



## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

### B. Tech CSE (AI&ML) (R23) COURSE STRUCTURE & SYLLABUS

(Applicable from the academic year 2023-24 and onwards)

<b>III B. Tech I Semester</b>	<b>INFORMATION RETRIEVAL SYSTEMS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Unit I: Introduction to Information storage and retrieval systems:** Domain Analysis of IR systems, IR and other types of Information Systems, IR System Evaluation **Introduction to Data structures and algorithms related to Information Retrieval:** Basic Concepts, Data structures, Algorithms.

**Unit II: Inverted Files and Signature Files:** Introduction, Structures used in Inverted Files, building an Inverted file using a sorted array, Modifications to the Basic Techniques.

**Signature Files:** Concepts of Signature files, Compression, Vertical Partitioning, Horizontal Partitioning.

**Unit III: New Indices for Text, Lexical Analysis and Stoplists: PAT Trees and PAT Arrays:** Introduction, PAT Tree structure, Algorithms on the PAT Trees, Building PAT Trees as PATRICIA Trees, PAT representation as Arrays. Stoplists.

**Unit IV: Stemming Algorithms and Thesaurus Construction:** Types of Stemming algorithms, Experimental Evaluations of Stemming, stemming to Compress Inverted Files.

**Thesaurus Construction:** Features of Thesauri, Thesaurus Construction, Thesaurus construction from Texts, Merging existing Thesauri.

**Unit V: String Searching Algorithms:** Introduction, Preliminaries, The Naive Algorithm, The Knutt-Morris-Pratt Algorithm, The Boyer-Moore Algorithm, The Shift-Or Algorithm, The Karp-Rabin Algorithm.

### TEXT BOOKS

1. Modern Information Retrieval, Ricardo Baeza-Yates, Neto, PEA, 2007.
2. Information Storage and Retrieval Systems: Theory and Implementation, Kowalski, Gerald, Mark Academic Press, 2000.



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<b>III B. Tech I Semester</b>	<b>COMPUTER NETWORKS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

#### Course Objectives:

- To understand the Fundamental Concepts related to sources, shadows and shading
- To understand the Geometry of Multiple Views

**UNIT I: Introduction:** Types of Computer Networks, Reference Models- The OSI Reference Model, The TCP/IP Reference Model, A Critique of the OSI Model and Protocols, A Critique of the TCP/IP Reference Model. History of Internet.

**UNITII: The Data Link Layer:** Transmission Media, Guided and Un-guided media, Data Link Layer Design Issues, Services Provided to the Network Layer, Error detecting and Error Correcting codes, Elementary Data Link Protocols, Sliding Window Protocols, HDLC, PPP. Multiple Access Protocols Wired Lans: Ethernet, Fast Ethernet, Gigabit Ethernet

**UNITIII: The Network Layer:** Network Layer Design Issues, Routing Algorithms, Congestion, Congestion control algorithms. The Network Layer in the Internet, The IP Version 4 Protocol, IP Addresses- Classful, CIDR, NAT, IP Version 6 Protocol, Transition from IPV4 to IPV6

**UNITIV: The Transport Layer:** The Transport Layer Services, Transport Layer Protocols: UDP, TCP and SCTP

**UNITV: The Application Layer:** The World Wide Web, HTTP, Domain Name Space, Remote Logging, Electronic Mail and File Transfer

#### Text Books:

1. "Computer Networks", Andrew S Tanenbaum, David J Wetherall, 5<sup>th</sup> Edition, Pearson
2. "Data Communications and Networking", Behrouz A Forouzan, 4<sup>th</sup> Edition, Tata McGraw Hill Education

#### Reference Books:

1. "Data and Computer Communication", William Stallings, Pearson
2. "TCP/IP Protocol Suite", Behrouz Forouzan, McGraw Hill.



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III B. Tech I Semester	OPERATING SYSTEMS	L	T	P	C
		3	0	0	3

**UNIT-I: Operating Systems Overview:** Introduction, operating system functions, operating systems operations, Computing environments, Free and Open-Source Operating Systems System Structures: Operating System Services, User and Operating-System Interface, system calls, Types of System Calls, system programs, operating system Design and Implementation, operating system structure, Building and Booting an Operating System, Operating system debugging

**UNIT-II: Processes:** Process Concept, Process scheduling, Operations on processes, Inter-process communication. Threads and Concurrency: Multithreading models, Thread libraries, Threading issues. CPU Scheduling: Basic concepts, Scheduling criteria, Scheduling algorithms, Multiple processor scheduling.

