SREE RAMA ENGINEERING COLLEGE

(AUTONOMOUS)

Approved by AICTE, New Delhi – Affiliated to JNTUA, Ananthapuramu
Accredited by NAAC with 'A' Grade & NBA (ECE & CSE)
Rami Reddy Nagar, Karakambadi Road, Tirupati – 517507

Department of Computer Science Engineering

SRET25 - I M. Tech, I Semester
Computer Science and Engineering
Course Structure

Semester–I						
S. No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**Credits**
1.	25MTCS01T	Advanced Data Structures & Algorithms	3	0	0	3
2.	25MTCS02T	Distributed Operating Systems	3	0	0	3
3.	**Program Elective – I**					
	25MTCS03Ta	Advanced Computer Architecture	3	0	0	3
	25MTCS03Tb	Enterprise Cloud Concepts				
	25MTCS03Tc	Applied Machine Learning				
4.	**Program Elective – II**					
	25MTCS04Ta	Natural Language Processing	3	0	0	3
	25MTCS04Tb	Smart Sensor Networks & IoT				
	25MTCS04Tc	Computing for Data Analytics				
5.	25MTCS01P	Advanced Data Structures & Algorithms Lab	0	0	4	2
6.	25MTCS02P	Distributed Operating Systems Lab	0	0	4	2
7.	25MTMB01T	Research Methodology and IPR	2	0	0	2
8.	25MTCS01S	Full stack Development Using MERN	0	1	2	2
9.	**Audit Course – I**					
	25MTHS01Aa	English for Research paper writing	2	0	0	0
	25MTSE01A	Disaster Management				
	25MTHS01Ab	Essence of Indian Traditional Knowledge				
		Total	**16**	**1**	**10**	**20**

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I Year I Semester

L	T	P	C
3	0	0	3

(25MTCS01T) ADVANCED DATA STRUCTURES & ALGORITHMS
(Computer Science and Engineering)

Course Objectives:

- Introduce fundamental data structures including linked lists, stacks, queues, trees, graphs, dictionaries, and hashing techniques.
- Develop algorithmic skills for designing and analyzing searching, sorting, and traversal methods.
- Teach implementation of priority queues, binary search trees, and balanced trees (AVL, Red-Black, Splay, B-Trees).
- Enable students to select and apply appropriate data structures for solving computational problems efficiently.
- Foster understanding of the performance analysis and comparative evaluation of data structures and algorithms.

Course Outcomes: After completing this course, students will be able to:

CO1. Implement and manipulate linear data structures like singly/doubly linked lists, circular lists, stacks, and queues using dynamic memory allocation. (L3)
CO2. Apply and analyze searching and sorting algorithms including linear, binary search, bubble, selection, insertion, quick, and merge sort. L3)
CO3. Design and implement dictionaries and hashing techniques to efficiently store and retrieve data (L6).
CO4. Construct and operate on trees and priority queues, performing insertion, deletion, and traversal operations. (L6)
CO5. Compare and implement balanced search trees (AVL, Red-Black, Splay, B-Trees) for optimized data access and storage. (L4)

UNIT I: Introduction **No. of Hours: 08**

Introduction to Data Structures, Singly Linked Lists, Doubly Linked Lists, Circular Lists-Algorithms. Stacks and Queues: Algorithm Implementation using Linked Lists.

UNIT II: Searching and Sorting: **No. of Hours: 10**

Linear and Binary, Search Methods, Sorting: -Basic sorting techniques, Radix Sort, Bucket Sort, Shell Sort Trees- Binary trees, Properties, Representation and Traversals, Expression Trees (Infix, prefix, postfix). Graphs-Basic Concepts, Storage structures and Traversals.

UNIT III: Dictionaries and Hashing **No. of Hours: 10**

Dictionaries: Definition, Dictionary Abstract Data Type, Implementation of Dictionaries.
Hashing: Review of Hashing, Hash Function, Collision Resolution Techniques in Hashing, Separate Chaining, Open Addressing, Linear Probing, Quadratic Probing, Double Hashing, Rehashing, Extendible Hashing.

UNIT IV: Priority queues **No. of Hours: 10**

Definition, ADT, Realizing a Priority Queue Using Heaps, Definition, Insertion, Deletion. Search Trees-Binary Search Trees, Definition, ADT, Implementation, Operations-Searching, Insertion, Deletion.

UNIT V: Search Trees- **No. of Hours: 10**

AVL Trees, Definition, Height of AVL Tree, Operations-, Insertion, Deletion and Searching, Introduction to Red-Black and Splay Trees, B-Trees, Height of B-Tree, Insertion, Deletion and Searching, Comparison of Search Trees.

Text Books:

1. Data Structures: A Pseudo Code Approach, 2/e, Richard F.Gilberg, Behrouz A. Forouzon and Cengage
2. Data Structures, Algorithms and Applications in java, 2/e, SartajSahni, University Press

Reference Books:

1. Data Structures and Algorithm Analysis, 2/e, Mark Allen Weiss, Pearson.
2. Data Structures and Algorithms, 3/e, Adam Drozdek, Cengage
3. C and Data Structures: A Snap Shot Oriented Treatise Using Live Engineering Examples, N.B.Venkateswarulu, E.V.Prasad and S Chand & Co.

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I Year I Semester

L	T	P	C
3	0	0	3

(25MTCS02T) DISTRIBUTED OPERATING SYSTEMS
(Computer Science and Engineering)

Course Objectives: This course is aimed at enabling the students to

- Introduce the architectures, principles, and design issues of distributed, database, and multiprocessor operating systems.
- Develop an understanding of communication, synchronization, deadlock handling, and agreement protocols in distributed environments.
- Explain distributed resource management, shared memory, scheduling, and fault tolerance techniques.
- Provide knowledge of security and protection models, and cryptographic methods for secure distributed computing.
- Explore the structure and design issues of multiprocessor and database operating systems with concurrency control mechanisms.

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

CO1. Explain the architectures, limitations, and synchronization mechanisms (logical clocks, mutual exclusion) in distributed systems. (L2)
CO2. Analyze distributed mutual exclusion algorithms (L4)
CO3. Analyze distributed deadlock detection methods, agreement protocols, and distributed resource management techniques (L2)
CO4. Understand the concepts of multiprocessors (L2)
CO5. Examine and differentiate between various distributed scheduling algorithms (L4)

UNIT I: Introduction **No of Hours: 10**

Architectures of Distributed Systems, System Architecture types, issues in distributed operating systems, communication networks, communication primitives. Theoretical Foundations, inherent limitations of a distributed system, lamp ports logical clocks, vector clocks, casual ordering of messages, global state, cuts of a distributed computation, termination detection.

UNIT II: Distributed Mutual Exclusion **No of Hours: 08**

The Classification of Mutual Exclusion Algorithms, Non-Token – Based Algorithms: Lamport's Algorithm, The Ricart-Agrawala Algorithm, Maekawa's Algorithm, Token-Based Algorithms: Suzuki-Kasami's Broadcast Algorithm, Singhal'sHeurisric Algorithm, Raymond's Heuristic Algorithm.

