion and inter modulation.

UNIT II

Angle modulation – Phase and frequency modulation – NBFM – WBFM – Multitone FM – Transmission Bandwidth of FM – Direct and indirect generation of FM – Demodulation methods – Nonlinear effects – FM Versus AM.

UNIT III

Block diagram study of Radio Broadcast AM and FM transmitters Superheterodyne Receivers – Choice of IFAGC – Tracking – Characteristic of Radio Receivers – FM stereo.

UNIT IV

Noise – External and internal sources of Noise – Gaussian and white noise characteristics, Noise calculations – Noise equivalent resistance – Noise figure – Noise temperature Effects of noise in AM and FM modulation systems – FM threshold effect –pre-emphasis and de-emphasis.

UNIT V

Pulse analog modulation – TDM,types of pulse modulation-PAM,PWM,PPM,Generation and demodulation of PAM,PWM and PPM,TDM.

Text Books

1. Simon Haykin,"Communication Systems",4th Edition,Wiley &sons.
2. H.Taub&D.Schilling,Gautamsahe, "Principle of Communication Systems",3rd Edition,TMH,2007.

Reference Books

1. K.Sam Shanmugam,"Analog and Digital Communication" Wiley,2005.
2. B.P. Lathi and ZhiDing,"Modern Digital and Analog Communication Systems,"4thEdition.

Course Outcomes-Program Outcomes -Program Specific Outcomes(CO-PO-PSO) Mapping

	PO 1	PO 2	PO 3	PO 4	PO5	PO6	PO7	PO8	PO 9	PO1 0	PO1 1	PO12	PSO 1	PSO 2	PSO 3
CO 1	**H**	**M**	**L**	**L**					**L**	**L**	**L**		**H**		
CO 2	**H**	**M**	**L**	**M**					**L**	**L**	**L**			**M**	**H**
CO 3	**L**		**M**	**H**										**M**	**H**
CO 4	**M**	**H**	**L**						**L**	**L**	**L**			**M**	**H**
CO 5	**H**	**M**	**L**	**L**					**L**	**L**	**L**			**M**	**H**

19ECP04: ANALOG ELECTRONICS LAB

Credits – 1 **Sessional Marks: 40**

L: T: P:: 0:0:2 **University Exam Marks: 60**

Course Objectives

1. To test different amplifier circuits.
2. To generate sinusoidal and non-sinusoidal signals.
3. To design and test various multi-vibrator circuits and oscillators experimentally.
4. To Design and construct UJT relaxation oscillator

Course Outcomes

After successful completion of the course the student should be able to
CO1. Construct and experiment amplifiers, oscillators and multi-vibrator circuits
CO2. Measure different parameters and waveforms.
CO3. Use different electronic equipment.
CO4. Verify experimentally determined parameters with theoretical values.
CO5. Identify the applications of different Electronic circuits.

LIST OF EXPERIMENTS

1. Two stage RC coupled amplifier.
2. Darlington Amplifier with Bootstrapping.
3. Power amplifier.
4. Feedback amplifiers.
5. RC Phase shift oscillator.
6. Colpitts or Hartley oscillator.
7. RC Low pass and High pass circuits.
8. Diode clipper circuits
9. Schmitt Trigger.
10. Monostable Multivibrator.
11. Astable Multivibrator.
12. Sweep circuit using UJT.

Note: A minimum of 10 experiments have to be conducted.

Course Outcomes-Program Outcomes -Program Specific Outcomes(CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		M	H						L	L	L		H		
CO2			H	M					L	L	L			H	L
CO3		L	H	M					L	L	L		H	M	L
CO4		M	H						L	L	L		H		M
CO5		H	M	M					L	L	L	L	L		H

19ECP03:DIGITAL SYSTEM DESIGN LAB

Credits – 1 **Sessional Marks: 40**

L: T: P::0:0:2 **University Exam Marks: 60**

Course Objectives

1. To Know about the behavior of digital logic.
2. To Understand combinational logic circuits and sequential logic circuits.

Course Outcomes

After successful completion of the course the student should be able to
CO1. Construct and experiment different logic gates.
CO2. Measure Test combinational logic circuits.
CO3. Usage different adders and subtractor.
CO4. Verify experimentally sequential logic circuits.
CO5. Identify the applications of decoders and display.

LIST OF EXPERIMENTS

1. Testing of Logic gates and simulation of gates using universal gates
2. Decoders
3. Encoders
4. Multiplexers
5. Demultiplexers
6. Flip –Flops
7. MOD-10 Counter
8. Shift register
9. Johnson counter
10. Half adder, Full adder and 4-bit parallel adder
11. Half subtractor & Full subtractor
12. Seven Segment Decoder and display

Note: A minimum of 10 experiments have to be conducted.

Course Outcomes-Program Outcomes -Program Specific Outcomes(CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M	H	H	L					L	M	L		H		
CO2	L	L	H	M					L	L	M			H	M
CO3	M	H											H	M	
CO4	H	L												H	M
CO5		L	L	M	**H**									M	H

19ECT09: MICROPROCESSORS AND MICROCONTROLLERS

Credits - 3 **Sessional Marks: 30**

L: T: P::2:1:0 **University Exam Marks: 70**

Course Objectives

1. To design and implement programs on 8085, 8086,8051 Microcontroller
2. To design I/O circuits.
3. The program prepares students to successfully analyse electronic equipment of modern usage.
4. To design Memory Interfacing circuits.
5. To design and implement 8051 microcontroller based systems.

Course Outcomes

After successful completion of the course the student should be able to CO1.Assess and solve basic binary math operations using the microprocessor.
CO2.Apply knowledge and demonstrate programming proficiency using the various addressing modes and data transfer instructions of microprocessors and microcontrollers.
CO3.Compare accepted standards and guidelines to select appropriate Microprocessor (8085 & 8086) and Microcontroller to meet specified performance requirements.
CO4.Select appropriate assemblers of a microprocessor and microcontroller.
CO5.Design electrical circuitry to the Microprocessor I/O ports in order to interface the processor to external devices.
CO6.Evaluate assembly language programs and download the machine code that will provide solutions in real-world control problems.

UNIT I

8086Architecture: Introduction to 8085 Microprocessor, 8086 Architecture-Functional diagram. Register Organization, Memory Segmentation. Programming Mode!. Memory addresses. Physical memory organization. Architecture of 8086, signal descriptions of 8086- common function signals. Minimum and Maximum mode signals. Timing diagrams. Interrupts of 8086.

UNIT II

Instruction Set and Assembly Language Programming of 8086: Instruction formats, addressing modes, instruction set, assembler directives, macros, simple programs involving logical, branch and call instructions, sorting, evaluating arithmetic expressions, string manipulations.

UNIT III

I/OInterface:8255 PPI various modes of operation and interfacing to 8086. Interfacing keyboard, display, stepper motor interfacing, D/A and A/D converter.Memory interfacing to 8086, Interrupt structure of 8086, Vector interrupt table, Interrupt service routine. Serial communication standards, Serial data transfer schemes. 8251 USART architecture and interfacing.RS- 232.IEEE-4-88, Prototyping and trouble shooting.

UNIT IV

IntroductiontoMicrocontrollers: Overview of 8051 microcontroller. Architecture.I/O Ports. Memory organization, addressing modes and instruction set of 8051, simple programs Interrupts, timer/ Counter and serial communication, programming Timer Interrupts, programming external hardware interrupts, programming the serial communication interrupts, programming8051timersandcounters

UNIT V

8051 Interrupts: 8051 Real Time Control Interrupts, Timer/ Counter And Serial Communication, Programming Timer Interrupts, Programming External Hardware Interrupts, Programming The Serial Communication Interrupts, Programming 8051 Timers And Counters

TextBooks

1. D. V. Hall. Microprocessors and Interfacing, TMH. 2nd edition 2006.
2. Kenneth. J. Ayala. The 8051 microcontroller, 3rd edition, Cengage learning, 2010

ReferenceBooks

1. K. Ray and K.M. Bhurchandani,-" Advanced Microprocessors and Peripherals" TMH, 2nd edition2006.
2. K.Uma Rao, AndhePallavi,- "The 8051 Microcontrollers, Architecture and programming and Applications " Pearson,2009.
3. Ajay. V. Deshmukh, - "Microcontrollers and application "TMH, 2005

Course Outcomes-Program Outcomes -Program Specific Outcomes(CO-PO-PSO) Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO8	PO9	PO10	PO1 1	PO12	PSO 1	PSO 2	PSO 3
CO 1	M	H	L										H		
CO 2	H	M	L	L									H	M	
CO 3			L	H		M	L							L	M
CO 4		L	L	M	H									L	M
CO 5			H	M	M	L					M		H	L	M
CO 6			H	M	M	L					M		H	L	M

19BST09: INDUSTRIAL MANAGEMENT

Credits – 3 **Sessional Marks: 30**
L: T: P:: 2:1:0 **University Exam Marks: 70**

Course Objectives

To expose the students to the following

1. Know on scientific processes of work measurement.
2. Understand the applications of motion study in various fields of manufacturing industries.
3. Familiarize time study methods to design and control production systems.
4. Provide basic knowledge over Ergonomics.

Course Outcomes

After successful completion of course the student should be able to

CO1. Learn different method study techniques.
CO2. Determine standard time for the operations.
CO3. Use the models to calculate wages and incentives of an employee.
CO4. Design efficient workstation.
CO5. Apply ergonomic principles in plant layout design.

UNIT I

Work study: Definition of work study – Productivity – Time and motion study, work simplification – process charts and flow diagrams, Production Planning.

UNIT II

Motion Study: Operation analysis-Analysis of Motion-principles of motion Economy-Design of workplace Layout-Therbligs-S.I.M.O Charts-Analytical Estimating-Advantages and applications of motion study.

UNIT III

Work Measurement and Time Study: Introduction- Time Study Equipment – Stop watch Procedure for collecting data - Performance Rating –methods - Allowances - sample problems-Use time study data in Wage incentives and Collective bargaining**.**

UNIT IV

Predetermined Motion Time Standards: Work Factor System - Method Time Measurement - Basic Motion Time Study – MOST (Maynard Operation Sequence Technique).
Work Sampling - Objectives - Procedure - Number of Cycles to be timed - Applications of Work Sampling - Advantages of Work Sampling over Time Study –Disadvantages.

UNIT V

Ergonomics: Introduction, history of development, man-machine system and its components. Introduction to structure of the body- features of the human body, stress and strain, and metabolism, measure of physiological functions- workload and energy consumption, biomechanics, types of movements of body members, strength and endurance, speed of movements.

Text Books

1. International Labour organization, “Work-study”, Oxford and IBH publishing company Pvt. Ltd.,N.Delhi, 2001.
2. Barnes Ralph M., “Motion & Time study: Design and Measurement of Work”, Wiley Text Books, 2001.

Reference Books

1. Benjamin E Niebel and FreivaldsAndris, “Methods Standards & Work Design”, McGraw Hill, 1997.
2. Groover, M.P., Automation production Systems and Computer Integrated Manufacturing, Pearson Education, 2003.
3. Marvin E, Mundel& David L, “Motion & Time Study: Improving Productivity”, Pearson Education, 2000
4. Sanders Mark S and McCormick Ernert J, “Human Factors in Engineering and Design”, McGraw Hill Inc., 1993.

Course Outcomes – Program Outcomes–Program Specific Outcome (CO-PO-PSO) Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO 1	H									M			H		M
CO 2	M	H		M						M	M		H		M

Ms. M. Krupa Swaroopa Rani Dr. P. Satyanarayana Dr. R.V.Satyanarayana Dr. A. Ramakrishna Rao
Coordinator (ECE) BoS Chairman (I/C) (ECE) BoS Chairman (ECE)

CO 3	L	H	M							M			H		M
CO 4	L		H							M			H		M
CO 5		H	M							M	M	H	H		M

Ms. M. Krupa Swaroopa Rani
Coordinator (ECE)

Dr. P. Satyanarayana
BoS Chairman (I/C) (ECE)

Dr. R.V. Satyanarayana
BoS Chairman (ECE)

Dr. A. Ramakrishna Rao

19ECT11: DIGITAL COMMUNICATION

Credits - 3 **Sessional Marks: 30**

L: T: P::2:1:0 **University Exam Marks: 70**

Course Objectives

1. To design digital communication systems.
2. To analyze the performance of a digital communication link when additive noise ispresent in terms of the signal-to-noise ratio and bit error rate.
3. To compute and compare power, power spectral density and bandwidth requirements of modern communication systems.
4. To compute the probability of errors for various digital modulation techniques.
5. To evaluate the performance of spread spectrum modulation techniques.

Course Outcomes:

After successful completion of the course the student should be able to

CO1.Interpret the fundamentals of digital communications and demonstrate generation and reconstruction of different Pulse Code Modulation schemes like PCM, DPCM etc.

CO2.Demonstratethe generation and reconstruction of various passband techniques.

CO3. Calculate different parameters like power spectrum density, probability of erroretc of base band signal for optimum transmission.

CO4.Understandthe basic concepts of Information theory and coding techniques like Huffman and Shannon-fanocoding to increase average information per bit.

CO5. Evaluate the Performance of spread spectrum communication system

UNIT I

Pulse Digital Modulation: Elements of digital communication systems, advantages of digital communication systems, Elements of PCM: Sampling, Quantization and coding, Quantization error, companding in PCM systems. Differential PCM Systems (DPCM).

Delta Modulation: Delta Modulation, its drawbacks, adaptive delta modulation, comparison of PCM and delta and adaptive delta modulation, noise in PCM and DM systems.

UNIT II

Digital Modulation Techniques: Introduction, BPSK, DPSK, DEPSK, QPSK, M-ary PSK, ASK, QASK, BFSK, M-ary FSK, MSK, Duobinary Encoding, Comparison of digital modulation techniques, Partial response signalling.

UNIT III

Data Transmission: Base band signal receiver, Inter symbol Interference and Nyquist criterion, probability of error, the optimum filter, matched filter, probability of errorusing matched filter, coherent reception, non-coherent detection of FSK, calculation of error probability of ASK BPSK, BFSK, QPSK, Time Division Multiplexing, Digital Multiplexers.

UNIT IV

Information Theory: Discrete messages, concept of amount of information and its properties. Average

information, Entropy and its properties. Information rate, Mutual information and its properties. Source Coding: Introductions, Advantages, Shannon's theorem, Shannon-Fano coding, Huffman coding, efficiency calculations, channel capacity of discrete and analog Channels, capacity of a Gaussian channel, bandwidth –S/N trade off.

UNIT V

Spread Spectrum Modulation: Pseudo-noise Sequences, Generation and characteristics, Direct Sequence Spread Spectrum Modulation, Frequency Hopping Spread Spectrum Modulation, Comparison of Spread Spectrum Modulation, Applications.

Text Books

1. Digital communications- Simon Haykin, John Wiley,2005
2. "Principles of Communication Systems", Herbert Taub & Donald L Schilling Tata McGraw-Hill, 3rd Edition, 2009.

Reference Books

1. "Digital Communications", John G. Proakis, Masoud Salehi – 5th Edition, McGrawHill, 2008.
2. "Modern Digital & Analog Communication Systems", B.P. Lathi, &Zhi Ding," Oxford University Press, International 4th edition, 2010.

Course Outcomes-Program Outcomes -Program Specific Outcomes(CO-PO-PSO) Mapping

	PO 1	PO 2	PO 3	PO 4	PO5	PO6	PO7	PO8	PO 9	PO1 0	PO1 1	PO12	PSO 1	PSO 2	PSO 3
CO 1	H	M	M						L	L	L				M
CO 2	L	H	M	L					L	L	L			H	M
CO 3		H	M	L					L	L	L		H	M	
CO 4		M	L						L	L	L		H	M	
CO 5			H	M									L	M	H

19ECT12:ELECTRONIC MEASUREMENTS & INSTRUMENTATION

Credits - 3 **Sessional Marks: 30**

L: T: P:: 2:1:0 **UniversityExam Marks: 70**

Course Objectives

1. To explain basic concepts and definitions inmeasurement.
2. To describe the bridge configurations and their applications.
3. To elaborate discussion about the importance of signal generators and analyzers in measurement.
4. To understand the concept of Transducer Technology and construct the equipment for measurement of physical parameters.

Course Outcomes

After successful completion of the course the student should be able to CO1.Measure various electrical parameters with accuracy, precision, resolution. CO2.Use AC and DC bridges for relevant parameter measurement.
CO3.Select appropriate passive or active transducers for measurement of physicalparameters.
CO4.Use Signal Generator, frequency counter, CRO and digital IC tester for appropriate measurement effectively.
CO5.Test and troubleshoot electronic circuits using various measuring instruments. CO6.Maintain various types of test and measuring instruments.

UNIT I

Electronic Instruments: Performance characteristics of instruments, Static characteristics, Accuracy, Resolution, Precision, Expected value, Error, Sensitivity. Errors in Measurement, Dynamic Characteristics-speed of response, Fidelity, Lag and Dynamic error. DC Voltmeters- Multi-range, Range extension/Solid state and differential voltmeters, AC voltmeters- multi range, range extension, shunt. Thermocouple type RF ammeter, Ohmmeters series type, shunt type, Multi- meter for Voltage, Current and resistance measurements.

