NEW HORIZON
COLLEGE OF ENGINEERING
Autonomous College Permanently Affiliated to VTU, Approved by AICTE & UGC
Accredited by NAAC with 'A' Grade, Accredited by NBA
The Trust is a Recipient of Prestigious Rajyotsava State Award 2012 Conferred by the Government of Karnataka
Awarded Outstanding Technical Education Institute in Karnataka-2016
Ring Road, Bellandur Post, Near Marathalli, Bangalore -560 103, INDIA

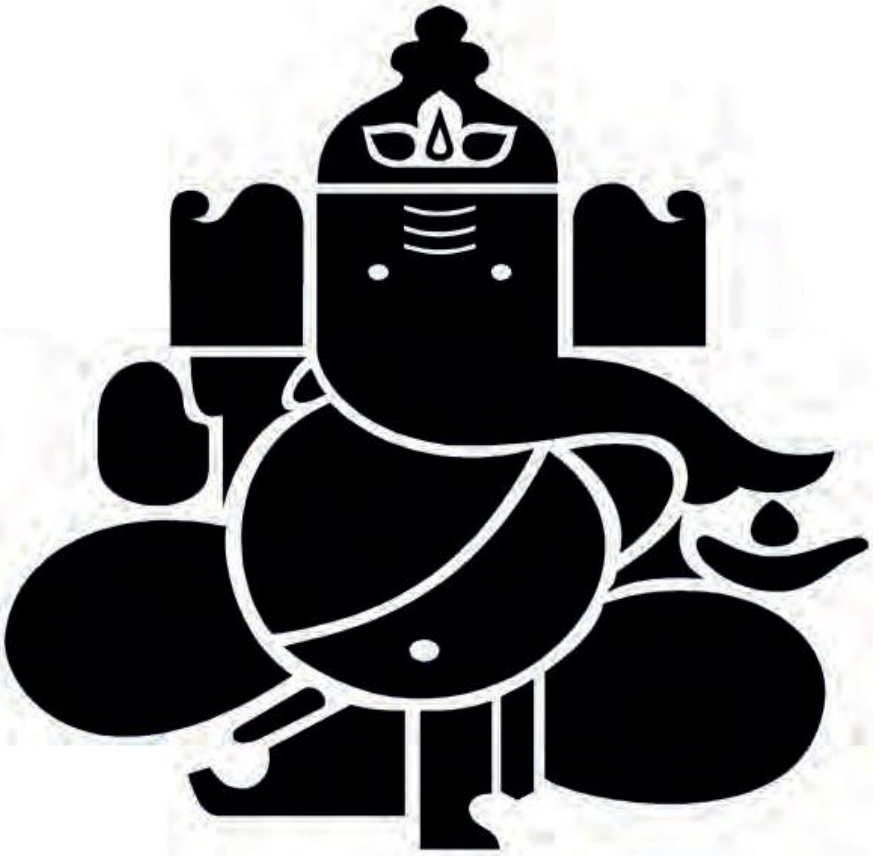
Department of Computer Science and Engineering

Academic Year 2017-18

Fifth and Sixth Semesters B.E.

Scheme and Syllabus

2015-19 Batch



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VISION

To emerge as a department of eminence in Computer Science and Engineering in serving the Information Technology Industry and the nation by empowering students with a high degree of technical and practical competence.

MISSION

- To strengthen the theoretical and practical aspects of the learning process by strongly encouraging a culture of research, innovation and hands-on learning in Computer Science and Engineering

- To encourage long-term interaction between the department and the IT industry, through the involvement of the IT industry in the design of the curriculum and its hands-on implementation

- To widen the awareness of students in professional, ethical, social and environmental dimensions by encouraging their participation in co-curricular and extracurricular activities

Program Education objectives (PEOs)

PEO1 Proficiency as computer scientists with an ability to solve a wide range of computing- related problems in industry, government, or other work environments.

PEO2 Ability to adapt quickly to new environments and technologies, assimilate new information, and work in multi-disciplinary areas with a strong focus on innovation and entrepreneurship.

PEO3 Possess the ability to think logically and the capacity to understand technical problems with computing systems and design alternative solutions.

PEO4 Possess an ability to collaborate as a team member and team leader to affect technical solutions for computing systems, providing improved function and outcomes.

PEO to Mission Statement Mapping

Mission Statements	PEO1	PEO2	PEO3	PEO4
To educate graduates and research scholars to be successful, ethical, and effective problem-solvers and life-long learners.	3	-	2	-
Produce versatile Computer Science graduates infused not only with technical skills, but also with innovative and entrepreneurial skills.	-	3	-	-
Prepare graduates for successful careers in Software Industry.	3	3	3	3
Provide a great work and learning environment and treat each other with respect and dignity.	-	-	2	3
To prepare graduates well enough to function as professional computer scientists and computer engineers.	-	3	-	-

Correlation: 3- High, 2-Medium, 1-Low

Program Outcomes (PO) with Graduate Attributes

	Graduate Attributes	Program Outcomes (POs)
1	Engineering Knowledge	**PO1:** The basic knowledge of Mathematics, Science and Engineering.
2	Problem analysis	**PO2:** An Ability to analyse, formulate and solve engineering problems.
3	Design and Development of Solutions	**PO3:** An Ability to design system, component or product and develop interfaces among subsystems of computing.
4	Investigation of Problem	**PO4:** An Ability to identify, formulate and analyze complex engineering problem and research literature through core subjects of Computer Science.
5	Modern Tool usage	**PO5:** An Ability to use modern engineering tools and equipment for computing practice.
6	Engineer and society	**PO6:** An Ability to assess societal, health, cultural, safety and legal issues in context of professional practice in Computer Science & Engineering.
7	Environment and sustainability	**PO7:** The broad education to understand the impact of engineering solution in a global, economic, environmental and societal context.
8	Ethics	**PO8:** An understanding of professional and ethical responsibility.
9	Individual & team work	**PO9:** An Ability to work both as individual and team player in achieving a common goal.
10	Communication	**PO10:** To communicate effectively both in written and oral formats with wide range of audiences.
11	Lifelong learning	**PO11:** Knowledge of contemporary issues, Management and Finance.
12	Project management and finance	**PO12:** An Ability to recognize the need and thereby to engage in independent and life-long learning for continued professional andcareer advancement.

Mapping of POs TO PEOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PEO1	3	3	3	-	-	-	-	-	-	-	-	-
PEO2	-	-	-	-	-	-	-	-	-	-	-	-
PEO3	-	-	3	3	-	-	-	-	-	-	3	-
PEO4	-	-	-	-	-	-	-	-	3	-	-	-

Correlation: 3- High, 2-Medium, 1-Low

NEW HORIZON COLLEGE OF ENGINEERING
Department of Computer Science & Engineering
Fifth Semester B.E. Program – Scheme AY: 2017-18

S. No	Course Code	Course	Credit Distribution				Overall Credits	Contact hours Weekly (Theory)	Contact hours Weekly (Lab)	Marks		
			L	P	T	S				CIE	SEE	Total
1	CSE51	Analysis & Design of Algorithms	3	2	0	0	5	4	4	75	75	150
2	CSE52	Operating System	3	0	0	1	4	4	-	50	50	100
3	CSE53	Database Management Systems	3	2	0	0	5	4	4	75	75	150
4	CSE54	Software Engineering	3	0	0	1	4	4	0	50	50	100
5	CSE55x	Professional Elective - 1	3	0	0	1	4	0	3	50	50	100
6	CSE56	Mini Project	0	2	0	0	2	0	2	25	25	50
TOTAL							**24**	**16**	**13**	**325**	**325**	**650**

	Professional Elective -1
CSE551	Digital Experience Management using Adobe Experience Manager
CSE552	Virtualization Essentials with VMware
CSE553	Big Data Analytics with HP Vertica

NEW HORIZON COLLEGE OF ENGINEERING
Department of Computer Science & Engineering
Sixth Semester B.E. Program – Scheme AY: 2017-18

S. No	Course Code	Course	Credit Distribution				Overall Credits	Contact hours Weekly (Theory)	Contact hours Weekly (Lab)	Marks		
			L	P	T	S				CIE	SEE	Total
1	CSE61	Core JAVA Programming	3	2	0	0	5	4	4	75	75	150
2	CSE62	Computer Networks	3	2	0	0	5	4	4	75	75	150
3	CSE63	Finite Automata & Compiler Design	4	0	0	0	4	4	0	50	50	100
5	CSE64x	Professional Elective	3	0	0	1	4	4	0	50	50	100
6	NHOPxx	Open Elective	3	0	0	1	4	0	3	50	50	100
7	CSE65	Mini Project	0	2	0	0	2	0	2	25	25	50
TOTAL							**24**	**16**	**13**	**325**	**325**	**650**

Course Code	Professional Electives
CSE641	Social network Analysis
CSE642	Soft Computing
CSE643	Usability and Human Computer Interaction

Course Code	Open Electives
NHOP01	Big Data Analytics using HP Vertica- 1
NHOP02	VM Ware virtualization Essentials - 1
NHOP03	Adobe Experience manager – 1
NHOP04	Big Data Analytics using HP Vertica – 2 (Prerequisite : CSE553/ECE563/EEE563/ISE563)
NHOP05	VM Ware virtualization Essentials – 2 (Prerequisite : CSE552/ECE562/EEE562/ISE562)
NHOP06	Adobe Experience manager – 2 (Prerequisite : CSE551/ECE561/EEE561/ISE561)
NHOP07	SAP
NHOP08	Schneider – Industry Automation
NHOP09	Cisco – Routing and Switching – 1
NHOP10	Data Analytics

FIFTH SEMESTER
SYLLABUS

ANALYSIS AND DESIGN OF ALGORITHMS

Course Code : CSE51 **Credits : 05**
L:P:T:S : 3:2:0:0 **CIE Marks : 50+25**
Exam Hours : 3 + 3 Hrs **SEE Marks : 50 +25**

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Analyze and evaluate algorithms to solve complex problems by determining design technique
CO2	Apply Brute Force and Divide and Conquer design techniques by analyzing and evaluating algorithm to propose solution
CO3	Make use of greedy strategy and dynamic programming to choose an algorithm to solve graph and knapsack problems
CO4	Utilize Decrease & Conquer and Transform & Conquer to select an algorithm to solve search and sort problems
CO5	Apply Backtracking and Branch & Bound technique to assess an algorithm and formulate solution
CO6	Interpret P, NP & NP-complete classes to analyze the limitations of an algorithm.

