B.Tech in Electronics and communication engineering (Autonomy)

2nd Year, 3rd Semester
Data Structures
Code: CS(ECE)301
Contacts: 3L
Credits: 3
Allotted Lectures: 36L

Objective(s)

- To learn the basics of abstract data types.
- To learn the principles of linear and nonlinear data structures.
- To build an application using sorting and searching.

Outcome(s)

- Demonstrate the concept of linear and nonlinear data structures.
- Learn about the efficiency of algorithms.
- Studyof algorithms for various searching and sorting techniques.

Module I: Linear Data Structure   [10L]

Introduction (2L):
Concepts of data structures: a) Data and data structure b) Abstract Data Type and Data Type.
Algorithms and programs, basic idea of pseudo-code **(1L)**
Algorithm efficiency and analysis, time and space analysis of algorithms – order notations **(1L)**

Array (2L):
Different representations – row major, column major **(1L)**
Sparse matrix - its implementation and usage, Array representation of polynomials **(1L)**

Linked List (6L):
Singly linked list – operations, Doubly linked list – operations **(4L)**
Circular linked list – operations, Linked list representation of polynomial and applications **(2L)**

Module II: Linear Data Structure [6L]

Stack and Queue (4L):
Stack and its implementations (using array and linked list) **(1L)**
Applications (infix to Postfix, Postfix Evaluation) **(1L)**
Queue, circular queue de-queue **(1L)**
Implementation of queue- linear and circular (using array and linked list) **(1L)**

Recursion (2L):
Principles of recursion - use of stack, tail recursion. **(1L)**
Applications - The Tower of Hanoi, Eight Queens Puzzle **(1L)**

Module III: Nonlinear Data structures [12L]

Trees (8L):
Basic terminologies, forest, tree representation (using array and linked list) **(1L)**
Binary trees - binary tree traversal (pre-, in-, post- order) **(1L)**
Threaded binary tree **(1L)**
Binary search tree- operations (creation, insertion, deletion, searching) **(1L)**

Concept of Max-Heap and Min-Heap (creation, deletion) **(1L)**
Height balanced binary tree – AVL tree (insertion with examples only) **(1L)**
Height balanced binary tree – AVL tree (deletion with examples only) **(1L)**
m –Way Search Tree, B$^+$ Tree – operations (insertion, deletion with examples only) **(1L)**

Graphs (4L):
Graph theory review**(1L)**
Graph traversal and connectivity – Depth-first search (DFS), Breadth-first search (BFS) - concepts of edges used in
DFS and BFS (tree-edge, back-edge, cross-edge, and forward-edge) **(2L)**
Minimal spanning tree – Prim's algorithm, Kruskal's algorithm (basic idea of greedy methods) **(1L)**

Module IV: Searching, Sorting [8L]

Sorting Algorithms (4L):
Bubble sort, Insertion sort, Selection sort– with notion of complexity **(1L)**
Quick sort, Merge sort – with complexity **(2L)**
Radix sort – with complexity **(1L)**

Searching (2L):
Sequential search – with complexity **(1L)**
Binary search, Interpolation Search– with complexity**(1L)**

Hashing (2L):
Introduction to Hashing and Hashing functions **(1L)**
Collision resolution techniques **(1L)**

Text books:
1. "Fundamentals of Data Structures of C" by Ellis Horowitz, SartajSahni, Susan Anderson-freed

Recommended books:

1. **"The Art of Computer Programming" by Donald Knuth**
2. **"Data Structures, Algorithms, and Software Principles in C" by Thomas A. Standish**
3. **"Data Structures" by S. Lipschutz**
4. **"Data Structures and Program Design In C", 2/E by Robert L. Kruse, Bruce P. Leung**
5. **"Data Structures in C" by Aaron M. Tenenbaum**

Name of the Paper: Data Structures
Lab Paper Code: CS(ECE)391
2nd Year, 3rd Semester

Contact (Periods/Week): L-T-P=0-0-3
Credit Point: 2
No. of Lab: 11

Objectives:

- To write and execute programs in C to solve problems using data structures such as arrays, linked lists, stacks, queues, trees, graphs, hash tables and search trees.
- To write and execute write programs in C to implement various sorting and searching methods.

