SYLLABUS: III SEMESTER (Computer Science and Engineering)
Syllabus for
Applied Mathematics- III (CS/CT)
Scheme (Theory: 4 hrs, Tutorial: 1hr.)

UNIT - I: LAPLACE TRANSFORM(12 Hrs)
Definition, Properties, Laplace Transform of Derivatives and Integrals, Evaluation of integrals by Laplace Transform, Inverse Laplace Transform and its Properties, Convolution theorem(Statement only), Laplace Transform of Periodic Functions(Statement only) and Unit Step Function, Applications of Laplace Transform to solve Ordinary Differential Equations, Simultaneous Differential Equations, Integral Equations &Integro-Differential Equations.

UNIT – II: FOURIER SERIES & FOURIER TRANSFORM(08 Hrs)
Periodic Functions and their Fourier Expansions, Even and Odd functions, Change of interval, Half Range Expansions.
Fourier Transform: Definition and Properties (excluding FFT), Fourier Integral Theorem, Relation with Laplace Transform, Applications of Fourier Transform to Solve Integral Equation.

UNIT – III: Z-TRANSFORM(08 Hrs)
Definition , Convergence of Z-transform and Properties, Inverse Z-transform by Partial Fraction Method, Residue Method (Inversion Integral Method) and Power Series Expansion, Convolution of two sequences. Solution of Difference Equation with Constant Coefficients by Z-transform method.

UNIT- IV: FUNCTIONS OF COMPLEX VARIABLE(12 Hrs)
Analytic Function, Cauchy- Riemann Conditions, Harmonic Functions (excluding orthogonal system), Milne-Thomson Method, Cauchy Integral Theorem & Integral Formula (Statement only), Taylor's & Laurent's series (Statement only), Zeros and Singularities of Analytic Function, Residue Theorem (Statement only), Contour Integration (Evaluation of real definite integral around unit circle and semi-circle).

UNIT –V: MATRICES(12 Hrs)
Linear and Orthogonal Transformations, Linear dependence of vectors, Characteristics equation, Eigen values and Eigen vectors, Statement and Verification of Cayley-Hamilton Theorem [without proof], Reduction to Diagonal form, Reduction of Quadratic form to Canonical form by Orthogonal Transformation, Sylvester's theorem[without proof], Solution of Second Order Linear Differential Equations with Constant Coefficients by Matrix method. Largest Eigen value and Eigen vector by Iteration method.

UNIT - VI: THEORY OF PROBABILITY(08 Hrs)

Axioms of Probability, Conditional Probability, Baye's Rule, Random variables: Discrete and Continuous random variables, Probability function and Distribution function, Mathematical Expectation, Variance, Standard Deviation, Moments, Moment generating function, Binomial, Poisson and Normal Distributions.

Text Books

1. Higher Engineering Mathematics by B.S. Grewal, 40th Edition, Khanna Publication
2. Advanced Engineering Mathematics by Erwin Kreysizig, 8th Edition, Wiley India
3. Applied Mathematics for Engineers & Physicist by L.R. Pipes and Harville
4. Theory & Problems of Probability and Statistics by M.R. Spiegal , Schaum Series, McGraw Hills

Reference Books

1. A Text Book of applied Mathematics, Volume II by P.N. Wartikar& J.N. Wartikar, Poona VidyarthiGrihaPrakashan
2. Introductory methods of Numerical Analysis by S.S. Sastry, PHI
3. Mathematics for Engineers by Chandrika Prasad
4. A text book of Engineering Mathematics by N. P. Bali & M. Goyal, Laxmi Publication.

BE3S2T: Advanced C Programming and Logic Design

Load	Credit	Total marks	Sessional marks	University marks	Total
4 hrs (Practical) 1 hr (Tutorial)	5	100	20	80	100

Unit-I

Arrays: single dimensional arrays, two dimensional arrays, multidimensional arrays, variable length arrays. Array operations. Strings, single dimensional array of string, two dimensional

array of string, operations in "string.h". Structures: array of structures, passing structure to function, structure within structures. Unions, bit-fields, enumerations, sizeof, typedef.

