Third Semester					
Group	**Paper Code**	**Paper**	**L**	**P**	**Credits**
Theory Papers					
ES	ES-201	Computational Methods	4		4
HS/MS	HS-203	Indian Knowledge System*	2		2
PC	CIC-205	Discrete Mathematics	4		4
PC	ECC-207	Digital Logic and Computer Design	4		4
PC	CIC-209	Data Structures	4		4
PC	CIC-211	Object-Oriented Programming using C++	4		4
Practical / Viva Voce					
ES	ES-251	Computational Methods Lab		2	1
PC	ECC-253	Digital Logic and Computer Design Lab		2	1
PC	CIC-255	Data Structures Lab		2	1
PC	CIC-257	Object-Oriented Programming using C++ Lab		2	1
Total			**22**	**8**	**26**

***NUES:**All examinations to be conducted by the concerned teacher as specified in the detailed syllabus of the paper.

Fourth Semester					
Group	**Paper Code**	**Paper**	**L**	**P**	**Credits**
Theory Papers					
BS	BS-202	Probability, Statistics and Linear Programming	4		4
HS/MS	HS-204	Technical Writing*	2		2
PC	CIC-206	Theory of Computation	4		4
PC	EEC-208	Circuits and Systems	4		4
PC	CIC-210	Database Management Systems	4		4
PC	CIC-212	Programming in Java	4		4
Practical / Viva Voce					
BS	BS-252	Probability, Statistics and Linear Programming Lab		2	1
PC	EEC-254	Circuits and Systems Lab		2	1
PC	CIC-256	Database Management Systems Lab		2	1
PC	CIC-258	Programming in Java Lab		2	1
Total			**22**	**8**	**26**

***NUES:**All examinations to be conducted by the concerned teacher as specified in the detailed syllabus of the paper.

Paper Code(s): ES-201	L	P	C
Paper: Computational Methods	4	-	4

Marking Scheme:

1. Teachers Continuous Evaluation: 25 marks
2. Term end Theory Examinations: 75 marks

Instructions for paper setter:

1. There should be 9 questions in the term end examinations question paper.
2. The first (1^{st}) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 15 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 15.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objectives :

1.	To understand numerical methods to find roots of functions and first order unconstrained minimization of functions.
2.	To introduce concept of interpolation methods and numerical integration.
3.	To understand numerical methods to solve systems of algebraic equations and curve fitting by splines.
4.	To understand numerical methods for the solution of Ordinary and partial differential equations.

Course Outcomes (CO)

CO 1	Ability to develop mathematical models of low level engineering problems
CO 2	Ability to apply interpolation methods and numerical integration.
CO 3	Ability to solve simultaneous linear equations and curve fitting by splines
CO 4	Ability to numerically solve ordinary differential equations that are initial value or boundary value problems

Course Outcomes (CO) to Programme Outcomes (PO) mapping (scale 1: low, 2: Medium, 3: High)

	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO 1	3	2	2	2	2	-	-	-	2	2	2	3
CO 2	3	2	2	2	2	-	-	-	2	2	2	3
CO 3	3	3	3	3	2	-	-	-	2	2	2	3
CO 4	3	3	3	3	2	-	-	-	2	2	2	3

UNIT-I

Review of Taylor Series, Rolle 's Theorem and Mean Value Theorem, Approximations and Errors in numerical computations, Data representation and computer arithmetic, Loss of significance in computation
Location of roots of equation: Bisection method (convergence analysis and implementation), Newton Method (convergence analysis and implementation), Secant Method (convergence analysis and implementation). Unconstrained one variable function minimization by Fibonacci search, Golden Section Search and Newton's method. Multivariate function minimization by the method of steepest descent, Nelder- Mead Algorithm.

UNIT-II

Interpolation: Assumptions for interpolation, errors in polynomial interpolation, Finite differences, Gregory-Newton's Forward Interpolation, Gregory-Newton's backward Interpolation, Lagrange's Interpolation, Newton's divided difference interpolation
Numerical Integration: Definite Integral, Newton-Cote's Quadrature formula, Trapezoidal Rule, Simpson's one-third rule, simpson's three-eight rule, Errors in quadrature formulae, Romberg's Algorithm, Gaussian Quadrature formula.

UNIT-III

System of Linear Algebraic Equations: Existence of solution, Gauss elimination method and its computational effort, concept of Pivoting, Gauss Jordan method and its computational effort, Triangular Matrix factorization methods: Dolittle algorithm, Crout's Algorithm, Cholesky method, Eigen value problem: Power method
Approximation by Spline Function: First-Degree and second degree Splines, Natural Cubic Splines, B Splines, Interpolation and Approximation

UNIT - IV

Numerical solution of ordinary Differential Equations: Picard's method, Taylor series method, Euler's and Runge-Kutta's methods, Predictor-corrector methods: Euler's method, Adams-Bashforth method, Milne's method.
Numerical Solution of Partial Differential equations: Parabolic, Hyperbolic, and elliptic equations
Implementation to be done in C/C++

Textbook(s):

1. E. Ward Cheney & David R. Kincaid , "Numerical Mathematics and Computing" Cengage; 7th ed (2013).

References:

1. R. L. Burden and J. D. Faires, "Numerical Analysis", CENGAGE Learning Custom Publishing; 10th Edition (2015).
2. S. D. Conte and C. de Boor, "Elementary Numerical Analysis: An Algorithmic Approach", McGraw Hill, 3rd ed. (2005).
3. H. M. Antia, "Numerical Methods for Scientists & Engineers", Hindustan Book Agency, (2002).
4. E Balagurusamy "Numerical Methods" McGraw Hill Education (2017).

Paper Code(s): HS-203	L	P	C
Paper: Indian Knowledge System	2	-	2

Marking Scheme:

1. Teachers Continuous Evaluation: 25 marks
2. Term end Theory Examinations: 75 marks
3. This is an NUES paper, hence all examinations to be conducted by the concerned teacher.

Instruction for paper setter:

1. There should be 9 questions in the term end examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 15 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 15.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objectives :

1.	To understand the Indian knowledge System.
2.	To understand the foundational concepts for science and technology.
3.	To understand the ancient Indian mathematics and astronomy.
4.	To understand the ancient Indian engineering and technology.

Course Outcomes (CO)

CO 1	Ability to understand the Indian knowledge System.
CO 2	Ability to understand and apply foundational concepts for science and technology.
CO 3	Ability to understand and apply ancient Indian mathematics and astronomy
CO 4	Ability to understand ancient Indian engineering and technology.

Course Outcomes (CO) to Programme Outcomes (PO) mapping (scale 1: low, 2: Medium, 3: High)

	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO 1	-	-	-	-	-	3	-	-	-	-	-	2
CO 2	-	-	-	-	-	3	-	-	-	2	-	2
CO 3	3	3	-	-	-	-	-	-	-	-	-	2
CO 4	3	3	-	-	-	-	-	-	-	-	-	2

UNIT-I

Indian Knowledge System (IKS) - An Introduction:
Overview of IKS - Importance of Ancient Knowledge; Defining IKS; The IKS Corpus – A Classification Framework; Chaturdaśa-Vidyāsthāna; History of IKS, Some unique aspects of IKS;
The Vedic Corpus – Introduction to Vedas; The Four Vedas and their divisions; Vedāngas; Vedic Life;
Philosophical Systems – Indian Philosophical Systems; Vedic Schools of Philosophy; Non-Vedic Philosophical Systems; Wisdom through the Ages – Purānas, Itihāsa as source of wisdom, Rāmāyana, Mahābhārata, Niti-śāstras, Subhāssitas.

UNIT-II

Foundational Concepts for Science and Technology:
Linguistics - Components of Language; Pānini's work on Sanskrit Grammar; Phonetics in Sanskrit; Patterns in Sanskrit Vocabulary; Computational Concepts in Astādhyāyi, Logic for Sentence Construction; Importance of Verbs; Role of Sanskrit in Natural Language Processing
Number System and Units of Measurement – Number System in India; Salient Features of the Indian Numeral System; Unique approaches to represent numbers; Measurements for Time, Distance and Weight; Pingala and

the Binary System
Knowledge: Framework and Classification – The Knowledge Triangle; Prameya; Pramāna; Samśaya; Framework for establishing Valid Knowledge

UNIT-III

Mathematic and Astronomy in IKS:
Mathematics – Unique aspects of Indian Mathematics; Great Mathematicians and their Contributions; Arithmetic; Geometry; Trigonometry; Algebra; Binary Mathematics and Combinatorial Problems in Chandah-śāstra of Pingala, Magic Squares in India
Astronomy - Unique aspects of Indian Astronomy; Historical Development of Astronomy in India; The Celestial Coordinate System; Elements of the Indian Calendar; Āryabhatiya and the Siddhāntic Tradition; Pancānga; Astronomical Instruments; Jantar Mantar of Rājā Jai Singh Sawai

UNIT - IV

Engineering and Technology in IKS:
Engineering and Technology: Metals and Metalworking – The Indian S & T Heritage; Mining and Ore Extraction; Metals and Metalworking Technology; Iron and Steel in India; Lost wax casting of Idols and Artefacts; Apparatuses used for Extraction of Metallic Components
Engineering and Technology: Other Applications – Literary sources for Science and Technology; Physical Structures in India; Irrigation and Water Management; Dyes and Painting Technology; Surgical Techniques; Shipbuilding; Sixty-four Art Forums; Status of Indigenous S & T

Textbook(s):
1. B. Mahadevan, Vinayaka Rajat Bhat & Nagendra Pavana R.N., "Introduction to Knowledge System: Concepts and Applications" PHI (2022).

References:
1. C.M Neelakandhan & K.A. Ravindran, "Vedic Texts and The Knowledge Systems of India", Sri Sankaracharya University of Sanskrit, Kalady (2010).
2. P.P. Divakaran, "The Mathematics of India: Concepts, Methods, Connections", Springer (2018)
3. C.A. Sharma, "Critical Survey of Indian Philosophy", Motilal Banarasidass Publication (1964)
4. G. Huet, A. Kulkarni & P. Scharf, "Sanskrit Computational Linguistics", Springer (2009).
5. A.K. Bag, "History of Technology in India", Indian National Science Academy, Vol 1, (1997)

Paper Code(s): CIC-205	L	P	C
Paper: Discrete Mathematics	4	-	4

Marking Scheme:

1. Teachers Continuous Evaluation: 25 marks
2. Term end Theory Examinations: 75 marks

Instructions for paper setter:

1. There should be 9 questions in the term end examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 15 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 15.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objectives :

1.	To introduce the concept of Mathematical Logic, concepts of sets, relation and functions
2.	To introduce the concept of Algorithm and number theory
3.	To understand Group theory and related examples
4.	To use Graph theory for solving problems

Course Outcomes (CO)

CO1:	Ability for constructing mathematical logic to solve problems
CO2:	Ability to Analyze/ quantify the efficiency of a developed solution (algorithm) of a computational problem
CO3:	Ability to Understand mathematical preliminaries to be used in the subsequent courses of the curriculum. This includes Boolean algebra, number theory, group theory, and combinatorics.
CO4:	Ability to Understand diverse relevant topics in discrete mathematics and computation theory with an emphasis on their applicability as mathematical tools in computer science.

Course Outcomes (CO) to Programme Outcomes (PO) mapping (scale 1: low, 2: Medium, 3: High)

	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO 1	3	3	3	2	2	-	-	-	2	2	3	3
CO 2	3	3	3	2	2	-	-	-	2	2	3	3
CO 3	3	3	3	3	2	-	-	-	2	2	3	3
CO 4	3	3	3	3	2	-	-	-	2	2	3	3

UNIT – I

Sets, Logic, and Relation: Sets, Subsets, powerset, operations on sets, Propositional Logic, Rules of inferences in propositional logic, Quantifiers, Predicates and validity, Predicate Logic, normal forms. Proof Techniques-Direct Proof, Proof by Contraposition, and proof by contradiction. Principle of inclusion and exclusion, pigeonhole principle, permutation and combination. Principle of Well Ordering, principle of mathematical induction, principle of complete induction. Relation, properties of binary relation, equivalence relation and class, closures (symmetric, reflexive, and transitive).

UNIT – II

Functions, Order relations and Boolean Algebra: Functions, Growth of functions, Permutation functions, Partially ordered sets, lattices, Boolean algebra, Minimization of Boolean Expressions. GCD, LCM, prime numbers.

Recurrence relations, solution methods for linear, first-order recurrence relations with constant coefficients, generating functions, Analysis of Algorithms involving recurrence relations, solution method for a divide-and-

conquer recurrence relation. Masters theorem (with proof).

UNIT – III

Group theory: Semi-group, Monoid, Groups, Group identity and uniqueness, inverse and its uniqueness, isomorphism and homomorphism, subgroups, Cosets and Lagrange's theorem, Permutation group and Cayley's theorem (without proof), Normal subgroup and quotient groups. Groups and Coding.

UNIT – IV

Graph theory: Graph Terminology, Planar graphs, Euler's formula (proof), Euler and Hamiltonian path/circuit. Chromatic number of a graph, five color theorem (proof), Shortest path and minimal spanning trees and algorithms, Depth-first and breadth first search, trees associated with DFS & BFS, Connected components. Complexity Analysis of the graph MST.

Textbook(s):

1. B. Kolman, R. C. Busby & S.C. Ross "Discrete Mathematical Structures", 6th edition, PHI/Pearson, 2009.
2. R. L. Graham, D. E. Knuth & O. Patashnik, "Concrete Mathematics", Pearson Education, 2000.

References:

1. Neal Koblitz, "A course in number theory and cryptography", Springer – Verlag, 1994.
2. J.P. Tremblay & R. Manohar, "Discrete Mathematical Structure with Application to Computer Science," TMH, New Delhi (2000).
3. Norman L. Biggs, "Discrete Mathematics", Second edition, Oxford University Press, New Delhi (2002).
4. T .H . Cormen, C . E . Leiserson, R .L . Rivest "Introduction to Algorithms", 3rd edition, PHI/Pearson.
5. Anne Benoit, Yves Robert, Frédéric Vivien "A Guide to Algorithm Design: Paradigms, Methods, and Complexity Analysis", CRC Press, 2013.

Paper Code(s): ECC-207	L	P	C
Paper: Digital Logic and Computer Design	4	-	4

Marking Scheme:
1. Teachers Continuous Evaluation: 25 marks
2. Term end Theory Examinations: 75 marks

Instructions for paper setter:

1. There should be 9 questions in the term end examinations question paper.
2. The first (1^{st}) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 15 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 15.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objectives :

1.	To introduce basic concepts of Boolean Algebra and Combinational Logic
2.	To introduce various sequential circuits, designing with examples
3.	To relate combination circuit design and sequential circuit design with respect to the design of a computer system
4.	To introduce machine learning, computer arithmetic, modes of data transfer with respect to I/O and Memory organization of a computer

Course Outcomes (CO) :

CO 1	Ability to understand Boolean Algebra and Design Combinational Circuits .
CO 2	Ability to understand and Design Sequential Circuits.
CO 3	Ability to understand Design of a basic computer.
CO 4	Ability to understand Input-Output and Memory Organization of a Computer.

