GEETHANJALI INSTITUTE OF SCIENCE & TECHNOLOGY
Unit of USHODAYA EDUCATIONAL SOCIETY
An ISO 9001:2015 certified Institution: Recognized under Sec. 2(f)& 12(B) of UGC Act, 1956
3rd Mile, Bombay Highway, Gangavaram (V), Kovur(M), SPSR Nellore (Dt), Andhra Pradesh, India- 524137
Ph. No. 08622-212769, E-Mail: geethanjali@gist.edu.in, Website: www.gist.edu.in

COURSES OFFERED FOR MINORS DEGREE IN CSE to OTHER DEPARTMENTS

Note: 1. Minors degree subjects are having a total of 20 additional Credits
2. Students should acquire 4 credits through MOOCs compulsory to award the Minors Degree

Sl. No.	Course Code	Course Title	Hours per week			Credits
			L	T	P	C
1	22A05M01	Computer Organization	3	1	0	4
2	22A05M02	Operating Systems	3	1	0	4
3	22A05M03	Advanced Java Programming	3	1	0	4
4	22A05M04	Design & Analysis Of Algorithms	3	1	0	4
5	22A05M05	Computer Networks	3	1	0	4
6	22A05M06	Full Stack Web Development	3	1	0	4
7	22A05M07	Object Oriented Analysis & Design	3	1	0	4
8	22A05M08	No SQL	3	1	0	4
9	22A05M09	Software Engineering	3	1	0	4

COMPUTER ORGANIZATION
(Common to CSE, AI&ML, DS, CS)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A05M01a	**4: 0:0:0**	**4**	**CIE:30 SEE:70**	**3 Hours**	**Minors**

Course Objectives:

This course will enable students to:

- Illustrate the fundamental concepts of computer organization.
- Determine the Machine Instructions, develop programs.
- Develop Arithmetic Operations on Integers and Floating Point Numbers.
- Demonstrate types of memories, use of I/O devices.
- Illustrate concepts of Pipelining, Large Computer Systems.

Course Outcomes(CO):

On completion of this course, student will be able to

- Determine the basic concepts of Computer Organization.
- Interpret the Machine Instructions and basic Input / Output Operations.
- Demonstrate Arithmetic Operations on signed and unsigned numbers, design of Control Unit.
- Differentiate types of memories and distinguish I/O Devices.
- Illustrate the concepts of Pipelining.
- Illustrate the concepts of Large Computer Systems

Syllabus		Total Hours:48
Module-I	**Basic Structure of Computers**	**9Hrs**

Basic Structure of Computer: Computer Types, Functional Units, Basic operational Concepts, Bus Structure, Software, Performance, Multiprocessors and Multi computer.

Module-II	**Machine Instructions and Programs**	**10Hrs**

Machine Instructions and Programs: Numbers, Arithmetic Operations and Programs, Instructions and Instruction Sequencing, Addressing Modes, Basic Input/output Operations, Stacks and Queues, Subroutines.

Module-III	**Computer Arithmetic and Micro Programmed Control Unit**	**10Hrs**

Computer Arithmetic: Addition and Subtraction, Multiplication algorithms, Division algorithms, Floating point arithmetic operations.
Micro Programmed Control Unit: Control memory, address sequencing, design of control unit.

Module-IV	**The Memory System and Input / Output Organization**	**10Hrs**

The Memory System: RAM, ROM, Cache Memory, Virtual Memory, And Secondary Storage.
Input / Output Organization: Accessing I/O Devices, Interrupts, Direct Memory Access, Buses, Standard I/O Interfaces.

Module-V	**Pipelining, Large Computer Systems**	**9Hrs**

Pipelining: Basic Concepts, Data Hazards, and Instruction Hazards.
Large Computer Systems: Forms of Parallel Processing, The Structure of General-Purpose multiprocessors, Interconnection Networks.

Text Books:
1. Carl Hamacher, Zvonko Vranesic, SafwatZaky, "Computer Organization", 5th Edition, McGraw Hill Education, 2013.
2. M.Morris Mano, RajibMall, "Computer System Architecture", Revised Third Edition, Pearson Education India.

Reference Books:
1. Themes and Variations, Alan Clements, "Computer Organization and Architecture", CENGAGE Learning.
2. Smruti Ranjan Sarangi, "Computer Organization and Architecture", McGraw Hill Education.

