



## 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](http://www.uktech.ac.in))*



# SYLLABUS

For

**B.TECH**

**(Computer Science and Information Technology)**

**2<sup>ND</sup>, 3<sup>RD</sup> and 4<sup>TH</sup> Year**



## Syllabus

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# SYLLABUS

For

B.TECH

(Computer Science & Information Technology)

2<sup>ND</sup> Year

Effective From – Session 2023-24



## Syllabus

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**



## Syllabus

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**



## Syllabus

### 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 Fourier transforms, 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 predictor-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, 10<sup>th</sup> ed.
2. B.V. Ramana: Higher Engineering Mathematics, McGrawHill.
3. Peter V.O'Neil: Advanced Engineering Mathematics, Cengage Learning, 7<sup>th</sup> ed.
4. B.S. Grewal: Higher Engineering Mathematics, Khanna Publishers, 44<sup>th</sup> ed.
5. T.Veerarajan: Engineering Mathematics (for semester III), McGrawHill, 3<sup>rd</sup> ed.
6. R.K. Jain and S.R.K. Iyenger: Advance Engineering Mathematics, Narosa Publishing House, 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, 5<sup>th</sup> ed.
9. N.P. Bali and Manish Goyal: Computer Based Numerical and Statistical Techniques, Laxmi Publications, 5<sup>th</sup> ed.
10. J.N. Kapur: Mathematical Statistics, S. Chand & Company.
11. D.N. Elhance, V. Elhance & B.M. Aggarwal: Fundamentals of Statistics, Kitab Mahal.



## Syllabus

### 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 assess the application of the digital circuits.
6. Understand the design flow of VLSI Circuits

**COURSE OUTCOMES:** 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:**



## **Syllabus**

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





## Syllabus

### 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.



## Syllabus

### 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



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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)



## Syllabus

### 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( $\wedge$ ), OR( $\vee$ ), NOT( $\sim$ ), 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, 3<sup>rd</sup> Edition, Pearson Education.
2. Discrete Mathematics and its Applications, Kenneth H. Rosen, Fifth Edition. TMH.
3. Mathematical foundations of computer science-Dr S. Chandra sekharaiiah-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.





## Syllabus

### 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 Multiple 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 I/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:



## Syllabus

- 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.



## Syllabus

### 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.



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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



## Syllabus

### 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 radius. If (distance between two balls centers)  $\leq$  (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 b are 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





## Syllabus

### 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.



## Syllabus

### 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, Indentation, 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



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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", 2<sup>nd</sup> 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”, 3<sup>rd</sup> edition, Pearson Education India, 2015. ISBN-13: 978-9332555365
4. Roberto Tamassia, Michael H Goldwasser, Michael T Goodrich, “Data Structures and Algorithms in Python”, 1st Edition, Wiley India Pvt Ltd, 2016. ISBN-13: 978- 8126562176
5. Reema Thareja, “Python Programming using problem-solving approach”, Oxford university press, 2017.



## Syllabus

### 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



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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, 11<sup>th</sup> 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. Carl Hamacher “ Computer Organization and Embedded Systems”, 6th Edition, McGraw Hill Higher Education.
3. Miles Murdocca and Vincent Heuring “Computer Architecture and Organization: An integrated Approach” 2<sup>nd</sup> edition, Wiley Publication.



## Syllabus

### 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.



## Syllabus

### 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, 3rd Edition, John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, Pearson Education.
2. Theory of Computer Science – Automata languages and computation, Mishra and Chandrashekar, 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.



## Syllabus

### 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.



## Syllabus

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](http://www.uktech.ac.in))*



# SYLLABUS

For

**B.TECH**

**(Computer Science and Information Technology)**

**3<sup>RD</sup> 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-021	DC	Computer Networks	3	1	0	30	20	50	100		150	4
2	CST-011	DC	Database Management System	3	1	0	30	20	50	100		150	4
3	ITT-201	DC	Computer Graphics & Multimedia	3	1	0	30	20	50	100		150	4
4	CST-0XX	DE	Departmental Elective–1	3	0	0	30	20	50	100		150	3
5	CST-0XX	DE	Departmental Elective–2	3	0	0	30	20	50	100		150	3
6	CSP-014	DLC	Computer Networks Lab	0	0	2		25	25		25	50	1
7	CSP-011	DLC	Database Management System Lab	0	0	2		25	25		25	50	1
8	ITP-201	DLC	Computer Graphics & Multimedia Lab	0	0	2		25	25		25	50	1
9	ITP-202	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	CST-013	Graph Theory
2	ITT-202	Data Warehouse & Data Mining
3	CST-015	Software Engineering
4	ITT-203	Digital Signal Processing

Departmental Elective- 2		
S. No.	Subject Code	Subject Name
1	CST-017	Fault Tolerant Computing
2	CST-018	Real-Time System
3	CST-019	Distributed System
4	CST-020	Fuzzy Logic

**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 CREDITS**

**1 CREDITS**

**1 CREDITS**



## 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-023	DC	Operating System	3	1	0	30	20	50	100		150	4
2	ITT-204	DC	Visual basic and .net programming	3	1	0	30	20	50	100		150	4
3	ITT-205	DC	Information Security and privacy	3	1	0	30	20	50	100		150	4
4	CST-0XX	DE	Departmental Elective-3	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 System Lab	0	0	2		25	25		25	50	1
7	ITP-203	DLC	Visual basic and .net programming Lab	0	0	2		25	25		25	50	1
8	ITP-204	DLC	Information Security and privacy 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	CST-024	Internet of Things
2	ITT-206	Management information system
3	CST-026	Augmented Reality
4	CST-027	Web Technology
5	CST-028	Reliable Computing

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**

<b>1 Hr Lecture</b>	<b>1 Hr Tutorial</b>	<b>2 or 3 Hr Practical</b>
<b>1 CREDITS</b>	<b>1 CREDITS</b>	<b>1 CREDITS</b>



## 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.



## Syllabus

**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

### DATABASE MANAGEMENT SYSTEM (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



## Syllabus

Control techniques: Locking Protocols, Two Phase Locking, timestamp-based protocol, Multi-version and optimistic Concurrency Control schemes, Database recovery.

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

### COMPUTER GRAPHICS & MULTIMEDIA (ITT-201)

**L:T:P:: 3:1:0**

**CREDITS-04**

Course objective: This course familiarizes the students with fundamental algorithms that are used in interactive graphics systems. The students will learn algorithms and techniques of fundamental 3D computer graphics and understand the relationship between the 2D and 3D versions of such algorithms. This course will benefit the students to apply these algorithms and techniques in upcoming real world scenarios.

COURSE OUTCOMES: At the end of the course learners will be able to:

- Illustrate the algorithm for drawing 2D Primitives.
- Implement 2D transformations for an object.
- Identify the visible and invisible surfaces of 3D objects by using surface detection algorithm.
- Understand Summarize various compression techniques and color models in multimedia.
- Understand Develop animation for graphics design problems.

#### UNIT I 2D PRIMITIVES 9

Graphics systems, Algorithms for drawing 2D primitives-Line, Circle and Ellipse,

Attributes of Output primitives, Applications of computer graphics.

#### UNIT II 2D GRAPHICS 9

Two Dimensional Geometric Transformations, 2D Viewing, 2D Line Clipping, 2D

Graphics design software-Inkscape, GIMP, Adobe Photoshop.

#### UNIT III 3D GRAPHICS 9

3D concepts, Object representations, 3D geometric and modeling transformations, 3D

Viewing, Visible Surface detection methods.

#### UNIT IV MULTIMEDIA 9

Multimedia Objects, Graphics and image data representations, Color Models,

Compression techniques and standards, Storage and Retrieval technologies, Hypermedia.

#### UNIT V ANIMATION 9

Animation and Modeling techniques in multimedia, Texture and Shading, Tweening and Morphing, Lightening and Rendering, Image editing and Manipulation, Interactive animation using authorized tools-



## Syllabus

Blender, Synfig, Adobe Animate.

### TEXTBOOKS

1. Donald Hearn and Pauline Baker M, Computer Graphics, Pearson Education, 2014.
2. Andleigh, P. K and Kiran Thakrar, Multimedia Systems and Design, PHI, 1st Edition 2015.

### REFERENCES

1. Judith Jeffcoate, Multimedia in practice: Technology and Applications, PHI, 2006.
2. Foley, Vandam, Feiner and Hughes, Computer Graphics: Principles and Practice, 2nd Edition, Addison wesley , 2013.
3. Jeffrey McConnel, Computer Graphics: Theory into Practice, Jones and Bartlett Publishers, 2006. 4. William M. Newman and Robert F.Sproul, Principles of Interactive Computer Graphics, Mc Graw Hill 2001.





## 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.



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### 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.

### REFERENCES:

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

### DATA WAREHOUSE & DATA MINING (ITT-202)

**LTP:3:0:0**

**CREDITS:03**

Course objectives:

- Understand the importance of Data Mining and its applications
- Introduce various types of data and pre-processing techniques
- Learn various multi-dimensional data models and OLAP Processing
- Study concepts of Association Analysis
- Learn various Classification methods
- Learn basics of cluster analysis

Course Outcomes:

- understand the functionality of various data warehousing and data mining components.
- understand various OLAP operations.
- understand the strengths and limitations of various data mining models
- implement the data mining algorithms with different datasets
- compare various approaches of data mining implementations
- identify and apply appropriate data mining technique to solve a problem

#### UNIT I: Introduction

Motivation for Data Mining, Importance of Data Mining, Definition, kinds of data, Data mining functionalities, kinds of patterns to be mined, pattern interestingness, Classification of data mining systems, data mining task primitives, integration of a data mining system with a database or data warehouse system.

#### UNIT II: Data preprocessing

Types of data sets and attribute values, Basic statistical descriptions of data, Data visualization, Measuring data similarity, data quality, Major tasks in data preprocessing, data cleaning and data integration, data reduction, data transformation and discretization. Data Warehousing and On-Line Analytical Processing: Data Warehouse- Basic concepts, data warehouse modeling: Data cube and OLAP, data generalization by attribute-oriented induction.

#### UNIT III: Mining frequent patterns, associations and correlations

Basic concepts, applications of frequent pattern and associations, frequent pattern and association mining: A road map, Apriori algorithm, FP growth algorithm, mining various kinds of association rules, Pattern evaluation methods.