Unit II

Introduction File handling,:-File structure, File handling function, File types, Streams, Text, Binary, File system basics, The file pointer, Opening a file, Closing a file, Writing a character, Reading a character, Using fopen(), getc(), putc(), and fclose(), Using feof(). Using fread() and fwrite(), Direct access file, fseek() and random access I/O, fprintf() and fscanf(), getting file name as Command line arguments.

Unit III

Pointers: pointers operators, pointer arithmetic, Pointers and function, Array of pointers, Pointer and Strings, Pointer to structure, Pointers within structure, Introduction of Static and Dynamic memory allocation, The process of Dynamic memory allocation, DMA functions Malloc() function, Sizeof() operator, Function free(), Function realloc()

Unit IV

Graphics: Graphics and Text mode, Video Adapter, Initialize Graphics Mode and resolution, header file graphics.h. Functions used In Graphics – Drawing a Point on Screen, Drawing – lines, rectangle, circles, arcs, polygon. Functions to fill colors. Display Text in Graphics mode, outtext(), outtextxy(), justifying text. Advanced Graphics : various functions used for moving of graphical objects vizmoverel(), moveto(), putimage(), putpixel().

Unit V

Introduction to problem solving and programming : Basic model of computation, Notion of Algorithms, Principle of Mathematical Induction, Basics of functional programming, notion of types, Iterative versus recursive style, Correctness and efficiency issues in programming, time and space measures

Unit VI

Introduction to problem solving and programming: Basics of imperative style programming, Assertions and loop invariants, Top down design and examples of step-wise refinement, Programming using structures, introduction to encapsulation and object oriented programming.

Text Books

1. The C Programming Language : Dennis Ritchie & Brain Kernighan [Pearson]
2. Practical "C" Programming: Steve Oualline, O'Reilly Publications
3. Programming with C :K.R.Venugopal&S.R.Prasad [TMH]
3. How to solve it by Computer by R. J. Dromey, Prentice-Hall India EEE Series.

Reference Books

1. The Complete Reference C (4th Edition) : Herbert Schildt [TMH]
2. Structure and Interpretation of Computer Programs by Harold Abelson and Gerald Sussman with Julie Sussman, MIT Press, 1985.

BE3S2P: Advance "C" & Programming Logic Design: Practical based on above syllabus

Load	Credit	Total marks	Sessional marks	University marks	Total
2 hrs (Practical)	2	50	25	25	50

BE3S3T: Digital Circuits & Fundamental of Microprocessor

Load	Credit	Total marks	Sessional marks	University marks	Total
3 hrs (Practical) 1 hr (Tutorial)	4	100	20	80	100

Unit I:
Motivation for digital systems: Logic and Boolean algebra, Number Systems. Logic Gates & Truth Tables, Demorgan's law, Minimization of combinational circuits using Karnaugh maps upto five variable.

Unit II:
Design procedure: Multiplexers, Demultiplexer , Encoders ,Decoders ,Code Converters, Adders ,Subtractor (Half ,Full),BCD Adder/ Subtractor , ripple and carry look-ahead adder design and their advantages & drawbacks.

Unit III:
Storage elements, Flip-flops and latches: D, T, J/K, S/R flip-flops. Master Slave FF's Sequential circuit Analysis & Design, Input equations, state table, analysis with J-K Flip flops. Design procedure, designing with D & J-K Flip flop.

Unit IV:
Applications of Flip Flops: Registers & Shift registers. Counters, asynchronous and synchronous design using state and excitation tables. Conversion of one of type of F/F to another

Unit V:
Programmable logic Devices: Read only Memory ROM , PLA,PAL, Architecture of 8085 MP and its instruction set.

Unit VI:
Programming of 8085 and interrupt structure and timing diagrams of 8085 and overview of some advanced processors.

Text Books:
1. Digital Logic Design: *2nd edition by M. Mano*
2. Fundamental of Digital Electronics: *A. Anand Kumar*
3. Modern Digital Electronic: *4th edition by R.P.Jain*
4. 8 bit microprocessor & controller: *fifth edition – V.J.Vibhute*
Reference books:
1. Fundamental of Digital Electronics: *A. Anand Kumar*
2. Digital circuit & design: *A.P.Godse*
3. 8 bit Microprocessor: *Ramesh Gaonkar*

BE3S3P: Digital Circuits & Fundamental of Microprocessor: Practical based on above syllabus.