Module 1

1. Write a C program that uses functions to perform the following:

   a. Create a singly linked list of integers.
   b. Delete a given integer from the above linked list.
   c. Display the contents of the above list after deletion.

2. Write a C program that uses functions to perform the following:

   a. Create a doubly linked list of integers.
   b. Delete a given integer from the above doubly linked list.
   c. Display the contents of the above list after deletion.

3. Write a C program to implement Polynomial addition and Polynomial multiplication using Linked List.

4. Write a C program that uses stack operations to convert a given infix expression into its postfix Equivalent, Implement the stack using an array.

5. Write C programs to implement a queue ADT using i) array and ii) doubly linked list respectively.

Module 2

6. Write a C program that uses functions to perform the following:

    a. Create a binary search tree of characters.
    b. Traverse the above Binary search tree recursively in Postorder.

7. Write a C program that uses functions to perform the following:

    a. Create a binary search tree of integers.
    b. Traverse the above Binary search tree non recursively in inorder.

Module 3

8. Write C programs for implementing the following sorting methods to arrange a list of integers in ascending order:

    a. Insertion sort
    b. Merge sort

9. Write C programs for implementing the following sorting methods to arrange a list of integers in ascending order:

    a. Quick sort
    b. Selection sort

10. Write C programs for implementing the following searching methods:

    a. Linear Search
    b. Binary Search

Write a C program to implement all the functions of a dictionary (ADT) using hashing.

Module 4

11. Write C programs for implementing the following graph traversal algorithms:

    a. Depth first search
    b. Breadth first search

TEXT BOOKS:

1. C and Data Structures, Third Edition, P.Padmanabham, BS Publications.
2. C and Data Structures, Prof. P.S.Deshpande and Prof. O.G. Kakde, Dreamtech Press.
3. Data structures using C, A.K.Sharma, 2nd edition, Pearson.
4. Data Structures using C, R.Thareja, Oxford University Press.
5. C and Data Structures, N.B.Venkateswarlu and E.V.Prasad,S.Chand.
6. C Programming and Data Structures, P.Radha Krishna, Hi-Tech Publishers.

Outcomes:

- Ability to identify the appropriate data structure for given problem.
- Graduate able to design and analyze the time and space complexity of algorithm or program.
- Ability to effectively use compilers includes library functions, debuggers and trouble shooting.

EC 301: SOLID STATE DEVICES
Contact: 3P
Credits: 3
Lectures: 40

Prerequisites: Conductors, Semiconductors and Insulators, electrical properties, band diagrams. Intrinsic and extrinsic, energy band diagram, electrical conduction phenomenon, P type and N-type semiconductors, drift and diffusion carriers, Diodes and Diode Circuits Formation of P-N junction, energy band diagram, built-in potential, Formation of PNP / NPN junctions, energy band diagram; transistor mechanism and principle of transistors, CE, CB, CC configuration, transistor characteristics, Biasing and Bias stability, Concept of Field Effect Transistors (channel width modulation),Gate isolation types, JFET Structure and characteristics and CS, CG, CD configurations.

Module I: Energy Band Theory, Charge Carriers in Semiconductors: [13L]

Energy Band Theory:
Crystalline, non-crystalline and poly crystalline structure with example; direction of planes-Miller Indices (concept only);   [1L]
Concept of Schrodinger's equation in formation of energy bands in crystal, Bloch theorem, Bloch functions, Review of the Kroning-penney model, Brillouin zones, Number of states in the band, Band gap in the nearly free electron model, the tight binding model, Formation of allowed and forbidden energy bands.   [3L]
Effective mass, Wave vector, Energy-band (E-k) diagram, Relation between E-K diagram & Effective mass, Debye length.   Direct & indirect band-gap semiconductors; Compound Semiconductor.   [2L]