Course Outcomes (CO) to Programme Outcomes (PO) mapping (scale 1: low, 2: Medium, 3: High)

	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO 1	3	2	3	2	2	-	-	-	3	2	2	3
CO 2	3	2	3	2	2	-	-	-	3	2	2	3
CO 3	3	2	3	3	2	-	-	-	3	2	2	3
CO 4	3	3	3	3	3	-	-	-	3	2	2	3

UNIT – I

Boolean Algebra and Combinational Logic: Review of number systems , signed, unsigned, fixed point, floating point numbers, Binary Codes, Boolean algebra – basic postulates, theorems , Simplification of Boolean function using Karnaugh map and Quine-McCluskey method – Implementations of combinational logic functions using gates, Adders, Subtractors, Magnitude comparator, encoder and decoders, multiplexers, code converters , parity generator/checker, implementation of combinational circuits using multiplexers.

UNIT – II

Sequential Circuits: General model of sequential circuits, Flip-flops, latches , level triggering, edge triggering, master slave configuration , concept of state diagram , state table, state reduction procedures , Design of synchronous sequential circuits , up/down and modulus counters , shift registers, Ring counter , Johnson counter , timing diagram , serial adder , sequence detector, Programmable Logic Array (PLA), Programmable Array Logic (PAL), Memory Unit, Random Access Memory

UNIT – III

Basic Computer organization: Stored Program, Organization, Computer registers, bus system, instruction set completeness, instruction cycle, Register Transfer Language, Arithmetic, Logic and Shift Micro-operations, Instruction Codes, Design of a simple computer, Design of Arithmetic Logic unit, shifter, Design of a simple hardwired control unit, Programming the basic computer, Machine language instructions, assembly language, Microprogrammed control, Horizontal and Vertical Microprogramming, Central Processing Unit, instruction sets and formats, addressing modes, data paths, RISC and CISC characteristics.

UNIT – IV

Computer Arithmetic, addition, subtraction, multiplication and division algorithms, Input-Output Organization, Modes of data transfer, Interrupt cycle, direct memory access, Input-Output processor, Memory Organization, Memory Hierarchy, Associative Memory, Cache Memory, Internal and external Memory, Virtual Memory.

Text Book(s)

1. M. Morris Mano, "Digital Logic and Computer Design", Pearson Education, 2016
2. M. Morris Mano, Rajib Mall "Computer System Architecture", 3rd Edition Pearson Education, 2017

References:

1. Leach, D. P., Albert P. Malvino, "Digital Principles and Applications", McGraw Hill Education, 8th Edition , 2014
2. Jain, R.P. ,"Modern Digital Electronics", McGraw Hill Education, 4th Edition , 2010
3. Floyd, Thomas L. , "Digital Fundamentals" Pearson Education, 11th Edition, 2017
4. M. Rafiquzzaman, "Fundamentals of Digital Logic and Microcomputer Design", Wiley, 5th Ed., 2005.

Paper Code(s): CIC-209	L	P	C
Paper: Data Structures	4	-	4

Marking Scheme:

1. Teachers Continuous Evaluation: 25 marks
2. Term end Theory Examinations: 75 marks

Instructions for paper setter:

1. There should be 9 questions in the term end examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 15 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 15.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objectives :

1.	To introduce basics of Data structures (Arrays, strings, linked list etc.)
2.	To understand the concepts of Stacks, Queues and Trees, related operations and their implementation
3.	To understand sets, heaps and graphs
4.	To introduce various Sorting and searching Algorithms

Course Outcomes (CO)

CO 1	To be able to understand difference between structured data and data structure
CO 2	To be able to create common basic data structures and trees
CO 3	To have a knowledge of sets, heaps and graphs
CO 4	To have basic knowledge of sorting and searching algorithms

Course Outcomes (CO) to Programme Outcomes (PO) mapping (scale 1: low, 2: Medium, 3: High)

	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO 1	3	2	2	2	3	-	-	-	2	2	2	3
CO 2	3	2	2	2	3	-	-	-	2	2	2	3
CO 3	3	2	2	2	3	-	-	-	2	2	2	3
CO 4	3	2	2	2	3	-	-	-	2	2	2	3

UNIT – I

Overview of data structure, Basics of Algorithm Analysis including Running Time Calculations, Abstract Data Types, Arrays, Arrays and Pointers, Multidimensional Array, String processing, General Lists and List ADT, List manipulations, Single, double and circular lists. Stacks and Stack ADT, Stack Manipulation, Prefix, infix and postfix expressions, recursion. Queues and Queue ADT, Queue manipulation.

UNIT – II

Sparse Matrix Representation (Array and Link List representation) and arithmetic (addition, subtraction and multiplication), polynomials and polynomial arithmetic.
Trees, Properties of Trees, Binary trees, Binary Tree traversal, Tree manipulation algorithms, Expression trees and their usage, binary search trees, AVL Trees, Heaps and their implementation, Priority Queues, B-Trees, B* Tree, B+ Tree

UNIT – III

Sorting concept, order, stability, Selection sorts (straight, heap), insertion sort (Straight Insertion, Shell sort), Exchange Sort (Bubble, quicksort), Merge sort (External Sorting) (Natural merge, balanced merge and

polyphase merge). Searching – List search, sequential search, binary search, hashing methods, collision resolution in hashing.

UNIT – IV

Disjoint sets representation, union find algorithm, Graphs, Graph representation, Graph Traversals and their implementations (BFS and DFS). Minimum Spanning Tree algorithms, Shortest Path Algorithms

Textbook(s):

1. Richard Gilberg , Behrouz A. Forouzan, “Data Structures: A Pseudocode Approach with C, 2nd Edition, Cengage Learning, Oct 2004
2. E. Horowitz, S. Sahni, S. Anderson-Freed, "Fundamentals of Data Structures in C", 2nd Edition, Silicon Press (US), 2007.

References:

1. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C”, 2nd Edition, Pearson, September, 1996
2. Robert Kruse, “Data Structures and Program Design in C”, 2nd Edition, Pearson, November, 1990
3. Seymour Lipschutz, “Data Structures with C (Schaum's Outline Series)”, McGrawhill, 2017
4. A. M. Tenenbaum, “Data structures using C”. Pearson Education, India, 1st Edition 2003.
5. Weiss M.A., “Data structures and algorithm analysis in C++”, Pearson Education, 2014.

Paper Code(s): CIC-211	L	P	C
Paper: Object-Oriented Programming Using C++	4	-	4

Marking Scheme:

1. Teachers Continuous Evaluation: 25 marks
2. Term end Theory Examinations: 75 marks

Instructions for paper setter:

1. There should be 9 questions in the term end examinations question paper.
2. The first (1^{st}) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 15 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 15.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objectives :

1.	To introduce the basic Concepts of Object Oriented Programming (data types, operators and functions) using C++
2.	To introduce concepts of Classes and Objects with the examples of C++ programming
3.	To understand object oriented features such as Inheritance and Polymorphism
4.	To use various object oriented concepts (exceptional handling) to solve different problems

Course Outcomes (CO)

CO 1	Ability to have an in-depth knowledge of object oriented programming paradigm
CO 2	To be able to develop basic C++ programming skills
CO 3	To be able to apply various object oriented features using C++
CO 4	Ability to have an understanding of generic programming & standard templates

Course Outcomes (CO) to Programme Outcomes (PO) mapping (scale 1: low, 2: Medium, 3: High)

	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO 1	3	2	2	2	3	-	-	-	3	2	2	3
CO 2	3	2	2	2	3	-	-	-	3	2	2	3
CO 3	3	2	2	2	3	-	-	-	3	2	2	3
CO 4	3	2	2	2	3	-	-	-	3	2	2	3

UNIT – I

Object Oriented Programming Paradigm, Basic Concepts of Object Oriented Programming, Benefits of Object Oriented Programming, Object Oriented Languages, Applications of Object Oriented Programming, C++ Programming Language, Tokens, Keywords, Identifiers and Constants, Data Types, Type Compatibility, Variables, Operators in C++, Implicit Type Conversions, Operator Precedence, The Main Function, Function Prototyping, Call by Reference, Return by Reference, Inline Functions, Function Overloading, Friend Functions, default parameter value.

UNIT – II

Specifying a class, Member Functions, Encapsulation, information hiding, abstract data types, objects & classes, Static Member Functions, Arrays of Objects, Constructors & Destructors, Parameterized Constructors, Copy Constructors, Dynamic Constructors, Destructors, identity and behaviour of an object, C++ garbage collection, dynamic memory allocation, Explicit Type Conversions, Operator Overloading.

UNIT – III

Inheritance, inheritance methods, Class hierarchy, derivation – public, private & protected, aggregation,

Inheritance Constructors, composition vs. classification hierarchies, Containership, Initialization List, Polymorphism, categorization of polymorphic techniques, polymorphism by parameter, parametric polymorphism, generic function – template function, function overriding, run time polymorphism, virtual functions.

UNIT – IV

Standard C++ classes, using multiple inheritance, persistant objects, streams and files, namespaces, exception handling, generic classes, standard template library: Library organization and containers, standard containers, algorithm and Function objects, iterators and allocators, strings, streams, manipulators, user defined manipulators, vectors.

Textbook(s):

1. Stanley B. Lippman, Josée Lajoie, Barbara E. Moo, "C++ Primer", Addison-Wesley Professional, 2012.
2. Ivor Horton, "Using the C++ Standard Template Libraries", Apress, 2015.
3. R. Lafore, "Object Oriented Programming using C++", Galgotia.

References:

1. A.R.Venugopal, Rajkumar, T. Ravishanker "Mastering C++", TMH
2. Bjarne Stroustrup, "Programming: principles and practice using C++", Addison-Wesley, 2015.
3. Bjarne Stroustrup, "A Tour of C++", Addison-Wesley Professional, 2018.
4. Bjarne Stroustrup, "The C++ Programming Language", 4th Edition, Addison-Wesley Professional, 2013.
5. Peter Van Weert and Marc Gregoire, "C++17 Standard Library Quick Reference: A Pocket Guide to Data Structures, Algorithms, and Functions", Apress (2019)
6. Rumbaugh et. al. " Object Oriented Modelling & Design", Prentice Hall
7. G . Booch "Object Oriented Design & Applications", Benjamin,Cummings.
8. E.Balaguruswamy, "Objected Oriented Programming with C++", TMH
9. Steven C. Lawlor, "The Art of Programming Computer Science with C++", Vikas Publication.
10. Slobodan Dmitrović, Modern C++ for Absolute Beginners":A Friendly Introduction to C++ Programming Language and C++11 to C++20 Standards", Apress, 2020.

Fifth Semester					
Group	**Paper Code**	**Paper**	**L**	**P**	**Credits**
Theory Papers					
HS/MS	HS-301	Economics for Engineers	2		2
PC	CIC-303	Compiler Design	3		3
PC	CIC-305	Operating Systems	4		4
PC	CIC-307	Computer Networks	4		4
PC	CIC-309	Software Engineering	3		3
PC	CIC-311	Design and Analysis of Algorithm	4		4
Practical / Viva Voce					
PC	CIC-351	Compiler Design Lab		2	1
PC	CIC-353	Operating Systems Lab		2	1
PC	CIC-355	Computer Networks Lab		2	1
PC	CIC-357	Software Engineering Lab		2	1
PC	CIC-359	Design and Analysis of Algorithm Lab		2	1
PC / Internship	ES-361	Summer Training Report - 1 *			1
Total		-	**20**	**10**	**26**

***NUES:**Comprehensive evaluation of the Summer Training Report – 1 (after 4th Semester) shall be done by the committee of teachers, constituted by the Academic Programme Committee, out of 100. The training shall be of 4 to 6 weeks duration. The training can be under the mentorship of a teacher of the institute.

Sixth Semester					
Group	**Paper Code**	**Paper**	**L**	**P**	**Credits**
Theory Papers					
HS/MS	MS-302	Principles of Management for Engineers	3		3
HS/MS	HS-304	Universal Human Values*	1		1
PCE		Programme Core Elective Paper (PCE –1)			4
PCE		Programme Core Elective Paper (PCE – 2)			4
PCE		Programme Core Elective Paper (PCE – 3)			4
EAE / OAE		Emerging Area/Open Area Elective Paper (EAE – 1 /OAE – 1)			4
EAE / OAE		Emerging Area/Open Area Elective Paper (EAE – 2 /OAE – 2)			4
Practical / Viva Voce					
HS/MS	HS-352	NSS / NCC / Cultural Clubs / Technical Society / Technical Club**			2
Total					**26**

***NUES:**All examinations to be conducted by the concerned teacher as specified in the detailed syllabus of the paper.

****NUES:** Comprehensive evaluation of the students by the concerned coordinator of NCC / NSS / Cultural Clubs / Technical Society / Technical Clubs, out of 100 as per the evaluation schemes worked out by these activity societies, organizations; the faculty co-ordinators shall be responsible for the evaluation of the same. These activities shall start from the 1st semester and the evaluation shall be conducted at the end of the 6th semester for students admitted in the first semester. Students admitted in the 2nd year (3rd semester) as lateral entry shall be evaluated on the basis their performance, by the faculty co-ordinator for the period of 3rd semester to 6th semester only.

Fifth Semester					
Group	**Paper Code**	**Paper**	**L**	**P**	**Credits**
Theory Papers					
HS/MS	HS-301	Economics for Engineers	2		2
PC	CIC-303	Compiler Design	3		3
PC	CIC-305	Operating Systems	4		4
PC	CIC-307	Computer Networks	4		4
PC	CIC-309	Software Engineering	3		3
PC	CIC-311	Design and Analysis of Algorithm	4		4
Practical / Viva Voce					
PC	CIC-351	Compiler Design Lab		2	1
PC	CIC-353	Operating Systems Lab		2	1
PC	CIC-355	Computer Networks Lab		2	1
PC	CIC-357	Software Engineering Lab		2	1
PC	CIC-359	Design and Analysis of Algorithm Lab		2	1
PC / Internship	ES-361	Summer Training Report - 1 *			1
Total		-	**20**	**10**	**26**

***NUES:**Comprehensive evaluation of the Summer Training Report – 1 (after 4th Semester) shall be done by the committee of teachers, constituted by the Academic Programme Committee, out of 100. The training shall be of 4 to 6 weeks duration. The training can be under the mentorship of a teacher of the institute.

Economics for Engineers	L	P	C
	2		2

Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
All	5	HS/MS	HS	HS-301

Marking Scheme:

1. Teachers Continuous Evaluation: 25 marks
2. Term end Theory Examinations: 75 marks

Instructions for paper setter:

1. There should be 9 questions in the term end examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 15 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 15.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objectives :

1.	To explain the basic micro and macro economics concepts.
2.	To analyze the theories of production, cost, profit and break even analysis.
3.	To evaluate the different market structures and their implications for thebehavior of the firm.
4.	To apply the basics of national income accounting and business cycles toIndian economy.