UNIT II

OSCILLOSCOPE : Oscilloscopes CRT features, vertical amplifiers, horizontal deflection system, sweep, trigger pulse, delay line, sync selector circuits, simple CRO, triggered sweep CRO, Dual beam CRO, Dual trace oscilloscope, sampling oscilloscope, storage oscilloscope, digital readout oscilloscope, digital storage oscilloscope, Lissajous method of frequency and phase measurement, standard specifications of CRO, probes for CRO- Active & Passive, attenuator type.

UNIT III

SIGNAL GENERATORS ,WAVE& HORMOIC DISTROTIONANALYZER: Signal Generator-

fixed and variable, AF oscillators, Standard and AF sine and square wave signal generators, Function Generators, Random noise generator, Arbitrary waveform generator. Wave Analyzers, Harmonic Distortion Analyzers, Spectrum Analyzers.

UNIT IV

BRIDGES:DC Bridges-Wheat stone bridge, Kelvins bridge and Kelvins double bridge. AC Bridges Measurement of inductance- Maxwell's bridge, Anderson bridge. Measurement of capacitance -Schearing Bridge.Wien Bridge, Errors and precautions in using bridges. Q-meter.

UNIT V

Transducers: Active & passive transducers- Resistance, Capacitance, inductance; Strain gauges, LVDT,Piezo Electric transducers, Resistance Thermometers, Thermocouples, Thermistors, Sensistors.

Text Books

1. HS. Kalsi –"Electronic Instrumentation", Mc Graw Hill Publications, 4th Edition,2019.
2. Albert D. Helfrick& William D. Kooper-"Modern Electronic Instrumentation & Measurement Techniques", Prentice Hall India Learning Private Limited,1992.

Reference Books

1. David A. Bell –"Electronic Instrumentation & Measurements ", PHI, 2nd Edition, 2003.
2. Robert A.Witte -"Electronic Test Instruments, Analog and Digital Measurements ", Pearson Education, 2nd EdITION., 2004.
3. K. Lal Kishore -"Electronic Measurements & Instrumentations ", Pearson Education – 2005.

Course Outcomes-Program Outcomes -Program Specific Outcomes(CO-PO-PSO) Mapping

	PO 1	PO 2	PO 3	PO 4	PO5	PO 6	PO 7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO 1	H	L											H		
CO 2	H	L											H		
CO 3		L	M	L		M	L						H		
CO 4	H	L											H	L	
CO 5		M	H	M									H	M	L
CO 6			L	M		H								M	H

19ECP06: IC APPLICATIONS LAB

Credits - 1 **Sessional Marks: 40**

L: T: P:: 0:0:2 **University Exam Marks: 60**

Course Objectives

1. To generate and measure sinusoidal and non-sinusoidal signals.
2. To design and construct different circuits with 555 timer and 566 VCO.
3. To acquire the basic Knowledge on special function ICs.

Course Outcomes

After successful completion of the course the student should be able to

CO1. Construct and experimentally verify different OP-Amp circuits.
CO2. Measure different parameters and waveforms.
CO3. Design different circuits using ICs.
CO4. Verify the experimentally determined parameters with theoretical values.
CO5. Identify the applications of different ICs.

LIST OF EXPERIMENTS

1. Measurement of OP Amp characteristics.
2. Design and construct the following using OP-Amp
a) Inverting amplifiers
b) Non-Inverting amplifiers
c) Adder
d) Subtractor
3. Integrator & Differentiator
4. Op-Amp Comparator and zero crossing detector
5. Astable and Monostable Multivibrators using Op-Amp
6. Design and construct Astable and Monostable Multivibrators using 555 timer
7. Schmitt trigger using 555 timer & 741 Op-Amp
8. VCO Application using 566 IC
9. IC Voltage Regulators.
10. Design and test Low pass and High pass filters using Op-Amp
11. 4-bit R-2R DAC using OPAMP
12. Design and test Wein bridge Oscillators.

Note: A minimum of 10 experiments have to be conducted.

Course outcomes - Program outcomes -Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		M	H						L	L	L		H		
CO2			H	M					L	L	L			H	L
CO3		L	H	M					L	L	L		H	M	L
CO4		M	H						L	L	L		H		M
CO5		H	M	M					L	L	L	L	L		H

19ECP07:ANALOG AND DIGITAL COMMUNICATION LAB

Credits - 1 **Sessional Marks: 40**

L: T: P:: 0:0:2 **University Exam Marks: 60**

Course Objectives

1. To analyze and specify fundamental parameters of communication systems.
2. To evaluate the advantages and disadvantages of communication systems from the point of view practical considerations.
3. To study various pulse modulation and demodulation techniques practically.
4. To interpret various digital modulation and demodulation techniques.

Course Outcomes

After successful completion of the course the student should be able to
CO1.Design, construct and evaluateamplitude, frequency modulation and demodulation techniques. CO2.Understand and analyse various pulse modulation and demodulation techniques.
CO3.Analyse the generation and detection of various digital modulation techniques.
CO4.Verify sampling theorem and applications.
CO5. Evaluate the characteristics of Mixer.

LIST OF EXPERIMENTS

1. Amplitude modulation and demodulation and its spectral analysis
2. Frequency modulation and demodulation and its spectral analysis
3. Balanced modulator.
4. Characteristics of Mixer.
5. Synchronous detector.
6. SSB system.
7. Pulse Amplitude Modulation and Demodulation.
8. Pulse Width and Pulse Position Modulation and Demodulation.
9. Pulse Code Modulation.
10. Delta Modulation
11. Frequency Shift Keying
12. Phase Shift Keying.
13. Verification of sampling theorem.

Course Outcomes-Program Outcomes -Program Specific Outcomes(CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1		L	H	M					L	L	L		H	M	
CO 2	H	M	L	L					L	L	L				H
CO 3		L	M	H					L	L	L			H	M
CO 4	H	M	L						L	L	L		L	H	M
CO 5	H	M							L	L	L		H	L	

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19ECP05: MICROPROCESSORS AND MICROCONTROLLERS LAB

Credits - 1 **Sessional Marks: 40**

L: T: P:: 0:0:2 **University Exam Marks: 60**

Course Objectives

1. Study the Architecture of 8086 microprocessor.
2. Learn the design aspects of I/O and Memory Interfacing circuits.
3. Study the Architecture of 8051 microcontroller

Course Outcomes

After successful completion of the course the student should be able to
CO1.Design and implement programs on 8086 microprocessor.
CO2.Design interfacing circuits with 8086.
CO3.Design and implement 8051 microcontroller-based systems CO4.To understand the concepts related to I/O and memory interfacing CO5.Design interfacing circuits with 8051 microcontroller

LIST OF EXPERIMENTS

8086 Microprocessor:

1. Arithmetic operations (Addition, subtraction, multiplication, division) using 8086 microprocessor
2. Sorting the n numbers in ascending & descending order.
3. Moving the block of string from one segment to another segment.
4. Sorting of string in ascending order
5. Sorting of string in descending order
6. Length of string
7. Reverse of string
8. Interface of ADC converter.
9. Interfacing of DAC converterStepper motor control using microprocessor.
10. Interfacing Keyboard/Display controller.
11. Microprocessor based traffic controller

8051 Microcontroller:

12. Programming using arithmetic, logical and bit manipulation instructions of 8051
13. Counter Design Display digits starting from 00 up to 99, incremented everysecond
14. Lamp Controller Switch ON a lamp through a relay and switch it OFF after say 2 minutes under p program control
15. Water Level Indicator Sense the presence or absence of water and switch ON or OFF an LED
16. DAC Interface Interface DAC to the microcontroller to generate a saw-tooth, square and triangular waveform
17. ADC Interface Interface to ADC and display the input analogue voltage to digital display of 8 LEDs
18. STEPPER MOTOR Interface to a Stepper motor to rotate
19. LCD Interface Interfacean 16 x 2 LCD display Serial Communication Establish

Course Outcomes-Program Outcomes -Program Specific Outcomes(CO-PO-PSO) Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO
1																
CO 2		L	H	M					M	M	M		H	L		
CO 3		L	H	M					M	M	L	L	H	M		
CO 4	H	L	M						M	L	M	L	M	H		
CO 5		L	H	M					L	M	M	M	H	L		

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19BST10: ENTREPRENEURSHIP & PROJECT MANAGEMENT

Credits – 3 **Sessional Marks: 30**
L:T: P::3:0:0 **University Exam Marks: 70**

Course Objectives

1. To understand the principles & phases of projects
2. To identify the resources of the project & duration.
3. To know the role entrepreneurship in economic development
4. To understand the problems of SSE
5. To learn the design & preparation of business plan.

Course Outcomes

After successful completion of the course the student should be able to

CO1. Define the concepts of project, engineering project design, and prototyping and feasibility study
CO2. Evaluate product duration, cost & quality control charts
CO3. Identify the ways to enhance economic development
CO4. Capable to maintain the problems of SSE and SWOT analysis
CO5. Design the business plan

UNIT I

Project Management: Concept of project - Project Life Cycle Phases – Human centred Engineering Project Design – Design thinking – Principles – Preliminary project specification – Feasibility Study – Detailed Project Design - Prototyping Methods – Validation of project with users.

UNIT II

Project Evaluation Techniques: PERT - CPM - Statistical Quality Control: X & R charts, P & C charts - Report preparation - Incubation – Concept – Support System.

UNIT III

Introduction to Entrepreneurship: Definition of Entrepreneur, Entrepreneurial Traits, Entrepreneur vs Manager, Entrepreneur vs Entrepreneur. The Entrepreneurial decision process. Role of Entrepreneurship in Economic Development – Problems faced by women entrepreneurs – Support System for entrepreneurs.

UNIT IV

Small Scale Enterprise: Definition, Characteristics, Role of Small Enterprise in Economic Development, Problems of SSE, and Steps involved to start SSE, Package for promotion of Small Scale Enterprise, SWOT Analysis.

UNIT V

Business Model Design: Innovation readiness to commercialisation – Business Plan Preparation - Venture capital support system – Start-up support system and Review of Indian start-up business models.

Reference Books

1 L.S. Srinath, PERT/CPM, Affiliated East-West Press, New Delhi , 2002
2 S. Choudary, Project Management, McGraw Hill Education (India) Private Limited, New Delhi.
3 S.S.Khanka, Entrepreneurial Development, S Chand & Company Ltd., New Delhi.

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Course Outcomes – Program Outcomes (CO-PO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1					**M**		**L**					
CO2					**M**						**H**	**L**
CO3									**L**			
CO4				**M**					**M**			**L**
CO5					**H**				**M**		**H**	**L**

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19ECT13: DIGITAL SIGNAL PROCESSING

Credits -3 **Sessional Marks: 30**

L: T: P:: 2:1:0 **University Exam Marks: 70**

Course Objectives

1. To make students familiar with the most important methods in DSP, including digital filter design, transform-domain processing and importance of Signal Processors.
2. To make students aware about the meaning and implications of the properties of systems and signals.

Course Outcomes

After successful completion of the course the student should be able to

CO1.Use concepts of trigonometry, complex algebra, Fourier transform, z-transform to analyze the operations on signals and acquire knowledge about Systems

CO2. Select proper tools for analog-to-digital and digital-to-analog conversion. Also select proper tools for time domain and frequency domain implementation.

CO3. Design, implement, analyse and compare of digital filters for processing of Discrete time signals

CO4. Integrate computer-based tools for engineering applications

CO5. Employ signal processing strategies at multidisciplinary team activities

UNIT I

Discrete-Time Signals And Systems: Discrete time signals and systems: Sequences; representation of signals on orthogonal basis; Representation of discrete systems using difference equations, Sampling and reconstruction of signals - aliasing; Sampling theorem and Nyquist rate.

UNIT II

Z-Transform And Discrete Fourier Transform: Z-Transform, Region of Convergence, Analysis of Linear Shift Invariant systems using z-transform, Properties of z-transform for causal signals, Interpretation of stability in z-domain, Inverse z-transforms.

Frequency Domain Analysis, Discrete Fourier Transform (DFT), Properties of DFT, Connvolution of signals, Fast Fourier Transform Algorithm, Parseval's Identity, Implementation of Discrete Time Systems.

UNIT III

Design Of Digital Filters:FIR Digital filters: Windowing method,strurctures of FIR filters

Effect of finite register length in FIR filter design.Parametric and non-parametric spectral estimation.

IIR Digital Filters: Butterworth, Chebyshev and Elliptic Approximations; Low-pass, Band-pass, Band-stop and High-pass filters. Strurctures of IIR filters.intorduction to multi rate digital signal processing.

UNIT IV

Applications Of Digital Signal Processing : Correlation Functions and Power Spectra, Stationary Processes, Optimal filtering using ARMA Model, Linear Mean-Square Estimation, Wiener Filter.

UNIT V

Digital Signal Processors: Introduction to Programmable DSP's, Multiplier and Multiplier accumulator (MAC), Modified bus structures and Memory Acess Schemes in P-DSP's Multiplier Access Memory, Multi ported Memory, VLIW Architecture, Pipelining, Special addressing modes in PDSPs, On-chip Peripherals.

Features Of TMS3210C5X Processors: Internal Architecture, External Memory accessories, Pipeline operations, Peripherals.

Text Books

1. J. G. Proakis and D.G. Manolakis, "Digital Signal Processing: Principles, Algorithms And Applications", Prentice Hall, 1997.
2. S. K. Mitra, "Digital Signal Processing: A computer based approach", McGraw Hill, 2011.

Reference Books

1. L. R. Rabiner and B. Gold, "Theory and Application of Digital Signal Processing", Prentice Hall, 1992.
2. J. R. Johnson, "Introduction to Digital Signal Processing", Prentice Hall, 1992.
3.A.V. Oppenheim and R. W. Schafer, "Discrete Time Signal Processing", Prentice Hall, 1989.

Course Outcomes - Program Outcomes - Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H	H	M	L	M				L	H	H	L	H	M	
CO2		M	M		H					L	M		M	H	L
CO3		M	M		H					L	M		H	M	L
CO4					H	M		L	M	M			M	L	H
CO5		L	L						H		L	M		M	H

19ECT14: MICROWAVE THEORY

Credits - 3 **Sessional Marks: 30**

L: T: P::2:1:0 **University Exam Marks: 70**

Course Objectives

1. To study characteristics of Microwave tube Generators and Amplifiers
2. ToUnderstand different semiconductor Microwave devices andapplications
3. To study different types of microwave components and their applications
4. To measure various microwave parameters using a microwave test bench
5. To study about Microwave Integrated circuits and antennas used at MW frequencies

Course Outcomes

After successful completion of the course the student should be able to
CO1. Know the knowledge ofMicrowave frequency bands,amplifiers, oscillators andefficiencyexpression for signal generators.
CO2.Study about different types of Microwave SemiconductorDiodes and Transistors CO3.Derive scattering parameters for Microwave Tees, couplers and networks.
CO4.Measure various Microwave parameters
CO5. Know Fabrication techniques of IC's in Microwave frequencies.

UNITI

Introduction to Microwaves: Microwave frequency bands, Mathematical model of Microwave transmission –concept of mode, features of TE and TM modes.
Microwave Tubes: Klystron amplifier, Reflex klystron oscillator, Traveling wave tube amplifier and magnetron oscillator.

UNITII

Semiconductor devices: Tunnel diode, GUNN diode, IMPATTdiode, PIN diode, Crystal diode, Schottky Barrier diode,Varactor diode and parametric amplifier, MASER, microwave transistors and FET's.

UNITIII

Components: Cavity resonators, attenuators, Tees, bends, corners, windows. Coupling probes and loops, phase shifters, Rotary joints, Directional couplers, matching elements, Isolators and circulators, S-parameters of networks.

UNITIV

Measurements: Measurement of frequency, power, VSWR, Impedance, Reflection coefficient, Attenuation constant and dielectric constant, S-parameters and Q of a cavity..

UNITV

MIC's and Antennas: Advantages of MIC's, Hybrid MIC's, Strip lines and microstrip lines, Monolithic MIC's. Parabolic reflector antennas, passive reflector, Horn and lens antennas.

Text Books

1. GottapuSasiBhushanaRao ,"Microwave and Radar Engineering", ISBN – 978813179944 Pearson Education Chennai 2013.
2. Samuel Y Liao," Microwave Devices and Circuits", Pearson, 3rd Edition, 2003.

Reference Books

1. David M. Pozar ,"Microwave Engineering", Wiley ,4th Edition,Nov.2011.

2. R.E. Collins, Microwave Circuits, McGraw Hill 2nd Edition, June 1992.

Course Outcomes-Program Outcomes -Program Specific Outcomes(CO-PO-PSO) Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PO8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO 1	H	M	M	L									H	M	M
CO 2	L	M	L	L						M			H	L	H
CO 3	M	H	H	M	H				M		L	M	M	H	
CO 4	H	M	L	M	M				H	L	L	H		M	
CO 5			L	H		M						M			

19BST11: CONSTITUTION OF INDIA

Credits – No credits

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L:T: P::3:0:0

Course Objectives

1. To learn basic concepts of Indian Constitution.
2. To understand Fundamental Rights, Fundamental Duties and its implications.