**UNIT-III: Synchronization Tools:** The Critical Section Problem, Peterson's Solution, Mutex Locks, semaphores, Monitors, Classic problems of Synchronization. Deadlocks: system Model, Deadlock characterization, Methods for handling Deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from Deadlock.

**UNIT-IV: Memory- Management Strategies:** Introduction, Contiguous memory allocation, Paging, Structure of the Page Table, Swapping. Virtual Memory Management: Introduction, Demand paging, Copy-on-write, Page replacement Allocation of frames, Thrashing Storage Management: Overview of Mass Storage Structure, HDD Scheduling.

**UNIT-V: File System:** File System Interface: File concept, Access methods, Directory Structure; File system Implementation: File-system structure, File-system Operations, Directory implementation, Allocation method, Free space management; File-System Internals: File-System Mounting, Partitions and Mounting, File Sharing. Protection: Goals of protection, Principles of protection, Protection Rings, Domain of protection, Access matrix

#### Text Books:

1. Operating System Concepts, Silberschatz A, GalvinPB, GagneG, 10<sup>th</sup> Edition, Wiley, 2018.
2. Modern Operating Systems, Tanenbaum AS, 4<sup>th</sup> Edition, Pearson ,2016

#### Reference Books:

1. Operating Systems -Internals and Design Principles, Stallings W, 9<sup>th</sup> edition, Pearson, 2018
2. Operating Systems: A Concept Based Approach, D. M Dhamdhere, 3<sup>rd</sup> Edition, McGraw- Hill, 2013

#### Online Learning Resources:

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



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III B. Tech I Semester	SOFTWARE ENGINEERING	L	T	P	C
		3	0	0	3

#### Course Objectives:

The objectives of this course are to introduce

- Software life cycle models, Software requirements and SRS document.
- Project Planning, quality control and ensuring good quality software.
- Software Testing strategies, use of CASE tools, Implementation issues, validation & verification procedures.

**UNIT-I: Introduction:** Evolution, Software development projects, Exploratory style of software developments, Emergence of software engineering, Notable changes in software development practices, Computer system engineering.

**Software Life Cycle Models:** Basic concepts, Waterfall model and its extensions, Rapid application development, Agile development model, Spiral model.

**UNIT-II: Software Project Management:** Software project management complexities, Responsibilities of a software project manager, Metrics for project size estimation, Project estimation techniques, Empirical Estimation techniques, COCOMO, Halstead's software science, risk management.

**Requirements Analysis and Specification:** Requirements gathering and analysis, Software Requirements Specification (SRS), Formal system specification, Axiomatic specification, Algebraic specification, Executable specification and 4GL.

**UNIT-III: Software Design:** Overview of the design process, how to characterize a good software design? Layered arrangement of modules, Cohesion and Coupling. approaches to software design. Agility: Agility and the Cost of Change, Agile Process, Extreme Programming (XP), Other Agile Process Models, Tool Set for the Agile Process (Text Book 2)

**Function-Oriented Software Design:** Overview of SA/SD methodology, Structured analysis, Developing the DFD model of a system, Structured design, Detailed design, and Design Review.

**User Interface Design:** Characteristics of a good user interface, Basic concepts, Types of user interfaces, Fundamentals of component-based GUI development, and user interface design methodology.

**UNIT-IV: Coding and Testing:** Coding, Code review, Software documentation, Testing, Black-box testing, White-Box testing, Debugging, Program analysis tools, Integration testing, testing object-oriented programs, Smoke testing, and Some general issues associated with testing.

**Software Reliability and Quality Management:** Software reliability. Statistical testing, Software quality. Software quality management system, ISO9000. SEICapability maturity model. Few other Important quality standards, and Six Sigma.



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**UNIT-V: Computer-Aided Software Engineering (Case):** CASE and its scope, CASE environment, CASE support in the software life cycle, other characteristics of CASE tools, Towards second generation CASE Tool, and Architecture of a CASE Environment.