Course Outcomes (CO)

CO 1	Analyze the theories of demand, supply, elasticity and consumer choicein the market.
CO 2	Analyze the theories of production, cost, profit and break even analysis.
CO 3	Evaluate the different market structures and their implications for thebehavior of the firm.
CO 4	Apply the basics of national income accounting and business cycles toIndian economy.

Course Outcomes (CO) to Programme Outcomes (PO) mapping (scale 1: low, 2: Medium, 3: High)

	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO 1	1	2	1	2	1	-	1	-	1	1	3	1
CO 2	1	2	1	2	1	-	1	-	1	1	3	1
CO 3	1	2	1	2	1	-	1	-	1	1	3	1
CO 4	1	2	1	2	1	-	1	-	1	1	3	1

UNIT-I

Introduction: Economics Definition, Basic economic problems, Resource constraints and welfare maximization. Microand Macro economics. Production Possibility Curve.Circular flow of economic activities.
Basics of Demand, Supply and Equilibrium: Demand side and supply side of the market. Factors affecting demand & supply. Elasticity of demand & supply – price, income and cross-price elasticity. Market equilibrium price.

UNIT-II

Theory of Consumer Choice: Theory of Utility and consumer's equilibrium.Indifference Curve analysis, Budget Constraints, Consumer Equilibrium.
Demand forecasting: Regression Technique, Time-series, Smoothing Techniques: Exponential, Moving AveragesMethod

UNIT-III

Cost Theory and Analysis: Nature and types of cost, Cost functions- short run and long run, Economies and diseconomies of scale
Market Structure: Market structure and degree of competitionPerfect competition, Monopoly, Monopolistic competition, Oligopoly

UNIT - IV

National Income Accounting: Overview of Macroeconomics, Basic concepts of NationalIncome Accounting
Macro Economics Issues: Introduction to Business Cycle, Inflation-causes,consequences and remedies: Monetary and Fiscal policy.

Textbook(s):
1. H.C. Petersen, W.C. Lewis, Managerial Economics, 4th ed., Pearson Education 2001.

References:
1. S.K. Misra& V. K. Puri, Indian Economy, 38th ed., Himalaya Publishing House, 2020.
2. D.N. Dwivedi, Managerial Economics, 8th Edition, Vikas Publishing house
3. D. Salvatore, Managerial Economics in a Global Economy, 8th ed., Oxford University Press, 2015.
4. S. Damodaran, Managerial Economics, 2 nd ed., Oxford University Press, 2010.
5. M. Hirschey, Managerial Economics, 12th ed., Cengage India, 2013.
6. P.A. Samuelson, W.D. Nordhaus, S. Nordhaus,Economics,18th ed., Tata Mc-Graw Hill, 2006.

Compiler Design	L	P	C
	3		3

Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
CSE/IT/CST/ITE	5	PC	PC	CIC-303

Marking Scheme:

1. Teachers Continuous Evaluation: 25 marks
2. Term end Theory Examinations: 75 marks

Instructions for paper setter:

1. There should be 9 questions in the term end examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 15 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 15.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objectives :

1.	introduce the major concept areas of language translation and compiler design.
2.	To enrich the knowledge in various phases of compiler ant its use, code optimization techniques, machine code generation, and use of symbol table.
3.	To extend the knowledge of parser by parsing LL parser and LR parser.
4.	To provide practical programming skills necessary for constructing a compiler.

Course Outcomes (CO)

CO 1	Able to apply the knowledge of LEX tool & YACC tool to develop a scanner & parser.
CO 2	Able to design & implement a software system for backend of the compiler.
CO 3	Able to design syntax tree and intermediate code generator.
CO 4	To understand the concept of symbol table and to use various code optimization techniques

Course Outcomes (CO) to Programme Outcomes (PO) mapping (scale 1: low, 2: Medium, 3: High)

	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO 1	3	2	-	2	3	2	-	-	-	-	-	3
CO 2	3	2	-	2	3	2	-	-	-	-	-	3
CO 3	3	2	-	2	3	2	-	-	-	-	-	3
CO 4	3	2	-	2	3	2	-	-	-	-	-	3

UNIT-I

Compilers and translators, need of translators, structure of compiler: its different phases, compiler construction tools, Lexical analysis: Role of lexical analyzer, Input Buffering, A simple approach to the design of Lexical Analyzers, Specification and recognition of tokens, Finite automata, From regular expressions to automata, and vice versa, minimizing number of states of DFA, A language for specifying Lexical Analyzers, Design and implementation of lexical analyzer.

UNIT-II

The role of the parser, Context free grammars, Writing a grammar: Lexical versus Syntactic analysis, Eliminating ambiguity, Elimination of left recursion, Left factoring, Top Down Parsing: Recursive- Decent parsing, Non-recursive Predictive parsing, LL(1) grammars, Bottom Up Parsing: Shift Reduce Parsing, Operator precedence parsing, LR Parsing: SLR, LALR and Canonical LR parser, Parser Generators.

UNIT-III

Syntax Directed Translation: Syntax directed definitions, Evaluation orders for SDD's, construction of syntax trees, syntax directed translation schemes, implementation of syntax directed translation,
Intermediate Code Generation: Kinds of intermediate code: Postfix notation, Parse trees and syntax trees, Three-address code, quadruples and triples, Semantic Analysis: Types and Declarations, Translation of Expressions, Type checking.

UNIT - IV

Symbol Table: Symbol tables, its contents, Data Structure for Symbol Table: lists, trees, linked lists, hash tables, Error Detection and Recovery: Errors, lexical phase errors, syntactic phase errors, semantic errors, Error seen by each phase.
Code Optimization: The principal sources of optimizations, Loop optimization, Basic blocks and Flow Graphs, DAG representation of basic blocks, Code Generation: Issues in the design of code generation, A simple target machine mode, A Simple Code Generator, Peep-hole optimization, Register allocation and assignment.

Textbook(s):

1. Alfred V. Aho, Monica S. Lam, Ravi Sethi and Jeffrey D. Ullman, "Compilers Principle, Techniques, and Tool", Pearson.
2. Alfred V. Aho, Ravi Sethi and Jeffrey D. Ullman, "Compilers Principle, Techniques, and Tool", Addison Wesley.

References:

1. Trembley and Sorenson, "Theory and Practice of Compiler Writing", McGraw Hill.
2. Jhon R. Levine, Tony Mason and Doug Brown, —Lex &Yacc, O'Reilly.
3. M. Joseph, "Elements compiler Design", University Science Press.

Operating Systems	L	P	C
	4		4

Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
CSE/IT/CST/ITE	5	PC	PC	CIC-305
OAE	7	CSE-OAE	CSE-OAE-4	OCSE-409

Marking Scheme:

1. Teachers Continuous Evaluation: 25 marks
2. Term end Theory Examinations: 75 marks

Instructions for paper setter:

1. There should be 9 questions in the term end examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 15 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 15.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objectives :

1.	To understand the basics of OS and their functions. To learn the scheduling policies of various operating systems.
2.	Learn memory management methods.
3.	To understand the characterisation of deadlock, system deadlock, preventing deadlock, avoiding deadlock and related concepts.
4.	To understand the meaning of a file, structure of the directories, file structure system and implementation, free-space management

Course Outcomes (CO)

CO 1	Understand the role of operating system in a computing device, and Ability to understand paging and segmentation methods of memory binding and their pros & cons.
CO 2	Understand scheduling of process over a processor. Ability to use concepts of semaphore and its usage in process synchronization.
CO 3	Ability to synchronize programs and make the system deadlock free.
CO 4	Ability to understand file system like file access methods, directory structures, file space allocation in disk and free space management in disk. Ability to understand disk scheduling and disk recovery procedures.

Course Outcomes (CO) to Programme Outcomes (PO) mapping (scale 1: low, 2: Medium, 3: High)

	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO 1	3	3	2	-	3	-	-	-	-	-	-	-
CO 2	3	3	-	-	2	-	-	-	-	-	-	-
CO 3	3	2	3	-	2	-	-	-	-	-	-	-
CO 4	3	3	-	-	2	-	-	-	-	-	-	-

UNIT-I

Introduction: What is an Operating System, Simple Batch Systems, Multiprogrammed Batches systems, Time Sharing Systems, Personal-computer systems, Parallel systems, Distributed Systems, Real-Time Systems, OS – A Resource Manager.

Processes: Introduction, Process states, process management, Interrupts, Interprocess Communication Threads: Introduction, Thread states, Thread Operation, Threading Models. Processor Scheduling: Scheduling levels, preemptive vs no preemptive scheduling, priorities, scheduling objective, scheduling criteria, scheduling algorithms, demand scheduling, real time scheduling.

UNIT-II

Process Synchronization: Mutual exclusion, software solution to Mutual exclusion problem, hardware solution to Mutual exclusion problem, semaphores, Critical section problems. Case study on Dining philosopher problem, Barber shop problem etc.
Memory Organization & Management: Memory Organization, Memory Hierarchy, Memory Management Strategies, Contiguous versus non- Contiguous memory allocation, Partition Management Techniques, Logical versus Physical Address space, swapping, Paging, Segmentation, Segmentation with Paging Virtual Memory: Demand Paging, Page Replacement, Page-replacement Algorithms, Performance of Demand Paging, Thrashing, Demand Segmentation, and Overlay Concepts.

UNIT-III

Deadlocks: examples of deadlock, resource concepts, necessary conditions for deadlock, deadlock solution, deadlock prevention, deadlock avoidance with Bankers algorithms, deadlock detection, deadlock recovery.
Device Management: Disk Scheduling Strategies, Rotational Optimization, System Consideration, Caching and Buffering.

UNIT - IV

File System: Introduction, File Organization, Logical File System, Physical File System, File Allocation strategy, Free Space Management, File Access Control, Data Access Techniques, Data Integrity Protection, Case study on file system viz FAT32, NTFS, Ext2/Ext3 etc.

Textbook(s):

1. Deitel & Dietel, “Operating System”, Pearson, 3 rd Ed., 2011
2. Silbersachatz and Galvin, “Operating System Concepts”, Pearson, 5th Ed., 2001
3. Madnick & Donovan, “Operating System”, TMH,1st Ed., 2001

References:

1. Tannenbaum, “Operating Systems”, PHI, 4th Edition, 2000
2. Godbole, “Operating Systems”, Tata McGraw Hill, 3rd edition, 2014
3. Chauhan, “Principles of Operating Systems”, Oxford Uni. Press, 2014
4. Dhamdhere, “Operating Systems”, Tata McGraw Hill, 3rd edition, 2012
5. Loomis, “Data Management & File Structure”, PHI, 2nd Ed.

Computer Networks	**L**	**P**	**C**
	4		**4**

Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
CSE/IT/CST/ITE	5	PC	PC	CIC-307
ICE	5	PC	PC	CIC-313

Marking Scheme:

1. Teachers Continuous Evaluation: 25 marks
2. Term end Theory Examinations: 75 marks

Instructions for paper setter:

1. There should be 9 questions in the term end examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 15 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 15.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objectives :

1.	ild an understanding of the fundamental concepts of computer networking.
2.	Familiarize the student with the basic taxonomy and terminology of the computer networking area.
3.	Introduce the student to advanced networking concepts, preparing the student for entry Advanced courses in computer networking.
4.	Allow the student to gain expertise in some specific areas of networking such as the design and maintenance of individual networks.

Course Outcomes (CO)

CO 1	Understand basic computer network technology.
CO 2	Understand and explain Data Communications System and its components.
CO 3	Implements various network topologies and IP addressing, subnetting.
CO 4	Enumerate the layers of the OSI model and TCP/IP.

Course Outcomes (CO) to Programme Outcomes (PO) mapping (scale 1: low, 2: Medium, 3: High)

	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO 1	3	2	1	1	3	1	-	-	-	-	-	3
CO 2	3	2	1	1	3	1	-	-	-	-	-	3
CO 3	3	2	1	1	3	1	-	-	-	-	-	3
CO 4	3	2	1	1	3	1	-	-	-	-	-	3

UNIT-I

Data Communications: Components, Networks, The Internet, Protocols and Standards, Network Models: The OSI Model, TCP/IP Protocol Suite , A Comparison of the OSI and TCP/IP Reference Models, Addressing, Physical Layer: Analog and Digital Signals, Transmission modes, Transmission Media: Guided Media, Unguided Media, Review of Error Detection and Correction codes.

Switching: Circuit switching (space-division, time division and space-time division), packet switching (virtual circuit and Datagram approach), message switching.

UNIT-II

Data Link Layer: Design issues, Data Link Control and Protocols: Flow and Error Control, Stop-and-wait ARQ. Sliding window protocol, Go-Back-N ARQ, Selective Repeat ARQ, HDLC, Point-to –Point Access: PPP Point –to-Point Protocol, PPP Stack,
Medium Access Sub layer: Channel allocation problem, Controlled Access, Channelization, multiple access protocols, IEEE standard 802.3 & 802.11 for LANS and WLAN, high-speed LANs, Token ring, Token Bus, FDDI based LAN, Network Devices-repeaters, hubs, switches bridges.

UNIT-III

Network Layer: Design issues, Routing algorithms, Congestion control algorithms, Host to Host Delivery: Internetworking, addressing and routing, IP addressing (class full & Classless), Subnet, Network Layer Protocols: ARP, IPV4, ICMP, IPV6 ad ICMPV6.

UNIT - IV

Transport Layer: Process to Process Delivery: UDP; TCP, congestion control and Quality of service. Application Layer: Client Server Model, Socket Interface, Domain Name System (DNS): Electronic Mail (SMTP), file transfer (FTP), HTTP and WWW.

Textbook(s):

1. Behrouz A. Forouzan, “Data Communications and Networking”, Tata McGraw-Hill.

References:

1. A. S. Tannenbum, D. Wetherall,, “Computer Networks”, Prentice Hall, Pearson.
2. Fred Halsall, “Computer Networks”, Addison – Wesley.
3. Tomasi, “Introduction To Data Communications & Networking”, Pearson.

Software Engineering	L	P	C
	3		3

Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
CSE/IT/CST/ITE	5	PC	PC	CIC-309

Marking Scheme:

1. Teachers Continuous Evaluation: 25 marks
2. Term end Theory Examinations: 75 marks

Instructions for paper setter:

1. There should be 9 questions in the term end examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 15 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 15.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objectives :

1.	To introduce the basic concepts of the software development processes, Software requirements and specifications
2.	To impart knowledge of Software Project Planning and various Software design techniques for developing large software systems.
3.	To understand Software Metrics, Software Reliability, and Quality assurance using ISO 9001 and SEI-CMM.
4.	To impart the knowledge and use of software engineering processes and tools in analysis, design, implementation, software testing, documentation, and maintenance for software systems.

Course Outcomes (CO)

CO 1	Ability to have an understanding of SDLC Models, Techniques for Requirement Elicitation, and SRS Document.
CO 2	To be able to explain Software Project Planning and various methods for software design
CO 3	To Understand Software Metrics, Software Reliability, and Quality assurance
CO 4	Ability to have an understanding of Software testing, documentation and maintenance.