Course Outcomes

After successful completion of course the student should be able to

CO1. Acquire the knowledge of Indian constitution.

CO2. Understand the Fundamental Rights, Directive Principles of State Policies and Fundamental Duties.

UNIT I

Constitution-structure and principles: Meaning and importance of Constitution, making of Indian Constitution, salient features of Indian constitution.

UNIT II

Fundamental Rights and Directive Principles of State Policy: Fundamental Rights , Fundamental Duties, Directive Principles.

UNIT III

Government of the Union: President of India – election, powers and functions, Prime Minister and Council of Ministers, Loksabha - composition and powers, Rajyasabha -composition and powers.

UNIT IV

Government of states: Governor - powers and functions, Chief Minister and Council of Ministers, Legislative Assembly and Legislative Council.

UNIT V

Judiciary: Features of Judicial System in India, Supreme Court, High court- structure and Jurisdiction.

Administrative Organizations and Construction: Federalism in India, local government –panchayat, election commission, citizen oriented measures - RTI and PIL significance and provisions.

Text Books

1. HM Seervai ,"Constitutional Law of India",Universal Law Publishing Co Ltd
2. Parvinrai Mulwantrai Bakshi, Constitution of India, LexisNexis,2019.

Reference Books

1. Dr.J.N.Pandey," Constitutional Law Of India", Central Law Agency,Allahabad, 2019
2. Durga Das Basu, Shorter Constitution of India, LexisNexis, 2019.

19ECP08 -DIGITAL SIGNAL PROCESSING LAB

Credits - 1 **Sessional Marks: 40**

L: T: P:: 0:0:2 **University Exam Marks: 60**

Course Objectives

1. To develop simple algorithms for signal processing and test them using MATLAB 2.To write programs to perform computation in DSP processor using CCS.
3.To design and test digital filters for signal processing

Course Outcomes

After successful completion of the course the student should be able to
CO1.Analyze and process signals in the discrete domain
CO2. Design filters to suit specific requirements for specific applications CO3. Perform statistical analysis and inferences on various types of signals CO4. Design multi rate signal processing of signals through systems.
CO5. Analyze binary fixed point and floating-point representation of numbers and arithmetic Operations

LIST OF EXPERIMENTS USING MATLAB

1. To verify linear convolution
2. To verify the circular convolution.
3. To design FIR filter (LP/HP) using WindowingTechniques.
   a. Using Rectangular Window.
   b. Using triangular Window.
   c. Using Kaiser Window.
4. To implement IIR filter (LP/HP) on DSP Processors.
5. N-point FFT algorithm.
6. MATLABprogram to find frequency response of analog LP/HP Filters.
7. To compute power density spectrum of sequence.
8. To find the FFT of given 1-D signal andplot.

LIST OF EXPERIMENTS USING TMS320C5X

9. To verify linear convolution
10. To verify the circular convolution.
11. N-point FFT algorithm.
12. To compute power density spectrum of sequence.
13. To find the FFT of given I-D signal andplot.

Course Outcomes-Program Outcomes -Program Specific Outcomes(CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1		H	L		H				H	H	L	L	H	M	
CO 2			H	M	L				M	L	M	M	M	H	L
CO 3	H	M	H	M	M								H	M	
CO 4			M	H	M				L	M	H	L	M	H	L
CO 5	H	M	L	L									H	M	

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19ECP09: MICROWAVELab

Credits – 1 **Sessional Marks: 40**

L: T: P:: 0:0:2 **University Exam Marks: 60**

Course Objectives

1. To Know about the behaviour of microwave components.
2. To Know about the behaviour of microwave Devices.
3. To Understand the radiation pattern of different types of antennas.
4. To measure the impedance,attenuation and other parameters at microwave frequencies.
5. To analyse loss estimation of different components.

Course Outcomes

After successful completion of the course the student should be able to
CO1.Design, construct and test the various microwave devices and components.
CO2.Compare the characteristics of the microwave devices and compare withtheoretical values.
CO3.Analyze the variations of theoretical and practical values of differentcomponents.
CO4.Practice microwave measurement procedures.
CO5.Evaluate the frequency, wave length, VSWR, impedance and scatteringparameters of various microwave devices practically.

LIST OF EXPERIMENTS

1. Reflex Klystron Characteristics.
2. Gunn Diode Characteristics.
3. Measurement of dielectric constant.
4. Measurement of Waveguide Parameters.
5. Low and High VSWR measurements.
6. Attenuation Measurements.
7. Impedance Measurements by using smith chart.
8. Directional Coupler Characteristics.
9. Antenna Measurements.
10. Scattering Parameters of Circulator, isolator.
11. S-matrix of T junctions.

Note: Aminimum of 10 experiments has to be conducted.

Course Outcomes-Program Outcomes -Program Specific Outcomes(CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1		L	H	M		L			L	L	M	L	H	M	

CO 2	**M**	**H**	**L**	**L**					**L**	**L**	**M**		**H**	**M**	
CO 3	**H**	**M**	**L**	**L**					**L**	**L**	**M**		**H**	**M**	
CO 4	**H**	**M**	**L**	**L**					**L**	**L**	**M**		**H**		**L**
CO 5	**H**	**M**	**L**	**L**	**L**				**L**	**L**	**M**		**H**		**L**

IV YEAR

19CST14: COMPUTER NETWORKS

Credits – 3 **Sessional Marks: 30**

L:T:P::2:1:0 **University Exam Marks: 70**

Course Objectives

To expose the students to the following:

1. Modern network architectures from a design and performance perspective.
2. Major concepts involved in wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs).
3. Impart skills in network programming.
4. Define WLAN metrics.

Course Outcomes

After successful completion of course the student should be able to

CO1. Understand and explore the basics of Computer Networks and Various Protocols.
CO2. Administrate a network and schedule flow of information.
CO3. Examine the network security issues in Mobile and ad hoc networks.
CO4. Demonstrate the TCP/IP and OSI models with merits and demerits.
CO5. Evaluate the shortest path by using Routing algorithms.
CO6. Design the various layers protocols.

UNIT I

Introduction: Introduction to computer networks, network hardware, network software, Reference models, examples of networks, example of data communication services, network Standardization. Overview of Physical layer

Data Link Layer: Design issues, error detection and correction, elementary data link protocols, sliding window protocols, protocol specification and verification, examples of data link protocols.

UNIT II

Medium Access Sublayer: Channel allocation problem, multiple access protocols, IEEE standard 802 for LANs and MANs, Bridges, High-speed LANs, Satellite network.

UNIT III

Network Layer: Design issues, routing algorithms, congestion control algorithms, internetworking, the network layer in the internet, the network layer in ATM network.

UNIT IV

Transport Layer: Transport services, elements of transport protocols, a simple transport protocol, the internet transport protocols, (TCP and UDP), the ATN ALL layer protocols, performance issues.

UNIT V

Application Layer: Network security, DNS – Domain Name System, SNMP –Simple Network Management protocol, Electronic Mail, Usenet news, the World Wide Web (WWW), Multimedia.

Textbooks

1. Andrew S. Tanenbaum, David J. Wetherall, "Computer Networks", 5th Edition, Pearson, 2011.

Reference Books

1. Behrouz A. Forouzan, "Data Communication and Networking", 5th Edition, Tata McGraw Hill, 2013

Web References

1. https://nptel.ac.in/courses/106/105/106105081/
2. https://nptel.ac.in/courses/106/106/106106091/

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H	M	-	-	-	-	L	-	-	-	-	-	H	-	-
CO2	-	H	H	-	-	-	M	-	-	-	-	-	H	-	-
CO3	-	M	-	H	-	M	M	-	-	-	-	-	H	-	M
CO4	-	H	-	-	-	-	-	-	-	-	M	-	H	-	-
CO5	L	M	-	H	-	-	-	-	-	-	-	-	L	M	-
CO6	-	-	H	M	-	-	-	-	L	L	-	-	L	M	H

19ECT15: VLSI DESIGN

Credits – 3 **Sessional Marks: 30**

L: T: P:: 2:1:0 **University Exam Marks: 70**

Course Objectives

1. Be able to use mathematical methods and analysis ofCMOS digital electronics circuits, including logic components and their interconnect.
2. Be able to create models of moderately sized CMOS circuits that realize specifieddigital functions.
3. Have exposure to the design rules to be followed to draw the layout of any logic circuit.
4. Provide design concepts to design building blocks of data path of any system usinglogic gates.
5. Understand basic programmable logic devices and testing of CMOScircuits.

Course Outcomes

After successful completion of the course the student should be able to
CO1.Acquire qualitative knowledge about different types of MOS IC technologies. CO2. Illustratestick diagrams and layouts for NMOS, CMOS and BiCMOS circuits. CO3.Describe Circuit Concepts of various Gate Level Designs.
CO4. Understand Basic architectures of Data path subsystems and design simple memories using MOS transistors.
CO5:Design simple logic circuits using PLA, PAL, FPGA and CPLD.

UNITI

Introduction to IC Technology – MOS, PMOS, NMOS, CMOS & BiCMOS,

Basic Electrical Properties of MOS and BiCMOS Circuits: I_{ds}-V_{ds} relationships, MOS transistor threshold Voltage, g_m, g_{ds}, Figure of merit ωo; Pass transistor, NMOS Inverter, Various pull ups, CMOS Inverter analysis and design, Bi-CMOS Inverters.

UNIT II

VLSI Circuit Design Processes: VLSI Design Flow, MOS Layers, Stick Diagrams, Design Rules and Layout, 2 μm CMOS Design rules for wires, Contacts and Transistors Layout Diagrams for NMOS and CMOS Inverters and Gates, Scaling of MOS circuits.

UNIT III

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

UNITIV

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

VHDL Synthesis: VHDL Synthesis, Circuit Design Flow, Circuit Synthesis, Simulation, Layout, Designcapture tools, Design Verification Tools, Test Principles.

UNIT V

Programmable Logic Devices: PLAs, FPGAs, CPLDs, Standard Cells, Programmable Array Logic, Design Approach, Parameters influencing low power design.

CMOS Testing: CMOS Testing, Need for testing, Test Principles, Design Strategies for test, Chip level Test Techniques.

Text Books

1. Kamran Eshraghian, Eshraghian Dougles and A. Pucknell,"Essentials of VLSI circuits and systems", 2005 Edition , PHI.
2. Neil H. E Weste, David Harris, Ayan Banerjee,"CMOS VLSI Design – A Circuits and Systems Perspective", 3rdEd, Pearson, 2009.

Reference Books

1. John .P. Uyemura, "CMOS logic circuit Design",1stEdition., Springer.
2. Wayne Wolf,"Modern VLSI Design", 3rd Edition, Pearson Education.

Course Outcomes-Program Outcomes -Program Specific Outcomes(CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H	L											H		
CO2		H	H	M	M								M	H	
CO3	H	L		L										M	L
CO4		L	H	M										L	M
CO5		M	H	L										M	H

19ECT16 : CELLULAR MOBILE COMMUNICATIONS

Credits – 3 **Sessional Marks: 30**

L: T: P::2:1:0 **University Exam Marks: 70**

Course Objectives

1. To understand the basic cellular concepts like frequency reuse, cell splitting, cell sectoring etc., and various cellular systems.
2. To learn different types of interferences influencing cellular and mobile communications.
3. To study the frequency management, channel assignment and various propagation effects in cellular environment.
4. To understand different types of antennas used at cell site and in mobile.
5. To analyse the concepts of handoff and types of handoffs and understand the architectures of GSM and 3G cellular systems.

Course Outcomes

After successful completion of the course the student should be able to
CO1. Identify the limitations of conventional mobile telephone systems; understand the concepts of cellular systems.
CO2. Understand the frequency management, channel assignment strategies and antennas in cellular systems.
CO3. Understand the concepts of handoff and architectures of various cellular systems. CO4. Understand the relation between the user features and underlying technology.
CO5: Analyze mobile communication systems for improved performance.

UNIT I

Cellular Mobile Radio Systems: Introduction to Cellular Mobile System, uniqueness of mobile radio environment, operation of cellular systems, consideration of the components of Cellular system, Hexagonal shaped cells, Analog and Digital Cellular systems.
Cellular Concepts: Evolution of Cellular systems, Concept of frequency reuse, frequency reuse ratio, Number of channels in a cellular system, Cellular traffic: trunking and blocking, Grade of Service; Cellular structures: macro, micro, pico and femto cells; Cell splitting, Cell sectoring.

UNIT II

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

UNIT III

Frequency Management And Channel Assignment: Numbering and grouping, setup access and paging channels, channel assignments to cell sites and mobile units: fixed channel and

non-fixed channel assignment, channel sharing and borrowing, overlaid cells.
Cell Coverage For Signal And Traffic: Signal reflections in flat and hilly terrain, effect of manmade structures, phase difference between direct and reflected paths, straight line path loss slope, general formula for mobile propagation over water and flat open area, near and long-distance propagation, antenna height gain, form of a point to point model.

UNIT IV

Cell Site and Mobile Antennas: Sum and difference patterns and their synthesis, omnidirectional antennas, directional antennas for interference reduction, space diversity antennas, umbrella pattern antennas, minimum separation of cell site antennas, high gain antennas.

UNIT V

Handoff Strategies: Concept of Handoff, types of handoff, handoff initiation, delaying handoff, forced handoff, mobile assigned handoff, intersystem handoff, vehicle locating methods, dropped call rates and their evaluation.
Digital Cellular Networks: GSM architecture, GSM channels, multiple access schemes; TDMA, CDMA, OFDMA; architecture of 3G cellular systems.

Text Books

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

References Books

1. Theodore. S. Rapport , "Wireless Communications", Pearson education, 2nd Edition, 2002.
2. Lee , "Wireless and Mobile Communications" , McGraw Hills, 3rd Edition, 2006.
3. R. Blake, "Wireless Communication Technology " , Thompson Asia Privatet. Ltd., 2004.

Course Outcomes - Program Outcomes - Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H			L									H		M
CO2		H	M	L		M			L	L	L			M	H
CO3	H					M							M		H
CO4	H		M	L											H
CO5				H		M	L	M					H		

19CSP10: COMPUTER NETWORKS LAB

Credits – 1 **Sessional Mark: 40**

L:T:P::0:0:2 **University Exam Marks: 60**

Course Objectives

To expose the students to the following:
1. The concepts of all the layers to implement framing methods.
2. The required skills for developing algorithms.

Course Outcomes

After successful completion of course the students should able to
CO1. Develop the programs related to Bit stuffing, character count.
CO2. Apply appropriate algorithm for the finding of shortest route.
CO3. Simulate the encryption and decryption concepts in network layer
CO4. Demonstrate communication between the peers using client-server programming.

LIST OF PROGRAMS

1. Implement the data link layer framing methods such as bit stuffing
2. Implement the data link layer framing methods such as character stuffing.
3. Implement RSA Algorithm.
4. Implement on a data set of characters the three CRC.
5. Implement Dijkstra's algorithm to compute the shortest path.
6. Take an example subnet of hosts. Obtain broadcast tree for it.
7. Write a program to break the above DES coding.
8. Write a program to create a socket.
9. Write a program for Data link layer framing method (Character count).
10. Write a program for Sliding window protocol.
11. C Program To Implement UDP Client Server Communication Using Bind System Call
12. Java Client Server Program Using Byte Stream
13. Java Multicasting Program
14. C Program To Restart Server By Capturing SIGHUP signal
15. Java Program for Message Group Window
16. Java Window Chat Program

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	H	-	H	-	M	L	-	-	-	-	M	H	L
CO2	-	H	H	L	M	L	-	L	-	-	-	-	M	H	L
CO3	-	-	-	-	H	H	-	L	-	-	-	-	M	H	L
CO4	-	-	-	-	H	-	-	L	-	H	M	-	M	H	L

19ECP10: VLSI LAB

Credits - 1 **Sessional Marks: 40**

L: T: P:: 0:0:2 **University Exam Marks: 60**

Course Objectives

1. The objective of this laboratory is to design and analyze digital circuits using EDA tools.
2. To educate students with the knowledge of HDL and test becnch, to write verilog code for all logic gates, flip-flops, counters and adders etc.
3. Students will be able to compile, simulate and synthesize the HDL.

Course Outcomes

After successful completion of the course the student should be able to
CO1. Design Entry & simulation of basic logic gates, encoders, decoders and multiplexer circuit with test bench & functional verification.
CO2.Ability to design & simulation of comparator, adders and flip-flop circuits with EDA tool.
CO3.Synthesis, P&R and Post P&R simulation, Concepts of FPGA floor plan, critical path, design gate count, I/O configuration and pin assignments.