#### UNIT IV: Classification Analysis

Classification - Basic concepts, Decision tree induction, Bayes classification methods, Rule-based classification, Classification by neural networks, Model evaluation and selection, Techniques to improve classification accuracy: Ensemble methods.



## Syllabus

### UNIT V: Cluster analysis

Basic concepts and methods, Clustering structures, Major clustering approaches, Partitioning methods, Hierarchical methods, Density-based methods, Grid based methods, Evaluation of clustering.

#### **Text Books(s)**

1. Jiawei Han, Micheline Kamber, Jian Pei, Data Mining: Concepts and Techniques, Morgan Kaufmann publishers, 3/e, 2011.
2. Jiawei Han, Micheline Kamber, Data Mining: Concepts and Techniques, Morgan Kaufmann publishers, 2/e, 2006.

#### **Reference Book(s)**

1. Michael Steinbach, Vipin Kumar, Pang-Ning Tan, Introduction to Data Mining, Addison- Wesley, 1/e, 2006
2. Margaret H. Dunham, Data Mining: Introductory and Advanced Topics, Pearson publishers, 1/e, 2006



## Syllabus

### SOFTWARE ENGINEERING (CST-015)

**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.

**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-



## Syllabus

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, Clanye International ISBN- 10: 1632402939.



## Syllabus

### DIGITAL SIGNAL PROCESSING (ITT-203)

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

**CREDITS:03**

#### Course Objectives:

- To discuss about the characteristics of LTI discrete time systems.
- To explain the frequency analysis of DT signals and systems using DFT and FFT.
- To make the students understand various techniques for IIR filter design.
- To make the students understand various techniques for FIR filter design.
- To introduce the students the architectural features of DSP.

#### Course Outcomes: the students will be able to:

- identify the characteristics of LTI discrete time systems.
- compute the DFT of a sequence using DFT and FFT algorithms.
- identify and design the IIR filter from the specifications.
- identify and design the FIR filter from the specifications ,
- explain the architectural features of DSP processors.

#### UNIT I:

Discrete-Time Signals and Systems: Discrete time signals, linear shift invariant systems, stability and causality, frequency domain representation of discrete time signals and systems described by linear constant coefficient difference equations.

#### UNIT II:

Discrete Fourier Transform: The discrete Fourier transform, properties of discrete Fourier transform, linear convolution using circular convolution, Radix - 2 Decimation-in-time (DIT) FFT algorithms and Decimation-in-frequency (DIF) FFT algorithms.

#### UNIT III:

IIR Filter Design: Design of analog low pass and high pass filters using Butterworth approximation, design of IIR digital low pass and high pass filters using Bilinear transformation.

#### UNIT IV:

FIR Filter Design: Properties of FIR digital filters, design of FIR filters using rectangular and hamming windows, comparison of IIR and FIR digital filters.

#### UNIT V:

DSP Processors Architecture: DSP architecture for signal processing - Harvard architecture, pipelining, hardware multiplier-accumulator.

#### Text Books:

1. A.V. Oppenheim, R. W. Schaffer, Discrete-Time Signal Processing, 2/e, Prentice Hall of India, 2004.
2. Ifeachor E.C, Jervis B.W, Digital Signal Processing – A Practical Approach, 2/e, Pearson Education, 2002.



## Syllabus

### References:

1. Sanjay K.Mitra, Digital Signal Processing - A Computer based Approach, 4/e, TMH Publications, 2011.
2. J.G. Proakis and D.G. Manolakis, Digital Signal Processing: Principles, Algorithms and Applications, 4/e, Pearson Education, 2007.





## Syllabus

### DEPARTMENTAL ELECTIVE-2

#### FAULT TOLERANT COMPUTING (CST-017)

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

**CREDITS-03**

**COURSE OBJECTIVES:** The objectives of this course are to

1. Understand fault-tolerant design principles.
2. Identify the requirement of fault-tolerant systems.
3. Understand fault-tolerant distributed systems and its requirement.
4. Design algorithms for fault-tolerant systems.

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

1. Understand research problems and challenges in fault tolerance computing.
2. Identify the state-of-the-art techniques and tools to address research problems and challenges.
3. Develop strong technical reviewing, writing, and presentation skills.
4. Design more reliable systems that can tolerate S/W faults.
5. Design more reliable systems that can tolerate H/W faults.

**Unit 1- Basics of Fault Tolerance:** Fault Classification, Types of Redundancy, Basic Measures of Fault Tolerance, Reliability concepts, Failures & faults, Reliability and Failure rate, Relation between reliability and mean time between failure, maintainability and availability, Fault Tolerant Design: Basic concepts-static, dynamic, hybrid, triple modular redundant system (TMR), Data redundancy, Time redundancy and software Redundancy concepts.

**Unit 2- Hardware Fault Tolerance:** canonical and Resilient Structures- Series and Parallel Systems, Non-Series/Parallel Systems,  $M$ -of- $N$  Systems, Voters, Variations on  $N$ -Modular Redundancy, Duplex Systems, Other Reliability Evaluation Techniques-Poisson Processes, Markov Models, Fault-Tolerance Processor-Level Techniques, Watchdog Processor, Simultaneous Multithreading for Fault Tolerance, Byzantine Failures, Byzantine Agreement with Message Authentication.

**Unit 3- Testability for Hardware:** testability for combinational circuits: Basic concepts of Testability, Controllability and observability, The Reed Muller's expansion technique, use of control and syndrome testable designs. Design for testability by means of scan: Making circuits Testable, Testability Insertion, Full scan DFT technique- Full scan insertion, flip-flop Structures, Full scan design and Test, Scan Architectures full scan design, Shadow register DFT, Partial scan methods, multiple scan design, other scan designs.

**Unit 4- Software Fault Tolerance:** Acceptance Tests Single-Version Fault Tolerance- Wrappers, Software Rejuvenation, Data Diversity, Software Implemented Hardware Fault Tolerance (SIHFT),  $N$ -Version Programming- Consistent Comparison Problem, Version Independence, Recovery Block Approach- Basic Principles, Success Probability Calculation, Distributed Recovery Blocks, Preconditions, Postconditions, and Assertions, Exception-Handling- Requirements from Exception-Handlers, Basics of Exceptions and Exception-Handling, Language Support, Software Reliability Models- Jelinski-Moranda



## Syllabus

Model, Littlewood–Verrall Model, Musa–Okumoto Model, Model Selection and Parameter Estimation, Fault-Tolerant Remote Procedure Calls-Primary-Backup Approach, The Circus Approach.

**Unit 5- Checkpointing:** Basics of checkpoint, Checkpoint Level, Optimal Checkpointing- An Analytical Model, Time Between Checkpoints-A First-Order Approximation, Optimal Checkpoint Placement, Reducing Overhead, Reducing Latency, Checkpointing in Distributed Systems-The Domino Effect and Livelock, A Coordinated Checkpointing Algorithm, Time-Based Synchronization, Diskless Checkpointing, Message Logging, Checkpointing in Shared-Memory Systems- Bus-Based Coherence Protocol, Directory-Based Protocol, Checkpointing in Real-Time Systems.

### TEXTBOOKS:

1. Israel Koren And C. Mani Krishna, “Fault-Tolerant Systems, Morgan Kaufmann publisher
2. Parag K. Lala, “Fault Tolerant & Fault Testable Hardware Design”, 1984, PHI

### REFERENCE BOOKS:

1. Fault Tolerant Computer System Design, D. K. Pradhan, Prentice Hall, 1996.
2. Probability and Statistics with Reliability, Queuing and Computer Science Applications, Kishor S. Trivedi, John Wiley & Sons Inc., 2016.
3. ZainalabedinNavabi, “Digital System Test and Testable Design using HDL models and Architectures”, Springer International Edition.
4. MironAbramovici, Melvin A. Breuer and Arthur D. Friedman, “Digital Systems Testing and Testable Design”, Jaico Books



## Syllabus

### 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), Non-preemptive Critical Sections, Basic Priority-Inheritance and Priority-Ceiling Protocols, Stack Based Priority-Ceiling Protocol, Use of Priority-Ceiling Protocol in Dynamic Priority Systems, Preemption Ceiling Protocol, Access Control in Multiple-Unit Resources, Controlling Concurrent Accesses 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-



## **Syllabus**

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

### DISTRIBUTED SYSTEM (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.



## Syllabus

### TEXTBOOK(S):

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



## Syllabus

### FUZZY LOGIC (CST-020)

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

**CREDITSs-03**

**COURSE OBJECTIVES:** The objectives of this course are to

1. Develop the fundamental concepts such as fuzzy sets, operations and fuzzy relations.
2. Learn about scalar variables' fuzzification and membership functions' defuzzification.
3. Learn three different inference methods to design fuzzy rule-based system.
4. Develop fuzzy decision making by introducing some concepts and also Bayesian decision methods.
5. Learn different fuzzy classification methods.

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

1. Understand the basic ideas of fuzzy sets, operations and properties of fuzzy sets, and fuzzy relations.
2. Understand the basic features of membership functions, fuzzification process and defuzzification process.
3. Design fuzzy rule-based system.
4. Know about combining fuzzy set theory with probability to handle random and non-random uncertainty, and the decision-making process.
5. Gain the knowledge about fuzzy C-Means clustering.

**Unit – I: Classical Sets:** Operations and properties of classical sets, Mapping of classical sets to the functions. Fuzzy sets - Membership functions, Fuzzy set operations, Properties of fuzzy sets.

**Classical and Fuzzy Relations:** Cartesian product, crisp relations-cardinality, operations, and properties of crisp relations. Fuzzy relations-cardinality, operations, properties of fuzzy relations, fuzzy Cartesian product and composition, Fuzzy tolerance and equivalence relations, value assignments and other format of the composition operation.

**UNIT II: Fuzzification and Defuzzification :** Features of the membership functions, various forms, fuzzification, defuzzification to crisp sets,  $\alpha$ - cuts for fuzzy relations, Defuzzification to scalars. Fuzzy logic and approximate reasoning, other forms of the implication operation.

**UNIT III : Fuzzy Systems :** Natural language, Linguistic hedges, Fuzzy (Rule based) System, Aggregation of fuzzy rules, Graphical techniques of inference, Membership value assignments: Intuition, Inference, rank ordering, Fuzzy Associative memories.

**UNIT IV: Fuzzy Decision Making:** Fuzzy synthetic evaluation, Fuzzy ordering, Preference and consensus, Multi objective decision making, Fuzzy Bayesian, Decision method, Decision making under Fuzzy states and fuzzy actions.