Mapping of Course Outcomes to Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	-	-	-	3	-	-	2	3	2
CO2	3	3	3	3	3	-	-	-	3	-	-	2	3	2
CO3	3	3	3	3	3	-	-	-	3	-	-	-	3	-
CO4	3	3	3	3	3	-	-	-	3	-	-	-	3	-
CO5	3	3	3	3	3	-	-	-	3	-	-	-	3	-
CO6	3	3	3	3	-	-	-	-	-	-	-	-	-	-

Module No	Module Contents	Hours	Cos
1	INTRODUCTION TO ALGORITHMS & GROWTH OF FUNCTIONS Algorithm introduction, Role of algorithms in computing, Fundamentals of Algorithmic problem solving, Fundamentals of Analysis of Algorithms, Analysis Framework, Asymptotic notations, Standard notations and common functions, Important problem types – Searching, sorting, string processing, graph problems, combinatorial problems, Recurrences, Mathematical Analysis of Recursive and Non Recursive Algorithms	8	CO1
	List of Programs: 1. Write a program to find GCD of two numbers using different algorithms 2. Write a C Program to Implement Sieve of Eratosthenes to generate Prime Numbers Between Given Range	8	
2	BRUTE FORCE & DIVIDE & CONQUER **BRUTE FORCE:** Brute force string matching algorithms –NAÏVE string matching algorithms, Rabin Karp algorithm & Knuth Morris Pratt	9	CO2

	algorithm, Exhaustive Search – Travelling Salesman problem, Knapsack problem, Assignment problem **DIVIDE & CONQUER:** Merge Sort and its analysis, Quick sort – its performance and analysis		
3	GREEDY METHOD & DYNAMIC PROGRAMMING **GREEDY METHOD:** Introduction, Job scheduling problem, Minimum Spanning tree algorithms – Kruskals& Prims, Shortest Path algorithm – Dijkstra's, Huffman Trees, Knapsack problems, Travelling Salesman problem **DYNAMIC PROGRAMMING:** Introduction, Computing Binomial Coefficients, Transitive closure - Warshall's and Floyds algorithm	9	CO3
	List of Programs: 1. Write a program to obtain minimum cost spanning tree using Prim's Algorithm 2. Write a program to obtain minimum cost spanning tree using Kruskal's Algorithm 3. Write a program to obtain shortest path using Djikstra's algorithm 4. Write a program to compute Binomial Coefficient 5. Write a program to obtain shortest path using Floyds algorithms 6. Write a program to compute Transitive closure using Warshall's algorithm	9	
4	DECREASE & CONQUER, TRANSFORM & CONQUER **DECREASE & CONQUER:** Introduction – Decrease by constant, decrease by constant factor, variable size decrease, Breadth First search traversal, Depth First search traversal, Topological sorting **TRANSFORM & CONQUER:** Introduction, Balanced Search trees – AVL trees & 2-3 trees, Red Black Trees	9	CO4
	List of Programs: 1. Write a program to implement Breadth First search 2. Write a program to implement Depth First search 3. Write a program to implement Topological sorting	9	
5	**COPING WITH LIMITATIONS OF ALGORITHMIC POWER:** Introduction, lower bound arguments, decision trees, P, NP & NP complete problems **BACKTRACKING:** Introduction, N Queens problem, subset sum problem, **BRANCH & BOUND:** Introduction, Travelling Salesman problem, Knapsack problem, Assignment problem	9	CO5, CO6
	List of Programs: 1. Write a program to implement Subset Sum problem using Backtracking 2. Write a program to implement N Queens problem using Backtracking	8	

Text Book:

Anany Levitin, " Introduction to the Design & Analysis of Algorithms", SECOND Edition, PEARSON Education

Reference Book:

Thomas H Cormen, Charles E Leiserson, Ronald R Rivest& Clifford Stein, " Introduction to Algorithms", THIRD Edition, Eastern Economy Edition

CIE – Continuous Internal Evaluation: Theory (50 Marks)

Blooms Taxonomy	Tests	Assignments	Quizzes
Marks (Out of 50)	25	15	10
Remember	5	7.5	-
Understand	10	7.5	-
Apply	10	-	-
Analyze	-	-	05
Evaluate	-	-	05
Create	-	-	-

CIE – Continuous Internal Evaluation: Lab (25 Marks)

Blooms Taxonomy	Lab
Marks (Out of 25)	25
Remember	-
Understand	-
Apply	-
Analyze	-
Evaluate	-
Create	25

SEE – Semester End Examination: Theory (50 Marks)

Blooms Taxonomy	Tests
Marks (Out of 50)	50
Remember	05
Understand	05
Apply	10
Analyze	10
Evaluate	10
Create	10

SEE – Semester End Examination: Lab (25 Marks)

Blooms Taxonomy	Lab
Marks (Out of 25)	25
Remember	-
Understand	-
Apply	-
Analyze	05
Evaluate	-
Create	20

OPERATING SYSTEMS

Course Code : CSE52 | **Credits : 04**
L:P:T:S : 3:0:0:1 | **CIE Marks : 50**
Exam Hours : 3 Hrs | **SEE Marks : 50**

COURSE OUTCOMES: At the end of the Course, the Student will be able to

CO #	COURSE OUTCOMES
CO1	Identify the roles and functions of traditional and modern operating systems.
CO2	Analyze the concept of process and its management which includes process scheduling algorithms.
CO3	Evaluate the problems related to concurrency, different synchronization mechanisms and deadlock handling.
CO4	Compare and contrast various memory management techniques.
CO5	Evaluate the various file implementation techniques.
CO6	Analyze various disk storage mechanisms.

Course Outcomes to Program Outcomes Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	3	-	1	-	-
CO2	3	3	3	3	-	-	-	-	-	-	-	-	3	3
CO3	3	3	3	3	-	-	-	-	-	-	-	-	3	3
CO4	3	3	3	3	-	-	-	-	-	3	-	-	3	3
CO5	3	3	3	3	-	-	-	-	-	-	-	-	3	3
CO6	3	3	3	3	-	-	-	-	-	3	-	-	3	3

Module No.	Module Contents	Hours	COs
1	**Introduction and Operating System Services:** Basics of Operating Systems: Definition - Operating System structure; Operating System operations – Dual-Mode and Multi-Mode; Kernel Data Structure – Lists, Stacks, and Queues, Trees; Computing Environments – Traditional Computing, Mobile Computing, Distributed Systems, Client-Server Computing, Peer-to-Peer, Virtualization, Cloud Computing, Real-Time Embedded Systems. Operating System Services; System Calls; Types of System Calls; Operating System Design and Implementation – Design Goals – Mechanisms and Policies – Implementation; Operating System structure – Simple Structure – Layered Structure – Microkernels, Modules, Hybrid Systems – Mac OS X, iOS, Android.	9	CO1

2	**Process Management:** **Process:** Process Concept – The Processes, Process States, PCB; Process Scheduling – Scheduling Queues, Schedulers, Context Switch; Operation; Operation on Process; Inter-Process Communication – Shared-Memory System, Message Passing System. **Threads:** Overview – Benefits; Multithreading Models – Many-to-One, One-to-One, Many-to-Many. **CPU Scheduling:** Basic Concepts, CPU-I/O Burst Cycle; CPU Scheduler – Pre-emptive Scheduling, Dispatcher; Scheduling Criteria; Scheduling Algorithms – FCFS Scheduling, SJF Scheduling, Round-Robin Scheduling, Priority Scheduling.	9	CO2
3	**Process Synchronization:** Background; The Critical Section Problem; Peterson's Solution; Synchronization Hardware; Mutex Locks; Semaphores – Semaphore Usage, Semaphore Implementation, Deadlock and Starvation; Classical Problems of Synchronization – The Reader-Writer Problem, Dining-Philosopher Problem; Monitors – Monitors Usage. **Deadlocks:** System Model; Deadlock Characterization – Necessary Conditions, Resource-Allocation Graph; Methods for Handling Deadlocks; Deadlock Prevention; Deadlock Avoidance; Deadlock Detection and Recovery from Deadlock.	9	CO3
4	**Memory Management:** **Main Memory:** Background; Swapping; Contiguous Memory Allocation – Memory Protection, Memory Allocation, Fragmentation; Paging – Basic Method, Hardware Support, Protection; Structure of Page Table – Hierarchical Paging, Hash-Page Table; Segmentation – Basic Method, Segmentation Hardware. **Virtual Memory:** Background; Demand Paging; Page Replacement – Basic Page Replacement – FIFO Page Replacement, Optimal Page Replacement, LRU Page Replacement; Allocation of Frames – Minimum Number of Frames, Allocation Algorithms, Global Vs Local; Thrashing – Causes of Thrashing.	9	CO4
5	**File System Interface and Implementation:** **File-System Interface:** File Concept – File Attribute, File Operation, File Types, File Structure; Access methods – Sequential Access, Direct Access, Other Access Methods; Protection – Types of Access, Access Control, Other Protection Approaches. **Implementation:** Overview, Partitions and Mounting, Virtual File-System; Directory Implementation – Linear List, Hash Table; Allocation Methods – Contiguous Allocation, Linked Allocation, Indexed Allocation; Free Space Management – Bit-Vector, Linked List, Grouping, Counting. **Mass Storage Structures:** Overview; Disk Structure; Disk Scheduling – FCFS, SSTF, SCAN Scheduling, CSCAN Scheduling, LOOK Scheduling, Selection of Disk Scheduling Algorithm.	9	CO5, CO6

TEXT BOOK:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, Operating System Concepts, John Wiley & Sons ,Inc., 9th Edition, 2012, ISBN 9781118063330.

REFERENCE BOOK:

1. William Stallings, "Operating Systems: Internals and Design Principles", EighthEdition, Prentice Hall, 2015.

SELF STUDY

The student shall identify any modern operating system and can come out with a case study on the same. Topic should be socially relevant and research-oriented ones. On the completion student will submit a report, which will be evaluated.