Charge Carriers in Semiconductors:
Intrinsic & extrinsic semiconductor. Effect of temperature and energy gap on intrinsic concentration , effect of temperature on extrinsic semiconductor , derivation of equilibrium electron and hole concentration in terms of effective density of states and intrinsic level, derivation of electron and hole concentration in a compensated semiconductor ,basic concept on optical absorption ,photoluminescence, carrier life time , carrier generation and recombination , continuity equation (expression and significance only).Degeneracy and non-degeneracy of semiconductor.   [3L]
Carrier concentration in terms of bulk Density of states and Fermi-Dirac distribution (no derivation, expression and significance only); Concept of Fermi level, Fermi Level shift with doping & temperature, invariance of Fermi level at equilibrium, intrinsic carrier concentration expression (no derivation).   [2L]
Non-equilibrium condition: Effect of temperature and doping concentration on mobility, Effective mobility due to scattering effect, Drift & diffusion of carriers with simple expressions, High field effect on drift velocity, Hall Effect and piezo electric effect, Generation and re combination, quasi-Fermi energy level (concept only).   [2L]

Module II: Junction Physics in Semiconductor Devices: [11L]

Semiconductor-Semiconductor Junction: Homo Junction
P-N Junction Diode: Energy band diagram, creation of depletion region; plotting of junction voltage, depletion layer charge and junction field ;current components in forward and reverse biased junction ; derivation of inbuilt potential and depletion width; junction capacitance , Varactor diode ; derivation of diode current equation ; Zener break down principle , static and

dynamic resistance of rectifier diode , dynamic resistance of Zener diode, effect of temperature on breakdown voltage. [3L]

Photo Devices: Solar cell – photo-voltaic effect, constructional features of solar cell, conversion efficiency and fill factor; LED; [2L]

Special Diodes: PiN Diode-basic operating principle only, Gunn Diode and IMPATT diode. Tunnel Diode- Energy band diagram & Negative resistance property. [3L]

Semiconductor-Semiconductor Junction: Hetero Junction
Energy band diagram, Classification of Hetero Junction, 2D Electron Gas (Isotype Heterojunction), Anisotype Heterojunction, I-V Characteristics. Numerical Problems. [2L]

Metal-Semiconductor Junction:
Metal-Semiconductor Contact: Ohmic and non-Ohmic contact and explanation using energy band diagram; Schottky diode and its application. [2L]

Module III: Device Physics of Bipolar Junction Transistor: [8L]

Physical mechanism, carrier distribution in forward active mode , terminal current equations, common base current gain (α) , common emitter current gain (β),controlling parameters for β, punch-through and avalanche effect , expression for punch through voltage and avalanche breakdown voltage (no derivation) , Solution of continuity equation and Poisson's equation for BJT, Eber's Moll model for Static behavior & Charge controlled model (without derivation) for dynamic behavior, equivalent circuits, Basic idea about Photo-transistors & Power transistors (only their features Vis-à-vis the ordinary transistors), origin of parameters in hybrid-pi model, time delay factors in BJT , alpha and beta cut-off frequency ,idea of photo transistor. Numerical Problems. [8L]

Module IV: Field Effect Transistors: [8L]

Junction Field Effect Transistor (JFET):
Construction, field control action and characteristics (recapitulation), pinch-off voltage derivation. Numerical Problems. [2L]

Metal Oxide Field Effect Transistor (MOSFET):
Types of MOSFET , structure of E-MOSFET, MOS structure under external bias -accumulation, depletion and inversion phenomenon with energy band diagram ,threshold voltage and flat band voltage ; working of E-MOSFET with characteristics ;drain current equation for linear and saturation region with condition (expression only); channel length modulation ;derivation of threshold voltage of ideal and non-ideal MOSFET;
MOSFET Capacitance- Different types of MOSFET Capacitances, MOS capacitance variation with gate to source voltage under low frequency & High Frequency; large and small signal model of MOSFET (explanation with diagram). Numerical Problems. [6L]

Text Books :
Streetman & Banerjee - Solid State Electronic Devices, PHI
S.M. Sze, Physics of semiconductor devices, Wiley

Reference Books :
Milman, Halkias–Integrated Electronics – TMH
Sedra & Smith-Microelectronic Circuits- Oxford
Neamen- Semiconductor Physics and Devices TMH
S.M. Kang and Y. Leblebici. -CMOS Digital Integrated Circuits,Tata McGraw-Hill