**Software Maintenance:** Characteristics of software maintenance, Software reverse engineering, Software maintenance process models and Estimation of maintenance cost.

**Software Reuse:** Reuse-definition, introduction, reason behind no reuse so far, Basic issues in any reuse program, A reuse approach, and Reuse at organization level.

#### Text Books:

1. Fundamentals of Software Engineering, Rajib Mall, 5<sup>th</sup> Edition, PHI.
2. Software Engineering A Practitioner's Approach, Roger S. Pressman, 9<sup>th</sup> Edition, McGraw Hill International Edition.

#### Reference Books:

1. Software Engineering ,Ian Sommerville, 10<sup>th</sup> Edition, Pearson.
2. Software Engineering, Principles and Practices, Deepak Jain, Oxford University Press.

#### e-Resources:

- 1) <https://nptel.ac.in/courses/106/105/106105182/>
- 2) [https://infyspringboard.onwingspan.com/web/en/app/toc/lex\\_auth\\_01260589506387148827\\_shared/overview](https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01260589506387148827_shared/overview)
- 3) [https://infyspringboard.onwingspan.com/web/en/app/toc/lex\\_auth\\_013382690411003904735\\_shared/overview](https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013382690411003904735_shared/overview)



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III B. Tech I Semester	CLOUD COMPUTING	L	T	P	C
		3	0	0	3

#### Course Objectives:

- To explain the evolving utility computing model called cloud computing.
- To introduce the various levels of services offered by cloud.
- To discuss the fundamentals of cloud enabling technologies such as distributed computing, service-oriented architecture and virtualization.
- To emphasize the security and other challenges in cloud computing.
- To introduce the advanced concepts such as containers, serverless computing and cloud-centric Internet of Things.

**UNIT -I: Introduction to Cloud Computing Fundamentals:** Cloud computing at a glance, defining a cloud, cloud computing reference model, types of services (IaaS, PaaS, SaaS), cloud deployment models (public, private, hybrid), utility computing, cloud computing characteristics and benefits, cloud service providers (Amazon Web Services, Microsoft Azure, Google App Engine).

**UNIT-II: Cloud Enabling Technologies:** Ubiquitous Internet, parallel and distributed computing, elements of parallel computing, hardware architectures for parallel computing (SISD, SIMD, MISD, MIMD), elements of distributed computing, Inter-process communication, technologies for distributed computing, remote procedure calls (RPC), service-oriented architecture (SOA), Web services, virtualization.

**UNIT-III: Virtualization and Containers:** Characteristics of virtualized environments, taxonomy of virtualization techniques, virtualization and cloud Computing, pros and cons of virtualization, technology examples (XEN, VMware), building blocks of containers, container platforms (LXC, Docker), container orchestration, Docker Swarm and Kubernetes, public cloud VM (e.g. Amazon EC2) and container (e.g. Amazon Elastic Container Service) offerings.

**UNIT-IV: Cloud computing challenges:** Economics of the cloud, cloud interoperability and standards, scalability and fault tolerance, energy efficiency in clouds, federated clouds, cloud computing security, fundamentals of computer security, cloud security architecture, cloud shared responsibility model, security in cloud deployment models.

**UNIT -V: Advanced concepts in cloud computing:** Serverless computing, Function-as-a-Service, serverless computing architecture, public cloud (e.g. AWS Lambda) and open-source (e.g. OpenFaaS) serverless platforms, Internet of Things (IoT), applications, cloud-centric IoT and layers, edge and fog computing, DevOps, infrastructure-as-code, quantum cloud computing.



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#### Text Books:

1. Mastering Cloud Computing, 2<sup>nd</sup> edition, RajkumarBuyya, Christian Vecchiola, ThamaraiSelvi, ShivanandaPoojara, Satish N. Srirama, Mc Graw Hill, 2024.
2. Distributed and Cloud Computing, Kai Hwang, Geoffery C. Fox, Jack J. Dongarra, Elsevier, 2012.