UNIT III: Distributed Deadlock Detection **No of Hours :10**

Preliminaries, Deadlock Handling Strategies in Distributed Systems, Issues in Deadlock Detection and Resolution, Control Organizations for Distributed Deadlock Detection, Centralized- Deadlock – Detection Algorithms, Distributed Deadlock Detection Algorithms, Hierarchical Deadlock Detection Algorithms

UNITIV: Microprocessor System Architecture **No of Hours: 10**

Multiprocessor System Architectures: Introduction, Motivation for multiprocessor Systems, Basic Multiprocessor System Architectures Multi Processor Operating Systems: Introduction, Structures of Multiprocessor Operating Systems, Operating Design Issues, Threads, Process Synchronization, Processor Scheduling. Distributed File Systems: Architecture, Mechanisms for Building Distributed File Systems, Design Issues

UNIT – V: Distributed Scheduling **No of Hours: 10**

Issues in Load Distributing, Components of a Load Distributed Algorithm, Stability, Load Distributing Algorithms, Requirements for Load Distributing, Task Migration, Issues in task Migration Distributed

Shared Memory: Architecture and Motivation, Algorithms for Implementing DSM, Memory Coherence, Coherence Protocols, Design Issues

TEXT BOOKS

1. Advanced concepts in operating systems: Distributed, Data base and multiprocessor operating systems", Mukesh Singhal, Niranjan and G. Shivaratri, TMH, 2001.
2. Andrew S. Tanenbaum, Maarten Van Steen, *Distributed Systems: Principles and Paradigms*, Pearson Education, 2nd Edition, 2006.

REFERENCES

1. Andrew S. Tanenbaum, Maarten Van Steen, Distributed Systems: Principles and Paradigms, Pearson Education, 2nd Edition, 2006.
2. Silberschatz, Galvin, Gagne, Operating System Concepts, Wiley, 9th Edition, 2018.
3. M. Mitzenmacher, E. Upfal, Probability and Computing: Randomized Algorithms and Probabilistic Analysis, Cambridge University Press, 2005.
4. Alan Tucker, Applied Combinatorics, John Wiley & Sons, 5th Edition, 2007.
5. Nancy A. Lynch, Distributed Algorithms, Morgan Kaufmann, 1996.
6. George Coulouris, Jean Dollimore, Tim Kindberg, Gordon Blair, Distributed Systems: Concepts and Design, Pearson, 5th Edition, 2011.

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I Year I Semester

L	T	P	C
3	0	0	3

(25MTCS03Ta) ADVANCED COMPUTER ARCHITECTURE
(Computer Science and Engineering)
Program Elective – I

Course Objectives:

- To impart the concepts and principles of parallel and advanced computer architectures.
- To develop the design techniques of Scalable and multithreaded Architectures.
- To apply the concepts and techniques of parallel and advanced computer architectures to design modern computer systems

Course Outcomes: After the completion of the course, student will be able to

CO1. Analyze various parallel computer models, program partitioning techniques, and system interconnect architectures to evaluate conditions for parallelism. (L4)
CO2. Apply performance metrics and scalability analysis to assess parallel processing applications using advanced processor and memory technologies. (L3)
CO3. Design and differentiate linear, non-linear, instruction, and arithmetic pipelines to enhance execution performance in modern processors. (L6)
CO4. Examine multiprocessor and multicomputer architectures, cache coherence protocols, and synchronization mechanisms for scalable system design. (L4)
CO5. Evaluate vector and SIMD processing principles through case studies like CM-5 to identify their effectiveness in solving computationally intensive applications. (L5)

UNIT I: Micro Processors **No. of Hours: 10**

Theory of Parallelism, Parallel computer models, The State of Computing, Multiprocessors and Multi computers, Multi vector and SIMD Computers, PRAM and VLSI models, Architectural development tracks, Program and network properties, Conditions of parallelism, Program partitioning and Scheduling, Program flow Mechanisms, System interconnect Architectures.

UNIT II: Parallel Processing **No. of Hours: 10**

Principles of Scalable performance, Performance metrics and measures, Parallel Processing applications, Speed up performance laws, Scalability Analysis and Approaches, Hardware Technologies, Processes and Memory Hierarchy, Advanced Processor Technology, Superscalar and Vector Processors

UNIT III: Pipeline Processors **No. of Hours: 10**

Shared-Memory Organizations, Sequential and weak consistency models, Pipelining and superscalar techniques, Linear Pipeline Processors, Non-Linear Pipeline Processors, Instruction Pipeline design, Arithmetic pipeline design, superscalar pipeline design.

UNIT IV: Architecture of Microprocessors **No. of Hours: 10**

Parallel and Scalable Architectures, Multiprocessors and Multi computers, Multiprocessor system interconnects, cache coherence and synchronization mechanism, Three Generations of Multi computers, Message-passing Mechanisms, Multi vector and SIMD computers.

UNIT V: Applications **No. of Hours: 10**

Vector Processing Principles, Multi vector Multiprocessors, Compound Vector processing, SIMD computer Organizations, The connection machine CM-5.

TEXT BOOKS:

1. Advanced Computer Architecture, Kai Hwang, 2nd Edition, Tata McGraw Hill Publishers.

REFERENCE BOOKS:

1. Computer Architecture, J.L. Hennessy and D.A. Patterson, 4th Edition, ELSEVIER.

2. Advanced Computer Architectures, S.G.Shiva, Special Indian edition, CRC, Taylor &Francis.
3. Introduction to High Performance Computing for Scientists and Engineers, G. Hager and G.Wellein, CRC Press, Taylor & Francis Group.
4. Advanced Computer Architecture, D. Sima, T. Fountain, P. Kacsuk, Pearson education.
5. Computer Architecture, B. Parhami, Oxford Univ. Press.

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I Year I Semester

L	T	P	C
3	0	0	3

(25MTCS03Tb) ENTERPRISE CLOUD CONCEPTS
(Computer Science and Engineering)
Program Elective – I

Course Objectives:

Knowledge on significance of cloud computing and its fundamental concepts and models.

Course Outcomes:

CO1. Understand the fundamental concepts and models of cloud computing (L2)
CO2. Analyze various cloud computing mechanisms (L4)
CO3. Analyze cloud Architectures and Implement cloud mechanisams (L4)
CO4. Design Cloud based Enterprise Solutions (L6)
CO5. Understand Cloud Infrastructure concepts (L2)

UNIT I: Introduction to Cloud Computing **No of Hours: 08**

Understanding Cloud Computing: Origins and influences, Basic Concepts and Terminology, Goals and Benefits, Risks and Challenges. Fundamental Concepts and Models: Roles and Boundaries, Cloud Characteristics, Cloud Delivery Models, Cloud Deployment Models.

UNIT II: Cloud Mechanisams **No of Hours: 10**

Cloud-Enabling Technology: Broadband Networks and Internet Architecture, Data Center Technology, Virtualization Technology CLOUD COMPUTING MECHANISMS: Cloud Infrastructure Mechanisms: Logical Network Perimeter, Virtual Server, Cloud Storage Device, Cloud Usage Monitor, Resource Replication

UNIT III: Cloud Architecture and Management **No of Hours: 10**

Cloud Management Mechanisms: Remote Administration System, Resource Management System, SLA Management System, Billing Management System, Case Study Example
Cloud Computing Architecture
Fundamental Cloud Architectures: Workload Distribution Architecture, Resource Pooling Architecture, Dynamic Scalability Architecture, Elastic Resource Capacity Architecture, Service Load Balancing Architecture, Cloud Bursting Architecture, Elastic Disk Provisioning Architecture, Redundant Storage Architecture, Case Study Example