**UNIT V: Fuzzy Classification:** Classification by equivalence relations-crisp relations, Fuzzy relations, Cluster analysis, Cluster validity, C-Means clustering, Hard C-Means clustering, Fuzzy C-Means algorithm, Classification metric, Hardening



## Syllabus

the Fuzzy C-Partition.

### TEXTBOOK(s):

1. Timothy J.Ross - Fuzzy logic with engineering applications, 3rd edition, Wiley,2010.
2. George J.KlirBo Yuan - Fuzzy sets and Fuzzy logic theory and Applications, PHI, New Delhi,1995.

### REFERENCE BOOK(s):

1. S.Rajasekaran, G.A.Vijayalakshmi - Neural Networks and Fuzzy logic and Genetic Algorithms, Synthesis and Applications, PHI, New Delhi,2003.





## 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

### 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/DDI 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 names and item numbers
- d) List the total Bill details with the quantity sold price of the item and the final amount
- e) List the details of the customer who have bought a product which has a price > 200
- f) Give a count of how many products have been bought by each customer
- g) Give a list of products bought by a customer having cust\_id as 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



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- 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.



## **Syllabus**

- 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



## Syllabus

### COMPUTER GRAPHICS & MULTIMEDIA LAB (ITP-201)

**L:T:P:0:0:2**

**CREDITS:01**

1. To Study various in build graphics functions in C library.
2. Write a program to draw a line using DDA algorithm.
3. Write a program to draw a line using Bresenham's algorithm.
4. Write a program to draw a circle using midpoint algorithm.
5. Write a program to draw a circle using Bresenham's algorithm.
6. Write a program to draw a rectangle using line drawing algorithm.
7. Write a program to perform 2D Transformation on a line.
8. Write a program to perform shear transformation on a rectangle.
9. Write a program to rotate a circle (alternatively inside and outside) around the circumference of another circle.
10. Write a program to draw a car using in build graphics function and translate it from bottom left corner to right bottom corner of screen.
11. Write a program to draw balloons using in build graphics function and translate it from bottom left corner to right top corner of screen.
12. Write a program to draw a cube using in build library function and perform 3D transformations i) Translations in x, y, z directions ii) Rotation by angle 450 about z axis, rotation by 600 about y-axis in succession. iii) Scaling in x-direction by a factor of 2, scaling in y- direction by a factor of 3. 12. Write a program to implement line clipping (Cohen Sutherland algorithm).
13. Write a program for making Bezier curve.
14. Write a program to study various in build functions for 2D drawing in MAYA software.
15. Write a program to show animation of a ball moving in a helical path.
16. Write a program to show animation of solar system.

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## Syllabus

### INTERNSHIP-II / MINI PROJECT-II (ITP-202)

**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 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 instill 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.



## Syllabus

### 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



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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, 21<sup>st</sup> edition, 2020
3. S.C. Kashyap, “ Constitution of India”, Vitasta publishing Pvt. Ltd., 2019





## Syllabus

### 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



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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 Kapoor<sup>1</sup>, Michel Danino<sup>2</sup>.
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.



## Syllabus

### OPERATING SYSTEM (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: Pre-emptive 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, Dining 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 Memory allocation-Fixed and variable partition- Internal and External fragmentation and Compaction; Paging: Principle of operation



## Syllabus

– 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

### VISUAL BASIC AND .NET PROGRAMMING (ITT-204)

L:T:P:3:1:0

CREDITS:04

**COURSE DESCRIPTION:** This course introduces computer programming using the Visual BASIC programming language with object-oriented programming principles. Emphasis is placed on event-driven programming methods, including creating and manipulating objects, classes, and using object-oriented tools such as the class debugger. Upon completion, students should be able to design, code, test, and debug at a beginning level.

**COURSE OUTCOMES:** the student will be able to:

1. Create a GUI with Visual Basic.NET.
2. Write console applications with Visual Basic.NET.
3. Write programs in Visual Basic.NET which utilize the seven basic control structures.
4. Debug Visual Basic.NET applications and Write Visual Basic.NET modules.
6. List and explain concepts associated with the .NET framework.
7. Build a setup install program from Visual Basic binary files.

**UNIT –I:** Introduction to .NET Introduction to .NET Framework, Basic Functionality of CLR, MSIL, About Platform Independency, Language Interoperability, CTS and CLS, .NET Languages, Assemblies, Garbage Collection, Architecture of GC and Application Domain.

**UNIT- II:** Visual Studio.NET WPF Designer and Windows Form Integration, Multi-Framework Targeting, Better Intelligent Support, Refactoring and Enhancements, Visual Studio Split View, Debugging the .NET Source Code VB.NET Language: Features of VB.Net, Writing Programs in VB.Net, Compiling and Execution from Command Prompt Data Types, Expressions and Operators: Option Statements, Basic Element of Programming (Data types, Variable, Constant, Control Flow Statement), Type Casting, Boxing and Unboxing, Built-in Functions in VB.Net, Sub Programs and Working with Arrays.

**UNIT- III:** Object Oriented Programming with VB.Net Principles of OOP, Data Encapsulation, Data Abstraction, Properties, Method Overloading, Constructors, Inheritance, Overloading and Overriding, Shadowing, Abstract Classes and Sealed Class, Polymorphism, Delegate - Unicast and Multicast, Events, Collections, Directories, Strings, String Builders, Attributes, Namespaces and Generics Windows Applications: Introduction to System.Windows.Forms.DLL, Basic Controls and Event Driven Programming, Programming with Advanced Controls. Windows Control Library Error Handling: Structured Error Handling, Error Categories, Debug and Trace Classes, Code Optimization, Testing Phases and Strategies.



## Syllabus

UNIT- IV: Data Access with ADO.NET Introduction to Access Libraries ADO, Limitation of ADO, ADO.Net Objects and Usage, ADO.Net Managed Providers, Data Reader, Data Adapter and Dataset, Data Relation and Dataset, Data Binding, Connected and Disconnected Environments, Connection Pooling, ADO.Net Exceptions, Using Stored Procedures, N-Tier Database Application, Crystal Reports

**Text Books:** 1) David I. Schneider, “An Introduction to Programming Using Visual Basic .Net”, PHI, ISBN 81-203-2159-6

2) ShirishChavan, “Visual Basic .NET”, Pearson, ISBN 81-317-1391-1 3) Mastering Crystal Report - BPB Publication, ISBN 13 9788176567091

**References:**

1) Jeffrey R. Shapiro, “The Complete Reference -Visual Basic .NET”, TMH, ISBN-0-07- 049511-4

2) Anne Prince and Doug Lowe, “Murach’s VB.NET database programming with ADO.NET”. 3) Crystal Report – The Complete Reference, TMH



## Syllabus

### INFORMATION SECURITY AND PRIVACY (ITT-205)

**L:T:P:3:1:0**

**CREDITS:04**

Course Objectives:

- 1 To understand the basic principles of Information Security & Privacy management.
- 2 To understand the basic concepts of the technical components involved in implementing of the security & privacy.
- 3 To understand that ensuring information security & privacy in a modern organization is a problem for the management to solve and not one that the technology alone can address.
- 4 To analyze the important economic and commercial consequences of devising security and privacy solutions in an enterprise or the lack thereof.

**Course Outcomes :** students will be able to

1. Examine and apply the fundamental techniques of computer security.
- 2 Examine and apply and identify potential security issues and the associated risks.
- 3 Demonstrate responsible computer use as it deals with social, political, legal and ethical issues in today's electronic society.
- 4 Demonstrate foundation knowledge of information security/assurance within the organization.
- 5 Plan for the future and design a solution based on user requirements. Explain business continuity, backup and disaster recovery. Understand troubleshooting and quality consumer support.

#### UNIT-1

##### INTRODUCTION

Introduction to Information Security and Privacy: Review of the essential terminologies, basic concepts of security and privacy. Relation or lack thereof between the Information Security, Network Security, Systems Security and the Cyber Security. Key principles of Information Security in terms of Security mechanisms, security attributes and the security attacks. Role of National Security Systems (CNSS) and CERTIN. The McCumber Cube for Security. Introduction to the Security Systems Development Life Cycle and the difference between the Software Security and the Security Software. Classical Security Models.

##### SECURITY THREATS AND SECURITY ATTACKS

Taxonomy of Security attacks. Illustrations of typical attacks. Cyber security threats. The basic terminologies viz. threats, defects, vulnerabilities, exploits, attacks, bugs.

#### UNIT-2

##### INTRODUCTION TO INFORMATION PRIVACY

The importance of Data privacy; Privacy rules; Data Protection – Organization Roles. Approaches to protect sensitive data. Personally Identifiable Information and Sensitive Data. Data Privacy And Protection Responsibilities. Consequences Of Privacy Unawareness. Overview Of Global Data Privacy Laws. The DSCI



## Syllabus

Privacy Framework for global privacy best practices and frameworks.

### UNIT-3

#### SECURITY TECHNOLOGY – I

Security Mechanisms: The Symmetric and Asymmetric Key Cryptography, Ciphers: Cryptographic Algorithms and the Cryptosystems, Mechanisms for Data Integrity and Entity Authentication, Access Control mechanisms.

#### SECURITY TECHNOLOGY – II

Cryptographic Tools: The Public-Key-Infrastructure (PKI), Digital Signatures, Digital Certificates, Hybrid Cryptographic Systems, Steganography. The Public Key Cryptography (PKC) limitations and looking beyond the PKC.

### UNIT-4

#### SECURITY TECHNOLOGY – III

Protocols for Secure Communications: S-HTTP, TLS for Secure Internet Communication, S/MIME, PEM, PGP for Secure Email, the SET, TLS, and S-HTTP for Securing Web Transactions, WEP and WPA for Secure Wireless Communications, Securing TCP/IP with IPSec PGP.

#### SECURITY TECHNOLOGY – IV

Firewalls: Processing Modes, Categorized by Generations, by Structure, Architectures, Selecting the right firewall, Configuring and Managing Firewalls. Remote Access, the concept of Virtual Private Networks.

### UNIT-5

#### SECURITY TECHNOLOGY – V

Intrusion Detection and Prevention Systems: Why use IDPSs, Types, IDPSs Detection Methods, IDPS Response Behaviour, IDPS Approaches. Strengths and Limitations. Deployment and Implementation of IDPSs. Measuring the effectiveness of IDPSs. Honeypots, Honeynets and Padded Cell Systems. Network Reconnaissance: Network Scanning and Analysis.