LIST OF EXPERIMENTS

1. HDL Code to realize all the logic gates.
2. Design of 2-to-4 decoder
3. Design of 8-to-3 encoder (without and with priority)
4. Design of 8-to-1 multiplexer
5. Design of 4 bit Binary to Gray code converter
6. Design of Demultiplexer and comparator
7. Design of Full Adder using 3 modeling styles
8. Design of Flip Flops: SR, D, JK,T(Asynchronous Reset and Synchronous Reset)
9. Design of 4-bit binary, BCD Counters(Asyn Reset and Syn Reset) or any Sequence Counter
10. Finite State Machine Design

Course Outcomes-Program Outcomes – Program Specific Outcomes(CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		M	H						M	L	L		H	M	
CO2		L	L	M	H				M	L	L			L	H
CO3			H	M	M	L			L	M	L	L		L	H

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19ECI01: INTERNSHIP

Credits – 2 **Sessional Marks: 100**

Course Objectives

To expose the students to the following:

1. Expose technical students to the industrial environment, which cannot be simulated in the classroom and creating competent professionals for the industry.
2. Provide possible opportunities to learn understand and sharpen the real time technical/managerial skills required at the job.
3. Exposure to the current technological developments relevant to the subject area of training.
4. Experience gained from the "industrial internship" in classroom will be used in classroom discussions.
5. Create conditions conductive to quest for knowledge and its applicability on the job.

Course Outcomes

After successful completion of course the student should be able to

CO1. An opportunity to get hired by industry/organization.
CO2. Practical experience in organization setting
CO3. Excellent opportunity to see how the theoretical aspects learned in classes are integrated in to practical world.
CO4. Helps to decide if the industry and the profession is the best career option to pursue
CO5. Opportunity to learn new skills and supplement knowledge.
CO6. Opportunity to practice communication and team work skills.
CO7. Opportunity to learn strategies like time management, multi-tasking in an industrial setup.
CO8. Enhances their candidacy for higher education.
CO9. Creating network and social circle and developing relationships with industry people.

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	-	-	-	-	H	-	M	H
CO2	-	H	-	-	-	-	-	-	M	-	-	M	-	M	H
CO3	M	-	-	-	-	H	M	-	-	-	-	-	H	M	-
CO4	-	-	-	-	H	-	-	-	-	-	-	M	M	H	-
CO5	M	M	-	-	-	-	-	-	-	H	-	-	-	-	H

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CO6	-	-	-	-	-	-	-	-	**M**	**M**	**H**	-	-	-	**H**
CO7	-	-	-	-	-	-	-	-	-	-	-	**H**	-	-	**H**

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19ECS01: SEMINAR

Credits – 1

L: T: P:: 0:0:2 **Sessional Marks: 100**

Course Objectives

To expose the students to the following:

1. Identify, understand and discuss current, real-time issues.
2. Improve oral and written communication skills.
3. Explore an appreciation of the self in relation to its larger diverse social and academic contexts.
4. Apply principles of ethics and respect in interaction with others.

Course Outcomes

After successful completion of course the student should be able to

CO1. Acquire in-depth knowledge in the chosen seminar topic.
CO2. Analyse critically the chosen seminar topic for arriving at conclusions.
CO3. Understand the impact of seminar output in the context of environmental sustainability.
CO4. Develop communication skills for preparing and presenting seminar report.
CO5. Develop skills for continuous learning to improve knowledge and competence in the chosen field of Seminar.

Course Outcome-Program Outcome- Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H	M	-	-	-	-	-	-	-	-	-	-	H	M	-
CO2	-	H	-	M	-	-	-	-	-	-	-	-	M	H	-
CO3	-	-	-	-	-	-	H	-	-	-	-	-	L	-	-
CO4	-	-	-	-	L	-	-	-	-	H	-	-	-	M	H
CO5	-	-	-	-	-	-	-	-	-	-	-	H	-	-	H

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19ECJ01: PROJECT WORK PHASE – I

Credits – 3 **Sessional Marks: 40**

L:T:P::0:0:6 **University Exam Marks: 60**

Course Objectives

To expose the students to the following:

1. To offer students a glimpse into real world problems and challenges that need IT based solutions.
2. To enable students to create very precise specifications of the IT solution to be designed.
3. To introduce students to the vast array of literature available of the various research challenges in the field of IT.
4. To create awareness among the students of the characteristics of several domain areas where IT can be effectively used.
5. To enable students to use all concepts of IT in creating a solution for a problem.
6. To improve the team building, communication and management skills of the students.

Course Outcomes

After successful completion of course the student should be able to

CO1. Acquire in-depth knowledge in the core and/or interdisciplinary area of project topic.
CO2. Critically analyze the chosen topic for arriving at conclusions.
CO3. Develop and design feasible solutions for the project topic.
CO4. Undertake research and solve real world problems in the project domain.
CO5. Apply appropriate techniques, resources and modern software tools necessary for implementing the project work.
CO6. Use project results for sustainable development of the society.
CO7. Understand the impact of project results in the context of environmental sustainability.
CO8. Understand professional and ethical responsibilities for sustainable development of society in the chosen field of project.
CO9. Function effectively as individual and a member in the project team.
CO10. Develop communication skills, both oral and written for preparing and presenting project report.
CO11. Demonstrate knowledge and understanding of cost and time analysis required for carrying out the project.
CO12. Engage in continuous learning to improve knowledge and competence in the chosen subject area of project.

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H	M	-	M	-	-	-	-	-	-	-	-	H	M	-
CO2	-	H	M	-	M	-	-	-	-	-	-	-	M	H	-
CO3	-	M	H	-	M	-	-	-	-	-	-	-	H	M	-
CO4	-	-	-	H	-	M	-	-	-	M	-	-	-	M	H
CO5	-	-	M	-	H	-	-	-	-	M	-	-	-	H	-
CO6	-	-	-	-	-	H	M	-	-	-	-	-	-	-	H
CO7	-	-	-	-	-	M	H	-	-	-	-	-	-	-	H
CO8	-	-	-	-	-	-	M	H	-	-	-	-	-	-	H
CO9	-	-	-	-	-	-	-	-	H	M	M	-	-	-	H
CO10	-	-	-	-	-	-	-	M	-	H	M	-	-	-	H
CO11	-	-	-	-	-	-	-	-	M	-	H	-	-	-	H
CO12	M	M	-	-	-	-	-	-	-	-	-	H	-	-	H

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ELECTIVE – I

S.No.	Course Code	Course Title
1	19ECT17	Antennas and wave propagation
2	19EET29	Digital control systems
3	19EET11	Power electronics

19ECT17: ANTENNAS & WAVEPROPOGATION

Credits - 3 **Sessional Marks: 30**

L: T: P::2:1:0 **University Exam Marks: 70**

Course Objectives

1. To learn Antenna parameters and radiation patterns of different types of Antennas
2. To know different types of Broadband Antennas
3. To study about different types of Antenna arrays
4. To distinguish between modes of propagation and their applications

Course Outcomes

After successful completion of this course the student will be able to
CO1: Understand Antenna parameters
CO2: Calculate the radiation resistance for Quarter wave monopole and Half wave dipole andtheprinciple of Pattern multiplication
CO3: Knowthe applications of Folded dipole and its use in design of Yagi-uda
array CO4: Analyze and comparedifferent propagation techniques
CO5: Derive formulas for Critical frequency, MUF, Skip distance

UNIT I

Radiation Fundamentals: Definition of an antenna, Retarded potential, relation between potentials and time varying fields. Far-field approximation. Radiation from a current element. Antenna parameters – Radiation pattern, Radiation intensity, Directivity, Gain, HPBW, Effective aperture, relation between Directivity and maximum Effective aperture

UNIT II

Linear wire Antennas and Arrays: Current distribution on thin linear wire antennas. Half-wave dipole and Quarter-wave monopole. Array of two point sources. Principle of pattern multiplication. Uniform linear arrays – Broad side and End fire cases.

UNIT III

Broadband antennas – Long wire, V and Rhombic antennas, folded dipole, Yagi-Uda array. Log-periodic dipole array and Helical antenna.

UNITIV

Surface wave and Space wave propagation: Friis transmission formula. Salient features of Sommerfeld's theory. Ground wave field strength calculation. Antennas located over a flat earth. Effect of curvature of earth. Refraction of radio waves in troposphere. Effective radius of earth. Radio horizon and maximum radio range.

UNIT V

Sky wave propagation: Structure of ionosphere, Mechanism of wave reflection in ionosphere. Critical frequency, MUF, Virtual height, Skip distance. Effect of earth's magnetic field, Faraday rotation

Textbooks:

1. C. A. Balanis, "Antenna Theory- Analysis and design", John Wiley,3rd Edition.,1982
2. J. D. Krauss, "Antennas", McGraw -Hill,2nd Edition.,1988.

Reference books:

1. R.E Collin," Antennas and Radio WavePropagation", McGraw Hill,1985.
2. J. Griffiths, "Radio wave propagation and Antennas", Prentice Hall International.

Course Outcomes-Program Outcomes -Program Specific Outcomes(CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H	M			M							L	L		
CO2	M	H	L						M	L		L	H	L	L
CO3	L	L	H	M		H					L		H	L	L
CO4		M	M				L					M	L	M	M
CO5	M	L	H	M									H		L

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19EET32: DIGITAL CONTROL SYSTEMS

Credits - 3 **Sessional Marks: 30**

L: T: P: 2:1:0 **University Exam Marks: 70**

Course Objectives:

1. To equip the students with the basic knowledge of discretization.
2. To impart knowledge on Z-Transforms for Discrete system analysis.
3. To learn the stability analysis of digital control system.
4. To familiarize the design concepts of the controller and observer for digital control systems.

Course Outcomes:

At the end of this course, students will be able to
CO1: Obtain discrete representation of LTI systems.
CO2: Acquire knowledge on Z-Transforms in discrete time analysis.
CO3: Analyze stability of open loop and closed loop discrete-time systems.
CO4: Describe and analyze digital controllers.
CO5: Design state feedback and output feedback controllers.

UNIT I

DISCRETE REPRESENTATION OF CONTINUOUS SYSTEMS

Basics of Digital Control Systems. Discrete representation of continuous systems. Sample and hold circuit. Mathematical Modelling of sample and hold circuit. Effects of Sampling and Quantization. Choice of sampling frequency. ZOH equivalent.

UNIT II

DISCRETE SYSTEM ANALYSIS

Z-Transform and Inverse Z Transform for analyzing discrete time systems. Pulse Transfer function. Pulse transfer function of closed loop systems. Mapping from s-plane to z plane. Solution of Discrete time systems. Time response of discrete time system.

UNIT III

STABILITY OF DISCRETE TIME SYSTEM

Stability analysis by Jury test. Stability analysis using bilinear transformation. Design of digital control system with dead beat response. Practical issues with dead beat response design.

UNIT IV

STATE SPACE APPROACH FOR DISCRETE TIME SYSTEMS

State space models of discrete systems, State space analysis. Lyapunov Stability. Controllability, reachability, Reconstructibility and Observability analysis. Effect of pole zero cancellation on the controllability & Observability.

UNIT V

DESIGN OF DIGITAL CONTROL SYSTEM

Design of Discrete PID Controller, Design of discrete state feedback controller. Design of Discrete Observer for LTI System. Design of Discrete compensator. Design of discrete output feedback control. Fast output sampling (FOS) and periodic output feedback controller design for discrete time systems.

TEXT BOOKS:

1. K. Ogata, "Digital Control Engineering", Prentice Hall, Englewood Cliffs, 1995.
2. M. Gopal, "Digital Control Engineering", Wiley Eastern, 1988.
3. G. F. Franklin, J. D. Powell and M. L. Workman, "Digital Control of Dynamic Systems", Addison-Wesley, 1998.
4. B.C. Kuo, "Digital Control System", Holt, Rinehart and Winston, 1980.

Course Outcomes – Program Outcomes (CO-PO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	√											
CO2		√										
CO3		√										
CO4					√							
CO5					√							

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19EET13: POWER ELECTRONICS

Credits – 4 **Sessional Marks: 30**

L: T: P:: 3:1:0 **University Exam Marks: 70**

Course objectives:

1. To study the characteristics of various power semiconductor devices and to design firing circuits for SCR.
2. To learn the operation of single phase and three phase controlled rectifiers with R, RL, RLE loads and effect of source inductance and freewheeling diode on converter performance.
3. To know about control strategies of Choppers and their performance
4. To impart knowledge on line commutated converters, Cycloconverter and ac voltage regulators.

Course outcomes:

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

CO1: Describe the characteristics of various power semiconductor devices and analyze The Static and dynamic characteristics of SCR's and Design firing circuits for SCR

CO2: Understand the operation of single phase and three phase converters.

CO3: Analyze the operation of different types of DC-DC converters and control Strategies.

CO4: Explain the operation of single and three phase inverters and application of PWM techniques for voltage Control.

CO5: Discuss about the operation of AC voltage controllers and Cyclo converters.

UNIT-I

Power semi conductor devices: Diode , thyristor, MOSFET, IGBT : V-I characteristics; dynamic characteristics of SCR, Firing circuit for thyristor– Series and parallel operation of SCR's, Need for Equalizing Network and Equalizing Network design – Protection circuits – Design of Snubber circuit – Class A,B,C,D,E types of commutation circuits.

UNIT-II

Phase controlled Rectifiers - Principles of phase control – Half-wave and full- wave controlled rectifiers with resistive, inductive load – Freewheeling diode operation – Bridge rectifiers – Single phase and three phase Rectifiers with inductive load – Half and fully controlled rectifiers – freewheeling diode operation – Effect of source inductance –Dual converter – circulating and non-circulating current mode of operation.

UNIT-III

Choppers –Principles of operation – Principles of operation – control strategies, constant and variable frequency system, current limit control – Types of chopper circuits – Type-A, Type B and Type E chopper circuits Morgan chopper Jone's chopper – step-up and multiphase chopper circuits – load commutated chopper.

UNIT-IV

Inverters – Classification – series and parallel inverters improved series inverters – Bridge inverters – Commutation circuits – current and voltage commutation circuits – single phase and three phase inverters – output waveform control – Mc Murray and Inverter – Introduction to current source inverters.

UNIT-V

Cyclo-converters – Principle of operation – single phase step-up and step down cyclo converters – Three-phase half-wave cyclo converters – output voltage equation – circulation and non-circulating current mode of operation – Load commutated cyclo converter. Introduction to AC voltage controller.

TEXTBOOKS:

1. Power Electronics - Dr.P.S.Bimbhra 2nd edition – Khanna publishers.
2. Power Electronics – M.D.SINGH and K.B.KHANCHANDANI – Tata Mc.Graw Hill publishers.

REFERENCES

1. Power Electronics – Dr.Vedam Subramanyam.
2. A TEXTbook of Power Electronics – S.N.SINGH.

Course Outcomes – Program Outcomes (CO-PO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	√											
CO2	√											
CO3			√									
CO4		√										
CO5			√									

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ELECTIVE – II

S.No.	Course Code	Course Title
1	19ECT19	Embedded systems
2	19ECT21	Bio medical electronics
3	19CST06	Oops

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19ECT19 -EMBEDDED SYSTEMS

Credits - 3 **Sessional Marks: 30**

L: T: P:: 2:1:0 **University Exam Marks: 70**

Course objectives:

1. To familiarize about the basic functions of embedded systems.
2. To inculcate the basic architecture of general purpose processors and its applications.
3. To Gain interface between analog and digital systems, also Software aspects of embedded systems.
4. To develop different State Machine and Concurrent Process Models.
5. To Learn Evolution of complication and synthesis, Verification and reuse of intellectual property cores.

Course Outcomes:

After successful completion of the course the student should be able to

CO1: Understand the embedded system concepts and technologies of embedded systems.

CO2: Analyze the general process of embedded system development.

CO3: Construct interfacing between analog and digital systems and apply Software aspects of embedded systems.

CO4: Create finite state machines and analyze Communication and Synchronization among processes.

CO5: Design and develop automation.

UNIT I

Introduction: The concept of embedded systems design, Examples of embedded systems Design challenge, Processor technology, IC technology, Design technology. RT-Level combinational logic, Sequential logic (RT-Level), Custom single purpose processor design (RT-Level), Optimizing custom single purpose processors.

UNIT II

General Purpose Processors: Basic architecture, Development environment, Application specific system depth, Set processors (ASIPs), embedded Memories.

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UNIT III

Technological aspects of embedded systems: Interfacing between analog and digital blocks, signal conditioning, digital signal processing. System interfacing, interfacing with external systems, user interfacing. Design tradeoffs due to process compatibility, thermal considerations, etc., Software aspects of embedded systems: real time programming languages and operating systems for embedded systems.

UNIT IV

State Machine and Concurrent Process Models: Introduction, Models Vs languages, Finite State Machine with Data path model (FSMD), Using State Machines, Program State Machine (PSM),Concurrent Process Model, Concurrent Processes, Communication among processors, Synchronization among processes, Implementation, Data flow model.

UNIT V

Introduction Automation: The parallel evolution of complication and synthesis, Logic, RT, Behavioral synthesis, System synthesis and hardware/software code sign, Verification of hardware/software co-simulation, Reuse of intellectual property cores, Embedded microcontroller cores.

Text Books

1. Frank Vahid, Tony D. Givargis, John Wiley & Sons," Embedded Systems Design – A unified Hardware/Software introduction" by Inc.2nd edition 2002.
2. J.W. Valvano, "Embedded Microcomputer System: Real Time Interfacing", Brooks/Cole, 3rd edition 2000.