Load	Credit	Total marks	Sessional marks	University marks	Total
2 hrs (Practical)	2	50	25	25	25

BE3S4T: Ethics in IT

Load	Credit	Total marks	Sessional marks	University marks	Total
3 hrs (Theory) 1 hr (Tutorial)	4	100	20	80	100

BE3S5T: Computer Architecture & Organization

Load	Credit	Total marks	Sessional marks	University marks	Total
3 hrs (Practical) 1 hr (Tutorial)	4	100	20	80	100

UNIT I
BASIC STRUCTURE OF COMPUTERS: Functional units, Von Neumann Architecture, Basic operational concepts, Bus structures Addressing modes, Subroutines: parameter passing, Instruction formats: Three- address Instructions, Two-address instructions, One- address instructions, Zero-address instructions.
BASIC PROCESSING UNIT: Bus architecture, Execution of a complete instruction, sequencing of control signals, Hardwired control, Micro-programmed Control, microinstruction format.
UNIT II
ARITHMETIC: Number representations and their operations, Addition and Subtraction with signed-magnitude, Design of Fast Adders, Array multiplier, Signed multiplication: Booth's Algorithm, Bit-pair recoding, Integer Division, Floating-point Arithmetic operations, guard bits and rounding.
UNIT III
THE MEMORY SYSTEM: Various technologies used in memory design, higher order memory design, Memory hierarchy, Main memory, Auxiliary memory, Cache memory, cache optimization techniques ,Memory interleaving, Virtual memory, Address Space and Memory Space, Associative memory, Page table, Page Replacement
UNIT IV
INPUT/OUTPUT ORGANIZATION: I/O mapped I/O and memory mapped I/O, Interrupts and Interrupts handling mechanisms, vectored interrupts, Synchronous vs. Asynchronous data transfer, Direct Memory Access COMPUTER PERIPHERALS: I/O devices such as magnetic disk, magnetic tape, CD-ROM systems.
UNIT V
RISC philosophy, pipelining, basic concepts in pipelining, delayed branch, branch prediction, data dependency, influence of pipelining on instruction set design, multiple execution units, performance considerations,
UNIT VI. Introduction to multiprocessors:
Basic concepts in parallel processing, classification of parallel architectures. Vector Processing, Array Processor, Literature review of multi-core architecture
BOOKS:
- V.C.Hamacher,Z.G.Vranesic and S.G.Zaky, Computer Organisation, McGraw Hill,5thed,2002.
- Computer Organization, Design and Architecture (IV Ed), Sajjan G. Shiva, CRC Press
- Computer Architecture & Organization III Ed- J.P.Hayes.

REFERENCES BOOKS:
- M Mano,"Computer System and Architecture", PHI, 1993.
- W. Stallings, "Computer Organization & Architecture", PHI, 2001.

BE3S6: COMPUTER WORKSHOP LAB

Load	Credit	Total marks	Sessional marks	University marks	Total
2 hrs (Practical)	2	50	25	25	50

Unit I:

Basic concepts of HTML: HTML, Web Pages, World Wide Web, Tags in HTML, HTML As a Markup Language, HTML as a Page Formatting Tool, Structure of an HTML Page, Commands Written In Notepad, the <H> TAG, the basic tags, the <P> TAG, The <PRE>Tag**The text attributes**: The <marquee> tag, Example of Text Styles, the images, the list tag: Ordered List, Unordered List, Nested List **The links**: Links between Two Pages, Links in the Same Page, Images as Links, Attributes of Links, the basic web page, **other formatting tags**: sounds and videos, comments, the <XMP> tag, special characters

Unit II:

The tables: The Table, The Rows, The Columns, Cellspacing, Cellpadding, Alignment of the Text Present inside the Cells, Alignment of Table, Border Attributes in the Table, Merging Of Rows and Columns, Colspan, Rowspan, Table within a Table, Empty Cells inside the Table, Links in the Table, **the frames**: Frames with Column Arrangement, Column Size for Frames, Row Size for Frames, Frame Spacing, Margin Width and Height in Frames,