OTHER TOPICS: Legal and Ethical Issues in Information Security and Privacy. Introduction to Cyber Laws. Introduction to Security policies and Security Acts.

#### Text Books

1. Principles of Information Security, By Michael E. Whitman, Herbert J. Mattord, Course Technology Press, 4th edition, 2011
2. Computer Security, by Dieter Gollmann, Wiley, 3rd edition, 2014
3. Principles of Information Systems Security: Texts and Cases, By Gurpreet Dhillon, John Wiley & Sons, 1st edition, 2006
4. Information Security Management Principles, by Andy Taylor, David Alexander, Amanda Finch, David Sutton, 3rd edition, BCS, The Chartered Institute for IT Publishers, 2020
5. Cyber Security: A practitioner's guide, by David Sutton, BCS, The Chartered Institute for IT Publishers, 2017.





## Syllabus

### DEPARTMENT ELECTIVE -3 INTERNET OF THINGS (IOT) (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 RASPBERRY 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.

**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



## Syllabus

### 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 Madiseti, —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.



## Syllabus

### DEPARTMENT ELECTIVE -3

### MANAGEMENT INFORMATION SYSTEM (ITT-206)

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

**CREDITS:03**

Course Objective: Information Systems (IS) enables new approaches to improve efficiency and efficacy of business models. This course will equip the students with understanding of role, advantages and components of an Information System. The objective of the course is to help students integrate their learning from functional areas, decision making process in an organization and role of Information Systems to have a vintage point in this competitive world.

#### UNIT I:

Basic Concepts of Information System Role of data and information, Organization structures, Business Process, Systems Approach and introduction to Information Systems.

#### UNIT II:

Types of IS Resources and components of Information System, integration and automation of business functions and developing business models. Role and advantages of Transaction Processing System, Management Information System, Expert Systems and Artificial Intelligence, Executive Support Systems and Strategic Information Systems.

#### UNIT III:

Architecture & Design of IS Architecture, development and maintenance of Information Systems, Centralized and Decentralized Information Systems, Factors of success and failure, value and risk of IS.

#### UNIT IV:

Decision Making Process Programmed and Non- Programmed decisions, Decision Support Systems, Models and approaches to DSS.

#### UNIT V:

Introduction to Enterprise Management technologies Business Process Reengineering, Total Quality Management and Enterprise Management System viz. ERP, SCM, CRM and Ecommerce.

#### UNIT VI:

Introduction to SAD System Analysis and Design. Models and Approaches of Systems Development.

#### Text book

- Management Information Systems, Effy OZ, Thomson Learning/Vikas Publications
- Management Information Systems, James A. O'Brein, Tata McGraw-Hill

#### Reference Book

- Management Information System, W.S Jawadekar, Tata Mc Graw Hill Publication.
- Management Information System, David Kroenke, Tata Mc Graw Hill Publication.



## **Syllabus**

- MIS: Management Perspective, D.P. Goyal, Macmillan Business Books.
- MIS and Corporate Communications, Raj K. Wadwha, Jimmy Dawar, P. Bhaskara Rao, Kanishka Publishers.
- MIS: Managing the digital firm, Kenneth C. Landon, Jane P. Landon, Pearson Education



## Syllabus

### DEPARTMENT ELECTIVE -3

### AUGEMENTED REALITY (CST-026)

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

**CREDITS-03**

**COURSE OBJECTIVES:** The objectives of this course are to

1. Gain the knowledge of historical and modern overviews and perspectives on virtual reality.
2. Learn the fundamentals of sensation, perception, and perceptual training.
3. Have the scientific, technical, and engineering aspects of augmented and virtual reality systems.
4. Learn the technology of augmented reality and implement it to have practical knowledge.

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

1. Understand geometric modelling and Virtual environment.
2. Study about Virtual Hardware and Software
3. Present geometric model for VR systems
4. Identify which type hardware and software is suitable to design their own VR systems
5. Develop Virtual Reality applications.

**Unit 1-Introduction to Virtual Reality:** Virtual Reality and Virtual Environment: Introduction, Computer graphics, Real time computer graphics, Flight Simulation, Virtual environment requirement, benefits of virtual reality, Historical development of VR, Scientific Landmark, 3D Computer Graphics: Introduction, The Virtual world space, positioning the virtual observer, the perspective projection, human vision, stereo perspective projection, 3D clipping, Colour theory, Simple 3D modelling, Illumination models, Reflection models, Shading algorithms, Radiosity, Hidden Surface Removal, Realism-Stereographic image.

**Unit 2-Geometric Modelling:** Geometric Modelling: Introduction, From 2D to 3D, 3D space curves, 3D boundary representation Geometrical Transformations: Introduction, Frames of reference, Modelling transformations, Instances, Picking, Flying, Scaling the VE, Collision detection Generic VR system: Introduction, Virtual environment, Computer environment, VR technology, Model of interaction, VR Systems.

**Unit 3-Virtual Environment:** Animating the Virtual Environment: Introduction, The dynamics of numbers, Linear and Non-linear interpolation, the animation of objects, linear and non-linear translation. Physical Simulation: Introduction, Objects falling in a gravitational field, Rotating wheels, Elastic collisions, projectiles, simple pendulum, springs, Flight dynamics of an aircraft.

**Unit 4-VR Hardware and Software:** Human factors: Introduction, the eye, the ear, the somatic senses.

VR Hardware: Introduction, sensor hardware, Head-coupled displays, Acoustic hardware, Integrated VR systems. VR Software: Introduction, Modelling virtual world, Physical simulation, VR toolkits, Introduction to VRML



## Syllabus

**Unit 5-VR Applications:** Introduction, Engineering, Entertainment, Science, Training. The Future: Virtual environment, modes of interaction.

### TEXTBOOKS:

1. Coiffet, P., Burdea, G. C., (2003), “Virtual Reality Technology,” Wiley-IEEE Press, ISBN: 9780471360896
2. Schmalstieg, D., Höllerer, T., (2016), “Augmented Reality: Principles & Practice,” Pearson, ISBN: 9789332578494
3. Norman, K., Kirakowski, J., (2018), “Wiley Handbook of Human Computer Interaction,” Wiley-Blackwell, ISBN: 9781118976135
4. LaViola Jr., J. J., Kruijff, E., McMahan, R. P., Bowman, D. A., Poupyrev, I., (2017), “3D User Interfaces: Theory and Practice,” Pearson, ISBN: 9780134034324
5. Fowler, A., (2019), “Beginning iOS AR Game Development: Developing Augmented Reality Apps with Unity and C#,” Apress, ISBN: 9781484246672
6. Hassanien, A. E., Gupta, D., Khanna, A., Slowik, A., (2022), “Virtual and Augmented Reality for Automobile Industry: Innovation Vision and Applications,” Springer, ISBN: 9783030941017

### REFERENCE BOOKS:

1. Craig, A. B., (2013), “Understanding Augmented Reality, Concepts and Applications,” Morgan Kaufmann, ISBN: 9780240824086
2. Craig, A. B., Sherman, W. R., Will, J. D., (2009), “Developing Virtual Reality Applications, Foundations of Effective Design,” Morgan Kaufmann, ISBN: 9780123749437
3. John Vince, J., (2002), “Virtual Reality Systems,” Pearson, ISBN: 9788131708446
4. Anand, R., “Augmented and Virtual Reality,” Khanna Publishing House
5. Kim, G. J., (2005), “Designing Virtual Systems: The Structured Approach,” ISBN: 9781852339586
6. Bimber, O., Raskar, R., (2005), “Spatial Augmented Reality: Merging Real and Virtual Worlds,” CRC Press, ISBN: 9781568812304
7. O'Connell, K., (2019), “Designing for Mixed Reality: Blending Data, AR, and the Physical World,” O'Reilly, ISBN: 9789352138371
8. SanniSiltanen, S., (2012), “Theory and applications of marker-based augmented reality,” Julkaisija – Utgivare Publisher, ISBN: 9789513874490



## Syllabus

### DEPARTMENT 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, JDK Introspection, Using Bean properties, Bean Info Interface, Constrained properties Persistence, Customizers, Java Beans API, Introduction to EJB's

**UNIT-III Web Servers and Servlets:** Tomcat web server, Introduction to Servlets: Lifecycle of a Servlet, JSDK, The Servlet API, The javax.servelet Package, Reading Servlet 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 Servlet. 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



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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", 8<sup>th</sup>Edition(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, I I Volume I and II, Pearson Education, 2001.
4. Bates, —Developing Web ApplicationsI, Wiley, 2006





## Syllabus

### DEPARTMENT ELECTIVE -3 RELIABLE COMPUTING (CST-028)

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

**CREDITS-03**

**COURSE OBJECTIVES:** The objectives of this course are to

1. Understand the fault tolerant design principles
2. Identify the requirement of fault tolerant systems
3. Understand fault tolerant distributed systems and its requirement
4. Design algorithms for fault tolerant systems

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

1. Understand the risk of computer failures and their comparison with other equipment failures.
2. Analyze hardware and software fault-tolerant or non-fault-tolerant on the basis of dependability requirements.
3. Know the different advantages and limits of fault avoidance and fault tolerance techniques.
4. Understand the principles behind reliability
5. Gain knowledge in sources of faults and their prevention and forecasting.
6. Learn the programming tools in designing reliable systems

**Unit 1-Reliability& fault:** Definition, System reliability, Parameter values, Reliability models for hardware redundancy, Testing: Various testing methods, Definition, Fault types, Detection, Redundancy, Data diversity, Reversal checks, Byzantine failures, Integrated failure handling.

**Unit 2- Hardware Fault Tolerance:-**Definition, Fault types, Detection, Redundancy, Data diversity, Reversal checks, Byzantine failures, Integrated failure handling, canonical and Resilient Structures- Series and Parallel Systems, Non-Series/Parallel Systems,  $M$ -of- $N$  Systems, Voters, Variations on  $N$ -Modular Redundancy, Duplex Systems, Other Reliability Evaluation Techniques-Poisson Processes, Markov Models, Fault-Tolerance Processor-Level Techniques, Watchdog Processor, Simultaneous Multithreading for Fault Tolerance, Byzantine Failures, Byzantine Agreement with Message Authentication.

