ANNAMACHARYA UNIVERSITY

Department of CSE (Artificial Intelligence)

Semester V (Third year)

Sl. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	C
1	PC	24ACSE52T	Computer Networks	3	0	0	3
2	PC	24ACAI51T	Predictive Analytics	3	0	0	3
3	PC	24ACAI52T	Introduction to Deep Learning	3	0	0	3
4	PE	24ACSE5DT	Quantum Computing	3	0	0	3
		24ACSE5AT	Software Testing Methodologies				
		24ACAI5AT	Agile Methodologies				
		24ACSE5BT	Object Oriented Analysis and Design				
5	OE	24ACAI5BT	MOOC	3	0	0	3
6	PC	24ACSE52L	Computer Networks Lab	0	0	3	1.5
7	PC	24ACAI51L	Predictive Analytics Lab	0	0	3	1.5
8	PC	24ACAI52L	Deep Learning & Machine Learning Model Optimization Lab	0	0	3	1.5
9	MC	24AUD51T	Gender Sensitization	2	0	0	0
10	Internship	24ACAI51I	Summer Internship 2 Months after second year (to be evaluated during V semester)	0	0	0	2
							21.5

Category	Credits
Professional Core Courses	13.5
Professional Elective courses	3
Open Elective Courses	3
Industrial/Research Internship	2
Total Credits	21.5

Semester V (Third year)

Sl. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	C
1	PC	24ACSM62T	Natural Language Processing	3	0	0	3
2	PC	24ACAI61T	Generative AI	3	0	0	3
3	PC	24ACAI62T	AI for Cloud Computing	3	0	0	3
4	PE	24ACSM6AT	Internet of Things	3	0	0	3
		24ACSE6AT	Software Project Management				
		24ACSM6BT	Cryptography and Network Security				
		24AAIM6AT	Data Science using Python				
5	OE	24ACAI6AT	MOOC	3	0	0	3
6	PC	24ACSM62L	Natural Language Processing Lab	0	0	3	1.5
7	PC	24ACAI61L	Generative AI Lab	0	0	3	1.5
8	PC	24ACAI62L	AI for Cloud Computing Lab	0	0	3	1.5
9	SEC	24AENG61S	Soft Skills	1	0	2	2
10	MC	24AMBA61T	Technical Paper Writing and Intellectual Property Rights	2	0	0	0
	Total Credits						21.5

Category	Credits
Professional Core courses	13.5
Professional Elective courses	3
Open Elective Course/Job oriented elective	3
Skill Enhancement Courses	2
Total Credits	21.5

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(ESTD UNDER AP PRIVATE UNIVERSITIES (ESTABLISHMENT AND REGULATION) ACT, 2016)
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RAJAMPET, Annamayya District, AP – 516126, INDIA

Title of the Course: **Computer Networks**
Category: PC
Year: III
Semester: I
Course Code: 24ACSE52T
Branch/es: CSE, AI&ML, CSE(AI), CSE(AIML) & CSE (IoTCSBCT)

Lecture Hours	Tutorial Hours	Practice Hours	Credits	Total Hours
3	0	0	3	52

Course Objectives: This course is designed to

1. Understand the protocol layering and physical level communication.
2. Analyze the performance of a network.
3. Describe the functions of network layer and the various routing protocols.
4. Familiarize the functions and protocols of the Transport layer.
5. Understand the working of various Application Layer Protocols.

Course Outcomes:

After completion of the course, students will be able to

1. Explain protocol layering, OSI/TCP-IP models, and physical layer communication.
2. Analyze network performance using metrics like throughput and delay.
3. Apply network layer functions and routing protocols.
4. Explain transport layer functions and differentiate TCP and UDP.
5. Illustrate the working of application layer protocols such as DNS and HTTP.

Unit 1 Introduction to Physical Layer 10

Network hardware, Network software, OSI, TCP/IP Reference models, Example Networks: ARPANET, Internet. Physical Layer: Guided Transmission media: twisted pairs, coaxial cable, fiber optics, Wireless transmission.

