Syllabus

VEER MADHO SINGH BHANDARI UTTARAKHAND TECHNICAL UNIVERSITY

(Formerly Uttarakhand Technical University, Dehradun Established by Uttarakhand State Govt. wide Act no. 415 of 2005)
Suddhowala, PO-Chandanwadi, Premnagar, Dehradun, Uttarakhand (Website- www.uktech.ac.in)

SYLLABUS

For

B.TECH

(Information Technology)

2nd, 3rd and 4th Year

Syllabus

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Effective From – Session 2023-24

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SEMESTER-III														
S. NO.	Subject Codes	Category	Subject	Periods			Evaluation Scheme					Subject Total	Credit
							Sessional Exam			ESE			
				L	T	P	CT	TA	Total	TE	PE		
1	AHT-006/ ECT-033	BSC/ ESC	Advanced Applied Mathematics / Digital Electronics	3	1	0	30	20	50	100		150	4
2	AHT-007/AHT-008	HSC	Technical Communication/ Universal Human Value	2	1	0	30	20	50	100		150	3
3	CST-002	DC	Discrete Structure	3	1	0	30	20	50	100		150	4
4	CST-003	DC	Data Structures and Algorithms	3	1	0	30	20	50	100		150	4
5	CST-004	DC	Object Oriented Programming	3	1	0	30	20	50	100		150	4
6	CSP-003	DLC	Data Structures and Algorithms Lab	0	0	2		25	25		25	50	1
7	CSP-004	DLC	Object Oriented Programming Lab	0	0	2		25	25		25	50	1
8	CSP-005	DLC	Python Programming Lab	0	0	2		25	25		25	50	1
9	CSP-006	DLC	Internship-I/Mini Project-I*	0	0	2			50			50	1
10	CST-005/CST-006	MC	Python Programming/ Cyber Security	2	0	0	15	10	25	50			
11	GP-003	NC	General Proficiency						50				
			Total									950	23
12			Minor Course (Optional)**	3	1	0	30	20	50	100			4
	*The Mini Project-I or Internship-I(3-4weeks) will be conducted during summer break after the II semester and will be assessed during the III semester												
	MOOCs course												

Abbreviations: L-No. of Lecture hours per week, **T**-No. of Tutorial hours per week, **P**-No. of Practical hours per week, **CT**-Class Test Marks, **TA**-Marks of teacher's assessment including student's class performance and attendance, **PS**-Practical Sessional Marks, **ESE**-End Semester Examination, **TE**- Theory Examination Marks, PE- Practical External Examination Marks

Minor Courses (Optional) **: Select any subject from Annexure – II from other departments

1 Hr Lecture	**1 Hr Tutorial**	**2 or 3 Hr Practical**
1 Credit	**1 Credit**	**1 Credit**

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SEMESTER-IV													
S. NO.	Subject Codes	Category	Subject	Periods			Evaluation Scheme					Subject Total	Credit
							Sessional Exam			ESE			
				L	T	P	CT	TA	Total	TE	PE		
1	AHT-006/ ECT-033	BSC/ ESC	Advanced Applied Mathematics / Digital Electronics	3	1	0	30	20	50	100		150	4
2	AHT-007/AHT-008	HSC	Technical Communication/ Universal Human Value	2	1	0	30	20	50	100		150	3
3	CST-007	DC	Computer Organization and Architecture	3	1	0	30	20	50	100		150	4
4	CST-008	DC	JAVA Programming	3	1	0	30	20	50	100		150	4
5	CST-009	DC	Formal Languages & Automata Theory	3	1	0	30	20	50	100		150	4
6	CSP-007	DLC	Computer Organization and Architecture Lab	0	0	2		25	25		25	50	1
7	CSP-008	DLC	JAVA Programming Lab	0	0	2		25	25		25	50	1
8	CSP-009	DLC	UNIX/LINUX Programming Lab	0	0	2		25	25		25	50	1
9	CST-005/ CST-006	MC	Python Programming/ Cyber Security	2	0	0	15	10	25	50			
10	GP-004	NC	General Proficiency						50				
			Total									900	22
11			Minor Course (Optional)	3	1	0	30	20	50	100			4
		DLC	Internship-II/Mini Project-II*	To be completed at the end of the fourth semester (during the Summer).									
	MOOCs course												

Abbreviations: L-No. of Lecture hours per week, **T**-No. of Tutorial hours per week, **P**-No. of Practical hours per week, **CT**-Class Test Marks, **TA**-Marks of teacher's assessment including studentss class performance and attendance, **PS**-Practical Sessional Marks, **ESE**-End Semester Examination, **TE**- Theory Examination Marks, PE- Practical External Examination Marks

Minor Courses (Optional) **: Select any subject from Annexure – II from other departments

1 Hr Lecture	**1 Hr Tutorial**	**2 or 3 Hr Practical**
1 Credit	**1 Credit**	**1 Credit**

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Advanced Applied Mathematics (AHT-006)

L:T:P:: 3:1:0 **Credits-4**

COURSE OBJECTIVES: The objectives of the course are to:

1. The idea of Laplace transform of functions and their applications.
2. The idea of Fourier transform of functions and their applications.
3. Evaluate roots of algebraic and transcendental equations.
4. Interpolation, numerical differentiation& integration and the solution of differential equations.
5. Acquaintance with statistical analysis and techniques.

COURSE OUTCOMES:

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

1. Remember the concept of Laplace transform and apply in solving real life problems.
2. Apply the concept of Fourier transform to evaluate engineering problems.
3. Understand to evaluate roots of algebraic and transcendental equations.
4. Solve the problem related interpolation, differentiation, integration and the solution of differential equations.
5. Understand the concept of correlation, regression, moments, skewness and kurtosis and curve fitting.

Module 1: Laplace Transform: **(8 hours)**

Definition of Laplace transform, Existence theorem, Laplace transforms of derivatives and integrals, Initial and final value theorems, Unit step function, Dirac- delta function, Laplace transform of periodic function, Inverse Laplace transform, Convolution theorem, Application to solve linear differential equations.

Module 2: Fourier Transforms: **(8 hours)**

Fourier integral, Fourier sine and cosine integral, Complex form of Fourier integral, Fourier transform,Inverse Fouriertransforms, Convolution theorem, Fourier sine and cosine transform, Applications of Fourier transform to simple one dimensional heat transfer equations.

Module 3: Solution of Algebraic & Transcendental equations and Interpolation: **(8 hours)**

Number and their accuracy, Solution of algebraic and transcendental equations: Bisection method, Iteration method, Newton-Raphson method and Regula-Falsi method. Rate of convergence of these methods (without proof), Interpolation: Finite differences, Relation between operators, Interpolation using Newton's forward and backward difference formula, Interpolation with unequal intervals: Newton's divided difference and Lagrange's formula.

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Module 4: Numerical differentiation & Integration and Solution of ODE: (8 hours)

Numerical Differentiation, Numerical integration: Trapezoidal rule, Simpson's 1/3rd and 3/8 rule,Runge-Kutta method of fourth order for solving first order linear differential equations, Milne's predicator-corrector method.

Module 5: Statistical Techniques: (8 hours)

Introduction: Measures of central tendency, Moments, Skewness, Kurtosis, Curve fitting: Method of least squares, Fitting of straight lines, Fitting of second degree parabola, Exponential curves. Correlation and rank correlation, Regression analysis: Regression lines of y on x and x on y, Regression coefficients, Properties of regressions coefficients and non-linear regression.

Reference Books:

1. E. Kreyszig: Advanced Engineering Mathematics, John Wiley & Sons,10th ed.
2. B.V. Ramana: Higher Engineering Mathematics,McGrawHill.
3. Peter V.O'Neil: Advanced Engineering Mathematics, Cengage Learning,7th ed.
4. B.S. Grewal: Higher Engineering Mathematics, Khanna Publishers, 44th ed.
5. T.Veerarajan: Engineering Mathematics (for semester III), McGrawHill, 3rd ed.
6. R.K. Jain and S.R.K. Iyenger: Advance Engineering Mathematics,Narosa PublishingHouse,Std. ed.
7. P. Kandasamy, K. Thilagavathy, K. Gunavathi: Numerical Methods, S. Chand.
8. S.S. Sastry: Introductory methods of numerical analysis, Prentice Hall India, 5thed.
9. N.P. Bali and Manish Goyal: Computer Based Numerical and Statistical Techniques,Laxmi Publications, 5th ed.
10. J.N. Kapur: Mathematical Statistics, S. Chand &Company.
11. D.N.Elhance,V. Elhance&B.M. Aggarwal: Fundamentals of Statistics,Kitab Mahal.

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DIGITAL ELECTRONICS (ECT-033)

L:T:P:: 3:1:0 **Credits-04**

COURSE OBJECTIVES: The objectives of the course are to:

1. Understand the basics of digital electronics.
2. Understand the basics of Logic family.
3. Apply the knowledge of digital electronics to construct various digital circuits.
4. Analyze the characteristics and explain the outputs of digital circuits.
5. Evaluate and asses the application of the digital circuits.
6. Understand the design flow of VLSI Circuits

COURSEOUTCOMES: After completion of the course student will be able to:

1. Understand the Boolean algebra and minimization of digital functions.
2. Design and implement various combinational circuits.
3. Design and implement various sequential circuits.
4. Understand the digital logic families, semiconductor memories.
5. Design the digital circuits using VHDL

UNIT 1: **MINIMIZATION OF LOGIC FUNCTIONS**: Review of logic gate and Boolean algebra, DeMorgan's Theorem, SOP & POS forms, canonical forms, don't care conditions, K-maps up to 6 variables, Quine-McClusky's algorithm, X-OR & X-NOR simplification of K-maps, binary codes, code conversion.

UNIT 2: **COMBINATIONAL CIRCUITS**: Combinational circuit design, half and full adders, subtractors, serial and parallel adders, code converters, comparators, decoders, encoders, multiplexers, de-multiplexer, parity checker, driver &multiplexed display, BCD adder, Barrel shifter and ALU.

UNIT 3: **SEQUENTIAL CIRCUITS**: Building blocks like S-R, JK and master-slave JK FF, edge triggered FF, ripple and synchronous counters, shift registers, finite state machines, design of synchronous FSM, algorithmic state machines charts, designing synchronous circuits like pulse train generator, pseudo random binary sequence generator, clock generation

UNIT 4: **LOGIC FAMILIES & SEMICONDUCTOR MEMORIES**: TTL NAND gate, specifications, noise margin, propagation delay, fan-in, fan-out, tri-state TTL, ECL, CMOS families and their interfacing, memory elements, concept of programmable logic devices like FPGA, logic implementation using programmable devices.

UNIT 5: **VLSI DESIGN FLOW**: Design entry: schematic, FSM & HDL, different modelling styles in VHDL, data types and objects, dataflow, behavioral and structural modelling, synthesis and simulation VHDL constructs and codes for combinational and sequential circuits.

BOOKS:

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1. Mano, Digital electronics,TMH,2007.
2. Malvino, Digital Principle and applications, TMH,2014.
3. Jain, Modern digital electronics, PHI, 2012.
4. Tocci, Digital Electronics, PHI,2001.
5. W.H.Gothmann, “Digital Electronics-An introduction to theory and practice”,PHI,2nd edition,2006

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Technical Communication (AHT-007)

L:T:P:: 2:1:0 **Credits-03**

COURSE OBJECTIVES: The objectives of the course are:

1. Produce technical documents that use tools commonly employed by engineering and computer science professionals.
2. Communicate effectively in a professional context, using appropriate rhetorical approaches for technical documents, adhering to required templates, and complying with constraints on document format.
3. Clarify the nuances of phonetics, intonation and pronunciation skills.
4. Get familiarized with English vocabulary and language proficiency.

COURSE OUTCOMES: On successful completion of the course, the student will be able to:

1. Students will be enabled to **understand** the nature and objective of Technical Communication relevant for the work place as Engineers.
2. Students will **utilize** the technical writing for the purposes of Technical Communication and its exposure in various dimensions.
3. Students would imbibe inputs by presentation skills to **enhance** confidence in face of diverse audience.
4. Technical communication skills will **create** a vast know-how of the application of the learning to promote their technical competence.
5. It would enable them to **evaluate** their efficacy as fluent & efficient communicators by learning the voice-dynamics.

Unit -1 Fundamentals of Technical Communication:

Technical Communication: Introduction, Features; Distinction between General and Technical Communication; The flow of Communication: Downward; upward, Lateral or Horizontal; Barriers to Communication, Importance of communication

Unit - II Forms of Technical Communication:

Technical Report: Definition & importance; Thesis/Project writing: structure & importance; synopsis writing: Methods; Technical research Paper writing: Methods & style; Seminar & Conference paper writing; 7 Cs of effective business writing: concreteness, completeness, clarity, conciseness, courtesy, correctness, consideration.

Unit - III Technical Presentation: Strategies & Techniques

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Presentation: Forms; interpersonal Communication; Class Room presentation; style;method, Public Speaking: method; Techniques: Clarity of substance; emotion; Humour; Modes of Presentation; Overcoming Stage Fear: Confident speaking; Audience Analysis & retention of audience interest; Methods of Presentation: Interpersonal; Impersonal; Audience Participation: Quizzes & Interjections

Unit - IV Technical Communication Skills

Interview skills; Group Discussion: Objective & Method; Seminar/Conferences Presentation skills: Focus; Content; Style; Argumentation skills: Devices: Analysis; Cohesion & Emphasis; Critical thinking; Nuances, exposition, narration and description

Unit - V Kinesics & Voice Dynamics:

Kinesics: Definitions; importance; Features of Body Language; Voice Modulation: Quality, Pitch; Rhythm; intonation, pronunciation, articulation, vowel and consonants sounds

Reference Books

1. Technical Communication – Principles and Practices by Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press, 2007, New Delhi.
2. Business Correspondence and Report Writing by Prof. R.C. Sharma & Krishna Mohan, Tata McGraw Hill & Co. Ltd., 2001, New Delhi.
3. Practical Communication: Process and Practice by L.U.B. Pandey; A.I.T.B.S. Publications India Ltd.; Krishan Nagar, 2014, Delhi.
4. Modern Technical Writing by Sherman, Theodore A (et.al); Apprentice Hall; New Jersey; U.S.
5. A Text Book of Scientific and Technical Writing by S.D. Sharma; Vikas Publication, Delhi.
6. Skills for Effective Business Communication by Michael Murphy, Harward University, U.S. Business Communication for Managers by Payal Mehra, Pearson Publication, Delhi.

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UNIVERSAL HUMAN VALUES (AHT-008)

L:T:P:: 2:1:0 **Credits-03**

COURSE OBJECTIVES: The objectives of the course are to:

1. Development of a holistic perspective based on self- exploration about themselves (human being), family, society and nature/existence.
2. Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence.
3. Strengthening of self-reflection.
4. Development of commitment and courage to act.

COURSE OUTCOMES: On successful completion of the course, the student will be able to:

1. Expected to become more aware of themselves, and their surroundings (family, society, nature)
2. Become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
3. Have better critical ability.
4. Become sensitive to their commitment towards what they have understood (human values, human relationship and human society).
5. Able to apply what they have learnt to their own self in different day-to- day settings in real life, at least a beginning would be made in this direction.

COURSE TOPICS: The course has 28 lectures and 14 practice sessions in 5 modules:

Module 1: Introduction - Value Education
Universal human values; self exploration, natural acceptance an experimental validation; Human aspirations, right understanding, relationship and physical facility, current scenario; Understanding and living in harmony at various levels.

Module 2: Harmony in the Human Being
Understanding human being, needs of self(I) and body; body as an instrument of 'I'; characteristics and activities of 'I' and harmony in 'I'; harmony of I with the Body: Sanyam and Health, Physical needs an prosperity; Programs to ensure Sanyam and Health.

Module 3: Harmony in the Family and Society
Values in human-human relationship; nine universal values in relationships; justice, truth, respect, trust; Difference between intention and competence; Respect and differentiation, Harmony in society: resolution, prosperity, fearlessness and coexistence; Universal harmonious order in society.

Module 4: Harmony in the Nature and Existence

Harmony in the nature. Four orders of nature; existence as co-existence, harmony at all levels of existence.

Module 5: Harmony in the Professional Ethics

Natural acceptance of human values**,** Definitiveness of Ethical Human Conduct**;** Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order; Competence in professional ethics; Case studies; transition from the present state to Universal Human Order: at individual level and societal level.

TEXT BOOK

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010

REFERENCE BOOKS

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karam chand Gandhi.
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj - PanditSunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English)
13. Gandhi - Romain Rolland (English)

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DISCRETE STRUCTURE (CST-002)

L:T:P:: 3:1:0 **Credits-04**

COURSE OBJECTIVES: The objectives of the course are to:

1. To introduce several Discrete Mathematical Structures to serve as tools in the development of theoretical computer science.
2. Transform a given problem into a combination of several simpler statements, reach at a solution and prove it logically.
3. Enhance the ability to reasoning and presenting the mathematically accurate argument.
4. Apply the abstract concepts of graph theory in the modelling and solving of non-trivial.

COURSE OUTCOMES: On successful completion of the course, the student will be able to:

1. Develop new models to represent and interpret the data.
2. Apply knowledge of mathematics, probability & statistics, graph theory and logics.
3. Interpret statements presented in disjunctive normal form and determine their validity by applying the rules and methods of propositional calculus.
4. Reformulate statements from common language to formal logic using the rules of propositional and predicate calculus.
5. Apply graph theory in solving computing problems.

Unit 1- Set Theory: Introduction to set theory, set operations, Algebra of Sets, Combination of sets, Duality, Finite and infinite sets, Classes of sets, Power sets, Multi sets, Cartesian Product, Representation of relations, Types of relation, Binary relation, Equivalence relations and partitions, Mathematics Induction.

Function and its types: Composition of function and relations, Cardinality and inverse relations, Functions, logic and proofs injective, surjective and bijective functions.

Unit 2- Propositional Calculus: Basic operations; AND(^), OR(v), NOT(~), True value of a compound statement, propositions, tautologies, and contradictions. Partial ordering relations and lattices.
Lattice theory: Partial ordering, posets, lattices as posets, properties of lattices as algebraic systems, sublattices, and some special lattices.

Unit 3-Combinations: The Basic of Counting**,** Pigeonhole Principles, Permutations and Combinations, Principle of Inclusion and Exclusion.

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Recursion and Recurrence Relation: linear recurrence relation with constant coefficients, Homogeneous solutions, Particular solutions, and Total solution of a recurrence relation using generating functions.

Unit 4- Algebraic Structures: Definition, elementary properties of Algebraic structures, examples of a Monoid, sunmonoid, semigroup, groups and rings, Homomorphism, Isomorphism and automorphism, Subgroups and Normal subgroups, Cyclic groups, Integral domain and fields, Rings, Division Ring.

Unit 5- Graphs and Trees: Introduction to graphs, Directed and undirected graphs, Homomorphic and Isomorphic graphs, Subgraphs, cut points and bridges, Multigraph and Weighted graphs, Paths and circuits, Shortest path in a weighted graph, Eulerian path and circuits, Hamilton paths and circuits, Planar graphs, Euler's formula, Trees, Rooted trees, Spanning trees and cut-sets, Binary trees and its traversals.

TEXTBOOKS:

1. Discrete and combinatorial mathematics-An applied introduction-5th edition- Ralph P. Grimaldi, Pearson Education.
2. Discrete Mathematics for Computer Scientists & Mathematicians, J.L. Mott. A. Kandel, T.P. Baker, Prentice Hall.

REFERENCE BOOKS:

1. Discrete mathematical with graph theory, edgar G. Goodaire, 3rd Edition, Pearson Education.
2. Discrete Mathematics and its Applications, Kenneth H. Rosen, Fifth Edition. TMH.
3. Mathematical foundations of computer science-Dr S. Chandra sekharaiah-Prism books Prv. Lt.
4. Discrete mathematical structures Theory and applications-malik & Sen.
5. Logic and Discrete Mathematics, Grass Mann & Trembley, Person Education.
6. Discrete mathematical structures with applications to Comp. Science- J. P. Tremblay and R. Manohar, Tata-McGraw-Hill publications.
7. Elements of DISCRETE MATHEMATICS – A computer-oriented Approach – C L Liu, D P Mohapatra. Third Edition, Tata McGraw Hill

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DATA STRUCTURES AND ALGORITHMS (CST-003)

L:T:P:: 3:1:0 **Credits-04**

Course Objectives: The objectives of this course are to:

1. Introduce the fundamentals of Data Structures, Abstract concepts and how these concepts are useful in problem-solving.
2. Analyze step by step and develop algorithms to solve real-world problems.
3. Implement various data structures, viz. Stacks, Queues, Linked Lists, Trees and Graphs.
4. Understand various searching & sorting techniques

Course Outcomes: On successful completion of the course, the student will be able to:

1. Compare functions using asymptotic analysis and describe the relative merits of worst-case, average-case, and best-case analysis.
2. Become familiar with a variety of sorting algorithms and their performance characteristics (e.g., running time, stability, space usage) and be able to choose the best one under a variety of requirements.
3. Understand and identify the performance characteristics of fundamental algorithms and data structures and be able to trace their operations for problems such as sorting, searching, selection, operations on numbers, and graphs.
4. Solve real-world problems using arrays, stacks, queues, and linked lists.
5. Become familiar with the major graph algorithms and their analyses. Employ graphs to model engineering problems when appropriate.

Unit 1-Introduction: Basic Terminologies: Elementary Data Organizations, Data Structure Operations: insertion, deletion, traversal etc.; Analysis of an Algorithm, Asymptotic Notations, Time-Space trade-off.

Searching: Linear Search and Binary Search Techniques and their complexity analysis.

Unit 2-Stacks and Queues: ADT Stack and its operations: Algorithms and their complexity analysis, Applications of Stacks: Expression Conversion and evaluation – corresponding algorithms and complexity analysis. ADT queue, Types of Queues: Simple Queue, Circular Queue, Priority Queue; Operations on each type of Queues: Algorithms and their analysis.

Unit 3-Linked Lists: Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from the linked list; Linked representation of Stack and Queue, Header nodes, Doubly linked list: operations on it and algorithmic analysis; Circular Linked Lists: all operations their algorithms and complexity analysis.

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Unit 4-Trees and Graphs: Basic Tree Terminologies, Different types of Trees: Binary Tree, Threaded Binary Tree, Binary Search Tree, AVL Tree; Tree operations on each of the trees and their algorithms with complexity analysis. Applications of Binary Trees. B Tree, B+ Tree: definitions, algorithms and analysis.

Graphs: Basic Terminologies and Representations, Graph search and traversal algorithms and complexity analysis.

Unit 5-Sorting and Hashing: Objective and properties of different sorting algorithms: Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort; Performance and Comparison among all the methods,

Hashing: Symbol table, Hashing Functions, Collision-Resolution Techniques

TEXTBOOKS:

1. An Introduction to Data Structures with Applications. by Jean-Paul Tremblay & Paul G. Sorenson Publisher-Tata McGraw Hill.
2. Ritika Mehra, Data Structures Using C, Pearson Education.
3. Data Structures using C & C++ -By Ten Baum Publisher – Prentice-Hall International**.**

REFERENCE BOOKS:

1. Schaum's Outlines Data structure Seymour Lipschutz Tata McGraw Hill 2nd Edition.
2. Fundamentals of Computer Algorithms by Horowitz, Sahni, Galgotia Pub. 2001 ed.
3. Fundamentals of Data Structures in C++-By Sartaj Sahani.
4. Data Structures: A Pseudo-code approach with C -By Gilberg&Forouzan Publisher-Thomson Learning.

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OBJECT ORIENTED PROGRAMMING (CST-004)

L:T:P:: 3:1:0 **Credits-04**

COURSE OBJECTIVES: The objectives of this course are to:

1. Provide flexible and powerful abstraction.
2. Allow programmers to think the problem in terms of the structure rather than in terms of structure of the computer.
3. Decompose the problem into a set of objects.
4. Objects interact with each other to solve the problem.
5. Create new type of objects to model elements from the problem space

COURSE OUTCOMES: On successful completion of the course, the student will be able to:

1. Recognize features of object-oriented design such as encapsulation, polymorphism, inheritance, and composition of systems based on object identity.
2. Apply some common object-oriented design patterns.
3. Specify simple abstract data types and design implementations using abstraction functions to document them.
4. Design a convenient way for the handling problems using templates and use simple try-catch blocks for Exception Handling.
5. Manage I/O streams and File I/O oriented interactions.

Unit 1- Object Oriented Programming Concepts: Classes and Objects, Methods and Messages, Abstraction and Encapsulation, Inheritance, Abstract Classes, Polymorphism. Introduction to C++: Classes and Objects, Structures and Classes, Unions and Classes, Friend Functions, Friend Classes, Inline Functions, Static Class Members, Scope Resolution Operator, Nested Classes, Local Classes, Passing Objects to Functions, Returning objects, object assignment. Arrays, Pointers, References, and the Dynamic Allocation Operators: Arrays of Objects, Pointers to Objects, Type Checking, this Pointer, Pointers to Derived Types, Pointers to Class Members, References, Dynamic Allocation Operators.

Unit 2- Function Overloading and Constructors: Function Overloading, Constructors, parameterized constructors, Copy Constructors, Overloading Constructors, Finding the Address of an Overloaded Function, Default Function Arguments, Function Overloading and Ambiguity. Operator overloading: Creating member Operator Function, Operator Overloading Using Friend Function, Overloading New and Delete, Overloading Special Operators, Overloading Comma Operator.

Unit 3- Inheritance and Polymorphism: Inheritance: Base-Class Access Control, Inheritance and Protected Members, Inheriting Muitiple Base Classes, Constructors, Destructors and Inheritance, Granting Access, Virtual Base Classes. Polymorphism: Virtual Functions, Virtual Attribute and Inheritance, Virtual Functions and Hierarchy, Pure Virtual Functions,

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Early vs. Late Binding, Run-Time Type ID and Casting Operators: RTTI, Casting Operators, Dynamic Cast.

Unit 4- Templates and Exception Handling: Templates: Generic Functions, Applying Generic Functions, Generic Classes, The type name and export Keywords, Power of Templates, Exception Handling: Fundamentals, Handling Derived Class Exceptions, Exception Handling Options, Understanding terminate() and unexpected(), uncaught_exception () Function, exception and bad_exception Classes, Applying Exception Handling.

Unit 5- I/O System Basics: Streams and Formatted 1/O. File I/O: File Classes, File Operations. Namespaces: Namespaces, std Namespace. Standard Template Library: Overview, Container Classes, General Theory of Operation, Lists, string Class, Final Thoughts on STL.

TEXTBOOKS:

1. Object Oriented Programming with C++ by E. Balagurusamy, McGraw-Hill Education (India).
2. ANSI and Turbo C++ by Ashoke N. Kamthane, Pearson Education

REFERENCE BOOKS:

1. Big C++ - Wiley India.
2. C++: The Complete Reference- Schildt, McGraw-Hill Education (India).
3. C++ and Object Oriented Programming – Jana, PHI Learning.
4. Object Oriented Programming with C++ - Rajiv Sahay, Oxford.
5. Mastering C++ - Venugopal, McGraw-Hill Education (India)

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DATA STRUCTURES AND ALGORITHMS LAB (CSP-003)

L:T:P:: 0:0:2 **Credits-01**

Course Objectives: The objectives of this course are to:

1. Analyse step by step development of algorithms to solve real-world problems.
2. Implement various data structures, viz. Stacks, Queues, Linked Lists, Trees and Graphs.
3. Understand various data searching & sorting techniques.

Course Outcomes: On successful completion of the course, the student will be able to:

1. Develop programs using dynamic memory allocation and linked list ADT.
2. Apply Stack and Queue to solve problems.
3. Implement the concept of hashing in real-time dictionaries.
4. Identify and implement suitable data structures for the given problem.
5. Solve real-world problems by finding the minimum spanning tree and the shortest path algorithm.

LIST OF EXPERIMENTS:

1. Write programs to implement the following using an array.
   a) Stack ADT
   b) Queue ADT
2. Write programs to implement the following using a singly linked list.
   a) Stack ADT
   b) Queue ADT
3. Write a program to implement the deque (double-ended queue) ADT using a doubly linked list.
4. Write a program to perform the following operations:
   a) Insert an element into a binary search tree.
   b) Delete an element from a binary search tree.
   c) Search for a key element in a binary search tree.
5. Write a program to implement circular queue ADT using an array.
6. Write a program to implement all the functions of a dictionary (ADT) using hashing.
7. Write a program to perform the following operations on B-Trees and AVL-trees:
   a) Insertion.
   b) Deletion.
8. Write programs for implementing BFS and DFS for a given graph.
9. Write programs to implement the following to generate a minimum cost-spanning tree:

a) Prim's algorithm.

b) Kruskal's algorithm.

10. Write a program to solve the single source shortest path problem.

(Note: Use Dijkstra's algorithm).

11. Write a program that uses non-recursive functions to traverse a binary tree in:

a) Pre-order.

b) In-order.

c) Post-order.

12. Write programs for sorting a given list of elements in ascending order using the following sorting methods:

a) Quick sort.

b) Merge sort.