UNIT IV: Cloud Enterprise Services **No of Hours: 10**

Cloud-Enabled Smart Enterprises Introduction, Revisiting the Enterprise Journey, Service-Oriented Enterprises, Cloud Enterprises, Smart Enterprises, The Enabling Mechanisms of Smart Enterprises Cloud-Inspired Enterprise Transformations Introduction, The Cloud Scheme for Enterprise Success, Elucidating the Evolving Cloud Idea, Implications of the Cloud on Enterprise Strategy, Establishing a Cloud-Incorporated Business Strategy

UNIT V: Cloud Infrastructure **No of Hours: 10**

Transitioning to Cloud-Centric Enterprises The Tuning Methodology, Contract Management in the Cloud Cloud-Instigated IT Transformations Introduction, Explaining Cloud Infrastructures, A Briefing on Next-Generation Services, Service Infrastructures, Cloud Infrastructures, Cloud Infrastructure Solutions, Clouds for Business Continuity, The Relevance of Private Clouds, The Emergence of Enterprise Clouds

TEXT BOOKS:

1. Erl Thomas, Puttini Ricardo, Mahmood Zaigham, Cloud Computing: Concepts, Technology & Architecture 1st Edition,
2. Pethuru Raj, Cloud Enterprise Architecture, CRC Press

REFERENCE BOOKS:

1. James Bond, The Enterprise Cloud, O'Reilly Media, Inc.

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I Year I Semester

L	T	P	C
3	0	0	3

(25MTCS03Tc) APPLIED MACHINE LEARNING
(Computer Science and Engineering)
Program Elective – I

Course Objectives:

- To know the fundamental concepts of Machine Learning.
- To understand linear, distance based, and decision tree based models
- To explore tools and practices for Machine learning in Real world situation.
- To know the Artificial Neural Network and Reinforcement Learning.

Course Outcomes: After the completion of the course, student will be able to

CO1. Understand the fundamental concepts of machine learning (L2)
CO2. Evaluate Binary classifier performance (L5)
CO3. Apply linear, distance based, and decision tree based models (L3)
CO4. Analyze probabilistic, neural network models (L4)
CO5. Design a suitable machine learning model for a given scenario (L6)

UNIT I: Introduction **No. of Hours:10**

Introduction to Machine Learning: Introduction. Different types of learning, Examples of Machine Learning Applications Supervised Learning: Learning a Class from Examples, Probably Approximately Correct Learning, Learning multiple classes, Model selection and generalization Regression: Linear regression, Multiple Linear regression, Logistic Regression.

UNIT II: Classification **No. of Hours: 10**

The ingredients of machine learning: Tasks, Models, Features Binary classification and related tasks: Classification, assessing classification performance, Visualizing classification performance Beyond binary classification: multi-class classification, Regression, Unsupervised and descriptive learning

UNIT III: Decision Tree Learning **No. of Hours: 10**

Decision Tree learning – Introduction, Decision tree representation, Appropriate problems for decision tree learning, The basic decision tree learning algorithm, Inductive bias in decision tree, Issues in decision tree learning. Linear models: The least-squares method, Multivariate linear regression, The perceptron, Support vector machines, Soft margin SVM, Going beyond linearity with kernel methods.

UNIT IV: Clustering **No. of Hours:10**

Distance Based Models: Introduction, Neighbours and exemplars, Nearest Neighbours classification, K-Means algorithms, Clustering around medoids Probabilistic Models: Using Naïve Bayes Model for classification, Expectation Maximization, Gaussian Mixture models

UNIT V: Artificial Neural Networks **No. of Hours:10**

Artificial Neural Networks: Introduction, Neural network representation, appropriate problems for neural network learning, Multilayer networks and the back propagation, Advanced topics in Artificial Neural Networks Reinforcement Learning: Introduction, Learning tasks, Q-learning

TEXT BOOKS:

1. Machine Learning: The art and Science of algorithms that make sense of data, Peter Flach, Cambridge University Press, 2012
2. Tom M. Mitchell, Machine Learning, India Edition 2013, McGraw Hill Education

REFERENCE BOOKS:

1. Aurélien Géron, Hands-On Machine Learning with Scikit-Learn, Keras, and Tensor Flow: Concepts, Tools, and Techniques to Build Intelligent Systems 2nd Edition.
2. Stephen Marsland, “Machine Learning – An Algorithmic Perspective”, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.
3. Ethem Alpaydın, Introduction to machine learning, second edition, MIT press.
4. T. Hastie, R. Tibshirani and J. Friedman, “Elements of Statistical Learning”, Springer Series, 2nd edition.

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I Year I Semester

L	T	P	C
3	0	0	3

(25MTCS04Ta) NATURAL LANGUAGE PROCESSING
(Computer Science and Engineering)
Program Elective – II

Course Objectives:

- Introduce the fundamental concepts of human language, linguistic structures, and their computational representation for Natural Language Processing.
- Develop knowledge of grammars, parsing strategies, semantic interpretation, and language modelling techniques for designing NLP systems.
- Explore advanced NLP applications such as machine translation, multilingual information retrieval, and cross-lingual language processing.

Course Outcomes: After completing this course, students will be able to:

CO1. Understand linguistic foundations of English syntax and various levels of language analysis for Natural Language Processing (L2)
CO2. Apply parsing techniques such as top-down, bottom-up, ATNs, and feature-based systems for grammatical analysis of natural language. (L3)
CO3. Construct semantic representations using logical forms, thematic roles, and speech acts, and apply n-gram and statistical models for language modelling (L3)
CO4. Evaluate and compare machine translation approaches and demonstrate understanding of systems like Anusaraka for multilingual language processing. (L5)
CO5. Implement and analyse multilingual information retrieval systems, applying appropriate pre-processing, evaluation metrics, and tools for cross-lingual retrieval. (L4)

UNIT I: Introduction to NLP **No. of Hours: 08**

The Study of Language, Applications of NLP, Evaluating Language Understanding Systems, Different Levels of Language Analysis, Representations and Understanding, Organization of Natural Language Understanding Systems, Linguistic Background: An outline of English Syntax.

UNIT II: Morphology & Lexical Syntax **No. of Hours: 10**

Grammars and Parsing- Top-Down and Bottom-Up Parsers, Transition Network Grammars, Feature Systems and Augmented Grammars, Morphological Analysis and the Lexicon, Parsing with Features, Augmented Transition Networks, Bayes Rule, Shannon game, Entropy and Cross Entropy.

UNIT III: Introduction to Natural Language Grammar **No of Hours: 10**

Grammars for Natural Language, Movement Phenomenon in Language, Handling questions in Context Free Grammars, Hold Mechanisms in ATNs, Gap Threading, Human Preferences in Parsing, Shift Reduce Parsers, Deterministic Parsers.

UNIT IV: Semantics and Language Models **No of Hours: 10**

Semantic Interpretation: Semantic & Logical form, Word senses & ambiguity, The basic logical form language, Encoding ambiguity in the logical Form, Verbs & States in logical form, Thematic roles, Speech acts &embedded sentences, Defining semantics structure model theory.

Language Modelling: Introduction, n-Gram Models, Language model Evaluation, Parameter Estimation, Language Model Adaption, Types of Language Models, Language-Specific Modelling Problems, Multilingual and Cross lingual Language Modelling.

UNIT V: Machine Translation and Information retrieval **No of Hours :10**

Machine Translation Survey: Introduction, Problems of Machine Translation, Is Machine Translation Possible, Brief History, Possible Approaches, Current Status. Anusaraka or Language Accessor:

Background, Cutting the Gordian Knot, The Problem, Structure of Anusaraka System, User Interface, Linguistic Area, Giving up Agreement in Anusarsaka Output, Language Bridges.