#### Reference Books:

1. Cloud Computing, Theory and Practice, Dan C Marinescu, 2<sup>nd</sup> edition, MK Elsevier, 2018.
2. Essentials of cloud Computing, K. Chandrasekhran, CRC press, 2014.
3. Online documentation and tutorials from cloud service providers (e.g., AWS, Azure, GCP)



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III B. Tech I Semester	INTERNET OF THINGS	L	T	P	C
		3	0	0	3

#### Course Objectives:

- Vision and Introduction to Internet of Things(IoT).
- Understand IoT Market perspective.
- Data and Knowledge Management and use of Devices in IoT Technology.
- Understand State of the Art – IoT Architecture.
- Understand Real World IoT Design Constraints, Industrial Automation and Commercial.

**UNIT I: The Internet of Things:** An Overview of Internet of things, Internet of Things Technology, behind IoTs Sources of the IoTs, M2M Communication, Examples of IoTs, Design Principles for Connected Devices Internet Connectivity Principles, Internet connectivity, Application Layer Protocols: HTTP, HTTPS, FTP, Telnet.

**UNIT II:** Business Models for Business Processes in the Internet of Things, IoT/M2M systems LAYERS AND designs standardizations, Modified OSI Stack for the IoT/M2M Systems, ETSI M2M domains and High- level capabilities ,Communication Technologies, Data Enrichment and Consolidation and Device Management Gateway Ease of designing and affordability

**UNIT III:** Design Principles for the Web Connectivity for Connected-Devices, Web Communication protocols for Connected Devices, Message Communication protocols for Connected Devices, Web Connectivity for Connected-Devices.

**UNIT IV:** Data Acquiring, Organizing and Analytics in IoT/M2M, Applications /Services /Business Processes, IOT/M2M Data Acquiring and Storage, Business Models for Business Processes in the Internet Of Things, Organizing Data, Transactions, Business Processes, Integration and Enterprise Systems.

**UNIT V:** Data Collection, Storage and Computing Using a Cloud Platform for IoT/M2M Applications/Services, Data Collection, Storage and Computing Using cloud platform Everything as a service and Cloud Service Models, IOT cloud-based services using the Xively (Pachube/COSM), Nimbots and other platforms Sensor, Participatory Sensing, Actuator, Radio Frequency Identification, and Wireless, Sensor Network Technology, Sensors Technology, Sensing the World.

#### Text Books:

1. Internet of Things: Architecture, Design Principles And Applications, Rajkamal, McGraw Hill Higher Education
2. Internet of Things, A.Bahgya and V.Madisetti, Univesity Press, 2015

#### Reference Books:

1. **Designing the Internet of Things, Adrian McEwen and Hakim Cassimally,Wiley**
2. Getting Started with the Internet of Things, CunoPfister ,Oreilly



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<b>III B. Tech I Semester</b>	<b>EXPLORATORY DATA ANALYSIS WITH PYTHON</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Course Objectives:** The main objectives of the course are to

- Introduce the fundamentals of Exploratory Data Analysis
- Cover essential exploratory techniques for understanding multivariate data by summarizing it through statistical methods and graphical methods.
- Evaluate the Models and select the best model

**UNIT-I: Exploratory Data Analysis Fundamentals:** Understanding data science, the significance of EDA, steps in EDA, Making sense of data, Numerical data, Categorical data, Measurement scales, Comparing EDA with classical and Bayesian analysis, Software tools available for EDA, Getting started with EDA.

**Sample Experiments:**

1. a) Download Dataset from Kaggle using the following link :  
<https://www.kaggle.com/datasets/sukhmanibedi/cars4u>
- b) Install python libraries required for Exploratory Data Analysis (numpy, pandas, matplotlib, seaborn)
2. Perform Numpy Array basic operations and Explore Numpy Built-in functions.
3. Loading Dataset into pandas dataframe
4. Selecting rows and columns in the dataframe

**UNIT-II: Visual Aids for EDA:** Technical requirements, Line chart, Bar charts, Scatter plot using seaborn, Polar chart, Histogram, Choosing the best chart

**Case Study:** EDA with Personal Email, Technical requirements, Loading the dataset, Data transformation, Data cleansing, Applying descriptive statistics, Data refactoring, Data analysis.