**Unit 3-Testability for Hardware:** testability for combinational circuits: Basic concepts of Testability, Controllability and observability, The Reed Muller's expansion technique, use of control and syndrome testable designs. Design for testability by means of scan: Making circuits Testable, Testability Insertion, Full scan DFT technique- Full scan insertion, flip-flop Structures, Full scan design and Test, Scan Architecturesfull scan design, Shadow register DFT, Partial scan methods, multiple scan design, other scan designs.



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**Unit 4- Software Fault Tolerance:**Acceptance Tests Single-Version Fault Tolerance- Wrappers, Software Rejuvenation, Data Diversity, Software Implemented Hardware Fault Tolerance (SIHFT),  $N$ -Version Programming- Consistent Comparison Problem, Version Independence, Recovery Block Approach- Basic Principles, Success Probability Calculation, Distributed Recovery Blocks, Preconditions, Postconditions, and Assertions, Exception-Handling- Requirements from Exception-Handlers, Basics of Exceptions and Exception-Handling

**Unit 5-Programming Languages and Tools:** Desired Language Characteristics, Data typing, control structures, Hierarchical decomposition, Packages, Exception handling, Over loading and Generics, Multi-tasking, Task scheduling, Timing specification., Flex, Euclid, Environments, Run time support.

### Text Book:

2. Fault Tolerant Systems, I. Koren, Morgan Kauffman , 2007
3. Fault Tolerant Computer System Design,D. K. Pradhan, Prentice Hall, 1996.

### Reference Book:

1. Probability and Statistics with Reliability, Queuing and Computer Science Applications, Kishor S. Trivedi, John Wiley & Sons Inc., 2016.



## Syllabus

### OPEN ELECTIVE-1

### TOTAL QUALITY MANAGEMENT (AHT-011)

**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	<b>Introduction:</b> 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	<b>Conceptualization of TQM:</b> 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	<b>Organization Structure in TQM:</b> 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	<b>Tools and Systems for Quality Management:</b> 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	<b>Quality Assurance:</b> 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. <b>Implementation and Need of ISO 9000:</b> ISO 9000 - 2000 Quality System: Elements, Registration, Documentation, Implemental Steps, Quality Audit,	09



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	Product and Process Audit Scope, Steps and Benefits.	
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### 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	<b>Introduction to digital marketing:</b> 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	<b>Online buyer behaviour and models:</b> 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	<b>Digital promotion techniques:</b> email marketing, strategy to craft email marketing campaign, permission marketing, viral marketing, blogs, search engines marketing (SEM), Search engine optimization, content marketing.	08
IV	<b>Social media marketing:</b> 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	<b>Introduction to e-Commerce and Retailing in Online Space:</b> 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<sup>th</sup> ed . India: Pearson Education .



## **Syllabus**

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 identify 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.



## Syllabus

Unit	Course Content	Lectures
I	<b>Concepts and Techniques:</b> 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	<b>Occupational Health and Toxicology:</b> 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	<b>Hazard Identification and Risk Assessment:</b> The process of risk management, hazard identification, evaluation (risk assessment, risk matrix), risk control implementation, action and recommendation.	08
IV	<b>Acts and Rules:</b> 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	<b>Safety Education and Training:</b> 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 SYSTEM 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

### VISUAL BASIC AND .NET PROGRAMMING LAB (ITP-203)

**L:T:P:: 0:0:2**

**CREDITS-01**

#### **A. Create programs and build projects in Visual Basic .N**

1. Launch Visual Studio in the Windows operating system.
2. Open and save a Visual Basic .NET application
3. Navigate Visual Basic .NET Form Designer
  - Use menu bar to open, add to, save, debug, and print forms, code, and project.
  - Use Standard toolbar to debug, save, open and close forms and projects.
  - Navigate between Code Editor window and Form Designer window
  - Add control from Toolbox pane to form
  - Switch files using the Solution Explorer window
  - Change properties of controls through Properties window.

#### **B. Design top-down structured applications using the Visual Basic .NET environment.**

1. Create Object-Event Diagram to implement top-down design.
2. Formulate the algorithm implementing the modularity concept.
3. Interpret documentation describing algorithm.

#### **C. Design user interface**

1. Create a form
2. Add controls to a form
3. Change the appearance of a form
4. Print the contents of a form to a printer
5. Manipulate multiple forms in a single project

#### **D. Write programming code using the Visual Basic syntax.**

1. Declare and define the appropriate type of variable.
  - Declare and define numeric variables (integers, floating point numbers, currency)
  - Declare and define string variables
  - Choose the appropriate scope for each variable
2. Code expressions and assignment statements
  - Implement mathematical operators and functions in expressions and statements
  - Implement string functions in expressions and statements
3. Write code for procedures
  - Write code for event procedures



## Syllabus

- Implement sub procedures to achieve modularity
  - Write code for and implement user defined functions
  - Write code to pass values to procedures
4. Code decision making into algorithm
    - Design and code if blocks
    - Design and code Select Case blocks
  5. Implement repetition of code through loops: For..Next loops, Do While..Loop loops, and Do..Loop Until loops
  6. Declare and define arrays
    - Assign values to elements of numerical and string arrays
    - Create adjustable arrays
    - Use two-dimensional arrays

### **E. Employ sequential disk files for input and output of information.**

1. Write code to open and close files
2. Write code to input values from file
3. Illustrate how to output values to files

### **F. Implement basic Controls**

1. Create text boxes and list boxes
2. Write code to display strings in text boxes and list boxes
3. Retrieving input from text boxes and input boxes
4. Write code to use message boxes and labels for display of information
5. Use picture box to hold a picture

### **G. Implement control buttons within project**

1. Create buttons
2. Write code to use a command button to initiate an action
3. Write code to use an option button to select an option



## Syllabus

### INFORMATION SECURITY AND PRIVACY LAB (ITP-204)

**L:T:P:: 0:0:02**

**CREDITS-1**

The following experiments shall be conducted using C/C++

1. Write a program to make study of different security protocols like WEP/ WPA2 PSK, 802.1x EAP security protocol. And Implement RC4 Algorithm.
2. Write a Program to implement AES.
3. Write a program to perform Encryption / Decryption using Caesar cipher.
4. Write a program to perform Encryption / Decryption using Mono alphabetic techniques
5. Write a program to perform Encryption / Decryption using playfair system.
6. Write a program to perform Encryption / Decryption using Hill cipher Technique.
7. Write a program to perform Encryption / Decryption using transposition technique.
8. Write a program to perform Encryption/Decryption using Diffie-Helmen Key exchange.
9. Write a program for simple RSA algorithm to encrypt and decrypt the data.
10. Write a program for DES algorithm to encrypt and decrypt the data.
11. Write a program to study a simulation tool related to Information Security.
12. Write a program to study the steps of implementation of VPN using Packet tracer



## Syllabus

### CONSTITUTION OF INDIA (AHT-009)

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

CREDITS-0

**COURSE OBJECTIVES:** The objectives of this course are to

4. 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.
5. To make students aware of the theoretical and functional aspects of the Indian Parliamentary System.
6. 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

6. Understand the basic knowledge and salient features of Indian Constitution.
7. Identify and explore the basic features and modalities about Indian constitution.
8. Discusses the essence of Union and its territories, Citizenship, Fundamental Rights, DPSP and Fundamental Duties.
9. Differentiate and relate the functioning of Indian parliamentary system at the center and state level.
10. 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



## Syllabus

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-**

4. M. Laxmikanth, “Indian Polity”, McGraw- Hill, 6th edition, 2020
5. D.D. Basu, “Introduction to the Indian Constitution”, LexisNexis, 21<sup>st</sup> edition, 2020
6. S.C. Kashyap, “ Constitution of India”, Vitasta publishing Pvt. Ltd., 2019



## Syllabus

### ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE (AHT-010)

**L:T:P:: 2:0:0**

**CREDITS-0**

**COURSE OBJECTIVES:** The objectives of this course are to

6. To facilitate the students with the concepts of Indian traditional knowledge and to make them understand the Importance of roots of knowledge system.
7. To make the students understand the traditional knowledge and analyses it and apply it to their day to day life.
8. To make the students know the need and importance of protecting traditional knowledge.
9. To make the students understand the concepts of Intellectual property to protect the traditional knowledge.
10. 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

6. Understand the concept of Traditional knowledge and its importance.
7. Know the need and importance of protecting traditional knowledge.
8. Know the various enactments related to the protection of traditional knowledge.
9. Understand the concepts of Intellectual property to protect the traditional knowledge.
10. 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.



## Syllabus

### 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:

6. Traditional Knowledge System in India by Amit Jha Atlantic publishers, 2002.
7. "Knowledge Traditions and Practices of India" Kapil Kapoor<sup>1</sup>, Michel Danino<sup>2</sup>.
8. Traditional Knowledge System in India, by Amit Jha, 2009.
9. Satya Prakash, "Founders of Sciences in Ancient India", Vijay Kumar Publisher, 1989
10. Traditional Knowledge System and Technology in India by Basanta Kumar Mohanta and Vipin Kumar Singh Pratibha Prakashan 2012.





## Syllabus

### HAPPINESS AND WELL-BEING (AHT-014)

**L:T:P: 2:0:0**

**CREDITSs-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.

#### **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.



## Syllabus

### 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](http://www.uktech.ac.in))



# SYLLABUS

For

B.TECH

(Computer Science and Information Technology)

4<sup>th</sup> Year

Effective Form 2025-26



## EFFECTIVE FROM 2025-26

B.Tech. – Computer Science and Information Technology (CS & IT) ( w.e.f. 2025-26)													
SEMESTER-VII													
Sl. No.	Subject Codes	Category	Subject	Periods			Evaluation Scheme					Subject Total	Credit
				L	T	P	Sessional Exam			ESE			
			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-205	DLC	Project Seminar	0	0	2			50			50	1
6	ITP-206	DLC	Design Project	0	0	4			100			100	2
7	ITP-207	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													

\*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	
CST-029	Ad-HOC & Sensor Networks	CST-034	Data Science
CST-030	Machine Learning	CST-035	Cryptography and Network Security
CST-031	Mobile Computing	CST-036	DevOps
CST-032	Data Mining	CST-037	Cloud Computing
CST-033	Blockchain	ITT-207	Software Quality assurance and Testing

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



**EFFECTIVE FROM 2025-26**

B.Tech. - Computer Science and Information Technology (CS & IT) (w.e.f. 2025-26)													
SEMESTER-VIII													
Sl. No.	Subject Codes	Category	Subject	Periods			Evaluation Scheme					Subject Total	Credit
				L	T	P	Sessional Exam			ESE			
			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	XXT-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-208	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-039	Soft Computing
CST-040	Software Project Management
CST-041	Cyber and Digital Forensics
CST-042	Digital Image Processing
ITT-208	IT Laws and Patents

**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.



## Syllabus

### 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 Clelland'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.