Multilingual Information Retrieval: Introduction, Document Pre-processing, Monolingual Information Retrieval, CLIR, MLIR, Evaluation in Information Retrieval, Tools, Software and Resources.

Textbooks:

1. James Allen, Natural Language Understanding, 2nd Edition, 2003, Pearson Education.
2. Multilingual Natural Language Processing Applications: From Theory To Practice-Daniel M.Bikel and ImedZitouni, Pearson Publications.
3. Natural Language Processing, Apaninian perspective, AksharBharathi, Vineetchaitanya, Prentice–Hall of India.

Reference Books:

1. Charniack, Eugene, Statistical Language Learning, MIT Press, 1993.
2. Jurafsky, Dan and Martin, James, Speech and Language Processing, 2nd Edition, Prentice Hall, 2008.
3. Manning, Christopher and Henrich, Schutze, Foundations of Statistical Natural Language Processing, MIT Press, 1999.

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I Year I Semester

L	T	P	C
3	0	0	3

(25MTCS04Tb) SMART SENSOR NETWORKS & IOT

(Computer Science and Engineering)

Program Elective – II

Course Objectives:

- To provide an in-depth understanding of IoT concepts, applications, and research areas in domains such as smart cities, smart health, smart energy, and smart transportation.
- To analyze IoT system architectures, design constraints, physical devices, communication protocols, and middleware for advanced implementation.
- To explore industrial and commercial IoT applications, including automation, sensor networks, and emerging trends like edge computing, cloud of things, and digital twins.

Course Outcomes: After the completion of the course, student will be able to

CO1. Explain the fundamental concepts, applications, and research areas of IoT across various domains. (L2)

CO2. Analyze IoT reference architectures, functional and deployment views, and real-world design constraints including hardware, technical, and operational limitations. (L4)

CO3. Demonstrate practical knowledge of IoT devices, programming, operating systems, communication protocols, network security, and database management. (L3)

CO4. Apply IoT principles to industrial automation and enterprise integration using frameworks such as SOCRADES and IMC-AESOP. (L3)

CO5. Evaluate case studies in commercial building automation and emerging IoT trends, including edge/fog computing, predictive maintenance, and digital twin technologies. (L5)

UNIT I: INTRODUCTION **No. of Hours: 10**

Introduction and Applications: smart transportation, smart cities, smart living, smart energy, smart health, and smart learning. Examples of research areas include for instance: Self-Adaptive Systems, Cyber Physical Systems, Systems of Systems, Software Architectures and Connectors, Software Interoperability, Big Data and Big Data Mining, Privacy and Security IoT Reference Architecture Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views.

UNIT II: REAL-WORLD DESIGN CONSTRAINTS **No. of Hours: 10**

Introduction, Technical Design constraints, hardware, Data representation and visualization, Interaction and remote control.

UNIT III: IOT PHYSICAL DEVICES **No. of Hours: 10**

What is an IOT Device, Exemplary Device Board, Linux on Raspberry, Interface and Programming & IOT Device. Hardware Platforms and Energy Consumption, Operating Systems, Time Synchronization, Positioning and Localization, Medium Access Control, Topology and Coverage Control, **Routing:** Transport Protocols, Network Security, Middleware, Databases

UNIT IV: INDUSTRIAL AUTOMATION **No. of Hours: 10**

Industrial Automation-Service-oriented architecture-based device integration, SOCRADES: realizing the enterprise integrated Web of Things, IMC-AESOP: from the Web of Things to the Cloud of Things, Commercial Building Automation-Introduction,

UNIT V: CASE STUDY **No. of Hours: 10**

Case study: phase one-commercial building automation today.

Case study: phase two commercial building automation in the future. Recent trends in sensor network and IOT architecture, Automation in Industrial aspect of IOT.

Textbooks:

1. Mandler, B., Barja, J., MitreCampista, M.E., Cagáová, D., Chaouchi, H., Zeadally, S., Badra, M., Giordano, S., Fazio, M., Somov, A., Vieriu, R.-L., Internet of Things. IoT Infrastructures, Springer International Publication
2. Internet of Things: A Hands-On Approach Paperback – 2015, by ArsheepBahga (Author), Vijay Madisetti (Author)
3. IoT Fundamentals: Networking Technologies, Protocols and Use Cases for the Internet of Things by Pearson Paperback – 16 Aug 2017 by Hanes David (Author), Salgueiro Gonzalo (Author), Grossetete Patrick (Author), Barton Rob (Author).

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I Year I Semester

L	T	P	C
3	0	0	3

(25MTCS04Tc) COMPUTING FOR DATA ANALYTICS
(Computer Science and Engineering)
Program Elective – II

Course Objectives

- Provide knowledge of the data analytics lifecycle, including business understanding, data science roles, and project deliverables.
- Develop a strong foundation in statistical methods, probability, and hypothesis testing for data-driven decision-making.
- Equip students with skills to apply predictive analytics, regression, time series forecasting, and experimental design techniques to real-world datasets.

Course Outcomes: After completing this course, students will be able to:

CO1. Understand the data analytics lifecycle and identify the roles and responsibilities of data scientists in business analytics projects. (L2)

CO2. Apply statistical techniques such as measures of central tendency, variation, skewness, and kurtosis for data summarization and interpretation. (L3)

CO3. Analyze probability distributions (binomial, Poisson, normal, exponential, gamma, etc.) and apply them in modeling uncertain events. (L4)

CO4. Perform hypothesis testing and predictive analytics using t-tests, chi-square tests, regression, correlation, and multiple correlation methods. (L3)

CO5. Design forecasting models (moving average, exponential smoothing, seasonal trends) and conduct design of experiments (ANOVA, Latin square, factorial design) for analytical problem solving. (L6)

UNIT – I DATA ANALYTICS LIFE CYCLE **No. of Hours: 10**

Introduction to Big data Business Analytics - State of the practice in analytics role of data scientists - Key roles for successful analytic project - Main phases of life cycle - Developing core deliverables for stakeholders.

UNIT – II STATISTICS **No. of Hours: 12**

Sampling Techniques - Data classification, Tabulation, Frequency and Graphic representation - Measures of central value - Arithmetic mean, Geometric mean, Harmonic mean, Mode, Median, Quartiles, Deciles, Percentile - Measures of variation – Range, IQR, Quartile deviation, Mean deviation, standard deviation, coefficient variance, skewness, Moments & Kurtosis.

UNIT – III PROBABILITY AND HYPOTHESIS TESTING **No. of Hours: 10**

Random variable, distributions, joint probability function, marginal density function. Random vectors - Some special probability distribution - Binomial, Poison, Geometric, uniform, exponential, normal, gamma and Erlang - Normal distribution.

UNIT – IV PREDICTIVE ANALYTICS **No. of Hours: 10**

Sampling distribution – Estimation - point, confidence - Test of significance, 1& 2 tailed test, uses of t-distribution, F-distribution, $\chi 2$ distribution - Predictive modeling and Analysis - Regression Analysis, Correlation analysis, Rank correlation coefficient, Multiple correlation.

UNIT – V TIME SERIES FORECASTING AND DESIGN OF EXPERIMENTS **No. of Hours: 10**

Forecasting Models for Time series: MA, SES, TS with trend, season - Design of Experiments, one way classification, two way classification, ANOVA, Latin square, Factorial Design.