Reference Books

1. Jack Ganssle, "The Art of Designing Embedded Systems", 3rd edition Newness, 1999.
2. David Simon, "An Embedded Software Primer", Addison Wesley, 2nd edition,2000.

Course Outcomes-Program Outcomes -Program Specific Outcomes(CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H		L				M						H		
CO2	L	M	H	M	L					L				M	H
CO3				M	H		L		L	M	L		L	M	H
CO4		L	M	H				L	M		M	L		L	H
CO5			M	L		H	L	M	L	L	M	M	L	H	M

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19ECT21: BIO-MEDICAL ELECTRONICS

Credits-3 **Sessional Marks: 30**

L:T:P::2:1:0 **University Exam Marks:70**

Course Objectives

1. To acquire knowledge on basics of human physiology and cardiovascular systems.
2. To study different bio electrodes, biomedical transducers and measurements of physiological parameters.
3. To deal with ECG, EEG &EMG machines, recordings and their interpretations.
4. To learn how electronic instruments works in various departments and laboratories of a hospital and solve engineering problems related to medical field.

Course Outcomes

After successful completion of the course the student should be able to
CO1.Describe the functioning of human physiological systems.
CO2.Understand the origin of Bioelectric Potential and their measurements using electrodesand transducers.
CO3.Explore the applications of the electronic systems in biological measurements using namely the ECG, EMG and EEG machines.
CO4.Analyse the biological processes by using electronic systems.
CO5.Examine the various medical imaging techniques and discuss about therapeutic and assist Doctors about conditions of patients.

UNIT 1

Human physiological Systems: Brief introduction to human physiology, cells and their structure, transport of ions through the cell membrane, Resting and action potentials, Bioelectric potentials, Nerve tissues and organs, Different systems of human body.

UNIT II

Biomedical Transducers: The transducer and transduction principles, active transducers, passive transducers, transducers for biomedical applications. Bio-electrodes: Electrode theory, Biopotential Electrodes, Biochemical transducers.

UNIT III

Bioelectric potentials and Measurements: Resting and action potentials, propagation of action potentials, Bioelectric potentials for ECG, EMG and EEG machines.

UNIT IV

Cardiovascular System and Measurements:The heart and Cardiovascular System, measurement of blood pressure, measurement of blood flow, Impedance plethysmography, temperature measurements, ultrasonic measurement, X-ray and nuclear imaging.

UNIT V

Prosthetic Devices:Block diagram approach of Pacemakers, Defibrillators, heart-lung machine and kidney machine. Safety aids: Introduction, radiation safety instrumentation, Microshock and macroshock hazards, aids for the handicapped, devices to protect against electric hazards.

Text Books

1. Leslie Cromwell, F.J.Weibell, E.A.Pfeiffer, Biomedical Instrumentation and Measurements, 2nd Edition, PHI, 2004.
2. John G. Webster, Medical Instrumentation, Application and Design, 3rd Edition, John Wiley, 2001.

Reference Books

1. L.A. Geoddes and L.E. Baker, Principles of Applied Biomedical Instrumentation, 3rd Edition, John Wiley and Sons, 1991.
2. R.S. Khandpur, Hand-book of Biomedical Instrumentation, 2nd Edition, McGraw-Hill, 2003.
3. M. Cook and J.G. Webster(eds.), Therapeutic Medical Devices: Application and Design, Prentice-Hall, 1982.
4. Arun Ghosh, Introduction to measurements and instrumentation, 3rd Edition, PHI learning, 2010.
5. W. F. Ganong, Review of Medical Physiology, 8th Asian Ed, Medical, Publishers, 1977.

Course outcomes-Program outcomes -Program Specific Outcomes-(CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H	M											H		
CO2	H			M									H	M	
CO3	L	L	M	H									H	M	
CO4	H	M													H
CO5	L	M	M	H										M	H

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19CST06: OBJECT ORIENTED PROGRAMMING

Credits – 3 **Sessional Marks: 30**

L:T:P::2:1:0 **University Exam Marks: 70**

Course Objectives

To expose the students to the following:

1. Study the syntax, semantics and features of Java Programming Language.
2. Learn inheritance, polymorphism and interfaces.
3. The method of creating Multi-threaded programs and handle exceptions.
4. Java features to create GUI applications & perform event handling.
5. Basics of Java Data Base Connectivity.

Course Outcomes

After successful completion of course the student should be able to

CO1. Understand the basic concepts of object oriented programming.
CO2. Solve problems using object-oriented approach and implement them using Java.
CO3. Write efficient programs with multitasking.
CO4. Create own Exceptions and handle Exceptions.
CO5. Develop GUI Components and design application projects.
CO6. Design java application to connect to Database.

UNIT I

OOP concepts: Classes and objects, data abstraction, encapsulation, inheritance, benefits of inheritance, Polymorphism

Java Programming: History of java, comments, data types, variables, constants, scope and life time of variables, operators, hierarchy expressions, type conversions and casting, enumerated types, control for block scope, conditional statements, loops, break and continue statements, simple java standalone programs, arrays, console input and output, formatting output, constructors, methods, parameter passing, static fields and methods, access controls, this reference, overloading methods and constructors, recursions, garbage collections, building strings, exploring strings class.

UNIT II

Inheritance: Inheritance hierarchies super and sub classes, member access rules, super keyword, and preventing inheritance: final classes and methods, the object class and its methods.

Polymorphism: Dynamic binding, method overloading, abstract classes and methods.

Interface: Interface vs. Abstract classes, defining an interface, implementing interfaces, accessing implementations through interfaces references, extending interface.

Inner classes- use of inner classes, local inner classes, anonymous inner classes, static inner classes, example

Packages: Defining, creating and accessing a package, understanding CLASSPATH, importing packages

UNIT III

Exception Handling: Dealing with errors, benefits of exception handling, the classification of exceptions, exception hierarchy, checked exceptions and unchecked exception, usage of try, catch, throw, throws, and finally, re-throwing exceptions, exception specification, built in exceptions, creating own exception sub classes.

Multithreading-difference between multiple processes and multiple threads, thread states, creating threads, interrupting threads, thread priorities, synchronizing threads, inter-thread communication, producer consumer pattern.

UNIT IV

Collection Framework in Java: Introduction to java collections, overview of java collection frame work, Generics, Commonly used Collection Classes-Array List, vector, Hash table, Stack, Enumeration, Iterator, String Tokenizer, Random, Scanner, calendar and Properties.

Files: Streams-byte streams, character streams, text input/output, binary input/output, random access file operations, file management using File class.

Connecting to Database: JDBC type I to IV drivers, connecting to a database, querying a database and processing the results, updating data with JDBC

UNIT V

GUI Programming with Java: The AWT class hierarchy, introduction to Swing, Swing vs. AWT, Hierarchy for Swing components, Containers-JFrame, JApplet, JDialog, JPanel, Overview of some swing components, JButton, JLabel, JTextField, JTextArea, simple Swing applications, Layout management- Layout manager types- border grid and flow.

Event Handling: Events, Event sources, Event classes, Event Listeners, Relationship between Event sources and Listeners, Delegation event model, examples: handling a button click, handling mouse events, Adapter classes.

Text Books

1. Herbert Schildt,DaleSkrien, “Java Fundamentals-A Comprehensive Introduction”, 1st Edition, McGraw-Hill, 2013.
2. Herbert Schildt, “Java the complete Reference”, 8th Edition, McGraw-Hill, Osborne 2011.

Reference Books

1. P.Radha Krishna, “Object Oriented Programming through java”, Universities Press, 2007.
2. Bruce Eckel, “Thinking in Java”, Pearson Education, 2006.
3. S.Malhotra and S.Choudhary, “Programming in Java”, Oxford University Press, 2013.

Web References

1. http://www.javatpoint.com/java-tutorial
2. http://www.javatutorialpoint.com/2015/03/introduction-to-java.html

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H	M	-	-	-	-	-	-	-	-	-	-	H	-	-
CO2	L	M	H	-	-	-	-	-	-	-	-	-	H	M	-
CO3	-	M	H	L	-	-	-	-	-	-	-	-	L	H	L
CO4	-	H	M	-	-	-	-	-	-	-	-	-	L	H	-
CO5	L	-	H	-	M	-	-	-	-	-	-	-	L	H	M
CO6	M	L	H	-	-	-	-	-	-	-	-	-	L	H	-

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ELECTIVE – III

S.No.	Course Code	Course Title
1	19ECT26	Satellite communication
2	19ECT20	Coding theory and techniques
3	19ECT27	Nano electronics
4	19CST10	Operating systems

19ECT26: SATELLITE COMMUNICATION

Credits - 3 **Sessional Marks: 30**

L: T: P:: 2:1:0

University Exam Marks: 70

Course Objectives

6. To learn Principles, architecture, advantages and disadvantages of satellite Communication.
7. To study various sub-systems of a satellite.
8. To familiarize various effects on satellite and its remedies.
9. To develop different parameters associated with satellite link budget.
10. To categorize types of antennas and it's multiple access schemes.

Course Outcomes

After successful completion of the course the student should be able to

CO1. To understand the basic concepts of satellite Communication.

CO2. To analyze various satellite sub-systems and communication among them.

CO3. To create effects and remedies on satellite

CO4. To formulate equations and calculations for satellite link budget.

CO5. To analyze various types of modulations and multiple access schemes.

UNIT I

Introduction to Satellite Communication: Principles and architecture of satellite Communication, Brief history of Satellite systems, advantages, disadvantages, applications and frequency bands used for satellite communication. Orbital Mechanics: Orbital equations, Kepler's laws, Apogee and Perigee for an elliptical orbit, evaluation of velocity, orbital period, angular velocity etc. of a satellite, concepts of Solar day and Sidereal day.

UNIT II

Satellite sub-systems: Study of Architecture and Roles of various sub-systems of a satellite system such as Telemetry, tracking, command and monitoring (TTC & M), Attitude and orbit control system (AOCS), Communication sub-system, Power supply, Station Keeping, Thermal control, TT&C subsystem, Transponders, Propulsion system, Antenna subsystem.

UNIT III

Typical Phenomena in Satellite Communication: Solar Eclipse on satellite, its effects, remedies for Eclipse, Sun Transit Outage phenomena, its effects and remedies, Doppler frequency shift phenomena and expression for Doppler shift.

UNIT IV

Space Link: Satellite link budget: Flux density and received signal power equations, Calculation of System noise temperature for satellite receiver, noise power calculation, Drafting of satellite link budget and C/N ratio

calculations in clear air and rainy conditions, ERIP, Transmission losses, Link power budget equation system noise, E_b/E_o and C/N ratios, Up – link, Down link

UNIT V

Earth Station: Antenna types, High power amplifier, Low – amplifier, Up converter, Down converter. Modulation and Multiple Access Schemes: Various modulation schemes used in satellite communication

Multiple Access: Meaning of Multiple Access, Multiple access schemes based on time, frequency, FDMA, SPADE network, TDMA, Frame structure, CDMA, VSAT and MSATs.

Text Books

1. Timothy Pratt Charles W. Bostian, Jeremy E. Allnutt: Satellite Communications: Wiley India. 2nd edition 2002
2. Dennis Roddy: Satellite Communication: 4th Edition, McGraw Hill,2009

Reference Books

1. K. N. Rajarao, “Fundamentals of Satellite Communication”, Prentice
2. Tri T. Ha: Digital Satellite Communications: Tata McGraw Hill, 2009

Course outcomes-Program outcomes -Program Specific Outcomes-(CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H	L				L							H	M	
CO2		H	M	L			L		L	L	M	L	H		L
CO3			H	H			M				L	M		L	H
CO4		H				M	L		M	L	L	L		M	H
CO5		H	M	L			L		L	M	M	L	M	H	

19ECT20: CODING THEORY AND TECHNIQUES

Credits – 3 **Sessional Marks: 30**

L: T: P: 2:1:0 **University Exam Marks: 70**

Course Objectives

1. To introduce the principles and applications of information theory.
2. To study how information is measured in terms of probability and entropy, and the relationships among conditional and joint entropies.
3. To learn coding schemes, including error correcting codes.
4. To explain how this quantitative measure of information may be used in order to build efficient solutions to multitudinous engineering problems.

Course Outcomes:

After successful completion of the course the student should be able to CO1: Apply linear block codes with error correction and error detection. CO2: Develop the concepts of cyclic codes.
CO3: Apply convolutional codes for performance analysis.
CO4: Acquire the basics of turbo codes.
CO5: Design space codes for the channel performance.

UNIT I

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

UNIT II

Cyclic Codes : Description, Generator and Parity-check Matrices, Encoding, Syndrome Computation and Error Detection, Decoding ,Cyclic Hamming Codes, Shortened cyclic codes, Error-trapping decoding for cyclic codes, Majority logic decoding for cyclic codes.

UNIT III

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

UNIT IV

Turbo Codes: LDPC Codes- Codes based on sparse graphs, Decoding for binary erasure channel, Log-likelihood algebra, Brief propagation, Product codes, Iterative decoding of product codes, Concatenated convolutional codes- Parallel concatenation, The UMTS Turbo code, Serial concatenation, Parallel concatenation, Turbo decoding

UNIT V

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

Text Books

1. Ranjan Bose, "Information Theory, Coding and Cryptography", 2nd Edition, TMH,2009,.
2. Man YoungRhee, "Error Correcting Coding Theory", McGraw-Hill, 1989.

Reference Books

1. Bernard Sklar, "Digital Communications-Fundamental and Application", PE,2000.
2. John G. Proakis, "Digital Communications", 5th Edition, 2008, TMH.
3. K.Moon, "Error Correction Coding – Mathematical Methods and Algorithms", Wiley India, 2006,.

Course Outcomes- Program Outcomes -Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H	M	M	L					L	L	L		H	M	
CO2	H	M	M	L					L	L	L		H	H	
CO3	H	M	M	L					L	L	L		H		
CO4	H	M	L	L					L	L	L		H	M	
CO5	L	L	H	M					L	L	L	L	L	M	H

19ECT27-NANO ELECTRONICS

Credits – 3 **Sessional Marks: 30**

L: T: P::2:1: **University Exam Marks: 70**

Course Objectives

1. To study the concept of Nano electronics.
2. To understand the Mesostructure, Schrodinger equation, Kronig penny model.
3. To construct the shrink down approaches.
4. To discuss Nano particles, Nano shells and Nano tubes electronics.

Course Outcomes

After successful completion of the course the student should be able to CO1: Apply knowledge on Nano technology and its applications.
CO2: Analyse the concept of Quantum Mechanics, solid band theory, Kronig penny model. CO3: Demonstrate the Shrink- down approaches, CMOS scaling.
CO4: Recognize Nano crystals, Nano particles and apply their knowledge on practicalapplications. CO5: Compare the performance of different nano electronic devices.

UNITI

Introduction to Nano Technology: Nano – The Beginning – Electron microscope – Scanning probe microscope Optical microscope for Nano science and Technology otherkindsofmicroscope.
Carbon Nanotubes: Synthesis and purification – Filling of Nanotubes Mechanism of growth – Electronic structure – Transport, Mechanical and physical properties – Applications.

UNIT II

Basics of Quantum Mechanics:Meso structure, Schrodinger equation, Density of States. Particle in a box Concepts, Degeneracy, Band Theory of Solid, Kronig-Penny Model, Brillouin Zones.

UNIT III

Shrink-downapproaches: Introduction, CMOS Scaling, The Nano scale MOSFET, Finfets, Vertical MOSFETs, limits to scaling, system integration limits (interconnect issues etc.).

UNIT IV

Nano Particles and Nanoshells:Electronic structure of Nanocrystals Correlation of properties with size uses. Monolayer -protected metal, Nanoparticles method of preparation characterization Functionalized Metal, Nanoparticles Applications super lattices. Core-shell Nanoparticles Types of systems characterization properties Applications.Types of Nano shells and its properties characterization applications.

UNITV

Nano Electronic Devices:Synthesis of Quantum dots, ResonantTunnelling Diode, Coulomb dots, Quantum blockade, Single electron transistors, Carbon nanotube electronics, Band structure and transport, devices, applications, 2D semiconductors and electronic devices, Graphene, atomistic simulation.

Text Books

1. Rainer waser, "Nanoelectronics and Information Technology (Advanced Electronic Materialand Novel Devices)", 3rd edition,Wiley-VCH, 2012.
2. G.W. Hanson,"Fundamentals of Nanoelectronics", Pearson, 2009.

Reference Books

1. K.Goser, P.Glosekotter,J.Dienstuhl, "Nanoelectronics and Nanosystems", Springer Edition, 2004.
2. .P. Poole, F. J. Owens,"Introduction to Nanotechnology", Wiley, 2003.
3. T.Pradeep, "Nano: The Essentials", TMH Edition, 2008.

Course Outcomes-Program Outcomes -Program Specific Outcomes(CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H	M											H		
CO2	H	M											H		
CO3			H	M									H	M	
CO4	H		L	M									L	M	H
CO5	H												L	M	H

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19CST10: OPERATING SYSTEMS

Credits – 3 **Sessional Marks: 30**

L:T:P::2:1:0 **University Exam Marks: 70**

Course Objectives

To expose the students to the following:

1. The basic concepts of Operating System, its functions and services.
2. The functionality of CPU Scheduling, Processes and Threads.
3. Various views and management policies adopted by OS as pertaining with processes, Deadlock, memory.
4. Fundamental concepts towards File and I/O operations.