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OBJECT ORIENTED PROGRAMMING LAB (CSP-004)

L:T:P:: 0:0:2 **Credits-01**

COURSE OBJECTIVES: The objectives of this course are to:

1. Build software development skills using C++programming for real-world applications.
2. Understand and apply the concepts of classes, packages, interfaces, List, exception handling and file processing.
3. Develop applications using event handling.

COURSE OUTCOMES: On successful completion of the course, the student will be able to:

1. Design object-oriented programs with static members and friend functions using C++.
2. Implement C++ programs with operator overloading and type conversions.
3. Develop class templates for various data structures like stack, queue and linked list.
4. Create classes with necessary exception handling
5. Construct simple test applications using polymorphism.

LIST OF EXPERIMENTS

1. Design C++ classes with static members, methods with default arguments, and friend functions. (For example, design matrix and vector classes with static allocation, and a friend function to do matrix-vector multiplication).
2. Implement Matrix class with dynamic memory allocation and necessary methods. Give proper constructor, destructor, copy constructor, and overloading of the assignment operator.
3. Implement complex number class with necessary operator overloading and type conversions such as integer to complex, double to complex, complex to double etc.
4. Overload the new and delete operators to provide a custom dynamic allocation of memory.
5. Develop C++ class hierarchy for various types of inheritances.
6. Design a simple test application to demonstrate dynamic polymorphism and RTTI.
7. Develop a template of the linked-list class and its methods.
8. Develop templates of standard sorting algorithms such as bubble sort, insertion sort and quick sort.
9. Design stack and queue classes with necessary exception handling.

10. Write a C++ program that randomly generates complex numbers (use previously designed Complex class) and write them two per line in a file along with an operator (+, -, *, or /). The numbers are written to file in the format (a + ib). Write another program to read one line at a time from this file, perform the

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PYTHON PROGRAMMING LAB (CSP-005)

L:T:P:: 0:0:2 **Credits-01**

COURSE OBJECTIVES: The objectives of this course are to:

1. Learn and understand Python programming basics and control statements.
2. Illustrate the applications of string handling and regular expressions in building Python programs using functions.
3. Discover the use of supported data structures like lists, dictionaries, and tuples in Python.
4. Understand a range of Object-Oriented Programming and in-depth data and information processing techniques.
5. Apply the concepts of file I/O in python.

COURSE OUTCOMES: On successful completion of the course, the student will be able to:

1. Demonstrate the basic concepts of python programming with the help of data types, operators and expressions, and console input/output.
2. Apply the concept of Control Structures in Python to solve any given problem.
3. Demonstrate operations on built-in container data types (list, tuple, set, dictionary) and strings.
4. Ability to explore python, especially the object-oriented concepts and the built-in objects of Python.
5. Implement the concepts of file handling using packages.

LIST OF PROGRAMS:

Exercise 1 - Basics

a) Running instructions in Interactive interpreter and a Python Script

b) Write a program to purposefully raise Indentation Error and Correct it

Exercise 2 - Operations

a) Write a program to compute distance between two points taking input from the user (Pythagorean Theorem)

b) Write a program add.py that takes 2 numbers as command line arguments and prints its sum.

Exercise - 3 Control Flow

a) Write a Program for checking whether the given number is a even number or not.

b) Using a for loop, write a program that prints out the decimal equivalents of 1/2, 1/3, 1/4, . . . ,1/10

c) Write a program using a for loop that loops over a sequence.

d) Write a program using a while loop that asks the user for a number, and prints a countdown from that number to zero.

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Exercise 4 - Control Flow - Continued

a) Find the sum of all the primes below two million. Adding the previous two terms, each new term in the Fibonacci sequence is generated. By starting with 1 and 2, the first 10 terms will be:

1, 2, 3, 5, 8, 13, 21, 34, 55, 89, ...

b) By considering the terms in the Fibonacci sequence whose values do not exceed four million,find the sum of the even-valued terms.

c) Linear search and Binary search

d) Selection sort, Insertion sort

Exercise - 5 - DS

a) Write a program to count the numbers of characters in the string and store them in a dictionary data structure

b) Write a program to use split and join methods in the string and trace a birthday with a dictionary data structure.

Exercise - 6 DS - Continued

a) Write a program combine_lists that combines these lists into a dictionary.

b) Write a program to count frequency of characters in a given file. Can you use character frequency to tell whether the given file is a Python program file, C program file or a text file?

Exercise - 7 Files

a) Write a program to print each line of a file in reverse order.

b) Write a program to compute the number of characters, words and lines in a file.

Exercise - 8 Functions

a) Write a function ball_collide that takes two balls as parameters and computes if they are colliding. Your function should return a Boolean representing whether or not the balls are colliding.

Hint: Represent a ball on a plane as a tuple of (x, y, r), r being the radiusIf (distance between two balls centers) <= (sum of their radii), then (they are colliding)

b) Find the mean, median, and mode for the given set of numbers in a list.

Exercise - 9 Functions - Continued

a) Write a function nearly_equal to test whether two strings are nearly equal. Two strings a and bare nearly equal when a single mutation on b can generate a.

b) Write a function dups to find all duplicates in the list.

c) Write a function unique to find all the unique elements of a list.

Exercise - 10 - Functions –Problem-Solving

a) Write a function cumulative_product to compute the cumulative product of a list of numbers.

b) Write a function reverse to reverse a list. Without using the reverse function.

c) Write a function to compute gcd, lcm of two numbers. Each function shouldn't exceed one line.

Exercise - 11–Python Packages

a) Install packages requests, flask and explore them. using (pip)

b) Plot graphs using python and Matplotlib.

c) Data Analysis using numpy and Pandas Libraries

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INTERNSHIP-I/MINI PROJECT-I (CSP-006)

L:T:P:: 0:0:2 **Credits-01**

ABOUT INTERNSHIP/ MINI PROJECT

It is an organized method or activity of enhancing and improving engineering students' skill sets and knowledge, which boosts their performance and consequently helps them meet their career objectives. Industrial Training is essential in developing the practical and professional skills required for an Engineer and an aid to prospective employment.

OBJECTIVES OF INTERNSHIP/ MINI PROJECT: The objectives of this course is to:

1. Expose the students to the actual working environment and enhance their knowledge and skill from what they have learned in college.
2. Enhance the good qualities of integrity, responsibility, and self-confidence. Students must follow all ethical values and good working practices.
3. Help the students with the safety practices and regulations inside the industry and to instils the spirit of teamwork and good relationship between students and employees.

COURSE OUTCOMES: On successful completion of the course, the student will be able to:

1. Understand organizational issues and their impact on the organization and employees.
2. Identify industrial problems and suggest possible solutions.
3. Relate, apply and adapt relevant knowledge, concepts and theories within an industrial organization, practice and ethics.
4. Apply technical knowledge in an industry to solve real world problems.
5. Demonstrate effective group communication, presentation, self-management, and report writing skills**.**

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PYTHON PROGRAMMING (CST-005)

L:T:P:: 2:0:0 **Credits-0**

Course Objectives: The objectives of this course are to:

1. Introduce the basic principles and concepts of python programming, and how python programming concepts are useful in problem-solving.
2. Write clear and effective python code.
3. To perform file operations to read and write data in files.
4. To create applications using Python Programming.

Course Outcomes: On successful completion of the course, the student will be able to:

1. Develop essential programming skills in computer programming concepts like data types.
2. Examine Python syntax and semantics and be fluent in the use of Python flow control and functions.
3. Illustrate the process of structuring the data using lists, tuples, and dictionaries.
4. Demonstrate using built-in functions and operations to navigate the file system.
5. Interpret the concepts of modules and user-defined functions in Python.

UNIT – I: Introduction and Syntax of Python Program: Features of Python, Interactive, Object-oriented, Interpreted, platform-independent, Python building blocks -Identifiers, Keywords, Indention, Variables, Comments, Python environment setup – Installation and working of IDE, Running Simple Python scripts to display a welcome message, Python variables.

Python Data Types: Numbers, String, Tuples, Lists, Dictionary. Declaration and use of datatypes, Built-in Functions.

UNIT – II: Python Operators and Control Flow statements: Basic Operators: Arithmetic, Comparison/ Relational, Assignment, Logical, Bitwise, Membership, Identity operators, Python Operator Precedence.

Control Flow: Conditional Statements (if, if...else, nested if), Looping in python (while loop, for loop, nested loops), loop manipulation using continue, pass, break, else.

UNIT – III: **Data Structures in Python: String:** Concept, escape characters, String special operations, String formatting operator, Single quotes, Double quotes, Triple quotes, Raw String, Unicode strings, Built-in String methods.

Lists: Defining lists, accessing values in lists, deleting values in lists, updating lists, Basic List Operations, and Built-in List functions.

Tuples: Accessing values in Tuples, deleting values in Tuples, and updating Tuples, Basic Tuple operations, and Built-in Tuple functions.

Sets: Accessing values in Set, deleting values in Set, and updating Sets, Basic Set operations, Built-in Set functions.

Dictionaries: Accessing values in Dictionary, deleting values in Dictionary, and updating Dictionary, Basic Dictionary

operations, Built-in Dictionaries functions.

UNIT – IV: Python Functions, modules, and Packages: Use of Python built-in functions (e.g., type/data conversion functions, math functions etc.),

user-defined functions: Function definition, Function call, function arguments and parameter passing, Return statement, **Scope of Variables:** Global variable and Local Variable.

Modules: Writing modules, importing modules, importing objects from modules, Python built-in modules (e.g., Numeric, mathematical module, Functional Programming Module), Packages.

UNIT – V: File Handling: Opening files in different modes, accessing file contents using standard library functions, Reading, and writing files, closing a file, Renaming, and deleting files, File related standard functions.

TEXTBOOKS:

1. Charles R. Severance, "Python for Everybody: Exploring Data Using Python 3", 1st Edition, CreateSpace Independent Publishing Platform, 2016.
2. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd Edition, Green Tea Press, 2015.
3. Ch Satyanarayana, "Python Programming", 1st Edition, universities press (India) private limited 2018.

REFERENCE BOOKS:

1. Charles Dierbach, "Introduction to Computer Science Using Python", 1st Edition, Wiley India Pvt Ltd. ISBN-13: 978-8126556014
2. Mark Lutz, "Programming Python", 4th Edition, O'Reilly Media, 2011.ISBN-13: 978-9350232873
3. Wesley J Chun, "Core Python Applications Programming", 3rd edition, Pearson Education India, 2015. ISBN-13: 978-9332555365
4. Roberto Tamassia, Michael H Goldwasser, Michael T Goodrich, "Data Structures and Algorithms in Python",1stEdition, Wiley India Pvt Ltd, 2016. ISBN-13: 978- 8126562176
5. Reema Thareja, "Python Programming using problem-solving approach", Oxford university press, 2017.

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CYBER SECURITY (CST-006)

L:T:P:: 2:0:0 **Credits-0**

Course Objectives: The objectives of this course are to:

1. Familiarize with network security, network security threats, security services, and countermeasures.
2. Be aware of computer security and Internet security.
3. Study the defensive techniques against these attacks.
4. To familiarize with cyber forensics, cybercrimes, and Cyberspace laws.
5. Understand ethical laws of computers for different countries, Offences under cyberspace and the Internet in India.

Course Outcomes: On successful completion of the course, the student will be able to:

1. Understand cyber-attacks and types of cybercrimes, and familiarity with cyber forensics
2. Realize the importance of cyber security and various forms of cyber-attacks and countermeasures.
3. Get familiar with obscenity and pornography in cyberspace and understand the violation of the Right to privacy on the Internet.
4. Appraise cyber laws and how to protect themselves and, ultimately, the entire Internet community from such attacks.
5. Elucidate the various chapters of the IT Act 2008 power of the Central and State Governments to make rules under IT Act 2008.

UNIT – I: Introduction to Cyber Security: Basic Cyber Security Concepts, layers of security, Vulnerability, threat, Harmful acts, the motive of attackers, active attacks, passive attacks, Software attacks, hardware attacks, Spectrum of attacks, Taxonomy of various attacks, IP spoofing, Methods of defense, Security Models, risk management, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, etc., CIA Triad

UNIT – II: Cyber Forensics: Introduction to cyber forensic, Historical background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Forensics Investigation, Challenges in Computer Forensics, Special Techniques for Forensics Auditing.

UNIT – III: Cybercrime (Mobile and Wireless Devices): Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for

Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops and desktop.

UNIT – IV: Cyber Security (Organizational Implications): Introduction cost of cybercrimes and IPR issues, web threats for organizations, security and privacy implications, social media marketing: security risks and perils for organizations, social computing, and the associated challenges for organizations.

Cybercrime and Cyber terrorism: Introduction, intellectual property in cyberspace, the ethical dimension of cybercrimes, the psychology, mindset and skills of hackers and other cybercriminals.

UNIT – V: Cyberspace and the Law &Miscellaneous provisions of IT Act.: Introduction to Cyber Security Regulations, International Law. The INDIAN Cyberspace, National Cyber Security Policy. Internet Governance – Challenges and Constraints, Computer Criminals, Assets and Threats. Other offences under the Information Technology Act in India, The role of Electronic Evidence and miscellaneous provisions of the IT Act.2008.

TEXTBOOKS:

1. Nina Godbole and SunitBelpure, Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley.
2. B. B. Gupta, D. P. Agrawal, Haoxiang Wang, Computer and Cyber Security: Principles, Algorithm, Applications, and Perspectives, CRC Press, ISBN 9780815371335, 2018.

REFERENCE BOOKS:

1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.
2. Introduction to Cyber Security, Chwan-Hwa(john) Wu,J. David Irwin, CRC Press T&F Group.
3. Debby Russell and Sr. G.T Gangemi, "Computer Security Basics (Paperback)", 2ndEdition, O' Reilly Media, 2006.
4. Wenbo Mao, "Modern Cryptography – Theory and Practice", Pearson Education, New Delhi, 2006.
5. Cyberspace and Cybersecurity, George Kostopoulos, Auerbach Publications, 2012.
6. Cyber Forensics: A Field Manual for Collecting, Examining, and Preserving Evidence of Computer Crimes, Second Edition, Albert Marcella, Jr., Doug Menendez, Auerbach Publications, 2007.
7. Cyber Laws and IT Protection, Harish Chander, PHI, 2013.

Syllabus

COMPUTER ORGANIZATION AND ARCHITECTURE (CST-007)

L:T:P:: 3:1:0 **Credits-04**

COURSE OBJECTIVES: The objectives of this course are to:

1. Thoroughly understand the basic structure and operation of a digital computer.
2. Study the different communication methods with I/O devices and standard I/O interfaces.
3. Learn the various instruction modes, Addressing modes and RISC and CISC Architecture
4. Study the various memory architecture.

COURSE OUTCOMES: On successful completion of the course, the student will be able to:

1. Draw the functional block diagram of a single bus architecture of a computer and describe the function of the instruction execution cycle, RTL interpretation of instructions.
2. Given a CPU organization and instruction, design a memory module and analyze its operation by interfacing with the CPU.
3. Design the connection between I/O address from the CPU and the I/O interface.
4. Understand the concept of Pipelining and multiprocessor.
5. Draw a flowchart for concurrent access to memory and cache coherency in parallel processors.

Unit 1- Functional Blocks of a Computer: CPU, Memory, Input-Output Subsystems, Control Unit. Instruction Set Architecture of a CPU – Registers, Instruction Execution Cycle, RTL Representation and Interpretation of Instructions, Addressing Modes, Instruction Set. Case Study – Instruction Sets of Some Common CPUs, RISC and CISC Architecture.

Unit 2- Basic Processing Unit: Signed Number Representation, Fixed Point Arithmetic, Addition and Subtraction of Signed Numbers, Multiplication of Positive Numbers, Signed Operand Multiplication Algorithm, Booth Multiplication Algorithm, division algorithm, floating point numbers and its arithmetic operation. Fundamental Concepts: Execution of a Complete Instruction, Multiple Bus Organization, Hardwired Control, Micro Programmed Control.

Unit 3- Peripheral Devices and their Characteristics: Input-Output Subsystems, I/O Device Interface, I/O Transfers– Program Controlled, Interrupt Driven and DMA, Software Interrupts and Exceptions, Programs and Processes – Role of Interrupts in Process State Transitions, I/O Device Interfaces – SCII, USB.

Unit 4- Pipelining& Multiprocessor: Basic Concepts of Pipelining, Throughput and Speedup, Instruction Pipeline, Pipeline Hazards, Introduction to Parallel Processors, Symmetric Shared Memory and Distributed Shared Memory Multiprocessors, Performance Issues of Symmetric and Distributed Shared Memory, Synchronization.

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Unit 5- Memory Organization: Basic Concepts, Concept of Hierarchical Memory Organization, Main Memory: RAM, ROM, Speed, Size and cost, Cache Memory and its Mapping, Replacement Algorithms, Write Policies, Virtual Memory, Memory Management Requirements, Associative Memory, Secondary storage devices.

TEXTBOOKS:

1. William Stallings, Computer Organization and architecture, 11th edition (2022), Pearson Education.
2. David A. Patterson and John L. Hennessy "Computer Organization and Design: The Hardware/Software Interface" , 5th Edition, Elsevier.
3. M. Morris Mano, "Computer System Architecture", Third Edition, Pearson Education.

REFERENCE BOOKS:

1. Microprocessor Architecture, Programming, and Applications with the 8085 -Ramesh S. Gaonkar Pub: Penram International.
2. CarlHamacher" Computer Organization and EmbeddedSystems", 6th Edition, McGraw Hill HigherEducation.
3. Miles Murdoccaa and Vincent Heuring"Computer Architecture and Organization: An integrated Approach" 2nd edition,Wiley Publication.

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JAVA PROGRAMMING (CST-008)

L:T:P:: 3:1:0 **Credits-04**

COURSE OBJECTIVES: The objectives of this course are to:

1. Understand Object Oriented Programming concepts and basic characteristics of Java.
2. Know the principles of packages, inheritance and interfaces.
3. Define exceptions and use I/O streams.
4. Develop a java application with threads and generics classes
5. Design and build simple Graphical User Interfaces.

COURSE OUTCOMES: On successful completion of the course, the student will be able to:

1. Write Java programs with properly designed constants, variables, objects, methods and reusability functionality
2. Learn how and where to implement interface and exception-handling concepts.
3. Write multi-threaded programming concepts for concurrency control based applications.
4. Construct GUI based JAVA enterprise applications
5. Develop web applications using JDBC, RMI and Servlet methodologies.

Unit 1- Java Basics and Inheritance: The Genesis of Java, Overview of Java, Data Types, Variables, and Arrays, Operators, Control Statements, Introducing Classes, Methods and Classes,Type Casting, String Handling, Abstract Class, Method overriding.

Inheritance: Basics, Using Super, Creating a Multilevel Hierarchy, Problem with Multiple Inheritance.

Unit 2- Packages, Interfaces and Exception Handling: Packages- Packages, Access Protection, Importing Packages,

Interfaces- Definition and Implementations,

Exception Handling- Types, Try and Catch, Throw and Finally statements.

Unit 3- Multi Threading and File Handling: Multithreaded Programming, Thread Life Cycle Creating Threads, Creating Multiple Threads, Thread Priorities, Synchronization, Inter Thread Communication, Suspending, Resuming and Stopping Threads.

File Handling: I/O Basics, Reading Console Input, Writing Console output, I/ O Classes and Interfaces.

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Unit 4- Applets, Event Handling and AWT: Applet Basics, Applet Architecture, Applet Display Methods, Passing parameters to Applets,

Event Handling: Delegation Event Model, Event Classes, Event Listener Interfaces,

AWT: Working with Windows, Graphics, Colors and Fonts, Using AWT Controls, Layout Managers and Menus.

Unit 5- JDBC, RMI And Servlets: JDBC-JDBC Architecture, The Structured Query Language, JDBC Configuration, Executing SQL, RMI Architecture, A simple client/server application using RMI, **Servlets-** Life cycle of a Servlet, Servlet packages ,Handling HTTP Requests and Responses.

TEXTBOOKS:

1. Herbert Schildt, ―Java The complete reference, 8th Edition, McGraw Hill Education, 2011.
2. Cay S. Horstmann, Gary cornell, ―Core Java Volume –I Fundamentals, 9th Edition, Prentice Hall, 2013.

REFERENCES:

1. Paul Deitel, Harvey Deitel, ―Java SE 8 for programmers, 3rd Edition, Pearson, 2015.
2. Steven Holzner, ―Java 2 Black book, Dreamtech press, 2011.
3. Timothy Budd, ―Understanding Object-oriented programming with Java, Updated Edition, Pearson Education, 2000.

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FORMAL LANGUAGES & AUTOMATA THEORY (CST-009)

L:T:P:: 3:1:0 **Credits-04**

COURSE OBJECTIVES: The objectives of this course are to:

1. Introduce the student to the concepts of theory of computation in computer science.
2. Acquire insights into the relationship among formal languages, formal grammars, and automata.
3. Learn to design automats and Turing machine.

COURSE OUTCOMES: On successful completion of the course, the student will be able to:

1. Apply the knowledge of automata theory, grammars & regular expressions for solving the problem.
2. Analyze the give automata, regular expression & grammar to know the language it represents.
3. Design Automata & Grammar for pattern recognition and syntax checking.
4. Distinguish between decidability and un-decidability of problems.
5. Identify limitations of some computational models and possible methods of proving them.

Unit 1- Introduction: Alphabets, Strings and Languages; Automata and Grammars, Deterministic finite Automata (DFA)-Formal Definition, Simplified notation: State transition graph, Transition table, Language of DFA, Nondeterministic finite Automata (NFA), NFA with epsilon transition, Language of NFA, Equivalence of NFA and DFA, Minimization of Finite Automata, Distinguishing one string from other, Myhill-Nerode Theorem

Unit 2- Regular Expressions: Definition, Operators of regular expression and their precedence, Algebraic laws for Regular expressions, Kleen's Theorem, Regular expression to FA, DFA to Regular expression, Arden Theorem, Non Regular Languages, Pumping Lemma for regular Languages. Application of Pumping Lemma, Closure properties of Regular Languages, Decision properties of Regular Languages, FA with output: Moore and Mealy machine, Equivalence of Moore and Mealy Machine, Applications and Limitation of FA.

Unit 3- Context-free languages and pushdown automata: Context-free grammars (CFG) and languages (CFL), Chomsky and Greibach normal forms, nondeterministic pushdown automata (PDA) and equivalence with CFG, parse trees, ambiguity in CFG, pumping lemma for context-free languages, deterministic pushdown automata, closure properties of CFLs.

Unit 4- Context-sensitive languages: Context-sensitive grammars (CSG) and languages, linear bounded automata and equivalence with CSG. Turing machines: The basic model for Turing machines (TM), Turing- recognizable (recursively enumerable) and Turing-decidable (recursive) languages and their closure properties, variants of Turing machines, nondeterministic TMs and equivalence with deterministic TMs, unrestricted grammars and equivalence with Turing machines, TMs as enumerators.

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Unit 5- Types of Turing machine: Turing machines and halting Problem

Undecidability: Undecidability, A Language that is Not Recursively Enumerable, An Undecidable Problem That is RE, Undecidable Problems about Turing Machines, Recursive languages, Properties of recursive languages, Post's Correspondence Problem, Modified Post Correspondence problem, Other Undecidable Problems, Counter machines.

TEXTBOOKS:

1. Introduction to Automata Theory, Languages, and Computation, 3nd Edition, John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, Pearson Education.
2. Theory of Computer Science – Automata languages and computation, Mishra and Chandrashekaran, 2nd edition, PHI.

REFERENCE BOOKS:

1. Introduction to Languages and The Theory of Computation, John C Martin, TMH.
2. Introduction to Computer Theory, Daniel I.A. Cohen, John Wiley.
3. A Textbook on Automata Theory, P. K. Srimani, Nasir S. F. B, Cambridge University Press.
4. Introduction to the Theory of Computation, Michael Sipser, 3rd edition, Cengage Learning.
5. Introduction to Formal languages Automata Theory and Computation Kamala Krithivasan, Rama R, Pearson.

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COMPUTER ORGANIZATION AND ARCHITECTURE LAB (CSP-007)

L:T:P:: 0:0:2 **Credits-01**

COURSE OBJECTIVES: The objectives of this course are to:

1. Understanding the behaviour of Logic Gates, Adders, Decoders, Multiplexers and Flip-Flops.
2. Understanding the behaviour of ALU, RAM, STACK and PROCESSOR from working modules and the modules designed by the student as part of the experiment.

COURSE OUTCOMES: On successful completion of the course, the student will be able to:

1. Recognize basic logic gates with IC chips.
2. Design combinational circuits using IC Chips.
3. Connect the theory of computer organization with hardware.
4. Implement the concept of adders
5. Apply fundamentals of digital design and extend the learning to design sequential circuits.

LIST OF EXPERIMENTS

1. Implementing HALF ADDER, FULL ADDER using basic logic gates.
2. Implementing Binary -to -Gray, Gray -to -Binary code conversions.
3. Implementing 3-8 line DECODER and Implementing 4x1 and 8x1 MULTIPLEXERS.
4. Verify the excitation tables of various FLIP-FLOPS.
5. Design of an 8-bit Input/ Output system with four 8-bit Internal Registers.
6. Design of an 8-bit ARITHMETIC LOGIC UNIT.
7. Design the data path of a computer from its register transfer language description.
8. Design the control unit of a computer using either hardwiring or microprogramming based on its register transfer language description.
9. Write an algorithm and program to perform matrix multiplication of two n * n matrices on the 2-D mesh SIMD model, Hypercube SIMD Model or multiprocessor system.
10. Study of Scalability for Single board Multi-board, multi-core, multiprocessor using Simulator.

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JAVA PROGRAMMING LAB (CSP-008)

L:T:P:: 0:0:2 **Credits-01**

COURSE OBJECTIVES: The objectives of this course are to:

1. Write the program using abstract classes.
2. Write programs for solving real world problems using java collection framework
3. Write multithreaded program.

COURSE OUTCOMES: On successful completion of the course, the student will be able to:

1. Develop programs using object-oriented concepts, exception handling and multi-threading.
2. Demonstrate java features such as Inheritance, Interfaces, Polymorphism for different scenarios
3. Demonstrate java features such as Abstract class and method overriding
4. Design and implement data driven applications and assign responsibilities.
5. Develop web application using JDBC and Servlets

LIST OF EXPERIMENTS

1. Develop a java program to find the sum of odd and even numbers in an array.
2. Develop a java program to print the prime numbers between n1 to n2 using class, objects and methods.
3. Develop a program for calculating the age of a person and display the age in the form of years, months and days.
4. Demonstrate a program for method overloading. Consider the different types of transaction modes used for transferring money. (Credit card, Debit card, Net banking etc).
5. Create a Abstract class and calculate the area of different shapes by overriding methods.
6. Develop a Library application using multiple inheritances. Consider Book, Magazines and Journals as base classes and Library as derived class. In the Book class, perform the operations like Search Book, Issue Book, Return Book, Renew Book, and Fine Calculation. In the Magazines and Journals classes, perform issue and return operations.
7. Develop a program for banking application with exception handling. Handle the exceptions in following cases:
   a) Account balance <1000
   b) Withdrawal amount is greater than balance amount
   c) Transaction count exceeds 3
   d) One day transaction exceeds 1 lakh.
8. Create a student database and store the details of the students in a table. Perform the SELECT, INSERT, UPDATE and DELETE operations using JDBC connectivity.

9. Design a login page using servlets and validate the username and password by comparing the details stored in the database.

10. Mini project (Anyone)

(Front End: Java, Back End: Oracle, define classes for the application and assign responsibilities)

a) Central Library OPAC Engine

b) ATM Banking

c) Online Shopping

d) E-Ticketing System

e) Student Information Management System

f) City Info Browser

g) E-mail Server

Syllabus

UNIX/LINUX PROGRAMMING LAB (CSP-009)

L:T:P:: 0:0:2 **Credits-01**

COURSE OBJECTIVES: The objectives of this course are to:

1. Describe the basic file system in Linux and its file attributes.
2. Appraise different filters, process handling, regular expressions and network handling features using suitable commands.
3. Summarize different Linux commands to write Shell Programs.

COURSE OUTCOMES: On successful completion of the course, the student will be able to:

2. Demonstrate the basic knowledge of Linux commands and file-handling utilities by using a Linux shell environment.
3. Evaluate the concept of shell scripting programs by using AWK and SED commands.
4. Use tracing mechanisms for debugging.
5. Compile source code into an object and executable modules.
6. Use advanced network tools.

LIST OF EXPERIMENTS

1. Study of Unix/Linux general purpose utility command list (man, who, cat, cd, cp, ps, ls, mv, rm, mkdir, rmdir, echo, more, date, time, kill, history, chmod, chown, finger, pwd, cal, logout, shutdown etc.), vi editor, .bashrc, /etc/bashrc and environment variables.
2. Write a shell script program to: a) display list of user currently logged in; b) to copy contents of one file to another.
3. Write a program using sed command to print duplicated lines of Input.
4. Write a grep/egrep script to find the number of words character, words and lines in a file.
5. Write an awk script to: a). develop a Fibonacci series; b) display the pattern of given string or number.
6. Write a shell script program to a) display the process attributes; b) change priority of processes; c) change the ownership of processes; d)to send back a process from foreground ; e) to retrieve a process from background ; f) create a Zombie process
7. Write a program to create a child process and allow the parent to display “parent” and the child to display “child” on the screen
8. Write a makefile to compile a C program.
9. Study to execute programs using gdb to utilize its various features like breakpoints, conditional breakpoints. Also write a shell script program to include verbose and xtrace debug option for debugging.
10. Study to use ssh, telnet, putty, ftp, ncftp and other network tools.