Course Outcomes (CO) to Programme Outcomes (PO) mapping (scale 1: low, 2: Medium, 3: High)

	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO 1	3	2	2	2	3	-	-	-	3	2	2	3
CO 2	3	2	2	2	3	-	-	-	3	2	2	3
CO 3	3	2	2	2	3	-	-	-	3	2	2	3
CO 4	3	2	2	2	3	-	-	-	3	2	2	3

UNIT-I

Introduction: Introduction to Software Engineering, Importance of software engineering as a discipline, Software applications, Software Crisis, Software Processes & Characteristics, Software life cycle models, Waterfall, Prototype, Evolutionary and Spiral Models.

Software Requirements Analysis & Specifications: Requirement engineering, Functional and non-functional requirements, User requirements, System requirements, requirement elicitation techniques like FAST, QFD & Use case approach, requirements analysis using DFD, Data dictionaries & ER Diagrams, Requirements documentation, Nature of SRS, Characteristics & organization of SRS, Requirement Management, IEEE Std. for SRS.

UNIT-II

Software Project Planning: Size Estimation like lines of Code & Function Count, Cost Estimation Models, COCOMO, Putnam resource allocation model, Validating Software Estimates, Risk Management.
Software Design: Cohesion & Coupling, Classification of Cohesiveness & Coupling, Function Oriented Design, Object Oriented Design, User Interface Design.

UNIT-III

Software Metrics: Software measurements: What & Why, Token Count, Halstead Software Science Measures, Data Structure Metrics, Information Flow Metrics.
Software Reliability: Importance, Hardware Reliability & Software Reliability, Failure and Faults, Reliability Models- Basic Model, Logarithmic Poisson Model, Software Quality Models, CMM & ISO 9001.

UNIT – IV

Software Testing: Testing process, Functional testing: Boundary value analysis, Equivalence class testing, Decision table testing, Cause effect graphing, Structural testing: Path testing, Data flow and mutation testing, unit testing, integration and system testing, Debugging, Testing Tools & Standards.
Software Maintenance: Management of Maintenance, Maintenance Process, Maintenance Models, Regression Testing, Reverse Engineering, Software Re-engineering, Configuration Management, Documentation.

Textbook(s):
1. K. K. Aggarwal and Yogesh Singh, “Software Engineering”, New Age International, 3rd Ed., 2005.
2. R. S. Pressman, “Software Engineering – A Practitioner's Approach”, McGraw Hill Int. , 5th Ed., 2001.
3. Pankaj Jalote, “An Integrated Approach to Software Engineering”, Narosa, 3rd Ed., 2005.

References:
1. Stephen R. Schach, “Classical & Object Oriented Software Engineering”, IRWIN, 1996.
2. James Peter, W. Pedrycz, “Software Engineering: An Engineering Approach”, John Wiley & Sons.
3. I. Sommerville, “Software Engineering”, Addison Wesley,8th Ed., 2009.
4. Frank Tsui and Orlando Karan, “Essentials of Software Engineering”, Joes and Bartlett, 2nd Ed., 2010.
5. Kassem A. Saleh, “Software Engineering”, Cengage Learning, 2009.
6. Rajib Mall, “Fundamrntal of Software Engineering”, PHI, 3rd Ed., 2009.
7. Carlo Ghizzi, Mehdi Jazayeri and Dino Mandrioli, “Fundamental of Software Engineering”, PHI, 2nd Ed., 2003.
8. Carol L. Hoover, Mel Rosso-Llopart and Gil Taran, “Evaluating Project Decision Case Studies in Software Engineering”, Pearson, 2010.

Design and Analysis of Algorithm	L	P	C
	4		4

Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
CSE/IT/CST/ITE	5	PC	PC	CIC-311

Marking Scheme:

1. Teachers Continuous Evaluation: 25 marks
2. Term end Theory Examinations: 75 marks

Instructions for paper setter:

1. There should be 9 questions in the term end examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 15 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 15.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objectives :

1.	To Introduce various designing techniques and methods for algorithms
2.	Performance analysis of Algorithms using asymptotic and empirical approaches
3.	Demonstrate a familiarity with major algorithms and data structures.
4.	To give clear idea on algorithmic design paradigms like Divide-and-Conquer, Dynamic Programming, Greedy, Branch & Bound, Back tracking and string matching and network flow. .

Course Outcomes (CO)

CO 1	Analyse asymptotic runtime complexity of algorithms including formulating recurrence relations and divide and conquer designing method.
CO 2	Describe the greedy paradigm and apply Greedy strategy for solving various problems.
CO 3	Apply dynamic programming and Branch & Bound approach to solve suitable problems
CO 4	Understand the concept of NP problems and string matching algorithm and various flow & sorting networks

Course Outcomes (CO) to Programme Outcomes (PO) mapping (scale 1: low, 2: Medium, 3: High)

	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO 1	1	1	1	1	1	2	2	2	2	1	1	1
CO 2	2	2	3	1	2	3	1	2	3	1	2	2
CO 3	2	2	1	1	2	3	3	2	1	3	1	2
CO 4	3	2	2	3	2	1	3	2	1	1	2	3

UNIT-I

Asymptotic notations for time and space complexity, Methods for solving Recurrence relations, Brief Review of Graphs, Sets and disjoint sets, union, sorting and searching algorithms and their analysis in terms of space and time complexity.

Divide and Conquer: General method, binary search, merge sort, Quick sort, selection sort, Strassen's matrix multiplication algorithms and analysis of algorithms for these problems.

UNIT-II

Greedy Method: General method, knapsack problem, Huffman Codes, job sequencing with deadlines, minimum spanning trees, single souce paths and analysis of these problems.

Back Tracking: General method, 8 queen's problem, graph colouring, Hamiltonian cycles, and analysis of these problems.

UNIT-III

Dynamic Programming: Ingredients of Dynamic Programming. Matrix Chain Multiplication, Longest common subsequence and optimal binary search trees problems, 0-1 knapsack problem, Traveling salesperson problem, Floyd Warshall algorithm.
Branch and Bound: Method, O/I knapsack and traveling salesperson problem

UNIT - IV

String Matching: The naïve String Matching algorithm, The Rabin-Karp Algorithm, String Matching with finite automata, The Knuth-Morris Pratt algorithm.
Computational Complexity: Basic Concepts, Polynomial vs Non-Polynomial Complexity, NP- hard & NP-complete classes. Approximation Algorithms
Flow and Sorting Network:, Ford- Fulkerson method, Maximum bipartite matching, Sorting Networks, Comparison network, Zero- one principle, Bitonic sorting network, merging network

Textbook(s):

1. T. H. Cormen, C. E. Leiserson, R. L. Rivest, Clifford Stein, Introduction to Algorithms, 3rd Ed., PHI, 2013.
2. Udit Aggarwal, Algorithm Design and Analysis, Dhanpat Rai and Co.

References:

1. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, Computer Algorithms/C++, Second Edition, Universities Press.
2. Jon Klenberg, Eva Tardos, Algorithm Design, Pearson Publications,2014.
3. A. V. Aho, J. E. Hopcroft, J. D. Ullman, The Design and Analysis of Computer Algorithms, Pearson, 2013.
4. Richard Neapolitan, Foundations of Algorithms, Fifth Edition, Jones & Bartlett Learning
5. Sara Base, Introduction to Design & analysis,Pearson

Compiler Design Lab	L	P	C
		2	1

Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
CSE/IT/CST/ITE	5	PC	PC	CIC-351

Marking Scheme:

1. Teachers Continuous Evaluation: 40 marks
2. Term end Theory Examinations: 60 marks

Instructions:

1. The course objectives and course outcomes are identical to that of (Compiler Design) as this is the practical component of the corresponding theory paper.
2. The practical list shall be notified by the teacher in the first week of the class commencement under intimation to the office of the Head of Department / Institution in which the paper is being offered from the list of practicals below. Atleast 10 experiments must be performed by the students, they may be asked to do more. Atleast 5 experiments must be from the given list.

1. Practice of LEX/YACC of compiler writing.
2. Write a program to check whether a string belong to the grammar or not.
3. Write a program to check whether a string include Keyword or not.
4. Write a program to remove left Recursion from a Grammar.
5. Write a program to perform Left Factoring on a Grammar.
6. Write a program to show all the operations of a stack.
7. Write a program to find out the leading of the non-terminals in a grammar.
8. Write a program to Implement Shift Reduce parsing for a String.
9. Write a program to find out the FIRST of the Non-terminals in a grammar.
10. Write a program to check whether a grammar is operator precedent.

Operating Systems Lab	L	P	C
		2	1

Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
CSE/IT/CST/ITE	5	PC	PC	CIC-353

Marking Scheme:
1. Teachers Continuous Evaluation: 40 marks
2. Term end Theory Examinations: 60 marks

Instructions:
1. The course objectives and course outcomes are identical to that of (Operating Systems) as this is the practical component of the corresponding theory paper.
2. The practical list shall be notified by the teacher in the first week of the class commencement under intimation to the office of the Head of Department / Institution in which the paper is being offered from the list of practicals below. Atleast 10 experiments must be performed by the students, they may be asked to do more. Atleast 5 experiments must be from the given list.

1. Write a program to implement CPU scheduling for first come first serve.
2. Write a program to implement CPU scheduling for shortest job first.
3. Write a program to perform priority scheduling.
4. Write a program to implement CPU scheduling for Round Robin.
5. Wite a program for page replacement policy using a) LRU b) FIFO c) Optimal.
6. Write a program to implement first fit, best fit and worst fit algorithm for memory management.
7. Write a program to implement reader/writer problem using semaphore.
8. Write a program to implement Producer-Consumer problem using semaphores.
9. Write a program to implement Banker's algorithm for deadlock avoidance.
10. Write C programs to implement the various File Organization Techniques

Computer Networks Lab	L	P	C
		2	1

Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
CSE/IT/CST/ITE	5	PC	PC	CIC-355
ICE	5	PC	PC	CIC-365

Marking Scheme:
1. Teachers Continuous Evaluation: 40 marks
2. Term end Theory Examinations: 60 marks

Instructions:
1. The course objectives and course outcomes are identical to that of (Computer Networks) as this is the practical component of the corresponding theory paper.
2. The practical list shall be notified by the teacher in the first week of the class commencement under intimation to the office of the Head of Department / Institution in which the paper is being offered from the list of practicals below. Atleast 10 experiments must be performed by the students, they may be asked to do more. Atleast 5 experiments must be from the given list.

1. Introduction to Networking Simulation Tools: Wireshark, Cisco Packet Tracer.
2. To understand the operation of TELNET by accessing the router in server room from a PC in IT office.
3. To implement an IP Addressing Scheme and Subnetting in small networks using Cisco Packet Tracer.
4. To implement the static routing using Cisco Packet Tracer.
5. To implement the DHCP onto the Network Topology using Cisco Packet Tracer.
6. To implement the DNS, Email Services in the Network using Cisco Packet Tracer.
7. To implement the Dynamic Routing Protocols: RIP, IGRP using Cisco Packet Tracer.
8. To construct multiple router networks and implement the EIGRP Protocol.
9. To implement the Network Address Resolution (NAT) using Cisco Packet Tracer.
10. Conducting a Network Capture and Monitoring with Wireshark Simulation Tool.

Software Engineering Lab	L	P	C
		2	1

Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
CSE/IT/CST/ITE	5	PC	PC	CIC-357

Marking Scheme:
1. Teachers Continuous Evaluation: 40 marks
2. Term end Theory Examinations: 60 marks

Instructions:
1. The course objectives and course outcomes are identical to that of (Software Engineering) as this is the practical component of the corresponding theory paper.
2. The practical list shall be notified by the teacher in the first week of the class commencement under intimation to the office of the Head of Department / Institution in which the paper is being offered from the list of practicals below. Atleast 10 experiments must be performed by the students, they may be asked to do more. Atleast 5 experiments must be from the given list.

1. Write down the problem statement for a suggested system of relevance.
2. Do requirement analysis and develop Software Requirement Specification Sheet (SRS) for suggested system.
3. To perform the function oriented diagram: Data Flow Diagram (DFD) and Structured chart.
4. Draw the entity relationship diagram for the suggested system.
5. To perform the user's view analysis for the suggested system: Use case diagram.
6. To draw the structural view diagram for the system: Class diagram, object diagram.
7. To draw the behavioral view diagram: State-chart diagram, Activity diagram
8. To perform the behavioral view diagram for the suggested system: Sequence diagram, Collaboration diagram
9. To perform the implementation view diagram: Component diagram for the system.
10. To perform the environmental view diagram: Deployment diagram for the system.
11. To perform various testing using the testing tool unit testing, integration testing for a sample code of the suggested system.
12. Perform Estimation of effort using FP Estimation for chosen system.
13. To prepare time Line Chart / Gantt Chart / PERT Chart for selected software project.

Design and Analysis of Algorithm Lab	L	P	C
		2	1

Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
CSE/IT/CST/ITE	5	PC	PC	CIC-359

Marking Scheme:
1. Teachers Continuous Evaluation: 40 marks
2. Term end Theory Examinations: 60 marks

Instructions:
1. The course objectives and course outcomes are identical to that of (Design and Analysis of Algorithm) as this is the practical component of the corresponding theory paper.
2. The practical list shall be notified by the teacher in the first week of the class commencement under intimation to the office of the Head of Department / Institution in which the paper is being offered from the list of practicals below. Atleast 10 experiments must be performed by the students, they may be asked to do more. Atleast 5 experiments must be from the given list.

1. To implement following algorithm using array as a data structure and analyse its time complexity.
   a) Merge sort
   b) Quick sort
   c) Bubble sort
   d) Selection sort
   e) Heap sort
2. To implement Linear search and Binary search and analyse its time complexity.
3. To implement Huffman Coding and analyse its time complexity.
4. To implement Minimum Spanning Tree and analyse its time complexity.
5. To implement Dijkstra‘s algorithm and analyse its time complexity.
6. To implement Bellman Ford algorithm and analyse its time complexity.
7. Implement N Queen's problem using Back Tracking.
8. To implement Matrix Multiplication and analyse its time complexity.
9. To implement Longest Common Subsequence problem and analyse its time complexity.
10. To implement naïve String Matching algorithm, Rabin Karp algorithm and Knuth Morris Pratt algorithm and analyse its time complexity.
11. To implement Sorting Network.

Fifth Semester					
Group	**Paper Code**	**Paper**	**L**	**P**	**Credits**
Theory Papers					
HS/MS	HS-301	Economics for Engineers	2		2
PC	CIC-303	Compiler Design	3		3
PC	CIC-305	Operating Systems	4		4
PC	CIC-307	Computer Networks	4		4
PC	CIC-309	Software Engineering	3		3
PC	CIC-311	Design and Analysis of Algorithm	4		4
Practical / Viva Voce					
PC	CIC-351	Compiler Design Lab		2	1
PC	CIC-353	Operating Systems Lab		2	1
PC	CIC-355	Computer Networks Lab		2	1
PC	CIC-357	Software Engineering Lab		2	1
PC	CIC-359	Design and Analysis of Algorithm Lab		2	1
PC / Internship	ES-361	Summer Training Report - 1 *			1
Total		-	**20**	**10**	**26**

***NUES:**Comprehensive evaluation of the Summer Training Report – 1 (after 4th Semester) shall be done by the committee of teachers, constituted by the Academic Programme Committee, out of 100. The training shall be of 4 to 6 weeks duration. The training can be under the mentorship of a teacher of the institute.