**Sample Experiments:**

1. Apply different visualization techniques using sample dataset
  - a. Line Chart b. Bar Chart c. Scatter Plots d.Bubble Plot
2. Generate Scatter Plot using seaborn library for iris dataset
3. Apply following visualization Techniques for a sample dataset
  - a. Area Plot b. Stacked Plot c. Pie chart d. Table Chart
4. Generate the following charts for a dataset.
  - a. Polar Chart b. Histogram c.Lollipop chart
5. Case Study: Perform Exploratory Data Analysis with Personal Email Data

**UNIT-III: Data Transformation:** Merging database-style data frames, Concatenating along with an axis, Merging on index, Reshaping and pivoting, Transformation techniques, Handling missing data, Mathematical operations with NaN, Filling missing values, Discretization and binning, Outlier detection and filtering, Permutation and random sampling, Benefits of data transformation, Challenges.

**Sample Experiments:**



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1. Perform the following operations
  - a) Merging Dataframes      b) Reshaping with Hierarchical Indexing
  - c) Data Deduplication    d) Replacing Values
2. Apply different Missing Data handling techniques
  - a)NaN values in mathematical Operations      b) Filling in missing data
  - c) Forward and Backward filling of missing values    d) Filling with index values
  - e) Interpolation of missing values
3. Apply different data transformation techniques
  - a) Renaming axis indexes      b) Discretization and Binning
  - c) Permutation and Random Sampling      d) Dummy variables

**UNIT-IV : Descriptive Statistics:** Distribution function, Measures of central tendency, Measures of dispersion, Types of kurtosis, Calculating percentiles, Quartiles, Grouping Datasets, Correlation, Understanding univariate, bivariate, multivariate analysis, Time Series Analysis

**Sample Experiments:**

1. Study the following Distribution Techniques on a sample data
  - a) Uniform Distribution    b) Normal Distribution    c) Gamma Distribution
  - d) Exponential Distribution    e) Poisson Distribution    f) Binomial Distribution
2. Perform Data Cleaning on a sample dataset.
3. Compute measure of Central Tendency on a sample dataset
  - a) Mean    b) Median    c) Mode
4. Explore Measures of Dispersion on a sample dataset
  - a) Variance    b) Standard Deviation    c) Skewness    d) Kurtosis
5. a) Calculating percentiles on sample dataset
  - b) Calculate Inter Quartile Range(IQR) and Visualize using Box Plots
6. Perform the following analysis on automobile dataset.
  - a) Bivariate analysis    b) Multivariate analysis
7. Perform Time Series Analysis on Open Power systems dataset

**UNIT-V: Model Development and Evaluation:** Unified machine learning workflow, Data preprocessing, Data preparation, Training sets and corpus creation, Model creation and training, Model evaluation, Best model selection and evaluation, Model deployment

Case Study: EDA on Wine Quality Data Analysis

**Sample Experiments:**

1. Perform hypothesis testing using stats models library
  - a) Z-Test    b)T-Test
2. Develop model and Perform Model Evaluation using different metrics such as prediction score, R2 Score, MAE Score, MSE Score.
3. Case Study: Perform Exploratory Data Analysis with Wine Quality Dataset



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**Text Book:**

1. Suresh Kumar Mukhiya, Usman Ahmed, Hands-On Exploratory Data Analysis with Python, Packt Publishing, 2020.

**Reference Books:**

1. Ronald K. Pearson, Exploratory Data Analysis Using R, CRC Press, 2020
2. RadhikaDatar, Harish Garg, Hands-On Exploratory Data Analysis with R: Become an expert in exploratory data analysis using R packages, 1st Edition, Packt Publishing, 2019

**Web References:**

1. <https://github.com/PacktPublishing/Hands-on-Exploratory-Data-Analysis-with-Python>
2. <https://www.analyticsvidhya.com/blog/2022/07/step-by-step-exploratory-dataanalysis-eda-using-python/#h-conclusion>
3. <https://github.com/PacktPublishing/Exploratory-Data-Analysis-with-Python-Cookbook>



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III B.Tech I Semester	AUTOMATA THEORY AND COMPILER DESIGN	L	T	P	C
		3	0	0	3