Syllabus

VEER MADHO SINGH BHANDARI UTTARAKHAND TECHNICAL UNIVERSITY

(Formerly Uttarakhand Technical University, Dehradun Established by Uttarakhand State Govt. wide Act no. 415 of 2005)
Suddhowala, PO-Chandanwadi, Premnagar, Dehradun, Uttarakhand (Website- www.uktech.ac.in)

SYLLABUS

For

B.TECH

(Information Technology)

3rd Year

Effective From – Session 2024-25

Syllabus

SEMESTER-V													
S. NO.	Subject Codes	Category	Subject	Periods			Evaluation Scheme					Subject Total	Credit
							Sessional Exam			ESE			
				L	T	P	CT	TA	Total	TE	PE		
1	CST-010	DC	Algorithms Design and Analysis	3	1	0	30	20	50	100		150	4
2	CST-015	DC	Software Engineering	3	1	0	30	20	50	100		150	4
3	CST-011	DC	Database management Systems	3	1	0	30	20	50	100		150	4
4	CST-0XX	DE	Department Elective-I	3	0	0	30	20	50	100		150	3
5	CST-0XX	DE	Department Elective-II	3	0	0	30	20	50	100		150	3
6	CSP-010	DLC	Algorithm Design and Analysis Lab	0	0	2		25	25		25	50	1
7	ITP-101	DLC	Software Engineering Lab	0	0	2		25	25		25	50	1
8	CSP-011	DLC	DBMS Lab	0	0	2		25	25		25	50	1
9	ITP-102	DLC	Mini Project-II or Internship-II*	0	0	2			50			50	1
10	AHT-009/ AHT-010	MC	Constitution of India / Essence of Indian Traditional Knowledge	2	0	0	15	10	25	50			
11	GP-005	NC	General Proficiency						50				
			Total	17	3	8						950	22
12			Minor Course(Optional)**	3	1	0	30	20	50	100			4
	*The Mini Project-II or Internship-II (4-6weeks)will be conducted during summer break after IV semester and will be assessed during the V semester												
	MOOCs course												

Departmental Elective–1		
S. No.	**Subject Code**	**Subject Name**
1	ITT-101	Embedded System
2	CST-013	Graph theory
3	CST-039	Soft Computing
4	ITT-102	Bio Informatics

Departmental Elective- 2		
S. No.	**Subject Code**	**Subject Name**
1	CST-032	Data Mining
2	ITT-103	GPS and GIS
3	ITT104	Next Generation Networks
4	CST-019	Distributed Systems

Abbreviations: L-No. of Lecture hours per week, **T**-No. of Tutorial hours per week, **P**-No. of Practical hours per week, **CT**-Class Test Marks, **TA**-Marks of teacher's assessment including student's class performance and attendance, **PS**-Practical Sessional Marks, **ESE**-End Semester Examination, **TE**- Theory Examination Marks, PE-Practical External Examination Marks

Minor Courses (Optional) **: Select any subject from Annexure – II from other departments

1 Hr Lecture	**1 Hr Tutorial**	**2 or 3 Hr Practical**
1 Credit	**1 Credit**	**1 Credit**

Syllabus

SEMESTER-VI													
S. NO.	Subject Codes	Category	Subject	Periods			Evaluation Scheme					Subject Total	Credit
							Sessional Exam			ESE			
				L	T	P	CT	TA	Total	TE	PE		
1	CST-012	DC	Compiler Design	3	1	0	30	20	50	100		150	4
2	CST-023	DC	Operating Systems	3	1	0	30	20	50	100		150	4
3	CST-021	DC	Computer Networks	3	1	0	30	20	50	100		150	4
4	CST-0XX	DE	Department Elective-III	3	0	0	30	20	50	100		150	3
5	AHT-0XX	HSC	Open Elective-1	3	0	0	30	20	50	100		150	3
6	CSP-016	DLC	Operating Systems Lab	0	0	2		25	25		25	50	1
7	CSP-014	DLC	Computer Networks Lab	0	0	2		25	25		25	50	1
8	ITP-103	DLC	Web Technology Lab	0	0	2		25	25		25	50	1
9	AHT-009/AHT-010	MC	Constitution of India / Essence of Indian Traditional Knowledge	2	0	0	15	10	25	50			
10	AHT-014	NC	Happiness and Well-being	2	0	0	25	25	50				
11	GP-006	NC	General Proficiency						50				
			Total	17	3	6						900	21
12			Minor Course (Optional)	3	1	0	30	20	50	100			4
		DLC	Internship-III/Mini Project-III*	To be completed at the end of the sixth semester (during the Summer).									
	MOOCs course												

Departmental Elective-3		
S. No.	**Subject Code**	**Subject Name**
1	ITT-105	Distributed Database
2	CST-027	Web Technology
3	ITT-106	Digital Signal Processing
4	ITT-107	.Net and C# Programming
5	ITT-108	System and Network Administration

Open Elective-1		
S. No.	**Subject Code**	**Subject Name**
1	AHT-011	Total Quality Management
2	AHT-012	Managing E-Commerce and Digital Communication
3	AHT-013	Industrial safety and Hazard Management

Abbreviations: L-No. of Lecture hours per week, **T**-No. of Tutorial hours per week, **P**-No. of Practical hours per week, **CT**-Class Test Marks, **TA**-Marks of teacher's assessment including student's class performance and attendance, **PS**-Practical Sessional Marks, **ESE**-End Semester Examination, **TE**- Theory Examination Marks, PE- Practical External Examination Marks

Minor Courses (Optional) **: Select any subject from Annexure – II from other departments

1 Hr Lecture	**1 Hr Tutorial**	**2 or 3 Hr Practical**
1 Credit	**1 Credit**	**1 Credit**

Syllabus

ALGORITHMS DESIGN & ANALYSIS (CST-010)

L:T:P:: 3:1:0 **Credits-04**

COURSE OUTCOMES: The objectives of this course are to:

1. Understand and apply the algorithm analysis techniques.
2. Analyze the efficiency of alternative algorithmic solutions for the same problem.
3. Understand different algorithm design techniques.
4. Understand the limitations of Algorithmic power.

COURSE OUTCOMES: On successful completion of the course, the student will be able to:

1. Analyze worst-case running times of algorithms based on asymptotic analysis and justify the correctness of algorithms.
2. Describe the greedy paradigm and explain when an algorithmic design situation calls for it. For a given problem develop the greedy algorithms.
3. Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Synthesize divide-and-conquer algorithms. Derive and solve recurrence relation.
4. Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it.
5. Analyze randomized algorithms and approximation algorithms.

Unit 1- Introduction: Characteristics of an algorithm, Analysis of algorithm: Asymptotic analysis of complexity bounds – best, average, and worst-case behavior, Sorting techniques and their performance analysis, Time a space trade-off.

Analysis of recursive algorithms through recurrence relations: Substitution method, Recursion tree method and master's theorem.

Unit 2- Fundamental Algorithmic Strategies: Brute-Force, Greedy, Dynamic Programming, Branch- andBound and Back tracking methodologies for the design of an algorithms, Illustrations of these techniques for Problem-Solving, Knapsack, Matrix Chain Multiplication, Activity selection and LCS Problem.

Unit 3- Graph and Tree Algorithms: Traversal algorithms: Depth First Search (DFS) and Breadth First Search (BFS), Shortest path algorithms, Minimum Spanning Tree, Topological sorting, Network Flow Algorithm, Binomial Heap and Fibonacci Heap.

Unit 4- Tractable and Intractable Problems: Computability of Algorithms, Computability classes – P, NP, NP-complete and NP-hard, Standard NP-complete problems and Reduction techniques.

Unit 5- Advanced Topics: Approximation algorithms and Randomized algorithms, Distributed Hash Table

TEXTBOOKS:

1. Thomas H Cormen, Charles E Lieserson, Ronald L Rivest and Clifford Stein, Introduction to Algorithms, 4TH Edition, MITPress/McGraw-Hill.

2. Ellis Horowitz, Sartaj Sahni and SanguthevarRajasekaran, Computer Algorithms/ C++, Second Edition, Universities Press, 2007.

REFERENCE BOOKS:

1. Jon Kleinberg and ÉvaTardos,Algorithm Design, 1ST Edition, Pearson.

2. Michael T Goodrich and Roberto Tamassia,Algorithm Design: Foundations, Analysis, and Internet Examples, Second EditionWiley. 3. Anany Levitin, ―Introduction to the Design and Analysis of Algorithms, Third Edition, Pearson Education, 2012.

Syllabus

SOFTWARE ENGINEERING (CST-015)

L:T:P:: 3:1:0 **Credits-04**

COURSE OBJECTIVES: The objectives of this course are to

1. Learn and understand the principles of Software Engineering.
2. Learn methods of capturing, specifying, visualizing, and analyzing software requirements.
3. Apply Design and Testing principles to S/W project development.
4. Understand project management through life cycle of the project.

COURSE OUTCOMES: On successful completion of the course, the student will be able to

1. Identify appropriate software design model based on requirement analysis.
2. Formulate Software Requirements Specification (SRS) reports for the real world application.
3. Translate a specification into a design and identify the components to build the architecture.
4. Plan a software engineering process to account for quality issues and non-functional requirements.
5. Estimate the work to be done, resources required and the schedule for a software project plan.

Unit 1- : Introduction to Software Engineering: Introduction, software applications, importance of software evolution of software, Software Components, Software Characteristics, Software Crisis & myths. Software Engineering paradigms: introduction, principles & Processes, Software Quality Attributes. Comparison between software engineering & computer science, & software engineering & Engineering. Some terminologies: product & process, deliverables and milestones, measures, metrics& indicators. Programs & software products. Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, RAD model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models.

Unit 2- Software Requirement Analysis: Structured analysis, object-oriented analysis, software requirement specification, and validation.

Unit 3- Design and Implementation of Software: software design fundamentals, design methodology (structured design and object-oriented design), design verification, monitoring and control coding.

Unit 4- Testing: Testing fundamentals, white box and black box testing, software testing strategies: unit testing, integration testing, validation testing, system testing, debugging.

Unit 5- Software Reliability: Metric and specification, fault avoidance and tolerance, exception handling, defensive programming.Software Maintenance – maintenance characteristics, maintainability, maintenance tasks, maintenance side effects. CASE tools, software certification- requirement, types of certifications, third part certification. Software Re-Engineering, reverse software Engineering. Software Configuration Management Activities, Change Control Process, Software Version Control, CASE: introduction, levels of case, architecture, case building blocks, objectives, case repository, characteristics of case tools, categories, Estimation of Various Parameters such as Cost, Efforts, Schedule/Duration, Constructive Cost Models (COCOMO), Resource Allocation Models, Software Risk Analysis and Management.

Syllabus

TEXTBOOKS:

1. Roger Pressman, ―Software Engineering: A Practitioner ‘s Approach, McGraw Hill, ISBN 007– 337597–7. 2. Ian Sommerville, ―Software Engineering, Addison and Wesley, ISBN 0-13-703515-2.

REFERENCE BOOKS:

1. Carlo Ghezzi, ―Fundamentals of Software Engineering, Prentice Hall India, ISBN-10: 0133056996.

2. Rajib Mall, ―Fundamentals of Software Engineering, Prentice Hall India, ISBN-13: 9788120348981.

3. Pankaj Jalote, ―An Integrated Approach to Software Engineering, Springer, ISBN 13: 9788173192715.

4. S K Chang, ―Handbook of Software Engineering and Knowledge Engineering, World Scientific, Vol I, II, ISBN: 978-981-02-4973-1.

5. Tom Halt, ―Handbook of Software Engineering, Clanye International ISBN- 10: 1632402939.

Syllabus

DATABASE MANAGEMENT SYSTEMS (CST-011)

L:T:P:: 3:1:0 **Credits-04**

COURSE OBJECTIVES: The objectives of this course are to:

1. Learn the fundamentals of data models and to represent a database system using ER diagrams.
2. Study SQL and relational database design.
3. Understanding the internal storage structures using different file and indexing techniques which will help in physical DB design.
4. Understand the fundamental concepts of transaction processing- concurrency control techniques and recovery procedures.
5. Have the knowledge about the Storage and Query Processing Techniques

COURSE OUTCOMES: On successful completion of the course, the student will be able to:

1. Write relational algebra expressions for that query and optimize the developed expressions.
2. Design the databases using E-R method and normalization.
3. Understand the concepts of function dependencies and various normal forms.
4. Understand the concept of transaction atomicity, consistency, isolation, and durability properties in context of real life examples.
5. Develop the understanding of query processing and advanced databases.

Unit 1-Introduction: Data Abstraction, Data Independence, Data Definition Language(DDL),Data Manipulation Language(DML), 3 level Database System Architecture.
Database models: Entity-relationship model, network model, relational and object oriented data models, integrity constraints, data manipulation operations.

Unit 2-Relational Model: Structure of relational database, Relational Algebra: Fundamental operations, Additional Operations, Extended Relational-Algebra operations, Tuple Relational Calculus – Domain Relational Calculus. SQL: Basic structure, Set operations, Aggregate functions, Null Values, Nested subqueries, Views, Data Definition Language, Embedded SQL, Dynamic SQL, Domain Constraints, Referential Integrity and Triggers.

Unit 3-Relational database design: Functional Dependencies, First, Second, Third Normal Forms, Closure, Armstrong's Axioms, Canonical cover, Decomposition, Properties of Decomposition, Dependency Preservation, Boyce-Codd Normal Form, Fourth Normal Form, Fifth Normal Form.

Unit 4-Transaction processing: Transaction Concepts, ACID Properties, Two-Phase Commit, Save Points, Concurrency Control techniques: Locking Protocols, Two Phase Locking, timestamp-based protocol, Multiversion and optimistic Concurrency Control schemes, Database recovery.

Unit 5-Storage Structure, Query Processing and Advanced database: Storage structures: RAID. File

Syllabus

Organization: Organization of Records, Indexing, Ordered Indices, B+ tree Index Files, B tree Index Files. Query Processing: Overview, Measures of Query Cost, Query optimization. Advanced Database: Object-oriented and object-relational databases, logical databases, web databases, distributed databases, data warehousing and data mining.

TEXTBOOKS:

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, ―Database System Concepts, Sixth Edition, Tata McGraw Hill, 2011.

2. RamezElmasri, Shamkant B. Navathe, ―Fundamentals of Database Systems, Sixth Edition, Pearson Education, 2011.

REFERENCE BOOK:

1. C.J.Date, A.Kannan, S.Swamynathan, ―An Introduction to Database Systems, Eighth Edition, Pearson Education, 2006.

2. Raghu Ramakrishnan, ―Database Management Systems, Fourth Edition, McGraw-Hill College Publications, 2015.

3. G.K.Gupta,"Database Management Systems, Tata McGraw Hill, 2011.

Syllabus

DEPARTMENTAL ELECTIVE -1

EMBEDDED SYSTEM (ITT-101)

L:T:P:: 3:0:0: **Credits-03**

Course Objectives: The objective of this course is to equip the students with the basic concepts of embedded system, applications in which they are used, 8051 microcontroller programming concepts and various aspects of embedded system design from Hardware and Software points of view and it describes tools and methodologies needed for embedded system design. It provides RTOS concepts for coding the embedded system software routines. It tells what makes a system a real-time system and describes the characteristics of latency in real-time systems.

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

1. Understand the microprocessor architecture and its components used in embedded systems.
2. Write the 8051 assembly language code for specific purposes.
3. Impliment code for interfacing various devices.
4. Develop simple embedded systems for real time operations CO5) Compose simple embedded system with error free software to obtain target system.

UNIT 1 Embedded Systems Basics: Introduction to Embedded systems, Examples of embedded systems, Typical Hardware,Gates,Timing Diagrams,Memory, Microprocessors, Buses, Direct Memory Access, Interrupts, Microprocessor Architecture, and Interrupt Basics.

UNIT 2 The 8051 Architecture: Introduction, 8051 Micro controller Hardware, Input/output Pin Ports and Circuits, External Memory, Serial data Input/output, Interrupts.

UNIT 3 Basic Assembly Language Programming Concepts: The Assembly Language Programming Process, Programming Tools and Techniques, Programming the 8051.

UNIT 4 Moving Data: Introduction, Addressing Modes, External Data Moves, Code Memory ReadOnly Data Moves, Push and Pop Opcodes, Data Exchanges. Basic Design Using a Real-Time Operating System: Message Queues, Mailboxes and Pipes, Timer Functions, Events, Memory Management, Interrupt Routines in an RTOS Environment

UNIT 5 Applications: Introduction, keyboards, Human Factor, Key Switch Factors, Keyboard Configurations, Displays, Seven-Segment Numeric Display, D/A and A/D Conversions. Embedded Software Development Tools: Host and Target machines, Linker/Locators for Embedded Software, Getting Embedded Software into the Target System; Debugging Techniques: Testing on Host Machine, Using Laboratory Tools, An Example System. Learning Resource.

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Text Books:

1.An Embedded Software Primer, David E. Simon, Pearson Education.

2.The 8051 Microcontroller, Third Edition, Kenneth J.Ayala, Thomson.

Reference Books:

1. 8051 Microcontrollers, Satish Shah, Oxford Higher Education.

2. Embedded Microcomputer Systems Real Time Interfacing, Jonathan W.Valvano, Cengage Learning.

3. Micro Controllers, Ajay V Deshmukhi, TMH.

4. Embedded System Design, Frank Vahid, Tony Givargis, John Wiley.

5. Microcontrollers, Raj kamal, Pearson Education.

a. http://nptel.ac.in/courses.php

b. http://jntuk-coeerd.in/

Syllabus

DEPARTMENTAL ELECTIVE -1

GRAPH THEORY (CST-013)

L:T:P:: 3:0:0 **Credits-03**

COURSE OBJECTIVES: The objectives of this course are to:

1. Understand the fundamentals of graph theory.
2. Study proof techniques related to various concepts in graphs.
3. Explore modern applications of graph theory.

COURSE OUTCOMES: On successful completion of the course, the student will be able to:

1. Understand the basic concept of walk, path and circuit in a graph.
2. Perform the basic operation of Euler graph and digraph
3. Discuss the various spanning trees algorithms.
4. Understand the concept of edge connectivity, vertex connectivity and separable graphs.
5. Derive the relations between the reduced incidence matrix, the fundamental cycle matrix, and the fundamental cut-set matrix of a graph G.

UNIT I: INTRODUCTION: Introduction to Graphs, Basic definition – Application of graphs – finite, infinite and bipartite graphs – Incidence and Degree – Isolated vertex, pendant vertex and Null graph. Paths and circuits – Isomorphism, sub graphs, walks, paths and circuits, connected graphs, disconnected graphs and components.

UNIT II: EULERIAN AND HAMILTONIAN GRAPHS : Euler graphs, Operations on graphs, Hamiltonian paths and circuits, Travelling salesman problem. Directed graphs – types of digraphs, Digraphs and binary relation, Directed paths and connectedness – Euler graphs.

UNIT III TREES AND GRAPH ALGORITHMS : Trees – properties, pendant vertex, Distance and centres in a tree - Rooted and binary trees, counting trees, spanning trees, Prim's algorithm and Kruskal's algorithm, Dijkstra's shortest path algorithm, Floyd-Warshall shortest path algorithm.

UNIT IV CONNECTIVITY AND PLANAR GRAPHS : Vertex Connectivity, Edge Connectivity, Cut set and Cut Vertices, Fundamental circuits, Planar graphs, Kuratowski's theorem (proof not required), Different representations of planar graphs, Euler's theorem, Geometric dual.

UNIT V: GRAPH REPRESENTATIONS AND VERTEX COLOURING : Matrix representation of graphs Adjacency matrix, Incidence Matrix, Circuit Matrix, Path Matrix. Coloring- Chromatic number, Chromatic polynomial, Matchings, Coverings, Four colour problem and Fivecolour problem.

TEXTBOOKS:

1. Narsingh Deo, "Graph Theory with Application to Engineering and Computer Science", Prentice-Hall of India

Pvt.Ltd, 2003.

2. L.R.Foulds, "Graph Theory Applications", Springer ,2016.

REFERENCE BOOKS:

1. Bondy, J. A. and Murty, U.S.R., "Graph Theory with Applications", North Holland Publication,2008.

2. West, D. B., ―Introduction to Graph Theory, Pearson Education, 2011.

3. John Clark, Derek Allan Holton, ―A First Look at Graph Theory, World Scientific Publishing Company, 1991.

4. Diestel, R, "Graph Theory", Springer,3rd Edition,2006. Kenneth H.Rosen, "Discrete Mathematics and Its Applications", Mc Graw Hill , 2007.

Syllabus

DEPARTMENTAL ELECTIVE -1

SOFT COMPUTING (CST-039)

L:T:P:: 3:0:0 **Credits-03**

COURSE OBJECTIVES: The objectives of the course are to

1. Familiarize with soft computing concepts.
2. Introduce and use the idea of Neural networks, fuzzy logic and use of heuristics based on human experience
3. Introduce and use the concepts of Genetic algorithm and its applications to soft computing using some applications.

COURSE OUTCOMES: On completion of this course, the students will be able to

1. Implement, evaluate and compare solutions by various soft computing approaches for finding the optimal solutions
2. Recognize the feasibility of applying a soft computing methodology for a particular problem.
3. Design the methodology to solve problem and decision making using fuzzy logic, genetic algorithms and neural networks.
4. Mining the bulk of data present in the warehouse.
5. Effectively use existing software tools to solve real problems using a soft computing approach.

Unit 1- Introduction to Genetic Algorithm: Introduction to soft computing, soft computing vs hard computing, Genetic Operators and Parameters, Genetic Algorithms in Problem Solving, Theoretical Foundations of Genetic Algorithms, Implementation Issues, challenges and applications of G.A.

Unit 2- Artificial Neural Networks & Learning :Introduction to Learning concept: Supervised Learning, Unsupervised Learning and Reinforcement Learning, Neural Model and Network Architectures, Model of Artificial Neuron, Different Activation Functions, Perceptron network, Perceptron Learning, Supervised Hebbian Learning, Adaptive Linear Neuron, Backpropagation network, Backpropogation learning, Fundamentals of Associative Memory, Associative memory models, Auto associative memory, Bi-directional hetero associative memory.

Unit 3- Competitive Networks: Introduction to Competitive Nerual Networks, Principles of Competitive Learning, Hopfield Network, Computing with Neural Nets and applications of Neural Network.

Unit 4- Introduction to Fuzzy Sets: Introduction to fuzzy sets, difference between fuzzy sets and crisp sets theory, Operations on Fuzzy sets, Fuzzy properties, Fuzzy Relations, Fuzzy Measures, Applications of Fuzzy Set Theory to different branches of Science and Engineering.

Unit 5- Knowledge discovery in databases: KDD process, star schema, snowflack schema, Data mining and

web mining using soft computing techniques. new datawarehouse architecture, database vs datawarehouse bioinformatics, amazon redshift, google big query, panoply.

TEXT BOOKS:

1. E – Neuro Fuzzy and Soft computing – Jang J.S.R., Sun C.T and Mizutami, Prentice hall New Jersey, 1998
2. Fuzzy Logic Engineering Applications – Timothy J.Ross, McGraw Hill, NewYork, 1997.
3. Fundamentals of Neural Networks – Laurene Fauseett, Prentice Hall India, New Delhi, 1994.

REFERENCE BOOKS:

1. Introduction to Artificial Intelligence – E Charniak and D McDermott, Pearson Education
2. Artificial Intelligence and Expert Systems – Dan W. Patterson, Prentice Hall of India.

Syllabus

DEPARTMENTAL ELECTIVE -1

BIO INFORMATICS (ITT 102)

L:T:P:: 3:0:0: **Credits-03**

Course Objectives:

1. To provide a national bio-information network designed to bridge the inter-disciplinary gaps in biotechnology information.
2. To establish link among scientists in organizations involved in R & D and manufacturing activities in biotechnology.
3. To build up information resources, prepare database on biotechnology and to develop relevant information handling tools and techniques.

Course Outcomes:

1. Infer the biological problems using appropriate in silico approaches.
2. Select the suitable tools or servers to solve the specific biological issue and curate experimental data.
3. Perform and analyze database similarity search and sequence alignment.
4. Construct and analyze phylogenetic trees.
5. Use appropriate tools and packages to analyze varied range of biological problems.

UNIT – I INTRODUCTION: Introduction to strings, edit distance strings, string similarity, elementary commands and protocols, Scope of Bioinformatics.

UNIT – II SEQUENCE DATABASES AND THEIR USE: Introduction to databases, database search, algorithms issues in database search, sequence database search, parametric sequence alignments, sub optimal alignments, dynamic programming global and local alignment gaps, multiple alignment, common multiple alignment methods. FASTA and BLAST. Amino acid substitution matrices PAM and BLOSSOM.

UNIT – III EVOLUTIONARY TREES AND PHYLOGENY: Ultrasonic trees, parsimony, ultrametric problem, perfect phylogeny, phylogenetic alignment, connection between multiple alignment and tree constructions.

UNIT – IV PROTEIN CLASSIFICATION AND STRUCTURE VISUALIZATION:Overview of the protein structure, protein structure visualization, visualization tools and databases, protein structure alignment, protein classification approaches, tools for plotting Protein - ligand interaction.

UNIT – V PROTEIN STRUCTURE PREDICTION: Protein identification and characterization, primary structure analysis and prediction, secondary structure analysis and prediction, Ab initio method for protein prediction, protein function prediction.

UNIT – VI APPLICATIONS OF BIOINFORMATICS: DNA mapping and sequencing, gene predictions, molecular predictions with DNA strings, role of bioinformatics in drug design.

Syllabus

REFERENCE BOOKS: 1. David W. Mount. 2005. Bioinformatics: Sequence and Genome analysis, Cold Spring Harbor Laboratory Press. Jones, N.C. and Pevzner, P. A. 2004. An Introduction to Bioinformatics Algorithms. The MIT Press

Syllabus

DEPARTMENTAL ELECTIVE -2

DATA MINING (CST-032)

L:T:P:: 3:0:0 **Credits-03**

COURSE OBJECTIVES: The objectives of the course are to

1. Present methods for mining frequent patterns, associations, and correlations.
2. Describes methods for data classification and prediction, and data–clustering approaches.
3. Covers mining various types of data stores such as spatial, textual, multimedia, streams.

COURSE OUTCOMES: On successful completion of this course, the students will be able to

1. Interpret the contribution of data warehousing and data mining to the decision-support level of organizations
2. Evaluate different models used for OLAP and data preprocessing
3. Categorize and carefully differentiate between situations for applying different data-mining techniques: frequent pattern mining, association, correlation, classification, prediction, and cluster and outlier analysis
4. Design, implement and evaluate the performance of different data-mining algorithms
5. Propose data-mining solutions for different applications

Unit 1- DATA WAREHOUSE: Data Warehousing - Operational Database Systems vs Data Warehouses - Multidimensional Data Model - Schemas for Multidimensional Databases – OLAP operations – Data Warehouse Architecture – Indexing – OLAP queries & Tools.

Unit 2- DATA MINING & DATA PREPROCESSING: Introduction to KDD process – Knowledge Discovery from Databases - Need for Data Pre-processing – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization and Concept Hierarchy Generation.

Unit 3- ASSOCIATION RULE MINING: Introduction - Data Mining Functionalities - Association Rule Mining - Mining Frequent Item sets with and without Candidate Generation - Mining Various Kinds of Association Rules - Constraint – Based Association Mining.

Unit 4- CLASSIFICATION & PREDICTION: Classification vs Prediction – Data preparation for Classification and Prediction – Classification by Decision Tree Introduction – Bayesian Classification – Rule Based Classification – Classification by Back propagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods – Prediction – Accuracy and Error Measures – Evaluating the Accuracy of a Classifier or Predictor – Ensemble Methods – Model Section.

Unit 5- CLUSTERING: Cluster Analysis - Types of Data in Cluster Analysis – A Categorization of Major Clustering Methods – Partitioning Methods – Hierarchical methods – Density-Based Methods – Grid-Based

Methods – Model-Based Clustering Methods – Clustering High- Dimensional Data – Constraint-Based Cluster Analysis – Outlier Analysis. Data Visualization: Principles, Parallel Coordinates, Visualization Neural Networks, Visualization of trees.

TEXTBOOKS:

1. Data Mining – Concepts and Techniques – Jiawei Han & Micheline Kamber, 3rd Edition Elsevier.
2. Data Mining, pang-ning tan and Michael steinbach, second edition, Pearson Education.
3. Data Mining Introductory and Advanced topics – Margaret H Dunham, PEA.
4. Ian H. Witten and Eibe Frank, Data Mining: Practical Machine Learning Tools and Techniques (Second Edition), Morgan Kaufmann, 2005.