## Syllabus

### 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 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.



## Syllabus

**Unit 5- WSN PROTOCOLS:** Communication protocols, MAC protocols, Naming 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.



## Syllabus

### DEPARTMENTAL ELECTIVE-4 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

**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:



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- 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 Perspectivel, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.



## Syllabus

### DEPARTMENTAL ELECTIVE-4 MOBILE COMPUTING (CST-031)

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

CREDITS-03

**COURSE OBJECTIVES:** The objectives of the course are to

1. Understand the basic concepts of mobile computing and basics of mobile telecommunication system.
2. Become familiar with the network layer protocols and Ad-Hoc networks.
3. Know the basis of transport and application layer protocols.
4. Gain the knowledge about different mobile platforms and application development

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

1. Impart knowledge of mobile and wireless computing systems and techniques.
2. Understand the knowledge of wireless network
3. Understand the concepts of security and failure detection and recovery strategies.
4. Understand the concepts routing protocols.
5. Understand the working of mobile tracking in wireless network

**Unit 1- Introduction:** Issues, Challenges, and benefits of Mobile Computing, IEEE 802.11 & Bluetooth, Wireless Multiple access protocols, spread spectrum, cellular wireless networks.

**Unit 2- Data Management Issues:** Wireless computing, nomadic computing, ubiquitous computing and tunneling, data replication for mobile computers, adaptive Clustering for Mobile Wireless networks, LEACH and TORA, mobile TCP (M-TCP) Spooning TCP, Frequency for radio transmission.

**Unit 3- Distributed location Management:** pointer forwarding strategies, Process communication techniques, Socket Programming, RPC, RMI, Mobile IP, TCP Over wireless. Hidden and exposed terminal problems.

**Unit 4- Routing Protocols:** Routing Protocol, Dynamic State Routing (DSR), Ad hoc On-Demand Distance Vector (AODV), and Destination Sequenced Distance – Vector Routing (DSDV), Cluster Based Routing Protocol (CBRP).

**Unit 5- Fault tolerance and security:** Security and fault tolerance, transaction processing in Mobile computing environment. Mobile Agent Systems: Aglets, PMADE, Case Studies, agent failure scenarios, node failure detection and recovery.

#### TEXT BOOKS:

1. Jochen Schiller, —Mobile Communications, PHI, Second Edition, 2003.



## Syllabus

2. Prasant Kumar Pattnaik, Rajib Mall, —Fundamentals of Mobile Computing, PHI Learning Pvt. Ltd, New Delhi – 2012

### REFERENCE BOOKS:

1. Dharma Prakash Agarwal, Qing and An Zeng, "Introduction to Wireless and Mobile systems, Thomson Asia Pvt Ltd, 2005.
2. Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, —Principles of Mobile Computing, Springer, 2003.
3. William.C.Y.Lee,—Mobile Cellular Telecommunications-Analog and Digital Systems, Second Edition,TataMcGraw Hill Edition ,2006.
4. C.K.Toth, —AdHoc Mobile Wireless Networks, First Edition, Pearson Education, 2002.



## Syllabus

### DEPARTMENTAL ELECTIVE-4

#### 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.





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**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



## Syllabus

### DEPARTMENTAL ELECTIVE-4

#### BLOCKCHAIN (CST-033)

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

CREDITS-03

**COURSE OBJECTIVES:** The objectives of the course are to

1. Study the concepts of blockchain technologies.
2. Cover the technical aspects of crypto currencies, block chain technologies, and distributed consensus.
3. Familiarize potential applications for Bit coin-like crypto currencies.
4. Learn, how these systems work and how to engineer secure software that interacts with the Bit coin network and other crypto currencies.

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

1. Understand Blockchain technology.
2. Develop Blockchain based solutions and write smart contract using Hyperledger Fabric and Ethereum frameworks.
3. Build and deploy Blockchain application for on premise and cloud-based architecture.
4. Develop the concepts for safe use of crypto currency
5. Integrate ideas from various domains and implement them using Blockchain technology

**Unit 1-Introduction:** Overview of Blockchain, Public Ledgers, Bitcoin, Smart Contracts, Block in a Blockchain, Transactions, Distributed Consensus, Public vs Private Blockchain, Understanding Crypto currency toBlockchain, Permissioned Model of Blockchain, Overview of Security aspects of Blockchain. Basic Crypto Primitives: Cryptographic Hash Function, Properties of a hash function, Hash pointer and Merkle tree, Digital Signature, Public Key Cryptography, A basic cryptocurrency.

**Unit 2-Understanding Blockchain with Crypto currency:** Bitcoin and Blockchain: Creation of coins, Payments and double spending, Bitcoin Scripts, Bitcoin P2P Network, Transaction in Bitcoin Network, Block Mining, Block propagation and block relay. Working with Consensus in Bitcoin: Distributed consensus in open environments, Consensus in a Bitcoin network, Proof of Work (PoW) – basic introduction, HashcashPoW, BitcoinPoW, Attacks on PoW and the monopoly problem, Proof of Stake, Proof of Burn and Proof of Elapsed Time, The life of a Bitcoin Miner, Mining Difficulty, Mining Pool.

**Unit 3-Understanding Blockchain for Enterprises:** Permissioned Block chain: Permissioned model and use cases, Design issues for Permissioned Blockchains, Execute contracts, State machine replication, Overview of Consensus models for permissioned Blockchain- Distributed consensus in closed environment, Paxos, RAFT Consensus, Byzantine general problem, Byzantine fault tolerant system, Lamport-Shostak-Pease BFT Algorithm, BFT over Asynchronous systems.



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**Unit 4-Enterprise application of Blockchain:** Cross border payments, Know Your Customer (KYC), Food Security, Mortgage over Block chain, Block chain enabled Trade, We Trade – Trade Finance Network, Supply Chain Financing, Identity on Blockchain

**Unit 5-Blockchain application development:** Hyperledger Fabric- Architecture, Identities and Policies, Membership and Access Control, Channels, Transaction Validation, Writing smart contract using Hyperledger Fabric, Writing smart contract using Ethereum, Overview of Ripple and Corda

### TEXT BOOKS:

1. Melanie Swan, “Block Chain: Blueprint for a New Economy”, O’Reilly, first edition – 2015.
2. Daniel Drescher, “Block Chain Basics”, Apress; 1st edition, 2017.
3. Anshul Kaushik, “Block Chain and Crypto Currencies”, Khanna Publishing House, Delhi.
4. Imran Bashir, “Mastering Block Chain: Distributed Ledger Technology, Decentralization and Smart Contracts Explained”, Packt Publishing, first edition – 2012.

### REFERENCE BOOKS:

1. Ritesh Modi, “Solidity Programming Essentials: A Beginner’s Guide to Build Sma Ethereum and Block Chain”, Packt Publishing.
2. Antony Lewis, “The Basics of Bitcoins and Blockchains: An Introduction to Cryptocurrencies and the Technology that Powers Them (Cryptography, Crypto Trading, Digital Assets)”, Mango Publications.
3. Melanie Swan, “Blockchain: Blueprint for a New Economy”, O’Reilly, 2015.



## Syllabus

### DEPARTMENTAL ELECTIVE -5

### DATA SCIENCE (CST-034)

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

CREDITS-03

**COURSE OBJECTIVE:** The objectives of the course are to

1. Learn concepts, techniques and tools they need to deal with various facets of data science practice, including data collection and integration.
2. Understand the basic types of data and basic statistics.
3. Identify the importance of data reduction and data visualization techniques

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

1. Demonstrate the mathematical foundations needed for data science.
2. Collect, explore, clean and manipulate data.
3. Demonstrate the basic concepts of machine learning.
4. Implement models such as k-nearest Neighbors, Naive Bayes, linear and logistic regression, decision trees, neural networks and clustering.
5. Build data science applications using Python based toolkits.

**Unit 1-Introduction to Data Science:** Concept of Data Science, Traits of Big data, Web Scraping, Analysis vs Reporting

**Unit 2-Introduction to Programming Tools for Data Science:** Toolkits using Python: Matplotlib, NumPy, Scikit-learn, NLTK Visualizing Data: Bar Charts, Line Charts, Scatterplots Working with data: Reading Files, Scraping the Web, Using APIs (Example: Using the Twitter APIs), Cleaning , Manipulating Data, Rescaling, Dimensionality Reduction

**Unit 3-Mathematical Foundations:** Linear Algebra: Vectors, Matrices, Statistics: Describing a Single Set of Data, Correlation, Simpson's Paradox, Correlation and Causation Probability: Dependence and Independence, Conditional Probability, Bayes's Theorem, Random Variables, Continuous Distributions, The Normal Distribution

**Unit 4-Machine Learning:** Overview of Machine learning concepts – Over fitting and train/test splits, Types of Machine learning – Supervised, Unsupervised, Reinforced learning, Introduction to Bayes Theorem, Linear Regression- model assumptions, regularization (lasso, ridge, elastic net), Classification and Regression algorithms- Naïve Bayes, K-Nearest Neighbors, logistic regression, support vector machines (SVM), decision trees, and random forest, Classification Errors, Analysis of Time Series- Linear Systems Analysis, Nonlinear Dynamics, Rule Induction, Neural Networks- Learning and Generalization, Overview of Deep Learning.

**Unit 5-Case Studies of Data Science Application:** Weather forecasting, Stock market prediction, Object recognition, Real



## Syllabus

Time Sentiment Analysis.

### TEXT BOOKS:

1. Doing Data Science, Straight Talk from The Frontline. Cathy O'Neil and Rachel Schutt, O'Reilly, 2014.
2. Jiawei Han, Micheline Kamber and Jian Pei. Data Mining: Concepts and Techniques, 3rd ed. The Morgan Kaufmann Series in Data Management Systems.
3. K G Srinivas, G M Siddesh, "Statistical programming in R", Oxford Publications.