**UNIT – I: Introduction to Finite Automata:** Structural Representations, Automata and Complexity, the Central Concepts of Automata Theory – Alphabets, Strings, Languages, Problems. Nondeterministic Finite Automata: Formal Definition, an application, Text Search, Finite Automata with Epsilon-Transitions. **Deterministic Finite Automata:** Definition of DFA, How A DFA Process Strings, The language of DFA, Conversion of NFA with  $\epsilon$ -transitions to NFA without  $\epsilon$ -transitions. Conversion of NFA to DFA

**UNIT – II: Regular Expressions:** Finite Automata and Regular Expressions, Applications of Regular Expressions, Algebraic Laws for Regular Expressions, Conversion of Finite Automata to Regular Expressions. Pumping Lemma for Regular Languages: Statement of the pumping lemma, Applications of the Pumping Lemma. **Context-Free Grammars:** Definition of Context-Free Grammars, Derivations Using a Grammar, Leftmost and Rightmost Derivations, the Language of a Grammar, Parse Trees, Ambiguity in Grammars and Languages.

**UNIT – III: Push Down Automata:** Definition of the Pushdown Automaton, the Languages of a PDA, Equivalence of PDA's and CFG's, Acceptance by final state Turing Machines: Introduction to Turing Machine, Formal Description, Instantaneous description, The language of a Turing machine Undecidability: Undecidability, A Language that is Not Recursively Enumerable, An Undecidable Problem That is RE, Undecidable Problems about Turing Machines

**UNIT - IV Introduction:** The structure of a compiler, Lexical Analysis: The Role of the Lexical Analyzer, Input Buffering, Recognition of Tokens, The Lexical- Analyzer Generator Lex, Syntax Analysis: Introduction, Context-Free Grammars, Writing a Grammar, Top-Down Parsing, Bottom- Up Parsing, Introduction to LR Parsing: Simple LR, More Powerful LR Parsers R18 B.Tech. CS&D Syllabus JNTU Hyderabad

**UNIT - V Syntax-Directed Translation:** Syntax-Directed Definitions, Evaluation Orders for SDD's, Syntax Directed Translation Schemes, Implementing L-Attributed SDD's. Intermediate-Code Generation: Variants of Syntax Trees, Three-Address Code Run-Time Environments: Stack Allocation of Space, Access to Nonlocal Data on the Stack, Heap Management



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**TEXT BOOKS:**

1. Introduction to Automata Theory, Languages, and Computation, 3nd Edition, John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, Pearson Education.
2. Compilers: Principles, Techniques and Tools, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffry D. Ullman, 2nd Edition, Pearson.
3. Theory of Computer Science – Automata languages and computation, Mishra and Chandrashekaran, 2nd Edition, PHI.

**REFERENCE BOOKS:**

1. Introduction to Formal languages Automata Theory and Computation, Kamala Krithivasan, Rama R, Pearson.
2. Introduction to Languages and The Theory of Computation, John C Martin, TMH.
3. lex&yacc – John R. Levine, Tony Mason, Doug Brown, O'reilly
4. Compiler Construction, Kenneth C. Louden, Thomson. Course Technology.



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III B. Tech I Semester	INFORMATION RETRIEVAL LAB	L	T	P	C
		0	0	3	1.5

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

- Compute the similarity between text documents
- Apply all pre-processing steps for text-data
- Implement classification of text documents.
- Perform document clustering using different algorithms.
- Implement PageRank algorithm for any network.

**Programming Language:** Python/R

#### Lab Experiments:

1. Representation of a Text Document in Vector Space Model and Computing Similarity between two documents.
2. Pre-processing of a Text Document: stop word removal and stemming
3. Construction of an Inverted Index for a given document collection comprising of at least 50 documents with a total vocabulary size of at least 1000 words.
4. Classification of a set of Text Documents into known classes (You may use any of the Classification algorithms like Naive Bayes, Max Entropy, Rochio's, Support Vector Machine). Standard Datasets will have to be used to show the results.
5. Text Document Clustering using K-means. Demonstrate with a standard dataset and compute performance measures- Purity, Precision, Recall and F-measure.
6. Crawling/ Searching the Web to collect news stories on a specific topic (based on user input). The program should have an option to limit the crawling to certain selected websites only.
7. To parse XML text, generate Web graph and compute topic specific page rank
8. Implement Matrix Decomposition and LSI for a standard dataset.
9. Mining Twitter to identify tweets for a specific period (and/or from a geographical location) and identify trends and named entities.
10. Implementation of PageRank on Scholarly Citation Network.