Text Books:

1. Chris Eaton, Dirk Deroos, Tom Deutsch et al., —Understanding Big Data, Mc Graw Hill, 2012.
2. Alberto Cordoba, —Understanding the Predictive Analytics Lifecycle, Wiley, 2014.

3. Eric Siegel, Thomas H. Davenport, —Predictive Analytics: The Power to Predict Who Will Click, Buy, Lie, or Die, Wiley, 2013.

Reference Books:

1. James R Evans,—Business Analytics – Methods, Models and Decisions, Pearson 2013.
2. R. N. Prasad, Seema Acharya, —Fundamentals of Business Analytics, Wiley, 2015.
3. S M Ross, —Introduction to Probability and Statistics for Engineers and Scientists‖, Academic Foundation, 2011.
4. David Hand, HeikiMannila, Padhria Smyth, —Principles of Data Mining, PHI 2013.
5. Spyros Makridakis, Steven C Wheelwright, Rob J Hyndman, —Forecasting methods and applications Wiley 2013(Reprint).
6. David Hand, HeikkiMannila, Padhraic Smyth, —Principles of Data mining, PHI 2013.

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I Year I Semester

L	T	P	C
0	0	4	2

(25MTCS01P) ADVANCED DATA STRUCTURES AND ALGORITHMS LAB

(Computer Science and Engineering)

Course Objectives:

- To introduce students to the implementation of linear and non-linear data structures using linked representation.
- To provide practical knowledge on stack and queue operations and their applications in problem solving.
- To enable students to implement tree structures and perform operations like traversal, insertion, deletion, and balancing.
- To develop skills in implementing searching and sorting techniques to improve problem-solving efficiency.
- To expose students to advanced data structures such as AVL Trees, B-Trees, and Hashing for efficient storage and retrieval.
- To enhance the ability to design, test, and analyze algorithms for graph traversal and dictionary

Course Outcomes: After completing these experiments, students will be able to:

CO1. Implement linear data structures such as single, double, and circular linked lists to perform insertion, deletion, searching, and traversal operations. (L4)
CO2. Apply stack and queue concepts using linked lists to solve real-world computational problems such as expression evaluation and infix-to-postfix conversion. (L3)
CO3. Develop and test tree-based and Graph-based data structures including Binary Trees, AVL Trees, and B-Trees using recursive and iterative approaches, Graph traversals. (L3)
CO4. Implement and compare searching and sorting techniques to analyze their performance and efficiency. (L4)
CO5. Apply hashing techniques for efficient dictionary implementation and collision resolution. (L3)

Experiment 1:
Write a program to perform various operations on single linked list
Experiment 2:
Write a program for the following

a) Reverse a linked list
b) Sort the data in a linked list
c) Remove duplicates
d) Merge two linked lists

Experiment 3: Write a program to perform various operations on doubly linked list.
Experiment 4: Write a program to perform various operations on circular linked list.
Experiment 5: Write a program for performing various operations on stack using linked list.
Experiment 6: Write a program for performing various operations on queue using linked list.
Experiment 7: Write a program for the following using stack

a) Infix to postfix conversion.
b) Expression evaluation.

Experiment 8: Write a program to implement various operations on Binary Search Tree Using Recursive and Non-Recursive methods.
Experiment 9: Write a program to implement the following for a graph. a) BFS b) DFS
Experiment 10: Write a program to implement various Sorting Techniques
Experiment 11: Write a program to implement various Searching Techniques
Experiment 12: Write a program to implement various operations on AVL trees.
Experiment 13: Write a program to perform the following operations:

a) Insertion into a B-tree
b) Searching in a B-tree

Experiment 15: Write a program to implement all the functions of Dictionary (ADT) using Hashing.

References:

1. Ellis Horowitz, SartajSahni, and SanguthevarRajasekaran – Fundamentals of Computer Algorithms, Universities Press, 2008.
2. Mark Allen Weiss – Data Structures and Algorithm Analysis in C++ / Java, Pearson Education, 4th Edition, 2013.
3. Seymour Lipschutz – Data Structures with C, Schaum's Outline Series, McGraw Hill, 2011.
4. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein – Introduction to Algorithms, MIT Press, 3rd Edition, 2009.

M. Tech. CSE **SRET25 Regulations**

I Year I Semester

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(25MTCS02P) DISTRIBUTED OPERATING SYSTEMS LAB

(Computer Science and Engineering)

Course Objectives

- To provide hands-on experience in implementing synchronization, deadlock detection, and resource management algorithms in distributed and multiprocessor systems.
- To develop the ability to design and simulate mechanisms for fault tolerance, load balancing, task migration, and secure communication using cryptographic techniques.
- To enable students to apply concurrency control methods in distributed databases and critically analyze the performance of various distributed algorithms.

Course Outcomes: After completing this lab, students will be able to:

CO1. Implement and analyze synchronization mechanisms in distributed environments. (L4)
CO2. Develop and evaluate distributed deadlock detection techniques. (L3)
CO3. Design and implement distributed shared memory models and scheduling algorithms. (L6)
CO4. Apply security and cryptographic techniques to distributed systems. (L3)
CO5. Implement concurrency control algorithms in database operating systems (L4)

List of Experiments

Unit I: Architectures & Synchronization

1. **Implementation of Lamport's Logical Clocks** – Simulate logical clock updates in a distributed system.
2. **Vector Clocks and Causal Ordering** – Implement vector clocks and analyze message ordering.
3. **Distributed Mutual Exclusion Algorithms** – Implement Ricart-Agrawala and Maekawa's mutual exclusion algorithms.

Unit II: Deadlock Detection & Resource Management

4. **Simulation of Distributed Deadlock Detection Algorithms** – Implement centralized and distributed deadlock detection techniques.
5. **Hierarchical Deadlock Detection** – Implement a hierarchical approach to detecting deadlocks in a distributed system.

Unit III: Shared Memory, Scheduling & Fault Tolerance

6. **Implementation of Load Balancing Algorithms** – Compare load balancing techniques (static and dynamic).
7. **Task Migration Mechanism** – Implement and analyze task migration in a distributed system.

Unit IV: Security & Cryptography

8. **Access Matrix Model Implementation** – Simulate access control using an access matrix.
9. **Implementation of Data Encryption Standard (DES) Algorithm** – Encrypt and decrypt messages using DES.
10. **Public Key Cryptography using RSA** – Implement RSA encryption and authentication mechanisms.

Unit V: Multiprocessor & Database OS

11. **Process Synchronization in Multiprocessor Systems** – Implement and analyze thread synchronization.
12. **Concurrency Control using Lock-Based Algorithms** – Implement two-phase locking protocol.
13. **Timestamp-Based Concurrency Control** – Develop a timestamp-based concurrency control mechanism.
14. **Optimistic Concurrency Control Algorithm** – Implement an optimistic concurrency control protocol.

References:

1. Mukesh Singhal and Niranjan G. Shivaratri – *Advanced Concepts in Operating Systems: Distributed, Database, and Multiprocessor Operating Systems*, McGraw Hill, 2001.
2. Andrew S. Tanenbaum and Maarten Van Steen – *Distributed Systems: Principles and Paradigms*, Pearson Education, 2nd Edition, 2007.
3. George Coulouris, Jean Dollimore, Tim Kindberg, and Gordon Blair – *Distributed Systems: Concepts and Design*, Pearson Education, 5th Edition, 2012.
4. Pradeep K. Sinha – *Distributed Operating Systems: Concepts and Design*, PHI Learning, 2008.