Subject: Circuit Theory & Networks
Subject Code: EC 302
Stream: ECE
Contacts: 3L+1T
Credits: 4

MODULE I: Resonance - Series and Parallel resonance, Impedance & Admittance Characteristics, Properties of resonance, Quality Factor, Half Power Points, Bandwidth, Phasor diagrams, Transform diagrams, Practical resonant circuits, Solution of Problems.   [5]

MODULE II: Network Analysis - Node Voltage Analysis: Kirchoff's Current law, Formulation of Node equations and solutions,Solution of problems with DC and AC sources.
Mesh Current Analysis: Kirchoff's Voltage law, Formulation of mesh equations , Solution of mesh equations by Cramer's rule and matrix method , Solution of problems with DC and AC sources
Network Theorems: Definition and Implication of Superposition Theorem , Thevenin's theorem, Norton's theorem , Reciprocity theorem, Compensation theorem , maximum Power Transfer theorem, Millman's theorem, Star delta transformations, Tellegen's Theorem, Solutions and problems with DC and AC sources, driving point admittance, transfer Admittance, Driving point impedance, Transfer impedance.   [12]

MODULE III: Graph Theory - Concept of Tree, Branch, Tree link, Incidence Matrix, Cut Set Matrix, Tie Set Matrix, Formation of incidence, tie set, cut set matrices of electric circuits   [4]

MODULE IV: Magnetically Coupled Circuit - Magnetic coupling, Polarity of coils, Polarity of induced voltage, Concept of Self and Mutual inductance, Coefficient of coupling, Solution of problems.   [4]

MODULE V: Laplace Transform - Concept of Complex frequency, Properties of Laplace Transform, transform of-step, gate, impulse, exponential, periodic functions, over damped surge, critically damped surge, damped and un-damped sine functions, transfer function, poles, zeroes, Initial value theorem and final value theorem, Inverse Laplace Transform using partial fraction method, circuit analysis in s-domain [7]

MODULE VI: Transient Analysis -Transient analysis of RC, RL, RLC circuit with DC & AC sources, Application of Laplace Transform to transient analysis.   [5]

MODULE VII: Two Port Network - Open circuit Impedance & Short circuit Admittance parameter, Transmission parameter, Hybrid Parameter, Conditions of Reciprocity and Symmetry, Interrelation between different parameters, Ladder Network & General Network, Solution of Problems.   [5]

Text Books :
1. A.Chakrabarti - Circuit Theory: Analysis and Synthesis , Dhanpat Rai & Co.
2. Valkenburg M. E. Van, "Network Analysis", Prentice Hall./Pearson Education
3. Hayt "Engg Circuit Analysis" 6/e Tata McGraw-Hill
4.D. Roy Chowdhury -Networks And Systems, New Age International

Reference Books :
1.B.L. Thereja and A.K. Thereja - A Textbook of Electrical Technology : Basic Electrical Engineering in S. I. Units (Volume - 1) , S-Chand
2. Sudhakar: Circuits & Networks:Analysis & Synthesis" 2/e TMH
3. D.A.Bell- Electrical Circuits- Oxford
4 P.Ramesh Babu- Electrical Circuit Analysis- Scitech
5. M.S.Sukhija & T.K.NagSarkar- Circuits and Networks-Oxford
6. Skilling H.H.: "Electrical Engineering Circuits", John Wiley & Sons.
7. Edminister J.A.: "Theory & Problems of Electric Circuits", McGraw-Hill Co.
8. Kuo F. F., "Network Analysis & Synthesis", John Wiley & Sons.
9. Sivandam- Electric Circuits and Analysis, Vikas

Signature:

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(BISWAMOY PAL) (SURAJIT BARI) (SUMAN MAZUMDER)

JISCE NIT GNIT

COORDINATOR MEMBER MEMBER

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(DR. S. BHATTACHAIRYYA) (DR. S. PANDA) (DR. S. ROY)