Web References:
1. https://archive.nptel.ac.in/courses/106/105/106105163/

GEETHANJALI INSTITUTE OF SCIENCE & TECHNOLOGY

Unit of USHODAYA EDUCATIONAL SOCIETY

An ISO 9001:2015 certified Institution: Recognized under Sec. 2(f)& 12(B) of UGC Act, 1956
3rd Mile, Bombay Highway, Gangavaram (V), Kovur(M), SPSR Nellore (Dt), Andhra Pradesh, India- 524137
Ph. No. 08622-212769, E-Mail: geethanjali@gist.edu.in, Website: www.gist.edu.in

OPERATING SYSTEMS
(Common to CSE, AI&ML, DS, CS)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A05M01b	4: 0:0:0	4	CIE:30 SEE:70	3 Hours	Minors

Course Objectives:

This course will enable students to:
- Choose different Scheduling Algorithms.
- Solve Classic problems of synchronization.
- Apply various memory management techniques.
- Analyzing disk management functions and techniques.
- Implement files and directories.
- Analyze the Protection and Security mechanisms.

Course Outcomes (CO):

On completion of this course, student will be able to
- Illustrate the overall view of operating system structure. (L3)
- Analyze process scheduling algorithms and Synchronization methods. (L4)
- Solve Deadlock problems using various synchronization techniques. (L3)
- Apply memory management techniques in the design of operating systems (L3).
- Identify efficient file allocation methods for optimal disk utilization. (L3).
- Analyze Security and Protection Mechanism in Operating System (L4).

Syllabus		Total Hours:48
Module-I	**Operating Systems Overview and Structures**	**10 Hrs**

Introduction, Operating System Operations, Types of Operating Systems, functions of Operating Systems, Operating System Services, System Calls, System Programs, Operating System Structure.

Module-II	**Process Management and Synchronization**	**10 Hrs**

Process Management: Process Concepts, Process Scheduling, Operations on Processes, Inter-process Communication, Thread Models, Implementing Threads in User Space and the Kernel

Process Synchronization: Critical - Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Classic Problems of Synchronization.

Module-III	**Deadlocks and Memory Management**	**10 Hrs**

Deadlocks: System Model, Deadlock Characterization, Deadlock Prevention, Detection and Avoidance, Deadlock Detection, Recovery from Deadlock.

Memory Management: Introduction, Swapping, Contiguous memory allocation, Paging, Segmentation, Virtual Memory Management, Page-Replacement Algorithms, Thrashing, Kernel memory allocation.

Module-IV	**Mass – Storage Structure and File Systems**	**9Hrs**

Mass – Storage Structure: Disk Structure, Disk Scheduling, RAID Structure.

File Systems: Files, Directory, File System Structure, File- System Implementation, Directory Implementation.

Module-V	**System Protection, System Security**	**9 Hrs**

System Protection: Goals of protection, Principles and domain of protection, Access matrix, Access control, Revocation of access rights.

System Security: Introduction, Program threats, System and network threats.

Text Books:
1. Silberschatz A, Galvin P B, and Gagne G, Operating System Concepts, 9th edition, Wiley, 2016.

2. Tanenbaum A S, Modern Operating Systems, 3rd edition, Pearson Education, 2008. (Topics: Distributed Systems)

Reference Books:
1. Tanenbaum A S, Woodhull A S, Operating Systems Design and Implementation, 3rd edition, PHI, 2006.
2. Dhamdhere D M, Operating Systems A Concept Based Approach, 3rd edition, Tata McGraw Hill, 2012.
3. Stallings W, Operating Systems -Internals and Design Principles, 6th edition, Pearson Education, 2009.
4. Nutt G, Operating Systems, 3rd edition, Pearson Education, 2004.

Web References:
1. https://nptel.ac.in/courses/106/106/106106144/
2. http://peterindia.net/OperatingSystems.html

ADVANCED JAVA PROGRAMMING
(Common to CSE, AI&ML, DS, CS)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A05M01c	4: 0:0:0	4	CIE:30 SEE:70	3 Hours	Minors

Course Objectives:

This course will enable students to:

- To provide knowledge on console, GUI and Web based applications.
- To understand the java technologies for multi-tier enterprise application development.
- To practice applications development on Integrated Development Environment.
- To perform operations on database using Hibernate Query lnaguage.
- To examine the working principles of real time enterprise applications.
- To develop the enterprise applications with cross platform capabilities.