Sixth Semester					
Group	**Paper Code**	**Paper**	**L**	**P**	**Credits**
Theory Papers					
HS/MS	MS-302	Principles of Management for Engineers	3		3
HS/MS	HS-304	Universal Human Values*	1		1
PCE		Programme Core Elective Paper (PCE –1)			4
PCE		Programme Core Elective Paper (PCE – 2)			4
PCE		Programme Core Elective Paper (PCE – 3)			4
EAE / OAE		Emerging Area/Open Area Elective Paper (EAE – 1 /OAE – 1)			4
EAE / OAE		Emerging Area/Open Area Elective Paper (EAE – 2 /OAE – 2)			4
Practical / Viva Voce					
HS/MS	HS-352	NSS / NCC / Cultural Clubs / Technical Society / Technical Club**			2
Total					**26**

***NUES:**All examinations to be conducted by the concerned teacher as specified in the detailed syllabus of the paper.

****NUES:** Comprehensive evaluation of the students by the concerned coordinator of NCC / NSS / Cultural Clubs / Technical Society / Technical Clubs, out of 100 as per the evaluation schemes worked out by these activity societies, organizations; the faculty co-ordinators shall be responsible for the evaluation of the same. These activities shall start from the 1st semester and the evaluation shall be conducted at the end of the 6th semester for students admitted in the first semester. Students admitted in the 2nd year (3rd semester) as lateral entry shall be evaluated on the basis their performance, by the faculty co-ordinator for the period of 3rd semester to 6th semester only.

Programme Core Electives

Semester	Paper Code	PCE – 1 (Choose Any One)	L	P	Credits
6	CIE-306T	Advanced Java Programming	3		3
	CIE-306P	Advanced Java Programming Lab		2	1
6	CIE-308T	Visual Basic.NET Programming	3		3
	CIE-308P	Visual Basic.NET Programming Lab		2	1
6	CIE-310T	Advanced DBMS	3		3
	CIE-310P	Advanced DBMS Lab		2	1
6	CIE-318T	Network Security and Cryptography	3		3
	CIE-318P	Network Security and Cryptography Lab		2	1
6	CIE-326T	VHDL Programming	3		3
	CIE-326P	VHDL Programming Lab		2	1
Semester	**Paper Code**	**PCE – 2 (Choose Any One)**	**L**	**P**	**Credits**
6	CIE-330T	Introduction to Internet of Things	3		3
	CIE-330P	Introduction to Internet of Things Lab		2	1
6	CIE-332T	Programming in Python	3		3
	CIE-332P	Programming in Python Lab		2	1
6	CIE-334	Quantum Computing	4		4
6	CIE-342T	Multimedia Technologies	3		3
	CIE-342P	Multimedia Technologies Lab		2	1
6	CIE-350	Windows System Administration	4		4
Semester	**Paper Code**	**PCE – 3 (Choose Any One)**	**L**	**P**	**Credits**
6	CIE-354T	Introduction to Digital Signal Processing	3		3
	CIE-354P	Introduction to Digital Signal Processing Lab		2	1
6	CIE-356T	Web Technologies	3		3
	CIE-356P	Web Technologies Lab		2	1
6	CIE-362T	Linux System Administration	3		3
	CIE-362P	Linux System Administration Lab		2	1
6	CIE-364T	Microprocessors and Interfacing	3		3
	CIE-364P	Microprocessors and Interfacing Lab		2	1
6	CIE-374T	Artificial Intelligence	3		3
	CIE-374P	Artificial Intelligence Lab		2	1
Semester	**Paper Code**	**PCE – 4 (Choose Any One)**	**L**	**P**	**Credits**
7	CIE-403T	Blockchain Technology	3		3
	CIE-403P	Blockchain Technology Lab		2	1
7	CIE-405T	Data Science	3		3
	CIE-405P	Data Science Lab		2	1
7	CIE-407T	Distributed Systems and Cloud Computing	3		3
	CIE-407P	Distributed Systems and Cloud Computing Lab		2	1
7	CIE-409T	Social Network Analysis and Sentiment Analysis	3		3
	CIE-409P	Social Network Analysis and Sentiment Analysis Lab		2	1
7	CIE-411T	Computer Graphics and Multimedia Technologies	3		3
	CIE-411P	Computer Graphics and Multimedia Technologies Lab		2	1
Semester	**Paper Code**	**PCE – 5 (Choose Any One)**	**L**	**P**	**Credits**
7	CIE-417T	C#.NET Programming	3		3
	CIE-417P	C#.NET Programming Lab		2	1
7	CIE-419	Intellectual Property Rights	4		4
7	CIE-421T	Machine Learning	3		3
	CIE-421P	Machine Learning Lab		2	1
7	CIE-423T	Data Visualization	3		3
	CIE-423P	Data Visualization Lab		2	1
7	CIE-429T	Web Intelligence and Big Data Analytics	3		3
	CIE-429P	Web Intelligence and Big Data Analytics Lab		2	1

Emerging Area Specialization: Artificial Intelligence and Machine Learning (for CSE / IT / CST / ITE / ECE / EE / EEE / ICE / ME / CE)

Semester	Paper Group	Paper Code	Paper Name	L	P	Credits
6	AIML-EAE-1	AI-302T	Artificial Intelligence	3		3
		AI-302P	Artificial Intelligence Lab		2	1
6	AIML-EAE-2	DA-304T	Statistics, Statistical Modelling & Data Analytics	3		3
		DA-304P	Statistics, Statistical Modelling & Data Analytics Lab		2	1
7	AIML-EAE-3	ML-407T	Machine Learning	3		3
		ML-407P	Machine Learning Lab		2	1
7	AIML-EAE-4	ML-409T	Reinforcement Learning and Deep Learning	3		3
		ML-409P	Reinforcement Learning and Deep Learning Lab		2	1
7	AIML-EAE-5	ML-411T	Pattern Recognition and Computer Vision	3		3
		ML-411P	Pattern Recognition and Computer Vision Lab		2	1

Emerging Area Specialization: Data Science (for CSE / IT / CST / ITE / ECE / EE / EEE / ICE / ME / CE)

Semester	Paper Group	Paper Code	Paper Name	L	P	Credits
6	DS-EAE-1	DA-304T	Statistics, Statistical Modelling & Data Analytics	3		3
		DA-304P	Statistics, Statistical Modelling & Data Analytics Lab		2	1
6	DS-EAE-2	AI-316T	Artificial Intelligence and Machine Learning	3		3
		AI-316P	Artificial Intelligence and Machine Learning Lab		2	1
7	DS-EAE-3	DS-427T	Data Science using R	3		3
		DS-427P	Data Science using R Lab		2	1
7	DS-EAE-4	DS-429T	Big Data Analytics	3		3
		DS-429P	Big Data Analytics Lab		2	1
7	DS-EAE-5A OR	DS-431T	Business Intelligence	3		3
		DS-431P	Business Intelligence Lab		2	1
	DS-EAE-5B	DS-433T	Exploratory Data Analytics and Data Visualization	3		3
		DS-433P	Exploratory Data Analytics and Data Visualization Lab		2	1

Emerging Area Specialization: Block Chain Technology (for CSE / IT / CST / ITE/ECE/EE/EEE)

Semester	Paper Group	Paper Code	Paper Name	L	P	Credits
6	BT-EAE-1	CS-306T	Mathematics of Modern Cryptography	3		3
		CS-306P	Mathematics of Modern Cryptography Lab		2	1
6	BT-EAE-2	BT-308T	Blockchain Technology	3		3
		BT-308P	Blockchain Technology Lab		2	1
7	BT-EAE-3	BT-413T	Bitcoin and Cryptocurrency Technologies	3		3
		BT-413P	Bitcoin and Cryptocurrency Technologies Lab		2	1
7	BT-EAE-4	BT-415T	Smart Contracts	3		3
		BT-415P	Smart Contracts Lab		2	1
7	BT-EAE-5A OR	BT-417T	Blockchain for Cyber Security	3		3
		BT-417P	Blockchain for Cyber Security Lab		2	1
	BT-EAE-5B	BT-419T	Blockchain Technology in Web Development	3		3
		BT-419P	Blockchain Technology in Web Development Lab		2	1

Emerging Area Specialization: Internet of Things (for CSE / IT / CST / ITE / ECE / EE / EEE / ICE / ME)

Semester	Paper Group	Paper Code	Paper Name	L	P	Credits
6	IOT-EAE-1A OR	IOT-324T	Introduction to Internet of Things	3		3
		IOT-324P	Introduction to Internet of Things Lab		2	1
	IOT-EAE-1B	IOT-326T	Introduction to Sensors and Transducers	3		3
		IOT-326P	Introduction to Sensors and Transducers Lab		2	1
6	IOT-EAE-2A OR	ES-328T	Embedded Linux	3		3
		ES-328P	Embedded Linux Lab		2	1
	IOT-EAE-2B OR	IOT-330T	Programming in Python	3		3
		IOT-330P	Programming in Python Lab		2	1
	IOT-EAE-2C	IOT-332T	Wireless Sensor Networks	3		3
		IOT-332P	Wireless Sensor Networks Lab		2	1
7	IOT-EAE-3	IOT-441T	IoT with Arduino, ESP and Raspberry Pi	3		3
		IOT-441P	IoT with Arduino, ESP and Raspberry Pi Lab		2	1
7	IOT-EAE-4	IOT-443T	Design of Smart Systems	3		3
		IOT-443P	Design of Smart Systems Lab		2	1
7	IOT-EAE-5A OR	IOT-445T	Internet of Things Industrial and Medical Case Studies	3		3
		IOT-445P	Internet of Things Industrial and Medical Case Studies Lab		2	1
	IOT-EAE-5B OR	IOT-447T	Internet of Things Frameworks	3		3
		IOT-447P	Internet of Things Frameworks Lab		2	1
	IOT-EAE-5C	IOT-449	Privacy and Security issues in IoT	4		4

Emerging Area Specialization: Internet of Things and Cyber Security including Block Chain Technology (for CSE / IT / CST / ITE / ECE / EE / EEE / ICE / ME)

Semester	Paper Group	Paper Code	Paper Name	L	P	Credits
6	ICB-EAE-1A OR	IOT-324T	Introduction to Internet of Things	3		3
		IOT-324P	Introduction to Internet of Things Lab		2	1
	ICB-EAE-1B	IOT-326T	Introduction to Sensors and Transducers	3		3
		IOT-326P	Introduction to Sensors and Transducers Lab		2	1
6	ICB-EAE-2A OR	ES-328T	Embedded Linux	3		3
		ES-328P	Embedded Linux Lab		2	1
	ICB-EAE-2B OR	IOT-330T	Programming in Python	3		3
		IOT-330P	Programming in Python Lab		2	1
	ICB-EAE-2C	IOT-332T	Wireless Sensor Networks	3		3
		IOT-332P	Wireless Sensor Networks Lab		2	1
7	ICB-EAE-3	CS-423T	Cyber Security and Forensics	3		3
		CS-423P	Cyber Security and Forensics Lab		2	1
7	ICB-EAE-4	IOT-441T	IoT with Arduino, ESP and Raspberry Pi	3		3
		IOT-441P	IoT with Arduino, ESP and Raspberry Pi Lab		2	1
7	ICB-EAE-5	BT-443T	Blockchain Technology	3		3
		BT-443P	Blockchain Technology Lab		2	1

Emerging Area Specialization: Networks (for CSE / IT / CST / ITE / ECE)

Semester	Paper Group	Paper Code	Paper Name	L	P	Credits
6	NET-EAE-1	NET-344T	Advanced Computer Networks and Administration	3		3
		NET-344P	Advanced Computer Networks and Administration Lab		2	1
6	NET-EAE-2	NET-346T	Linux System Administration	3		3
		NET-346P	Linux System Administration Lab		2	1
7	NET-EAE-3	NET-471T	Network Programming	3		3
		NET-471P	Network Programming Lab		2	1
7	NET-EAE-4	NET-473T	Cloud Computing and Security	3		3
		NET-473P	Cloud Computing and Security Lab		2	1
7	NET-EAE-5	NET-475T	Wireless Sensor Networks	3		3
		NET-475P	Wireless Sensor Networks Lab		2	1

Emerging Area Specialization: Cyber Security (for CSE / IT / CST / ITE / ECE)

Semester	Paper Group	Paper Code	Paper Name	L	P	Credits
6	CS-EAE-1	CS-310T	Information Theory and Coding	3		3
		CS-310P	Information Theory and Coding Lab		2	1
6	CS-EAE-2A OR	CS-312T	Network Security and Cryptography	3		3
		CS-312P	Network Security and Cryptography Lab		2	1
	CS-EAE-2B	CS-314T	Network Security Issues and Challenges	3		3
		CS-314P	Network Security Issues and Challenges Lab		2	1
7	CS-EAE-3	CS-421T	Cyber Crime and Cyber Laws	3		3
		CS-421P	Cyber Crime and Cyber Laws Lab		2	1
7	CS-EAE-4	CS-423T	Cyber Security and Forensics	3		3
		CS-423P	Cyber Security and Forensics Lab		2	1
7	CS-EAE-5	CS-425T	Ethical Hacking	3		3
		CS-425P	Ethical Hacking Lab		2	1

Emerging Area Specialization: Soft Computing (for CSE / IT / CST / ITE / ECE / EE / EEE / ICE / ME / CE)

Semester	Paper Group	Paper Code	Paper Name	L	P	Credits
6	SC-EAE-1	DA-304T	Statistics, Statistical Modelling & Data Analytics	3		3
		DA-304P	Statistics, Statistical Modelling & Data Analytics Lab		2	1
6	SC-EAE-2	ML-348T	Artificial Neural Networks and Deep Learning	3		3
		ML-348P	Artificial Neural Networks and Deep Learning Lab		2	1
7	SC-EAE-3	SC-477T	Fuzzy Systems and Applications	3		3
		SC-477P	Fuzzy Systems and Applications Lab		2	1
7	SC-EAE-4	SC-479T	Global Optimization Methods	3		3
		SC-479P	Global Optimization Methods Lab		2	1
7	SC-EAE-5	SC-481T	Soft Computing and Expert Systems	3		3
		SC-481P	Soft Computing and Expert Systems Lab		2	1

Emerging Area Specialization: Machine Learning & Data Analytics (for CSE / IT / CST / ITE / ECE / EE / EEE / ICE / ME / CE)