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Tests	Assignments	Quizzes	Self Study
Marks (out of 50)	**25**	**10**	**5**	**10**
Remember	5	-	-	-
Understand	10	-	-	-
Apply	10	5	5	5
Analyze	-	5	-	-
Evaluate	-	-	-	5
Create	-	-	-	-

SEE- Semester End Examination (50 Marks)

Bloom's Category	Tests
Remember	10
Understand	20
Apply	20
Analyze	-
Evaluate	-
Create	-

DATABASE MANAGEMENT SYSTEM

Course Code : CSE53 **Credits : 05**
L:P:T:S : 3:2:0:0 **CIE Marks : 50+25**
Exam Hours : 3 +3 Hrs **SEE Marks : 50 +25**

COURSE OUTCOMES: At the end of the Course, the Student will be able to

CO #	COURSE OUTCOMES
CO1	Demonstrate basic concepts of DBMS by identifying, analyzing and defining database objects.
CO2	Design of entity relationship diagrams and build relational database schema.
CO3	Apply the concepts of structured query language to create, query and manipulate databases given the constraints.
CO4	Apply the concept of functional dependencies and normalization techniques to refine databases.
CO5	Creation of user-defined view, trigger, and assertion to manipulate database objects.
CO6	Demonstrate the usage of SQL in programming languages and create simple user interfaces.

Course Outcomes to Program Outcomes Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	1	-	1
CO2	3	3	3	2	-	-	-	-	3	-	-	-	-	-
CO3	3	3	3	-	3	-	-	-	3	-	-	-	3	-
CO4	3	3	-	-	-	-	-	-	3	-	-	-	-	-
CO5	3	3	3	2	3	-	-	-	3	-	-	-	3	-
CO6	3	3	3	-	3	-	-	-	3	-	-	-	3	-

Module No.	Module Contents	Hours	Cos
1	**Introduction To Databases:** Definition of database, DBMS; Characteristics of Database approach; Advantages of using DBMS approach; when not to use a DBMS. **Database Concept And Architecture:** Data models, schemas and instances; Data Abstraction; Three-schema architecture and data independence; Components of a DBMS - Database Designer- Database Administrator - Database Users. **Introduction to Entity-Relationship Model:** Entity Types, Attributes and Keys; Relationship types, Roles and Structural Constraints; Weak Entity Types; ER Diagrams, Naming Conventions and Design Issues; Relationship types of degree higher than two; Reduction of an E-R schema to relational Tables.	9	CO1 CO2
	Lab Exercises/Program: Drawing an ER Diagram based on given assumption and mapping them to Relational data base schema for the following databases 1.Student Database 2.General Hospital Database 3.Organization Database	9	
2	**Introduction to Logical Design and Relational Model:** Domains, Attributes, Tuples, and Relations; Relational Model Constraints; Relational Database Schemas; **SQL-1:** Overview of SQL language; SQL Data Definition and Data Types; Schema change statements in SQL; Enforcing basic constraints in SQL; Basic structure of SQL queries Joins; Logical connectives - AND, OR and NOT; Addition basic operations ; Set operations; Aggregate function; Comparisons Involving NULL and Three-Valued Logic; Introduction to Nested Queries; Correlated Nested Queries; SQL modification language; Select, Delete, Update clause.	9	CO3
	Lab Exercise/Program: 1. To practice and implement Data Definition Language commands and constraints 2. To study various DML,DCL and TCL commands and implement them on various databases 3. To Apply different Aggregate functions along with Group by, having and Order-by clause, Using relational-logical operators, additional operators and string operations To perform Nested Queries and joining Queries using DML commands.	9	

3	**SQL -2 :**Introduction to Views: creation, implementation, update of views; Introduction to Assertion and Trigger; Index Structures: Indexes on Sequential Files: dense , sparse index; multilevel indexing; Secondary Indexing; B-Trees, B+ trees; Hash Based Indexing: Static Hashing and dynamic hashing.	9	CO5
	Lab Exercise/Program: 1. To create and manipulate various database objects of the table using Views 2. To create and Drop Triggers for various events such as insert, update etc. 3. To create and Drop Index on the given table.	9	
4	**Database Refinement :** Informal Design Guidelines for Relation Schemas; Functional Dependencies; Normalization on Relational Data Base:1NF, 2NF, 3NF, BCNF;	9	CO4
	Lab Exercises/Program: 1.Normalizing the given database schema to the highest Normal form and justifying it in each step of conversion.	9	
5	**Advanced SQL:** Accessing SQL from programming languages: Basics of Embedded SQL, Dynamic SQL, Database stored procedures and SQL / PSM. **Transaction Management:** The ACID Properties; Transactions and Schedules; Concurrent Execution of Transactions; Lock- Based Concu5rrency Control: strict 2PL, 2PL;	9	CO6
	Lab Exercise/Program: . To access database from other programming languages	8	

Text Books:

1. Ramez Elmasri and Shamkant B.Navathe: Fundamentals of Database Systems, 7th Edition, Pearson ,2016.
2. Johannes Gehrke, Raghu Ramakrishnan ,Database Management Systems 3rd Edition ,Mcgraw Hill Education,2014.

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	**Tests**	**Assignments**	**Quizzes**
Marks (out of 50)	25	15	10
Remember	5	-	5
Understand	5	7.5	-
Apply	5	7.5	5
Analyze	5	-	-
Evaluate	-	-	-
Create	5	-	-

CIE - Continuous Internal Evaluation: Lab (25 Marks)

Bloom's Taxonomy **Marks (out of 25)**	**Lab**
Remember	-
Understand	-
Apply	15
Analyze	-
Evaluate	-
Create	10

SEE- Semester End Examination (50 Marks)

Bloom's Taxonomy Marks (out of 50)	Tests
Remember	10
Understand	10
Apply	20
Analyze	5
Evaluate	-
Create	5

SEE – Semester End Examination: Lab (25 Marks)

Bloom's Taxonomy Marks (out of 25)	Lab
Remember	-
Understand	-
Apply	15
Analyze	-
Evaluate	-
Create	10

SOFTWARE ENGINEERING

Course Code : CSE54 **Credits : 04**
L:P:T:S : 3:0:0:1 **CIE Marks : 50**
Exam Hours : 3 Hrs **SEE Marks : 50**

COURSE OUTCOMES: At the end of the Course, the Student will be able to

CO #	COURSE OUTCOMES
CO1	Analyze, design, verify, validate, implement, apply, and maintain software systems.
CO2	Use the techniques, skills, and modern engineering tools necessary for engineering practice.
CO3	Develop an appreciation of the cost, quality, and management issues involved in software construction.
CO4	Develop an awareness of the role and responsibilities of the professional software engineer.
CO5	Have an ability to work with other people in a team, communicating computing ideas effectively in speech and in writing.
CO6	Use tools and techniques for producing application software solutions from informal and semi-formal problem specifications.

Course Outcomes to Program Outcomes Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	-	-	2	-	3	-	3	-	3	3	-
CO2	3	3	3	-	-	-	-	3	-	3	-	3	3	-
CO3	3	3	3	2	-	-	-	3	-	3	-	3	3	-
CO4	3	3	3	-	-	-	-	3	-	3	-	3	3	-
CO5	3	3	-	2	-	-	-	3	-	3	-	3	3	1
CO6	3	3	3	2	-	-	-	3	-	3	-	3	3	-

Module No.	Module Content	Hours	COs
1.	**INTRODUCTION TO SOFTWARE ENGINEERING:** Professional Software Development, Software Engineering Ethics, Software process models, Process Activities, The Rational Unified Process. Agile Software development: Agile methods, Plan-driven and agile development, Extreme Programming, Agile Project management	9	**CO1, CO2**
2	**REQUIREMENTS ENGINEERING:** Functional and non-functional requirements, The Software Requirements document, Requirements specification, Requirements engineering processes, Requirements elicitation and analysis, Requirements validation, Requirements management	9	**CO1, CO6**
3	**DESIGN AND IMPLEMENTATION:** System Modelling: Context models, Interaction models, Structural models, Behavioural models, Model-driven engineering Object-oriented design using the UML, Design patterns, Implementation issues, Open source development	9	**CO1, CO2, CO6**
4	**SOFTWARE TESTING:** Test strategies for conventional software, Test strategies for Object Oriented software, System testing, white box testing, Basis path testing, Control structure testing, Black Box testing. Testing Web Applications: Testing concepts for WebApps, Content testing, User Interface Testing, Navigation Testing, Configuration Testing, Performance Testing	9	**CO1, CO2**
5	**SOFTWARE MANAGEMENT:** Project Management: Risk management, Managing people, Teamwork Project planning: Software pricing, Plan-driven development, Project scheduling, Agile planning	9	**CO3, CO4, CO5**

TEXT BOOKS:

1. "Software Engineering by Ian Sommerville", 9th edition, 2012, PearsonEdu.
2. "Software Engineering – A Practitioner's Approach" by Roger S Pressman,7thedition, 2014, Pearson.

REFERENCE BOOKS:

1. Pearson Edu, "Software Engineering" by Chandramouli, first edition, 2015.

Co-Curricular

The student shall attend a workshop/Seminar on Software Engineering - the recent advancements, tools or techniques - to improve his/her knowledge and understanding of the course. On completion of the Workshop/Seminar the student will submit a report along with the certificate, which will be evaluated.

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Tests	Assignments	Quizzes	Co-Curricular
Marks(out of 50)	**25**	**10**	**5**	**10**
Remember	5	-	-	-
Understand	10	-	-	-
Apply	5	5	5	5
Analyze	5	5	-	5
Evaluate	-	-	-	-
Create	-	-	-	-

SEE – Semester End Examination (50 Marks)

Bloom's Category	Tests
Remember	20
Understand	20
Apply	10
Analyze	-
Evaluate	-
Create	-

Digital Experience Management using Adobe Experience Manager

Course Code : CSE551 **Credits: 04**
L:P:T:S : 3:0:0:1 **CIE Marks: 50**
Exam Hours : 3 **SEE Marks: 50**

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Gain a fresh perspective on online marketing in a global scenario. Understand the concepts of object oriented programming in JAVA.
CO2	Understand the programming concepts in Web scripting languages and will be able develop web pages using scripting languages.
CO3	Understand the architecture, technologies and frameworks in Adobe Experience Manager.
CO4	Create online webpages, Digital asset management and campaigning using AEM
CO5	Integrate new digital marketing techniques into the strategic marketing plan using AEM.