HOD,ECE HOD,ECE HOD,ECE

JISCE NIT GNIT

Stream: ECE

Subject Name: CIRCUIT THEORY AND NETWORK   LAB

Subject Code: EC392

List of Experiments

1. Characteristics of Series & Parallel Resonant circuits
2. Verification of Network Theorems
3. Transient Response in R-L & R-C Networks ; simulation / hardware.
4. Study the effect of inductance on speed of system response; simulation/Hardware
5. Transient Response in RLC Series & Parallel Circuits & Networks ; simulation / hardware
6. Determination of Impedance (Z), and Admittance (Y) parameters of Two-port networks
7. Generation of periodic, exponential, sinusoidal, damped sinusoidal, step, impulse, and ramp signals using MATLAB
8. Representation of Poles and Zeros in s-plane, determination of partial fraction expansion in s-domain and cascade connection of second-order systems using MATLAB
9. Determination of Laplace Transform, different time domain functions, and Inverse Laplace
10. Transformation using MATLAB Note: An Institution / college may opt for some other hardware or software simulation wherever possible in place of MATLAB

Signature:

Paper Name: VALUE AND ETHICS IN PROFESSION

Paper Code: HU 302

Total Contact Hours: 24

Credit: 2

I. Prerequisities:

Ethics in engineering practice is about professional responsibilities of engineers. Professional ethics have been recognized as an important foundation in the practice of engineering for several decades in many industrialized countries. Codes of ethics have been invoked as a basis for professional engineering licensure. Violations of such ethical codes have led to many well-known tragic engineering failures that endangered human life and jeopardized public welfare. As a response to this concern, a new discipline, engineering ethics, is emerging. This discipline will doubtless take its place alongside such well-established fields as medical ethics, business ethics, and legal ethics. Recently, ethics has attracted the attention of several colleges of engineering around the world. In this regard, ethics started merging into engineering curricula for the last two decades. Implementations varied from introducing some ethics case studies into existing courses, to introducing standalone ethics courses.

II. Course Objectives:

1. To provide a values-based approach to ethical professionalism and to provide a method of thinking about and dealing with ethical issues in the work place.

2. To provide a discussion of what a profession is and what it means to act professionally.

3. To include a discussion of the features of moral reasoning and to provide a case resolution method for dealing with ethical issues of the work place.

4. To cover in-depth those values central to moral life of any professional: integrity, respect for persons, justice, compassion, beneficence and No maleficence, and responsibility.

III. Course Outcome (CO):

Upon completion of the course, students will be able to
1. Discuss real-world controversies in a sophisticated fashion, using critical thinking and argument analysis.
2. Identify the strengths and weaknesses of philosophical principles applied to everyday moral problems.
3. Analyze the coherence in the dynamic relationship between moral principles and moral facts.
4. Read, comprehend, and criticize philosophical analyses of the central problems in environmental ethics (including the proper boundaries of moral concern, the scarcity of natural resources, the policy options available to regulators and legislators, etc.)

IV. CO – PO Mapping :

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

V. Syllabus Description :

Paper Name: VALUE AND ETHICS IN PROFESSION

Paper Code: HU 702

Total Contact Hours: 24

Credit: 2

Module: 1. Introduction: Definition of Ethics; Approaches to Ethics: Psychological, Philosophical, Social.

Module: 2. Psycho-social theories of moral development: View of Kohlberg; Morality and Ideology, Culture and Morality, Morality in everyday Context.

Module: 3. Ethical Concerns: Work Ethics and Work Values, Business Ethics, Human values in organizations: Values Crisis in contemporary society. Nature of values: Value Spectrum of a good life.

Module: 4. Ethics of Profession:

Engineering profession: Ethical issues in Engineering practice, Conflicts between business demands and professional ideals. Social and ethical responsibilities of Technologists. Codes of professional ethics. Whistle blowing and beyond, Case studies.

Module: 5. Self Development: Character strengths and virtues, Emotional Intelligence, Social intelligence, Positive cognitive states and processes (Self-efficacy, Empathy, Gratitude, Compassion, and Forgiveness).

Module: 6.Effects of Technological Growth:

Rapid Technological growth and depletion of resources, Reports of the Club of Rome. Limits of growth: sustainable development Energy Crisis: Renewable Energy Resources, Environmental degradation and pollution. Eco-friendly Technologies. Environmental Regulations, Environmental Ethics. Appropriate Technology, Movement of Schumacher; Problems of man, machine, interaction.