Unit I:

The forms: The<input> Tag, The <textarea></textarea> Tag, The Dropdown List, The Normal List, HTML 5: New Markup Elements of HTML5, Basic Tags, Images, List and Links, Tables and Forms, Audio and Video, Canvas, XHTML, and CSS, design and deploy a web site

Unit IV:

VB script: Introduction to vbscript, Printing Text Using vbscript, Alert / msgbox in vbscript, Variables in vbscript, Arrays in vbscript, Conditional Statements, Looping Statements, Procedures , Events

Unit V:

Java script: Variables , Array, Comments, Operators, Conditional Statements, Looping Statements,

Unit VI:

Working under UNIX /LINUX Operating Systems:
   a) Structure: Unix Architecture
   b) Features of UNIX operating system
   c) Layered model of UNIX operating system (study of kernel and Shell)
   d) General file commands and Directory commands
   e) File structure and Directory structure

Text Book:

1. **HTML Programming, Freeman and Robson, Oreilly publications**

BE3S7T: Environmental Engineering

Load	Credit	Total marks	Sessional marks	University marks	Total
2 hrs (Theory)	0				

SYLLABUS IV SEMESTER (Computer Science & Engineering)

PROPOSED SYLLABUS FOR
DISCRETE MATHEMATICS AND GRAPH THEORY
BE IV Semester (CS/CT/CE/IT)
Scheme (Theory: 4 hrs. & Tutorial:1 hr.)

UNIT-I: Mathematical Logic and Set Theory (08 Hrs)
Propositions and Logical Operations, Quantifiers, Conditional Statements and Tautologies, Methods of Proof, Principle of Mathematical Induction. Basic concepts of set theory, Operations on Sets, The power set.

UNIT-II: Relations and Functions (12 Hrs)
Relations: Ordered pairs and n-tuples, Product Sets and Partitions, Relations and Digraphs, Matrix of Relation, Paths in Relations and Digraphs, Properties of Relations, Equivalence Relations & Partitions, Compatible Relation, Manipulation of Relations, Composition of Relations, Transitive Closure of a relation, Partial order relation, Partially ordered set, Hasse Diagrams. **Functions**: Definition, Composition of functions, Types of Functions, Invertible Function, Permutation Function, Characteristics function of a set with Theorems.

UNIT-III: Group Theory (12 Hrs)
Binary Operations, Properties, Semigroups, Monoids,Subsemigroup,Submonoid, Isomorphism & Homomorphism, , Groups (only definitions and examples) Subgroups and Homomorphism, Cosets and Lagrange's Theorem, Normal subgroups.

Unit- IV:Rings, Lattices & Boolean Algebra(10 Hrs)

 Rings, Fields, Integral Domain, Ring Homomorphism (definitions & examples), Lattices: Properties, Types of Lattices, Sub lattices, Isomorphic Lattices, Complemented & Modular Lattices (definitions & examples), Boolean Algebra: Definition, Properties, Simplification of Switching Circuits.

Unit-V: Graph Theory (12 Hrs)

 Basic concepts of Graph Theory, Digraphs, Basic definitions, Paths and Circuits, Reachability and Connectedness, Matrix representation of graphs, Subgraphs& Quotient Graphs, Isomorphic digraphs & Transitive Closure digraph, Euler's Path & Circuit (only definitions and examples). Trees, Binary Tree, Labeled Trees, Undirected Trees, Spanning Trees of Connected Relations, Prim's Algorithm to

construct Spanning Trees, Weighted Graphs, Minimal Spanning Trees by Prim's Algorithm &Kruskal's Algorithm.

Unit-VI: Combinatorics(06 Hrs)

Generating Functions, Recurrence Relations, Counting: Permutations & Combinations, Pigeonhole Principle with Simple Applications.