### REFERENCE BOOKS:

1. Introduction to Data Mining, Pang-Ning Tan, Vipin Kumar, Michael Steinbach, Pearson Education.
2. Brian S. Everitt, "A Handbook of Statistical Analysis Using R", Second Edition, 4 LLC, 2014.
3. Dalgaard, Peter, "Introductory statistics with R", Springer Science & Business Media, 2008.
4. Paul Teetor, "R Cookbook", O'Reilly, 2011.



## Syllabus

### DEPARTMENTAL ELECTIVE -5

### CRYPTOGRAPHY & NETWORK SECURITY (CST-035)

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

CREDITS-03

**COURSE OBJECTIVES:** The objectives of the course are to

1. Explain the importance and application of each of confidentiality, integrity, authentication and availability.
2. Understand various cryptographic algorithms and basic categories of threats to computers and networks.
3. Describe the enhancements made to IPv4 by IPSec.
4. Understand Intrusions, intrusion detection, Web security and Firewalls.

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

1. Identify the various attacks and its issues.
2. Learn usage of cryptographic algorithms for avoiding basic level threats.
3. Comprehend the issues involved in Integrity, Authentication and Key Management techniques.
4. Realize the importance of user authentication and Kerberos concepts.
5. Acquire the knowledge of network and system security domain.

**Unit 1- Introduction of Cryptography:** Introduction To security: Attacks, Services and Mechanisms, Conventional Encryption: Conventional Encryption Model, Steganography, Block Cipher Principles, DES Standard, DES Strength, Differential and Linear Cryptanalysis, Block Cipher Modes of Operations. Double DES, Triples DES, Blowfish, International Data Encryption Algorithm, Placement of Encryption Function, Key Distribution, Random Number Generation and Traffic confidentiality

**Unit 2- Number Theory and Public Key Encryption:** Fermat's and Euler's Theorem, Primality Testing, Chinese Remainder Theorem, Public-Key Cryptography: Principles of Public-Key Cryptosystems, RSA Algorithm.

**Unit 3- Key Management:** Key Management scenario in secret key and public key cryptography, Diffie Hellman Key Exchange algorithm, OAKLEY and ISAKMP key management protocol, Elliptic Curve Cryptography

**Unit 4-Hash Functions:** Message Authentication and Hash Functions: Authentication Requirements, Authentication Functions, Message Authentication Codes, Hash Function Birthday Attacks, Security of Hash Function and MACS, MD5 Message Digest Algorithm, Secure Hash Algorithm (SHA), Digital Signatures, Digital Signature Standard (DSS).

**Unit 5- Network and System Security:** Authentication Applications: Kerberos, X.509, Electronic Mail Security, Pretty Good Privacy (PGP), S/MIME Security: Architecture, Authentication Header, Encapsulating Security Payloads, Combining Security Associations, Key Management, Web Security: Secure Socket Layer and Transport Layer Security, Secure Electronic Transaction (SET), System Security: Intruders, Viruses, Firewall Design Principles, Trusted Systems.



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### TEXT BOOKS:

1. Cryptography and Network Security - Principles and Practice: William Stallings, Pearson Education, 6th Edition.
2. Cryptography and Network Security: Atul Kahate, Mc Graw Hill, 3rd Edition.

### REFERENCE BOOKS:

1. Cryptography and Network Security: C K Shyamala, N Harini, Dr T R Padmanabhan, Wiley India, 1st Edition.
2. Cryptography and Network Security: Forouzan Mukhopadhyay, Mc Graw Hill, 3rd Edition.
3. Information Security, Principles, and Practice: Mark Stamp, Wiley India.
4. Principles of Computer Security: WM. Arthur Conklin, Greg White, TMH.
5. Introduction to Network Security: Neal Krawetz, CENGAGE Learning.
6. Network Security and Cryptography: Bernard Menezes, CENGAGE Learning.



## Syllabus

### DEPARTMENTAL ELECTIVE -5

#### DEVOPS (CST-036)

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

CREDITS-03

**COURSE OBJECTIVES:** The objectives of the course are to

1. Describe the agile relationship between development and IT operations.
2. Understand the skill sets and high-functioning teams involved in DevOps and related methods to reach a continuous delivery capability.
3. Implement automated system update and DevOps lifecycle.

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

1. Identify components of Devops environment.
2. Describe Software development models and architectures of DevOps.
3. Apply different project management, integration, testing and code deployment tool.
4. Investigate different DevOps Software development models.
5. Assess, collaborate, and adopt Devops in real-time projects

**Unit 1-Introduction:** Introduction, Agile development model, DevOps, and ITIL. DevOps process and Continuous Delivery, Release management, Scrum, Kanban, delivery pipeline, bottlenecks, examples.

**Unit 2-Software development models and DevOps:** DevOps Lifecycle for Business Agility, DevOps, and Continuous Testing.

**DevOps influence on Architecture:** Introducing software architecture, The monolithic scenario, Architecture rules of thumb, The separation of concerns, Handling database migrations, Microservices, and the data tier, DevOps, architecture, and resilience.

**Unit 3-Introduction to project management:** The need for source code control, The history of source code management, Roles and code, source code management system and migrations, Shared authentication, Hosted Git servers, Different Git server implementations, Docker intermission, Gerrit, The pull request model, GitLab.

**Unit 4-Integrating the system:** Build systems, Jenkins build server, Managing build dependencies, Jenkins plugins, and file system layout, The host server, Build slaves, Software on the host, Triggers, Job chaining and build pipelines, Build servers and infrastructure as code, Building by dependency order, Build phases, Alternative build servers, Collating quality measures.

**Unit 5-Testing Tools and automation:** Various types of testing, Automation of testing Pros and cons, Selenium -





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Introduction, Selenium features, JavaScript testing, Testing backend integration points, Test-driven development, REPL-driven development

**Deployment of the system:** Deployment systems, Virtualization stacks, code execution at the client, Puppet master and agents, Ansible, Deployment tools: Chef, Salt Stack and Docker

### TEXTBOOKS:

1. Joakim Verona. Practical Devops, Second Edition. Ingram short title; 2nd edition (2018). ISBN10: 1788392574.
2. Deepak Gaikwad, Viral Thakkar. DevOps Tools from Practitioner's Viewpoint. Wiley publications. ISBN: 9788126579952

### REFERENCE BOOK:

1. Len Bass, Ingo Weber, Liming Zhu. DevOps: A Software Architect's Perspective. Addison Wesley; ISBN-10.



## 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

#### SOFTWARE QUALITY ASSURANCE AND TESTING (ITT-207)

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

CREDITS-03

##### Course Objectives:

- To understand the basic view of software quality and quality factors.
- To understand the Software Quality Assurance (SQA) architecture and the details of its components.
- To understand of how the SQA components can be integrated into the project life cycle.
- To be familiar with the software quality infrastructure.

##### Course Outcomes:

- Utilize the concepts in software development life cycle.
- Demonstrate their capability to adopt quality standards.
- Assess the quality of software product.
- Apply the concepts in preparing the quality plan & documents.

##### Unit I

Introduction to software Quality and Assurance The software quality challenge, Software quality, Software quality factors Management and its role in software quality assurance

##### Unit II

Components of SQA The components of the software quality assurance system – overview Pre-project Software Quality Components Contract review, Development and quality plans

##### Unit III

SQA Components in the Project Life Cycle and Strategies Integrating quality activities in the project life cycle, Reviews, Software testing – strategies

##### Unit IV

Software Testing – Implementation: Software Quality Implementation, Assuring the quality of software maintenance components, Assuring the quality of external participants' contributions, CASE tools and their effect on software quality

##### Unit V

Software Quality Infrastructure Components Procedures and work instructions, Staff training and certification, Corrective and preventive actions, Documentation control 10% Unit VI Software Quality Metrics Software Quality metrics, Cost of Quality

##### Text Book:

Daniel Galin, “Software Quality Assurance”, Pearson Publication, 2009.

##### Reference Books:

- 1) Kshirsagar Naik and Priyadarshi Tripathy, Software Testing & Quality Assurance Theory and Practice, Wiley



## Syllabus

Student edition

- 2) William E. Perry, Effective Methods for Software Testing, WILEY, 3rd Edition
- 3) Alan C. Gillies, “Software Quality: Theory and Management”, International Thomson Computer Press, 1997.
- 4) M G Limaye, Software Testing, Tata McGraw-Hill Education, 2009



## Syllabus

### COMPUTER NETWORKS (CSO-053)

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

**CREDITS-03**

**COURSE OBJECTIVES:** The objectives of this course are to

5. Understand the protocol layering and physical level communication.
6. Analyze the performance of a network .and understand the various components required to build different networks.
7. Learn the functions of network layer and the various routing protocols.
8. Familiarize the functions and protocols of the Transport layer.

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

6. Explain the functions of the different layer of the OSI Protocol.
7. Draw the functional block diagram of local area networks (LANs, wide-area networks (WANs) and Wireless LANs (WLANs).
8. Address the issues related to network layer and various routing protocols.
9. Configure DNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP.
10. 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.



## Syllabus

**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:**

6. Larry L. Peterson, Bruce S. Davie, Computer Networks: A Systems Approach, Fifth Edition, Morgan Kaufmann Publishers Inc., 2012.
7. William Stallings, Data and Computer Communications, Tenth Edition, Pearson Education, 2013.
8. Nader F. Mir, Computer and Communication Networks, Second Edition, Prentice Hall, 2014.
9. Ying-Dar Lin, Ren-Hung Hwang and Fred Baker, Computer Networks: An Open Source Approach, McGraw Hill Publisher, 2011.
10. James F. Kurose, Keith W. Ross, Computer Networking, A Top-Down Approach Featuring the Internet, Sixth Edition, Pearson Education, 2013



## Syllabus

### ETHICAL HACKING LAB (ITP-205)

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

CREDITS-01

#### Course Objectives

1. The aim of the course is to introduce the methodologies framework tools of ethical hacking to get awareness in enhancing the security
2. To get knowledge on various attacks and their detection

#### Course Outcomes

1. Gain the knowledge of the use and availability of tools to support an ethical hack
2. Gain the knowledge of interpreting the results of a controlled attack

#### List of Experiments

1. Setup a honey pot and monitor the honey pot on network
2. Write a script or code to demonstrate SQL injection attacks
3. Create a social networking website login page using phishing techniques
4. Write a code to demonstrate DoS attacks
5. Install rootkits and study variety of options
6. Study of Techniques uses for Web Based Password Capturing.
7. Install jcrypt tool (or any other equivalent) and demonstrate Asymmetric, Symmetric Crypto algorithm, Hash and Digital/PKI signatures studied in theory Network Security And Management
8. Implement Passive scanning, active scanning, session hijacking, cookies extraction using Burp suit tool





## Syllabus

### PROJECT SEMINAR (ITP-206)

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.