M. Tech. CSE **SRET25 Regulations**

I Year - I Semester

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2	0	0	2

(25MTMB01T) RESEARCH METHODOLOGY AND IPR
(Common to SE, ES, VLSID & CSE)

Course Objectives:

- To understand the basic principles of research methodology, including research designs, types of research, ethical considerations, and proper documentation styles.
- To learn effective methods of collecting high-quality data from primary, secondary, and big data sources using appropriate tools and technologies.
- To develop skills in analyzing research data, formulating hypotheses, validating experiments, and preparing structured research reports and papers.
- To gain knowledge of the concepts, types, global frameworks, and practices of Intellectual Property Rights, including trade secrets, trademarks, and biodiversity-related IP.
- To understand the patent system, including patent application processes, examination, grant, revocation, licensing, and the role of patent agents.

Course Outcomes: On completion of the course, the student should be able to:

CO1. Explain the fundamental concepts, types, and approaches of research, and apply ethical principles, reasoning, and documentation styles (APA/IEEE) to ensure research integrity and avoid plagiarism. (L3)

CO2. Identify and analyze appropriate data collection methods, sources, and technologies while ensuring data quality, reliability, and ethical handling of primary, secondary, and big data sources. (L4)

CO3. Demonstrate skills in designing experiments, analyzing multivariate data, and developing valid hypotheses, and prepare well-structured research papers, reports, and proposals. (L6)

CO4. Interpret the concept, evolution, and global framework of Intellectual Property Rights (IPR), and differentiate various forms such as patents, trademarks, and trade secrets in the context of WIPO, WTO, and UNESCO guidelines. (L4)

CO5. Evaluate and apply the processes of patent filing, examination, grant, and licensing, including e-filing procedures and roles of patent agents, to protect and commercialize innovative research outcomes. (L5)

UNIT I: FUNDAMENTALS OF RESEARCH METHODOLOGY **No. of Hours: 12**

Overview of research process and design - Types of Research - Approaches to Research (Qualitative vs Quantitative) - Observation studies, Experiments and Surveys - Use of Secondary and exploratory data to answer the research question - Importance of Reasoning in Research and Research ethics - Documentation Styles (APA/IEEE etc.) - Plagiarism and its consequences

UNIT II: DATA COLLECTION AND SOURCES **No. of Hours: 08**

Importance of Data Collection - Types of Data - Data Collection Methods - Data Sources - primary, secondary and Big Data sources - Data Quality & Ethics - Tools and Technology for Data Collection

UNIT III: DATA ANALYSIS AND REPORTING **No. of Hours: 10**

Overview of Multivariate analysis - Experimental research, cause-effect relationship, and development of hypotheses- Measurement systems analysis, error propagation, and validity of experiments - Guidelines for writing abstracts, introductions, methodologies, results, and discussions - Writing Research Papers & proposals

UNIT IV: P UNDERSTANDING INTELLECTUAL PROPERTY RIGHTS **No. of Hours: 10**

Intellectual Property – The concept of IPR, Evolution and development of concept of IPR, IPR development process, Trade secrets, utility Models, IPR & Bio diversity, Role of WIPO and WTO in IPR establishments, Right of Property, Common rules of IPR practices, Types and Features of IPR Agreement, Trademark, Functions of UNESCO in IPR maintenance.

UNIT V: PATENTS **No. of Hours: 10**

Patents – objectives and benefits of patent, Concept, features of patent, Inventive step, Specification - Types of patent application, process E-filling, Examination of patent, Grant of patent, Revocation, Equitable Assignments, Licenses, Licensing of related patents, patent agents, Registration of patent agents

Textbooks:

1. Stuart Melville and Wayne Goddard, Research Methodology: An introduction for Science & Engineering students, Juta and Company Ltd, 2004.
2. Catherine J. Holland, Intellectual property: Patents, Trademarks, Copyrights, Trade Secrets, Entrepreneur Press, 2007.

Reference Books:

1. Cooper Donald R, Schindler Pamela S and Sharma JK, "Business Research Methods", Tata McGraw Hill Education 11e (2012).
2. Ranjit Kumar , Research Methodology: A Step-by-Step Guide for Beginners. . David Hunt, Long Nguyen, Matthew Rodgers, "Patent searching: tools & techniques", Wiley, 2007.
3. Deborah E. Bouchoux , Intellectual Property: The Law of Trademarks, Copyrights, Patents, and Trade Secrets, 6th Edition, Cengage 2024.
4. Wayne C. Booth, Gregory G. Colomb, Joseph M. Williams, The Craft of Research, 5th Edition, University of Chicago Press, 2024
5. The Institute of Company Secretaries of India, Statutory body under an Act of parliament, "Professional Programme Intellectual Property Rights, Law and practice", September 2013.
6. Peter Elbow, Writing With Power, Oxford University Press, 1998.

Online Resources (Free & Authentic)

- Coursera / edX – Research Methodology and Data Analysis courses
- Springer Link & ScienceDirect – Latest journals on research design and statistics
- Google Scholar – Free access to research papers
- NCBI Bookshelf – Open-access research methodology resources
- Khan Academy (Statistics & Probability) – For fundamentals of hypothesis testing, regression, and ANOVA.

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I Year I Semester

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(25MTCS01S) FULL STACK DEVELOPMENT USING MERN
(Computer Science and Engineering)

Course Objectives:

- Provide strong foundations in web development technologies (HTML, CSS, JavaScript, ES6).
- Introduce server-side programming with Node.js and Express.js for building scalable applications.
- Enable students to work with relational (MySQL) and non-relational (MongoDB) databases.
- Impart skills to design and develop interactive user interfaces using ReactJS.
- Enhance problem-solving abilities through full-stack web application development experiments.

Course Outcomes (COs): After completing the course, the students will be able to:

CO1. Apply fundamental web technologies (HTML, CSS, JavaScript, ES6) to design responsive web pages. (L3)
CO2. Develop server-side applications using Node.js and Express.js with REST API integration. (L3)
CO3. Perform database operations using MySQL and MongoDB and integrate them with backend services. (L3)
CO4. Design and implement dynamic, component-based user interfaces using ReactJS. (L6)
CO5. Develop and deploy full-stack applications by combining frontend, backend, and database skills. (L3)

Module 1: Web Development Fundamentals **No. of Hours: 10**

Fundamentals of Web Design, Webpage and Website, Web application HTML Typography, Images, Tables, Lists, Hyperlinks etc. CSS Syntax and usage, CSS Selectors, CSS on body, CSS on Text, CSS on Links, CSS on Tables, CSS on Lists, CSS on Forms, CSS on Images, CSS on DIV, W3.CSS Framework

List of Experiments:

- **HTML & CSS Basics** – Create a personal portfolio webpage using HTML (headings, lists, tables, hyperlinks, forms) and style it with CSS selectors.
- **Responsive Layout** – Develop a responsive webpage using DIV, CSS box model, and W3.CSS framework.
- **Styled Components** – Design a webpage for a college event with images, tables, and styled navigation menu using CSS.

Module 2: JavaScript and ECMA Script 6 **No. of Hours: 10**

JavaScript Fundamentals - Grammar and types, Control flow and error handling - Loops, Function - Objects, Arrays, Promises - ES6 Let and const, Template literals - Arrow Function, Default parameter, Async Await

List of Experiments:

- **JavaScript Fundamentals** – Build a simple calculator app using functions, loops, and control flow.
- **Array & Object Manipulation** – Write a program using ES6 features (let/const, arrow functions, template literals) to manage student records.
- **Async Programming** – Create a webpage that fetches and displays random user data from a public API using Promises and Async/Await.