CO6	Drive change and foster innovation in Digital Marketing with AEM

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	2	3	1	2	-	-	-	2	2	1	3	2
CO2	2	3	2	3	1	2	-	-	-	2	2	1	3	2
CO3	2	3	2	3	1	2	-	-	-	2	2	1	3	2
CO4	2	3	2	3	1	2	-	-	-	2	2	1	3	2
CO5	2	3	2	3	1	2	-	-	-	2	2	1	3	2
CO6	2	3	2	3	1	2	-	-	-	2	2	1	3	2

Module No	Module Contents	Hours	COs
1	**Introduction to DM & AEM** **Getting started with DM:** What is online marketing? Characteristics of good domain name? What is digital marketing? Different methods of digital Marketing, Main methods of DM, Search engine optimization, pay per click & display advertising, email marketing, content marketing, social media marketing. **Introduction Object Oriented Programming with JAVA** **Fundamentals:** Class Objects, Methods, Constructor, this reference, inheritance, and polymorphism, Introduction to JSP	8	CO1
	Hands on : 1. Write a program to calculate and area of four different geometric shapes: triangles, squares, rectangles, and circles. Use Method overriding. 2. Employee program to create n object to find gross salary. Data: empid, empname, gender, basic, hra = 25% of basic, DA = 125% of basic, CCA=Rs 300, IT=10% if gross >1L. • Display all information. • Use constructors • Implement required methods. 3. Student program to create n objects to find Grade. Data:usn,studname,sem,sub name[ ],sub marks[],percentage, Grade. 90 - 100 = S 80 – 89 = A	4	

	70-79 =B 60 – 69 = C 50 – 59 = D 40 – 49 =E < 40 = F		
2	**Introduction to Scripting Languages:** **Web and XHTML:**Internet, WWW, Web Browsers and Web Servers, URLs, HTTP, **XHTML:** Basic syntax, Standard structure, Basic text markup, Images, Hypertext Links, Lists, Tables, Forms, Frames **CSS:** Introduction,Levels of style sheets,formats,selector forms,The box model,conflict resolution**Javascript:** Overview , Object orientation and Javascript, Syntactic characteristics, Primitives, operations, and expressions, Screen output and keyboard input, Control statements, Arrays, Functions, Pattern matching using regular expressions, Errors in scripts. **Introduction to Sightly**	9	CO2
	Hands on: 1. Create a web page using HTML forms for email registration. 2. Create a web page using HTML frames. 3. Develop a XHTML file that includes Javascript script for that accepts a number n using prompt and outputs the first n Fibonacci numbers 4. Develop a XHTML file that includes Javascript script for that accepts a number n using prompt and outputsa table of numbers from 1 to n and their squares using alert 5. Develop a web page usingHTML and apply the various CSS styles. Develop a web page usingHTML and apply selector forms.	4	
3	**Getting started with AEM:** Introduction to Web content management, History of AEM ,The adobe marketing cloud, Install & deploy AEM, Author Instance, Publish Instance,AEM Consoles: Authoring in AEM, work with user interfaces: Classic UI, Touch optimized UI, AEM web console: OSGi management console, CRX Explorer, CRXDE Lite **AEM Architecture** **OSGi framework**: Introduction ,AEM functional building blocks, Architecture stack, OSGi framework. **Content Repository:** JCR, Jackrabbit Oak, Adobe CRX**Web Framework:** REST, Apache Sling.	9	CO3
	Hands on: **1.** AEM installation & deployment. **2.** Working in AEM Environment **3.** Familiarize yourself with a Repository structure. **4.** Create a Node and add properties.	4	
4	**Managing Content** **AEM Authoring Framework —**Templates, Create Templates, Components and Design ,components ,Create a Page-Rendering Component ,Modularize the Page Component ,Inheriting Foundation	9	CO4

	Components , Design , Adding a design to a page ,Creating Components and Include them in Scripts, Create a Top Navigation Component, Dialog Boxes ,Create Dialog Boxes for Components, Dialog Box -Classic-UI ,touch-optimized UI ,Use Design Dialog Boxes for Global Content , Create a logo component.		
	Hands On 1. Create the Structure of Your Website 2. Create a Template for Your Website 3. Create a Page-Rendering Component 4. Create a Website Structure 5. Modularize the Page Component 6. Inherit the Sightly Foundation Component Page 7. Add a Design to the Page 8. Create a Top Navigation Component and Include it in a Script 9. Create a Training Title Component 10. Create a Logo Component	4	
5	**Digital Asset Management, Mobile pages, Managing Campaign :** Introduction to DAM, Basic DAM functions, DAM Metadata, DAM Components, Finding Assets, Asset Management, Adding New content, Authoring Responsive& Mobile Pages,Managing Campaigns& Content Targeting.		CO5
	Hands on: 1. Create and customize asset share page 2. Add a predicate to the asset share page 3. Add an asset editor page 4. Versioning for assets 5. Create folders 6. Add CUG properties to folders 7. Use tags to organize assets 8. Edit images 9. Upload thumbnail 10. View references to assets 11. Edit metadata of an asset 12. Create a Page 13. Insert a New Paragraph 14. Edit the next Paragraph 15. Add an image from the content finder 16. Insert an image from your file system 17. Add more Components 18. Annotate a component 19. Move or delete a component 20. Working with responsive page Layout 21. Create a Mobile page	4	

	22.	Add content to Mobile Page		
	23.	Creating brand		
	24.	Creating campaign		
	25.	Defining a new segment		
	26.	Create experiences		
	27.	Turn a component into targeted component		
	28.	Test the campaign		

Text Books:

1. Ryan D Lunka **,"Adobe Experience Manager: Classroom in a Book",** 2014, Adobe Press .
2. Shane closser , **Adobe Experience Manager: Quick Reference Guide** , 2014, Adobe Press .
3. Shivanikarwal, **Digital Marketing Handbook** , 2015 , CreateSpace Independent Publishing Platform.
4. RobertW.Sebesta , **Programming the World Wide Web** ,4th Edition,PearsonEductaion , 2008
5. M.Deitel,P.JDeitel,A.B.Goldberg, **Internet and World Wide Web How to Program**,4th Edition,Pearson Eductaion , 2004
6. Shivanikarwal , **Digital Marketing Handbook:A Guide to Search Engine Optimization, Pay Per Click Marketing, Email Marketing, Social Media Marketing and Content Marketing** , 2015 , CreateSpace Independent Publishing Platform
7. HerbertSchield , **"Java:The Complete Reference** , 9th Edition,OraclePress,Tata McGraw Hill.

Assessment Pattern

CIE - Continuous Internal Evaluation (50 Marks)

Bloom's Taxonomy	Lab (25 Marks)	Mini Project (25 Marks)
Remember	-	-
Understand	-	-
Apply	-	-
Analyze	-	-
Evaluate	25	-
Create	-	25

SEE – Semester End Examination (50marks)

Bloom's Taxonomy	Lab (50 Marks)
Remember	

Understand	
Apply	
Analyze	25
Evaluate	25
Create	

Virtualization Essentials with VM ware

Course Code:CSE552 **Credits: 04**
L:P:T:S : 3:0:0:1 **CIE Marks: 50**
Exam Hours: 3 **SEE Marks: 50**

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Understand the common terms and definitions of Operating System, Cloud Computing and Virtualization.
CO2	Learning the business benefits and considerations of VMware virtualization.
CO3	Knowing various approaches to server virtualization, its relevance to the modern data center, available platforms and important features.
CO4	Analyzing the implications of virtualization on Data Center Challenges.
CO5	Enable to configure the VMware vSphere storage and network virtualization.

Mapping of Course Outcomes to Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	2	2	1	-	-	1	2	1	1	3	2
CO2	2	2	2	2	2	1	-	-	1	2	1	1	3	2
CO3	2	2	2	2	2	1	-	-	1	2	1	1	3	2
CO4	2	2	2	2	2	1	-	-	1	2	1	1	3	2
CO5	2	2	2	2	2	1	-	-	1	2	1	1	3	2

Module No	Module Contents	Hours	COs
1	**Understanding Virtualization: Operating Systems Essentials:** Process Management, Memory Management, Storage Management. **Cloud Computing Essentials:** Introduction to Cloud Computing, Cloud Deployment Models, Challenges. **Virtualization Essentials:** Importance of Virtualization, Examining today's trends, Virtualization Software Operations: Virtualizing Servers, Virtualizing Desktop, Virtualizing	8	CO1

	Applications.		
	List of programs: 1. Using vSphere Web Client. 2. Creating a Virtual Machine.	4	
2	**VMware vSphere Virtualization Overview: Introduction to Data Center** **Virtualization:** Traditional Architecture, Virtual Architecture, Types of Virtualization**. Understanding Hypervisors:** Describing hypervisor, Type-1 Hypervisor, Type-2 Hypervisor**. vSphere Products & Features:** vSphere vMotion, vSphere HA, vSphere DRS, vSphere FT, vSphere replication, vSphere data protection.	9	CO2
	List of programs: 1. Deploying Virtual Machines Using Cloning, Templates, and a Content Library 2. Modifying Virtual Machine Settings	4	
3	**Creating & Managing Virtual Machines: Creating, Managing, Monitoring & Configuring VM:** vSphere Client and vSphere Web Client, vSphere Web Client UI, **Creating VM**:VM Components, Installing Guest OS, **ManagingVM:** Startup and Shutdown of VM's, Creating and	9	CO3
	Managing Snapshots, RDM, **Configuring VM:** Memory/CPU Hot Plug, Swap Files**. Creating Clones, Templates & Content Libraries**Cloning VM, Creating Templates, OVF Templates, Types of Content Library.	4	
4	**vSphere Solutions to Data Center Challenges: Data Center Challenges:** Availability, Scalability, Optimization, Management, Application Upgrade & Cloud Challenges.**vSphere for Scalability and Business Continuity:** vSphere vMotion, vSphere HA, vSphere DRS, vSphere FT, vSphere replication, vSphere data protection.	9	CO4
	List of programs: 1. Managing Tasks, Events, and Alarms 2. Using vSphere vApps, Managing Multitiered Applications	4	
5	**Understanding VMware vSphere Storage & Network Virtualization Storage Virtualization:** Storage Concepts, iSCSI Concepts, NFS Data stores, VMFS Data stores, Virtual SAN Data stores, Virtual Volume **Network Virtualization:** Introduction to vSphere Standard Switch, Configuring Standard Switch Policies, Introduction to vSphere Distributed Switch	9	CO5

	List of programs: 1. Using vSphere vMotion and Storage vMotion to Migrate Virtual Machines 2. Implementing a vSphere DRS Cluster	4	

TEXT BOOKS:

1. Nick Marshall, Scott Lowe (Foreword by) with Grant Orchard, Josh Atwell, **Mastering VMware vSphere 6** ,Publisher:Sybex; 1 edition (24 March 2015).
2. Matthew Portnoy, **Virtualization Essentials** , 2nd Edition, Wiley India Pvt. Ltd.