Course Outcomes (CO):

On completion of this course, student will be able to

- Implement simple Web Applications and networking API.
- Develop database applications using JDBC.
- Understand the dynamic request and response model using Servlets
- Design enterprise application using Java Server Pages (JSP)
- Implement Web applications using java server faces and struts
- Develop applications using Hibernate and Spring Frameworks

Syllabus		Total Hours:48
Module-I	Introduction to J2EE and Networking	10 Hrs

Java Enterprise Edition: Java Platform, J2EE Architecture Types, Explore Java EE Containers, Types of Servers in J2EE Application, HTTP Protocols and API, Request Processing in Web Application, Web Application Structure, Web Containers and Web Architecture Models.

Java Networking: Network Basics and Socket overview, TCP/IP client sockets, URL,TCP/IP server sockets, Data grams, java.net package Socket, ServerSocket, InetAddress, URL, URL Connection

Module-II	JDBC Programming	9 Hrs

The JDBC Connectivity Model, Database Programming: Connecting to the Database, Creating a SQL Query, Getting the Results, Updating Database Data, Error Checking and the SQLException Class, The SQLWarning Class, The Statement Interface, PreparedStatement, CallableStatement The ResultSet Interface, Updatable Result Sets, JDBC Types, Executing SQL Queries, ResultSetMetaData, Executing SQL Updates, Transaction Management.

Module-III	Servlet API and Overview	9 Hrs

Servlet Model: Overview of Servlet, Servlet Life Cycle, HTTP MethodsStructure and Deployment descriptor ServletContext and ServletConfig interface, Attributes in ServeltRequestDispacher interface The Filter API: Filter, FilterChain. Using the GenericServlet Class

Filter Config Cookies and Session Management: Understanding state and session, Understanding Session Timeout and Session Tracking, URL Rewriting.

Module-IV	Java Server Pages	10 Hrs

JSP Overview: The Problem with Servlets, Life Cycle of JSP Page, JSP Processing, JSP Application Design with MVC, Setting Up the JSP Environment JSP Directives, JSP Action, JSP Implicit Objects JSP Form Processing, JSP Session and Cookies Handling.

JSP with DATABASES: JSP Session Tracking JSP Database Access, JSP Standard Tag Libraries, JSP Custom Tag, JSP Expression Language, JSP Exception Handling, JSP XML Processing.

Module-V	Java Server Faces and struts	10 Hrs

Java Server Faces :Introduction to JSF, JSF request processing Life cycle, JSF Expression Language, JSF Standard Component, JSF Facelets Tag, JSF Convertor Tag, JSF Validation Tag, JSF Event Handling and Database Access.

Struts Framework: Basics & Architecture – Request Handling Life Cycle - Building a simple struts– Configuration, Actions, Interceptors, Results, Struts2 Tag Libraries,Struts2 XML based Validations - Database Access

Text Books:
1. Black Book " Java server programming" J2EE, 1st ed., Dream Tech Publishers, 2008. 3. Kathy walrath
2. Complete Reference J2EE by James Keogh mcgraw publication
3. Professional Java Server Programming by SubrahmanyamAllamaraju, Cedric Buest Wiley Publication

Reference Books:
1. SCWCD, Matthew Scarpino, HanumantDeshmukh, JigneshMalavie, Manning publication
2. Core Java, Volume II: Advanced Features by Cay Horstmann and Gary Cornell Pearson Publication
3. Java Persistence with Hibernate by Christian Bauer, Gavin King
4. Spring in Action 3rdedition , Craig walls, Manning Publication
5. Hibernate 2nd edition, Jeff Linwood and Dave Minter, Beginning Après publication
6. Java Server Faces in Action, Kito D. Mann, Manning Publication
7. JDBC™ API Tutorial and Reference, Third Edition, Maydene Fisher, Jon Ellis, Jonathan Bruce, Addison Wesley.
8. Beginning JSP, JSF andTomcat, Giulio Zambon, Apress.
9. JSF2.0 CookBook, Anghel Leonard, PACKT publication

E-resources:
1. https://www.computerscienceonline.org/learn-java/
2. https://docs.oracle.com/javase/tutorial/
3. https://www.tutorialspoint.com/servlets/
4. https://www.tutorialspoint.com/hibernate/index.htm
5. https://www.geeksforgeeks.org/java/

GEETHANJALI INSTITUTE OF SCIENCE & TECHNOLOGY
Unit of USHODAYA EDUCATIONAL SOCIETY
An ISO 9001:2015 certified Institution: Recognized under Sec. 2(f)& 12(B) of UGC Act, 1956
3rd Mile, Bombay Highway, Gangavaram (V), Kovur(M), SPSR Nellore (Dt), Andhra Pradesh, India- 524137
Ph. No. 08622-212769, E-Mail: geethanjali@gist.edu.in, Website: www.gist.edu.in