Module 3: Node.js **No. of Hours: 10**

overview, Node.js - basics and setup - Node.js console, Node.js command utilities - Node.js modules, concepts - Node.js events, database access - Node.js with Express.js, Express.js Request/Response - Express.js Get, Express.js Post - Express.js Routing, Express.js Cookies - Express.js File Upload, Middleware - Express.js Scaffolding, Template

List of Experiments:

- **Node.js Basics** – Write a Node.js script to create a local server and display “Hello World” in the browser.
- **Express.js Routing** – Build a REST API with Express.js that handles GET and POST requests for a student information system.
- **File Handling** – Develop a Node.js application to upload, read, and display a text/JSON file using Express middleware.

Module 4: MySQL and MongoDB **No. of Hours: 10**

MySQL Concepts - Create, Read, Update, Delete Operation - SQL and NoSQL concepts - Create and manage MongoDB - Migration of data into MongoDB - MongoDB with NodeJS - Services offered by MongoDB

List of Experiments:

- **MySQL CRUD** – Create a MySQL database for employee records and perform Create, Read, Update, Delete (CRUD) operations.
- **MongoDB CRUD with Node.js** – Build a Node.js application that connects to MongoDB and manages student data.
- **Migration Project** – Write a script to migrate data from MySQL to MongoDB and display it through a Node.js API.

Module 5: React JS **No. of Hours: 10**

ReactJS introduction and overview - ReactJS installation and environment setup - Introducing JSX, Rendering Elements - Components and Props - State and Lifecycle - Handling Events - Conditional Rendering - Lists and Keys, Forms - Lifting State Up

List of Experiments:

- **React Components** – Build a React app to display a list of courses using functional components and props.
- **State & Events** – Create a counter and a form component in React using useState and event handling.
- **Conditional Rendering & Lists** – Develop a React to-do list application with add/delete functionality and conditional rendering of completed tasks.

Textbooks

1. Alex Banks, Eve Porcello – *Learning React: Modern Patterns for Developing React Apps*, O’Reilly.
2. StoyanStefanov – *React Up & Running: Building Web Applications*, O’Reilly.
3. Mario Casciaro, Luciano Mammino – *Node.js Design Patterns*, Packt.
4. Seyed M.M. Iravani – *Learning Web Design: A Beginner’s Guide to HTML, CSS, JavaScript, and Web Graphics*, O’Reilly.

Reference Books

1. Robin Wieruch – *The Road to React*, Leanpub.
2. Carl Rippon – *React 18 Design Patterns and Best Practices*, Packt.
3. KirupaChinnathambi – *Learning React: A Hands-On Guide to Building Web Applications*, Addison-Wesley.
4. Ethan Brown – *Web Development with Node and Express: Leveraging the JavaScript Stack*, O’Reilly.
5. Kristina Chodorow – *MongoDB: The Definitive Guide*, O’Reilly.
6. Ben Forta – *SQL in 10 Minutes, Sams Teach Yourself*, Sams Publishing.

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I Year I Semester

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(25MTHS01Aa) ENGLISH FOR RESEARCH PAPER WRITING
(Common to SE, ES, VLSID & CSE)
Audit Course - I

Course Objectives:

- To equip students with the fundamentals of academic English for research paper writing.
- To develop students' advanced reading skills for analyzing and evaluating research articles.
- To refine students' grammar and language skills for clarity and precision in research writing.
- To master the skills of revising, editing, and proofreading research papers.
- To familiarize students with the role of technology and AI in research writing, including digital literacy and ethical considerations.

Course Outcomes (CO): Student will be able to

CO1. Create well-organized academic writing outputs—titles, sub-headings, paraphrased content, and referenced paragraphs—demonstrating accuracy, cohesion, and adherence to academic writing conventions. (L6)

CO2. Create well-organized academic notes by synthesizing information from research articles using effective note-making and summarizing techniques. (L6)

CO3. Create well-structured and grammatically accurate academic writing sections by integrating critical reading insights and advanced grammar skills relevant to research papers. (L6)

CO4. Create polished academic writing outputs by integrating critical and creative writing phases, applying editorial guidelines, and incorporating effective correspondence practices with journal editors (L6)

CO5. Create ethically sound research writing by integrating fair-use principles, proper citation practices, and responsible use of AI technologies and digital tools (L6)

UNIT – I: Fundamentals of Academic English **No. of Hours: 10**

Academic English - MAP (Message-Audience-Purpose) - Language Proficiency for Writing - Key Language Aspects - Clarity and Precision - Objectivity - Formal Tone - Integrating References - Word order - Sentences and Paragraphs - Link Words for Cohesion - Avoiding Redundancy / Repetition - Breaking up long sentences - Structuring Paragraphs - Paraphrasing Skills – Framing Title and Sub-headings

UNIT – II: Reading Skills for Researchers **No. of Hours: 10**

Reading Academic Texts - Critical Reading Strategies - Skimming and Scanning - Primary Research Article vs. Review Article - Reading an Abstract - Analyzing Research Articles - Identifying Arguments - Classifying Methodologies - Evaluating Findings - Making Notes

UNIT – III: Grammar Refinement for Research Writing **No. of Hours: 10**

Advanced Punctuation Usage - Grammar for Clarity - Complex Sentence Structures - Active- Passive Voice - Subject-Verb Agreement - Proper Use of Modifiers - Avoiding Ambiguous Pronoun References - Verb Tense Consistency - Conditional Sentences

UNIT – IV: Mastery in Refining Written Content/Editing Skills **No. of Hours: 10**

Effective Revisions - Restructuring Paragraph - Editing vs Proofreading, Editing for Clarity and Coherence - Rectifying Sentence Structure Issues - Proofreading for Grammatical Precision – Spellings - Tips for Correspondence with Editors - Critical and Creative Phases of Writing

UNIT – V: Technology and Language for Research **No. of Hours: 10**

Digital Literacy and Critical Evaluation of Online Content - Technology and Role of AI in Research Writing – Assistance in Generating Citations and References - Plagiarism and Ethical Considerations – Tools and Awareness – Fair Practices

Textbooks:

1. Bailey. S. Academic Writing: A Handbook for International Students. London and New York: Routledge, 2015.
2. Adrian Wallwork, English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011.

Reference Books:

1. Craswell, G. Writing for Academic Success, Sage Publications, 2004.
2. Peter Elbow, Writing With Power, E-book, Oxford University Press, 2007
2. Oshima, A. & Hogue, A. Writing Academic English, Addison-Wesley, New York, 2005
3. Swales, J. & C. Feak, Academic Writing for Graduate Students: Essential Skills
4. and Tasks. Michigan University Press, 2012.
5. 5.Goldbort R.Writing for Science, Yale University Press (available on Google Books), 2006
6. Day R.How to Write and Publish a Scientific Paper, Cambridge University Press, 2006

Online Learning Resources:

1. https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-ge04/
2. https://onlinecourses.swayam2.ac.in/ntr24_ed15/preview
3. "Writing in the Sciences" – Stanford University (MOOC on Coursera) https://www.coursera.org/learn/sciwrite
4. Academic Phrasebank – University of Manchester http://www.phrasebank.manchester.ac.uk
5. OWL (Online Writing Lab) – Purdue University, https://owl.purdue.edu *(Resources on APA/MLA formats, grammar, structure, paraphrasing)*
6. Zotero or Mendeley (Reference Management Tools) – Useful for managing citations and sources.