REFERENCES:

1. Thomas Kraus, KamauWanguhu, Jason Karnes , VMware Network Virtualization: Connectivity for the Software-Designed Data Center , VMwarePressTechnology 1st Edition.

2. Bill Ferguson , vSphere 6 Foundations Exam Official Cert Guide (Exam #2V0-620): VMware Certified Professional 6 VMware Press , 1st Edition.

Assessment Pattern

CIE - Continuous Internal Evaluation (50 Marks)

Bloom's Taxonomy	CIE (25 Marks)	LAB (25 Marks)
Remember	-	-
Understand	10	-
Apply	10	10
Analyze	5	-
Evaluate	-	-
Create	-	15

SEE – Semester End Examination (50marks)

Bloom's Taxonomy	LAB (50 Marks)
Marks	**50**
Remember	-
Understand	5
Apply	25
Analyze	-
Evaluate	-
Create	20

Big Data Analytics with HP vertica

Course Code : CSE553 **Credits : 04**
L:P:T:S : 3:0:0:1 **CIE Marks : 50**
Exam Hours : 03 **SEE Marks : 50**

COURSE OUTCOMES: At the end of the Course, the Student will be able to

CO #	COURSE OUTCOMES
CO1	Analyse data in Oracle & Vertica databases using SQL statements.
CO2	Explore Vertica for organizing and faster processing of data.
CO3	Create projection partition manually using Vertica for efficient data analysis.
CO4	Apply copy, delete, merge, purge operations in Vertica database.
CO5	Design multi-node clustering in Hadoop for real time applications.
CO6	Illustrate working of Hadoop ecosystem tools for big data analysis.

Course Outcomes to Program Outcomes Articulation Matrix

	PO1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	3	-	-	-	3	-	-	2	3	2
CO2	3	-	-	-	3	-	-	-	3	-	-	-	3	-
CO3	3	-	2	1	3	-	-	-	3	-	-	-	3	-
CO4	3	-	-	-	3	-	-	-	3	-	-	-	3	-
CO5	3	2	2	-	3	-	-	-	3	2	-	2	3	2
CO6	3	-	-	-	3	-	-	-	-	2	-	-	-	-

Module No	Module Contents	Hours	COs
1	**Introduction to Big Data:** What is big data? Why big data is important? Characteristics of Big data, Applications of Big data. **Introduction to SQL and HP Vertica:** Types of SQL, Data Types, Constrains, JOINS, Types of JOINS, Clause, Group by, Having, Order by, Where Clause with examples,SQL Alias, Views, Union, Union all, aggregate functions, Operators Introduction to HP-Vertica Database, Vertica Analytics Platform, Columnar Orientation, Advanced Compression, High Availability, Automatic Database design, Massively Parallel Processing, Application Integration	9	CO1
	Lab Exercises*:* a) Creation of tables with constrains and insertion of values into tables		

	b) Hands-on DML commands to apply different aggregate function, Group by-Having-Order by clause, Operators. c) Creation of views and working with joins.		
2	**HP Vertica- 1** Projections, Query Execution ,Vertica Transactions, Hybrid data store – WOS & ROS, **Projection Design**: Projection fundamentals, Projection types, Projection properties, Replication and Segmentation Database Designer, Comprehensive mode, Incremental mode, Sample data, Sample queries, DBD Advantages	**9**	**CO2**
	Lab Exercises*:* **a)** Creation of schema, tables and execution of SQL statements on Vertica Database, **b)** Creation of projections manually **c)** Running Database designer		
3	**HP Vertica -2** Loading data via INSERT-COPY-MERGE, Deleting data in Vertica- delete vector, design for delete, process of deleting. Truncate, Purge, Update, Partitioning, Tuple Mover- MoveOut Parameter, MergeOut Parameter, Working with Vertica Management Console.	**9**	**CO3** **CO4**
	Lab Exercises*:* **a)** Loading data files from different sources to Vertica database and verifying the log files after loading the data into Vertica database. **b)** Performing Merge Operation in Vertica **c)** Creating tables with partitions and analyzing the data moment from WOS to ROS with the Tuple Mover's tasks.		
4	**Big Data Analytics with Hadoop** Big data overview, Introduction to Hadoop, Overview of Hadoop Distribution File Systems[HDFS] and Map reduce Operations Clustering types in Hadoop- Standalone mode, Pseudo distributed mode, Fully distributed mode.	**9**	**CO5**
	Lab Exercises*:* **<u>Verifying Hadoop installation</u>** (Pseudo distributed mode) ● Java path ● Hadoop location ● Hadoop configuration files ● Name Node setup ● Job Tracker ● Metadata files ● Accessing Hadoop on browser ● Moving data from local file system to Hadoop file system		

	● Performing Map-reduce operation in Hadoop ● Verification of operation results through terminal and browser		
5	**Hadoop Ecosystem** Introduction to SQOOP, Overview of PIG -Standalone mode, cluster mode, when to use PIG latin, Introduction to HIVE, Introduction to HBASE- comparison of Hadoophdfs and HBASE	**9**	**CO6**

CIE – Continuous Internal Evaluation: Theory (50 Marks)

Blooms Taxonomy	**Tests**	**Assignments**	**Daily Assessment**	**Self-Study**
Marks (Out of 50)	**25**	**5**	**10**	**10**
L1: Remember	-	-	-	-
L2: Understand	5	-	-	-
L3: Apply	10	2.5	10	10
L4: Analyze	-	-	-	-
L5: Evaluate	-	-	-	-
L6: Create	10	2.5	-	-

CIE – Continuous Internal Evaluation: Lab (25 Marks)

Blooms Taxonomy	**Marks (Out of 25)**
L1: Remember	-
L2: Understand	5
L3: Apply	10
L4: Analyze	-
L5: Evaluate	-
L6: Create	10

SEE – Semester End Examination: Theory (50 Marks)

Blooms Taxonomy	**Marks (Out of 50)**
L1: Remember	-
L2: Understand	10
L3: Apply	10
L4: Analyze	10
L5: Evaluate	-
L6: Create	20

MINI PROJECT

Course Code	**: CSE56**	**Credits**	**: 02**
L:P:T:S	**: 0:2:0:0**	**CIE Marks**	**: 25**
Exam Hours	**: 3 Hrs**	**SEE Marks**	**: 25**

COURSE OUTCOMES: At the end of the Course, the Student will be able to

CO #	COURSE OUTCOMES
CO1	Design ER diagram for the chosen problem statement.
CO2	Understand the basic concepts of DBMS and data models.
CO3	Design a relational database model and schema with all constraints defined.
CO4	Apply normalization in designing database.
CO5	Design and develop appropriate front end, apply SQL queries in creation and manipulation of databases.
CO6	Demonstrate their communication skill effectively with technical presentation.

Course Outcomes to Program Outcomes Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	-	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	-	1	-	-	-	1	-	3
CO3	3	3	3	3	-	-	-	3	-	-	-	-	-	3
CO4	3	3	-	-	-	-	-	-	-	-	-	-	-	-
CO5	3	3	3-	3	1	-	-	3	2	-	-	-	1	3
CO6	3	-	-	-	-	-	-	3	2	1	-	-	-	-

The student shall be capable of identifying a problem related to the field of Computer Science and carry out a mini project on the problem defined. Each student is expected to do the mini project individually. The code developed the project will be reviewed by a panel of experts during the course of the semester. Plagiarized projects will automatically get an **"F" GRADE** and the student will be liable for further disciplinary action. At the completion of a project the student will submit a project report, which will be evaluated by duly appointed examiner(s).

Sample Mini Project includes:

1) Banking database
2) Company database
3) Inventory control
4) Online reservation
5) Health care organization system
6) Blood donation system

CIE- Continuous Internal Evaluation (25 Marks)

Bloom's Category	Mini Project
Marks(out of 25)	
Remember	-
Understand	-
Apply	-
Analyze	-
Evaluate	25
Create	-

SEE – Semester End Examination (25 Marks)

Bloom's Category	Mini Project
Marks(out of 25)	
Remember	-
Understand	-
Apply	-
Analyze	-
Evaluate	25
Create	-

SIXTH SEMESTER SYLLABUS

CORE JAVA PROGRAMMING

Course Code: CSE61	**Credits : 05**
L: P: T: S : 3:2:0:0	**CIE Marks : 50+25**
Exam Hours: 3+3	**SEE Marks : 50+25**

COURSE OUTCOMES: At the end of the Course, the Student will be able to

CO #	COURSE OUTCOMES
CO1	Create Java application programs incorporating OOP principles.
CO2	Design and develop programs using collections.
CO3	Apply the features of exception handling and multithreading.
CO4	Construct GUI applications with Java swings.
CO5	Understand various I/O manipulation operations through file streams.
CO6	Create database applications using JDBC concepts.

Course Outcomes to Program Outcomes Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	-	3	-	-	-	3	-	-	2	3	2
CO2	3	3	3	-	3	-	-	-	3	-	-	-	3	-
CO3	3	-	3	-	3	-	-	-	3	-	-	-	3	-
CO4	3	3	3	2	3	-	-	-	3	-	-	-	3	-
CO5	3	-	-	-	-	-	-	-	-	-	-	2	-	2
CO6	3	3	3	2	3	-	-	-	3	-	-	-	3	2

Module	Contents of the Module	Cos	Hours
1	**Introduction** -The history and evolution of Java, An overview of Java, Data Types, Variables and Arrays, Operators, Control Statements, Introducing Classes, Methods and Classes,String Handling – The String Constructors , String Length , Special String operations, Character Extraction , String Comparison , Searching Strings, Modifying a String.	**CO1**	**9**
	List of Experiments 1. Write a Java Program to define a class, describe its constructor, overload the Constructors and instantiate its object. 2. Write a Java Program to define a class, define instance methods for setting and Retrieving values of instance variables and instantiate its object 3. Write a Java Program to define a class, define instance methods and overload them and use them for dynamic method invocation.		**9**