Semester	Paper Group	Paper Code	Paper Name	L	P	Credits
6	MLDA-EAE-1	DA-304T	Statistics, Statistical Modelling & Data Analytics	3		3
		DA-304P	Statistics, Statistical Modelling & Data Analytics Lab		2	1
6	MLDA-EAE-2A OR	DA-338T	Data Analytics	3		3
		DA-338P	Data Analytics Lab		2	1
	MLDA-EAE-2B OR	DS-340T	Data Visualization	3		3
		DS-340P	Data Visualization Lab		2	1
	MLDA-EAE-2C	ML-342T	Machine Learning	3		3
		ML-342P	Machine Learning Lab		2	1
7	MLDA-EAE-3	ML-463T	Supervised and Deep Learning	3		3
		ML-463P	Supervised and Deep Learning Lab		2	1
7	MLDA-EAE-4	ML-465T	Unsupervised Learning	3		3
		ML-465P	Unsupervised Learning Lab		2	1
7	MLDA-EAE-5A OR	ML-467T	Machine Learning and Data Analytics Case Studies	3		3
		ML-467P	Machine Learning and Data Analytics Case Studies Lab		2	1
	MLDA-EAE-5B	ML-469T	Machine Learning and Data Analytics Frameworks	3		3
		ML-469P	Machine Learning and Data Analytics Frameworks Lab		2	1

Emerging Area Specialization: Software Engineering (for CSE / IT / CST / ITE)

Semester	Paper Group	Paper Code	Paper Name	L	P	Credits
6	SE-EAE-1	SE-350T	Software Measurements, Metrics and Modelling	3		3
		SE-350P	Software Measurements, Metrics and Modelling Lab		2	1
6	SE-EAE-2A OR	SE-352T	Service Oriented Architecture	3		3
		SE-352P	Service Oriented Architecture Lab		2	1
	SE-EAE-2B	SE-354T	Software Project Management	3		3
		SE-354P	Software Project Management Lab		2	1
7	SE-EAE-3	SE-483T	Mining Software Repositories and Predictive Modelling	3		3
		SE-483P	Mining Software Repositories and Predictive Modelling Lab		2	1
7	SE-EAE-4A OR	SE-485	Software Security	4		4
	SE-EAE-4B	SE-487T	Software Verification, Validation and Testing	3		3
		SE-487P	Software Verification, Validation and Testing Lab		2	1
7	SE-EAE-5	SE-489	Software Engineering Standards	4		4

Emerging Area Specialization: Full Stack Development (for CSE / IT / CST / ITE)

Semester	Paper Group	Paper Code	Paper Name	L	P	Credits
6	FSD-EAE-1	FSD-318T	Advanced Java Programming	3		3
		FSD-318P	Advanced Java Programming Lab		2	1
6	FSD-EAE-2A OR	FSD-320T	Web Development using MEAN Stack	3		3
		FSD-320P	Web Development using MEAN Stack Lab		2	1
	FSD-EAE-2B	FSD-322T	Web Development using MERN Stack	3		3
		FSD-322P	Web Development using MERN Stack Lab		2	1
7	FSD-EAE-3	FSD-435T	PHP Programming and MySQL	3		3
		FSD-435P	PHP Programming and MySQL Lab		2	1
7	FSD-EAE-4	FSD-437T	Mobile App Development	3		3
		FSD-437P	Mobile App Development Lab		2	1
7	FSD-EAE-5	FSD-439T	Web and Mobile Application Testing and Deployment	3		3
		FSD-43P	Web and Mobile Application Testing and Deployment Lab		2	1

Emerging Area Specialization: Image Processing and Computer Vision (for CSE/IT/CST/ITE/ECE/ EE / EEE / ICE)

Semester	Paper Group	Paper Code	Paper Name	L	P	Credits
6	IPCV-EAE-1A OR	IPCV-334T	Digital Image Processing	3		3
		IPCV-334P	Digital Image Processing Lab		2	1
	IPCV-EAE-1B	IPCV-356T	Digital Signal and Image Processing	3		3
		IPCV-356P	Digital Signal and Image Processing Lab		2	1
6	IPCV-EAE-2	IPCV-336T	Pattern Recognition	3		3
		IPCV-336P	Pattern Recognition Lab		2	1
7	IPCV-EAE-3	IPCV-451T	Computer Vision	3		3
		IPCV-451P	Computer Vision Lab		2	1
7	IPCV-EAE-4A OR	IPCV-453T	Biometrics	3		3
		IPCV-453P	Biometrics Lab		2	1
	IPCV-EAE-4B OR	IPCV-455T	Medical Image Processing, Analysis and Reconstruction	3		3
		IPCV-455P	Medical Image Processing, Analysis and Reconstruction Lab		2	1
	IPCV-EAE-4C	IPCV-457T	Remote Sensing Image Analysis and Classification	3		3
		IPCV-457P	Remote Sensing Image Analysis and Classification Lab		2	1
7	IPCV-EAE-5A OR	IPCV-459T	Deep Learning for Image Processing and Computer Vision	3		3
		IPCV-459P	Deep Learning for Image Processing and Computer Vision Lab		2	1
	IPCV-EAE-5B	IPCV-461T	Machine Learning for Image and Vision Analysis	3		3
		IPCV-461P	Machine Learning for Image and Vision Analysis Lab		2	1

Principles of Programming Languages	L	P	C
	4		4

Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
CSE	6	PCE	PCE-1	CIE-320

Marking Scheme:

1. Teachers Continuous Evaluation: 25 marks
2. Term end Theory Examinations: 75 marks

Instructions for paper setter:

1. There should be 9 questions in the term end examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 15 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 15.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objectives :

1.	To understand and describe syntax and semantics of programming languages.
2.	To understand Data, Data types, and Bindings
3.	To learn the concepts of functional and logical programming
4.	To explore the knowledge about concurrent Programming paradigms.

Course Outcomes (CO)

CO 1	Describe syntax and semantics of programming languages
CO 2	Explain data, data types, and basic statements of programming languages
CO 3	Design and implement subprogram constructs, Apply object - oriented, concurrency, pro and event handling programming constructs
CO 4	Develop programs in various programming languages

Course Outcomes (CO) to Programme Outcomes (PO) mapping (scale 1: low, 2: Medium, 3: High)

	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO 1		3	-	-	-	2	-	2	-	-	3	2
CO 2		-	2	-	-	-	2	-	-	3	-	-
CO 3	-	-	-	2	3	-	-	3	-	-	2	-
CO 4	3	-	3	-	-	3	3	-	3	-	-	3

UNIT-I

Introduction: Syntax, semantics and pragmatics; Formal translation models, Variables, Expressions & Statements, Binding time spectrum; Variables and expressions; Assignment; I-values and r-values; Environments and stores; Storage allocation; Constants and initialization; Statement-level control structure.

UNIT-II

Primitive Types: Pointers; Structured types; Coercion; Notion of type equivalence; Polymorphism: overloading, inheritance, type parameterization, Abstract data types; Information hiding and abstraction; Visibility, Procedures, Modules, Classes, Packages, Objects and Object-Oriented Programming.

UNIT-III

Storage Management: Static and dynamic, stack-based, and heap-based storage management. Sequence

Control: Implicit and explicit sequencing with arithmetic and non-arithmetic expressions; Sequence control between statements. Subprogram Control: Subprogram sequence control, data control and referencing environments; parameter passing; static and dynamic scope; block structure.

UNIT-IV

Concurrent Programming: Concepts, Communication, Deadlocks, Semaphores, Monitors, Threads, Synchronization. Logic programming: Introduction; Rules, Structured Data and Scope of the variables; Operators and Functions; Recursion and recursive rules; Lists, Input and Output; Program control; Logic Program design.

Textbooks:

1. Programming Languages – Pratt T.V. (Pearson Ed).
2. Introduction to Programming Languages: Programming in C, C++, Scheme, Prolog, C# and SOA – Chen Y., Tsai W-T. (Kendall).
3. Programming Languages: Design & Implementation – Pratt T.W., Zelkowski M.V. (PHI). [4] Programming Languages, Adesh K Pandey, Narosa Publishing House

References:

1. Programming Languages: Principles and Practice – Louden K.C. (Addision-Wesley).
2. Programming languages – Grover P.S. (S. Chand).
3. Programming Languages: Principles and Paradigms - Tucker A., Noonan R. (TMH).

Universal Human Values	L	P	C
	1		1

Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
All	6	HS/MS	HS	HS-304

Marking Scheme:

4. Teachers Continuous Evaluation: 25 marks
5. Term end Theory Examinations: 75 marks
6. This is an NUES paper, hence all examinations to be conducted by the concerned teacher.

Instructions for paper setter:

1. There should be 9 questions in the term end examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 15 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 15.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper.

Course Objectives :

1.	To help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
2.	To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
3.	To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature.
4.	To analyze the value of harmonious relationship based on trust and respect in their life and profession

Course Outcomes (CO)

CO 1	Evaluate the significance of value inputs in formal education and start applying them in their life and profession
CO 2	Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc.
CO 3	Examine the role of a human being in ensuring harmony in society and nature.
CO 4	Apply the understanding of ethical conduct to formulate the strategy for ethical life and profession.

Course Outcomes (CO) to Programme Outcomes (PO) mapping (scale 1: low, 2: Medium, 3: High)

	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO 1	-	-	-	-	-	3	-	3	1	1	-	1
CO 2	-	-	-	-	-	3	-	3	1	1	-	1
CO 3	-	-	-	-	-	3	-	3	1	1	-	1
CO 4	-	-	-	-	-	3	-	3	1	1	-	1

UNIT-I

Introduction-Basic Human Aspiration, its fulfillment through All-encompassing Resolution: The basic human aspirations and their fulfillment through Right understanding and Resolution, Right understanding and Resolution as the activities of the Self, Self being central to Human Existence; All-encompassing Resolution for a Human Being, its details and solution of problems in the light of Resolution

UNIT-II

Understanding Human Being: Understanding the human being comprehensively as the first step and the core

theme of this course; human being as co-existence of the self and the body; the activities and potentialities of the self; Basis for harmony/contradiction in the self

UNIT-III

Understanding Nature and Existence: A comprehensive understanding (knowledge) about the existence, Nature being included; the need and process of inner evolution (through self-exploration, self-awareness and self-evaluation), particularly awakening to activities of the Self: Realization, Understanding and Contemplation in the Self (Realization of Co-Existence, Understanding of Harmony in Nature and Contemplation of Participation of Human in this harmony/ order leading to comprehensive knowledge about the existence).

UNIT - IV

Understanding Human Conduct, All-encompassing Resolution & Holistic Way of Living: Understanding Human Conduct, different aspects of All-encompassing Resolution (understanding, wisdom, science etc.), Holistic way of living for Human Being with All-encompassing Resolution covering all four dimensions of human endeavor viz., realization, thought, behavior and work (participation in the larger order) leading to harmony at all levels from Self to Nature and entire Existence

Textbook(s):

1. R R Gaur, R Asthana, G P Bagaria, 2019 (2nd Revised Edition), A Foundation Course in Human Values and Professional Ethics. ISBN 978-93-87034-47-1, Excel Books, New Delhi.
2. Premvir Kapoor, Professional Ethics and Human Values, Khanna Book Publishing, New Delhi, 2022.

References:

1. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and Harper Collins, USA
2. E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
3. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986.
4. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth – Club of Rome's report, Universe Books.
5. A Nagraj, 1998, Jeevan Vidya EkParichay, Divya Path Sansthan, Amarkantak.
6. P L Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.
7. A N Tripathy, 2003, Human Values, New Age International Publishers.
8. Subhas Palekar, 2000, How to practice Natural Farming, Pracheen (Vaidik) Krishi Tantra Shodh, Amravati.
9. E G Seebauer& Robert L. Berry, 2000, Fundamentals of Ethics for Scientists &Engineers, Oxford University Press
10. M Govindrajran, S Natrajan& V.S. Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.
11. B P Banerjee, 2005, Foundations of Ethics and Management, Excel Books.
12. B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008.

Artificial Intelligence	L	P	C
	3		3

Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
CSE/IT/CST/ITE	6	PCE	PCE-3	CIE-374T
ECE	6	PCE	PCE-1	ECE-318T
CSE-AI/CSE-AIML	6	PC	PC	AI-302T
EAE	6	AI-EAE	AI-EAE-1	AI-302T
EAE	6	AIML-EAE	AIML-EAE-1	AI-302T

Marking Scheme:

1. Teachers Continuous Evaluation: 25 marks
2. Term end Theory Examinations: 75 marks

Instructions for paper setter:

1. There should be 9 questions in the term end examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 15 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 15.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objectives :

1.	To impart the definition and basic knowledge of Artificial Intelligence.
2.	To introduces AI by examining the nature of the difficult problems.
3.	To understand with AI demonstration that intelligence requires ability to find reason.
4.	To understand the latest techniques and the future scope of the technology.

Course Outcomes (CO)

CO 1	Ability to use AI methods and control strategies to solve the problems.
CO 2	Understand the production system and its applications. Also, to understand the properties and applications for the different search algorithms.
CO 3	Applying the different algorithms and the techniques, also analyse the reason for the results.
CO 4	Study the expert systems and the modern approaches.

Course Outcomes (CO) to Programme Outcomes (PO) mapping (scale 1: low, 2: Medium, 3: High)

	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO 1	3	3	3	3	3	2	2	-	-	-	-	2
CO 2	3	3	3	3	3	2	2	-	-	-	-	2
CO 3	3	3	3	3	3	2	2	-	-	-	-	2
CO 4	3	3	3	3	3	2	2	-	-	-	-	2

UNIT-I

AI Definition, Problems, The Foundations of Artificial Intelligence, Techniques, Models, Defining Problem as a state space search, production system, Intelligent Agents: Agents and Environments, Characteristics, Search methods and issues in the design of search problems.

UNIT-II

Knowledge representation issues, mapping, frame problem. Predicate logic, facts in logic, representing instance and Isa relationship, Resolution, procedural and declarative knowledge, matching, control knowledge. Symbolic reasoning under uncertainty, Non monotonic reasoning, statistical reasoning.

UNIT-III

Game Playing, minimax search, Alfa beta cut-offs, Natural Language Processing, Learning, Explanation-based learning, discovery, analogy, Neural net learning and Genetic Learning.

UNIT - IV

Fuzzy logic systems, Perception and action, Expert systems, Inference in Bayesian Networks, K-means Clustering Algorithm, Machine learning.

Textbook(s):

1. Elaine Rich, Kevin Knight, and Shivashankar B Nair, "Artificial Intelligence", Tata McGraw Hill.
2. S. Russel and P. Norvig, "Artificial Intelligence: A Modern Approach", Pearson Edu.

References:

1. Deepak Khemani, "A First Choice in Artificial Intelligence", McGraw Hill.
2. K M Fu, "Neural Networks in Computer Intelligence", McGraw Hill.