Unit 2 Data Link Layer 12

Data link layer: Design issues, framing, Error detection and correction. Elementary data link protocols: simplex protocol, A simplex stop and wait protocol for an error-free channel, A simplex stop and wait protocol for noisy channel. Sliding Window protocols: A one-bit sliding window protocol, A protocol using Go-Back-N, A protocol using Selective Repeat, Example data link protocols. Medium Access sub layer: The channel allocation problem, Multiple access protocols: ALOHA, Carrier sense multiple access protocols, collision free protocols.

Unit 3 The Network Layer 10

Design issues, Routing algorithms: shortest path routing, Flooding, Hierarchical routing, Broadcast, Multicast, distance vector routing, Congestion Control Algorithms, Quality of Service, Internetworking, The Network layer in the internet.

Unit 4 The Transport Layer 10

Transport Services, Elements of Transport protocols, Connection management, TCP and UDP protocols: RTP, RTTP.

Unit 5 The Application Layer 10

Domain name system, SNMP, Electronic Mail; the World WEB, HTTP, Streaming audio and video.

Textbook:

1. Andrew S.Tanenbaum, David j.wetherall, Computer Networks, 7th Edition, PEARSON.

Reference Books:

1. James F. Kurose, Keith W. Ross, —Computer Networking: A Top-Down Approach‖, 6th edition, Pearson, 2019.
2. Forouzan, Datacommunications and Networking, 5th Edition, McGraw Hill Publication.
3. Youlu Zheng, Shakil Akthar, —Networks for Computer Scientists and Engineers‖, Oxford Publishers, 2016.

Online Learning Resources:

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

CO-PO MAPPING:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Engineering tool usage	The engineer and The world	Ethics	Individual and Collaborative team work	Communication	Project management and finance	Life-long learning	PSO1	PSO2	PSO3
24ACSE52T.1	3	2	1	1	2	-	-	-	1	-	2	3	-	2
24ACSE52T.2	3	3	1	2	2	-	-	-	1	-	2	3	-	1
24ACSE52T.3	3	2	2	2	2	1	-	-	1	-	2	3	-	1
24ACSE52T.4	3	2	2	1	2	-	-	-	1	-	2	3	-	1
24ACSE52T.5	3	2	2	1	2	1	-	-	2	-	2	3	1	2

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RAJAMPET, Annamayya District, AP – 516126, INDIA

Title of the Course: PREDICTIVE ANALYTICS
Category : PC
Year : III
Semester : I
Course Code : 24ACAI51T
Branch/es : CSE(AI)

Lecture Hours	Tutorial Hours	Practice Hours	Credits	Total Hours
3	0	0	3	52

Course Objectives:

- To introduce the fundamental concepts and techniques of predictive analytics.
- To apply statistical models and machine learning algorithms for prediction.
- To interpret model performance using evaluation metrics.
- To explore feature engineering, model tuning, and cross-validation.
- To implement predictive solutions for real-world business and research problems.

Course Outcomes:

At the end of the course, the student will be able to

1. Understand the principles and importance of predictive analytics.
2. Apply regression and classification models for predictive tasks.
3. Perform data preprocessing, feature selection, and transformation.
4. Evaluate and validate models using standard metrics.
5. Design predictive solutions to solve domain-specific challenges

Unit 1 INTRODUCTION TO PREDICTIVE ANALYTICS **10**

Introduction to Predictive Analytics and Business Intelligence, Types of Predictive Models: Classification, Regression, Time Series, Supervised vs Unsupervised Learning, Predictive Modeling Workflow, Applications in Marketing, Finance, Healthcare, Challenges in Predictive Analytics.

Unit 2 DATA PREPARATION AND FEATURE ENGINEERING 10

Data Cleaning: Handling Missing, Noisy, and Inconsistent Data, Feature Selection and Dimensionality Reduction (PCA, LDA), Feature Scaling: Normalization, Standardization, Encoding Categorical Variables, Feature Extraction and Construction, Dealing with Imbalanced Datasets.