Course Outcomes

After successful completion of course the students should able to

CO1. Understand the fundamental concepts of operating systems and its structure, processes and threads.
CO2. Develop algorithms for process scheduling for a given specification of CPU utilization, Throughput, Turnaround Time, Waiting Time, and Response Time.
CO3. Analyze the memory management techniques.
CO4. Apply page replacement algorithms to resolve the issues in virtual memory.
CO5. Acquire the knowledge on files and I/O management system.

UNIT I

Introduction and Operating System Structure: Operating-System Structure, Operating-System Operations, Protection and Security, Kernel Data Structures, Computing Environments, Open-Source Operating Systems, Operating-System Services, User and Operating-System Interface, System Calls, Types of System Calls, System Programs, Operating-System Design and Implementation, Operating-System Structure, Operating-System Debugging, Operating-System Generation, System Boot

UNIT II

Process Management: Processes: Process Concept, Process Scheduling, Operations on Processes Inter-process Communication, Examples of IPC Systems, Communication in Client– Server Systems Threads: Overview, Multicore Programming, Multithreading Models, Thread Libraries, Implicit Threading, Threading Issues. CPU Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms, Thread Scheduling, Multiple-Processor Scheduling, Real-Time CPU Scheduling, Operating-System Examples, Algorithm Evaluation

UNIT III

Deadlocks: System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.
Memory Management: Main memory: Background, Swapping, Contiguous Memory Allocation, Segmentation, Paging, structure of the Page Table
Virtual Memory: Background, Demand Paging, Copy-on-Write, Page Replacement, Allocation of

Frames, Thrashing, Memory-Mapped Files, Allocating Kernel Memory

UNIT IV

Storage management: Mass-Storage Structure: Overview of Mass-Storage Structure, Disk Structure, Disk Attachment, Disk Scheduling, Disk Management, Swap-Space Management, RAID Structure
File-System Interface: File Concept, Access Methods, Directory and Disk Structure, File-System Mounting, File Sharing, Protection.

UNIT V

File-System Implementation: File-System Structure, File-System Implementation, Directory Implementation, Allocation Methods, Free-Space Management, Efficiency and Performance, Recovery, NFS
I/O Systems: Overview, I/O Hardware, Application I/O Interface, Kernel I/O Subsystem, Transforming I/O Requests to Hardware Operations, STREAMS.

Text Books

1. Silberschatz and Galvin John, "Operating Systems Concepts", 9th Edition, Wiley ,2013.

Reference Books

1. Williams Stallings, "Operating Systems", Second Edition, PHI, 1997.
2. Ida M. Flynn and Ann Mclver Mc Hoes, "Understanding Operating Systems", 7th Edition, Delmar Cengage Learning,2013.
3. Charles Crowley, "Operating System: A Design-oriented Approach", 1st Edition, Irwin Publishing 1997.

Web References

1. https://nptel.ac.in/courses/106/106/106106144/

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H	M	-	-	-	-	-	-	-	-	-	-	H	-	-
CO2	M	M	H	L	-	-	-	-	-	-	-	-	M	H	L
CO3	M	H	-	L	-	-	-	-	-	-	-	-	H	M	-
CO4	-	H	M	M	-	-	-	L	-	-	-	-	M	H	L
CO5	H	M	L	-	M	-	-	-	-	-	-	-	H	-	-

ELECTIVE – IV

S. No	Course Code	Course Title
1	19ECM01	Mandatory MOOCs

ELECTIVE – V

S.No.	Course Code	Course Title
1	19ECT23	Digital CMOS design
2	19ECT22	Digital image and video processing
3	19ECT24	Radar systems

19ECT23:DIGITAL CMOS DESIGN

Credits - 3 **Sessional Marks: 30**

L: T: P::2:1:0 **University Exam Marks: 70**

Course Objectives

1. To design transistor level digital building blocks CMOS microprocessors, DPSs, network processors, digital backend of all wireless systems etc.
2. To design building blocks by using combinational and sequential logic circuits of different switch logics, latches, registers etc.
3. To focus on the transistor level design and will address all important issues related to size, speed and power consumption.
4. To design and analyse clocking of various circuits.

Course Outcomes

At the end of the course, students will be able to:
CO1. Carry out transistor level hand calculation-based design
CO2: Analyse building blocks used in digital CMOS VLSI circuits.
CO3. Develop building blocks for sequential circuits.
CO4. Understand the design methodology
CO5.Maketrade-offs of the various circuit choices for each of all the blocks discussed.

UNIT I

MOS Transistor Principles And CMOS Inverter: MOS(FET) Transistor Characteristic under Static and Dynamic Conditions, MOS Transistor Secondary Effects, Process Variations, Technology Scaling, CMOS Inverter - Static Characteristic, Dynamic Characteristic, Power, Energy, and Energy Delay parameters.

UNIT II

Combinational Logic Circuits: Propagation Delays, Stick diagram, Layout diagrams, Examples of combinational logic design, Elmore's constant, Dynamic Logic Gates, Pass Transistor Logic, Power Dissipation, Low Power Design principles.

UNIT III

Sequential Logic Circuits: Static Latches and Registers, Dynamic Latches and Registers, Timing Issues, Pipelines, Pulse and sense amplifier based Registers, Non-bistable Sequential Circuits.

UNIT IV

Arithmetic Building Blocks And Memory Architectures: Data path circuits, Architectures for Adders, Accumulators, Multipliers, Barrel Shifters, Speed and Area Tradeoffs, Memory Architectures, and Memory control circuits.

UNIT V

Interconnect And Clocking Strategies: Interconnect Parameters – Capacitance, Resistance, and Inductance, Electrical Wire Models, Timing classification of Digital Systems, Synchronous Design, Self-Timed Circuit Design.

Text Books

1. Jan Rabaey, AnanthaChandrakasan, B Nikolic, "Digital Integrated Circuits: A Design Perspective". Second Edition, Feb 2003, Prentice Hall of India.
2. N.Weste, K. Eshraghian, " Principles of CMOS VLSI Design". Second Edition, 1993 Addision Wesley.

ReferenceBooks

1. M J Smith, "Application Specific Integrated Circuits", Addisson Wesley, 1997
2. Jacob Baker "CMOS: Circuit Design, Layout, and Simulation, Third Edition", Wiley IEEE Press 2010 3rd Edition

Course outcomes-Program outcomes -Program Specific Outcomes-(CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	L	M	H											H	
CO2		M		H		L							H		
CO3	M	L	H										H		
CO4			M	H	L								H		
CO5				H	L							M			H

19ECT22: DIGITAL IMAGE AND VIDEO PROCESSING

Credits: 3 **Sessional Marks: 30**

L:T:P:: 2:1:0 **University Exam Marks: 70**

Course Objectives

The objective of this course is to make the students:

1. To learn basic concepts of image processing, fundamentals and mathematical models in digital image and video processing.
2. Ability to study different types of image transforms for image and video processing
3. To develop time and frequency domain techniques for image enhancement.
4. To understand Image segmentation, restoration, and morphological signal processing with applications.
5. To expose the students to current applications, techniques and issues in image and video processing.

Course Outcomes

At the end of the course, students will demonstrate the ability to

CO1.Understand theory and models in Image and Video Processing.
CO2.Interpret and analyze 2D signals in frequency domain through image transforms.
CO3. Apply quantitative models of image and video processing for various engineering applications.
CO4. Develop innovative design for practical applications in various fields.
CO5. Understand
different methods, models for video processing and motion estimation.

UNIT I

Fundamentals of Image Processing and Image Transforms: Introduction, Image sampling, Quantization, Resolution, Image file formats, Elements of image processing system, Applications of Digital image processing, Need for transform, image transforms, Fourier transform, 2 D Discrete Fourier transform and its properties, Importance of phase, Walsh transform, Hadamard transform,Discrete cosine transform, KL transform, comparison of different image transforms.

UNITII

Image Enhancement: Spatial domain methods: Histogram processing, Fundamentals of Spatial filtering, Smoothing spatial filters, Sharpening spatial filters. Frequency domain methods: Basics of filtering in frequency domain, image smoothing, image sharpening, Selective filtering.
Image Restoration: Introduction to Image restoration, Image degradation, Types of image blur, Classification of image restoration techniques, Image restoration model, Inverse filtering and Wiener filtering.

UNIT III

Image Segmentation: Introduction to image segmentation, Point, Line and Edge Detection, Region based segmentation., Classification of segmentation techniques, Region approach to image segmentation, clustering techniques, Image segmentation based on thresholding, Edge based segmentation.

UNIT IV

Image Compression: Introduction, Need for image compression, Redundancy in images, Classification of redundancy in images, image compression scheme, Classification of image compression schemes, Fundamentals of information theory, Run length coding, Shannon – Fano coding, Huffman coding, Discrete cosine transform, JPEG coding, Transformed based compression, Image compression standard, JPEG Standards.

Basic Steps of Video Processing:Analog Video, Digital Video. Time-Varying Image Formation models: Three-Dimensional Motion Models, Geometric Image Formation, Photometric Image Formation.

UNIT V

2-DMotionEstimation: Optical flow, General Methodologies, Pixel Based Motion Estimation,

Block-Matching Algorithm, Mesh based Motion Estimation, Global Motion Estimation, Region based Motion Estimation, Multi resolution motion estimation, Waveform based coding, Block based transform coding, Predictive coding, Application of motion estimationinVideocoding.

Text Books

1.R.C. Gonzalez and Woods,"Digital Image Processing"- 3rd Ed., Pearson.-2002

2. Yao Wang, Joern Ostermann and Ya–quin zhang, "Video Processing and Communications" – Zhang. 1st Ed., PH Int.-2002.

Reference Books

1. ScotteUmbaugh,"Digital Image Processing and Analysis-Human and Computer Vision Application withCVIP Tools" – 2nd Ed, CRC Press,2011.

2. M. Tekalp, "Digital Video Processing", –Prentice Hall International.

3. S.Jayaraman, S.Esakkirajan, T.VeeraKumar –"Digital Image Processing", TMH, 2009.

Course outcomes-Program outcomes -Program Specific Outcomes-(CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H	L	L	M	M					M		M	H		
CO2	L	M	M	H	L	L				L			H	M	
CO3	L	M	M	M	M	H		M		L				H	L
CO4			H	M	L	M	L	L	L	M	L	L	H	L	M
CO5	H	M	L		H	L			M	L		L	M	H	
CO6															

19ECT24: RADAR SYSTEMS

Credits - 3 **Sessional Marks: 30**

L: T: P::2:1:0 **University Exam Marks: 70**

Course Objectives

1. To derive the basic RADAR equation and its dependence on various parameters.
2. To study CW RADAR system and its applications along with FMCW RADAR system for altimeter applications.
3. To compare Pulse RADAR and MTI RADAR
4. To understand moving target indicator and to study its applications.
5. To study and understand the effect of noise on RADAR signal detection.

Course Outcomes

After successful completion of the course the student should be able to
CO1.Understand the basic concepts of Radar.
CO2. Analyze the CW Radar and FMCW Radar system for the measurement of speed and distance.
CO3. Apply the techniques to remove the clutter using MTI Radar and Pulse Doppler Radar.
CO4. Distinguish different navigation systems
CO5. Compare Navigation aids for direction finding and range of travel of aircrafts

UNIT I

Nature of Radar, simple form radar equation, radar blocks diagram and operation, Radar frequencies, applications of Radar.
Minimum detectable signal – Receiver noise, Probability Density function, signal-to-noise ratio, Radar cross section of target, cross-section fluctuations.

UNIT II

Radar Components: RF amplifier, TWT, CFA, Modulators, mixers – Conversion loss, Noise figure, Balanced mixer, Image recovery mixer, Duplexers – Branch type, Balanced type and solid-state duplexers, limiters, Displays – CRT displays, A, B,C, D – scopes, PPI and RHI.

UNIT III

Radar Systems: CW radar, frequency – modulated CW radar, multiple – Frequency CW radar, MTI radar – Delay line cancellers, Pulse repetition frequencies, Range-gated Doppler filters, tracking radar, Range and angle tracking, sequential lobbing and conical scanning.

UNIT IV

Navigational Systems: Radio direction finding and radio ranges, loop antenna, Goniometer, errors in direction finding, LF/MF four-course radio range, VHF –VOR,VOR receiving equipment.

UNIT V

Navigational Aids: Hyperbolic systems of navigation, DME, TACAN, Loran-A, Loran-C specifications, Decca navigation systems and Decca receivers, DME-operation, TACAN equipment.

Text Books

1. Merrill I. Skolnik ,"Introduction to Radar Systems", 2nd Ed.,Mc Graw Hill Education Special Indian Edition, 2007.
2. N.S. Nagaraju ,"Elements on electronic navigation " ,2nd edition 1996.

Reference Books

1. Mark A. Richards, James A. Scheer William A. Holm, Yesdee, " Principles of Modern Radar Basic Principles ",2013
1. G.M. Mikker ,"Modern Electronic Communication" ,6th edition, Prentice Hall 1999.
2. Kennedy & Davis ,"Electronic Communication Systems ", 4th edition, TMH 1993.

Course Outcomes-Program Outcomes -Program Specific Outcomes-(CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H	M					L						H		L
CO2		H	M	L		L	L			M	L		L	H	M
CO3		H	M	L		L	L			M	L		L	H	M
CO4			H	M			L				L	L	H		M
CO5			H	M			L		L		L	L	H		M

ELECTIVE – VI

S.No.	Course Code	Course Title
1	19ECT18	Low power VLSI design
2	19ECT28	Wireless sensor networks
3	19ECT25	Fiber optic communications

Ms. M. Krupa Swaroopa Rani
Coordinator (ECE)

Dr. P. Satyanarayana
BoS Chairman (I/C) (ECE)

Dr. R.V. Satyanarayana
BoS Chairman (ECE)

Dr. A. Ramakrishna Rao
Director, SE&T

19ECT18: LOW POWER VLSI DESIGN

Credits - 3 **SessionalMarks:30**

L: T: P::2:1:0 **University Exam Marks: 70**

Course objectives:

1. To know the various power dissipations in digitalcircuits
2. Toidentify different sources of power dissipation in CMOS devices.
3. To understand the circuit techniques for dynamic power reduction.
4. To acquire circuit techniques for leakage reduction.
5. To analyze power dissipation in Arithmetic circuits.

Course Outcomes:

At the end of this course students will be able to
CO1:Identify the types of power dissipation in MOSFET devices and understand its impact on system performance and reliability.
CO2:Understand various sources of power dissipation in CMOS devices.
CO3:Analyze different circuit techniques for dynamic power dissipation
CO4:Examine different circuit techniques for Static power dissipation.
CO5:Categorize the power dissipation in low power arithmetic circuits.

UNIT – I

Physics of Power Dissipation In MOSFET Devices: MOS structure, Need for low power circuit design, Threshold voltage, Body effects, Shortchannel effects-Surface scattering, Punch through, Velocity saturation, Impactionization, Hot electron effects, drain induced barrier lowering, Narrow width effects.

UNIT – II

Sources Of Power Dissipation In CMOS:Switching power dissipation, Short circuit powerdissipation, Glitching power dissipation, Leakage power dissipation, Transistorleakage mechanism of deep submicron transistors.

UNIT – III

Circuit Techniques For Dynamic Power Reduction:Dynamic power consumption components, Circuit parallelization, memory parallelization, voltagescaling based circuit techniques: Multiple voltage techniques, Low voltage swing, Pre computation, Circuit Technology-Dependent power reduction, Path balanced.

UNIT – IV

Circuit Techniques For Leakage Reduction: Leakage components,Sub thresholdleakage ,Gate

leakage,Source/Substrate and drain/Substrate P-N Junction Leakage, Circuit Techniques to reduce leakage in logic:Dual Threshold CMOS,multiple supply Voltage, Runtime Stand by leakage reduction techniques, Leakage control using Transistor Stacks(self-reverse bias),Sleep transistor, variable threshold CMOS(VTCMOS), DynamicV_{dd}scaling(DVS).

UNIT – V

Low Power Arithmetic Circuits:Introduction, Addition, 1Bit addition cells, SequentialAdder, Propagation and generationmechanisms, Carry select adder, Carry skip adder, power –delayComparison.

Text Books:

1. Kaushik Roy,SharatPrasad, "Low power CMOS VLSI Circuit Design", John Wiley sons Inc.,2000
2. Christian Piguet, "Low power CMOS VLSI circuits", Taylorand Francis, Inc., 2010.

Reference books:

1. J.B.Kulo and J.H Lou," LowVoltage CMOS VLSI Circuits", Wiley, 1999.
2. A.P.Chandrasekaran and R.W.vroatersen, "Low power Digital CMOS Design", Kluwer, 1995.