REFERENCE BOOKS:

1. K.P. Soman, ShyamDiwakar and V. Ajay, “Insight into Data mining Theory and Practice”, Easter Economy Edition, Prentice Hall of India, 2006.
2. G. K. Gupta, “Introduction to Data Mining with Case Studies”, Easter Economy Edition

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DEPARTMENTAL ELECTIVE -2

GPS AND GIS (ITT 103)

L:T:P:: 3:0:0 **Credits-03**

Course Objectives:

1. To introduce the student to the physical principles of Remote Sensing and image interpretation as a tool for mapping.
2. To provide exposure to fundamental data models and data structures in GIS
3. To introduced principle of GPS , It's components, signal structure, and working procedure.:

C**ourse outcome:** On completion of this course students shall be able to

1. understand the principles of Remote Sensing and image interpretation
2. Understand the fundamental of GIS, GPS,its component signal and applications which helps them in getting job in space organization
3. Acquire skills create and manage spatial data in GIS and GPS.

Unit -I (Fundamental of Remote Sensing) Concept and foundations of remote sensing: Basics of Remote sensing, remote sensing Art or Science process. Energy: Sources of energy, Energy radiation principle, Energy interaction in the atmosphere , Energy interactions with earth surface feature, Recording energy by sensor transmission, Reception processing, Interpretation & Analysis.

Unit -II (Fundamental of Image interpretation): Satellite imagery interpretation, Elements of image interpretation, image interpretation strategies, interpretation keys, temporal aspect of image interpretation, interpretation techniques, methods of search in image interpretation.Steps of Image interpretation.

Unit -III (Fundamental of G.I.S) Evolution of Geographical Information system, Concept of Geographic information systems: Introduction, Definition of GIS, Key components of GIS, Data Conceptual model of spatial information: Spatial Information and data models conceptual models of spatial information- raster and models vector data models, advantages and disadvantages of raster and vector data models.

Unit -IV (Fundamental of GPS) Global positioning system (GPS): Concept of Global positioning system (GPS) and its architecture. Working procedure of GPS, Different types of Errors in GPS, Kinds of GPS, application of GPS in different applications.

Unit IV Application of GPS: GPS in Natural Resource Management, GPS in Surveying and Mapping, GPS in Navigation, GPS Application in Crustal Mapping, GPS Application in Agriculture, GPS Application in Military Operations, GPS in Urban Utilities and Services.

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Unit V Application of Geoinformatics: Natural Resources Management - Environmental Studies - Disaster Management - Utilities Management - Land Parcel Based - Urban Studies - Military Applications – Navigation - Location Based Services – Civil Engineering - Agriculture.

Text books :

1. Ahmed El-Rabbany, Introduction to GPS The Global Positioning System, Artech House Boston London 2002
2. Rueger, J.M., Electronic distance Measurement, Springer - Verlag, Berlin, 1990
3. Laurila, S.H., Electronic Surveying in Practice, John Wiley & Sons, Inc, 1983
4. Soastamoinen, J.J., Surveyor's Guide to electro-magnetic pistance Measurement, Adam Hilger Ltd., 1967
5. SantheeshGopi., Global Positioning System - Principles and Applications, Tata McGraw- Hill Publishing Company Limited, New Delhi, 2005
6. Seeber, G., Satellite Geodesy, Walter de Gruyter, Berlin, 1993
7. Alfred Leick, GPS Satellite surveying, John Wiley and Sons, 1995
8. Hofmann Wellenhof, B. Lichtenegger, H. and Collins, J., Global Positioning System, SorinQer - Verlag, New York, 199

REFERENCE BOOKS

1. Remote Sensing and Image interpretation: Thomas Lille sand & R.W. Keifer, John Wiley and Sons
2. Manual of Remote Sensing, Vol. 1, American Society of Photogrammetry.
3. Remote Sensing: Principles and Interpretation: F. Sabins, Freeman Publication.
4. Remote Sensing of the Environment by J.R. Jensen, Pearson Publication.

Syllabus

DEPARTMENTAL ELECTIVE -2

NEXT GENERATION NETWORKS (ITT 104)

L:T:P:: 3:0:0: **Credits-03**

COURSE OBJECTIVE • The course is designed to understand the motivation for and goals of next generation networks.

1. To understand the technical features, applications and design consideration of new and emerging network technologies.

2. To provide a comfortable understanding of applicable technology.

COURSE OUTCOME

1. Students will have brief idea of technical features and design considerations of the next generation mobile networks.

2. Students will be able to design a network with good capacity and efficiency.

Unit 1: Introduction Evolution of public mobile services - motivations for IP based services, Wireless IP network Architecture – 3GPP packet data network architecture, Introduction to next generation networks -Changes, Opportunities and Challenges, Technologies, Networks, and Services, Next GenerationSociety, future Trends.

Unit 2: IMS and Convergent Management IMS Architecture - IMS services, QoS Control and Authentication, Network and Service management for NGN, IMS advantages, Next Generation OSS Architecture - standards important to OSS architecture, Information framework, OSS interaction with IMS, NGN OSS function/ information view reference model, DMTF CIM.

Unit 3: MPLS AND VPN Technology overview –MPLS &QoS, MPLS services and components – layer 2 VPN, layer 2 Internetworking, VPN services, signaling, layer 3 VPN –Technology overview, Remote Access and IPsec integration with MPLS VPN.

Unit 4: Multicast MPLS Multicast VPN overview – Applications, examples, IPv6 and MPLS - Technology overview, Future of MPLS – Integrating IP and optical networks, Future layer 3 services, future layer 2 services. Module 5: NGN Management Network Management and Provisioning – Configuration, Accounting, performance, security, case study for MPLS, Future enhancements – Adaptive self healing networks.

Text Books:

1. Thomas Plavyk, “Next generation Telecommunication Networks, Services and Management”,Wiley& IEEE Press Publications, 2002.

2. Neill Wilkinson, “Next Generation Network Services”, John Wiley Publications, 2002.

3. Monique J. Morrow, “Next Generation Networks”, CISCO Press, 2007.

4. Robert Wood, “MPLS and Next Generation Networks: Foundations for NGN and EnterpriseVirtualization", CISCO Press, 2006.

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DEPARTMENTAL ELECTIVE -2

DISTRIBUTED SYSTEMS (CST-019)

L:T:P:: 3:0:0 **Credits-03**

COURSE OBJECTIVES: The objectives of this course are to

1. Understand the foundations of distributed systems.
2. Learn clock synchronisation issues and the need for global state in distributed systems.
3. Learn distributed mutual exclusion and deadlock detection algorithms.
4. Understand the significance of agreement, fault tolerance and recovery protocols in Distributed Systems.
5. Learn the characteristics of peer-to-peer and distributed shared memory systems.

COURSE OUTCOMES: On Successful completion of the course, the students will be able to

1. Acquire the theoretical and conceptual foundations of distributed computing.
2. Conceptualize the ideas of distributed operating systems and their issues.
3. Understand the issues involved in distributed resource environment.
4. Realize the importance of transaction and how to recovery the system from deadlocks.
5. Explore the principles of fault tolerance and its protocols.

Unit 1- Distributed Environment: Introduction, Limitations, Remote Procedure Call, Remote Object Invocation, Message-Oriented Communication, Unicasting, Multicasting and Broadcasting, Group Communication.

Unit 2-Distributed Operating Systems: Issues in Distributed Operating Systems, Threads in Distributed Systems, Clock Synchronization, Causal Ordering, Global States, Election Algorithms, Distributed Mutual Exclusion, Distributed Deadlock, Agreement Protocols

Unit 3- Distributed Resource Management: Distributed Shared Memory, Data-Centric Consistency Models, Client-Centric Consistency Models, Distributed File Systems, Sun NFS.

Unit 4- Distributed Transaction Processing: Transactions, Nested Transactions, Locks, Optimistic Concurrency Control, Timestamp Ordering, Comparison, Flat and Nested Distributed Transactions, Atomic Commit Protocols, Concurrency Control in Distributed Transactions, Distributed Deadlocks, Transaction Recovery, Overview of Replication and Distributed Multimedia Systems.

Unit 5- Fault Tolerance and Consensus: Introduction to Fault Tolerance, Distributed Commit Protocols, Byzantine Fault Tolerance, Impossibilities in Fault Tolerance.

TEXTBOOK(S):

1. A.S.Tanenbaum, M.Van Steen, “Distributed Systems”, Pearson Education, 2007. 2. MukeshSinghal,

NiranjanG.Shivaratri “Advanced Concepts in Operating Systems”, McGrawHill Series in Computer Science, 2011. REFERENCE BOOKS: 1. George Coulouris, Jean Dollimore, Tim Kindberg, “Distributed Systems Concepts and Design”, 3rd Edition, Pearson Education Asia, 2002. 2. M.L.Liu, “Distributed Computing Principles and Applications”, Pearson Addison Wesley, 2004. 3. Andrew S.Tenenbaum “Modern Operating system”, 3rd Edition, Pearson Addison Wesley, 2008.

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ALGORITHM DESIGN & ANALYSIS LAB (CSP-010)

L:T:P:: 0:0:2 **Credits-01**

COURSE OBJECTIVES: The objectives of this course are to

1. Build a solid foundation in algorithms and their applications.
2. Implement various divide and conquer techniques examples, Greedy techniques examples, and Dynamic Programming techniques examples.
3. Provide a practical exposure of various algorithms.
4. Understand the importance of algorithm and its complexities.

COURSE OUTCOMES: Upon successful completion of the course, the students will be able to

1. Solve recurrence equations by considering time and space complexity.
2. Analyse the complexities of various problems in different domains.
3. Solve the problems that comprises of shortest route issue.
4. Solve the problems that address the issue of dynamic programming
5. Synthesize efficient algorithms in common engineering design situations.

LIST OF EXCERCISES

1. Programming that uses recurrence relations to analyse recursive algorithms.
2. Computing best, average, and worst-case time complexity of various sorting techniques.
3. Performance analysis of different internal and external sorting algorithms with different type of data set.
4. Use of divide and conquer technique to solve some problem that uses two different algorithms for solving small problem.
5. Implementation of different basic computing algorithms like Hash tables, including collision-avoidance strategies, Search trees (AVL and B-trees).
6. Consider the problem of eight queens on an (8x8) chessboard. Two queens are said to attack each other if they are on the same row, column, or diagonal. Write a program that implements backtracking algorithm to solve the problem i.e. place eight non-attacking queens on the board.
7. Write a program to find the strongly connected components in a digraph.
8. Write a program to implement file compression (and un-compression) using Huffman's algorithm.
9. Write a program to implement dynamic programming algorithm to solve the all pairs shortest path problem.
10. Write a program to solve 0/1 knapsack problem using the following:
    a) Greedy algorithm.
    b) Dynamic programming algorithm.

c) Backtracking algorithm.

d) Branch and bound algorithm.

11. Write a program that uses dynamic programming algorithm to solve the optimal binary search tree problem.
12. Write a program for solving traveling salespersons problem using the following:
    a) Dynamic programming algorithm.
    b) The back tracking algorithm.
    c) Branch and bound.

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SOFTWARE ENGINEERING LAB (ITP-101)

L:T:P:: 0:0:2 **Credits-01**

COURSE OBJECTIVES:

1. To understand the software engineering methodologies involved in the phases for project development.
2. To gain knowledge about open source tools used for implementing software engineering methods.
3. To exercise developing product-startups implementing software engineering methods.
4.Open source Tools: StarUML / UMLGraph / Topcased .

COURSE OUTCOMES:

1. Ability to identify the minimum requirements for the development of application.
2. Ability to develop, maintain efficient, reliable and cost effective software solution.
3. Ability to critically thinking and evaluate assumptions and arguments.

SYLLABUS Prepare the following documents and develop the software project startup, prototype model, using software engineering methodology for at least two real time scenarios or for the sample experiments.

•**Problem Analysis and Project Planning -**Thorough study of the problem–Identify Project scope, Objectives and Infrastructure.

•**Software Requirement Analysis** –Describe the individual Phases/modules of the project and Identify deliverables. Identify functional and non-functional requirements. •Data Modeling –Use work products –data dictionary.

•**Software Designing** -Develop use case diagrams and activity diagrams, build and test class diagrams, sequence diagrams and add interface to class diagrams.

•**Prototype model** –Develop the prototype of the product. The SRS and prototype model should be submitted for end semester examination.

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DATABASE MANAGEMENT SYSTEM LAB (CSP-011)

L:T:P:: 0:0:2 **Credits-01**

COURSE OBJECTIVES: The objectives of this course are to

1. Understand data definitions and data manipulation commands.
2. Learn the use of nested and join queries.
3. Understand functions, procedures and procedural extensions of data bases.
4. Familiar with the use of a front-end tool and understand design and implementation of typical database applications

COURSE OUTCOMES: On successful completion of the course, the students will be able to

1. Understand, appreciate, and effectively explain the concepts of database Technologies.
2. Declare and enforce integrity constraints on a database using RDBMS.
3. Devise a complex query using SQL DML/DDL commands.
4. Create views and use in-built functions to query a database.
5. Write PL/SQL programs including stored procedures, stored functions and triggers.

LIST OF EXPERIMENTS

1. Build the following database schemas and perform the manipulation operations on these schemas using SQL DDL,DML,TCL and DCL commands.

(I) Database Schema for a customer-sale scenario

Customer(Custid : integer, cust_name: string)

Item(item_id: integer, item_name: string, price: integer)

Sale(bill_no: integer, bill_data: date, cust_id: integer, item_id: integer, qty_sold: integer)

For the above schema, perform the following:-

a) Create the tables with the appropriate integrity constraint

b) Insert around 10 records in each of the tables

c) List all the bills for the current date with the customer namesand item numbers

d) List the total Bill details with the quantity sold price of theitem and the final amount

e) List the details of the customer who have bought a productwhich has a price>200

f) Give a count of how many products have been bought byeach customer

g) Give a list of products bought by a customer having cust_idas 5

h) List the item details which are sold as of today

i) Create a view which lists out the bill_no, bill_date, cust_id, item_id, price, qty_sold, amount

j) Create a view which lists the date wise daily sales for the last one week

k) Identify the normalization of this schema. Justify your answer.

l) If the schema is not normalized, then normalize the schema.

(II) Database Schema for a Employee-pay scenario

Employee(emp_id : integer, emp_name: string)

Department (dept_id: integer, dept_name:string)

Paydetails(emp_id : integer, dept_id: integer, basic: integer,deductions: integer, additions: integer, DOJ: date)

payroll(emp_id : integer, pay_date: date)

For the above schema, perform the following:—

a) Create the tables with the appropriate integrity constraints

b) Insert around 10 records in each of the tables

c) List the employee details department wise

d) List all the employee names who joined after particular date

e) List the details of employees whose basic salary is between 10,000 and 20,000

f) Give a count of how many employees are working in each department

g) Give a name of the employees whose netsalary>10,000

h) List the details for an employee_id=5

i) Create a view which lists out the emp_name, department, basic, deductions,netsalary

j) Create a view which lists the emp_name and his netsalary

k) Identify the normalization of this schema. Justify your answer

l) If the schema is not normalized then normalize the schema.

2. Construct a PL/SQL program to find largest number from the given three numbers.
3. Build a PL/SQL program to generate all prime numbers below 100.
4. Construct a PL/SQL program to demonstrate %type and %row type attributes.
5. Develop a PL/SQL procedure to find reverse of a given number.
6. Create a PL/SQL procedure to update the salaries of all employees by 10% in their basic pay.
7. Execute a PL/SQL procedure to demonstrate IN, OUT and INOUT parameters.
8. Design a PL/SQL trigger before/after update on employee table for each row/statement.
9. Create a PL/SQL trigger before/after delete on employee table for each row/statement.
10. Build a PL/SQL trigger before/after insert on employee table for each row/statement.
11. Design and build the following applications using SQL and front end tool and generate report
    - Student information system for your college.
    - Hospital Management System.
    - A video library management system.
    - Inventory management system for a hardware / sanitary item shop.

- Banking System.
- Railway Reservation System
- Car Insurance Company

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INTERNSHIP-II / MINI PROJECT-II (ITP-102)

L:T:P:: 0:0:2 **Credits-01**

ABOUT INTERNSHIP/MINI PROJECT

It is an organized method or activity of enhancing and improving engineering students' skill sets and knowledge, which boosts their performance and consequently helps them meet their career objectives. Industrial Training is essential in developing the practical and professional skills required for an Engineer and an aid to prospective employment.

OBJECTIVES OF INTERNSHIP/MINI PROJECT:

1. The main objective of the internship/mini projectis to expose the students to the actual working environment and enhance their knowledge and skill from what they have learned in college.
2. Another purpose of this program is to enhance the good qualities of integrity, responsibility, and self confidence. Students must follow all ethical values and good working practices.
3. It is also to help the students with the safety practices and regulations inside the industry and to instils the spirit of teamwork and good relationship between students and employees.

COURSE OUTCOMES: At the end of internship/mini project, the students will be able to

1. Understand organizational issues and their impact on the organization and employees.
2. Identify industrial problems and suggest possible solutions.
3. Relate, apply and adapt relevant knowledge, concepts and theories within an industrial organization, practice and ethics.
4. Apply technical knowledge in an industry to solve real world problems.
5. Demonstrate effective group communication, presentation, self-management, and report writing skills.

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CONSTITUTION OF INDIA (AHT-009)

L:T:P:: 2:0:0 **CREDITSs-0**

COURSE OBJECTIVES: The objectives of this course are to

1. To acquaint the students with legacies of constitutional development in India and help to understand the most diversified legal document of India and philosophy behind it.
2. To make students aware of the theoretical and functional aspects of the Indian Parliamentary System.
3. To channelize students' thinking towards basic understanding of the legal concepts and its implications for engineers.

COURSE OUTCOMES

On successful completion of the course, the students will be able to

1. Understand the basic knowledge and salient features of Indian Constitution.
2. Identify and explore the basic features and modalities about Indian constitution.
3. Discusses the essence of Union and its territories, Citizenship, Fundamental Rights, DPSP and Fundamental Duties.
4. Differentiate and relate the functioning of Indian parliamentary system at the center and state level.
5. Differentiate different aspects of Indian Legal System and its related bodies.

Unit-1 Constitutional Framework

Meaning of Terms and Phrases frequently used in political system like constitution, constitutionalism, Rule of Law, Federal system, Government and so on. Historical Background of Indian Constitution, Making of Indian Constitution, Salient features of Indian Constitution, Preamble of Indian Constitution.

Unit-2 Different Parts, Articles, and their significance

Part I to IVA (Union and its territories w.r.t. Indian States, Citizenship, Fundamental Rights conferred to citizens and foreigners, Directive Principles of State Policy– Its importance and implementation and Fundamental Duties and its legal status), Article 1 to 51A and their significance.

Unit-3 System of Government

Parliamentary Form of Government in India – The constitution powers and status of the President of India, Federal structure and distribution of legislative and financial powers between the Union and the States, Emergency Provisions: National Emergency, President Rule, Financial Emergency and Amendment of the Constitutional Powers and Procedure and the significance of basic structure in Indian Judicial system

Unit-4 Working of Central, State & Local Self Government as per constitution

Framework for central government (President, Vice president, Prime Minister, Central council of ministers, Parliament, Supreme court and so on), Framework for state government (Governor, Chief

Minister, state legislature, High court and so on) and Framework for local self government (Panchayatiraj, Municipalities) and Union Territories.

Unit-5 Constitutional, Non-Constitutional and other bodies

Discussion on Various constitutional bodies like Election Commission, UPSC, SPSC, Finance commission, NCSC, NCST, NCBC, CAG and AGI. Discussion on Various non-constitutional bodies like NITI Aayog, NHRC, CIC, CVC, CBI, Lokpal and Lokayukta. Discussion on Various other constitutional bodies like Co- operative societies, Official Language, Tribunals etc.

Text/Reference books-

1. M. Laxmikanth, "Indian Polity", McGraw- Hill, 6th edition, 2020
2. D.D. Basu, "Introduction to the Indian Constitution", LexisNexis, 21st edition, 2020
3. S.C. Kashyap, " Constitution of India", Vitasta publishing Pvt. Ltd., 2019

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ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE (AHT-010)

L:T:P:: 2:0:0 **CREDITSs-0**

COURSE OBJECTIVES: The objectives of this course are to

1. To facilitate the students with the concepts of Indian traditional knowledge and to make them understand the Importance of roots of knowledge system.
2. To make the students understand the traditional knowledge and analyses it and apply it to their day to day life.
3. To make the students know the need and importance of protecting traditional knowledge.
4. To make the students understand the concepts of Intellectual property to protect the traditional knowledge.
5. This course is also concentrating on various acts in protecting the environment and Knowledge management impact on various sectors in the economy development of the country.

COURSE OUTCOMES:

On successful completion of the course, the students will be able to

1. Understand the concept of Traditional knowledge and its importance.
2. Know the need and importance of protecting traditional knowledge.
3. Know the various enactments related to the protection of traditional knowledge.
4. Understand the concepts of Intellectual property to protect the traditional knowledge.
5. Know the contribution of scientists of different areas.

Unit – 1 Introduction to Traditional and Culture Knowledge

Define culture, traditional, civilization and heritage knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, the physical and social contexts in which traditional knowledge develop, the historical impact of social change on traditional knowledge systems. Indigenous Knowledge (IK). Indigenous traditional knowledge Vs western traditional knowledge vis-à-vis formal knowledge.

Unit-2 Protection of Traditional Knowledge

Protection of traditional knowledge: The need for protecting traditional knowledge Significance of traditional knowledge Protection, value of traditional knowledge in global economy, Role of Government to harness traditional knowledge.

Unit – 3 Traditional Knowledge and Intellectual Property

Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Certain non IPR mechanisms of traditional knowledge protection, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge, Global legal forums for increasing protection of Indian Traditional Knowledge.

Unit – 4 Traditional Knowledge in Different Sectors

Traditional knowledge in engineering, biotechnology and agriculture, traditional medicine system, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of

traditional knowledge.

Unit – 5 Education System in India

Education in ancient, medieval and modern India, aims of education, subjects, languages, Science and Scientists of Ancient India, Scientists of Medieval India, Scientists of Modern India. The role Gurukulas in Education System, Value based Education.

Text/Reference Books:

1. Traditional Knowledge System in India by Amit Jha Atlantic publishers, 2002.
2. "Knowledge Traditions and Practices of India" Kapil Kapoor1, Michel Danino2.
3. Traditional Knowledge System in India, by Amit Jha, 2009.
4. Satya Prakash, “Founders of Sciences in Ancient India”, Vijay Kumar Publisher, 1989
5. Traditional Knowledge System and Technology in India by Basanta Kumar Mohanta and Vipin Kumar Singh Pratibha Prakashan 2012.

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COMPILER DESIGN (CST-012)

L:T:P:: 3:1:0 **Credits-04**

COURSE OBJECTIVES: The objectives of this course are to:

1. Learn the various phases of compiler and various parsing techniques.
2. Understand intermediate code generation and run-time environment.
3. Learn to implement front-end of the compiler and code generator.

COURSE OUTCOMES: On successful completion of the course, the student will be able to:

1. Understand the different phases of compiler.
2. Design a lexical analyser for a sample language using LEX tool.
3. Apply different parsing algorithms to develop the parsers for a given grammar using YACC tool.
4. Understand syntax-directed translation and run-time environment.
5. Learn to implement code optimization techniques and a simple code generator.

UNIT - I INTRODUCTION TO COMPILERS: Structure of a compiler – Lexical Analysis – Role of Lexical Analyzer – Input Buffering – Specification of Tokens – Recognition of Tokens – Lex – Finite Automata – Regular Expressions to Automata – Minimizing DFA.

UNIT- II SYNTAX ANALYSIS: Role of Parser – Grammars – Error Handling – Context-free grammars – Writing a grammar – Top Down Parsing - General Strategies, Recursive Descent Parser, Predictive Parser-LL(1) ParserShift Reduce Parser-LR Parser-LR (0)Item Construction of SLR Parsing Table - Introduction to LALR Parser - Error Handling and Recovery in Syntax Analyzer-YACC.

UNIT- III SYNTAX-DIRECTED TRANSLATION: Syntax-Directed Definitions, Evaluation Orders for SDD's, Applications of Syntax-Directed Translation, Syntax-Directed Translation Schemes, Implementing L-Attributed SDD's.

INTERMEDIATE-CODE GENERATION: Variants of Syntax Trees, Three-Address Code, Types and Declarations, Type Checking, Control Flow, Switch-Statements, Intermediate Code for Procedures.

UNIT- IV RUN-TIME ENVIRONMENTS: Stack Allocation of Space, Access to Nonlocal Data on the Stack, Heap Management, Introduction to Garbage Collection, Introduction to Trace-Based Collection.

CODE GENERATION: Issues in the Design of a Code Generator, The Target Language, addresses in the Target Code, Basic Blocks and Flow Graphs, Optimization of Basic Blocks, A Simple Code Generator, Peephole Optimization, Register Allocation and Assignment, Dynamic Programming Code-Generation.

UNIT- V MACHINE-INDEPENDENT OPTIMIZATION: The Principal Sources of Optimization, Introduction to Data-Flow Analysis, Foundations of Data-Flow Analysis, Constant Propagation, Partial-

Redundancy Elimination, Loops in Flow Graphs, peep-hole optimization.

TEXTBOOKS:

1. Compilers Principles, Techniques and Tools, Alfred V. Aho, Ravi Sethi, Jeffrey D. Ullman, PEA.

2. Introduction to Automata Theory Languages & Computation, 3rd Edition, Hopcroft, Ullman, PEA

REFERENCE BOOKS:

1. Theory of Computer Science, Automata Languages and Computation, 2nd Edition, Mishra, Chandra Shekaran, PHI.

2. Elements of Compiler Design, A.Meduna, Auerbach Publications, Taylor and Francis Group

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OPERATING SYSTEMS (CST-023)

L: T:P :: 3:1:0 **Credits-04**

COURSE OBJECTIVES: The objectives of this course are to

1. Learn and understand the Concepts of the operating systems.
2. Learn and understand operating system services.
3. The core structure, functions and design principles of operating system.
4. Interposes communications and basic concepts of virtualization.

COURSE OUTCOMES: On completion of this course, the students will be able to

1. Create processes and threads.
2. Develop process scheduling algorithms for a given CPU utilization specification, Throughput, Turnaround Time, Waiting Time, and Response Time.
3. Develop the techniques for optimally allocating memory to processes by increasing memory utilization and improving access time.
4. Design and implement a file management system.
5. Develop the I/O management functions in OS.

Unit 1- Introduction: Concept of Operating Systems, Generations of Operating systems, Types of Operating Systems, OS Services, System Calls, Structure of an OS -Layered, Microkernel Operating Systems, Concept of Virtual Machine.

Processes: Definition, Process Relationship, Different states of a Process, Process State transitions, Process Control Block (PCB), Context switching Thread: Definition, Various states, Benefits of threads, Types of threads, Concept of multi threads

Unit 2- Process Scheduling: Foundation and Scheduling objectives, Types of Schedulers, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time; Scheduling algorithms: Preemptive and Non-preemptive, FCFS, SJF, RR; Multiprocessor scheduling: Real-Time scheduling: RM and EDF.

Inter-process Communication: Critical Section, Race Conditions, Mutual Exclusion, Hardware Solution, Strict Alternation, Peterson's Solution, The Producer-Consumer Problem, Semaphores, Monitors, Message Passing, Classical IPC Problems: Reader's & Writer Problem, Dinning Philosopher Problem etc.

Unit 3- Deadlocks: Definition, Necessary and sufficient conditions for Deadlock, Deadlock Prevention, Deadlock Avoidance: Banker's algorithm, Deadlock detection and Recovery.

Memory Management: Basic concept, Logical and Physical address map, Memory allocation: Contiguous

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Memory allocation–Fixed and variable partition– Internal and External fragmentation and Compaction; Paging: Principle of operation – Page allocation –Hardware support for paging, Protection and sharing, Disadvantages of paging.

Unit 4- Virtual Memory: Basics of Virtual Memory – Hardware and control structures – Locality of reference, Page fault, Working Set, Dirty page/Dirty bit – Demand paging, Page Replacement algorithms: Optimal, First in First Out (FIFO), Second Chance (SC), Not recently used (NRU) and Least Recently used(LRU).

Unit 5- File Management: Concept of File, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods (Contiguous, linked, indexed).

Disk Management: Disk structure, Disk scheduling - FCFS, SSTF, SCAN, C-SCAN, Disk reliability.

TEXTBOOKS:

1. AviSilberschatz, Peter Galvin, Greg Gagne , Operating System Concepts Essentials, 9th Edition by, Wiley Asia Student Edition.

2. William Stallings , Operating Systems: Internals and Design Principles, 9th Edition (2022), Prentice Hall of India.

Reference Books:

1. RamazElmasri, A. Gil Carrick, David Levine, ―Operating Systems – A Spiral Approach, Tata McGraw Hill Edition, 2010.

2. Achyut S.Godbole, Atul Kahate, ―Operating Systems, McGraw Hill Education, 2016. 3. Andrew S. Tanenbaum, ―Modern Operating Systems, Second Edition, Pearson Education, 2004.