Unit 3 PREDICTIVE MODELING WITH REGRESSION AND CLASSIFICATION 10

Linear Regression and Polynomial Regression, Logistic Regression for Binary Classification, Decision Trees and Random Forest, k-Nearest Neighbors (k-NN) and Naïve Bayes, Support Vector Machines (SVM), Model Selection and Comparison.

Unit 4 MODEL EVALUATION AND VALIDATION 11

Training, Testing, and Validation Sets, Cross-Validation Techniques (k-Fold, Stratified, LOOCV), Evaluation Metrics: Accuracy, Precision, Recall, F1 Score, ROC-AUC, Confusion Matrix and Classification Report, Bias-Variance Trade-off and Overfitting, Hyperparameter Tuning: Grid Search, Random Search.

Unit 5 ADVANCED TOPICS AND APPLICATIONS 11

Ensemble Learning: Bagging, Boosting (AdaBoost, XGBoost), Predictive Analytics with Time Series (ARIMA, Prophet), Deep Learning for Predictive Modeling (ANNs, LSTM), Use of Predictive Analytics in IoT, Retail, and Healthcare, Ethics and Privacy in Predictive Analytics, Building and Deploying End-to-End Predictive Systems.

Textbook:

1. John D. Kelleher, Brendan Tierney, Data Science: Predictive Analytics and Data Mining, MIT Press, 2018.

Reference Books:

1. Dean Abbott,Applied Predictive Analytics: Principles and Techniques for the Professional Data Analyst, Wiley, 2014.
2. Galit Shmueli et al., Data Mining for Business Analytics: Concepts, Techniques, and Applications in R, Wiley, 2017.
3. Eric Siegel, Predictive Analytics: The Power to Predict Who Will Click, Buy, Lie, or Die, Wiley, 2016.
4. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning, Springer, 2009.

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Engineering tool usage	The engineer and the world	Ethics	Individual and Collaborative Team work	Communication	Project management and finance	Life-long learning
24ACAI51T.1	3	2	-	-	1	3	-	-	-	-	2
24ACAI51T.2	2	3	2	2	3	-	-	-	-	-	2
24ACAI51T.3	2	3	3	3	3	-	-	-	-	-	2
24ACAI51T.4	2	3	2	2	3	-	-	-	-	-	2
24ACAI51T.5	2	3	3	2	3	3	-	-	-	2	3

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RAJAMPET, Annamayya District, AP – 516126, INDIA

Title of the Course	:	INTRODUCTION TO DEEP LEARNING
Category	:	PC
Couse Code	:	24ACAI52T
Year	:	III
Semester	:	I
Branch	:	CSE(AI)

Lecture Hours	Tutorial Hours	Practice Hours	Credits	Total Hours
3	0	0	3	51

Course Objectives:

- Demonstrate the major technology trends driving Deep Learning
- Build, train, and apply fully connected deep neural networks
- Implement efficient (vectorized) neural networks
- Analyse the key parameters and hyper parameters in a neural network's architecture

Course Outcomes

1. Demonstrate the mathematical foundation of neural network
2. Describe the machine learning basics
3. Differentiate architecture of deep neural network
4. Build a convolution neural network
5. Build and train RNN and LSTMs

UNIT – 1 LINEAR ALGEBRA 10

Linear Algebra: Scalars, Vectors, Matrices and Tensors, Matrix operations, types of matrices, Norms, Eigen decomposition, Singular Value Decomposition, Principal Components Analysis. Probability and Information Theory: Random Variables, Probability Distributions, Marginal Probability, Conditional Probability, Expectation, Variance and Covariance, Bayes' Rule, Information Theory. Numerical Computation: Overflow and Underflow, Gradient-Based Optimization, Constrained Optimization, Linear Least Squares.

UNIT – 2 MACHINE LEARNING 10

Machine Learning: Basics and Under fitting, Hyper parameters and Validation Sets, Estimators, Bias and Variance, Maximum Likelihood, Bayesian Statistics, Supervised and Unsupervised Learning, Stochastic Gradient Descent, Challenges Motivating Deep Learning. Deep Feed forward Networks: Learning XOR, Gradient-Based Learning, Hidden Units, Architecture Design, Back-Propagation and other Differentiation Algorithms.