Course outcomes-Program outcomes -Program Specific Outcomes(CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H	M											H	L	
CO2		H	M	L									H	M	
CO3	L	M	H	M					L	M	L		L	H	M
CO4	L	M	H	M					L	L	M		M	H	L
CO5		H	M	L	L				M	L	L		M	L	H

19ECT28:WIRELESS SENSOR NETWORKS

Credits - 3 **Sessional Marks: 30**

L: T: P::2:1:0 **University Exam Marks: 70**

Course Objectives

1. To understand the basic WSN technology and supporting protocols.
2. To learn standardization basic sensor systems and provide a survey of sensor technology.
3. To understand the medium access control protocols and address physical layer issues.
4. To learn key routing protocols for sensor networks and main design issues.
5. To learn transport layer protocols for sensor networks, and design requirements.
6. To understand the Sensor management, sensor network middleware, operating system.

Course Outcomes

At the end of the course the students will be able to
CO1.Understand and explain common wireless sensor node architectures.
CO2.Be able to carry out simple analysis and planning of WSNs.
CO3.Demonstrate knowledge of MAC protocols developed for WSN.
CO4.Understand and explain mobile data-centric networking principles.
CO5.Be familiar with WSN standards.

UNIT I

Introduction: Introduction to Sensor Networks, unique constraints and challenges, Advantage of Sensor Networks, Applications of Sensor Networks, Types of wireless sensor networks, Mobile Ad-hocNetworks (MANETs) and Wireless Sensor Networks, Enabling technologies for Wireless Sensor Networks.

UNIT II

Sensor Node Hardware and Network Architecture: Single-node architecture, Hardware components & design constraints, Operating systems and execution environments, introduction to TinyOS and nesC, Network architecture, Optimization goals and figures of merit, Design principles for WSNs, Service interfaces of WSNs, Gateway concepts, Need for gateway, WSN to Internet Communication, and Internet to WSN Communication.

UNIT III

Deployment and Configuration: Localization and positioning, Coverage and connectivity, Single-hop and multi-hop localization, self configuring localization systems, sensor management.

UNIT IV

Network Protocols: Issues in designing MAC protocol for WSNs, Classification of MAC Protocols, S-MAC Protocol, B-MAC protocol, IEEE 802.15.4 standard and ZigBee, Dissemination protocol for large sensor network.Data dissemination, data gathering, and data fusion; Quality of a sensor network; Real-time traffic support and security protocols.

Routing protocols: Issues in designing routing protocols, Classification of routing protocols, Energy-efficient routing, Unicast, Broadcast and multicast, Geographic routing.

UNIT V

Data Storage and Manipulation: Data centric and content based routing, storage and retrieval in network, compression technologies for WSN, Data aggregation technique.

Applications: Detecting unauthorized activity using a sensor network, WSN for Habitat Monitoring.

Text Books

1. HolgerKerl, Andreas Willig, "Protocols and Architectures for Wireless Sensor Network", Student Edition, John Wiley and Sons, 2005 (ISBN: 978-0-470-09511-9).
2. Raghavendra, Cauligi S, Sivalingam, Krishna M., ZantiTaieb, "Wireless Sensor Network", 1st Edition,Springer, 2004 (ISBN: 978-4020-7883-5).

Reference Books

1. Kazem, Sohraby, Daniel Minoli, TaiebZanti, "Wireless Sensor Network: Technology, Protocols and Application", 1st Edition,John Wiley and Sons, 2007 (ISBN: 978-0-471-74300-2).
2. B. Krishnamachari, "Networking Wireless Sensors", 1st Edition, Cambridge University Press, 2005.
3. N. P. Mahalik, "Sensor Networks and Configuration: Fundamentals, Standards, Platforms, and Applications", 1st Edition, Springer Verlag, 2007.

Course Outcomes-Program Outcomes -Program Specific Outcomes-(CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H	M			L								H	H	
CO2		H	M	L	L								M	M	
CO3		L	M	H									L	H	H
CO4		M	H	L									M	M	
CO5	H		M				L			L	L		H		

19ECT25: FIBER OPTIC COMMUNICATION

Credits - 3 **Sessional Marks: 30**

L: T: P:: 2:1:0 **University Exam Marks: 70**

Course Objectives

1. To acquire the basic elements of optical fibre transmission link, fiber glass modes configurations and structures
2. To understand different kind of losses, signal attenuation in optical fibres &dispersion factor.
3. To Know various optical sources, LED/LASER structures, receivers (PIN, APD), and noise performance.
4. To learn optical network system components, variety of networking aspects, SONET/SDH.
5. To provide different optical system Designs.

Course Outcomes

After successful completion of the course the student should be able to
CO1. Apply the fundamental principles of optics and light wave to design optical fiber communication systems.
CO2. Differentiate losses in optical fiber link and state transmission characteristics of optical fiber.
CO3. Design optical fiber communication links using appropriate optical fibers light sources, optical detectors.
CO4. Explore concept of designing and operating principles of modern opticalsystems and networks
CO5. Apply different network access schemes and packet switching in OFC systems.

UNIT I

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

UNIT II

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.

UNIT III

Optical Sources:LEDs, Structures, Materials, Quantum Efficiency, Power, Modulation, Power Bandwidth Product, Injection Laser Diodes- Modes, Threshold Conditions, External Quantum Efficiency, 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.

UNITIV

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 switches - coupled mode analysis of directional couplers, electro-opticswitches.

UNIT V

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 Fiber, Rise Time Budget with Examples. Transmission Distance, Line Coding in Optical Links, Optical amplifiers - EDFA, WDM, Necessity, Principles, Types of WDM, Measurement of Attenuation and Dispersion, Eye Pattern.

Text Books

1. Gerd Keiser, "Optical Fiber Communications" , TMH, 4th Edition, 2008.
2. John M. Senior, "Optical Fiber Communications", Pearson Education, 3rd Edition, 2009.

Reference Books

1. D.K. Mynbaev, S.C.Gupta and Lowell L. Schemer,Fiber "Optic Communications",Pearson Education, 2nd Edition 2005.
2. S.C.Gupta ,"Optical Fibre Communication and its Applications", PHI, 3rd Edition 2005.
3. Govind P. Agarwal , John Wiley,"Fiber Optic Communication Systems", 3rd Edition, 2004.

Course Outcomes-Program Outcomes -Program Specific Outcomes-(CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	L	M	H	L		L	L		M				L	M	L
CO2		H	M	L		M							L		M
CO3		L	H	M					L	L	L	L	M	L	
CO4		L	H	M					M	L	L	L	L	M	H
CO5		M	H	L		L					L			H	M

OPEN ELECTIVE – I

S.No.	Course code	Course Title
1	19ECT33	Pulse and Digital Circuits
2	19ECT34	Electronic Measurements

19ECT33 -PULSE AND DIGITAL CIRCUITS

Credits - 3 **Sessional Marks: 30**

L: T: P::3:0:0 **University Exam Marks: 70**

Course Objectives

1. To explain the complete response of R-Ccircuits.
2. To explain clippers,clampers,switching characteristics of transistors.
3. Toconstruct various multivibrators using transistors, design of sweep circuits.
4. To discuss about different digital IC's, families andcharacteristics.

Course Outcomes

After successful completion of the course the student should be able to
CO1.Compare the applications of diode as integrator, differentiator, clipper, clamper circuits.
CO2.Design multivibrators for various applications, sweep circuit using a Transistor switch.
CO3. Compare time base generators and wave shaping circuits.
CO4.Understand 555 timer and multivibrator models.
CO5.Illustrate Digital IC's, characteristics and different IC families.

UNIT I

Wave shaping circuits: Types of waveforms, Characteristics of pulse waveforms. RC low pass and high pass circuits, their responses for step, pulse and square wave inputs, Rise time, Tilt, Square wave testing of amplifiers, Diode as a switch, Diode clipper and clamper circuits.

UNIT II

Multivibrators: BJT switch and switching times, Inverter, JFET switch, MOSFET and CMOS switches, Principle and operation of Bistable, Monostable, Astablemultivibrators and Schmitt trigger using BJTs.

UNIT III

Time Base Generators: General features of time base signal, Methods of generating time base waveform, Exponential sweep circuit, sweep circuit using UJT. Sweep circuit using a Transistor switch, Transistor constant current sweep, Miller and Boostrap time base generators using BJTs.

UNIT IV

IC Timer &Multivibrators: CMOS monostable and astablemultivibrators, 555 timer,Monostable and astable models, Dual timer and its applications.

UNIT V

Digital integrated circuits: Evaluation of ICs, Advantages and classification of ICs, Digital IC characteristic, Digital IC families, TTL, ECL, MOS, CMOS and their comparison, Totem pole, Open collector, and Tristate outputs, IC Packaging.

Text Books

1. David A. Bell, “Solid State Pulse Circuits”, PHI.
2. Taub and Schilling, “Digital Integrated Circuits” Mc Graw –Hill.

References

1. A Anand Kumar -“Pulse and Digital circuits” PHI
2. J Millman and H.Taub ,”Pulse, Digital and switching waveforms”, Mc Graw – Hill.

Course Outcomes-Program Outcomes -Program Specific Outcomes-(CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H	L	L										M	H	
CO2			H	M					L	L	L		H	L	
CO3	M	H											H		
CO4	H	L	M						L					H	
CO5	M	M		L									H		

19ECT34: ELECTRONIC MEASUREMENTS

Credits - 3 **Sessional Marks: 30**

L: T: P:: 3:0:0 **University Exam Marks: 70**

Course Objectives

1. To explain basic concepts and definitions in measurement.
2. To describe the bridge configurations and their applications.
3. To elaborate discussion about the importance of signal generators and analyzers in measurement.
4. To understand the concept of Transducer Technology and construct the equipment for measurement of physical parameters.

Course Outcomes

After successful completion of the course the student should be able to
CO1. Measure various electrical parameters with accuracy, precision, resolution.
CO2. Use AC and DC bridges for relevant parameter measurement.
CO3. Select appropriate passive or active transducers for measurement of physicalparameters.
CO4. Use Signal Generator, frequency counter, CRO and digital IC tester for appropriate measurement effectively.
CO5. Test and troubleshoot electronic circuits using various measuring instruments.
CO6: Maintain various types of test and measuring instruments.

UNIT I

Electronic Instruments: Performance characteristics of instruments, Static characteristics, Accuracy, Resolution, Precision, expected value, Error, Sensitivity. Errors in Measurement, Dynamic Characteristics-speed of response, Fidelity, Lag and Dynamic error. DC Voltmeters- Multi-range, Range extension/Solid state and differential voltmeters, AC voltmeters- multi range, range extension, shunt. Thermocouple type RF ammeter, Ohmmeters series type, shunt type, Multi- meter for Voltage, Current and resistance measurements.

UNIT II

Oscilloscope: Oscilloscopes CRT features, vertical amplifiers, horizontal deflection system, sweep, trigger pulse, delay line, sync selector circuits, simple CRO, triggered sweep CRO, Dual beam CRO, Dual trace oscilloscope, sampling oscilloscope, storage oscilloscope, digital readout oscilloscope, digital storage oscilloscope, Lissajous method of frequency and phase measurement, standard specifications of CRO, probes for CRO- Active & Passive, attenuator type.

UNIT III

Signal Generators, Wave & Hormonic Distortion Analyzer: Signal Generator- fixed and variable, AF oscillators, Standard and AF sine and square wave signal generators, Function Generators, Random noise generator, Arbitrary waveform generator. Wave Analyzers, Harmonic Distortion Analyzers, Spectrum Analyzers.

UNIT IV

BRIDGES: DC Bridges-Wheat stone bridge, Kelvins bridge and Kelvins double bridge. AC Bridges Measurement of inductance- Maxwell's bridge, Anderson bridge. Measurement of capacitance -Schearing Bridge. Wien Bridge, Errors and precautions in using bridges. Q-meter.

UNIT -V

Transducers: Active & passive transducers- Resistance, Capacitance, inductance; Strain gauges, LVDT,Piezo Electric transducers, Resistance Thermometers, Thermocouples, Thermistors, Sensistors.

Text Books

1. HS. Kalsi –"Electronic Instrumentation".
2. Albert D. Helfrick& William D. Copper-"Modern Electronic Instrumentation & Measurement Techniques".

References

1. David A. Bell –"Electronic Instrumentation & Measurements ", PHI, 2nd Edition, 2003.
2. Robert A.Witte -"Electronic Test Instruments, Analog and Digital Measurements ", Pearson Education, 2nd Ed., 2004.
3. K. Lal Kishore -"Electronic Measurements & Instrumentations ", Pearson Education – 2005.

Course Outcomes-Program Outcomes-Program SpecificOutcomes-(CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H	L											H		
CO2	H	L											H		
CO3		L	M	L		M	L						H		
CO4	H	L											H	L	
CO5		M	H	M									H	M	L
CO6			L	M		H								M	H

OPEN ELECTIVE – II

S.No.	Course code	Course Title
1	19ECT35	Communication Systems
2	19ECT36	Microprocessors & Interfacing
3	19ECT37	Digital Design using VHDL

19ECT35:COMMUNICATION SYSTEMS

Credits - 3 **Sessional Marks: 30**

L: T: P:: 3:0:0 **University Exam Marks: 70**

Course Objectives

The objective of this course is to make the students:

1. To introduce the concepts of various analog modulations and their spectral characteristics.
2. To understand the digital modulation techniques.
3. To study the limits set by Information Theory
4. To study the satellite and radar communications.

Course Outcomes

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

CO1.Understand and analyse the amplitude modulation

CO2.Analyse different frequency modulation techniques regarding angle modulation.

CO3. Analyse the different types of information techniques and their different codes.

CO4. Understand different digital modulation techniques.

CO5. Understand the systems and applications of Radar and satellite communications.

UNIT I

Amplitude Modulation: Generation and detection of AM wave-spectra-DSBSC, Hilbert Transform, Pre-envelope & complex envelope – SSB and VSB –comparison –Super heterodyne Receiver.

UNIT II

Angle Modulation: Phase and frequency modulation-Narrow Band and Wind band FM – Spectrum – FM modulation and demodulation – FM Discriminator- PLL as FM Demodulator – Transmission bandwidth.

UNIT III

Information Theory: Entropy – Discrete Memoryless channels – Channel Capacity -Hartley – Shannon law – Source coding theorem – Huffman & Shannon – Fano codes.

UNIT IV

Digital Modulation:Sampling, Quantization and coding, Quantization error, companding in PCM systems. Differential PCM Systems (DPCM),Delta Modulation, its drawbacks.

Digital Modulation Techniques: Introduction, BPSK, DPSK, DEPSK, QPSK, M-ary PSK, ASK, QASK, BFSK, M-ary FSK, MSK, Duo binary Encoding, Comparison of digital modulation techniques, Partial response signalling.

UNIT V

SYSTEMS: Nature of Radar and Radar equation, simple from radar equation, radar block diagram and operation, Radar frequencies, application of Radar.

Principles and architecture of satellite Communication, Brief history of Satellite systems, advantages,

disadvantages, applications and frequency bands used for satellite communication

Text Books

1. J.G.Proakis, M.Salehi, "Fundamentals of Communication Systems", Pearson Education 2006.
2. Simon Haykin, "Digital Communications", John Wiley, 2005.
3. Dennis Roddy, Satellite Communication: 4th Edition, McGraw Hill,2009
4. Introduction to radar systems – "M.I. Skolmik", 2nd edition TMH 2017.

References

1. B.P.Lathi, "Modern Digital and Analog Communication Systems", 3rd Edition, Oxford University Press, 2007.
2. H P Hsu, Schaum Outline Series –"Analog and Digital Communications" TMH 2006.
3. Electronic Communication Systems – "Kennedy & Davis" 4th edition TMH 2011.
4. Tri T. Ha: Digital Satellite Communications: Tata McGraw Hill, 2009

Course outcomes-Program Outcomes- Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H	M	L	L					L	L	L		H		
CO2		H	M	L					L	L	L	L	H	M	
CO3	H	M	L	L					L	L	L		M		H
CO4	H								L	L	L		H	M	
CO5	H	M	L											M	H

19ECT36- MICROPROCESSORS AND INTERFACING

Credits - 3 **Sessional Marks: 30**

L: T: P::3:0:0 **University Exam Marks: 70**

Course Objectives

1. To provide insight into architectural details of microprocessors.
2. To master the assembly language programming using concepts like assembler directives, procedures, macros, software interrupts etc.
3. To understand well the organization of 8085 and 8086 memory, addressing, address decoding concepts.
4. To provide the knowledge of interfacing 8086 with memory, I/O devices, 8255, keyboard etc
5. To understand the concept of Interrupts and their significance in 8086.
6. To study various hardware, software interrupts, Programmable Interrupt Controller etc
7. To provide the knowledge about aspects which differentiates the versions of microprocessors.

Course Outcomes

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

CO1.Understand the architecture, memory organization of microprocessor 8086.

CO2.Apply the programming using assembly level language in microprocessors for simple arithmetic, logical, string and real time applications.

CO3.Identify the different ways of interfacing memory and I/O with microprocessors.

CO4.Apply and Analyse the interfacing concept of different programmable interfacing modules with microprocessors for real time applications.

CO5.Develop a report to generate a code for applications using microprocessors to meet the societal requirements.

UNIT I

Microprocessors: Introduction to Microprocessor, development of microprocessors, 8086 microprocessor, - Architecture, Instruction set, Addressing modes, interrupt systems. System timing of 8086 – clock cycle, machine cycle and instruction cycle, timing diagram for simple instructions, generation of delays.