Syllabus

COMPUTER NETWORKS (CST-021)

L:T:P:: 3:1:0 **Credits-04**

COURSE OBJECTIVES: The objectives of this course are to

1. Understand the protocol layering and physical level communication.
2. Analyze the performance of a network .and understand the various components required to build different networks.
3. Learn the functions of network layer and the various routing protocols.
4. Familiarize the functions and protocols of the Transport layer.

COURSE OUTCOMES: On completion of the course, the students will be able to

1. Explain the functions of the different layer of the OSI Protocol.
2. Draw the functional block diagram of local area networks (LANs, wide-area networks (WANs) and Wireless LANs (WLANs).
3. Address the issues related to network layer and various routing protocols.
4. Configure DNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP.
5. Configure Bluetooth, Firewalls using open source available software and tools.

Unit 1- Data communication Components: Representation of data and its flow Networks, Various Connection Topology, Protocols and Standards, OSI model, Transmission Media, LAN: Wired LAN, Wireless LANs, Connecting LAN and Virtual LAN, Techniques for Bandwidth utilization: Multiplexing - Frequency division, Time division and Wave division, Concepts on spread spectrum.

Unit 2- Data Link Layer and Medium Access Sub Layer: Error Detection and Error Correction - Fundamentals, Block coding, Hamming Distance, CRC; Flow Control and Error control protocols - Stop and Wait, Go back – N ARQ, Selective Repeat ARQ, Sliding Window, Piggybacking, Random Access, Multiple access protocols- Pure ALOHA, Slotted ALOHA, CSMA/CD, CDMA/CA, high level data link control(HDLC), Point To Point protocol (PPP).

Unit 3- Network Layer: Repeater, Hub, Switches, Bridges, Gateways, Switching, Logical addressing – IPV4, IPV6, Address mapping – ARP, RARP, BOOTP and DHCP–Delivery, Forwarding and Unicast Routing protocols.

Unit 4- Transport Layer: Process to Process Communication, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), SCTP Congestion Control; Quality of Service, QoS improving techniques: Leaky Bucket and Token Bucket algorithm.

Unit 5- Application Layer: Domain Name Space (DNS), DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls, Basic concepts of Cryptography,Digital Signature.

Syllabus

TEXTBOOK:

1. Behrouz A. Forouzan, Data Communications and Networking, Fifth Edition TMH, 2013.

REFERENCE BOOKS:

1. Larry L. Peterson, Bruce S. Davie, Computer Networks: A Systems Approach, Fifth Edition, Morgan Kaufmann Publishers Inc., 2012.

2. William Stallings, Data and Computer Communications, Tenth Edition, Pearson Education, 2013.

3. Nader F. Mir, Computer and Communication Networks, Second Edition, Prentice Hall, 2014.

4. Ying-Dar Lin, Ren-Hung Hwang and Fred Baker, Computer Networks: An Open Source Approach, McGraw Hill Publisher, 2011.

5. James F. Kurose, Keith W. Ross, Computer Networking, A Top-Down Approach Featuring the Internet, Sixth Edition, Pearson Education, 2013

Syllabus

DEPARTMENTAL ELECTIVE -3

DISTRIBUTED DATABASE (ITT-105)

L:T:P:: 3:0:0 **Credits-03**

OBJECTIVES:

1. To understand the role of databases and database management systems in managing organizational data and information.
2. To understand the techniques used for data fragmentation, replication and allocation during the distributed database design process.
3. To discuss the issues involved in resource management and process.

COURSE OUTCOMES: the student will be able to

1: Identify the introductory distributed database concepts and its structures.

2: Produce the transaction management and query processing techniques in DDBMS.

3: Develop in-depth understanding of relational databases and skills to optimize database performance.

4: Critiques on each type of databases.

UNIT 1 INTRODUCTORY CONCEPTS AND DESIGN OF (DDBMS)

Data Fragmentation - Replication and allocation techniques for DDBMS - Methods for designing and implementing DDBMS - designing a distributed relational database - Architectures for DDBMS - Cluster federated - parallel databases and client server architecture - Overview of query processing.

UNIT 2 DISTRIBUTED SECURITY & DISTRIBUTED DATABASE APPLICATION TECHNOLOGIES

Overview of security techniques - Cryptographic algorithms - Digital signatures - Distributed Concurrency Control - Serializability theory - Taxonomy of concurrency control mechanisms - Distributed deadlocks – Distributed Database Recovery - Distributed Data Security - Web data management - Database Interoperability.

UNIT 3 ADVANCED IN DISTRIBUTED SYSTEMS

Authentication in distributed systems - Protocols based on symmetric cryptosystems - Protocols based on asymmetric cryptosystems - Password-based authentication - Unstructured overlays - Chord distributed hash table - Content addressable networks (CAN) - Tapestry - Some other challenges in P2P system design - Tradeoffs between table storage and route lengths - Graph structures of complex networks - Internet graphs - Generalized random graph networks.

Syllabus

UNIT 4 CURRENT TRENDS IN DISTRIBUTED DATABASE

Data Delivery Alternatives Data Warehousing World Wide Web Push-based Technologies Mobile Databases. Real Application Clusters (RAC) Cloud based databases

TEXT /REFERENCE BOOKS

1. George Coulouris, Jean Dollimore, Tim Kindberg, “Distributed Systems Concepts and Design”, Fifth Edition, Pearson Education Asia, 2012.

2. Ajay D. Kshemkalyani, MukeshSinghal, "Distributed Computing: Principles, Algorithms, and Systems", Cambridge University Press, 2008

Syllabus

DEPARTMENTAL ELECTIVE -3

WEB TECHNOLOGY (CST-027)

L:T:P:: 3:0:0 **Credits-03**

COURSE OBJECTIVES: The objectives of this course are to

1. Understand about client-server communication and protocols used during communication.
2. Design interactive web pages using Scripting languages.
3. Learn server-side programming using servlets and JSP.
4. Develop web pages using XML/XSLT.

COURSE OUTCOMES: On successful completion of this course, the student will be able to:

1. Design simple web pages using mark-up languages like HTML and XHTML.
2. Create dynamic web pages using DHTML and java script that is easy to navigate and use.
3. Program server-side web pages that have to process request from client side web pages.
4. Represent web data using XML and develop web pages using JSP.
5. Understand various web services and how these web services interact.

UNIT-I Introduction to HTML: HTML Common tags- List, Tables, images, forms, Frames; Cascading Style sheets; Introduction to JavaScript: Scripts, Objects in Java Script, Dynamic HTML with Java Script XML: Document type definition, XML Schemas, Document Object model, Presenting XML, Using XML Processors: DOM and SAX

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

UNIT-III Web Servers and Servlets: Tomcat web server, Introduction to Servelets: Lifecycle of a Serverlet, JSDK, The Servelet API, Thejavax.servelet Package, Reading Servelet parameters, Reading Initialization parameters. The javax.servelet HTTP package, Handling Http Request & Responses, Using Cookies-Session Tracking, Security Issues.

UNIT-IV Introduction to JSP: The Problem with Servelet. The Anatomy of a JSP Page, JSP Processing. JSP Application Design with MVC Setting Up and JSP Environment: Installing the Java Software Development Kit, Tomcat Server & Testing Tomcat

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

Control and Date between Pages – Sharing Session and Application Data – Memory Usage Considerations.

TEXT BOOK:

1. Jeffrey C. Jackson, "Web Technologies--A Computer Science Perspective", Pearson Education, 2006.

REFERENCE BOOK:

1. Robert. W. Sebesta, "Programming the World Wide Web", 8thEdition(2022), Pearson Education, 2007.

2. Deitel, Deitel, Goldberg, "Internet & World Wide Web How To Program", Third Edition, Pearson Education, 2006.

3. Marty Hall and Larry Brown, Core Web Programming Second Edition, ‖ ‖ Volume I and II, Pearson Education, 2001.

4. Bates, ―Developing Web Applications‖, Wiley, 2006

Syllabus

DEPARTMENTAL ELECTIVE -3

DIGITAL SIGNAL PROCESSING (ITT-106)

L:T:P:: 3:0:0 **Credits-03**

Objectives:

1. To describe signals mathematically and understand how to perform mathematical operations on signals.
2. It will provide knowledge of Digital filter.
3. To discuss word length issues ,multi rate signal processing and application.

Course Outcomes: the student will be able to :

1. Illustrate digital signals, systems and their significance.
2. Analyse the digital signals using various digital transforms DFT, FFT etc.
3. Design and develop the basic digital system.
4. Interpret the finite word length effects on functioning of digital filters.

UNIT- I: Basic elements of digital signal Processing: Concept of frequency in continuous time and discrete time signals –Sampling theorem – Discrete time signals. Discrete time systems –Analysis of Linear time invariant systems –Z transform –Convolution and correlation.

UNIT- II: Introduction to DFT: Efficient computation of DFT Properties of DFT – FFT algorithms – Radix-2 and Radix-4 FFT algorithms – Decimation in Time – Decimation in Frequency algorithms – Use of FFT algorithms in Linear Filtering and correlation.

UNIT- III Structure of IIR: System Design of Discrete time IIR filter from continuous time filter – IIR filter design by Impulse Invariance. Bilinear transformation – Approximation derivatives – Design of IIR filter in the Frequency domain.

UNIT - IV: Symmetric & Anti-symmetric FIR filters: Linear phase filter – Windowing techniques – rectangular, triangular, Blackman and Kaiser windows – Frequency sampling techniques – Structure for FIR systems.

UNIT-V: Finite word length effects in FIR and IIR digital filters: Quantization, round off errors and overflow errors. Multi rate digital signal processing: Concepts, design of practical sampling rate converters, Decimators, interpolators. Polyphasedecompositions.Application of DSP – Model of Speech Wave Form – Vocoder.

Text Books:

1.Oppenheim A V and Sehafer R W, “Discrete Time Signal Processing”, Prentice Hall (1989).

2. Proakis J G and Manolakis D G, “Digital Signal Processing”, Pearson Education India.

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References books:

1.Oppenheim A V, Willsky A S and Young I T, “Signal & Systems”, Prentice Hall, (1983).

2. Ifeachor and Jervis, “Digital Signal Processing”, Pearson Education India.

3.DeFatta D J, Lucas J G and Hodgkiss W S, “Digital Signal Processing”, J Wiley and Sons, Singapore, 1988

4. Sanjit K Mitra “Digital Signal Processing” TMH

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DEPARTMENTAL ELECTIVE -3

.NET AND C# PROGRAMMING (ITT-107)

L:T:P:: 3:0:0 **Credits-03**

UNIT I Introduction to C#, CLR, Visual studio console app, Simple windows forms, C# language fundamentals, Enumerations, structures, Namespaces

UNIT II C# Object oriented programming: OOPs, Encapsulation, Inheritance, Polymorphism, Object Lifetime, Components, Modules, Windows Forms, Interface, Cloneable objects, Comparable objects, Collections Namepaces Advanced Class Construction: Custom Indexer, Overloading operators, Delegates, Events

UNIT III Assemblies, Thread, and AppDomains: C# assemblies, GAC, threads, contexts, Appdomains, Processes concepts, Concurrency and synchronization- Locks, Monitors, ReaderWriterLock, Mutexes, Thread pooling,

UNIT IV IO, Object serialization and remoting: System.IO, Streams, TextWriter, TextReader, BinaryWirter, BinaryReader, Serialized Object Persistence and formatters, Remoting ADO.Net, C# windows forms for data control: Grid, Datasource and databinding controls, Connected and disconnected scenarios, ADO.Net system, Data, Dataset, connections, Adapters, commands, datareaders,

UNIT V ASP.net: Introduction, Architecture, Web forms,Web servers, Server controls, Data connectivity using ASP.net, Introduction of XML, Using XML with ASP.nat

Text Books

1. A Guide to the Project Management Body of Knowledge (PMBOK), Project Management Institute, PA,

2. Harold Kerzner, Frank P. Saladis, Project Management Workbook and PMP/CAPM Exam Study Guide , Wiley Publishers

3. Addison Wesley –C# Developers Guide to ASP.Net 4. Wiley," Beginning Visual C# 2008", Wrox

Reference Books

1. Claudia M. Baca, Patti, PMP: Project Management Professional Workbook, Sybex, Workbook.

2. C#.Net Developers Guide- Greg Hack, Jason Werry, Saurabh Nandu. (SyngRess)

3. Wrox Press Professional C# 3rd Edition – Simon Robinson, Jay Glynn

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DEPARTMENTAL ELECTIVE -3

SYSTEM AND NETWORK ADMINISTRATION (ITT-108)

L:T:P:: 3:0:0 **Credits-03**

Learning Objective: Introduction To System Administration. SA Components. Server Environment (Microsoft and Linux). Reliable Products, Server Hardware Costing, Maintenance Contracts and Spare Parts, Maintaining Data Integrity, Client Server OS Configuration, Providing Remote Console Access. Comparative Analysis of OS: Important Attributes, Key Features, Pros and Cons. Linux Installation and Verification, Configuring Local Services and Managing Basic System Issues. Administer Users and Groups. Software Management. Managing Network Services and Network Monitoring Tools. Boot Management and Process Management. IP Tables and Filtering. Securing Network Traffic. Advanced File Systems and Logs. Bash Shell Scripting. Configuring Servers (FTP, NFS, Samba, DHCP, DNS and Apache).

Unit 1.

Workstations, The Basics, Loading the OS, Updating the System Software and Applications, Network Configuration, Avoid Using Dynamic DNS with DHCP, The Icing, High Confidence in Completion, Involve Customers in the Standardization Process, A Variety of Standard Configurations

Servers, The Basics, Buy Server Hardware for Servers, Choose Vendors Known for Reliable Products, Understand the Cost of Server Hardware, Consider Maintenance Contracts and Spare Parts, Maintaining Data Integrity, Put Servers in the Data Center, Client Server OS Configuration, Provide Remote Console Access, Mirror Boot Disks, The Icing, Enhancing Reliability and Service Ability, An Alternative: Many Inexpensive Servers

Unit 2

Services, The Basics, Customer Requirements, Operational Requirements, Open Architecture, Simplicity, Vendor Relations, Machine Independence, Environment, Restricted Access, Reliability, Single or Multiple Servers, Centralization and Standards, Performance, Monitoring, Service Rollout, The Icing, Dedicated Machines, Full Redundancy, Dataflow Analysis for Scaling

Data Centers, The Basics, Location, Access, Security, Power and Cooling, Fire Suppression, Racks, Wiring, Labeling, Communication, Console Access, Workbench, Tools and Supplies, Parking Spaces, The Icing, Greater Redundancy, More Space, Ideal Data Centers, Tom’s Dream Data Center, Christine’s Dream Data Center

Unit 3

Networks, The Basics, The OSI Model, Clean Architecture, Network Topologies, Intermediate Distribution Frame, Main Distribution Frame, Demarcation Points, Documentation, Simple Host Routing, Network Devices, Overlay Networks, Number of Vendors, Standards-Based Protocols, Monitoring, Single Administrative Domain, The Icing, Leading Edge versus Reliability, Multiple Administrative Domains, Conclusion, Constants in Networking, Things That Change in Network Design

Namespaces, The Basics, Namespace Policies, Namespace Change Procedures, Centralizing Namespace Management, The Icing, One Huge Database, Further Automation, Customer-Based Updating, Leveraging Namespaces

Unit 4

Disaster Recovery and Data Integrity, The Basics, Definition of a Disaster, Risk Analysis, Legal Obligations, Damage Limitation, Preparation, Data Integrity, The Icing, Redundant Site, Security Disasters, Media Relations
Email Service, The Basics, Privacy Policy, Namespaces, Reliability, Simplicity, Spam and Virus Blocking, Generality, Automation, Basic Monitoring, Redundancy, Scaling, Security Issues, Communication, The Icing, Encryption, Email Retention Policy, Advanced Monitoring, High-Volume List Processing

Unit5

Print Service, The Basics, Level of Centralization, Print Architecture Policy, System Design, Documentation, Monitoring, Environmental Issues, The Icing, Automatic Failover and Load Balancing, Dedicated Clerical Support, Shredding, Dealing with Printer Abuse

Data Storage, he Basics, Terminology, Managing Storage, Storage as a Service, Performance, Evaluating New Storage Solutions, Common Problems, The Icing, Optimizing RAID Usage by Applications, Storage Limits: Disk Access Density Gap, Continuous Data Protection

Unit 6

Backup and Restore, The Basics, Reasons for Restores, Types of Restores, Corporate Guidelines, A Data-Recovery SLA and Policy, The Backup Schedule, Time and Capacity Planning, Consumables Planning, Restore-Process Issues, Backup Automation, Centralization, Tape Inventory, The Icing, Fire Drills, Backup Media and Off-Site Storage, High-Availability Databases, Technology Changes

Web Services, The Basics, Web Service Building Blocks, The Webmaster Role, Service-Level Agreements, Web Service Architectures, Monitoring, Scaling for Web Services, Web Service Security, Content Management, Building the Manageable Generic Web Server, The Icing, Third-Party Web Hosting, Mashup Applications

Recommended Text Books:

1. The Practice of System and Network Administration, Second Edition by Thomas Limoncelli, Christina Hogan and Strata Chalup, Addison-esley Professional; 2nd Edition (2007). ISBN-10: 0321492668

OPEN ELECTIVE -1

TOTAL QUALITY MANAGEMENT (AHT-011)

Syllabus

L: T: P: :3:0:0 **Credits-03**

Course Objectives:

The course should enable the students:
1. To understand the concept of Quality in Manufacturing and Service units.
2. To understand the Implication of Quality in Business.
3. To understand the Organization Structure in TQM.
4. To understand how to implement Quality Programs in an Organization.
5. To have exposure to challenges in Quality Improvement Programs.

Course Outcomes: Upon successful completion of the course, the student will be able to**:**
1. Identify the significance of quality in an organization.
2. Describe how to manage quality improvement teams.
3. Describe how to organize management and quality policies in TQM.
4. Apply the tools of quality improvement programs in an organization.
5. Assess the benefits of implementing TQM Program in an organization.

Unit	Course Content	Lectures
I	**Introduction:** Evolution of Quality, Historical Perspectives, Relationship among Quality, Vision, Mission and Objectives of an Organization, Role of Quality in a Corporate Structure of an Organization, Attributes of Product and Service Quality, Quality Characteristics: Quality of Design, Quality of Performance and Quality of Conformance, Zero Defect and Continuous Improvement.	07
II	**Conceptualization of TQM:** Introduction to Total Quality Management (TQM), Barriers to TQM, Benefits of TQM implementation, Basic Approaches of TQM, TQM Models, Quality Information System and Planning. Importance of TQM in manufacturing and Service Industry.	07
III	**Organization Structure in TQM:** Role of Top Management, Quality Council, Quality Circles, Organization Structure for Quality Circles, Quality Policies, Role of Middle and Lower Management, Problem Solving Techniques.	07
IV	**Tools and Systems for Quality Management:** Basic Tools: Cause & Effect Diagram, Flow Diagrams, Trend Charts, Histogram, Scatter Diagram, Control Chart, Advanced Tools: Affinity Diagram, Inter Relationship Diagram, Tree Diagram, Matrix Diagram, Process Decision Program Chart (PDPC) and Matrix Data Analysis, Fault Tree Analysis, Quality Function Deployment (QFD) Definition and Phases in QFD. Taguchi Approach To Quality System Design, Six - sigma Definition & Implementation Steps, Just In Time Production System, Quality Production through JIT and Kanban, Failure Mode and Effect Analysis (FMEA): Scope, Mode, Illustrative Example and Applications.	10
V	**Quality Assurance:** Causes of Quality Failure, Quality Assurance: Need and Various Elements in Quality Assurance Programme, Quality Control- on Line and off Line, Statistical Concepts in Quality, Chance and Assignable Causes, Bench Making in Quality Management. Implementation and Need of ISO 9000: ISO 9000 - 2000 Quality System: Elements, Registration, Documentation, Implemental Steps, Quality Audit, Product and Process Audit Scope, Steps and Benefits.	09

Books and References

1. Total Quality Management by Dale H Bersterfilled, PHI Publication.
2. Total Quality Management by N.V.R Naidu, G. Rajendra, New Age international Publication.
3. Total Quality Management by L. Sugandhi and Samuel Anand, PHI Publication.
4. Total Quality Management by R.S Naagarazan, New Age International Publication.

Syllabus

OPEN ELECTIVE -1

MANAGING E-COMMERCE AND DIGITAL COMMUNICATION (AHT-012)

L:T:P:: 3:0:0 **Credits-03**

COURSE OBJECTIVES:

The course should enable the students:

1. To understand of concepts and techniques of internet marketing.
2. To study behavior and experience of online customer.
3. To study the various techniques of digital promotion.
4. To find out the opportunities for marketers on digital platform.
5. To understand the role of several e commerce models in customer value creation.

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

1. Understand strategies used in digital marketing.
2. Apply interactive marketing communications to gratify online buyer.
3. Apply digital promotion techniques for marketing of product and services.
4. Evaluate the role of web analytics in social media marketing.
5. Apply and design various e commerce models for e-business.

Unit	Course Content	Lectures
I	**Introduction to digital marketing:** Digital marketing meaning scope and importance, Internet versus traditional marketing. Use of business to consumer and business to internet marketing, internet marketing strategy, Incorporating self-service technologies (SSTs).	08
II	**Online buyer behaviour and models:** marketing mix in online context. Managing online customer experience, planning website design, understanding site user requirement, site design and structure, integrated marketing communications (IIMC), measurement of interactive marketing communication, e-WOM.	08
III	**Digital promotion techniques:** email marketing, strategy to craft email marketing campaign, permission marketing, viral marketing, blogs, search engines marketing (SEM), Search engine optimization, content marketing.	08
IV	**Social media marketing:** designing content for social media marketing, mobile marketing advertising on mobile devices, mobile apps, tracking mobile marketing performance, and introduction to web analytics-meaning types, key metrics and tools.	08
V	**Introduction to e-Commerce and Retailing in Online Space:** advantages of e-Commerce Platforms, Differentiate Show-rooming and Web-rooming, e-tailing, e-Commerce Business Process, Business Models, Interpret e-Commerce Shopping Cart Software & Other Factors of e-Commerce based business, role of aggregators in e-Commerce business.	08

Books and References

1. Kotler, P. and Keller, K.L. (2017) Marketing Management. 15 ° ed . India: Pearson Education .
2. Chaffey, D. and Ellis - Chadwick, F. (2012) . Digital Marketing Strategy. Implementation and Practice. 1st ed. Education

3. Digital Marketing: Cases from India by Rajendra Nargundkar and Romi Sainy, Notion Press, Inc.
4. Understanding Digital Marketing: Marketing Strategies for Engaging the Digital Generation by Damian Rya Publisher.
5. Marketing 4.0: Moving from Traditional to Digital by Philip Kotler, Publisher Wiley.

Syllabus

OPEN ELECTIVE -1

INDUSTRIAL SAFETY AND HAZARD MANAGEMENT (AHT-013)

L:T:P: 3:0:0 **Credits-03**

COURSE OBJECTIVES:

The course should enable the students:

1. To impart knowledge about various aspects of industrial safety and occupational health.
2. To impart knowledge about Occupational Health and Toxicology.
3. To enable the students to identity hazard and assess risk.
4. To understand Acts and Rules of industrial safety and hazard management.
5. To teach about various safety acts and rules along with safety education and training.

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

1. Identify the key aspects of industrial safety and mitigating them.
2. Describe various types of solution to problems arising in safety operations and hygiene.
3. Apply principles of OSHA in controlling industrial disasters and losses.
4. Identify various Acts and Rules of industrial safety and hazard management.
5. Assess the overall performance of safety protocols of chemical industries and hazard management.

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Unit	Course Content	Lectures
I	**Concepts and Techniques:** History of safety movement -Evolution of modern safety concept - Incident Recall Technique (IRT), disaster control, safety analysis, safety survey,safety inspection, safety sampling. Safety Audits - components of safety audit, types of audit,audit methodology, non - conformity reporting (NCR), audit checklist- identification of unsafe acts of workers and unsafe conditions in the industry.	08
II	**Occupational Health and Toxicology:** Concept and spectrum of health, functional units and activities of occupational health services, occupational related diseases and levels of prevention of diseases. Toxicology- local, systemic and chronic effects, temporary and cumulative effects, carcinogens entry into human systems.	08
III	**Hazard Identification and Risk Assessment:** The process of risk management, hazard identification, evaluation (risk assessment, risk matrix), risk control implementation, action and recommendation.	08
IV	**Acts and Rules**: Indian boiler Act 1923, static and mobile pressure vessel rules (SMPV). motor vehicle rules, mines act 1952, workman compensation act, rules - electricity act and rules - hazardous wastes (management and handing) rules, 1989, with amendments in 2000 the building and other construction workers act 1996, Petroleum rules, Explosives Act 1963 Pesticides Act. Factories Act 1948 Air Act 1981 and Water Act 1974.	08
V	**Safety Education and Training:** importance of training - identification of training needs training methods - programmes, seminars, conferences, competitions - method of promoting sale practice motivation communication - role of government agencies and private consulting agencies in safety training creating awareness, awards, celebrations, safety posters, safety displays, safety pledge, safety incentive scheme, safety campaign - domestic Safety and Training.	08

Books and References

1. Industrial Accident Prevention by H.W Heinrich, McGraw - Hi 1980.
2. Safety Management in industry by NV. Krishnan, Jaico Publishing House, Bombay, 1997.
3. Loss Prevention in Process Industries by FP Lees, Butterworth London, 1990.
4. Safety at Work by J.R. Ridey Butterwort London 1983.

Syllabus

OPERATING SYSTEMS LAB (CSP-016)

L:T:P:: 0:0:2 **Credits-01**

COURSE OBJECTIVES: The objectives of this course are to

1. Learn Unix commands and shell programming.
2. Implement various CPU Scheduling Algorithms and Process Creation and Inter Process Communication.
3. Implement Deadlock Avoidance and Deadlock Detection Algorithms.
4. Implement Page Replacement Algorithms, File Organization and File Allocation Strategies.

COURSE OUTCOMES: On successful completion of the course, the students will be able to

1. Understand the system calls and I/O system calls in UNIX
2. Evaluate the process scheduling algorithms FCFS, SJF, Priority and Round robin
3. Simulate the process of communication through various techniques
4. Simulate memory management schemes
5. Simulate File Allocation Techniques

LIST OF EXPERIMENTS

1. Write programs using the following system calls of UNIX operating system: fork, exec, getpid, exit, wait, stat, opendir, readdir
2. Write programs using the I/O system calls of UNIX operating system (open, read, write, etc)
3. Write C programs to simulate UNIX commands like ls, grep, etc.
4. Given the list of processes, their CPU burst times and arrival times, display/print the Gantt chart for FCFS and SJF. For each of the scheduling policies, compute and print the average waiting time and average turnaround time (2 sessions)
5. Given the list of processes, their CPU burst times and arrival times, display/print the Gantt chart for Priority and Round robin. For each scheduling policy, compute and print the average waiting and turnaround times (2 Sessions).
6. Developing Applications using Inter Process communication (using shared memory and pipes)
7. Simulate the Producer-Consumer problem using semaphores (using UNIX system calls).
8. Simulate First fit, best fit and Worst fit memory management algorithms.
9. Simulate Page Replacement Algorithms (FIFO, LRU and Optimal)
10. Simulate the Paging memory management scheme

Syllabus

COMPUTER NETWORKS LAB (CSP-014)

L: T: P:: 0:0:2 **Credits-01**

COURSE OBJECTIVES: The objectives of this course are to

1. Equip the students with a general overview of the concepts and fundamentals of computer networks.
2. Familiarize the students with the standard models for the layered approach to communication between machines in a network and the protocols of the various layers.

COURSE OUTCOMES: On Completion of this course, the students will be able to

1. Learn about hardware component like RJ-45 connector, CAT-6 Cable etc.
2. Implement the various services of data link layer.
3. Configuration of router, hub, switch etc
4. Configuration of server in programming mode they will learn about socket programming, client server programming for deeply understanding TCP/ IP model and various protocols.
5. Configure their own Network management systems in simulation area, they will work on Cisco networking, NS-2 or NS-3 tools for more clear understanding about computer network.

LIST OF PRACTICALS

1. Installation and configuration of NS2 and Qual Net
2. Creating a network: nodes, links and queues, Creating connections, traffic and computing routers Insertion of errors and analysis of trace file.
3. Study of basic network command and network configuration commands.
4. Simple project on NS2 – wired, wireless and combination of wired and wireless
5. Implementation of new protocols in NS2
6. Simulation study of pure ALOHA protocol;
7. Simulation study of slotted ALOHA protocol;
8. Simulation study of Token Bus LAN protocol;
9. Simulation study of Token Ring LAN protocol;
10. Simulation study of WAN protocol like Frame Relay, X. 25
11. Study of 802. 11 wireless LAN protocols.
12. Implement the Distance Vector Routing protocol for finding the shortest path.
13. Write a program to connect server with client and passes information from one system to another and vice versa that by creating / establishing connection.