DESIGN AND ANALYSIS OFALGORITHMS
(Common to CSE, AI&ML, DS, CS)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A05M02a	4: 0:0:0	4	CIE:30 SEE:70	3 Hours	Minors

Course Objectives:

This course will enable students :

- To demonstrate the importance of algorithms in computing.
- To explain the analysis of algorithms
- To illustrate the method of finding the complexity of algorithms
- To explain the advanced algorithm design and analysis techniques.
- To introduce special classes of algorithms NP – completeness and the classes P and NP

Course Outcomes(CO):

On completion of this course, student will be able to

- To interpret the basic concepts of algorithms, Time complexity, Space complexity, Divide and conquer method, Greedy method, dynamic programming, Back tracking, Branch and Bound, NP-Hard and NP-Complete problems   (Remember/Understand)
- To apply Divide and Conquer method and Greedy Method to different problems and compute their time complexity (Apply)
- To apply Dynamic Programming method to different problems   (Apply)
- To apply Backtracking method to different real-world problems   (Apply)
- To apply branch and bound to different problems   (Apply)
- To apply NP-hard and Np-Complete concepts for different problems   (Apply)

Syllabus		Total Hours:48
Module-I	**Introduction & Asymptotic Notations**	**10Hrs**

Introduction:
What is an Algorithm? , Algorithm Specification , Performance Analysis: Space complexity, Time complexity, **Asymptotic Notations:** Big-Oh notation (O), Omega notation (Ω), Theta notation (Θ), Mathematical analysis of Non-Recursive and recursive Algorithms with Examples.

Module-II	**Divide and conquer & Greedy Method**	**9Hrs**

Divide and conquer: General method, Applications-Finding Maximum and minimum, Selection, binary search, quick sort, Strassen's matrix multiplication.

Greedy Method: General method, Applications-job sequencing with deadlines, Fractional knapsack problem, minimum cost spanning trees, Single source shortest path problem.

Module-III	**Dynamic Programming**	**10Hrs**

Dynamic Programming: General method, The Principle of Optimality, Applications- 0/1 knapsack problem, All pairs shortest path problem, Travelling salesperson problem, Optimal Binary Search Tree, Reliability design, Matrix chain multiplication.

Module-IV	**Backtracking**	**9Hrs**

Backtracking: General method, N-Queens problem, Sum of subsets problem , Graph coloring , Hamiltonian cycles.

Branch and Bound: General method, applications - travelling sales person problem, 0/1 knapsack problem- LC branch and bound solution, FIFO branch and bound solution.

Module-V	NP-Complete and NP-Hard problems	10Hrs

NP-Complete and NP-Hard problems:
Basic concepts: deterministic and non deterministic algorithms, Tractable and Intractable Problems , Complexity Classes: P, NP, NP-Hard and NP-Complete

Text Books:
1. Fundamentals of Computer Algorithms, Ellis Horowitz, Sartaj Sahni and Rajasekharam, Galgotia publications Pvt. Ltd.

Reference Books:
1. Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein, 3rd Edition, PHI.
2. Design and Analysis of Algorithms , S. Sridhar, Oxford (Higher Education).
3. Introduction to the Design and Analysis of Algorithms, Anany Levitin:, 2rd Edition, 2009. Pearson.
4. Design and Analysis of Computer Algorithms by Aho, Hopcraft, Ullman 1998, PEA.
5. Introduction to the Design and Analysis of Algorithms by Goodman, Hedetniemi, TMG.

Web References:
1. https://onlinecourses.nptel.ac.in/noc19_cs47/preview
2. https://nptel.ac.in/courses/106106131

GEETHANJALI INSTITUTE OF SCIENCE & TECHNOLOGY
Unit of USHODAYA EDUCATIONAL SOCIETY
An ISO 9001:2015 certified Institution: Recognized under Sec. 2(f)& 12(B) of UGC Act, 1956
3rd Mile, Bombay Highway, Gangavaram (V), Kovur(M), SPSR Nellore (Dt), Andhra Pradesh, India- 524137
Ph. No. 08622-212769, E-Mail: geethanjali@gist.edu.in, Website: www.gist.edu.in

COMPUTER NETWORKS
(Common to CSE, AI&ML, CS, DS)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A05M02b	4: 0:0:0	4	CIE:30 SEE:70	3 Hours	Minors

Course Objectives:

This course will enable students :
- Determine the basic concepts of Computer Networks.
- Determine the layered approach for design of computer networks
- Distinguish OSI and TCP/IP reference models
- Predict the network path used in Internet environment
- Use the format of headers of IP, TCP and UDP
- Illustrate the concepts of application layer, network security fundamentals.