Text / Reference Books:

1. Stephen H Unger, Controlling Technology: Ethics and the Responsible Engineers, John Wiley & Sons, New York 1994 (2nd Ed)

2. Deborah Johnson, Ethical Issues in Engineering, Prentice Hall, Englewood Cliffs, New Jersey 1991.

3. A N Tripathi, Human values in the Engineering Profession, Monograph published by IIM, Calcutta 1996.

DETAILED SYLLABUS
STREAM: ECE
SUBJECT NAME: NUMERICAL METHODS
SUBJECT CODE: M(CS) 391
YEAR: SECOND YEAR
SEMESTER: III
CONTACT HOURS: 0 : 0: 3
CREDIT: 2

1. Assignments on Newton forward /backward, Lagrange's interpolation, Sterling & Bessel's Interpolation formula, Newton's divided difference Interpolation.

2. Assignments on numerical integration using Trapezoidal rule, Simpson's 1/3 rule, Weddle's rule and Romberg Integration.

3. Assignments on numerical solution of a system of linear equations using Gauss elimination, Tridiagonal matrix algorithm, Gauss-Seidel iterations. Successive over Relaxation (SOR) method, LU Factorization method.

4. Assignments on numerical solution of Algebraic Equation by Bisection method, Regula-Falsi method, Secant Method, Newton-Raphson method

5. Assignments on ordinary differential equation: Euler's method, Euler's modified method, Runge-Kutta methods, Taylor series method and Predictor-Corrector method.

6. Assignments on numerical solution of partial differential equation: Finite Difference method, Crank–Nicolson method.

7. Implementation of numerical methods on computer through C/C++ and commercial Software Packages: Matlab / Scilab / Labview / Mathematica/NAG ([Numerical Algorithms Group](#))/Python.

Paper Name: Mathematics-III
Paper Code: M 301
Contact: 3L+1T
Credits: 4
Course: B.Tech
Target Stream: ECE
Semester: III
Total Lectures: 44L
Full Marks = 100 (30 for Continuous Evaluation; 70 for End Semester Exam.)

Course Structure and Syllabus: The course structure and syllabus has been discussed and proposed as mentioned below.

Prerequisite:

- Elementary mathematics including the notion of differential and integral calculus.
- Complex numbers, permutation & combination.

MODULE I:

Fourier Series and Fourier Transform:

Sub-Topics: Introduction, Periodic functions: Properties, Even & Odd functions: Properties, Special wave forms: Square wave, Half wave Rectifier, Full wave Rectifier, Saw-toothed wave, Triangular wave. Euler's Formulae for Fourier Series, Fourier Series for functions of period 2π, Fourier Series for functions of period , Dirichlet's conditions, Sum of Fourier series. Examples. Theorem for the convergence of Fourier Series (statement only). Fourier Series of a function with its periodic extension. Half Range Fourier Series: Construction of Half range Sine Series, Construction of Half range Cosine Series. Parseval's identity (statement only).Examples.

Fourier Transform:

Sub-Topics: Fourier Integral Theorem (statement only), Fourier Transform of a function, Fourier Sine and Cosine Integral Theorem (statement only), Fourier Cosine & Sine Transforms. Fourier, Fourier Cosine & Sine Transforms of elementary functions. Properties of Fourier Transform: Linearity, Shifting, Change of scale, Modulation. Examples.Fourier Transform of Derivatives.Examples.Convolution Theorem (statement only), Inverse of Fourier Transform, Examples.
Discussions on application of the topic related to ECE

10L

MODULE II:

Probability Distributions: Definition of random variable.Continuous and discrete random variables. Probability density function & probability mass function for single variable only. Distribution function and its properties (without proof).Examples. Definitions of Expectation & Variance, properties & examples. Some important discrete distributions: Binomial, Poisson. Continuous distributions: Normal. Determination of Mean, Variance and standard deviation of the distributions. Correlation &Regression analysis, Least Square method, Curve fitting.