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I Year I Semester

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(25MTSE01A) DISASTER MANAGEMENT
(Common to SE, ES, VLSID & CSE)
Audit Course - I

Course Objectives:

- Learn to demonstrate critical understanding of key concepts in disaster risk reduction and humanitarian response.
- Critically evaluate disaster risk reduction and humanitarian response policy and practice from Multiple perspectives.
- Develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations
- Critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in.

Course Outcomes: After the completion of the course, the student will be able to

CO1. Explain the fundamental concepts of disasters, hazards, and their significance, including the classification and characteristics of natural and manmade disasters. (L2)
CO2. Analyze the impacts of various types of disasters on human life, the economy, and the environment, and differentiate between their causes and effects. (L4)
CO3. Apply appropriate methods and tools, such as remote sensing and meteorological data, for disaster preparedness, monitoring, and management. (L3)
CO4. Assess disaster risk using scientific and participatory approaches, and evaluate strategies for risk reduction and survival. (L5)
CO5. Formulate effective disaster mitigation measures by integrating structural and non-structural approaches and examine national programs and policies on disaster management. (L6)

UNIT I: Introduction: **No. of Hours: 08**

Introduction:

Disaster: Definition, Factors and Significance; Difference Between Hazard and Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.

Disaster Prone Areas in India:

Study of Seismic Zones; Areas Prone to Floods and Droughts, Landslides and Avalanches; Areas Prone to Cyclonic and Coastal Hazards with Special Reference to Tsunami; Post- Disaster Diseases and Epidemics.

UNIT II: Repercussions of Disasters and Hazards: **No. of Hours: 08**

Economic Damage, Loss of Human and Animal Life, Destruction of Ecosystem. Natural Disasters: Earthquakes, Volcanic Reactions Cyclones, Tsunamis, Floods, Droughts and Famines, Landslides and Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks and Spills, Outbreaks of Disease and Epidemics, War and Conflicts.

UNIT III: Disaster Preparedness and Management: **No. of Hours: 08**

Preparedness: Monitoring of Phenomena Triggering A Disaster Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological and Other Agencies, Media Reports: Governmental and Community Preparedness.

UNIT IV: Risk Assessment Disaster Risk: **No. of Hours: 08**

Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation in Risk Assessment and Warning, People's Participation in Risk Assessment. Strategies for Survival.

UNIT V: Disaster Mitigation **No. of Hours: 08**

Meaning, Concept and Strategies of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation and Non-Structural Mitigation, Programs of Disaster Mitigation in India.

Textbooks:

1. R.Nishith, Singh AK, “Disaster Management in India:Perspectives,issues and strategies-2020.
2. Company Sahni, Pardeep Et.Al. (Eds.),”Disaster Mitigation Experiences and Reflections”, Prentice Hall of India, New Delhi.
3. Goel S.L., Disaster Administration And Management Text And Case Studies”, Deep & Deep Publication Pvt. Ltd., New Delhi.

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I Year I Semester

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(25MTHS01Ab) ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE
(Common to SE, ES, VLSID & CSE)
Audit Course - I

Course Objectives:

- To facilitate the students with the concepts of Indian traditional knowledge and to make them understand the importance of roots of knowledge system.
- To make them understand the need for protecting traditional knowledge and its significance in the global economy.
- To make them understand the legal frame work and policies related to traditional knowledge protection.
- To enable them to understand the relationship between traditional knowledge and intellectual property rights.
- To make them explore the applications of traditional knowledge in different sectors, such as engineering, medicine, agriculture, and biotechnology

Course Outcomes: After the completion of the course, the student will be able to

CO1. Evaluate the relevance and contemporary significance of traditional and indigenous knowledge systems in modern society (L6)
CO2. Assess the challenges, gaps, and opportunities in the protection and commercial utilization of traditional knowledge at national and international levels (L6)
CO3. Examine the importance of the Geographical Indications (GI) Act, 2003 in protecting region-specific traditional knowledge and supporting local economies (L6)
CO4. Evaluate global legal forums and strategies that enhance the protection of Indian Traditional Knowledge in international platforms (L6)
CO5. Examine the contributions of traditional knowledge to national priorities, including sustainable development, ecological balance, and cultural preservation (L6)

UNIT-I: Introduction to traditional knowledge **No. of Hours: 10**

Introduction to traditional knowledge - Definition, Nature and characteristics, scope and importance - Kinds of traditional knowledge - Physical and social contexts in which traditional knowledge develop - Historical impact of social change on traditional knowledge systems - Indigenous Knowledge (IK) – Characteristics - traditional knowledge vis-à-vis indigenous knowledge -Traditional knowledge Vs western knowledge, traditional knowledge vis-à-vis formal knowledge

UNIT-II: Protection of traditional knowledge **No. of Hours: 10**

Protection of traditional knowledge- Need for protecting traditional knowledge - Significance of TK Protection - Value of TK in global economy - Role of Government to harness TK.

UNIT-III: Legal frame work and TK **No. of Hours: 10**

Legal frame work and TK - A)The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 - Plant Varieties Protection and Farmer's Rights Act, 2001 (PPVFR Act) – B)The Biological Diversity Act 2002 and Rules 2004 - the protection of traditional knowledge bill, 2016 - Geographical Indicators Act 2003.

UNIT-IV: Traditional knowledge and Intellectual property **No. of Hours: 10**

Traditional knowledge and Intellectual property - Systems of traditional knowledge protection - Legal concepts for the protection of traditional knowledge - Certain non-IPR mechanisms of traditional knowledge protection - Patents and traditional knowledge - Strategies to increase protection of traditional knowledge -Global legal FORA for increasing protection of Indian Traditional Knowledge.

UNIT-V: Traditional knowledge in different sectors **No. of Hours: 10**

Traditional knowledge in different sectors - Traditional knowledge and Engineering - Traditional medicine system - TK and Biotechnology - TK in Agriculture - Traditional societies depend on it for their food and healthcare needs - Importance of conservation and sustainable development of

environment - Management of biodiversity, Food security of the country and protection of TK

Text Books:

1. Mahadevan, B., Bhat Vinayak Rajat, Nagendra Pavana R.N. Introduction to Indian Knowledge System: Concepts and Applications, PHI Learning Pvt.Ltd. Delhi, 2022.
2. Basanta Kumar Mohanta and Vipin Kumar Singh,Traditional Knowledge System and Technology in India, PratibhaPrakashan 2012.

Reference Books:

1. Pride of India: A Glimpse into India's Scientific Heritage, Samskrita Bharati, New Delhi.
2. Kak, S.C. "On Astronomy in Ancient India", Indian Journal of History of Science, 22(3), 1987
3. Subbarayappa, B.V. and Sarma, K.V. Indian Astronomy: A Source Book, Nehru Centre, Mumbai, 1985.
4. Bag, A.K. History of Technology in India, Vol. I, Indian National Science Academy, New Delhi, 1997.
5. Acarya, P.K. Indian Architecture, Munshiram Manoharlal Publishers, New Delhi, 1996.
6. Banerjea, P. Public Administration in Ancient India, Macmillan, London, 1961.
7. Kapoor Kapil, Singh Avadhesh,Indian Knowledge Systems Vol – I & II, Indian Institute of Advanced Study, Shimla, H.P., 2022

E-Resources:

https://www.youtube.com/watch?v=LZP1StpYEPM 2.http://nptel.ac.in/courses/121106003/