Course Outcomes(CO):

On completion of this course, student will be able to:
- Use the software and hardware components of a computer network (L3)
- Apply the reference model of a computer network(L3)
- Solve the error correction and detection in existing protocols(L3)
- Predict path for routing, and congestion control algorithms(L3)
- Determine the functionality of TCP and UDP(L3)
- Use the appropriate application layer applications(L3)

Syllabus		Total Hours:48
Module-I	**The Internet and the Reference Models**	**10Hrs**

Introduction: Computer Network, Network Topologies, types of networks, Reference models- The OSI Reference Model the TCP/IP Reference Model - A Comparison of the OSI and TCP/IP Reference Models.

Physical Layer –Introduction to physical layer, Guided Media- Twisted-pair cable, Coaxial cable, Fiber optic cable, Unguided media: Wireless-Radio waves, microwaves, infrared..

Module-II	**The Data Link Layer**	**9Hrs**

The Data Link Layer :Data Link Layer Design Issues, Error Detection and Correction, Elementary Data Link Protocols, Sliding Window Protocols

Module-III	**The Network Layer**	**10Hrs**

The Network Layer: Network Layer design issues, Routing algorithms, Congestion control and Internetworking, Network layer in internet.

Module-IV	**Transport Layer**	**9Hrs**

Transport Layer: Transport layer services, service primitives, Elements of transport protocols, The Internet Transport Protocols: TCP/IP, UDP.

Module-V	**The Application Layer and Network security**	**10Hrs**

The Application Layer : DNS, SMTP, FTP, Email and security, network security.

Text Books:
1. Andrew S.Tanenbaum, David j.wetherall, Computer Networks, 5th Edition, PEARSON.
1. James F. Kurose, Keith W. Ross, "Computer Networking: A Top-Down Approach", 6th edition, Pearson, 2019.

Reference Books:
1. Forouzan, Datacommunications and Networking, 5th Edition, McGraw Hill Publication.
2. Youlu Zheng, Shakil Akthar, "Networks for Computer Scientists and Engineers", Oxford Publishers, 2016.

Web Resources:
1. https://nptel.ac.in/courses/106105183/25
2. http://www.nptelvideos.in/2012/11/computer-networks.html
3. https://nptel.ac.in/courses/106105183/3

GEETHANJALI INSTITUTE OF SCIENCE & TECHNOLOGY

Unit of USHODAYA EDUCATIONAL SOCIETY

An ISO 9001:2015 certified Institution: Recognized under Sec. 2(f)& 12(B) of UGC Act, 1956

3rd Mile, Bombay Highway, Gangavaram (V), Kovur(M), SPSR Nellore (Dt), Andhra Pradesh, India- 524137

Ph. No. 08622-212769, E-Mail: geethanjali@gist.edu.in, Website: www.gist.edu.in

FULL STACK WEB DEVELOPMENT (Common **to CSE, AI&ML, CS, DS**)					
Course Code	**L:T:P:S**	**Credits**	**Exam Marks**	**Exam Duration**	**Course Type**
22A0536c	**3:0:0:0**	**3**	**CIE: 30 SEE:70**	**3 Hours**	**PEC**

Course Objectives:

This course will enable students to:

- To become knowledgeable about the most recent web development technologies.
- Idea for creating two tier and three tier architectural web applications.
- Design and analyze real time web applications.
- Constructing suitable client and server-side applications.
- To learn core concept of both front end and back end programming.

Course Outcomes(CO):

On completion of this course, student will be able to

- Summarize the knowledge on front end and back-end Tools
- Develop a fully functioning website on a web server.
- Use code packages based on their documentation to produce working results in a project.
- Construct web pages functioning from external data.
- Implement web application that employing efficient database access.

Syllabus		Total Hours:48
Module-I	**Web Development Basics**	**10Hrs**
Web Development Basics: Web development Basics - HTML & Web servers Shell - UNIX CLI Version control - Git &GitHub HTML, CSS		
Module-II	**Frontend Development**	**9Hrs**
Frontend Development: JavaScript basics OOPS Aspects of JavaScript Memory usage and Functions in JS AJAX for data exchange with server jQuery Framework jQuery events, UI components etc. JSON data format.		
Module-III	**REACT JS**	**10Hrs**
REACT JS: Introduction to React, React Router and Single Page Applications React Forms, Flow Architecture and Introduction to Redux More Redux and Client-Server Communication.		
Module-IV	**Architecture Requirements and Designing**	**9Hrs**
Java Web Development: JAVA PROGRAMMING BASICS, Model View Controller (MVC) Pattern, MVC Architecture using Spring RESTful API using Spring Framework,Building an application usingMaven		
Module-V	**Databases & Deployment**	**10Hrs**
Databases & Deployment: Relational schemas and normalization Structured Query Language (SQL) Data persistence using Spring JDBC Agile development principles.		