Discussions on application of the topic related to ECE

10L

MODULE III:

Calculus of Complex Variable

Introduction to Functions of a Complex Variable, Concept of Limit, Continuity and Differentiability. Analytic functions, Cauchy-Riemann Equations (statement only). Sufficient condition for a function to be analytic. Harmonic function and Conjugate Harmonic function, related problems. Construction of Analytic functions: Milne Thomson method, related problems.

Complex Integration.

Concept of simple curve, closed curve, smooth curve & contour. Some elementary properties of complex Integrals. Line integrals along a piecewise smooth curve. Examples.Cauchy's theorem (statement only).Cauchy-Goursat theorem (statement only).Examples.Cauchy's integral formula, Cauchy's integral formula for the derivative of an analytic function, Cauchy's integral formula for the successive derivatives of an analytic function.Examples.Taylor's series, Laurent's series. Examples.

Zeros and Singularities of an Analytic Function & Residue Theorem.

Zero of an Analytic function, order of zero, Singularities of an analytic function. Isolated and non-isolated singularity, essential singularities. Poles: simple pole, pole of order m. Examples on determination of singularities and their nature. Residue, Cauchy's Residue theorem (statement only), problems on finding the residue of a given function, Introduction Conformal transformation, Bilinear transformation, simple problems.

Discussions on application of the topic related to ECE

12L

MODULE IV:

Basic concepts of Partial **differential equation (PDE)**:

Origin of PDE, its order and degree, concept of solution in PDE. Introduction to different methods of solution: Separation of variables, Laplace & Fourier transform methods.

Topic: Solution of Initial Value & Boundary Value PDE's by Separation of variables, Laplace & Fourier transform methods.

PDE I: One dimensional Wave equation.

PDE II: One dimensional Heat equation.

PDE III: Two dimensional Laplace equation.

Introduction to series solution of Ordinary differential equation (ODE): Validity of the series solution of an ordinary differential equation. General method to solve Po $y''+P_1 y'+P_2 y=0$ and related problems to Power series method**.** Brief review on series solution of Bessel & Legendre differential equation. Concepts of generating functions.

Discussions on application of the topic related to ECE

12L

TOTAL LECTURES: 44

Text Books:

1. Rathor, Choudhari,:Descrete Structure And Graph Theory.

2. Gupta S. C and Kapoor V K: Fundamentals of Mathematical Statistics - Sultan Chand & Sons. **3.** Lipschutz S: Theory and Problems of Probability (Schaum's Outline Series) - McGraw Hill   Book. Co.

4. Spiegel M R: Theory and Problems of Probability and Statistics (Schaum's Outline Series) - McGraw Hill Book Co.

5. Goon A.M., Gupta M K and Dasgupta B: Fundamental of Statistics - The World Press Pvt. Ltd.

6. Spiegel M R: Theory and Problems of Complex Variables (Schaum's Outline Series) - McGraw Hill Book Co.

7. Bronson R: Differential Equations (Schaum's Outline Series) - McGraw Hill Book Co.

8. Ross S L: Differential Equations - John Willey & Sons.

9. Sneddon I. N.: Elements of Partial Differential Equations - McGraw Hill Book Co.

10. West D.B.: Introduction to Graph Theory - Prentice Hall

11. Deo N: Graph Theory with Applications to Engineering and Computer Science - Prentice Hall.

12. Grewal B S: Higher Engineering Mathematics (thirtyfifthedn) - Khanna Pub.

13. Kreyzig E: Advanced Engineering Mathematics - John Wiley and Sons.

14. Jana- Undergradute Mathematics

15. Lakshminarayan- Engineering Math 1.2.3

16. Gupta- Mathematical Physics (Vikas)

17. Singh- Modern Algebra

18. Rao B: Differential Equations with Applications & Programs, Universities Press

19. Murray: Introductory Courses in Differential Equations, Universities Press

20. Delampady, M: Probability & Statistics, Universities Press

21. Prasad: Partial Differential Equations, New Age International

22. Chowdhury: Elements of Complex Analysis, New Age International

23. Bhat: Modern Probability Theory, New Age International

24. Dutta: A Textbook of Engineering Mathematics Vol.1 & 2, New Age International

25. Sarveswarao: Engineering Mathematics, Universities Press

26. Dhami: Differential Calculus, New Age International

DETAILED SYLLABUS
STREAM: ECE
SUBJECT NAME: NUMERICAL METHODS
SUBJECT CODE: M(CS) 301
YEAR: SECOND YEAR
SEMESTER: III
CONTACT HOURS: 3 : 0:0
CREDIT: 3
TOTAL CONTACT HOURS: 33L