## Syllabus

**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-207)

**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-208)

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 instill 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)



## Syllabus

### 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.



## Syllabus

### 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

8 Hrs

##### Introduction to Critical Design Thinking

- Understanding critical thinking, creative thinking, and problem solving through examples.
- New ways to solve problems.

#### Unit – II

8 Hrs

##### Theory of Inventive Problem Solving

- Examples of inventive problem solving,
- Era of technical systems,
- Science of inventing,
- Art of inventing,
- Amazing world of tasks

#### Unit – III

8 Hrs

##### 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 Hrs



## Syllabus

### 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

8 Hrs

#### 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 solutions

### 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.





## Syllabus

### DEPARTMENTAL ELECTIVE -6

#### 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, Backpropagation learning, Fundamentals of Associative Memory, Associative memory models, Auto associative memory, Bi-directional hetero associative memory.

**Unit 3- Competitive Networks:** Introduction to Competitive Neural 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, snowflake schema, Data mining and web mining



## Syllabus

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 -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,



## Syllabus

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”, 3<sup>rd</sup> Edition, Wiley publishing Inc., 2006.



## Syllabus

### DEPARTMENTAL ELECTIVE -6 CYBER AND DIGITAL FORENSICS (CST-041)

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

**CREDITS-03**

**COURSE OBJECTIVE:** The objectives of the course are to

1. Understand the basics of the cyber forensics.
2. Introduce the essential and up-to-date concepts, algorithms, protocols, tools, and methodology of Digital Forensics

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

1. Understand the concept of cybercrime and emerging crime threats and attacks in cyberspace.
2. Demonstrate the various types of cyber laws and their applicability.
3. Apply the forensic science techniques to data acquisition and evidence collection
4. Get the practical exposure to forensic tools from the scenarios of passive and active attacks.
5. Demonstrate the use of anti-malware tools for enhancing system network protection.

**Unit 1: Introduction to IT laws & Cyber Crimes:** Internet, Hacking, Cracking, Viruses, Virus Attacks, Pornography, Software Piracy, Intellectual property, Legal System of Information Technology, Social Engineering, Mail Bombs, Bug Exploits, and Cyber Security.

**Legal and Ethical Principles:** Introduction to Forensics – The Investigative Process – Code of Ethics, Ethics of Investigations, Evidence Management – Collection, Transport, Storage, access control, disposition

**Unit 2- Forensic Science:** Principles and Methods –Scientific approach to Forensics, Identification and Classification of Evidence, Location of Evidence, Recovering Data, Media File Forensic Steps, Forensic Analysis – Planning, Case Notes and Reports, Quality Control .

**Unit 3- Digital Forensics:** Hardware Forensics – Hidden File and Anti- forensics - Network Forensics – Virtual Systems - Mobile Forensics Digital Watermarking Protocols: A Buyer-Seller Watermarking Protocol, an Efficient and Anonymous Buyer-Seller Watermarking Protocol, Extensions of Watermarking Protocols, Protocols for Secure Computation

**Unit 4- Application Forensics, Tools and Report Writing** – Application Forensics, Email and Social Media Investigations, Cloud Forensics, Current Digital Forensic Tools, Report Writing for Investigations.

**Unit 5- Counter Measures:** Defensive Strategies for Governments and Industry Groups, Tactics of the Military, Tactics of Private Companies, Information Warfare Arsenal of the future, and Surveillance Tools for Information Warfare of the Future.



## Syllabus

### TEXT BOOKS:

1. Bill Nelson, Christopher Steuart, Amelia Philips, “Computer Forensics and Investigations”, Delmar Cengage Learning; 5th edition January 2015.
2. Chuck Eastom, “Certified Cyber Forensics Professional Certification”, McGraw Hill, July 2017.
3. Nilakshi Jain, Dhananjay Kalbande, “Digital Forensic: The fascinating world of Digital Evidence” Wiley India Pvt Ltd 2017.
4. John R.Vacca, “Computer Forensics: Computer Crime Scene Investigation”, Laxmi Publications, 2015.

### REFERENCE BOOKS:

1. MarjieT.Britz, “Computer Forensics and Cyber Crime”: An Introduction”, 3rd Edition, Prentice Hall, 2013.
2. Clint P Garrison “Digital Forensics for Network, Internet, and Cloud Computing A forensic evidence guide for moving targets and data , Syngress Publishing, Inc. 2010.



## Syllabus

### DEPARTMENTAL ELECTIVE -6 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 Miss transform,



## Syllabus

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 -6 IT LAWS AND PATENTS (ITT-208)

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

**CREDITS-03**

#### Course Objectives:

1. The course aims at acquainting the students with the Basic concepts of Technology and Law and also puts those concepts in their practical perspective. It also provides an elementary understanding of the authorities under IT Act as well as penalties and offences under IT Act.
2. The course aims at providing extensive knowledge regarding IT Act, 2000 and Cyber Space Jurisdiction to the students so that students do not face any difficulty while handling practical cases in future as an advocate.
3. The course aims at acquainting the students with Cyber Crime & Computer related Crimes and also freedom of speech in cyber space. It also provides an elementary understanding of the Indian Penal Law and Cyber Crimes.

#### Course Outcomes:

1. Give Learners In Depth Knowledge Of Information Technology Act And Legal Frame Work Of Right To Privacy, Data Security And Data Protection.
2. To develop the conceptual understanding of the cyber dispute and its resolution
- 3.To explain the regime of the cyber laws

#### UNIT 1

Evolution of the Information Technology Act, Genesis and Necessity: International Perspective, History of Cyber law in India, Salient features of the Information Technology Act, 2000: Various concepts (Definitions), Digital Signature, Electronic Governance, Attribution, Acknowledgement and Despatch of Electronic Records., Secure Electronic Records and Secure Digital Signatures, Regulation of Certifying Authorities, Digital Signature Certificates, Duties of Subscribers.

#### UNIT 2

Penalties and Adjudication, The Cyber Regulations Appellate Tribunal, Offences, Network Service providers not to be liable in certain cases, Miscellaneous-Various Government Initiatives for awareness, The Information Technology (Amendment) Bill, 2006

#### UNIT 3

Impact of other related Acts (Amendments) - a. Amendments to Indian Penal Code. b. Amendments to Criminal Procedure Code. c. Amendments to Indian Evidence Act. d. Amendments to Bankers Books Evidence Act. e. Amendments to Reserve Bank of India Act, The Information Technology (Certifying Authorities) rules, 2001., The Cyber Regulations appellate Tribunals (Procedure) rules, 2000, The Information Technology (Certifying Authorities) regulations, 2001, The Cyber regulations appellate tribunal (Procedure for investigation of misbehaviour of incapacity of presiding officer) Rules, 2003, The Information Technology (Qualification and Experience of Adjudicating officers and manner of holding enquiry) Rules, 2003. a. Performa for complain to the



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adjudicating officer, The Information Technology (use of electronic record and digital signatures) Rules, 2004, The Information Technology (Security procedure) Rules, 2004

### UNIT 4

Concept of Patent – Historical view of Patent system in India and International Scenario – Evolution of Patent Laws in India – Legal basis of Patent Protection. Patentable Inventions - Process and Product (Biotechnology / Pharmaceutical Products / Software programme) – Patent protection of computer programme – Inventions NOT patentable.

### UNIT 5

Process of Obtaining a Patent – Application- Examination – Acceptance - Opposition – Sealing of Patents – Preservation of Patents- Documentation – Register of Patents. Duration of Patents – Rights of Patentee – Limitation of rights - Use and exercise of Rights – Right to Secrecy – Compulsory Licenses – Special Categories

### Reference books:

1. Raj, Niharikia, Law & Technology, Universal Law Publishing. Information Technology Act, 2000.
2. Fisher, Matthew (ed.), Fundamentals of Patent Law: Interpretation and Scope of Protection, (2010), New Delhi, Mohan law House.
3. Miller, Joseph Scott (ed.), Patents, (2010), UK, Edward Elgar.
4. Kankanala, Kalyan C., Indian Patent Law and Practice, (2010), India, Oxford University Press
5. Dr. Bhandari, M.K. Law relating to IPR, Central Law Publication, (4th Edition 2015)



## Syllabus

### OPEN ELECTIVE -3

### SOFTWARE ENGINEERING (CSO-052)

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

**CREDITS-03**

**COURSE OBJECTIVES:** The objectives of this course are to

5. Learn and understand the principles of Software Engineering.
6. Learn methods of capturing, specifying, visualizing, and analyzing software requirements.
7. Apply Design and Testing principles to S/W project development.
8. Understand project management through life cycle of the project.

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

6. Identify appropriate software design model based on requirement analysis.
7. Formulate Software Requirements Specification (SRS) reports for the real world application.
8. Translate a specification into a design and identify the components to build the architecture.
9. Plan a software engineering process to account for quality issues and non-functional requirements.
10. 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



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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, Clanye International ISBN- 10: 1632402939



## Syllabus

### 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:

6. Provide flexible and powerful abstraction.
7. Allow programmers to think the problem in terms of the structure rather than in terms of structure of the computer.
8. Decompose the problem into a set of objects.
9. Objects interact with each other to solve the problem.
10. 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:

6. Recognize features of object-oriented design such as encapsulation, polymorphism, inheritance, and composition of systems based on object identity.
7. Apply some common object-oriented design patterns.
8. Specify simple abstract data types and design implementations using abstraction functions to document them.
9. Design a convenient way for the handling problems using templates and use simple try-catch blocks for Exception Handling.
10. 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 Multiple Base Classes, Constructors, Destructors and Inheritance, Granting Access, Virtual Base Classes.



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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 I/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:

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

### REFERENCE BOOKS:

6. Big C++ - Wiley India.
7. C++: The Complete Reference- Schildt, McGraw-Hill Education (India).
8. C++ and Object Oriented Programming – Jana, PHI Learning.
9. Object Oriented Programming with C++ - Rajiv Sahay, Oxford.
10. Mastering C++ - Venugopal, McGraw-Hill Education (India)



## Syllabus

### PROJECT (ITP-209)

**L:T:P:: 0:0:12**

**CREDITSs-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.