Syllabus

WEB TECHNOLOGY LAB (ITP-103)

L: T: P:: 0:0:2 **Credits-01**

List of Experiments:

1. Write an HTML code to display your education details in a tabular format.
2. Write an HTML code to display your CV on a web page.
3. Write an HTML code to create a Home page having three links: About Us, Our Services and Contact Us. Create separate web pages for the three links.
4. Write an HTML code to create a login form. On submitting the form, the user should get navigated to a profile page.
5. Write an HTML code to create a Registration Form. On submitting the form, the user should be asked to login with this new credentials.
6. Write an HTML code to create your Institute website, Department Website and Tutorial website for specific subject.
7. Write an HTML code to illustrate the usage of the following: • Ordered List • Unordered List • Definition List
8. Write an HTML code to create a frameset having header, navigation and content sections.
9. Write an HTML code to demonstrate the usage of inline CSS.
10. Write an HTML code to demonstrate the usage of internal CSS.
11. Write an HTML code to demonstrate the usage of external CSS.
12. Write a Java script to prompt for users name and display it on the screen.
13. Design HTML form for keeping student record and validate it using Java script.
14. Write an HTML program to design an entry form of student details and send it to store at database server like SQL, Oracle or MS Access.
15. Write programs using Java script for Web Page to display browsers information.
16. Create an applet which will have a line, an Oval & a Rectangle
17. Writing program in XML and create a style sheet in CSS & display the document in internet explorer.
18. Write an XML program to display products
19. Write a program using PHP and HTML to create a form and display the details entered by the user

Syllabus

HAPPINESS AND WELL-BEING (AHT-014)

L:T:P: 2:0:0 **Credits-0**

COURSE OBJECTIVES: The objectives of this course are:

1. To obtain a basic understanding of Positive emotions, strengths and virtues; the concepts and determinants of happiness and well-being.
2. To bring an experience marked by predominance of positive emotions and informing them about emerging paradigm of Positive Psychology
3. Build relevant competencies for experiencing and sharing happiness as lived experience and its implication.
4. To become aware of contextual and cultural influences on health and happiness.

COURSE OUTCOMES: On successful completion of the course, the students will be able to

1. Provide an insight to see the importance of positive emotions, Strength and Virtues in everyday life and society.
2. Use the strength and virtues in improving human behavior and mental health.
3. Understand the biological, social, psychological and spiritual determinants of Happiness and well-being.
4. Light on research findings related to effects of happiness and well-being on mental illness and stress.
5. Give an insight of the Indian philosophy of happiness and life satisfaction in context of Karma, Moksha and destiny and role of socio-demographic and cultural factors in Happiness and well-being.
6. Establish work life balance in an individual's life.

UNIT I: Introduction to Positive Psychology

Importance of positive emotions in everyday life and society, Positive Emotions and well being: Hope & Optimism, Love. The Positive Psychology of Emotional Intelligence, Influence of Positive Emotions Strength and Virtues; implications for human behavior and mental health.

UNIT II: Happiness

Determinants of Happiness and well-being – biological, social, psychological and spiritual, Types of happiness- Eudaimonic and Hedonic, Traits associated with Happiness, Setting Goals for Life and Happiness, Research findings on effects of happiness and well-being on mental illness and stress.

Syllabus

UNIT III: Resilience and Well Being

Meaning, Nature and Approaches Theories of Resilience, Positive Response to loss, Post Traumatic Growth, Models of PTG as Outcome, Models of PTG as a Coping Strategy Benefit Finding, Mindfulness and Positive Thinking, Building Resilience and Wellbeing.

UNIT IV: Happiness and Well-being in the Indian context

Indian philosophy of happiness and life satisfaction. – Karma, Moksha and destiny. theory of happiness and wellbeing in Taittiriya Upanishad, Role of socio-demographic and cultural factors in Happiness and well-being. Health and Happiness in contemporary India – rural and urban differences and similarities.

UNIT V: Positive work life

Employee engagement- what causes individuals to join an organization and why they stay or leave, person-centered approach to engagement Understand the concept of work as meaning, Impact of employee well-being on the organization and impact of feelings about work on the individual's well-being. Bringing Positive Psychology to Organizational Psychology

SUGGESTED READINGS:

1. Dandekar, R. N. (1963). On dharma. In De Bary (ed.) Sources of Indian Tradition. Delhi, India: Motilal Banarasidass Publishers.
2. Dandekar R. N. (1981). Exercises in Indology. Delhi, India: Ajanta Publishers.
3. Snyder, C.R., &Lopez,S.J.(2007). Positive psychology: The scientific and practical explorations of human strengths. Thousand Oaks, CA: Sage. Snyder, C. R., & Lopez, S. (Eds.). (2002). Handbook of positive psychology. New York: Oxford University Press.
4. Seligman, M. (2011). Flourish: A Visionary New Understanding of Happiness and Well-being, Atria Books.
5. Peterson, C. A. (2006). A Primer in Positive Psychology, Oxford University Press.
6. Nettle, D.S. (2006). Happiness: The Science Behind Your Smile, Oxford University Press.
7. Lyubomirsky, S. (2013). The Myths of Happiness: What Should Make You Happy, but Doesn't, What Shouldn't Make You Happy, but Does, Penguin

Syllabus

VEER MADHO SINGH BHANDARI UTTARAKHAND TECHNICAL UNIVERSITY

(Formerly Uttarakhand Technical University, Dehradun Established by Uttarakhand State Govt. wide Act no. 415 of 2005)
Suddhowala, PO-Chandanwadi, Premnagar, Dehradun, Uttarakhand (Website- www.uktech.ac.in)

SYLLABUS

For

B.TECH

(Information Technology)

4th Year

Effective From – Session 2025-26

EFFECTIVE FROM 2025-26

B.Tech. (Information Technology) (w.e.f. 2025-26)												
SEMESTER-VII												
Sl. No.	**Subject Codes**	**Category**	**Subject**	**Periods**			**Evaluation Scheme**					**Subject Total**	**Credit**
							Sessional Exam			**ESE**			
				L	**T**	**P**	**CT**	**TA**	**Total**	**TE**	**PE**		
1	AHT-015/ AHT-016	HSC	HSMC -1 / HSMC-2	3	0	0	30	20	50	100		150	3
2	CST-0XX	DE	Departmental Elective-4	3	0	0	30	20	50	100		150	3
3	CST-0XX	DE	Departmental Elective-5	3	0	0	30	20	50	100		150	3
4		OE	Open Elective-2	3	0	0	30	20	50	100		150	3
5	ITP-104	DLC	Project Seminar	0	0	2			50			50	1
6	ITP-105	DLC	Design Project	0	0	4			100			100	2
7	ITP-106	DLC	Mini Project-III or Internship-III*	0	0	2			50			50	1
8	AHT-017	MC	Disaster Management	3	0	0	30	20	50	100		150	3
9	AHT-018	NC	Innovations and Problem Solving (Audit Course)	2	1	0	15	10	25	50		-	-
10	GP-07	NC	General Proficiency						50			-	-
			Total	**17**	**1**	**8**						**950**	**19**
11	**Minor Course (Optional)****			3	1	0	30	20	50	50		150	4
*The Internship-III (4-6 weeks) conducted during summer break after VI semester and will be assessed during VII semester													

Departmental Elective - 4		**Departmental Elective - 5**	
ITT-109	Social Network Analysis	CST-042	Digital Image Processing
CST-043	Big data Analysis	ITT-112	Advanced System and Network Administration
ITT-110	Web App Development Using Net	CST-022	Artificial Intelligence
CST-018	Real Time System	CST-037	Cloud Computing
ITT-111	Information Theory and Coding	ITT-113	E-Commerce And M-Commerce

HSMC-1	AHT-015	Rural Development, Administration and Planning
HSMC-2	AHT-016	Project Management & Entrepreneurship

Open Elective-2: (This course can be taken only by the students of branches other than CSE and specialized branches of CSE in VII Semester. Student of CSE and specialized branches of CSE shall opt open electives offered by other departments)

Subject code	Subject name
CSO-051	Computer Network

** **Minor Course (Optional): Select any subject from Annexure-II from other department**

Abbreviations: L-No. of Lecture hours per week, T-No. of Tutorial hours per week, P-No. of Practical hours per week, CT- Class Test Marks, TA-Marks of teacher's assessment including student's class performance and attendance, PS-Practical Sessional Marks, ESE-End Semester Examination, TE-Theory Examination Marks, PE- Practical External Examination Marks

1 Hr Lecture 1 Credit | 1 Hr Tutorial 1 Credit | 2 or 3 Hr Practical 1 Credit

EFFECTIVE FROM 2025-26

B.Tech. (Information Technology) (w.e.f. 2025-26)													
SEMESTER-VIII													
Sl. No.	**Subject Codes**	**Category**	**Subject**	**Periods**			**Evaluation Scheme**					**Subject Total**	**Credit**
							Sessional Exam			**ESE**			
				L	**T**	**P**	**CT**	**TA**	**Total**	**TE**	**PE**		
1	AHT-016/ AHT-015	HSC	HSMC -2 / HSMC-1	3	0	0	30	20	50	100		150	3
2	CST-0XX	DE	Departmental Elective-6	3	0	0	30	20	50	100		150	3
3		OE	Open Elective-3	3	0	0	30	20	50	100		150	3
4		OE	Open Elective-4	3	0	0	30	20	50	100		150	3
5	ITP-107	DLC	Project	0	0	12			100		200	300	6
6	GP-08	NC	General Proficiency						50			-	-
			Total	**12**	**0**	**12**						**900**	**18**
7	**Minor Course (Optional)****			3	1	0	30	20	50	50	100	150	4

Subject code	Departmental Elective - 6
CST-024	Internet of Things
CST-029	ADHOC and Sensor Networks
CST-030	Machine Learning
CST-040	Software Project Management
ITT-114	Information Security

Open Elective-3 and Open Elective-4: (This course can be taken only by the students of branches other than CSE and specialized branches of CSE in VIII Semester. Students of CSE and specialized branches of CSE shall opt open electives offered by other departments)

Open Elective-3		Open Elective-4	
CSO-052	Software Engineering	CSO-053	Object Oriented Programming

** **Minor Course (Optional): Select any subject from Annexure-II from other department**

Abbreviations: L-No. of Lecture hours per week, T-No. of Tutorial hours per week, P-No. of Practical hours per week, CT- Class Test Marks, TA-Marks of teacher's assessment including student's class performance and attendance, PS-Practical Sessional Marks, ESE-End Semester Examination, TE-Theory Examination Marks, PE- Practical External Examination Marks

1 Hr Lecture	1 Hr Tutorial	2 or 3 Hr Practical
1 Credit	1 Credit	1 Credit

Syllabus

RURAL DEVELOPMENT: ADMINISTRATION AND PLANNING (AHT-015)

L:T:P:: 3:1:0 **Credits-03**

Course Objectives

This course enables the students to:

1. Gain knowledge on the concepts related to administration, its importance and various approaches of Development Administration.
2. Gain skills on New Public Management, Public Grievances and Redressal Mechanisms, Accountability and Transparency in Administration and e-governance in the rural development sector.
3. Develop their competency on the role of Bureaucracy in Rural Development.

Course Outcomes

After completion of the course student will be able to:

1. Students can understand the definitions, concepts and components of Rural Development.
2. Students will know the importance, structure, significance, resources of Indian rural economy.
3. Students will have a clear idea about the area development programmes and its impact.
4. Students will be able to acquire knowledge about rural entrepreneurship.
5. Students will be able to understand about the using of different methods for human resource planning.

Course Contents

UNIT-I: **(8 hours)**

Rural Planning & Development: Concepts of Rural Development, Basic elements of rural Development, and Importance of Rural Development for creation of Sustainable Livelihoods, An overview of Policies and Programmes for Rural Development- Programmes in the agricultural sector, Programmes in the Social Security, Programmes in area of Social Sector.

UNIT-II: **(8 hours)**

Rural Development Programmes: Sriniketan experiment, Gurgaon experiment, Marthandam experiment, Baroda experiment, Firkha development scheme, Etawapilot project, Nilokheri experiment, approaches to rural community development: Tagore, Gandhi etc.

UNIT-III: **(8 hours)**

Panchayati Raj & Rural Administration: Administrative Structure: bureaucracy, structure of administration; Panchayati Raj Institutions Emergence and Growth of Panchayati Raj Institutions in India; People and Panchayati Raj; Financial Organizations in Panchayati Raj Institutions, Structure of rural finance, Government & Non-Government Organizations / Community Based Organizations, Concept of Self help group.

UNIT-IV: **(8 hours)**

Human Resource Development in Rural Sector: Need for Human Resource Development, Elements of Human Resource Development in Rural Sector Dimensions of HRD for rural development-Health, Education, Energy, Skill Development, Training, Nutritional Status access to basic amenities – Population composition.

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UNIT-V: **(8 hours)**

Rural Industrialization and Entrepreneurship: Concept of Rural Industrialization, Gandhian approach to Rural Industrialization, Appropriate Technology for Rural Industries, Entrepreneurship and Rural Industrialization- Problems and diagnosis of Rural Entrepreneurship in India, with special reference to Women Entrepreneurship; Development of Small Entrepreneurs in India, need for and scope of entrepreneurship in Rural area.

Text Books/References:

1. Corporate Social Responsibility: An Ethical Approach - Mark S. Schwartz.
2. Katar Singh: Rural Development in India – Theory History and Policy.
3. Todaro M.P. Economic Development in III World war.
4. Arora R.C – Integrated Rural Development in India.
5. Dhandekar V.M and Rath N poverty in India.
6. A.N.Agarwal and Kundana Lal: Rural Economy of India
7. B.K.Prasad: Rural Development-Sarup& Son's Publications.

Syllabus

PROJECT MANAGEMENT & ENTREPRENEURSHIP (AHT-016)

L:T:P:: 3:1:0 **Credits-03**

COURSE OBJECTIVES:

The course should enable the students to:

1 Understand the concepts of Project Management for planning to execution of projects.
2 Understand the feasibility analysis in Project Management and network analysis tools for cost and time estimation.
3 Be capable to analyze, apply and appreciate contemporary project management tools and methodologies in Indian context.
4 Understand the concepts of Entrepreneurship, role of entrepreneur in economic development, steps for establishing an enterprise.

COURSE OUTCOMES:

After completion of the course student will be able to:

1. Understand project characteristics and various stages of a project.
2. Understand the conceptual clarity about project organization and feasibility analyses – Market, Technical, Financial and Economic.
3. Analyze the learning and understand techniques for Project planning, scheduling and Execution Control.
4. Describe Entrepreneurship, Examine role of entrepreneur in economic development.
5. Describe the steps to establish an enterprise.

UNIT-I: **(8 hours)**

Entrepreneurship: Entrepreneurship: need, scope , Entrepreneurial competencies & traits, Factors affecting entrepreneurial development, Entrepreneurial motivation (Mc Clellend's Achievement motivation theory), conceptual model of entrepreneurship , entrepreneur vs. intrapreneur; Classification of entrepreneurs; Entrepreneurial Development Programmes.

UNIT-II **(8 hours)**

Entrepreneurial Idea and Innovation: Introduction to Innovation, Entrepreneurial Idea Generation and Identifying Business Opportunities, Management skills for Entrepreneurs and managing for Value Creation, Creating and Sustaining Enterprising Model & Organizational Effectiveness.

UNIT-III: **(8 hours)**

Project Management: Project management: meaning, scope & importance, role of project manager; project life-cycle Project appraisal: Preparation of a real time project feasibility report containing Technical appraisal, Environmental appraisal, Market appraisal (including market survey for forecasting future demand and sales) and Managerial appraisal.

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UNIT-IV **(8 hours)**

Project Financing: Project cost estimation & working capital requirements, sources of funds, capital budgeting, Risk & uncertainty in project evaluation , preparation of projected financial statements viz. Projected balance sheet, projected income statement, projected funds & cash flow statements, Preparation of detailed project report, Project finance.

UNIT-V: **(8 hours)**

Social Entrepreneurship: Social Sector Perspectives and Social Entrepreneurship, Social Entrepreneurship Opportunities and Successful Models, Social Innovations and Sustainability, Marketing Management for Social Ventures, Risk Management in Social Enterprises, Legal Framework for Social Ventures.

Case study and presentations: Case study of successful and failed entrepreneurs. Power point presentation on current business opportunities..

Text Book:

1. Innovation and Entrepreneurship by Drucker, P.F.; Harperand Row.
2. Business, Entrepreneurship and Management: Rao, V.S.P.;Vikas
3. Entrepreneurship: Roy Rajeev.
4. TextBookofProjectManagement:Gopalkrishnan,P.andRamamoorthy,V.E.;McMill.
5. Project Management for Engineering, Business and Technology: Nicholas, J.M., and Steyn, H.;PHI.
6. Project Management: The Managerial Process: Gray, C.F., Larson, E.W. and Desai, G.V.;MGH.

Syllabus

DEPARTMENTAL ELECTIVE -4

SOCIAL NETWORK ANALYSIS (ITT-109)

L:T:P:: 3:0:0 **Credits-03**

Course Objectives: This course covers data analysis on social networks, focusing on ways to handle large-scale networks efficiently. It provides the main theoretical results in social network mining as well as hands-on practice on key issues in the area.

Course Outcomes: By completing the course the students will be able to:

• understand the basic concepts of social networks

• understand the fundamental concepts in analyzing the large-scale data that are derived from social networks

• implement mining algorithms for social networks

• perform mining on large social networks and illustrate the results.

Unit 1: Introduction to Social Network Mining, Graph Models and Node Metrics

• Introduction to social network mining. Illustration of various social network mining tasks with real-world examples. Data characteristics unique to these settings and potential biases due to them. • Social Networks as Graphs. • Random graph models/ graph generators (Erd¨os-R´enyi, power law, preferential attachment, small world, stochastic block models, kronecker graphs), degree distributions. Models of evolving networks. • Node based metrics, ranking algorithms (Pagerank). • Gephi graph visualization and exploration software – practice.

Unit 2: Social-Network Graph Analysis

• Social network exploration/ processing: graph kernels, graph classification, clustering of social-network graphs, centrality measures, community detection and mining, degeneracy (outlier detection and centrality), partitioning of graphs. • SNAP system for large networks analysis and manipulation. • Assignment on SNAP. **Unit 3: Social-Network Graph Analysis and Properties**

• Social network exploration/ processing and properties: Finding overlapping communities, similarity between graph nodes, counting triangles in graphs, neighborhood properties of graphs. • Pregel paradigm and Apache Giraph graph processing system. • Assignment on Giraph.

Unit 4: Information Diffusion in Social Networks • Strategic network formation: game theoretic models for network creation/ user behavior in social networks. • Information diffusion in graphs: Cascading behavior, spreading, epidemics, heterogeneous social network mining, influence maximization, outbreak detection. • Opinion analysis on social networks: Contagion, opinion formation, coordination and cooperation. • Assignment on Gephi.

Unit 5: Dynamic Social Networks, Applications and Research Trends • Dynamic social networks, Link

prediction, Social learning on networks. • Special issues in Information and Biological networks. • Important applications of social network mining related to the above topics. Research trends.

Related Books

• David Easley and Jon Kleinberg, Networks, crowds, and markets, Cambridge University Press, 2010.

• Jure Leskovec, Anand Rajaraman and Jeffrey David Ullman, Mining of massive datasets, Cambridge University Press, 2014.

Syllabus

DEPARTMENTAL ELECTIVE -4

BIG DATA ANALYSIS (CST-043)

L:T:P:: 3:0:0 **Credits-03**

COURSE OBJECTIVES: The objectives of the course are to

1. Make students comfortable with tools and techniques required in handling large amounts of datasets.
2. Uncover various terminologies and techniques used in Big Data.
3. Use several tools publicly available to illustrate the application of these techniques.
4. Know about the research that requires the integration of large amounts of data.

COURSE OUTCOMES: On successful completion of this course, the students will be able to

1. Identify and distinguish big data analytics applications.
2. Design efficient algorithms for mining the data from large volumes.
3. Analyze the HADOOP and Map Reduce technologies associated with big data analytics.
4. Understand the fundamentals of various big data analytics techniques.
5. Present cases involving big data analytics in solving practical problems.

UNIT – I

Introduction to big data: Introduction to Big Data Platform – Challenges of Conventional Systems - Intelligent data analysis – Nature of Data - Analytic Processes and Tools - Analysis vs Reporting.

UNIT – II

Mining data streams: Introduction to Streams Concepts – Stream Data Model and Architecture - Stream Computing - Sampling Data in a Stream – Filtering Streams –Counting Distinct Elements in a Stream – Estimating Moments – Counting Oneness ina Window – Decaying Window - Real time Analytics Platform(RTAP) Applications – Case Studies - Real Time Sentiment Analysis- Stock Market Predictions.

UNIT – III

Hadoop: History of Hadoop- the Hadoop Distributed File System – Components of Hadoop Analyzing the Data with Hadoop- Scaling Out- Hadoop Streaming- Design of HDFS-Java interfaces to HDFS Basics- Developing a Map Reduce Application-How Map Reduce Works-Anatomy of a Map Reduce Job Run-Failures-Job Scheduling-Shuffle and Sort – Task execution - Map Reduce Types and Formats- Map Reduce Features-Hadoop environment.

UNIT – IV

Frameworks: Applications on Big Data Using Pig and Hive – Data processing operatorsin Pig – Hive services – HiveQL – Querying Data in Hive - fundamentals of HBase and Zookeeper - IBM Infosphere Big Insights and

Streams.

UNIT – V

Predictive Analytics- Simple linear regression- Multiple linear regression- Interpretation of regression coefficients. Visualizations - Visual data analysis techniques- interaction techniques - Systems and applications.

TEXTBOOKS:

1. Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.
2. Tom White "Hadoop: The Definitive Guide" Third Edition, O'reilly Media, 2012.
3. Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, "Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data", McGrawHill Publishing, 2012.
4. Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", CUP, 2012.
5. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", John Wiley& sons, 2012.

REFERENCE BOOKS:

1. Michael Minelli, Michele Chambers, and Ambiga Dhiraj, Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses, Wiley,2013.
2. Frank J. Ohlhorst, Big Data Analytics: Turning Big Data into Big Money, Wiley, 2012.
3. Arvind Sathi, Big Data Analytics: Disruptive Technologies for Changing the Game, MC Press, 2012.
4. Glenn J. Myatt, "Making Sense of Data", John Wiley & Sons, 2007.
5. Pete Warden, "Big Data Glossary", O'Reilly, 2011.
6. Jeffrey Aven, Hadoop in 24 hours, person education 2018.
7. Jiawei Han, Micheline Kamber "Data Mining Concepts and Techniques", 2nd Edition, Elsevier, Reprinted 2008.
8. Da Ruan, Guoquing Chen, Etienne E.Kerre, Geert Wets, "Intelligent Data Mining", Springer, 2007.
9. Paul Zikopoulos, Dirkde Roos, Krishnan Parasuraman, Thomas Deutsch, James Giles , David Corrigan, "Harness the Power of Big Data The IBM Big Data Platform", Tata McGraw Hill Publications, 2012.
10. Arshdeep Bahga, Vijay Madisetti, "Big Data Science & Analytics: A Hands- On Approach ",VPT, 2016
11. Bart Baesens "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications (WILEY Big Data Series)", John Wiley & Sons,2014.

DEPARTMENTAL ELECTIVE -4

WEB APP DEVELOPMENT USING .NET (ITT-110)

L:T:P:: 3:0:0 **Credits-03**

COURSE OBJECTIVES: To enable the students to

- To learn about basic features of ASP.NET and its controls
- To create an ASP.NET application using standard .NET Controls
- To learn about connecting data sources using ADO.NET and managing them.

COURSE OUTCOMES: Upon the completion of the course students will be able to

- able to design web applications using ASP.NET
- able to use ASP.NET controls in web applications
- able to create database driven ASP.NET web applications and web services

Unit 1 Introducing .NET: The .NET Framework, C#, VB, and the .NET Languages, The Common Language Runtime, The .NET Class Library.

The C# Language: C# Language Basics, Variables and Data Types, Variable Operations, Object-Based Manipulation, Conditional Logic, Loops, Methods.

Types, Objects, and Namespaces: The Basics About Classes, Building a Basic Class, Value Types and Reference Types, Understanding Namespaces and Assemblies, Advanced Class Programming.

Unit 2 Web Form Fundamentals: Writing Code, Using the Code-Behind Class, Adding Event Handlers, Understanding the Anatomy of an ASP.NET Application, Introducing Server Controls, Using the Page Class, Using Application Events, Configuring an ASP.NET Application.

Form Controls: Stepping Up to Web Controls, Web Control Classes, List Controls, Table Controls, Web Control Events and AutoPostBack, Validation, Understanding Validation, Using the Validation Controls, Rich Controls, The Calendar, The AdRotator, Pages with Multiple Views, User Controls and Graphics, User Controls, Dynamic Graphics, The Chart Control, Website Navigation: Site Maps, URL Mapping and Routing, The SiteMapPath Control, The TreeView Control, The Menu Control.

Unit 3 Error Handling, Logging, and Tracing: Avoiding Common Errors, Understanding Exception Handling, Handling Exceptions, Throwing Your Own Exceptions, Using Page Tracing

State Management: Understanding the Problem of State, Using View State, Transferring Information Between Pages, Using Cookies, Managing Session State, Configuring Session State, Using Application State, Comparing State Management Options

Styles, Themes, and Master Pages: Styles, Themes, Master Page Basics, Advanced Master Pages,

Syllabus

Unit 4 ADO.NET Fundamentals: Understanding Databases, Configuring Your Database, Understanding SQL Basics, Understanding the Data Provider Model, Using Direct Data Access, Using Disconnected Data Access.

Data Binding: Introducing Data Binding, Using Single-Value Data Binding, Using Repeated-Value Data Binding, Working with Data Source Controls,

The Data Controls: The GridView, Formatting the GridView, selecting a GridView Row, Editing with the GridView, Sorting and Paging the GridView, Using GridView Templates, The DetailsView and FormView

Unit 5: XML: XML Explained, The XML Classes, XML Validation, XML Display and Transforms.

Security Fundamentals: Understanding Security Requirements, Authentication and Authorization, Forms Authentication, Windows Authentication.

ASP.NET AJAX: Understanding Ajax, Using Partial Refreshes, Using Progress Notification, Implementing Timed Refreshes, Working with the ASP.NET AJAX Control Toolkit.

Books and References:

1. Beginning ASP.NET 4.5 in C# Matthew MacDonald Apress 2012
2. C# 2015 Anne Bohem and Joel Murach Murach Third 2016
3. Murach's ASP.NET 4.6 Web Programming in C#, 2015, Mary Delamater and Anne Bohem SPD Sixth 2016
4. ASP.NET 4.0 programming, J. Kanjilal Tata McGrawHill, 2011
5. Programming ASP.NET D.Esposito Microsoft, Press, (Dreamtech), 2011
6. Beginning Visual C#,2010,K. Watson, C. Nagel,,J.H Padderson, J.D. Reid, M.Skinner Wrox (Wiley) 2010

Syllabus

DEPARTMENTAL ELECTIVE -4

REAL-TIME SYSTEM (CST-018)

L:T:P:: 3:0:0 **Credits-03**

COURSE OBJECTIVES: The objectives of this course are to

1. Develop an understanding of various Real Time systems Application
2. Obtain a broad understanding of the technologies and applications for the emerging and exciting domain of real-time systems
3. Get in-depth hands-on experience in designing and developing a real operational system.

COURSE OUTCOMES: On successful completion of the course, the student will be able to

1. Grasp a fundamental understanding of goals, components, and evolution of real time systems.
2. Explain the concepts of real time scheduling.
3. Learn the scheduling policies of modern operating systems.
4. Understand the resource access control techniques in real time systems.
5. Understand the concept of real time communication.

Unit 1-Introduction: Definition, Typical Real Time Applications: Digital Control, High Level Controls, Signal Processing etc., Release Times, Deadlines, and Timing Constraints, Hard Real Time Systems and Soft Real Time Systems, Reference Models for Real Time Systems: Processors and Resources, Temporal Parameters of Real Time Workload, Periodic Task Model, Precedence Constraints and Data Dependency.

Unit 2-Real Time Scheduling: Common Approaches to Real Time Scheduling: Clock Driven Approach, Weighted Round Robin Approach, Priority Driven Approach, Dynamic Versus Static Systems, Optimality of Effective-Deadline-First (EDF) and Least-Slack-Time-First (LST) Algorithms, Offline Versus Online Scheduling, Scheduling Aperiodic and Sporadic jobs in Priority Driven and Clock Driven Systems.

Unit 3-Resources Access Control: Effect of Resource Contention and Resource Access Control (RAC), Nonpreemptive Critical Sections, Basic Priority-Inheritance and Priority-Ceiling Protocols, Stack Based PriorityCeiling Protocol, Use of Priority-Ceiling Protocol in Dynamic Priority Systems, PreemptionCeiling Protocol,Access Control in Multiple-Unit Resources, Controlling ConcurrentAccesses to Data Objects.