MODULE I: NUMERICAL METHOD I

Approximation in numerical computation: Truncation and rounding errors, Propagation of errors, Fixed and floating-point arithmetic.   (2L)

Interpolation: Newton forward/backward interpolation, Stirling & Bessel's Interpolation formula, Lagrange's Interpolation, Divided difference and Newton's divided difference Interpolation.   (7L)

Numerical integration: Newton Cotes formula, Trapezoidal rule, Simpson's 1/3 rule, Weddle's Rule, Romberg Integration, Expression for corresponding error terms.   (5L)

Numerical solution of a system of linear equations: Gauss elimination method, Tridiagonal matrix algorithm, LU Factorization method, Gauss-Seidel iterative method, Successive over Relaxation (SOR) method.   (6L)

MODULE II: NUMERICAL METHOD II

Solution of polynomial and transcendental equations: Bisection method, Regula-Falsi, Secant Method, Newton-Raphson method.   (5L)

Numerical solution of ordinary differential equation: Taylor series method,Euler's method, Euler's modified method, fourth order Runge- Kutta method and Milne's Predictor-Corrector methods.

(6L)

Numerical solution of partial differential equation: Finite Difference method, Crank–Nicolson method.

(2L)

Text Books:
1. Shishir Gupta &S.Dey, Numerical Methods, Mc. Grawhill Education Pvt. Ltd.
2. C.Xavier: C Language and Numerical Methods, New age International Publisher.
3. Dutta& Jana: Introductory Numerical Analysis. PHI Learning
4. J.B.Scarborough: Numerical Mathematical Analysis.Oxford and IBH Publishing
5. Jain, Iyengar ,& Jain: Numerical Methods (Problems and Solution).New age International Publisher.
6. Prasun Nayek: Numerical Analysis, Asian Books

References:

1. Balagurusamy: Numerical Methods, Scitech. TMH
2. Baburam: Numerical Methods, Pearson Education.
3. N. Dutta: Computer Programming & Numerical Analysis, Universities Press.
4. SoumenGuha& Rajesh Srivastava: Numerical Methods, Oxford Universities Press.
5. Srimanta Pal: Numerical Methods, Oxford Universities Press.
6. Numerical Analysis, Shastri, PHI
7. Numerical Analysis, S. Ali Mollah. New Central Book Agency.
8. Numerical Methods for Mathematics ,Science&Engg., Mathews, PHI
9. NumericalAnalysis,G.S.Rao,New Age International
10. Programmed Statistics (Questions – Answers),G.S.Rao,New Age International
11. Numerical Analysis & Algorithms, PradeepNiyogi, TMH
12. Computer Oriented Numerical Mathematics, N. Dutta, VIKAS
13. NumericalMethods,Arumugam,ScitechPublication
14. Probability and Statisics for Engineers,Rao,ScitechPublication
15. Numerical Methods in Computer Application,Wayse, EPH

ELECTRONICS AND COMMUNICATION ENGINEERING DEPARTMENT

Paper Name: Technical skill
development Paper Code: MC 381
Contacts: 3P
Credits: 0

1. Design of different resistive network to find the equivalent resistance.
2. Study of ripple factor and efficiency of bridge rectifier circuit.
3. Realization of active, cut off and saturation region in CE mode.
4. Design of unregulated dual mode power supply.
5. Design of regulated (fixed and variable) power supply using
     I.   Shunt type using Zener diode and transistor.
     II. Series type using transistor.
6. Design an audio power amplifier using transistor.
7. Filter design using R, L and C.
8. Design of OR and AND logic gate using diode.

To enhance the technical knowledge of students, hands on training of circuit design is the ultimate target of this course. This course is newly introduced in the autonomy curriculum from the industry perspective to make them prepared as 'production supervision' in the production unit of small/large scale industry.