Text Books:
1. Web Design with HTML, CSS, JavaScript and JQuery Set Book by Jon Duckett Professional JavaScript for Web Developers Book by Nicholas C. Zakas
2. Learning PHP, MySQL, JavaScript, CSS & HTML5: A Step-byStep Guide to Creating Dynamic Websites by Robin Nixon

Reference Books:
1. Full Stack JavaScript: Learn Backbone.js, Node.js and MongoDB. Copyright © 2015 BYAZAT MARDAN
2. Full-Stack JavaScript Development by Eric Bush.
3. Mastering Full Stack React Web Development Paperback – April 28, 2017 by TomaszDyl , Kamil Przeorski , Maciej Czarnecki

Web References:
1. https://www.udemy.com/course/the-complete-web-development-2020

GEETHANJALI INSTITUTE OF SCIENCE & TECHNOLOGY

Unit of USHODAYA EDUCATIONAL SOCIETY

An ISO 9001:2015 certified Institution: Recognized under Sec. 2(f)& 12(B) of UGC Act, 1956
3rd Mile, Bombay Highway, Gangavaram (V), Kovur(M), SPSR Nellore (Dt), Andhra Pradesh, India- 524137
Ph. No. 08622-212769, E-Mail: geethanjali@gist.edu.in, Website: www.gist.edu.in

OBJECT ORIENTED ANALYSIS AND DESIGN
(Common to CSE, AI&ML, DS, CS)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A05M03a	4:0:0:0	4	CIE: 30 SEE:70	3 Hours	Minors

Course Objectives:

This course will enable students to:

- Understand the concepts of object oriented system
- Unified approach,& Understand object oriented system development methodologies. & Demonstrate UML diagrams
- Model user interface and map object oriented system to relational system

Course Outcomes(CO):

On completion of this course, student will be able to

- Understand the concepts of object model.
- Identify the classes and vocabulary of the problem domain.
- Illustrate the importance of modeling and software development life cycle.
- Draw the class and object diagrams for various applications.
- Apply the basics of behavioral modeling to behavioral diagrams.
- Model the various components and deployment diagram for the applications.

Syllabus		Total Hours:48
Module-I	**Introduction & Asymptotic Notations**	**9Hrs**

Introduction to Object Model: Introduction to object oriented analysis and Design, Iterative development and the Unified Process (UP), UP phases: Inception, Elaboration, Construction and Transition, Object-oriented metrics,the Evaluation of Object Model, Foundation of Object Model, Elements of object Model, Applying object Model.

Module-II	**Classes and Objects**	**10Hrs**

Classes and Objects: The Nature of an Object, Relationships among Objects, The Nature of a Class, Relationships among Classes, The Interplay of Classes and Objects, The Importance of Proper Classification, Identifying Classes and Objects, Key Abstractions and Mechanisms.

Module-III	**Introduction to UML**	**9Hrs**

Introduction to UML: The importance of modeling, Principles of modeling, Object oriented modeling, why model, Conceptual model of UML, Architecture, Software Development Life Cycle.

Module-IV	**Structural Modeling**	**10Hrs**

Basic Structural Modelling: Classes, Relationships, Common Mechanisms, and diagrams, class diagrams.

Advanced Structural Modelling: Advanced classes, advanced relationships, Interfaces, Types and Roles, Packages, Object Diagrams

Module-V	**Behavioral Modeling**	**10Hrs**

Basic Behavioral Modeling: Interactions, Interaction diagrams, use cases, Use case diagrams, Activity Diagrams, Sequence Diagrams, Collaboration and Deployment diagrams.