Unit 4-Multiprocessor System Environment: Multiprocessor and Distributed System Model, Multiprocessor Priority-Ceiling Protocol,Schedulability of Fixed-Priority End-to-End Periodic Tasks, Scheduling Algorithms

for End-to-End Periodic Tasks, End-to-End Tasks in Heterogeneous Systems, Predictability and Validation of Dynamic Multiprocessor Systems, Scheduling of Tasks with Temporal Distance Constraints.

Unit 5-Real Time Communication: Model of Real Time Communication, Priority-Based Service and Weighted Round-Robin Service Disciplines for Switched Networks, Medium Access Control Protocols for Broadcast Networks, Internet and Resource Reservation Protocols, Real Time Protocols, Communication in Multicomputer System, An Overview of Real Time Operating Systems.

TEXTBOOKS:

1. Real Time Systems – Jane W. S. Liu, Pearson Education Publication.
2. Real-Time Systems Design and Analysis, Phillip. A. Laplante, second edition, PHI, 2005.

REFERENCE BOOKS:

1. Real Time Systems – Mall Rajib, Pearson Education
2. Real-Time Systems: Scheduling, Analysis, and Verification – Albert M. K. Cheng, Wiley.

Syllabus

DEPARTMENTAL ELECTIVE -4

INFORMATION THEORY AND CODING (ITT-111)

L:T:P:: 3:0:0 **Credits-03**

Course Objectives : After the completion of this course, students will be able to:

1. To understand the role of information theory for an efficient, error-free and secure delivery of information using binary data streams.
2. To have a complete understanding of error-control coding.
3. To understand encoding and decoding of digital data streams.
4. To introduce methods for the generation of these codes and their decoding techniques.
5. To have a detailed knowledge of compression and decompression techniques.
6. To evaluate the performance of various coding techniques over noisy communication channels.

Course Outcomes : After the completion of this course, students will be able to:

1. To be able to understand the principles behind an efficient, correct and secure transmission of digital data stream.
2. To be familiar with the basics of error-coding techniques.
3. To have knowledge about the encoding and decoding of digital data streams.
4. Generation of codes and knowledge about compression and decompression techniques.
5. To be able to understand the performance requirements of various coding techniques.
6. To produce professionals who will be able to conduct research in information theory.

SYLLABUS

Module I: Source Coding: Introduction to Information Theory, Uncertainty and Information, Average Mutual Information and Entropy, Information Measure for Continuous Random Variables, Source coding theorem, Huffman Coding, Shannon- Fano -Elias Coding, Arithmetic Coding, The Lempel-Ziv Algorithm, Run Length Encoding, and the PCX Format, Rate Distribution Function, Optimum Quantizer Design, Entropy Rate of a Stochastic Process.

Module II: Channel Capacity and Coding: Introduction, Channel Model, Channel Capacity, Channel Coding, Information Capacity Theorem, the Shannon Limit, Channel Capacity for MIMO System, Random Selection of Code. Error Control Coding (Channel Coding).

Module III: Linear Block Codes for Error Correction: Introduction to Error Correction Codes, Basic Definitions, Matrix Description of Linear Block Codes, Equivalent Codes, Parity Check Matrix, Decoding of

Linear Block Code, Syndrome Decoding, Error Probability after Coding (Probability of Error Correction), Perfect Codes, Hamming Codes, Low Density Parity Check (LDPC) Codes, Optimal Linear Codes, Maximum Distance Separable (MDS) Codes, Bound on Minimum Distance, Space Time Block Codes.

Module IV:Cyclic Codes: Introduction to the Cyclic Codes, Polynomials, The Division Algorithm for Polynomials, A Method for Generating Cyclic Codes, Matrix Description of Cyclic Codes,Burst Error Correction, Fire Codes, Golay Codes, Cyclic Redundancy Check(CRC) Codes, Circuit Implementation of Cyclic Codes.

Module V:

Bose Chaudhuri Hocquenghem (BCH) Codes: introduction to the Codes, Primitive Elements, Minimal Polynomials, Generator Polynomials, in Terms of Minimal Polynomials, Some Examples if BCH Codes, Reed – Solomon Codes, Implementation of Reed –Solomon Encoders and Decoders, Performance of RS Codes Over Real Channels, Nested Codes.

Books recommended:

TEXT BOOKS

1. R. Bose, “Information theory Coding and Cryptography,” 2nd Edition, McGraw-Hill, 2008.

REFERENCE BOOKS

1. Arijit Saha, Nilotpal Manna, Surajit Mandal, Information Theory, Coding and cryptography, Pearson India, 2013.

2. Cover Thomas and Joy Thomas, Elements of Information Theory, Wiley India Pvt. Ltd. 2nd Edition, 2006.

3. Salvatore Gravano, Introduction to errorControl Codes, Oxford Univ. Press, 2017.

Syllabus

DEPARTMENTAL ELECTIVE -5

DIGITAL IMAGE PROCESSING (CST-042)

L:T:P:: 3:0:0 **Credits-03**

COURSE OBJECTIVES: The objectives of the course are to

1. Understand the image fundamentals and mathematical transforms necessary for image processing.
2. Expose students to current applications in the field of digital image processing.

COURSE OUTCOMES: On completion of this course, the students will be able to

1. Learn the fundamental concepts of a digital image processing system.
2. Analyze images in the frequency domain using various transforms.
3. Evaluate the techniques for image enhancement and image restoration.
4. To learn and understand various image compression and Segmentation techniques used in digital image processing.
5. Understand the various image representation techniques and perform feature and object detection techniques.

Unit 1-Introduction: Digital Image Processing, The origins of Digital Image Processing, Examples of Digital Image Processing application, Fundamental steps in Digital Image processing, Components of Image Processing system Fundamentals: Elements of Visual Perception, Light and Electromagnetic Spectrum, Image Sensing and Acquisition, Image Sampling and Quantization, Some basic Relationships between Pixels, Linear and Nonlinear Operations, An introduction to mathematical tool used in digital image processing.

Unit 2-Image Enhancement in the spatial domain: Background, some basic gray level transformation, Introduction of Histogram processing, Enhancement using Arithmetic/Logic operations, Basics of spatial filtering, smoothing spatial filters, Sharpening spatial filters, Concept of Sampling.

Unit 3-Image Restoration: Model of the Image Degradation/Restoration process, Noise Models, Restoration in the presence of noise only spatial filtering, Inverse filtering, Minimum Mean Square Error (Wiener) filtering, Geometric mean filter.

Unit 4-Image Compression: Fundamentals, Lossy Compression, Lossless Compression, Image Compression models, Error-free Compression: Variable length coding, LZW coding, Bit plane coding, Run length coding,

Introduction to JPEG, introduction to color image processing, color fundamentals, color models, Pseudo color image processing.

Unit 5-Morphology and Segmentation: Erosion, Dilation, Duality, Opening and Closing, Hit-and Misstransform, Morphological Algorithms: Boundary Extraction, Hole filling, Extraction of connected components, Convex Hull, Concept of Thinning and Thickening.

Image Segmentation: Definition, characteristics of segmentation Detection of Discontinuities, Thresholding, Region based segmentation. Introduction Object Recognition, pattern and Pattern classes.

TEXT BOOK:

1. Rafael C. Gonzalez, Richard E. Woods, _Digital Image Processing‘, Pearson, Third Edition, 2010.

2. Anil K. Jain, _Fundamentals of Digital Image Processing‘, Pearson, 2002.

REFERENCE BOOKS:

1. Kenneth R. Castleman, _Digital Image Processing‘, Pearson, 2006.

2. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins, _Digital Image Processing using MATLAB‘, Pearson Education, Inc., 2011.

3. D,E. Dudgeon and RM. Mersereau, _Multidimensional Digital Signal Processing‘, Prentice Hall Professional Technical Reference, 1990.

4. William K. Pratt, _Digital Image Processing‘, John Wiley, New York, 2002

5. Milan Sonka et al _Image processing, analysis and machine vision‘, Brookes/Cole, Vikas Publishing House, 2nd edition, 1999.

Syllabus

DEPARTMENTAL ELECTIVE -5

ADVANCED SYSTEM AND NETWORK ADMINISTRATION (ITT-112)

L:T:P:: 3:0:0 **Credits-03**

Course Objectives:

- To expose students to advanced networking concepts in the information technology industry.
- To expose students to the language and terms of information technology and the impact of information systems on the strategic operations of businesses or organizations.
- To give students hands-on experience working with state-of-the-art networking hardware and software.
- To allow students to implement information systems theories and practices in a lab environment that simulates real business scenarios.
- To enable students to develop network plans and implement those plans in a laboratory setting.
- To expose students to the ethical issues facing information technology workers in the areas of networks, security, and data integrity.

Unit 1

OSI Model and Networking Protocols **,** Network Infrastructure and Topologies (Ethernet, Hubs, Switches, and Network Interface Cards) **,** Designing Wide and Local Area Networks **,**Designing Domains and Directory Services **,**Implementing Network Security

Unit 2

Managing Domain Controllers, Servers, and Workstations,Managing Users, Printers, Files, Permissions, and Other Network Resources ,Disaster Planning and Recovery with Backups, RAID, and Virus Protection

Using Network Management Tools to Install Software as well as Diagnose and Troubleshoot Hardware and Software Issues,Ethics of Network Administration

Unit 3

Introduction to CentOS Linux The CentOS Linux File system, The CentOS Shell, The CentOS Linux Utilities , Installing CentOS Server Preparing for the Installation, Starting the CentOS Server Installation Process, Configuring the Server's Hard Drive, Completing the Installation

Unit 4

Using the Command Line Working as root, working with the Shell, Using Bash to Best Effect, Managing Bash with Key Sequences, Performing Basic File System Management Tasks, Working with Directories, Working with Files, Viewing the Content of Text Files, Finding Files That Contain Specific Text , Creating Empty Files, Piping

and Redirection, Piping, Redirection, Finding Files, Working with Vi Editor: Vi Modes, Saving and Quitting, Cut, Copy, and Paste, Deleting Text. Getting Help: Using man to Get Help,Getting Information on Installed Packages

Unit 5

System Administration Software Management, Software Repositories and Package Databases, Package Management Utilities, Using apt, Installing Software from Tarballs, Configuring a Graphical User Interface, Creating Backups, Making File Backups with tar, Making Device Backups Using dd, Configuring Logging, Configuring syslog

Unit 6

File System Management Mounting Disks, Using the mount Command, Unmounting Devices, Automating Mounts with /etc/fstab, Checking File System Integrity, Working with Links: Working with Symbolic Links, Working with Hard Links. Configuring Storage, Comparing File Systems, Creating File Systems, Working with Logical Volum

Textbooks:

1. Terry Collings and Kurt Wall,Red hat Linux Networking and System Administration,wiily 3rd edition.

2. Linux Administration: a beginner's guide. by Soyinka, Wale. Edition: 5th

Syllabus

DEPARTMENTAL ELECTIVE -5

ARTIFICIAL INTELLIGENCE (CST-022)

L:T:P:: 3:0:0 **Credits-03**

COURSE OBJECTIVES: The objectives of this course are to

1. Understand the various characteristics of Intelligent agents.
2. Learn the different search strategies in AI.
3. Learn to represent knowledge in solving AI problems.
4. Understand the different ways of designing software agents and know about the various applications of AI.

COURSE OUTCOMES: On successful completion of the course, the students will be able to

1. Build intelligent agents for search and games
2. Solve AI problems through programming with Python.
3. Learn optimization and inference algorithms for model learning.
4. Design and develop programs for an agent to learn and act in a structured environment.
5. Possess the ability to apply AI techniques to solve problems of Game Playing, Expert Systems and machine learning.

Unit 1- Introduction: What is AI, Foundations of AI, History of AI, The State of the Art, AI Techniques, Problem Solving: Problem solving agents, uniformed search strategies, Informed search strategies, Constraint Satisfaction Problems.

Unit 2- Knowledge Representation: Approaches and issues in knowledge representation, Knowledge Based Agents, Propositional Logic, Predicate Logic- Unification and Resolution, Weak slot –Filler Structure, Strong slot- Filler structure.

Unit 3- Probabilistic Reasoning: Probability, conditional probability, Bayes Rule, Bayesian Networks representation, construction and inference, Brief introduction of Neural Networks, Fuzzy Logic and Genetic Algorithms

Unit 4- Planning and Learning: Planning with state space search, conditional planning, continuous planning, Multi-Agent planning. Forms of learning, Inductive Learning, Statistical learning method and Reinforcement learning.

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Unit 5- Advanced Topics: Expert Systems- Representation- Expert System shells- Knowledge Acquisition with examples.

Game Playing-Minimax Search Procedure, Alpha-Beta Pruning, Imperfect, Real-Time Decisions.

Swarm Intelligent Systems- Ant Colony System, Development, Application and Working of Ant Colony System.

TEXTBOOKS:

1. S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach, Prearson Education, 4th Edition, 2022.

2. Michael Negnevitsky, Artificial Intelligence, 3rd edition, Pearson Education.

3. I. Bratko, ―Prolog: Programming for Artificial Intelligence, Fourth edition, Addison-Wesley Educational Publishers Inc., 2011.

REFERENCE BOOKS:

1. George F Luger, Artificial Intelligence, 6th edition, Pearson Education.

2. M. Tim Jones, ―Artificial Intelligence: A Systems Approach(Computer Science), Jones and Bartlett Publishers, Inc.; First Edition, 2008.

3. Nils J. Nilsson, ―The Quest for Artificial Intelligence, Cambridge University Press, 2009.

4. William F. Clocksin and Christopher S. Mellish, Programming in Prolog: Using the ISO Standard, Fifth Edition, Springer, 2003.

5. Gerhard Weiss, ―Multi Agent Systems, Second Edition, MIT Press, 2013.

6. David L. Poole and Alan K. Mackworth, ―Artificial Intelligence: Foundations of Computational Agents, Cambridge University Press, 2010.

Syllabus

DEPARTMENTAL ELECTIVE -5

CLOUD COMPUTING (CST-037)

L:T:P:: 3:0:0 **Credits-03**

COURSE OBJECTIVES: The objectives of the course are to

1. Provides an insight into cloud computing.
2. Enable students to deliver an application built in the cloud with the concept of application-based building blocks for processing of data.
3. Appreciate the emergence of cloud as the next generation computing paradigm.

COURSE OUTCOMES: Upon completion of this course, the students will be able to

1. Impart the knowledge of cloud computing and technologies, issues in cloud computing etc.
2. Design and develop cloud and implement various services on cloud.
3. To develop an understating of virtualization technology and its different dimensions.
4. Investigate the issues and challenges in implementing cloud security.
5. Compare and contrast various open and proprietary cloud platforms

Unit 1- Introduction to Cloud Computing: Definition, Characteristics, Components, Cloud provider, SAAS, PAAS, IAAS and Others, Organizational scenarios of clouds, Administering & Monitoring cloud services, benefits and limitations, Deploy application over cloud.
Cloud computing platforms: Infrastructure as service: Amazon EC2, Platform as Service: Google App Engine, Microsoft Azure, Utility Computing, Elastic Computing

Unit 2- Introduction to Cloud Technologies: Study of Hypervisors, Web services: SOAP and REST, SOAP versus REST, AJAX: asynchronous 'rich' interfaces, Mashups: user interface services.
Virtualization Technology: Virtual machine technology, Virtual Machine migration, virtualization applications in enterprises, Pitfalls of virtualization.
Multitenant software: Multi-entity support, Multi-schema approach, Multi-tenancy using cloud data stores, Data access control for enterprise applications,

Unit 3- Data and Security in the cloud: Relational databases, Cloud file systems: GFS and HDFS, Big Table, HBase and Dynamo. Map-Reduce and extensions: Parallel computing, Map-Reduce model, Enterprise batch processing using Map-Reduce.

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Cloud computing security challenges: Virtualization security management- virtual threats, VM Security Recommendations, VM-Specific Security techniques, Secure Execution Environments and Communications in cloud

Unit 4- Service Management and Monitoring in Cloud: Traditional Approaches to SLO Management, Types of SLA, Life Cycle of SLA, SLA Management in Cloud.
Monitoring in cloud: Implementing real time application over cloud platform, Cloud Federation, QOS Issues in Cloud, Dependability, data migration, streaming in Cloud. Cloud Middleware, load balancing, resource optimization, resource dynamic reconfiguration,

Unit 5- Cloud computing platforms: Installing cloud platforms and performance evaluation Features and functions of cloud platforms: Xen Cloud Platform, Eucalyptus, OpenNebula, Nimbus, T-Platform, Apache Virtual Computing Lab (VCL), Enomaly Elastic Computing Platform

TEXT BOOK:

1. Kai Hwang, Geoffrey C. Fox and Jack J. Dongarra, “Distributed and cloud computing from Parallel Processing to the Internet of Things”, Morgan Kaufmann, Elsevier, 2012.
2. Rittinghouse, John W., and James F. Ransome, “Cloud Computing: Implementation, Management and Security”, CRC Press, 2017.

REFERENCE BOOK:

1. Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, “Mastering Cloud Computing”, Tata Mcgraw Hill, 2013.
2. Toby Velte, Anthony Velte, Robert Elsenpeter, “Cloud Computing – A Practical Approach, Tata Mcgraw Hill, 2009.
3. Barrie Sosinsky, “Cloud Computing Bible” John Wiley & Sons, 2010.
4. Tim Mather, Subra Kumaraswamy, and Shahed Latif, “Cloud Security and Privacy An Enterprise Perspective on Risks and Compliance”, O'Reilly, 2009.

Syllabus

DEPARTMENTAL ELECTIVE -5

E-COMMERCE AND M-COMMERCE (ITT-113)

L:T:P:: 3:0:0 **Credits-03**

COURSE OBJECTIVES:

1. To provide students with an overview and understanding of e-commerce with a specific emphasis on Internet Marketing.
2. To explore the major issues associated with e-commerce-security, privacy, intellectual property rights, authentication, encryption, acceptable use policies, and legal liabilities.

COURSE OUTCOMES:

1. Obtain a general understanding of basic business management concepts.
2. Have complete knowledge about basic technical concepts relating to E-Commerce.
3. Obtain thorough understanding about the security issues, threats and challenges of E-Commerce.

UNIT - I

History of E-commerce and Indian Business Context: E-Commerce –Emergence of the Internet – Emergence of the WWW – Advantages of E-Commerce – Transition to E-Commerce in India – The Internet and India – E-transition Challenges for Indian Corporate. Business Models for Ecommerce: Business Model – E-business Models Based on the Relationship of Transaction Parties - E-business Models Based on the Relationship of Transaction Types.

UNIT - II

Enabling Technologies of the World Wide Web: World Wide Web – Internet Client-Server Applications – Networks and Internets – Software Agents – Internet Standards and Specifications – ISP. e-Marketing :Traditional Marketing – Identifying Web Presence Goals – Online Marketing – E-advertising – E-branding.

UNIT - III

E-Security: Information system Security – Security on the Internet – E-business Risk Management Issues – Information Security Environment in India. Legal and Ethical Issues : Cybers talking – Privacy is at Risk in the Internet Age – Phishing – Application Fraud – Skimming – Copyright – Internet Gambling – Threats to Children.

UNIT - IV

e-Payment Systems: Main Concerns in Internet Banking – Digital Payment Requirements – Digital Token-based

e-payment Systems – Classification of New Payment Systems – Properties of Electronic Cash – Cheque Payment Systems on the Internet – Risk and e-Payment Systems – Designing e-payment Systems – Digital Signature – Online Financial Services in India – Online Stock Trading.

UNIT - V

Information systems for Mobile Commerce: What is Mobile Commerce? – Wireless Applications –Cellular Network – Wireless Spectrum – Technologies for Mobile Commerce – Wireless Technologies –Different Generations in Wireless Communication – Security Issues Pertaining to Cellular Technology. Portals for E-Business: Portals – Human Resource Management – Various HRIS Modules.

TEXT BOOK:

1. P.T.Joseph, S.J., “E-Commerce - An Indian Perspective”, PHI 2012, 4th Edition.

REFERENCE BOOKS:

1. David Whiteley , “E-Commerce Strategy, Technologies and Applications”, Tata McGraw Hill, 2001.
2. Ravi Kalakota, Andrew B Whinston, “Frontiers of Electronic Commerce”, Pearson 2006, 12th Impression.

WEB REFERENCES:

- https://www.docsity.com/en/e-commerce-notes-pdf-lecture-notes-universitylevel/2484734/
- https://magnetoitsolutions.com/blog/advantages-and-disadvantages-of-ecommerce
- https://www.researchgate.net/publication/320547139ECommerce_Merits_and_Demerits_A_Review_Pp

Syllabus

OPEN ELECTIVE -2

COMPUTER NETWORK (CSO-051)

L:T:P:: 3:0:0 **Credits-03**

COURSE OBJECTIVES: The objectives of this course are to

1. Understand the protocol layering and physical level communication.
2. Analyze the performance of a network .and understand the various components required to build different networks.
3. Learn the functions of network layer and the various routing protocols.
4. Familiarize the functions and protocols of the Transport layer.

COURSE OUTCOMES: On completion of the course, the students will be able to

1. Explain the functions of the different layer of the OSI Protocol.
2. Draw the functional block diagram of local area networks (LANs, wide-area networks (WANs) and Wireless LANs (WLANs).
3. Address the issues related to network layer and various routing protocols.
4. Configure DNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP.
5. Configure Bluetooth, Firewalls using open source available software and tools.

Unit 1- Data communication Components: Representation of data and its flow Networks, Various Connection Topology, Protocols and Standards, OSI model, Transmission Media, LAN: Wired LAN, Wireless LANs, Connecting LAN and Virtual LAN, Techniques for Bandwidth utilization: Multiplexing - Frequency division, Time division and Wave division, Concepts on spread spectrum.

Unit 2- Data Link Layer and Medium Access Sub Layer: Error Detection and Error Correction - Fundamentals, Block coding, Hamming Distance, CRC; Flow Control and Error control protocols - Stop and Wait, Go back – N ARQ, Selective Repeat ARQ, Sliding Window, Piggybacking, Random Access, Multiple access protocols- Pure ALOHA, Slotted ALOHA, CSMA/CD, CDMA/CA, high level data link control(HDLC), Point To Point protocol (PPP).

Unit 3- Network Layer: Repeater, Hub, Switches, Bridges, Gateways, Switching, Logical addressing – IPV4, IPV6, Address mapping – ARP, RARP, BOOTP and DHCP–Delivery, Forwarding and Unicast Routing protocols.

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Unit 4- Transport Layer: Process to Process Communication, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), SCTP Congestion Control; Quality of Service, QoS improving techniques: Leaky Bucket and Token Bucket algorithm.

Unit 5- Application Layer: Domain Name Space (DNS), DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls, Basic concepts of Cryptography , Digital Signature.

TEXTBOOK:

1. Behrouz A. Forouzan, Data Communications and Networking, Fifth Edition TMH, 2013.

REFERENCE BOOKS:

1. Larry L. Peterson, Bruce S. Davie, Computer Networks: A Systems Approach, Fifth Edition, Morgan Kaufmann Publishers Inc., 2012.

2. William Stallings, Data and Computer Communications, Tenth Edition, Pearson Education, 2013.

3. Nader F. Mir, Computer and Communication Networks, Second Edition, Prentice Hall, 2014.

4. Ying-Dar Lin, Ren-Hung Hwang and Fred Baker, Computer Networks: An Open Source Approach, McGraw Hill Publisher, 2011.

5. James F. Kurose, Keith W. Ross, Computer Networking, A Top-Down Approach Featuring the Internet, Sixth Edition, Pearson Education, 2013

Syllabus

ADVANCED COMPUTER NETWORKS LAB (ITP-104)

L:T:P:0:0:2 **CREDITS-1**

List of Experiments:

1. Configuration and logging to a CISCO Router and introduction to the basic user Interfaces.
Introduction to the basic router configuration and basic commands.
2. Configuration of IP addressing for a given scenario for a given set of topologies.
3. Configure a DHCP Server to serve contiguous IP addresses to a pool of four IP devices with a Default gateway and a default DNS address. Integrate the DHCP server with a BOOTP demon to Automatically serve Windows and Linux OS Binaries based on client MAC address.
4. Configure, implement and debug the following: Use open source tools for debugging and diagnostics.
a. ARP/RARP protocols
b. RIP routing protocols
c. BGP routing
d. OSPF routing protocols
e. Static routes (check using netstat)
5. Configure DNS: Make a caching DNS client, and a DNS Proxy; implement reverse DNS and Forward DNS, using TCP dump/Wireshark characterise traffic when the DNS server is up and when it is down.
6. Configure FTP Server on a Linux/Windows machine using a FTP client/SFTP client characterise file transfer rate for a cluster of small files 100k each and a video file of 700mb.Use a TFTP client and repeat the experiment.
7. Configure a mail server for IMAP/POP protocols and write a simple SMTP client in C/C++/Java client to send and receive mails.
8. Implement Open NMS+ SNMPD for checking Device status of devices in community MIB of a linux PC.
Using yellow pages and NIS/NFS protocols implement Network Attached Storage Controller (NAS).
Extend this to serve a windows client using SMB. Characterise the NAS traffic using wireshark.

Syllabus

PROJECT SEMINAR (ITP-105)

L:T:P:: 0:0:2 **Credits-01**

THE OVERVIEW OF PROJECT SEMINAR

The course is accompanied by seminars that introduce new approaches to understand and further elaborate different facets of innovation thinking and to provide participants with practical training as well as ready to use state of the art knowledge. Besides, students will present on a regular basis the development of their business plans of practical oriented innovation projects. At last, students will be asked to defend their developed business plans of projects with consideration of discussed aspects. The aim of this course is to consolidate, expand and exercise theoretical and practical skills for successful implementation of projects from start to finish by developing business plans of innovative projects.

COURSE OUTCOME: On successful completion of this course, the students shall be able to

1. Prepare and develop practically applicable business plan for an innovative project with consideration of addressed issues.
2. Develop the sub-skills required for business plans of innovation projects presentation and group discussions.
3. Acquire the soft skills and interpersonal skills which will help them in their workplace needed for these functions.
4. Develop planning skills of the innovative projects and business ideas in order to improve professional competencies.
5. Make presentation on the topic, answer the queries/questions that come forward, clarify, and supplement if necessary, and submit a report.

The Project Seminar consists of four major topics:

1. Project introduction
2. Project environment
3. Project assessment
4. Project presentation

Project introduction includes an introductory session where students will understand how to apply specific tools and models in innovation project management, as well as how to manage teamwork. Also, during this topic, the ideas of projects will be introduced with taking into account appropriate cases of specific projects across different industries. The session ends with the choice of core stream for which students will be asked to

prepare a project.

Project environment allows students to learn market analysis, including identification of current trends in the industry by using suitable strategic planning tools, and evaluating external/internal risk factors. In addition, the competition analysis and the estimation of risks in innovative projects will be introduced.

Project assessment provides understanding and practical knowledge of assessment and forecasting of potential markets by using various approaches within the innovation project management, as well as cost analysis and assessment of the impact of innovation on the cost structure.

Project presentation assumes that students will apply learned knowledge and skills by developing business plans of innovation projects, its discussions, and presentations. An oral defense will be held at the last class (final colloquium), in which students present the developed business plan of the innovation project with consideration of addressed issues.

The assessment of the Project Seminar

The activities on the Project Seminar classes and developed projects are assessed separately. Students form groups of 3-5 members to develop business plan of practical innovative project plan i.e., project. The final grade will be calculated in accordance with the syllabus of this course. Students are expected to develop and gradually improve their business plans of innovation projects with regular presentations of interim results. Apart from that, by the end of the course students are supposed to submit their final version of business plans of projects as an essay. The oral defense of group project will be held on the final colloquium.

Syllabus

DESIGN PROJECT (ITP-106)

L:T:P:: 0:0:4 **Credits-02**

COURSE OBJECTIVES: The objectives of the course are to

1. Develop skills in doing literature survey, technical presentation, and report preparation.
2. Enable project identification and execution of preliminary works on final semester project.

COURSE OUTCOMES: On successful completion of this course, the students shall be able to

1. Discover potential research areas in the field of information technology.
2. Create very precise specifications of the IT solution to be designed.
3. Have introduction to the vast array of literature available about the various research challenges in the field of IT.
4. Use all concepts of IT in creating a solution for a problem.
5. Have a glimpse of real world problems and challenges that need IT-based solutions.

Syllabus

Internship-III/Mini Project-III – (ITP-107)

L:T:P:: 0:0:2 **Credits-01**

ABOUT INTERNSHIP/MINI PROJECT

It is an organized method or activity of enhancing and improving engineering students' skill sets and knowledge, which boosts their performance and consequently helps them meet their career objectives. Internship/Mini Project is essential in developing the practical and professional skills required for an Engineer and an aid to prospective employment.

OBJECTIVES OF INTERNSHIP/MINI PROJECT:

1. The main objective of Internship/Mini Project is to expose the students to the actual working environment and enhance their knowledge and skill from what they have learned in college.
2. Another purpose of this program is to enhance the good qualities of integrity, responsibility, and self confidence. Students must follow all ethical values and good working practices.
3. It is also to help the students with the safety practices and regulations inside the industry and to instils the spirit of teamwork and good relationship between students and employees.