	4. Write a Java Program to demonstrate use of sub class 5. Write a Java Program to demonstrate use of nested class 6. Write a Java Program to implement array of objects 7. Write a Java program to practice using String class and its methods 8. Write a Java program to practice using String Buffer class and its methods		
2	**Inheritance –** Inheritance Basics, Using super, Creating multilevel Hierarchy, Method Overriding, Dynamic method Dispatch, using Abstract Classes , Using final with inheritance , The object class **Packages** – Packages, Access Protection, Importing Packages, Interfaces. **The Collections Framework:**Collections Overview The Collection Interfaces- The List Interface, The Set Interface, The Sorted SetInterface, The Queue Interface. The Collection Classes – Array ListClass,Linked List Class, Treeset Class	**CO2**	**9**
	List of Experiments 1. Write a Java Program to implement inheritance and demonstrate use of method overriding 2. Write a Java Program to implement multilevel inheritance by applying various access controls to its data members and methods 3. Write a program to demonstrate use of implementing interfaces 4. Write a program to demonstrate use of extending interfaces 5. Write a Java program to implement the concept of importing classes from user defined package and creating packages 6. Write a Java program to perform the basic linked list operation using collections		**9**
3	**Exception Handling** – Exception Types , Uncaught Exceptions, Using try and catch, Multi catch clauses, Nested try statements, throv throws , finally , Java's Built-in Exceptions. **Threads** – The java Thread Model , The main Thread , Creating a Thread Creating multiple Threads , Thread Priorities , Synchronization , Interthrea Communication, Suspending , resuming and Stopping Threads, usin Multithreading.	**CO3**	**9**
	List of related Experiments 1. Write a program to implement the concept of threading by extending Thread Class 2. Write a program to implement the concept of threading by implementing Runnable Interface		**9**

	3. Write a program to implement the concept of Exception Handling using predefined exception 4. Write a program to implement the concept of Exception Handling by creating user defined exceptions 5. Write a java program that implements a multi-thread application that has three threads. First thread generates random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number.		
4	**EventHandling** – Two Event Handling Mechanisms, Event Classes, Sources of Events, Event Listener Interfaces, Using the Delegation Event Model, Adapter Classes, Inner Classes. **Swing** – Introducing Swing, Exploring Swing – JLabel and ImageIcon. JTextField, The Swing Buttons, JYabbedPane, JScrollPane, JList, JComboBox, JTable.	**CO4**	**9**
	List of Experiments 1. Write a swing program to Set Background Color and Foregrour Color of JLabel and JTextField. 2. Write a swing program to set and get the horizontal and vertic alignment of JLabel and JTextField. 3. Develop a simple application using Swings. 4. Demonstrate the working of Inner classes using Mouse events.		**9**
5	**Java I/O Streams**: The Byte Streams, The Character Streams. **JDBC Objects** - The Concepts of JDBC, JDBC DriverTypes, JDB Packages, JDBC process , Database connections , statement Objects ResultSet, Transaction Processing.	**CO5, CO6**	**9**
	List of Experiments Write a java program that connects to a database using JDBC and does add, deletes, modify and retrieve operations		**8**

Text Books:

1. The Complete Reference: Java; Herbert Schildt; McGraw Hill Education; Seventh Edition.
2. The Complete Reference: J2EE ; Jim Keogh; McGraw Hill Education; First Edition

Reference books:

1 . Y. Daniel Liang: Introduction to JAVA Programming, 7th Edition, Pearson Education, 2007.
2. Stephanie Bodoff et al: The J2EE Tutorial, 2nd Edition, Pearson Education, 2004

Assessment Pattern

CIE- Continuous Internal Evaluation (50Marks)

Bloom's Category	Tests	Assignments	Quizzes
Marks (out of 50)	25	15	10
Remember	5	-	-
Understand	5	5	-
Apply	5	5	5
Analyze	5	5	5
Evaluate	-	-	-
Create	5	-	-

CIE- Continuous Internal Evaluation : Lab (25Marks)

Bloom's Category	Tests
Marks (out of 25)	25
Remember	-
Understand	-
Apply	-
Analyze	10
Evaluate	15
Create	-

SEE- Semester End Examination : Theory (50 Marks)

Bloom's Category	Tests
Remember	5
Understand	5
Apply	10
Analyze	10
Evaluate	10
Create	10

SEE- Semester End Examination : Lab (25 Marks)

Bloom's Category	Tests
Remember	-
Understand	-
Apply	-
Analyze	10
Evaluate	15
Create	-

Computer Networks

Course Code : CSE62 **Credits : 5**
L:P:T:S : 3:2:0:0 **CIE Marks : 50+25**
Exam Hours : 3+3 **SEE Marks : 50+25**

COURSE OUTCOMES: At the end of the Course, the Student will be able to

CO #	COURSE OUTCOMES
CO1	Apply the concepts of data Communication in real world.
CO2	Analyze functionalities of OSI Layers.
CO3	Compare and contrast various transmission media, flow control and error detection & correction techniques.
CO4	Evaluate the routing algorithms & transport protocols for achieving efficiency in societal and real world applications.
CO5	Analyze networking & application protocols with the help of simulation tools.
CO6	Evaluate the various security mechanisms in real world applications.

Course Outcomes to Program Outcomes Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	-	-	-	-	-	-	-	-	1	3	1
CO2	3	3	-	-	-	-	-	-	-	-	-	-	3	-
CO3	3	3	-	-	3	-	-	-	3	-	-	-	3	-
CO4	3	3	3	3	3	-	-	-	3	-	-	-	3	-
CO5	3	3	-	-	3	-	-	-	3	-	-	-	3	-
CO6	3	3	3	3	3	-	-	-	3	-	-	-	3	-

Module No.	Module Contents	Hours	CO's
1	**Introduction: Introduction:** Data Communication-Networks **Network Models**- Protocol Layering, TCP/IP Protocol Suite-Layered Architecture,Layers in the TCP/IP Protocol suite, Description of each layer,Encapsulation and Decapsulation and Addressing,OSI Model,TCP/IP vs OSI model.	9	CO1, CO2
	List of Experiments: Study of Network commands (ipconfig, traceroute, ifconfig, ping, arp commands, etc…)	9	
2	**PHYSICAL AND DATA LINK LAYER** **Physical Layer**- Digital transmission, DDC, ADC, Transmission modes. **Data Link Layer: Data Link Control-** Framing, Flow & Error control, Protocols, HDLC.	9	CO3
	List of Experiments 1. Write a program for error detecting code-using CRC-CCITT (16-bits). 2. Write a program to implement Go-Back N and Selective repeat sliding window protocol.	9	

	3. Write a program for implementation of stop and wait.		
3	**IP ADDRESSING AND ROUTING** Datagrams and Virtual Circuits, Routing in Packet networks, Shortest path routing: Bellman-Ford algorithm, Dijiikstra'a algorithm **TCP/IP architecture**, The Internet Protocol, IPv6, UDP, TCP.	9	CO4
	List of Experiments 1. Using TCP/IP Sockets, write a client-server program to make client sending the file name and the server to send back the contents of the requested file if present. 2. Design, develop, and execute a program in C under UNIX / LINUX environment to implement a simple echo server and demonstrate its working. Both the server and client are to be connectionless and use UDP. The system works as follows: Client reads a line from the standard input and writes the line to the server; the server reads a line from its network input and echoes the line back to the client; the client reads the echoed line and prints it on its standard output. 3. Write a program for Congestion control using the leaky bucket algorithm 4. Write a program for Distance Vector Algorithm to find suitable path for transmission. 5. Write a program for Link State Algorithm to find suitable path for transmission.	9	
4	**WIRELESS LANs AND NETWORK SECURITY: Wireless LAN:** 802.11, Bluetooth. **Network Security:** Overview of Network Security, Overview of Security Methods, Secret-Key Encryption Protocols, Public-Key Encryption Protocols.	9	CO5
	List of Experiments 1. Write a program for encryption and decryption using RSA algorithm. 2. Simulate a simple ESS with transmitting nodes in wireless LAN and determine the throughput with respect to transmission of packets.	9	
5	**APPLICATIONS, NETWORK MANAGEMENT:** Application layer overview, Domain Name System (DNS), Remote Login Protocols, E-mail, File Transfer and FTP, World Wide Web and HTTP	9	CO6
	List of Experiments 1. Simulate Capturing and analysing Ethernet frames. 2. Simulate HTTP GET/POST interaction 3. Simulate capturing a bulk TCP transfer from your computer to a remote server. 4. Simulate a. Analysis of ICMP and PING messages	8	

	b. Analysis of ICMP and Traceroute		

TEXT BOOKS:

1. Behrouz A. Forouzan: Data Communication and Networking, 5th Edition Tata McGraw-Hill, 2013. (M1,2,5)
2. Communication Networks – Fundamental Concepts & key architectures, Alberto Leon Garcia & Indra Widjaja, 2nd Edition, Tata McGraw-Hill, 2004, India. (M3)
3. Computer & Communication Networks, Nadir F Mir, Pearson Education, 2014, India. (M4,5)

REFERENCE BOOKS:

1. W.Stallings, Data& Computer Communication Prentice-Hall, 9th edition, 2014.
2. A.S. Tanenbaum, Computer networks, Prentice-Hall, 5th edition, 2014.

CIE - Continuous Internal Evaluation: Theory (50 Marks)

Bloom's Taxonomy	Tests	Assignments	Quizzes
Marks (Out of 50)	25	10	10
Remember	-	-	5
Understand	5	-	-
Apply	5	5	5
Analyze	5	2.5	-
Evaluate	5	2.5	-
Create	5	-	-

CIE - Continuous Internal Evaluation: Lab (25 Marks)

Bloom's Taxonomy	Lab
Marks (Out of 25)	25
Remember	-
Understand	10
Apply	15
Analyze	
Evaluate	
Create	

SEE – Semester End Examination: Theory (50 Marks)

Bloom's Taxonomy	Tests
Marks (Out of 50)	
Remember	-
Understand	15
Apply	20s
Analyze	5
Evaluate	5
Create	5

SEE – Semester End Examination: Lab (25Marks)

Bloom's Taxonomy Marks (Out of 25)	Lab
Remember	
Understand	10
Apply	15
Analyze	
Evaluate	
Create	

FINITE AUTOMATA AND COMPILER DESIGN

Course Code: CSE63 **Credits: 04**
L: P: T: S: 3:0:1:0 **CIE Marks: 50**
Exam Hours: 03 **SEE Marks: 50**

COURSE OUTCOMES: At the end of the Course, the Student will be able to

CO #	COURSE OUTCOMES
CO1	Design the finite automata and regular expressions for a given language.
CO2	Construct PDA's and CFG's for different languages and simplify the grammars.
CO3	Design turing machines for different languages and prove the properties of languages.
CO4	Analyze the phases of compiler.
CO5	Construct a top-down parsing table for given grammars.
CO6	Construct a bottom -up parsing table for given grammars and parse the given string.