Artificial Intelligence Lab	L	P	C
		2	1

Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
CSE/IT/CST/ITE	6	PCE	PCE-3	CIE-374P
ECE	6	PCE	PCE-1	ECE-318P
CSE-AI/CSE-AIML	6	PC	PC	AI-302P
EAE	6	AI-EAE	AI-EAE-1	AI-302P
EAE	6	AIML-EAE	AIML-EAE-1	AI-302P

Marking Scheme:

1. Teachers Continuous Evaluation: 40 marks
2. Term end Theory Examinations: 60 marks

Instructions:

1. The course objectives and course outcomes are identical to that of (Artificial Intelligence) as this is the practical component of the corresponding theory paper.
2. The practical list shall be notified by the teacher in the first week of the class commencement under intimation to the office of the Head of Department / Institution in which the paper is being offered from the list of practicals below. Atleast 10 experiments must be performed by the students, they may be asked to do more. Atleast 5 experiments must be from the given list.

1. Study of PROLOG.
2. Write simple fact for the statements using PROLOG
   a. Ram likes mango.
   b. Seema is a girl.
   c. Bill likes Cindy.
   d. Rose is red.
   e. John owns gold.
3. Write predicates, one converts centigrade temperatures to Fahrenheit, the other checksif a temperature is below freezing using PROLOG.
4. Write a program to implement Breath First Search Traversal.
5. Write a program to implement Water Jug Problem.
6. Write a program to remove punctuations from the given string.
7. Write a program to sort the sentence in alphabetical order.
8. Write a program to implement Hangman game using python.
9. Write a program to implement Hangman game.
10. Write a program to implement Tic-Tac-Toe game.
11. Write a program to remove stop words for a given passage from a text file using NLTK.
12. Write a program to implement stemming for a given sentence using NLTK.
13. Write a program to POS (part of speech) tagging for the give sentence using NLTK.
14. Write a program to implement Lemmatization using NLTK.
15. Write a program for Text Classification for the given sentence using NLTK.

Statistics, Statistical Modelling & Data Analytics	L	P	C
	3		3

Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
CSE-AI/CSE-AIML/CSE-DS	6	PC	PC	DA-304T
EAE	6	AI-EAE	AI-EAE-2	DA-304T
EAE	6	AIML-EAE	AIML-EAE-2	DA-304T
EAE	6	DS-EAE	DS-EAE-1	DA-304T
EAE	6	SC-EAE	SC-EAE-1	DA-304T
EAE	6	MLDA-EAE	MLDA-EAE-1	DA-304T

Marking Scheme:

1. Teachers Continuous Evaluation: 25 marks
2. Term end Theory Examinations: 75 marks

Instructions for paper setter:

1. There should be 9 questions in the term end examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 15 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 15.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objectives :

1.	To impart basic knowledge about Statistics, visualisation and probability.
2.	To impart basic knowledge about how to implement regression analysis and interpret the results.
3.	To impart basic knowledge about how to describe classes of open and closed sets of R, concept of compactness Describe Metric space - Metric in Rn.
4.	To impart basic knowledge about how to apply Eigen values, Eigen vectors.

Course Outcomes (CO)

CO 1	Ability to learn and understand the basic concepts about Statistics, visualisation and probability.
CO 2	Ability to implement regression analysis and interpret the results. Be able to fit a model to data and comment on the adequacy of the model
CO 3	Ability to describe classes of open and closed sets of R, concept of compactness Describe Metric space - Metric in Rn.
CO 4	Ability to impart basic knowledge about how to apply Eigen values, Eigen vectors.

Course Outcomes (CO) to Programme Outcomes (PO) mapping (scale 1: low, 2: Medium, 3: High)

	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO 1	3	3	3	3	3	-	-	1	2	-	-	3
CO 2	3	3	3	3	3	-	-	1	2	-	-	3
CO 3	3	3	3	3	3	-	-	1	2	-	-	3
CO 4	3	3	3	3	3	-	-	1	2	-	-	3

UNIT-I

Statistics: Introduction & Descriptive Statistics- mean, median, mode, variance, and standard deviation. Data Visualization, Introduction to Probability Distributions.

Hypothesis testing, Linear Algebra and Population Statistics, Mathematical Methods and Probability Theory, Sampling Distributions and Statistical Inference, Quantitative analysis.

UNIT-II

Statistical Modelling: Linear models, regression analysis, analysis of variance, applications in various fields. Gauss-Markov theorem; geometry of least squares, subspace formulation of linear models, orthogonal projections; regression models, factorial experiments, analysis of covariance and model formulae; regression diagnostics, residuals, influence diagnostics, transformations, Box-Cox models, model selection and model building strategies, logistic regression models; Poisson regression models.

UNIT-III

Data Analytics: Describe classes of open and closed set. Apply the concept of compactness. Describe Metric space - Metric in Rn. Use the concept of Cauchy sequence, completeness, compactness and connectedness to solve the problems.

UNIT – IV

Advanced concepts in Data Analytics: Describe vector space, subspaces, independence of vectors, basis and dimension. Describe Eigen values, Eigen vectors and related results.

Textbook(s):

1. Apostol T. M. (1974): Mathematical Analysis, Narosa Publishing House, New Delhi.
2. Malik, S.C., Arora, S. (2012): Mathematical Analysis, New Age International, New Delhi

References:

1. Pringle, R.M. and Rayner, A.(1971): Generalized Inverse of Matrices with Application to Statistics, Griffin, London
2. Peter Bruce, Andrew Bruce (2017), Practical Statistics for Data Scientists Paperback

Statistics, Statistical Modelling & Data Analytics Lab	L	P	C
		2	1

Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
CSE-AI/CSE-AIML/CSE-DS	6	PC	PC	DA-304P
EAE	6	AI-EAE	AI-EAE-2	DA-304P
EAE	6	AIML-EAE	AIML-EAE-2	DA-304P
EAE	6	DS-EAE	DS-EAE-1	DA-304P
EAE	6	SC-EAE	SC-EAE-1	DA-304P
EAE	6	MLDA-EAE	MLDA-EAE-1	DA-304P

Marking Scheme:

1. Teachers Continuous Evaluation: 40 marks
2. Term end Theory Examinations: 60 marks

Instructions:

1. The course objectives and course outcomes are identical to that of (Statistics, Statistical Modelling & Data Analytics) as this is the practical component of the corresponding theory paper.
2. The practical list shall be notified by the teacher in the first week of the class commencement under intimation to the office of the Head of Department / Institution in which the paper is being offered from the list of practicals below. Atleast 10 experiments must be performed by the students, they may be asked to do more. Atleast 5 experiments must be from the given list.

1. Exercises to implement the basic matrix operations in Scilab.
2. Exercises to find the Eigenvalues and eigenvectors in Scilab.
3. Exercises to solve equations by Gauss elimination, Gauss Jordan Method and Gauss Siedel in Scilab.
4. Exercises to implement the associative, commutative and distributive property in a matrix in Scilab.
5. Exercises to find the reduced row echelon form of a matrix in Scilab.
6. Exercises to plot the functions and to find its first and second derivatives in Scilab.
7. Exercises to present the data as a frequency table in SPSS.
8. Exercises to find the outliers in a dataset in SPSS.
9. Exercises to find the most risky project out of two mutually exclusive projects in SPSS
10. Exercises to draw a scatter diagram, residual plots, outliers leverage and influential data points in R
11. Exercises to calculate correlation using R
12. Exercises to implement Time series Analysis using R.
13. Exercises to implement linear regression using R.
14. Exercises to implement concepts of probability and distributions in R

Advanced Java Programming	L	P	C
	3		3

Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
CSE/IT/CST/ITE	6	PCE	PCE-1	CIE-306T
EAE	6	FSD-EAE	FSD-EAE-1	FSD-318T
CSE-in-EA	7	OAE-CSE-EA	OAE-2	OSD-453T
OAE	7	SD-OAE	SD-OAE-5A	OSD-453T

Marking Scheme:

1. Teachers Continuous Evaluation: 25 marks
2. Term end Theory Examinations: 75 marks

Instructions for paper setter:

1. There should be 9 questions in the term end examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 15 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 15.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objectives :

1.	To learn the ability to design console based, GUI based and web based applications
2.	To learn how to create dynamic web pages, using Servlets and JSP.
3.	To learn Designing applications using pre-built framework.
4.	To learn how to do distributed programming in Java using RMI, CORBA.

Course Outcomes (CO)

CO 1	Able to Understand advanced programming concepts.
CO 2	Able to Develop server side programs using JSP and Servlets
CO 3	Able to Develop component-based java software using java beans.
CO 4	Able to develop advanced projects based on java.

Course Outcomes (CO) to Programme Outcomes (PO) mapping (scale 1: low, 2: Medium, 3: High)

	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO 1	3	2	2	3	2	-	-	-	3	2	2	3
CO 2	3	2	2	3	2	-	-	-	3	2	2	3
CO 3	3	2	2	3	2	-	-	-	3	2	2	3
CO 4	3	2	2	3	2	-	-	-	3	2	2	3

UNIT-I

Introduction to Java, Inheritance, Exception Handling, Multithreading, Applet Programming. Connecting to a Server, Implementing Servers, Making URL Connections, Socket Programming.

UNIT-II

Preparing a Class to be a Java Bean, Creating a Java Bean, Java Bean Properties, Types of beans, Stateful Session bean, Stateless Session bean, Entity bean Servlet Overview and Architecture, Interface Servlet and the Servlet Life Cycle, Handling, HTTP GET Requests, Handling HTTP POST Requests, Session Tracking, Cookies.

UNIT-III

JSP- Introduction, Java Server Pages Overview, Implicit Objects, Scripting, Standard Actions, Directives, Custom Tag Libraries.

UNIT- IV

The Roles of Client and Server, Remote Method Invocations, Setup for Remote Method Invocation, Parameter Passing in Remote Methods, Introduction of HB, HB Architecture.

Textbook(s):

1. Kathy Sierra, Head First Servlets and JSP, O'Reilly Media.
2. Kanika Lakhani, Advance Java Programming, S.K. Kataria & Sons

References:

1. Brett Spell, Professional Java Programming, WROX Publication.
2. Harvey. M. Dietal, Advanced Java 2 Platform, How to Program, Prentice Hall.
3. Gajendra Gupta, Advanced Java, Firewall Media.

Advanced Java Programming Lab	L	P	C
		2	1

Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
CSE/IT/CST/ITE	6	PCE	PCE-1	CIE-306P
EAE	6	FSD-EAE	FSD-EAE-1	FSD-318P
CSE-in-EA	7	OAE-CSE-EA	OAE-2	OSD-453P
OAE	7	SD-OAE	SD-OAE-5A	OSD-453P

Marking Scheme:

1. Teachers Continuous Evaluation: 40 marks
2. Term end Theory Examinations: 60 marks

Instructions:

1. The course objectives and course outcomes are identical to that of (Advanced Java Programming) as this is the practical component of the corresponding theory paper.
2. The practical list shall be notified by the teacher in the first week of the class commencement under intimation to the office of the Head of Department / Institution in which the paper is being offered from the list of practicals below. Atleast 10 experiments must be performed by the students, they may be asked to do more. Atleast 5 experiments must be from the given list.

1. Write a Java program to demonstrate the concept of socket programming.
2. Write a Java program to demonstrate the concept of applet programming.
3. Write a Java program to demonstrate the concept of multi-threading.
4. Write a Java program to demonstrate the concept of applet.
5. Write a Java program to demonstrate the use of Java Beans.
6. Write a Java program to insert data into a table using JSP.
7. Write JSP program to implement form data validation.
8. Write a Java program to show user validation using Servlet.
9. Write a program to set cookie information using Servlet.
10. Develop a small web program using Servlets, JSPs with Database connectivity.

Programming in Python	L	P	C
	3		3

Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
CSE/IT/CST/ITE	6	PCE	PCE-2	CIE-332T
CSE-IoT/CSE-ICB	6	PC	PC	IOT-320T
EAE	6	IOT-EAE	IOT-EAE-2B	IOT-330T
EAE	6	ICB-EAE	ICB-EAE-2B	IOT-330T

Marking Scheme:

1. Teachers Continuous Evaluation: 25 marks
2. Term end Theory Examinations: 75 marks

Instructions for paper setter:

1. There should be 9 questions in the term end examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 15 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 15.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objectives :

1.	Learn the syntax and semantics of Python Programming Language.
2.	Write Python functions to facilitate code reuse and manipulate strings.
3.	Illustrate the process of structuring the data using lists, tuples and dictionaries.
4.	Demonstrate the use of built-in functions to navigate the file system.

Course Outcomes (CO)

CO 1	Demonstrate the concepts of control structures in Python.
CO 2	Implement Python programs using functions and strings.
CO 3	Implement methods to create and manipulate lists, tuples and dictionaries
CO 4	Apply the concepts of file handling and regExusing packages.

Course Outcomes (CO) to Programme Outcomes (PO) mapping (scale 1: low, 2: Medium, 3: High)

	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO 1	3	2	2	2	3	-	-	-	3	2	2	3
CO 2	3	2	2	2	3	-	-	-	3	2	2	3
CO 3	3	2	2	2	3	-	-	-	3	2	2	3
CO 4	3	2	2	2	3	-	-	-	3	2	2	3

UNIT-I

Introduction, Python Basics: Entering Expressions into the Interactive Shell, The Integer, Floating-Point, and String Data Types, String Concatenation and Replication, Storing Values in Variables, Dissecting Your Program. Flow control: Boolean Values, Comparison Operators, Boolean Operators, Mixing Boolean and Comparison Operators, Elements of Flow Control, Program Execution, Flow Control Statements, Importing Modules, Ending a Program Early with sys.exit().

UNIT-II

Functions: def Statements with Parameters, Return Values and return Statements, The None Value, Keyword Arguments and print(), Local and Global Scope, The global Statement, Exception Handling. Lists: The List Data Type, Working with Lists, Augmented Assignment Operators, Methods. Dictionaries and Structuring Data: The

Dictionary Data Type, Pretty Printing, Using Data Structures to Model Real-World Things. Manipulating Strings - Working with Strings, Useful String Methods.

UNIT-III

Reading and Writing Files: Files and File Paths, The os.path Module, The File Reading/Writing Process, Saving Variables with the shelve Module, Saving Variables with the pprint.pformat() Function. Organizing Files: The shutil Module, Walking a Directory Tree, Compressing Files with the zipfile Module.

UNIT – IV

Web Scraping: Project: MAPIT.PY with the web browser Module, Downloading Files from the Web with the requests Module, Saving Downloaded Files to the Hard Drive, HTML.