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III B. Tech I Semester	COMPUTER NETWORKS LAB	L	T	P	C
		0	0	3	1.5

#### List of Experiments:

1. Study of Network devices in detail and connect the computers in Local Area Network.
2. Write a Program to implement the data link layer framing methods such as
  - i) Character stuffing ii) bit stuffing.
3. Write a Program to implement data link layer framing method checksum.
4. Write a program for Hamming Code generation for error detection and correction.
5. Write a Program to implement on a data set of characters the three CRC polynomials – CRC 12, CRC 16 and CRC CCIP.
6. Write a Program to implement Sliding window protocol for Goback N.
7. Write a Program to implement Sliding window protocol for Selective repeat.
8. Write a Program to implement Stop and Wait Protocol.
9. Write a program for congestion control using leaky bucket algorithm
10. Write a Program to implement Dijkstra's algorithm to compute the Shortest path through a graph.
11. Write a Program to implement Distance vector routing algorithm by obtaining routing table at each node (Take an example subnet graph with weights indicating delay between nodes).
12. Write a Program to implement Broadcast tree by taking subnet of hosts.
13. Wireshark
  - i. Packet Capture Using Wire shark
  - ii. Starting Wire shark
  - iii. Viewing Captured Traffic
  - iv. Analysis and Statistics & Filters.
14. How to run Nmap scan
15. Operating System Detection using Nmap
16. Do the following using NS2 Simulator
  - i. NS2 Simulator-Introduction
  - ii. Simulate to Find the Number of Packets Dropped
  - iii. Simulate to Find the Number of Packets Dropped by TCP/UDP
  - iv. Simulate to Find the Number of Packets Dropped due to Congestion
  - v. Simulate to Compare Data Rate & Throughput.



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA**  
KAKINADA – 533 003, Andhra Pradesh, India  
**B. Tech CSE (AI&ML) (R23) COURSE STRUCTURE & SYLLABUS**  
**(Applicable from the academic year 2023-24 and onwards)**

III B. Tech I Semester	<b>FULL STACK DEVELOPMENT- 2</b>	L	T	P	C
		0	0	2	1

**Course Objectives:**

The main objectives of the course are to

- Make use of router, template engine and authentication using sessions to develop application in ExpressJS.
- Build a single page application using RESTful APIs in ExpressJS
- Apply router and hooks in designing ReactJS application
- Make use of MongoDB queries to perform CRUD operations on document database

**Experiments covering the Topics:**

- Typescript
- ExpressJS – Routing, HTTP Methods, Middleware, Templating, Form Data
- ExpressJS – Cookies, Sessions, Authentication, Database, RESTful APIs
- ReactJS – Render HTML, JSX, Components – function & Class, Props and States, Styles, Respond to Events
- ReactJS – Conditional Rendering, Rendering Lists, React Forms, React Router, Updating the Screen
- ReactJS – Hooks, Sharing data between Components, Applications – To-do list and Quiz
- MongoDB – Installation, Configuration, CRUD operations, Databases, Collections and Records

**Sample Experiments:**

**1. Typescript**

- a. Write a program to understand simple and special types.
- b. Write a program to understand function parameter and return types.
- c. Write a program to show the importance with Arrow function. Use optional, default and REST parameters.
- d. Write a program to understand the working of typescript with class, constructor, properties, methods and access specifiers.
- e. Write a program to understand the working of namespaces and modules.
- f. Write a program to understand generics with variables, functions and constraints.

**2. Express JS – Routing, HTTP Methods, Middleware.**

- a. Write a program to define a route, Handling Routes, Route Parameters, Query Parameters and URL building.
- b. Write a program to accept data, retrieve data and delete a specified resource using http methods.
- c. Write a program to show the working of middleware.

**3. Express JS – Templating, Form Data**

- a. Write a program using templating engine.
- b. Write a program to work with form data.

**4. Express JS – Cookies, Sessions, Authentication**

- a. Write a program for session management using cookies and sessions.
- b. Write a program for user authentication.