UNIT II

Programming:Assembler, Assembler directives, Assembly language programs, (8086) with assembler directives for addition, subtraction, multiplication, division etc., sorting and searching, bit multiplication program using look-up tables, stages of software development, modular programming, debugging and documentation.

UNIT III

Data Transfer Schemes:Synchronous, Asynchronous, Interrupt driven and DMA type schemes, USART (8251) and its interfacing, Programmable Interrupt controller (8259) and its interfacing, Programmable DMA controller and its interfacing, Data Communication standards RS – 232 Serial

Interface standards, IEEE – 488 GPIB standard.

UNIT IV

Memory Interface To 8086:Interfacing various types of RAM and ROM chips, Address decoding techniques, Interfacing ADC and DAC to 8086 systems, Data acquisition, Waveform generation, Traffic light controller, stepper motor control, temperature measurement and control.

UNIT V

Advance Microprocessor: Introduction to 80386 and 80486 microprocessor, different modes of operation, protected mode, virtual mode.
Introduction to Pentium processor – special Pentium register, Pentium Memory management, Introduction to Pro-Microprocessor.

Text Books

1. Barry B. Brey –"The Intel microprocessors", Prentice Hall, 2006.
2. Douglas V. Hall –"Microprocessors and interfacing", Tata Mc Graw-Hill,1986

Reference Books

1. A.K.Ray and K.M.Bhurchandi –"Advanced Microprocessor and Peripherals",2nd edition,TMH-2000
2. Douglas V.Hall–"Micoprocessors Interfacing" 2nd edition,2007
3. Rajkamal,"Microprocessors Architecture, programming, interfacing and system Design"- Pearson Education,2005

Course Outcomes-Program Outcomes-Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H		M										H	M	
CO2		L	H	M									M	H	L
CO3	M	H		L									H	L	
CO4		L	H	H	L								L	M	H
CO5		L	L	M					L	H	H			L	H

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19ECT37: DIGITAL DESIGN USING VHDL

Credits - 3 **Sessional Marks: 30**

L: T: P:: 3:0:0 **University Exam Marks: 70**

Course Objectives

1. To understand the design of ADC and DAC characteristic parameters and conversion errors.
2. To analyze different models in hardware description language.
3. To design VHDL models for different combinational logic circuits.
4. To design VHDL models for different sequential logic circuits.
5. To understand characteristics of memory and their classification.

Course Outcomes

After successful completion of the course the student should be able to

CO1. Develop an ADC and DAC and apply it to solve real life problems
CO2. Analyze, design and implement combinational logic circuits.
CO3. Classify different semiconductor memories.
CO4. Analyze, design and implement sequential logic circuits.
CO5. Simulate and implement combinational and sequential circuits using VHDL systems

UNIT I

Electronic data converters: D/A converters, characteristic parameters – DAC designs, DAC ICs – Conversion errors – performance measurements. A/D converters – characteristic parameters – ADC design ADC ICs – conversion errors – ADC testing.

UNIT II

The VHDL Hardware Description Language: Design flow, program structure, types and constants, functions and procedures, libraries and packages.

The VHDL design elements: Structural design elements, behavioral design elements, time dimension and simulation synthesis.

UNIT III

Combinational Logic Design: Decoders, encoders, three state devices, multiplexers and demultiplexers, Code Converters, EX-OR gates and parity circuits, comparators, adders & subtractors, ALUs, Combinational multipliers, VHDL models for the above ICs.

UNIT IV

Design Examples (using VHDL): Barrel shifter, comparators, floating-point encoder, and dual parity encoder.

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Sequential logic Design: Latches & flip flops, PLDs, counters, shift register and their VHDL models, Synchronous design methodology.

UNIT V

ROMs: Internal Structure, 2D – decoding commercial types, timing and applications.

Static RAMs: Internal Structure, timing and standard SRAMs, Synchronous SRAMs.

Dynamic RAMs: Internal Structure, timing and standard DRAMs, Synchronous DRAMs.

Text Books

1. John F.Wakerly -"Digital Design Principles & Practices", Pearson Education, 3rdEdition, 2005.
2. - J.Bhaskar –"VHDL Primer", Pearson education, 3rdEdition.

Reference Books

1. K.C.Chang –"Digital design and Modelling with VHDL & Synthesis",1st edition.
2. Peter J.A Shenden –"The designers guide to VHDL", JIM LEWIS 3rd edition.

Course outcomes-Program outcomes- Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		M	L	M									H	M	
CO2	M	H	L	L									H	M	
CO3	M	L	L										H		
CO4	L	H	M										H	M	L
CO5		M	L	H									L	L	H

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19ECJ02: PROJECT WORK PHASE – II

Credits – 8 **Sessional Marks: 40**
L:T:P::0:0:16 **University Exam Marks: 60**

Course Objectives

To expose the students to the following:

1. To offer students a glimpse into real world problems and challenges that need IT based solutions..
2. To enable students to create very precise specifications of the IT solution to be designed.
3. To introduce students to the vast array of literature available of the various research challenges in the field of IT.
4. To create awareness among the students of the characteristics of several domain areas where IT can be effectively used.
5. To enable students to use all concepts of IT in creating a solution for a problem.
6. To improve the team building, communication and management skills of the students.

Course Outcomes

After successful completion of course the student should be able to

CO1. Acquire in-depth knowledge in the core and/or interdisciplinary area of project topic.
CO2. Critically analyze the chosen topic for arriving at conclusions.
CO3. Develop and design feasible solutions for the project topic.
CO4. Undertake research and solve real world problems in the project domain.
CO5. Apply appropriate techniques, resources and modern software tools necessary for implementing the project work.
CO6. Use project results for sustainable development of the society.
CO7. Understand the impact of project results in the context of environmental sustainability.
CO8. Understand professional and ethical responsibilities for sustainable development of society in the chosen field of project.
CO9. Function effectively as individual and a member in the project team.
CO10. Develop communication skills, both oral and written for preparing and presenting project report.
CO11. Demonstrate knowledge and understanding of cost and time analysis required for carrying out the project.
CO12. Engage in continuous learning to improve knowledge and competence in the chosen subject area of project.

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H	M	-	M	-	-	-	-	-	-	-	-	H	M	-
CO2	-	H	M	-	M	-	-	-	-	-	-	-	M	H	-
CO3	-	M	H	-	M	-	-	-	-	-	-	-	H	M	-
CO4	-	-	-	H	-	M	-	-	-	M	-	-	-	M	H
CO5	-	-	M	-	H	-	-	-	-	M	-	-	-	H	-
CO6	-	-	-	-	-	H	M	-	-	-	-	-	-	-	H
CO7	-	-	-	-	-	M	H	-	-	-	-	-	-	-	H
CO8	-	-	-	-	-	-	M	H	-	-	-	-	-	-	H
CO9	-	-	-	-	-	-	-	-	H	M	M	-	-	-	H
CO10	-	-	-	-	-	-	-	M	-	H	M	-	-	-	H
CO11	-	-	-	-	-	-	-	-	M	-	H	-	-	-	H
CO12	M	M	-	-	-	-	-	-	-	-	-	H	-	-	H

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OPEN ELECTIVE – III

S. No	Course Code	Course Title
1	19ECT38	Microcontrollers & Interfacing
2	19ECT39	Basics of Embedded Systems
3	19ECT40	Digital Image Processing

19ECT38: MICROCONTROLLERS AND INTERFACING

Credits - 3 **Sessional Marks: 30**

L: T: P:3:0:0 **University Exam Marks: 70**

Course Objectives

1. The course aims to highlight the architecture of 8051 microcontroller and to provide the students with a basic understanding of instruction sets & assembly language programming.
2. Programming the microcontroller in 8051 C is also emphasized in syllabus.
3. The main purpose of this subject is to develop the student abilities to apply the general knowledge of the microcontroller architecture in specific projects.

Course Outcomes

At the end of this course, students will demonstrate the ability to
CO1.Identify features of various microcontroller
CO2.Select appropriate microcontroller for different application
CO3.Interface microcontroller with hardware for given application
CO4.Write and execute assembly language programs(software) for given application
CO5.Develop small microcontroller based applications.

UNIT I

8051 microcontroller: Overview of Architecture of microcontroller and advanced architecture and resources in advance,8051 microcontroller, internal and external memories, Counters and timers, synchronous serial-cum-asynchronous serial communication, Interrupt, instruction set-basic assembly language programming, Data transfer instructions, data and bit manipulation instructions, arithmetic instructions, Instructions for Logical operations on the test among the registers, internal RAM and SFR's, Program flow control instructions, Interrupt control flow.

UNIT II

Real –Time Control: Interrupt handling structures of a MCU, Interrupt latency and interrupt deadline, multiple source of interrupts, Enabling or disabling of interrupts, polling, priorities of interrupt, interrupt structure in Intel 8051.Timers-Programmable timers in MCU's.

UNIT III

Interface Methods: Key board interfacings, LED and array of LED's, Keyboard-cum-display controller (8279), Alphanumeric devices, Printer interfaces, Programmable instruction interface using IEEE 488 Bus, Interface with the flash memory, interfacing to high power devices specify one/two devices, Analog inputs and output interfaces, optical motor shaft encoder, industrial control, industrial process control system, prototype MCU based measuring instruments, Robotics and embedded control.

UNIT IV

Real- Time Operating system: RTOS of keil (RTX51), use of RTOS in design, software development tools for microcontrollers.

UNIT V

16-Bit Microcontrollers: Memory map in Intel 80196 family MCU system, I/O ports, Programmable timers and high-speed outputs and inputs, Captures, interrupt, instruction. ARM 32 Bit MCU's: Introduction to 16/32-bit processors, Architecture and organization, ARM/THUMB programming method, ARM/THUMB instruction set and development tools.

Text books

1. Raj Kamal –"Microcontrollers architecture, programming, interfacing and organization", Pearson Education, 2005
2. Mazidi and Mazidi –"The 8051 Micro controller and embedded systems"-, PHI, 2000.

References

1. A.V.Deshmuk–"Microcontrollers (Theory and applications) ", WTMH, 2005.
2. Mohammad Ali Mazdi –"The 8051 micro Controller and Embedded systems", Vol1, PHI, 2000.

Course Outcomes – Program Outcomes- Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H	L											H		
CO2	H	L		M									L	M	H
CO3		M	H	L		L							L	M	H
CO4		M	H	L		L							L	M	H
CO5			M	H	L	L			L	L	L	L		M	H

19ECT39 : BASICS OF EMBEDDED SYSTEMS

Credits - 3 **Sessional Marks: 30**

L: T: P:: 3:0:0 **University Exam Marks: 70**

Course Objectives

Students completing this course will be well positioned to:

1. Familiarize about the basic functions of embedded systems.
2. Inculcate the basic architecture of general-purpose processors and its applications.
3. Gain interface between analog and digital blocks, also Software aspects of embedded systems.
4. Develop different State Machine and Concurrent Process Models.
5. Learn Evolution of complication and synthesis, Verification and reuse of intellectual property cores.

Course Outcomes

After successful completion of the course the student should be able to

CO1. Understand the embedded system concepts and technologies of embedded systems.

CO2. Analyze the general process of embedded system development.

CO3. Apply Interfacing between analog and digital blocks and apply Software aspects of embedded systems.

CO4. Create finite state machines and analyze Communication and Synchronization among processes.

CO5. Remember evolution and verification of hardware/software co-simulation.

UNIT I

Introduction: The concept of embedded systems design, Examples of embedded systems Design challenge, Processor technology, IC technology, Design technology. RT-Level combinational logic, Sequential logic (RT-Level), Custom single purpose processor design (RT-Level), Optimizing custom single purpose processors.

UNIT II

General Purpose Processors: Basic architecture, Development environment, Application specific system depth, Set processors (ASIPs). Embedded Memories,

UNIT III

Technological aspects of embedded systems: Interfacing between analog and digital blocks, signal conditioning, digital signal processing. System interfacing, interfacing with external systems, user interfacing. Design tradeoffs due to process compatibility, thermal considerations, etc., Software aspects of embedded systems: real time programming languages and operating systems for embedded systems.

UNIT IV

State Machine and Concurrent Process Models: Introduction, Models Vs languages, Finite State Machine with Data path model (FSMD), Using State Machines, Program State Machine (PSM),Concurrent Process Model, Concurrent Processes, Communication among processors, Synchronization among processes, Implementation, Data flow model.

UNIT V

Introduction Automation: The parallel evolution of complication and synthesis, Logic, RT, Behavioral synthesis, System synthesis and hardware/software code sign, Verification of hardware/software co-simulation, Reuse of intellectual property cores, Embedded microcontroller cores.

Text Books

1. Frank Vahid, Tony D. Givargis –"Embedded Systems Design – A unified Hardware/Software introduction ", John Wiley & Sons. Inc. 2002.
2. J.W. Valvano, "Embedded Microcomputer System: Real Time Interfacing", Brooks/Cole, 2000.

Reference books

1. Jack Ganssle, "The Art of Designing Embedded Systems", Newness, 1999.
2. V.K. Madisetti, "VLSI Digital Signal Processing", IEEE Press (NY, USA), 1995.
3. David Simon, "An Embedded Software Primer", Addison Wesley, 2000.

Course Outcomes-Program Outcomes- Programming Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H		L				M						H		
CO2	L	M	H	M	L					L				M	H
CO3				M	H		L		L	M	L		L	M	H
CO4		L	M	H				L	M		M	L		L	H
CO5			M	L		H	L	M	L	L	M	M	L	H	M

19ECT40 – DIGITAL IMAGE PROCESSING

Cridits-3 **Sessional Marks: 30**

L:T:P:: 3:0:0 **University Exam Marks: 70**

Course Objectives

1. To learn basic concepts of signals, fundamentals and mathematical models in digital image processing.
2. To study different types of image transforms for image processing
3. To develop time and frequency domain techniques for image enhancement.
4. To understand Image segmentation, restoration, and filters with applications.
5. To expose the students to current applications, techniques and issues in image processing.

Course Outcomes

After successful completion of the course the student should be able to
CO1. Understand theory and models in Digital Image Processing.
CO2. Interpret and analyze 2D signals in frequency domain through image transforms.
CO3. Apply quantitative models of Digital image processing for various engineering applications.
CO4. Develop innovative design for practical applications in various fields.
CO5. Understand different methods for transmission and reception of Digital image.

UNIT I

Signals & Systems: Exponential and sinusoidal signals, continuous and Discrete time signals, sampling and reconstruction of signals- aliasing; sampling theorem and Nyquist rate.
Digital Image Fundamentals: Digital Image representation, Digital image processing systems, Visual perception, 2-D Sampling and Quantization, Basic relationships between pixels and imaging geometry.

UNIT II

Image Transforms: Discrete Fourier Transform, 1-D Discrete Fourier Transform, Fast Fourier Transform, Properities of 2 – D Fourier transform, Walsh, Hadmard, and Discrete cosine transform.

UNIT III

Image Enhancement: Background enhancement by point processing Histogram processing, Spatial filtering, Enhancement in frequency domain, Image smoothing, Image sharpering, Fundamentals of Colour image, Pseudo and False colour image.

UNIT IV

Image Restoration: Degradation model, Algebraic approach to restoration, Inverse filtering and Wiener filtering, Least mean Square filters, constrained least square restoration.

Image Coding: Fidelity criteria, Encoding process, Error free coding, Image coding relative to fidelity criterion, Image compression and decompression techniques.

Text Books

1. R.C. Gonzalez and R.E. Woods, ''Digital Image Processing" Prentice Hall 2002 .
2. A.V.Oppenheim, A.S.Willsky with S.Hamid Nawab, "Signals and Systems ",- PHI, 2nd Edition

Reference books

1. A.K. Jain, Prentice Hall, Fundamentals of "Digital Image Process", India, New Delhi 1983.
2. William K Pratt, John Wilely, - "Digital Image Processing",-3rd edition Wiley - 2004.
3. S.Jayaraman, S.Esakkirajan, T. Veera Kumar,"Digital Image Processing", TMH-2009.

Course outcomes-Program outcomes- Control Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H	L		M	M		L			M		M	H		
CO2	L	M	M	H	L	L				L			H	M	
CO3	L	M	M	M	M	H		M		L				H	L
CO4			H	M	L	M	L	L	L	M	L	L	H	L	M
CO5		H	M	L	H	L			M	L		L	M	H	L

OPEN ELECTIVE I

S.No	Course Code	Course Title	Offering Department
1	19CST33	Basics of Data Structures	CSE
2	19CST34	Introduction to C++ programming	
3	19CSP13	Advanced Programming Lab	
4	19CST35	Fundamentals of Computer Organization	
5	19EET31	Electrical Engineering Materials	EEE
6	19EET32	Energy Auditing and Demand Side Management	
7	19MEP13	Engineering Projects in Community Services (Project based)	ME
8	19MET36	Time and Motion Study	
9	19MET37	Nano Technology	
10	19MUP01	Music Vocal	BS&H
11	19MUP02	Dance Bharatanatyam	
12	19MUP03	Dance Kuchipudi	

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