Textbooks:

1. Al Sweigart, “Automate the Boring Stuff with Python”, William Pollock, 2015, ISBN: 978-1593275990.

References:

1. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist”, 2nd Edition, Green Tea Press, 2015, ISBN: 978-9352134755.
2. Charles Dierbach, "Introduction to Computer Science Using Python", 1st Edition, Wiley India Pvt Ltd. ISBN-13: 978-8126556014.
3. Wesley J Chun, “Core Python Applications Programming”, 3rd Edition, Pearson Education India, 2015. ISBN-13: 978-9332555365.
4. Roberto Tamassia, Michael H Goldwasser, Michael T Goodrich, “Data Structures and Algorithms in Python”, 1st Edition, Wiley India Pvt Ltd, 2016. ISBN-13: 978-8126562176.
5. Reema Thareja, “Python Programming using problem solving approach”, Oxford University press, 2017. ISBN-13: 978-0199480173

Programming in Python Lab	L	P	C
		2	1

Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
CSE/IT/CST/ITE	6	PCE	PCE-2	CIE-332P
CSE-IoT/CSE-ICB	6	PC	PC	IOT-320P
EAE	6	IOT-EAE	IOT-EAE-2B	IOT-330P
EAE	6	ICB-EAE	ICB-EAE-2B	IOT-330P

Marking Scheme:

1. Teachers Continuous Evaluation: 40 marks
2. Term end Theory Examinations: 60 marks

Instructions:

1. The course objectives and course outcomes are identical to that of (Programming in Python) as this is the practical component of the corresponding theory paper.
2. The practical list shall be notified by the teacher in the first week of the class commencement under intimation to the office of the Head of Department / Institution in which the paper is being offered from the list of practicals below. Atleast 10 experiments must be performed by the students, they may be asked to do more. Atleast 5 experiments must be from the given list.

1. Basic data types and operators: Create a program that prompts the user for their name and age and prints a personalized message.
2. Conditional statements: Create a program that prompts the user for their age and tells them if they can vote in the next election.
3. Loops: Create a program that calculates the factorial of a number entered by the user using a loop.
4. Lists and arrays: Create a program that prompts the user for a list of numbers and then sorts them in ascending order.
5. Strings and string manipulation: Create a program that prompts the user for a string and then prints out the string reversed.
6. Functions: Create a program that defines a function to calculate the area of a circle based on the radius entered by the user.
7. Classes and objects: Create a program that defines a class to represent a car and then creates an object of that class with specific attributes.
8. File input/output: Create a program that reads data from a file and writes it to another file in a different format.
9. Regular expressions: Create a program that uses regular expressions to find all instances of a specific pattern in a text file.
10. Exception handling: Create a program that prompts the user for two numbers and then divides them, handling any exceptions that may arise.
11. GUI programming: Create a program that uses a graphical user interface (GUI) to allow the user to perform simple calculations.
12. Web scraping: Create a program that uses a web scraping library to extract data from a website and then stores it in a database.
13. Data visualization: Create a program that reads data from a file and then creates a visualization of that data using a data visualization library.
14. Machine learning: Create a program that uses a machine learning library to classify images based on their content.
15. Networking: Create a program that uses a networking library to communicate with a server and retrieve data from it.

IT Project Management	L	P	C
	4		4

Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
CST	6	PCE	PCE-2	CIE-340

Marking Scheme:

1. Teachers Continuous Evaluation: 25 marks
2. Term end Theory Examinations: 75 marks

Instructions for paper setter:

1. There should be 9 questions in the term end examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 15 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 15.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objectives :

1.	To learn detailed information and knowledge about successfully managing complex IT projects.
2.	To learn self-learn and upskill one-self to apply advanced techniques and concepts in managing and completing IT projects
3.	To learn required maturity to manage the information security aspect of IT projects
4.	To learn necessary confidence and experience to predict challenges and risks and address these to prevent impact on project outcomes

Course Outcomes (CO)

CO 1	Explore the appropriate methods to initiate, plan, execute, control and close projects.
CO 2	Demonstrate the knowledge and understanding of concepts, theories, and principles of IT project management.
CO 3	Demonstrate the knowledge of IT projects, risk management and application of techniques to manage risks and deliver value.
CO 4	Analyse different project constraints and their impact on achieving IT project goals.

Course Outcomes (CO) to Programme Outcomes (PO) mapping (scale 1: low, 2: Medium, 3: High)

	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO 1	3	3	2	2	3	-	-	-	2	2	2	3
CO 2	3	3	2	2	3	-	-	-	2	2	2	3
CO 3	3	3	2	2	3	-	-	-	2	2	2	3
CO 4	3	3	2	2	3	-	-	-	2	2	2	3

UNIT-I

Introduction to Project Management: What Is a Project?, Program and Project Portfolio Management, The Role of the Project Manager, The Project Management Profession, The Project Management and Information Technology Context: A Systems View of Project Management, Understanding Organizations, Stakeholder Management, Project Phases and the Project Life Cycle, The Context of Information Technology Projects, Recent Trends Affecting Information Technology Project Management, The Project Management Process Groups: A Case Study: Project Management Process Groups, Mapping the Process Groups to the Knowledge Areas Developing an Information Technology Project, Management Methodology, Case Study.

UNIT-II

Project Integration Management: What Is Project Integration Management?, Strategic Planning and Project Selection, Developing a Project Charter, Developing a Project Management Plan, Directing and Managing Project Execution, Monitoring and Controlling Project Work, Performing Integrated Change Control, Closing Projects or Phases, Using Software to Assist in Project Integration Management, Project Scope Management: What Is Project Scope Management?, Collecting Requirements, Defining Scope, Creating the Work Breakdown Structure, Verifying Scope, Controlling Scope, Using Software to Assist in Project Scope Management.

UNIT-III

Project Time Management: The Importance of Project Schedules, Defining Activities, Sequencing Activities, Estimating Activity Resources, Estimating Activity Durations, Developing the Schedule, Controlling the Schedule, Using Software to Assist in Project Time Management, Project Cost Management: The Importance of Project Cost Management, Basic Principles of Cost Management, Estimating Costs, Determining the Budge, Controlling Costs, Using Project Management Software to Assist in Project Cost Management.

UNIT – IV

Project Quality Management: The Importance of Project Quality Management, Planning Quality, Performing Quality Assurance, Performing Quality Control, Tools and Techniques for Quality Control, Modern Quality Management, Improving Information Technology Project Quality, Using Software to Assist in Project Quality Management, Project Human Resource Management: The Importance of Human Resource Management, What Is Project Human Resource Management?, Keys to Managing People, Developing the Human Resource Plan, Acquiring the Project Team, Developing the Project Team, Managing the Project Team, Using Software to Assist in Human Resource Management,
The Importance of Project Communications Management, The Importance of Project Risk Management, The Importance of Project Procurement.

Textbook(s):

1. Kathy Schwalbe, “Managing Information Technology Projects”, Sixth Edition, Course Technology, 2011.
2. Ramesh Behl, “Information Technology for Management”, Mc Graw Hill.

References:

1. Bob Hughes and Mike Cotterell, “Software Project Management”, Fourth Edition, Tata McGraw-Hill.
2. Jack T Marchewka, “Information Technology Project Management”, 4Th Edition, John Wiley.
3. Marchewka J.T., Information Technology Project Management Providing Measurable Organizational Value (Pb 2003), DB JWO.

Web Technologies	L	P	C
	3		3

Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
CSE/IT/CST/ITE	6	PCE	PCE-3	CIE-356T

Marking Scheme:

1. Teachers Continuous Evaluation: 25 marks
2. Term end Theory Examinations: 75 marks

Instructions for paper setter:

1. There should be 9 questions in the term end examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 15 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 15.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objectives :

1.	To explain web application development with HTML and CSS
2.	Learn about scripting languages Java Script and JSP Technologies
3.	To Learn Server-side Development with PHP
4.	Develop web applications using PHP and MYSQL

Course Outcomes (CO)

CO 1	Identify and illustrate the basic concepts of HTML and CSS & apply those concepts to design web pages
CO 2	Understand various concepts related to dynamic web pages and validate them using JavaScript and JSP
CO 3	Outline and understand the concepts of PHP for Web Development
CO 4	Integrate PHP, MYSQL and Scripting languages for web applications.

Course Outcomes (CO) to Programme Outcomes (PO) mapping (scale 1: low, 2: Medium, 3: High)

	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO 1		3	-	-	-	2	-	2	-	-	3	2
CO 2		-	2	-	-	-	2	-	-	3	-	-
CO 3	-	-	-	2	3	-	-	3	-	-	2	-
CO 4	3	-	3	-	-	3	3	-	3	-	-	3

UNIT-I

HTML: Basic Syntax, Standard HTML Document Structure, Basic Text Markup, Html styles, Elements, Attributes, Heading, Layouts, I frames Images, Hypertext Links, Lists, Tables, Forms, Dynamic HTML.
CSS**:** Need for CSS, introduction to CSS, basic syntax and structure, using CSS, background images, colors, and properties, manipulating texts, using fonts, borders, boxes, margins, padding lists, positioning using CSS, CSS2, The Box Model, Working with XML: Document Type Definition (DTD), XML schemas, Document object model, Parsers -DOM, and SAX. Introduction to XHTML: XML, Meta tags, Character entities, frames, and frame sets.

UNIT-II

JavaScript - Client-side scripting, Introduction to JavaScript, Objects, Primitives Operations and Expressions, Control Statements, Arrays, Functions, Constructors, JavaScript, and objects, JavaScript own objects, the DOM and web browser environments, forms and validations
Introduction to JSP**:** The Anatomy of a JSP Page, JSP Processing, Declarations, Directives, Expressions, Code

Snippets, implicit objects, Using Beans in JSP Pages, Using Cookies and session for session tracking, connecting to database in JSP

UNIT-III

Introduction to Server-Side Development with PHP, what is Server-Side Development, A Web Server's Responsibilities, Quick Tour of PHP, Introduction and basic syntax of PHP, decision and looping with examples, PHP and HTML, Arrays, Functions, Browser control and detection, string, Form processing, Files, Advance Features: Cookies and Sessions.

UNIT – IV

PHP and MySQL: Basic commands with PHP examples, Connection to the server, creating a database, selecting a database, listing database, listing table names, creating a table, inserting data, altering tables, queries, deleting the database, deleting data, and tables, PHP my admin and database bugs. Managing State, The Problem of State in Web Applications, Passing Information via Query Strings, Passing Information via the URL Path, Cookies, Serialization, Session State.

Textbooks:

1. Web Technologies: A Computer Science Perspective, Jackson, Pearson Education India, 2007.
2. Programming the World Wide Web, 7th Edition, Robert W Sebesta, Pearson, 2013.

References:

1. Web Technologies, HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Black book, 1st Edition, Dream Tech, 2009.
2. An Introduction to Web Design, Programming, 1st Edition, Paul S Wang, Sanda S Katila, Cengage Learning, 2003.
3. PHP and MySQL Web Development, Luke Welling, Addison Wesley

Web Technologies Lab	L	P	C
		2	1

Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
CSE/IT/CST/ITE	6	PCE	PCE-3	CIE-356P

Marking Scheme:

1. Teachers Continuous Evaluation: 40 marks
2. Term end Theory Examinations: 60 marks

Instructions:

1. The course objectives and course outcomes are identical to that of (Web Technologies) as this is the practical component of the corresponding theory paper.
2. The practical list shall be notified by the teacher in the first week of the class commencement under intimation to the office of the Head of Department / Institution in which the paper is being offered from the list of practicals below. Atleast 10 experiments must be performed by the students, they may be asked to do more. Atleast 5 experiments must be from the given list.

1. Design web pages for your college containing a description of the courses, departments, faculties, library etc, use href, list tags.
2. Write html code to develop a webpage having two frames that divide the webpage into two equal rows and then divide the row into equal columns fill each frame with a different background color.
3. Design a web page of your home town with an attractive background color, text color, an Image, font etc. (use internal CSS).
4. Use External, Internal, and Inline CSS to format college web page that you created.
5. Create HTML Page with JavaScript which takes Integer number as input and tells whether the number is ODD or EVEN
6. Create HTML Page that contains form with fields Name, Email, Mobile No, Gender , Favourite Colour and a button now write a JavaScript code to combine and display the information in textbox when the button is clicked and implement validation.
7. Create XML file to store student information like Enrolment Number, Name Mobile Number , Email Id.
8. Write a php script to read data from txt file and display it in html table (the file contains info in format Name: Password: Email)
9. Write a PHP Script for login authentication. Design an html form which takes username and password from user and validate against stored username and password in file.
10. Write PHP Script for storing and retrieving user information from MySql table.

    a. Design A HTML page which takes Name, Address, Email and Mobile No. From user (register.php)

    b. Store this data in Mysql database / text file.

    c. Next page display all user in html table using PHP (display.php)

Seventh Semester					
Group	**Paper Code**	**Paper**	**L**	**P**	**Credits**
Theory Papers					
HS/MS	MS-401	Principles of Entrepreneurship Mindset	2		2
PCE		Programme Core Elective Paper (PCE – 4)			4
PCE		Programme Core Elective Paper (PCE – 5)			4
EAE / OAE		Emerging Area / Open Area Elective Paper (EAE – 3 / OAE – 3)			4
EAE / OAE		Emerging Area / Open Area Elective Paper (EAE – 4 / OAE – 4)			4
EAE / OAE		Emerging Area / Open Area Elective Paper (EAE – 5 / OAE – 5)			4
Practical / Viva Voce					
PC / Project	ES-451	Minor Project**			3
PC / Internship	ES-453	Summer Training Report - 2 *			1
Total					**26**

***NUES:**Comprehensive evaluation of the Summer Training Report – 2 (after 6th Semester) shall be done by the committee of teachers, constituted by the Academic Programme Committee, out of 100. The training shall be of 4 to 6 weeks duration. The training can be under the mentorship of a teacher of the institute.

****The student shall be allocated a supervisor / guide for project work at the end 6th semester by the department / institution, the project shall continue into the 8th semester. In the 7th semester evaluation, the criteria for evaluation shall be conceptualization of the project work, the background study / literature survey and identification of objectives and methodology to be followed for project. 40 marks evaluation for the Teachers' Continuous Evaluation / Internal Assessment shall be done by concerned supervisor while the term end examination of 60 marks shall be conducted by the supervisor concerned and the external examiner deputed by the Examinations Division. In the absence of the supervisor, the Director of the Institution / Head of the Department can assign the responsibility of the supervisor (for purpose of examinations) to any faculty of the Institution / Department.

Eight Semester					
Group	**Paper Code**	**Paper**	**L**	**P**	**Credits**
Practical / Viva Voce%					
PC / Project	ES-452	Major Project – Dissertation and Viva Voce#			18
	ES-454	Project Progress Evaluation*			2
PC / Internship	ES-456	Internship Report and Viva Voce#			18
	ES-458	Internship Progress Evaluation*			2
Total			**0**	**0**	**20**

***NUES: Comprehensive evaluation by the committee of teachers, constituted by the Academic Programme Committee, out of 100.**

%By default every student shall do the project work (ES-452 and ES-454). A student shall either be allowed to do a project work (ES-452 and ES-454) or an internship (ES-456 and ES-458). The student must apply for approval to do internship before the commencement of the 8th semester to the institute, and only after approval of Principal / Director of the institute through Training and Placement Officer of the institute, shall proceed for internship.

#Students may be allowed to do internship in this semester in lieu of Major project. The students allowed to proceed for internship shall be required to maintain a log-book of activities performed during internship. The same has to be countersigned by the mentor at the organization where internship is completed.