COURSE OUTCOMES: At the end of Industrial Training, the students will be able to

1. Understand organizational issues and their impact on the organization and employees.
2. Identify industrial problems and suggest possible solutions.
3. Relate, apply, and adapt relevant knowledge, concepts and theories within an industrial organization, practice and ethics.
4. Apply technical knowledge in an industry to solve real world problems.
5. Demonstrate effective group communication, presentation, self-management, and report writing skills.

Syllabus

DISASTER MANAGEMENT (AHT-017)

L:T:P:: 2:0:0 **Credits-02**

COURSE OBJECTIVES:

The course should enable the students:

1. To introduce the students to various types of natural and manmade disasters.
2. To understand causes and impact of disasters.
3. To understand approaches of Disaster Management.
4. To build skills to respond to disaster.

COURSE OUTCOMES:

At the end of the course, Student will be able:

1. To provide students an exposure to disasters, their significance and types.
2. To ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention and risk reduction.
3. To understand approaches of Disaster Management.
4. To build skills to respond to disaster.

Unit-1 Introduction to Disasters

Concepts, and definitions (Disaster, Hazard, Vulnerability, Resilience, Risks). Disaster Types, Trends, Causes, Consequences and Control of Disasters, Geological Disasters; Hydro-Meteorological, Biological, Technological and Manmade Disasters.

Unit-2 Disasters: Classification, Causes, Impacts (Including social, economic, political, environmental, health, psychosocial, etc.)Differential impacts-in terms of caste, class, gender, age, location, disability. Global trends in disasters urban disasters, pandemics, complex emergencies, Climate change.

Unit-3 Approaches to Disaster Risk Reduction: Disaster cycle- its analysis, Phases, Culture of safety, prevention, mitigation and preparedness, community based DRR, Structural- nonstructural measures, roles and responsibilities of community, Panchayati Raj Institutions/ Urban Local Bodies (PRIs/ULBs), States, Centre, and other stake-holders.

Unit-4 Inter-relationship between Disasters & Development Factors affecting Vulnerabilities, differential impacts, Impact of Development projects such as dams, embankments, changes in Land-use etc. Climate Change

Adaptation. Relevance of indigenous knowledge, appropriate technology and local resources

Unit-5 Disaster Risk Management in India:

Hazard and Vulnerability profile of India. Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management Institutional arrangements (Mitigation, Response and Preparedness, DM Act and Policy, Other related policies, plans, programmes and legislation)

Text/Reference Books:

1. Disaster Management Guidelines, GOI-UND Disaster Risk Program (2009-2012)

2. Damon, P. Copola, (2006) Introduction to International Disaster Management, Butterworth Heineman.

3. Gupta A.K., Niar S.S and Chatterjee S. (2013) Disaster management and Risk Reduction, Role of Environmental Knowledge, Narosa Publishing House, Delhi.

4. Murthy D.B.N. (2012) Disaster Management, Deep and Deep Publication PVT. Ltd. New Delhi.

5. Modh S. (2010) Managing Natural Disasters, Mac Millan publishers India LTD.

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INNOVATIONS AND PROBLEM SOLVING (AHT-018)

L:T:P:: 2:1:0 **Credits-0**

PREREQUISITE:

Basic Engineering Aptitude

COURSE OBJECTIVES:

This subject aims to inculcate critical thinking abilities and application of knowledge for problem solving. It will expose the students with various simple methods and practices that are essential to development of new systems, problem formulation and problem solving in technical and non-technical fields. This course will stimulate the work environment of the modern day engineers and technologists by familiarizing them with the state-of-the art results, design and analysis tools in various disciplines, the ability to extract relevant information to formulate and solve problems arising in practice.

COURSE OUTCOMES:

The course will enable students to,

1. Identify the market and value proposition
2. Carry out rigorous and accessible formulation to problems
3. Solutions via reducing the search space
4. Eliminating tradeoffs to reduce dimension of optimization problems
5. Execution through developing strategies for experiment, construction and monetization.
6. Simulate the work environment of the modern engineer or knowledge worker in general.

Unit – I Introduction to Critical Design Thinking

- Understanding critical thinking, creative thinking, and problem solving through examples.
- New ways to solve problems.

Unit – II

Theory of Inventive Problem Solving

- Examples of inventive problem solving,
- Era of technical systems,
- Science of inventing,
- Art of inventing,
- Amazing world of tasks

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Unit – III 8

Logic and Tools for Creativity and Clarity of Thought

- TRIZ tools for creativity and solutions,
- World's known solutions,
- Fundamentals of Problem solving,
- Thinking in Time and Scale,
- Uncovering and solving contradictions,
- Fast Thinking with ideal outcome.

Unit – IV 8

Modeling for Problem Solving

- Moving from problem to ideal final result,
- Tradeoffs and inherent contradictions,
- Invisible reserves,
- Law of increasing ideality,
- Evaluation of solutions,
- Enriching models for problem solving.

Unit – V

Principles for Innovation

- General review,
- Segmentation, Separation,
- Local quality, symmetry change, merging and multifunctionality,
- Nested doll and weight compensation,
- Preliminary counteraction, preliminary action, and beforehand compensation,
- Equipotentiality, the other way around and curvature increase,
- Dynamic parts, partial or excessive actions, dimensionality change, mechanical vibration
- Periodic action, continuity of useful action, and hurrying,
- Blessing in disguise, feedback, and intermediary,
- Self service, copying, cheap disposables, and mechanical interaction substitution
- Pneumatics and hydraulics, flexible shells and thin films, and porous materials,
- Optical property changes, homogeneous, and discarding and recovering,
- Parameter changes, phase transitions, and thermal expansion,
- Strong oxidants, inert atmosphere, and composite materials,
- How to select most suitable principle out of 40 ways to create good solution

References

1. ABC-TRIZ Introduction to Creative Design Thinking with Modern TRIZ Modeling
by Michael A. Orloff

2. TRIZ And Suddenly the Inventor Appeared TRIZ, the Theory of Inventive Problem Solving by GenrichAltshuller

3. TRIZ for Engineers Enabling Inventive Problem Solving by Karen Gadd

4. Simplified TRIZ New Problem Solving Applications for Engineers and Manufacturing Professionals by Rantanen K., Domb E.

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DEPARTMENTAL ELECTIVE -6

MACHINE LEARNING (CST-030)

L:T:P:: 3:0:0 **Credits-03**

COURSE OBJECTIVES: The objectives of the course are to

1. Understand the need for machine learning for various problem solving.
2. Study the various supervised, semi-supervised and unsupervised learning algorithms in machine learning.
3. Learn and design the appropriate machine learning algorithms for problem solving.

COURSE OUTCOME: On successful completion of this course, the students will be able to

1. Learn the basics of learning problems with hypothesis and version spaces.
2. Understand the machine learning algorithms as supervised learning and unsupervised learning and Apply and analyze the various algorithms of supervised and unsupervised learning.
3. Analyze the concept of neural networks for learning linear and non-linear activation functions.
4. Learn the concepts in tree, probability and graphical based models and methods.
5. Understand the fundamental concepts of Genetic Algorithm and Analyze and design the genetic algorithms for optimization engineering problems.

Unit 1- INTRODUCTION: Learning – Types of Machine Learning – Supervised Learning – The Brain and the Neuron – Design a Learning System – Perspectives and Issues in Machine Learning – Concept Learning Task – Concept Learning as Search – Finding a Maximally Specific Hypothesis – Version Spaces and the Candidate Elimination Algorithm – Linear Discriminants – Perceptron – Linear Separability – Linear Regression.

Unit 2- LINEAR MODELS: Multi-layer Perceptron – Going Forwards – Going Backwards: Back Propagation Error – Multilayer Perceptron in Practice – Examples of using the MLP – Overview – Deriving Back Propagation – Radial Basis Functions and Splines – Concepts – RBF Network – Curse of Dimensionality – Interpolations and Basis Functions – Support Vector Machines.

Unit 3- TREE AND PROBABILISTIC MODELS: Learning with Trees – Decision Trees – Constructing Decision Trees – Classification and Regression Trees – Ensemble Learning – Boosting – Bagging – Different ways to Combine Classifiers – Probability and Learning – Data into Probabilities – Basic Statistics – Gaussian Mixture Models – Nearest Neighbor Methods – Unsupervised Learning – K means Algorithms – Vector Quantization – Self Organizing Feature Map

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Unit 4- DIMENSIONALITY REDUCTION AND EVOLUTIONARY MODELS: Dimensionality Reduction – Linear Discriminant Analysis – Principal Component Analysis – Factor Analysis – Independent Component Analysis – Locally Linear Embedding – Isomap – Least Squares Optimization – Evolutionary Learning – Genetic algorithms – Genetic Offspring: - Genetic Operators – Using Genetic Algorithms – Reinforcement Learning – Overview – Getting Lost Example – Markov Decision Process

Unit 5- GRAPHICAL MODELS: Markov Chain Monte Carlo Methods – Sampling – Proposal Distribution – Markov Chain Monte Carlo – Graphical Models – Bayesian Networks – Markov Random Fields – Hidden Markov Models – Tracking Methods

TEXT BOOK:

1. Tom M. Mitchell, ―Machine Learning, McGraw-Hill Education (India) Private Limited, 2013.
2. Jason Bell, ―Machine learning – Hands on for Developers and Technical Professionals‖, First Edition, Wiley, 2014
3. Peter Flach, ―Machine Learning: The Art and Science of Algorithms that Make Sense of Data, First Edition, Cambridge University Press, 2012.

REFERENCE BOOKS:

1. EthemAlpaydin, ―Introduction to Machine Learning 3e (Adaptive Computation and Machine Learning Series) Third Edition, MIT Press, 2014
2. Ethem Alpaydin, ―Introduction to Machine Learning (Adaptive Computation and Machine Learning), The MIT Press 2004.
3. Stephen Marsland, ―Machine Learning: An Algorithmic Perspective, CRC Press, 2009.
4. Stephen Marsland, ―Machine Learning – An Algorithmic Perspective‖, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.

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DEPARTMENTAL ELECTIVE -6

INTERNET OF THINGS (CST-024)

L:T:P:: 3:0:0 **Credits-03**

COURSE OBJECTIVES: The objectives of this course are to

1. Understand Smart Objects, IoT Architectures and learn about various IOT-related protocols.
2. Build simple IoT Systems using Arduino and Raspberry Pi.
3. Understand data analytics and cloud in the context of IoT.
4. Develop IoT infrastructure for popular applications.

COURSE OUTCOMES: On completion of this course, the students will be able to

1. Understand the application areas of IOT
2. Explore interconnection and integration of the physical world
3. Design & develop IOT Devices
4. Realize the revolution of Internet in Mobile Devices, Cloud &Sensor Networks
5. Understand the building blocks of Internet of Things and their characteristics.

Unit 1-INTRODUCTION TO IOT: Internet of Things - Physical Design- Logical Design- IOT Enabling Technologies - IOT Levels & Deployment Templates - Domain Specific IOTs - IOT and M2M - IoT System Management with NETCONF-YANG- IoT Platforms Design Methodology

Unit 2-IOT ARCHITECTURE: M2M high-level ETSI architecture - IETF architecture for IoT - OGC architecture - IoT reference model - Domain model - information model - functional model - communication model - IoT reference architecture

Unit 3-IOT PROTOCOLS: Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFID Protocols – Unified Data Standards – Protocols – IEEE 802.15.4 – BACNet Protocol – Modbus– Zigbee Architecture – Network layer – 6LowPAN - CoAP – Security

Unit 4-BUILDING IOT WITH RASPBERRY PI & ARDUINO: Building IOT with RASPERRY PI- IoT Systems - Logical Design using Python – IoT Physical Devices & Endpoints - IoT Device -Building blocks - Raspberry Pi -Board - Linux on Raspberry Pi - Raspberry Pi Interfaces -Programming Raspberry Pi with Python - Other IoT Platforms - Arduino.

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Unit 5-CASE STUDIES AND REAL-WORLD APPLICATIONS: Real world design constraints - Applications - Asset management, Industrial automation, smart grid, Commercial building automation, Smart cities - participatory sensing - Data Analytics for IoT – Software & Management Tools for IoT, Cloud Storage Models & Communication APIs - Cloud for IoT - Amazon Web Services for IoT

TEXTBOOK:

1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, ―IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, Cisco Press, 2017

REFERENCE BOOKS:

1. ArshdeepBahga, Vijay Madisetti, ―Internet of Things – A hands-on approach, Universities Press, 2015.
2. Olivier Hersent, David Boswarthick, Omar Elloumi , ―The Internet of Things – Key applications and Protocols, Wiley, 2012.
3. Jan Ho¨ ller, VlasiosTsiatsis , Catherine Mulligan, Stamatis , Karnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things - Introduction to a New Age of Intelligence", Elsevier, 2014.
4. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), ―Architecting the Internet of Things, Springer, 2011.
5. Michael Margolis, Arduino Cookbook, Recipes to Begin, Expand, and Enhance Your Projects, 2nd Edition, O'Reilly Media, 2011

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DEPARTMENTAL ELECTIVE -6

ADHOC AND SENSOR NETWORKS (CST-029)

L:T:P:: 3:0:0 **Credits-03**

COURSE OBJECTIVES: The objectives of the course are to

1. Learn Ad hoc network and Sensor Network fundamentals.
2. Understand the different routing protocols
3. Have an in-depth knowledge on sensor network architecture and design issues
4. Understand the transport layer and security issues possible in Ad hoc and Sensor networks

COURSE OUTCOMES: On successful completion of this course, the students will be able to

1. Impart the trends in emerging field of wireless ad hoc and sensor networking.
2. Focus on layered communication modeling, such as the media access control and network layer.
3. Understand the basic concept of QoS and Multicast routing protocol.
4. Address quality of service issues and network reliability for transmission of real-time information.
5. Learn the various routing protocols of ad hoc and sensor networks

Unit 1- ADHOC NETWORKS INTRODUCTION: Introduction to Wireless Communication Technology, Characteristics of the Wireless Channel, IEEE 802.11a/b Standard, Origin of Ad-hoc Packet Radio Networks, Architecture of PRNETS, Introduction to Ad-hoc Wireless Networks, Heterogeneity in Mobile Devices.

Unit 2- ADHOC NETWORK ROUTING PROTOCOLS: Introduction -to designing a Routing Protocol, Classifications of Routing Protocols, Destination Sequenced Distance Vector (DSDV), Dynamic Source Routing (DSR), Zone Routing Protocol (ZRP), Wireless Routing Protocol (WRP), Source—Initiated On—Demand Approaches, Ad hoc On-Demand Distance Vector Routing , AODV.

Unit 3- QoS AND Multicast Routing Protocol in MANET: Issues and challenges in providing QoS in Adhoc Wiress Networks, Introduction to QoS in Ad hoc Wireless Networks, Classifications of QoS Solutions, Introduction to Multicast Routing Protocol, Classifications of Multicast Routing Protocols.

Unit 4- WSN INTRODUCTION: Characteristic requirements, Challenges of sensor networks Emerging technologies for wireless sensor networks, Advantages of sensor networks, Sensor network applications.
Unit 5- WSN PROTOCOLS: Communication protocols, MAC protocaols, Namlng and Addressing-Routing

protocols, Energy efficient routing.

TEXT BOOKS:

1. C. Siva Ram Murthy and B. S. Manoj, ―Ad Hoc Wireless Networks Architectures and Protocols, Prentice Hall, PTR, 2004.

2. Holger Karl , Andreas willig, ―Protocol and Architecture for Wireless Sensor Networks, John wiley publication, Jan 2006.

REFERENCE BOOKS:

1. Feng Zhao, Leonidas Guibas, ―Wireless Sensor Networks: an information processing approach, Elsevier publication, 2004.

2. Charles E. Perkins, ―Ad Hoc Networking, Addison Wesley, 2000.

3. I.F. Akyildiz, W. Su, Sankarasubramaniam, E. Cayirci, ―Wireless sensor networks: a survey, computer networks, Elsevier, 2002, 394 - 422.

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DEPARTMENTAL ELECTIVE -6

Information Security (ITT-114)

L:T:P:: 3:0:0 **Credits-03**

Course Objectives:

• Explaining the importance data warehousing and data mining.

• Learning the knowledge discovery process.

• Learning data mining tasks and study their well-known techniques.

Course Outcomes:

At the end of the course, a student should have:

1. To learn data mining tasks and pre-processing activities.
2. Understandability of data warehouse, architecture, schema designs, OLAP operations and servers.
3. Learning market basket analysis and association rules, understanding multilevel and multi-dimensional rules and its generation techniques.
4. Understanding various data classification and prediction techniques.
5. Learning various clustering techniques that are used in different types of data.

UNIT I: **Lectures: 4**

Core Information Security Principles, CIA (Confidentiality, Integrity, Availability),Information Security Management Governance, Security Policies, Procedures, Standards, Guidelines and Baselines, Organization Behavior and Security Models.

UNIT II: **Lectures: 6**

Classical Cryptography, Modern Cryptography, A Taxonomy of Cryptography and Cryptanalysis. Symmetric and Asymmetric key algorithms.

UNIT III: **Lectures: 8**

Information Risk Management – Concepts like Risk Acceptance, Risk Avoidance, Risk Mitigation, Risk Handling Strategies and Risk Assessment

Information Classification – Guidelines, Types, Criteria for data Classification, Data Classification procedures, Classification Controls.

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UNIT IV: **Lectures: 8**

Threats, Vulnerabilities, Attack vectors and their counter measures, Identity Management – Identification, Authorization and Access Controls – Categories, Models, Challenges, Principles, Techniques and Practices, Concept of trust and trustworthiness.

UNIT V: **Lectures: 7**

Authentication Methods, Passwords, Biometrics, Challenge Response based authentication, Two-Factor Authentication, Single Sign-On and Web Cookies.

UNIT VI: **Lectures: 3**

Software Flaws, Malware, Operating System Security Functions, Trusted Operating System, Next Generation Secure Computing Base.

UNIT VII: **Lectures: 6**

Ethics – Basic Concepts, Professional code of Ethics, Common Computer Ethics Fallacies (responsible disclosure), (cross reference SP/Professional Ethics / Accountability, responsibility and liability), Hacking and Hacktivism

Text/ Reference Books:

1. Fundamentals of Information Systems Security By David Kim, Michael G. Solomon, Jones & Bartlett Learning
2. Information Security: The Complete reference By Mark Rhodes Ousley, 2nd Edition. McGraw Hill
3. Information Security Principles and Practice By Mark Stamp, Wiley Publication
4. Enterprise Information Security and Privacy; By C. Warren Axelrod, Jennifer L. Bayuk, Daniel Schutzer, Artech House Press
5. Handbook of Information Security, Threats, Vulnerabilities, Prevention, Detection, and Management; Hossein Bidgoli, John Wiley & Sons
6. The Basics of Information Security, 2nd Edition; J Andress, Syngress Press; 2014

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DEPARTMENTAL ELECTIVE -6

SOFTWARE PROJECT MANAGEMENT (CST-040)

L:T:P:: 3:0:0 **Credits-03**

COURSE OBJECTIVES: The objectives of the course are to

1. Introduce the primary important concepts of project management related to managing software development projects.
2. Become familiar with the different activities involved in Software Project Management
3. Know how to successfully plan and implement a software project management activity, and to complete a specific project in time with the available budget.

COURSE OUTCOMES: Upon completion of this course, the students will be able to

1. Identify the different project contexts and suggest an appropriate management strategy.
2. Practice the role of professional ethics in successful software development.
3. Identify and describe the key phases of project management.
4. Determine an appropriate project management approach through an evaluation of the business context and scope of the project
5. Manage the people and control the defects.

Unit 1- Basic Concepts: Product, Process and Project, Definition, Components of Software Project Management(SPM), Challenges and Opportunities, Tools and Techniques, Managing Human Resource and Technical Resource, Costing and pricing of projects, Training and development, Project management technique, Product Life Cycle , Project Life Cycle Models.

Unit 2- Format Process Models and Their Use: Definition and Format Model for a Process, ISO 9001 and CMM Models and their relevance to Project Management, Other Emerging Models like People CMM

Unit 3- Umbrella Activities In Projects: Metrics, Methods and Tools for Metrics, Issues of Metrics in multiple Projects, Configuration Management, Software Quality Assurance, Quality Standards and Certifications, Process and Issues in obtaining Certifications, Risk issues in Software Development and Implementation, Identification of Risks , Resolving and Avoiding risks, Tools and Methods for Identifying Risk Management.

Unit 4- Instream Activities In Project: Project Initiation, Project Planning, Execution and Tracking, Project Wind

up, Concept of Process, Project Database.

Unit 5- Engineering And Issues In Project Management: Requirements, Design, Development, Testing, Maintenance, Deployment, Engineering Activities and Management Issues in Each Phase, Special Considerations in Project Management for India and Geographical Distribution Issues.

TEXT BOOK(S)

1. Royce and Walker, “Software Project Management”, 2nd Edition, Pearson Education, 2002.

REFERENCES

1. Bob Hughes and Mike Cotterell, “Software Project Management”, 5th Edition, Tata McGrawHill, 2011.
2. Kelker, S. A, “Software Project Management”, 2nd Edition, Prentice Hall, 2003.
3. Gopalaswamy Ramesh, "Managing Global Projects", 1st Reprint Edition, Tata McGraw Hill,2006.
4. Robert K. Wysocki, “Executive's Guide to Project Management”, 2nd Edition, John Wiley &Sons, 2011.
5. Teresa and luckey, Joseph Phillips, “Software project Management for dummies”, 3rdEdition, Wiley publishing Inc., 2006.

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OPEN ELECTIVE -3

SOFTWARE ENGINEERING (CSO-052)

L:T:P:: 3:0:0 **Credits-03**

COURSE OBJECTIVES: The objectives of this course are to

1. Learn and understand the principles of Software Engineering.
2. Learn methods of capturing, specifying, visualizing, and analyzing software requirements.
3. Apply Design and Testing principles to S/W project development.
4. Understand project management through life cycle of the project.

COURSE OUTCOMES: On successful completion of the course, the student will be able to

1. Identify appropriate software design model based on requirement analysis.
2. Formulate Software Requirements Specification (SRS) reports for the real world application.
3. Translate a specification into a design and identify the components to build the architecture.
4. Plan a software engineering process to account for quality issues and non-functional requirements.
5. Estimate the work to be done, resources required and the schedule for a software project plan.

Unit 1- : Introduction to Software Engineering: Introduction, software applications, importance of software evolution of software, Software Components, Software Characteristics, Software Crisis & myths. Software Engineering paradigms: introduction, principles & Processes, Software Quality Attributes. Comparison between software engineering & computer science, & software engineering & Engineering. Some terminologies: product & process, deliverables and milestones, measures, metrics& indicators. Programs & software products. Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, RAD model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models.

Unit 2- Software Requirement Analysis: Structured analysis, object-oriented analysis, software requirement specification, and validation.

Unit 3- Design and Implementation of Software: software design fundamentals, design methodology (structured design and object-oriented design), design verification, monitoring and control coding.

Unit 4- Testing:Testing fundamentals, white box and black box testing, software testing strategies: unit testing, integration testing, validation testing, system testing, debugging.

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Unit 5- Software Reliability: Metric and specification, fault avoidance and tolerance, exception handling, defensive programming. Software Maintenance – maintenance characteristics, maintainability, maintenance tasks, maintenance side effects. CASE tools, software certification- requirement, types of certifications, third part certification. Software Re-Engineering, reverse software Engineering. Software Configuration Management Activities, Change Control Process, Software Version Control, CASE: introduction, levels of case, architecture, case building blocks, objectives, case repository, characteristics of case tools, categories, Estimation of Various Parameters such as Cost, Efforts, Schedule/Duration, Constructive Cost Models (COCOMO), Resource Allocation Models, Software Risk Analysis and Management.

TEXTBOOKS:

1. Roger Pressman, ―Software Engineering: A Practitioner ‘s Approach, McGraw Hill, ISBN 007– 337597–7.
2. Ian Sommerville, ―Software Engineering, Addison and Wesley, ISBN 0-13-703515-2.

REFERENCE BOOKS:

1. Carlo Ghezzi, ―Fundamentals of Software Engineering, Prentice Hall India, ISBN-10: 0133056996.
2. Rajib Mall, ―Fundamentals of Software Engineering, Prentice Hall India, ISBN-13: 9788120348981.
3. Pankaj Jalote, ―An Integrated Approach to Software Engineering, Springer, ISBN 13: 9788173192715.
4. S K Chang, ―Handbook of Software Engineering and Knowledge Engineering, World Scientific, Vol I, II, ISBN: 978-981-02-4973-1.
5. Tom Halt, ―Handbook of Software Engineering, ClanyeInternational ISBN- 10: 1632402939

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OPEN ELECTIVE -4

OBJECT ORIENTED PROGRAMMING (CSO-053)

L:T:P:: 3:0:0 **Credits-03**

COURSE OBJECTIVES: The objectives of this course are to:

1. Provide flexible and powerful abstraction.
2. Allow programmers to think the problem in terms of the structure rather than in terms of structure of the computer.
3. Decompose the problem into a set of objects.
4. Objects interact with each other to solve the problem.
5. Create new type of objects to model elements from the problem space

COURSE OUTCOMES: On successful completion of the course, the student will be able to:

1. Recognize features of object-oriented design such as encapsulation, polymorphism, inheritance, and composition of systems based on object identity.
2. Apply some common object-oriented design patterns.
3. Specify simple abstract data types and design implementations using abstraction functions to document them.
4. Design a convenient way for the handling problems using templates and use simple try-catch blocks for Exception Handling.
5. Manage I/O streams and File I/O oriented interactions.

Unit 1- Object Oriented Programming Concepts: Classes and Objects, Methods and Messages, Abstraction and Encapsulation, Inheritance, Abstract Classes, Polymorphism. Introduction to C++: Classes and Objects, Structures and Classes, Unions and Classes, Friend Functions, Friend Classes, Inline Functions, Static Class Members, Scope Resolution Operator, Nested Classes, Local Classes, Passing Objects to Functions, Returning objects, object assignment. Arrays, Pointers, References, and the Dynamic Allocation Operators: Arrays of Objects, Pointers to Objects, Type Checking, this Pointer, Pointers to Derived Types, Pointers to Class Members, References, Dynamic Allocation Operators.

Unit 2- Function Overloading and Constructors: Function Overloading, Constructors, parameterized constructors, Copy Constructors, Overloading Constructors, Finding the Address of an Overloaded Function, Default Function Arguments, Function Overloading and Ambiguity. Operator overloading: Creating member Operator Function, Operator Overloading Using Friend Function, Overloading New and Delete, Overloading Special Operators, Overloading Comma Operator.

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Unit 3- Inheritance and Polymorphism: Inheritance: Base-Class Access Control, Inheritance and Protected Members, Inheriting Muitiple Base Classes, Constructors, Destructors and Inheritance, Granting Access, Virtual Base Classes. Polymorphism: Virtual Functions, Virtual Attribute and Inheritance, Virtual Functions and Hierarchy, Pure Virtual Functions, Early vs. Late Binding, Run-Time Type ID and Casting Operators: RTTI, Casting Operators, Dynamic Cast.

Unit 4- Templates and Exception Handling: Templates: Generic Functions, Applying Generic Functions, Generic Classes, The type name and export Keywords, Power of Templates, Exception Handling: Fundamentals, Handling Derived Class Exceptions, Exception Handling Options, Understanding terminate() and unexpected(), uncaught_exception () Function, exception and bad_exception Classes, Applying Exception Handling.

Unit 5- I/O System Basics: Streams and Formatted 1/O. File I/O: File Classes, File Operations. Namespaces: Namespaces, std Namespace. Standard Template Library: Overview, Container Classes, General Theory of Operation, Lists, string Class, Final Thoughts on STL.

TEXTBOOKS:

1. Object Oriented Programming with C++ by E. Balagurusamy, McGraw-Hill Education (India).
2. ANSI and Turbo C++ by Ashoke N. Kamthane, Pearson Education

REFERENCE BOOKS:

1. Big C++ - Wiley India.
2. C++: The Complete Reference- Schildt, McGraw-Hill Education (India).
3. C++ and Object Oriented Programming – Jana, PHI Learning.
4. Object Oriented Programming with C++ - Rajiv Sahay, Oxford.
5. Mastering C++ - Venugopal, McGraw-Hill Education (India)

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PROJECT (ITP-108)

L:T:P:: 0:0:12 **Credits-06**

COURSE OBJECTIVE:

The objective of Project is to enable the student to extend further the investigative study taken up under project either fully theoretical/practical or involving both theoretical and practical work, under the guidance of a Supervisor from the Department alone or jointly with a Supervisor drawn from R&D laboratory/Industry. This is expected to provide a good training for the student(s) in R&D work and technical leadership.

COURSE OUTCOME: On successful completion of this course, the students shall be able to

1. Review and finalize the approach to the problem relating to the assigned topic and prepare an action plan for preparing conducting the investigation and assign responsibilities for teamwork
2. Conduct detailed analysis, modeling, simulation, design, problem solving, or experiment as needed on the assigned topic
3. Develop product/process, test, draw results and conclusions, and give direction for future research and prepare a paper for conference presentation/publication in journals, if possible
4. Prepare a project report in the standard format for being evaluated by the Department and make final presentation on the project before a Departmental Committee.