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(Applicable from the academic year 2023-24 and onwards)

#### 5. ExpressJS – Database, RESTful APIs

- Write a program to connect MongoDB database using Mongoose and perform CRUD operations.
- Write a program to develop a single page application using RESTful APIs.

#### 6. ReactJS – Render HTML, JSX, Components – function & Class

- Write a program to render HTML to a web page.
- Write a program for writing markup with JSX.
- Write a program for creating and nesting components (function and class).

#### 7. ReactJS – Props and States, Styles, Respond to Events

- Write a program to work with props and states.
- Write a program to add styles (CSS & Sass Styling) and display data.
- Write a program for responding to events.

#### 8. ReactJS – Conditional Rendering, Rendering Lists, React Forms

- Write a program for conditional rendering.
- Write a program for rendering lists.
- Write a program for working with different form fields using react forms.

#### 9. ReactJS – React Router, Updating the Screen

- Write a program for routing to different pages using react router.
- Write a program for updating the screen.

#### 10. ReactJS – Hooks, Sharing data between Components

- Write a program to understand the importance of using hooks.
- Write a program for sharing data between components.

#### 11. ReactJS Applications – To-do list and Quiz

- Design to-do list application.

#### 12. MongoDB – Installation, Configuration, CRUD operations

- Install MongoDB and configure ATLAS
- Write MongoDB queries to perform CRUD operations on document using insert(), find(), update(), remove()

#### 13. MongoDB – Databases, Collections and Records

- Write MongoDB queries to Create and drop databases and collections.
- Write MongoDB queries to work with records using find(), limit(), sort(), createIndex(), aggregate().

#### 14. Augmented Programs: (Any 2 must be completed)

- Design a to-do list application using NodeJS and ExpressJS.
- Design a Quiz app using ReactJS.
- Complete the MongoDB certification from MongoDB University website.

#### Text Books:

- Programming the World Wide Web, 7<sup>th</sup> Edition, Robert W. Sebesta, Pearson, 2013.
- Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node, Vasan Subramanian, 2<sup>nd</sup> edition, APress, O'Reilly.



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**Web Links:**

1. ExpressJS - <https://www.tutorialspoint.com/expressjs>
2. ReactJS - <https://www.w3schools.com/REACT> (and) <https://react.dev/learn#>
3. MongoDB - <https://learn.mongodb.com/learning-paths/introduction-to-mongodb>



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(Applicable from the academic year 2023-24 and onwards)

III B.Tech I Semester	<b>TINKERING LAB (USER INTERFACE DESIGN USING FLUTTER)</b>	L	T	P	C
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#### Course Objectives:

- Learns to Implement Flutter Widgets and Layouts
- Understands Responsive UI Design and with Navigation in Flutter
- Knowledge on Widges and customize widgets for specific UI elements, Themes
- Understand to include animation apart from fetching data

#### List of Experiments:

Students need to implement the following experiments

1. a) Install Flutter and Dart SDK.  
b) Write a simple Dart program to understand the language basics.
2. a) Explore various Flutter widgets (Text, Image, Container, etc.).  
b) Implement different layout structures using Row, Column, and Stack widgets.
3. a) Design a responsive UI that adapts to different screen sizes.  
b) Implement media queries and breakpoints for responsiveness.
4. a) Set up navigation between different screens using Navigator.  
b) Implement navigation with named routes.
5. a) Learn about stateful and stateless widgets.  
b) Implement state management using set State and Provider.
6. a) Create custom widgets for specific UI elements.  
b) Apply styling using themes and custom styles.
7. a) Design a form with various input fields.  
b) Implement form validation and error handling.
8. a) Add animations to UI elements using Flutter's animation framework.  
b) Experiment with different types of animations (fade, slide, etc.).
9. a) Fetch data from a REST API.  
b) Display the fetched data in a meaningful way in the UI.
10. a) Write unit tests for UI components.  
b) Use Flutter's debugging tools to identify and fix issues.

#### Text Book:

1. Marco L. Napoli, Beginning Flutter: A Hands-on Guide to App Development.
2. Rap Payne, Beginning App Development with Flutter: Create Cross-Platform Mobile Apps 1<sup>st</sup> Edition, Apres.
- 3.