Advanced Behavioral Modeling: Events and signals, state machines, time and space, state chart diagrams

Text Books:
1. "Object- Oriented Analysis And Design with Applications", Grady BOOCH, Robert A. Maksimchuk, Michael W. ENGLE, Bobbi J. Young, Jim Conallen, Kellia Houston, PEARSON, 3rd edition, 2013.
2. The Unified Modeling Language User Guide", Grady Booch, James Rumbaugh, Ivar Jacobson, PEARSON 12th Impression, 2012

Reference Books:
1. "Object-oriented analysis and design using UML", Mahesh P. Matha, PHI
2. "Head first object-oriented analysis and design", Brett D. McLaughlin, Gary Pollice, Dave West, O'Reilly
3. "Object-oriented analysis and design with the Unified process", John W. Satzinger, Robert B. Jackson, Stephen D. Burd, Cengage Learning

Web Resources:
1. https://www.youtube.com/watch?v=VnVHgj6OPrQ&list=PLAXUYU7PbJhhH0iWvtyD_J2L8mv15pchq

GEETHANJALI INSTITUTE OF SCIENCE & TECHNOLOGY
Unit of USHODAYA EDUCATIONAL SOCIETY
An ISO 9001:2015 certified Institution: Recognized under Sec. 2(f)& 12(B) of UGC Act, 1956
3rd Mile, Bombay Highway, Gangavaram (V), Kovur(M), SPSR Nellore (Dt), Andhra Pradesh, India- 524137
Ph. No. 08622-212769, E-Mail: geethanjali@gist.edu.in, Website: www.gist.edu.in

<table>
<tr><td colspan="6" align="center">No SQL
(Common to CSE, AI&ML, DS, CS)</td></tr>
<tr><td>Course Code</td><td>L:T:P:S</td><td>Credits</td><td>Exam Marks</td><td>Exam Duration</td><td>Course Type</td></tr>
<tr><td>22A05M03b</td><td>4:0:0:0</td><td>4</td><td>CIE: 30 SEE:70</td><td>3 Hours</td><td>Minors</td></tr>
</table>

Course Objectives:
- Discuss the history unstructured data
- To know non-relational databases and their importance in Data science.
- Understand the differences between Relational and No SQL databases
- To explore the several types of No SQL databases and understand the role in Big Data

Course Outcomes(CO):

On completion of this course, student will be able to
- Explain and compare different types of No SQL Databases
- Compare and contrast RDBMS with different No SQL databases.
- Demonstrate the detailed architecture and performance tune of Document-oriented No SQL databases.
- Explain performance tune of Key-Value Pair No SQL databases.
- Explain performance tune of Column-oriented and Graph No SQL databases
- Apply No sql development tools on different types of No SQL Databases.

<table>
<tr><td colspan="2" align="center">Syllabus</td><td>Total Hours:48</td></tr>
<tr><td>Module-I</td><td align="center">Overview and history of No SQL Databases</td><td>8Hrs</td></tr>
<tr><td colspan="3">Definition of the four types of No SQL databases. The value of Relational Databases, Getting at Persistent Data, Concurrency, Integration, Impedance Mismatch, Application and Integration Databases, Attack of the Clusters, The emergence of No SQL, Key Points.</td></tr>
<tr><td>Module-II</td><td align="center">RDBMS Vs No SQL</td><td>8Hrs</td></tr>
<tr><td colspan="3">Comparison of relational databases to new No SQL stores, MongoDB, Cassandra, HBASE, Neo4j use and deployment, Application, RDBMS approach, Challenges No SQL approach, Key-Value and Document Data Models, Column-Family Stores, Aggregated-Oriented Databases, Replication and Sharding, MapReduce on databases, Distribution Models, Single Server, Sharding, Master-Slave Replication, Peer-to-Peer Replication, Combining Sharding and Replication</td></tr>
<tr><td>Module-III</td><td align="center">Document Databases</td><td>8Hrs</td></tr>
<tr><td colspan="3">No-SQL Key-Value Databases using MongoDB, Document Databases, Document oriented Database Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Web Analysis or Real Time Analytics.</td></tr>
<tr><td>Module-IV</td><td align="center">Column Oriented Databases</td><td>12Hrs</td></tr>
<tr><td colspan="3">Column-oriented No SQL databases using Apache HBASE, Column-oriented No SQL databases using Apache Cassandra, Architecture of HBASE, Column-Family Data Store Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Counters, Expiring Usage.</td></tr>
</table>

Module-V	Key Value Databases	12Hrs

No SQL Key-Value databases using Riak, Key-Value Databases, Key-Value Store, Key-Value Store Features, Consistency, Transactions, Query Features, Consistency, Transactions, Query Features, Structure of Data, Scaling, Suitable Use Cases, Storing Session Information, User Profiles, Preferences, Shopping Cart Data, Relationships among Data, Multi operation Transactions, Query by Data, Operations by Sets, Firebase- Cloud hosted No SQL Database, Graph No SQL databases using Neo4j, No SQL database development tools and programming languages, Graph Databases features, consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases.