Course Outcomes to Program Outcomes Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	-	-	-	-	-	-	-	3	3	3
CO2	3	3	3	3	-	-	-	-	-	-	-	3	3	3
CO3	3	3	3	3	-	-	-	-	-	-	-	3	3	3
CO4	3	3	-	-	-	-	-	-	-	-	-	-	3	3
CO5	3	3	3	-	-	-	-	-	-	-	-	-	3	3
CO6	3	3	3	-	-	-	-	-	-	-	-	-	3	3

Module No.	Module Contents	Hours	Cos
1	**Introduction to Finite Automata:** Central Concepts of Automata; Types of Finite Automata-DFA,NFA,∈-NFA; Conversion of NFA to DFA, ,∈-NFA to DFA; **Regular expressions and Language:** Introduction to Regular Expression, Conversion of RE and FA -State elimination technique; Minimization of DFA;	9	**CO1**
2	**Context-Free Grammars:** Writing CFG's for Different languages; Parse trees; Ambiguity in grammars; Simplification of CFG's; Normal Forms: CNF and GNF **Pushdown Automata:** Definition of PDA; Writing PDA's for different languages; DPDA, Conversion of CFG to PDA;	10	**CO2**
3	**Turing Machine and Chomsky Hierarchy:** Definition of TM, Writing TM for different languages; Type 0,1,2,3 Grammars and Languages; Multitape TM, Multi -Track TM, NDTM; **Properties of Languages:** Pumping Lemma for RL's, Proving languages are not Regular using Pumping lemma, Closure properties;	8	**CO3**
4	**Introduction to Compiler Design and Lexical Analysis:** Phases of Compiler; The Role of Lexical Analyzer; Input Buffering; Specifications of Tokens; Transition Diagrams in recognition of Tokens, lexemes; Regular Expressions and Finite Automata in Lexical analysis; Tools for Lexical Analysis;	7	**CO4**
5	**Syntax Analysis:** Role of parser; Types of parsers; Top Down parsing-Recursive Decent Parsing, Predictive parsing; Bottom Up Parsing-Shift reduce Parsing, LR parsing –LR(0),SLR(0); CFG's in Syntax Analysis; Tools for Syntax Analysis;	10	**CO5, CO6**

Text Books:

1. "**Introduction to Automata Theory, Languages and Computation**", John E. Hopcroft, Rajeev Motwani, Jeffrey D.Ullman, 3 rd Edition, Pearson Education, 2011.
2. "**Compilers- Principles, Techniques and Tools**", Alfred V Aho, Monica S.Lam, Ravi Sethi, Jeffrey D Ullman, 2nd Edition, Pearson Education, 2013.

Reference Books:

1. "**Theory of Computer Science, Automata, Languages, and Computation**", K.L.P. Mishra 3 rd Edition, PHI Learning, 2009.
2. "**Compiler Design**", K.Muneeswaran, OXFORD university Press, 2015.

Assessment pattern

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Tests	Assignments	Quizzes	Co-Curricular
Marks (out of 50)	25	10	5	10
Remember	-	-	-	-
Understand	5	-	-	-
Apply	5	3	2	5
Analyze	5	2	1	-
Evaluate	-	-	-	5
Create	10	5	2	-

SEE- Semester End Examination (50 Marks)

Bloom's Taxonomy Marks (out of 50)	Tests
Remember	-
Understand	5
Apply	15
Analyze	10
Evaluate	-
Create	20

SOCIAL NETWORK ANALYSIS

Course Code: CSE641 **Credits : 04**
L: P: T: S : 3:0:0:1 **CIE Marks : 50**
Exam Hours: 3 **SEE Marks : 50**

COURSE OUTCOMES: At the end of the Course, the Student will be able to

CO #	COURSE OUTCOMES
CO1	Infer and identify the various concepts in social media and also learn to use social media in an ethical manner
CO2	Make use of graph theory approach to model social networks.
CO3	Analyze the social networks to draw insights on the interactions between/within social groups.
CO4	Evaluate the structure of a social network and identify the influential entities.
CO5	Interpret the fundamental principles for analysing social media marketing and its importance.
CO6	Select and utilize data analysis methods for addressing real world problems.

Course Outcomes to Program Outcomes Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	3	-	-	-	-		3
CO2	3	3	-	-	-	-	-	-	-	-	-	-	3	-
CO3	3	3	-	3	-		-	-	-	-	-	-	3	-
CO4	3	3	-	2	-	3	-	-	-	-	-	-	3	-
CO5	3	-	-	-	-	3	-	-	-	-	-	-	3	-
CO6	3	3	3	-	-	-	-	-	-	-	-	-	3	-

Module No	Module Contents	Hours	COs
1	**INTRODUCTION**	**7**	**CO1**
	INTRODUCTION: Understand what social networking is, history of social network analysis, definitions, social network data, building a network, relations.		
2	**BUILDING A NETWORK**	**10**	**CO2**
	BUILDING A NETWORK:Networks as graphs, networks as matrices, properties of nodes, network relationships and structures,metrics in social network analysis and software,network properties, Advantages and Disadvantages of Social Networking, types of social networks, using graph and matrices to represent social relations, basic properties of networks and actors.		
3	**SOCIAL MEDIA FUNDAMENTALS**	**10**	**CO3**
	Various social networking sites - What is Social Media and Why It's Important; FACEBOOK, INSTAGRAM, TWITTER, LINKEDIN - Why and how they matter, history, statistics, demographics, Time Spent, Key Features, Marketing - What You Need to Know		
4	**SOCIAL MEDIA ANALYSIS**	**10**	**CO4**
	Four dimension of analysis,Criteria of effectiveness, metrics, social network analysis, semantic analysis, online sentiment analysis, tools, social media management, centrality, measures opinion mining, feature based sentiment analysis.		
5	**Case studies**	**7**	**CO5**
	Appropriate case studies will be discussed relevant to the industries.		

Literature:

1) James M Cook, University of Maine at Augusta “What is a Social Network”
2) Robert A Hanneman, Department of Sociology, University of California, Riverside, “Introduction to Social Network methods”.
3) Christina Falci, Department of Sociology, University of Nebraska, Lincoln, “Social Network Analysis”
4) Matthew Ganis&AvinashKohirkar, “Social Media Analytics”
5) Bobbi J Carothers, American Evaluation Association, Denver, Colorado, “Network Analysis from Start to finish: Techniques, Tools and Tips for Evaluating your Network”
6) Matthew Denny, Institute for Social Science Research, University of Massachusetts, AMHERST, “Social Network Analysis”

7) Timothy Baldwin, University of Melbourne, “Semantic Analysis of Social Media”
8) The Social Media Analytics Compass: What and How to Measure http://www.razorsocial.com/social-media-analytics-tools/
9) https://www.youtube.com/watch?v=P33xa4l4GTM
10) Overview of SNA https://www.youtube.com/watch?v=fgr_g1q2ikA
11) https://www.teachengineering.org/activities/view/uno_graphtheory_lesson01_activity1
12) The History of Social Media: social Networking Evolution! http://historycooperative.org/ the-history-of-social-media/
13) Social Media Fact Sheet http://www.pewinternet.org/fact-sheet/social-media/
14) https://www.meaningcloud.com/solutions/media-analysis
15) https://www.enotes.com/homework-help/what-hypotheses-social-media-intimate-relationship-488912

CIE – Continuous Internal Evaluation: Theory (50 Marks)

Bloom’s Taxonomy	**Tests**	**Assignments**	**Quizzes**
Marks (Out of 50)	25	15	10
Remember	5	-	5
Understand	5	-	-
Apply	5	7.5	5
Analyze	5	7.5	-
Evaluate	5	-	-
Create	-	-	-

SEE – Semester End Examination: Theory (50 Marks)

Blooms Taxonomy	**Marks (Out of 50)**
L1: Remember	-
L2: Understand	20
L3: Apply	20
L4: Analyze	10
L5: Evaluate	-
L6: Create	-

SOFT COMPUTING

Course Code	**: CSE642**	**Credits**	**: 4**
L: P: T: S	**: 3:0:0:1**	**CIE Marks**	**: 50**
Exam Hours	**: 3 hrs**	**SEE Marks**	**: 50**

COURSE OUTCOMES: At the end of the Course, the Student will be able to

CO #	COURSE OUTCOMES
CO1	Analyze the techniques for problem solving using soft computing.
CO2	Design artificial neural networks for real time problems.
CO3	Apply fuzzy concepts to design fuzzy expert system
CO4	Compare and contrast fuzzification and defuzzification techniques.
CO5	Examine the components and hypothesis of genetic algorithm.
CO6	Analyse the usage of different swarm intelligence algorithms.

Course Outcomes to Program Outcomes Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	3	-	3	3	3
CO3	3	3	2	-	-	-	-	-	-	3	-	3	3	3
CO4	3	3	-	-	-	-	-	-	-	3	-	3	3	3
CO5	3	3	-	-	-	-	-	-	-	3	-	3	3	3
CO6	3	3	-	-	-	-	-	-	-	3	-	3	3	3

Module No	Module Contents	Hours	Cos
1	**INTRODUCTION TO SOFT COMPUTING:** Evolution of Computing, Soft Computing Constituents, From Conventional AI to Computational Intelligence, Machine Learning Basics-Learning Problems – Designing Learning systems, Perspectives and Issues – Concept Learning	**7**	**C01**
2	**NEURAL NETWORKS :** Architecture-: Single Layer and Multilayer -Feed Forward Networks-Training and Learning methods	**10**	**C02**
3	**FUZZY LOGIC :**Fuzzy Sets, Membership Functions, Fuzzy Rules and Fuzzification and Defuzzification, Fuzzy Inference Systems	**10**	**C03,CO4**
4	**GENETIC ALGORITHM:** Biological background, operators of GA, classifications and applications of GA	**9**	**C05**
5	**COMPUTATIONAL INTELLIGENCE:** Computational Intelligence Paradigms, Swarm Intelligence Techniques, Basic Particle Swarm Optimization, Applications.	**9**	**C06**

Text Books:

1. Jyh-Shing Roger Jang, Chuen-Tsai Sun, EijiMizutani, "Neuro-Fuzzy and Soft Computing", Prentice-Hall of India, Ist Edition, 2009
2. Engelbrecht, A.P. Computational Intelligence: An Introduction, Second Edition, John Wiley and Sons, 2nd Edition, 2007.
3. S.N.Sivanandam, S.N.Deepa, Principles of Soft computing , Wiley India ,2nd Edition ,2011,
4. J.S.R. Jang, C.T. Sun and E. Mizutani, —Neuro-Fuzzy and Soft Computing, Pearson Education , Ist Edition ,2004.