Text Books

1. Discrete Mathematical Structures(3rd Edition) by Kolman, Busby & Ross PHI.
2. Discrete Mathematical Structures with Applications to Computer Science by Tremblay &Manohar, Tata McGraw- Hill.
3. Combinatorial Mathematics, C.L. Liu (McGraw Hill)

Reference Books

1. Discrete Maths for Computer Scientists & Mathematicians by Mott, Kandel, Baker.
2. Elements of Discrete Mathematics by C. L. Liu.
3. Discrete Mathematics by Lipschutz.
4. Discrete Mathematics by R.Johnsonbaugh.
5. Higher Engineering Mathematics by B.S. Grewal, 40th Edition, Khanna Publication

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BE4S2T: Data Structures & Program Design

Load	Credit	Total marks	Sessional marks	University marks	Total
4 hrs (Theory) 1 hr (Tutorial)	5	100	20	80	100

UNIT I

Introduction to algorithm, Time and space analysis of algorithms, Big oh and theta notations and omega notations, Average, best and worst case analysis, linear and binary search, selection sort,

insertion sort, bubble sort, shell sort, Radix sort. Abstract data structure as an organization of data with specified properties and operations, General concepts of data structures. Representation of Arrays -Single and Multi dimensional.

UNIT II
List: - representation of ordered list using array and operation on it, sparse matrix, polynomial, Linked Lists, Simply linked list, Implementation of linked list using static and dynamic memory allocation, operations on linked list, polynomial representations and manipulations are using linked list, circular linked list, doubly linked list, Generalized list

UNIT III
Stack & Queue: Representation of Stack & queue using array and linked list, , Application of stacks, Conversion from infix to post fix and pre-fix expressions, Evaluation of postfix expression using stacks, Multiple stacks, Circular queues, Priority Queues, Dequeue.

UNIT IV
Trees: General and binary trees, Representations and traversals, Threaded Binary Trees, Binary search trees, Applications, The concept of balancing and its advantages, B-Trees, B+ Trees, AVL Trees.

UNIT V
Graphs and digraphs: Representations, Breadth and depth first searches, connected component, spanning trees, shortest path–single source & all pairs , activity networks, topological sort, Hamiltonian path.

UNIT VI
Symbol Tables: static tree tables, dynamic tree tables, hash tables, hash functions, Collision resolution, overflow handling, Applications
Textbooks:
- Data Structures using C and C++ by Y. Langsam, Pearson Education
- Algorithms in a Nutshell, George H & Garry, O'reilly Publication
- Data Structures using C by Tanenbaum, Pearson Education
- S. Sahani, Data Structures in C,
- Data structures -Robert Kse

BE4S2P: Data Structures & Program Design Lab: Practical will be based on above syllabus

Load	Credit	Total marks	Sessional marks	University marks	Total
2 hrs (Practical)	2	50	25	25	50

BE4S3T: Operating Systems

Load	Credit	Total marks	Sessional marks	University marks	Total
3 hrs (Theory) 1 hr (Tutorial)	4	100	20	80	100

UNIT-I

Introduction: Evolution of OS, Types of OS, Basic h/w support necessary for modern operating systems, services provided by OS, system programs and system calls, system design and implementation.

UNIT-II

File systems: File concept, Access methods, Disk space management and space allocation strategies, directory structures, Recovery, Log-structured File System, disk arm scheduling strategies.

UNIT-III

Scheduling: Process concept, process control block, Types of scheduler, context switch, threads, multithreading model, goals of scheduling and different scheduling algorithms, examples from WINDOWS 2000 & LINUX.

UNIT-IV

Memory management: Contiguous allocation, Relocation, Paging, Segmentation, Segmentation with paging, demand paging , page faults and instruction restart , page replacement algorithms , working sets , Locality, Thrashing,Garbage Collection .

UNIT-V

Process cooperation and synchronization: Concurrency conditions, Critical section problem, software and hardware solution, semaphores, conditional critical regions and monitors, classical inter process communication problems.

UNIT-VI

Deadlocks & Protection: Deadlock definition, Prevention, Avoidance, Detection and recovery, Goals of Protection, access matrix, implementation, Security problem.