Text Books:
1. Sadalage, P. & Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Wiley Publications, 1st Edition 2019.

Reference Books:
1. NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence Paperback – Illustrated, 8 August 2012 by Martin Fowler (Author), Pramod Sadalage (Author)

Web References:
1. https://www.ibm.com/cloud/learn/nosql-databases
2. https://www.coursera.org/lecture/nosql-databases/introduction-to-nosql-VdRNp
3. https://www.geeksforgeeks.org/introduction-to-nosql/
4. https://www.javatpoint.com/nosql-databa

GEETHANJALI INSTITUTE OF SCIENCE & TECHNOLOGY
Unit of USHODAYA EDUCATIONAL SOCIETY
An ISO 9001:2015 certified Institution: Recognized under Sec. 2(f)& 12(B) of UGC Act, 1956
3rd Mile, Bombay Highway, Gangavaram (V), Kovur(M), SPSR Nellore (Dt), Andhra Pradesh, India- 524137
Ph. No. 08622-212769, E-Mail: geethanjali@gist.edu.in, Website: www.gist.edu.in

DEEP LEARNING
(Common to CSE, AI&ML, DS, CS)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A05M03c	**4:0:0:0**	**4**	**CIE: 30 SEE:70**	**3 Hours**	**Minors**

Course Objectives:

This course will enable students to:
- Demonstrate the major technology trends driving Deep Learning
- Build, train, and apply fully connected deep neural networks
- Implement efficient neural networks
- Analyse the key parameters and hyper parameters in a neural network's architecture

Course Outcomes(CO):

On completion of this course, student will be able to
- Apply Mathematical Operations on Neural Network. (L3)
- Choose proper Hyperparameters.(L4)
- Examine architecture of Deep Neural Network.(L3)
- Apply Convolutional Neural Networks in Image Classifications. (L3)
- Use RNN and LSTMs in Real time applications.(L3)
- Analyze different types of Autoencoders.(L4).

Syllabus		Total Hours:48
Module-I	**Linear Algebra**	**10Hrs**

Scalars, Vectors, Matrices and Tensors, Matrix operations, types of matrices, Norms, Eigen decomposition, Singular Value Decomposition, Principal Components Analysis.

Information Theory. Numerical Computation: Overflow and Underflow, Gradient-Based Optimization, Constrained Optimization, Linear Least Squares.

Module-II	**Fundamentals of Neural Networks and Deep Learning**	**9Hrs**

Neural Networks, Training Neural Networks, Activation Functions, Loss Functions, Hyper parameters, Building blocks of Deep Neural Networks.

Module-III	**Convolutional Networks**	**10Hrs**

The Convolution Operation, Pooling, Convolution, Basic Convolution Functions, Structured Outputs, Data Types, Efficient Convolution Algorithms, Random or Unsupervised Features, Basis for Convolutional Networks..

Module-IV	**Recurrent and Recursive Neural Networks**	**9Hrs**

Recurrent Neural Network: Modelling Time Dimension, 3D Volumetric Input, General Recursive Neural Network Architecture, LSTM Networks, Applications.

Recursive Neural Network: Architecture, Varieties of RNN, Applications of RNN.

Module-V	**AutoEncoders**	**10Hrs**

Undercomplete Autoencoders, Regularized Autoencoders, Representational Power, Layer Size and Depth, Stochastic Encoders and Decoders, Denoising Autoencoders..

Text Book:
1. Ian Goodfellow, YoshuaBengio, Aaron Courville, "Deep Learning", MIT Press,2016.
2. Josh Patterson and Adam Gibson, "Deep learning: A practitioner's approach", O'Reilly Media, First Edition, 2017

Reference Books:
1. Fundamentals of Deep Learning, Designing next-generation machine intelligence algorithms, Nikhil Buduma, O'Reilly, Shroff Publishers, 2019.
2. Deep learning Cook Book, Practical recipes to get started Quickly, DouweOsinga, O'Reilly, Shroff Publishers, 2019.

E-resources:
1. https://keras.io/datasets/
2. http://deeplearning.net/tutorial/deeplearning.pdf
3. https://arxiv.org/pdf/1404.7828v4.pdf
4. https://www.cse.iitm.ac.in/~miteshk/CS7015.html
5. https://www.deeplearningbook.org
6. https://nptel.ac.in/courses/106105215