CIE – Continuous Internal Evaluation: Theory (50 Marks)

Blooms Taxonomy	Tests	Assignments	Quizzes
Marks (Out of 50)	**25**	15	10
L1: Remember	-	-	5
L2: Understand	5	-	-
L3: Apply	10	7.5	5
L4: Analyze	5	7.5	-
L5: Evaluate	5	-	-
L6: Create	-	-	-

SEE-Semester End Examination (50 Marks)

Bloom's Category	Marks (Out of 50)
Remember	10
Understand	10
Apply	10
Analyze	10
Evaluate	10
Create	-

USABILITY AND HUMAN COMPUTER INTERACTION

Course Code	: CSE643	Credits	: 04
L:P:T:S	: 3:0:0:1	CIE Marks	: 50
Exam Hours	: 3	SEE Marks	: 50

Course Outcomes: At the end of the Course, the Student will be able to:

CO #	COURSE OUTCOME
CO1	Identify the need to study human-computer-interaction or human-factors while designing software.
CO2	Illustrate the process of designing user-friendly software based on usability engineering guidelines.
CO3	Apply interaction design and UI design process in enhancing user-experience of an application.
CO4	Evaluate the usability of user-interfaces or software applications.
CO5	Apply industry standards for designing and evaluating user-interfaces.
CO6	Identify current trends in usability engineering.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	1	-	-
CO2	3	-	2	-	-	-	-	-	-	-	-	-	2	2
CO3	3	3	2	-	-	-	-	-	-	2	-	-	2	2
CO4	3	3	-	-	-	-	-	-	-	2	-	-	-	-
CO5	3	3	2	-	-	-	-	1	-	-	-	-	-	2
CO6	3	-	-	-	-	-	-	-	-	-	-	-	-	-

Module #	Contents of Module	Hrs	COs
1	**MODULE– I HCI AND USABILITY** HCI design: Disciplines contributing to HCI, Importance of human factors in design, Levels of human computer interaction Usability: context of usability, Benefits of good design, Perception and cognition, attributes of system acceptability, generations of user interfaces.	9	CO1

2	**MODULE– II USABILITY DESIGN CYCLE** **Requirements analysis:** Task Analysis ,User Analysis, Environment Analysis **Design, testing, and development: Design standards, Conceptual model design, Iterative evaluation, prototyping (Level 1, Level 2, Level 3 Design)** **Installation** and Feedback	9	CO2
3	**MODULE– III USABILITY EVALUATION METHODS (UEMs)** User-based: Think -aloud, Interview, Questionnaire, Focused group Expert-based: Heuristic evaluation, Cognitive Walkthrough Model-based: GOMS, Cognitive Complexity Theory Empirical evaluation: Observational experiment , Controlled Experiment, Statistical analysis	9	CO3, CO4
4	**MODULE –IV HCI APPLICATIONS** Mobile devices interface: device capabilities, mobile interaction principles Case study 1: Android based UI Case study 2: iOS based UI Website Interface: Availability and Accessibility, Clarity, Learnability, Credibility, Relevancy Case study 3: Good design examples vs Bad design examples Wearable devices and IoT interfaces: sensors, visual, audio, tangible and tactile interfaces. Case study 4: Current Wearable device example Gaming software interface: Learnability, efficiency, memorability, errors, satisfaction Case study 5: Game designed with usability vs Game designed without considering usability	9	CO3, CO5
5	**MODULE -V RECENT ADVANCES AND FUTURE OF HCI** Emerging paradigms of user interaction, ubiquitous computing, intelligent user-interfaces , Pervasive Computing , Crowdsourcing, Virtual reality , Augmented reality , Mixed Reality, Haptic Interaction	9	CO6

References:

1. www.usability.gov
2. www.usabilitybok.org
3. www.usabilitygeek.com
4. *www.gameanalytics.com*
5. www.researchgate.net
6. www.BehaviorModel.org.
7. www.mprove.de/diplom/gui/kay72.html
8. www.pencomputing.com/palm/Pen33/hawkins2.html
9. www.fastcodesign.com/3059848/8-incredible-prototypes-that-show-the-future-of-human-computer-interaction
10. www.technologyreview.com/video/609888/technology-spotlight-mind-controlled-vr/
11. https://www.technologyreview.com/s/609329/for-brain-computer-interfaces-to-be-useful-theyll-need-to-be-wireless/
12. https://www.technologyreview.com/s/608087/the-quest-for-a-functional-new-interface-for-the-smartphone/
13. https://www.interaction-design.org/literature/topics/design-principles

14. https://www.technologyreview.com/s/608566/our-extended-sensoria-how-humans-will-connect-with-the-internet-of-things/
15. https://www.technologyreview.com/s/609331/more-evidence-that-humans-and-machines-are-better-when-they-team-up/
16. https://www.technologyreview.com/s/609334/brain-controlled-typing-may-be-the-killer-advance-that-ar-needs/

CIE – Continuous Internal Evaluation: Theory (50 Marks)

Blooms Taxonomy	Tests	Assignments	Quizzes
Marks (Out of 50)	**25**	15	10
L1: Remember	-	-	5
L2: Understand	5	-	-
L3: Apply	10	7.5	5
L4: Analyze	5	7.5	-
L5: Evaluate	5	-	-
L6: Create	-	-	-

SEE-Semester End Examination (50 Marks)

Bloom's Category	Marks (Out of 50)
Remember	10
Understand	10
Apply	10
Analyze	10
Evaluate	10
Create	-

Mini Project

Course Code : CSE65 | **Credits : 02**
L: P: T: S : 0:2:0:0 | **CIE Marks : 25**
Exam Hours : 3 | **SEE Marks : 25**

COURSE OUTCOMES: At the end of the Course, the Student will be able to

CO #	COURSE OUTCOMES
CO1	Design layouts for the given problem statement.
CO2	Apply the basic concepts and features of OOPS and Java
CO3	Develop the skills in designing and building applications.
CO4	Construct an application using concepts of class, objects and Inheritance

CO5	Build applications using polymorphism and abstraction.
CO6	Demonstrate their communication skill effectively with technical presentation.

Course Outcomes to Program Outcomes Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	3	-	1
CO2	3	3	3	3	-	-	-	-	-	-	-	3	-	-
CO3	3	3	3	-	-	-	-	-	3	-	-	3	2	-
CO4	3	3	3	3	-	-	-	-	3	1	-	3	-	-
CO5	3	3	3	3	-	-	-	-	3	-	-	-	2	-
CO6	3	3	-	-	-	-	-	-	3	-	-	-	-	-

Students are expected to independently identify a real time scenario problem related to the field of computer science and carry out a mini project on the problem defined. Projects should be coded (or programmed) individually and independently. The code developed towards the project will be reviewed by a panel of examiners at multiples levels. Plagiarized projects will automatically get an **"F" GRADE** and the student will be liable for further disciplinary action. At the completion of a project, the student is to submit a project report and make a presentation, which will be evaluated (end semester assessment) by duly appointed examiner(s).

CIE- Continuous Internal Evaluation : Lab (25Marks)

Bloom's Category	**Tests**
Marks (out of 25)	25
Remember	-
Understand	-
Apply	-
Analyze	-
Evaluate	25
Create	-

SEE- Semester End Examination (25 Marks)

Bloom's Category	**Tests**
Remember	-
Understand	-
Apply	-
Analyze	-
Evaluate	25
Create	-

APPENDIX A

Outcome Based Education

Outcome-based education (OBE) is an educational theory that bases each part of an educational system around goals (outcomes). By the end of the educational experience each student should have achieved the goal. There is no specified style of teaching or assessment in OBE; instead classes, opportunities, and assessments should all help students achieve the specified outcomes.

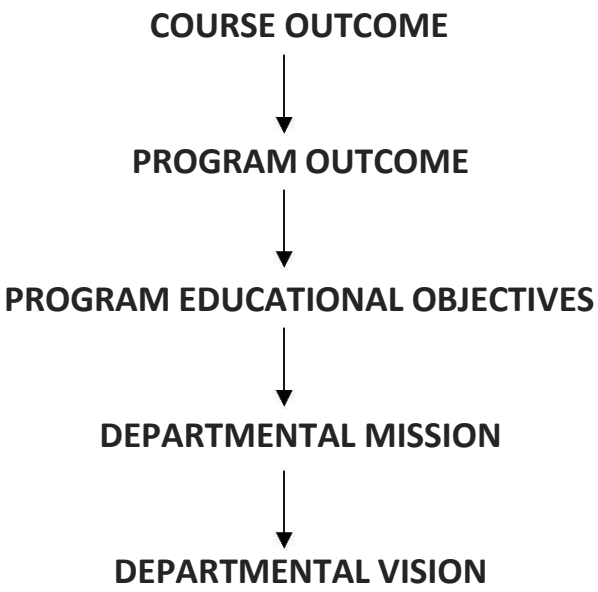
There are three educational Outcomes as defined by the National Board of Accreditation:

Program Educational Objectives: The Educational objectives of an engineering degree program are the statements that describe the expected achievements of graduate in their career and also in particular what the graduates are expected to perform and achieve during the first few years after graduation. [nbaindia.org]

Program Outcomes: What the student would demonstrate upon graduation. Graduate attributes are separately listed in Appendix C

Course Outcome: The specific outcome/s of each course/subject that is a part of the program curriculum. Each subject/course is expected to have a set of Course Outcomes

Mapping of Outcomes



APPENDIX B

The Graduate Attributes of NBA

Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

Problem analysis: Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

Conduct investigations of complex problems: The problems that cannot be solved by straightforward application of knowledge, theories and techniques applicable to the engineering discipline that may not have a unique solution. For example, a design problem can be solved in many ways and lead to multiple possible solutions that require consideration of appropriate constraints/requirements not explicitly given in the problem statement (like: cost, power requirement, durability, product life, etc.) which need to be defined (modeled) within appropriate mathematical framework that often require use of modern computational concepts and tools.

Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

Life-long learning: Recognise the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

APPENDIX C

BLOOM'S TAXONOMY

Bloom's taxonomy is a classification system used to define and distinguish different levels of human cognition—i.e., thinking, learning, and understanding. Educators have typically used Bloom's taxonomy to inform or guide the development of assessments (tests and other evaluations of student learning), curriculum (units, lessons, projects, and other learning activities), and instructional methods such as questioning strategies. **[eduglosarry.org]**