BOOKS:

- Operating System concepts – Silberchatz& Galvin, Addison Wesley, 6th Edn.
- Modern Operating Systems – Tanenbaum, Pearson Edn. 2ndedn
- Operating Systems – A.Godbole: TMH Pubilcations

Reference Books:

- Operating System –Milan Milenkovik
- Operating Systems, 3rd Edition by Gary Nutt, Pearson Education

BE4S3T: Operating Systems Lab: Practical will be based on above syllabus

Load	Credit	Total marks	Sessional marks	University marks	Total
2 hrs (Practical)	2	50	25	25	50

BE4S4T: Theoretical Foundations of Computer Sciences

Load	Credit	Total marks	Sessional marks	University marks	Total
4 hrs (Theory) 1 hr (Tutorial)	5	100	20	80	100

UNIT 1
Mathematical preliminaries – Sets, operations, relations, strings, closure of relation, countabilityanddiagonalization, induction and proof methods- pigeon-hole principle ,concept of language, formal grammars, Chomsky hierarchy.

UNIT 2
Finite Automaton, regular languages, deterministic & non deterministic finite automata, E-closures, minimization of automata, equivalence, Moore and Mealy machine.

UNIT 3
Regular expression, identities, Regular grammar, right linear, left linear, Arden theorem, Pumping lemma for regular sets, closure & decision properties for regular sets, Context free languages, parse trees and ambiguity, reduction of CFGS, Normal forms for CFG .

UNIT 4
Push down Automata (PDA), non-determinism, acceptance by two methods and their equivalence, conversion of PDA to CFG, CFG to PDAs, closure and decision properties of CFLs, pumping lemma for CFL

UNIT 5
Turing machines, TM as acceptor, TM as transducers, Variations of TM, linear bounded automata, TM as computer of function.

UNIT 6
Recursively enumerable (r.e.) set, recursive sets, Decidability and solvability, Post correspondence Problem (PCP), Introduction to recursive function theory, primitive recursive functions, Ackerman function

Text Books:
- Introduction Of Automata Theory, Languages and computation- Hopcroft, Motwani&Ulman
- Introduction to formal languages and automata – Peter Linz.
- Introduction to Theory of Computation –Michael Sipser.

Reference Books:
- Theory Of Computer Science –Mishra and Chandrashekharan,
- Theory Of Computation –John C. Martin

BE4S5T: SYSTEM PROGRAMMING

Load	Credit	Total marks	Sessional marks	University marks	Total
3 hrs (Theory) 1 hr (Tutorial)	4	100	20	80	100

UNIT 1:
IBM 360/370 & Assembler – Introduction to System Programming & its components, M/c Architecture, Instruction Formats, Data Formats & Register Formats, Concept of assembler, design of single pass and two pass assembler.
UNIT 2:
Macroprocessor – Concept of macro, macro call within macro, macro definition within macro, recursive macro calls, design of macro processor.
UNIT 3:
Linker and Loader – Concept of static and dynamic relocation, external symbols, design of linker, design of object file for different loading schemes.
UNIT 4:
Common Object files format & System Utilities – Structure of object file and executable file, section or segment headers, symbol table, concept of storage class, string, various data types, line insert, character, arrays structures. Source code control system), make, link editor, symbolic debugger, GNU debugger.
UNIT 5:
Unix Device Drivers – Definition, Anatomy and Types, Device programming, Installation, Incorporation of driver routines, Basic device operation, Implementation with Line Printer, Comparative study between device drivers for UNIX & Windows.
UNIT 6:
Compiler – Phases of Compilers, Overview of Databases and Algorithms required for all phases. Role of lexical analyzer, recognition of tokens, Study of LEX & YACC.
Text Books:
1. System Programming- J. J. Donovan, Tata McGraw-Hill Education.
2. UNIX Device Drivers- George Pajari, Pearson Education.
3. UNIX system Utilities manual.
4. UNIX programming Tools LEX and YACC –Levine, Mason and Brown, O'Reilly.
Reference Books:
1. System Programming and Operating systems- D. M. Dhamdhere, Tata McGraw-Hill Education.

2. UNIX programming Environment- Keringham and Pike, PHI.
3. System Software: An introduction to systems programming- Leland L. Beck, Pearson Education.
4. Principles of Compiler Design-Aho and Ullman, Pearson Education.

BE4S6: COMPUTER WORKSHOP – 2 LAB

Load	Credit	Total marks	Sessional marks	University marks	Total
2 hrs (Practical)	2	50	25	25	50

The contents will be based on LINUX and LINUX Administration. The contents can be revised as per the current trends in Software Industry.