UNIT – 3 REGULARIZATION FOR DEEP LEARNING 9

Qubit: Physical implementations of Qubit. Qubit as a quantum unit of information. The Bloch sphere Quantum Circuits: single qubit gates, multiple qubit gates, designing the quantum circuits. Bell states.

UNIT – 4 CONVOLUTION NETWORKS 10

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

UNIT – 5 SEQUENCE MODELLING 12

Sequence Modelling: Recurrent and Recursive Nets: Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs, Encoder-Decoder Sequence-to-Sequence Architectures, Deep Recurrent Networks, Recursive Neural Networks, Echo State Networks, LSTM, Gated RNNs, Optimization for Long-Term Dependencies, Auto encoders, Deep Generative Models.

TEXT BOOK:

1. Ian Good fellow, Joshua Bagnio, Aaron Carville, —Deep Learning, MIT Press,2016.

REFERENCE BOOKS:

1. Josh Patterson and Adam Gibson, —Deep learning: A practitioner's approach‖, O'Reilly Media, First Edition,2017
2. 1Fundamentals of Deep Learning, Designing next-generation machine intelligence algorithms, Nikhil Baume, O'Reilly, Sheriff Publishers,2019.
3. Deep learning Cook Book, Practical recipes to get started Quickly, Douse Using, O'Reilly, Sheriff Publishers, 2019

ONLINE LEARNING RESOURCES

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

CO-PO MAPPING

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Engineering tool usage	The engineer and the world	Ethics	Individual and Collaborative Team work	Communication	Project management and finance	Life-long learning
24ACAI52T.1	3	3	2	2	2	-	-	-	-	2	1
24ACAI52T.2	3	2	2	2	2	-	-	-	-	2	1
24ACAI52T.3	3	2	3	2	3	-	-	-	-	2	2
24ACAI52T.4	3	2	3	3	3	-	-	-	-	2	2
24ACAI52T.5	3	2	3	3	3	-	-	-	-	2	2

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RAJAMPET, Annamayya District, AP – 516126, INDIA

Title of the Course	:	**Quantum Computing**
Category	:	PE
Couse Code	:	24ACSE5DT
Year	:	III
Semester	:	I
Branch	:	CSE, AI&ML, CSE(AI)

Lecture Hours	Tutorial Hours	Practice Hours	Credits	Total Hours
3	0	0	3	52

Course Objectives:

1. Introduce fundamentals and history of quantum computing.
2. Develop background in mathematics, physics, and biology for quantum systems.
3. Explain qubits and quantum circuit design.
4. Present key quantum algorithms and their significance.
5. Study quantum error correction and cryptography applications.

Course Outcomes

1. Understand differences between classical and quantum computing.
2. Grasp core principles like superposition, entanglement, and measurement.
3. Analyze qubits and basic quantum circuits.
4. Evaluate major quantum algorithms.
5. Understand quantum error correction and impact on cryptography.

UNIT – 1 **10**

History of Quantum Computing: Importance of Mathematics, Physics and Biology. Introduction to Quantum Computing: Bits Vs Qubits, Classical Vs Quantum logical operations

UNIT – 2 **12**

Background Mathematics: Basics of Linear Algebra, Hilbert space, Probabilities and measurements. Background Physics: Paul's exclusion Principle, Superposition, Entanglement and super-symmetry, density operators and correlation, basics of quantum mechanics, Measurements in bases other than computational basis. Background Biology: Basic concepts of Genomics and Proteomics (Central Dogma)

UNIT – 3 **10**

Qubit: Physical implementations of Qubit. Qubit as a quantum unit of information. The Bloch sphere Quantum Circuits: single qubit gates, multiple qubit gates, designing the quantum circuits. Bell states.

UNIT – 4 **10**

Quantum Algorithms: Classical computation on quantum computers. Relationship between quantum and classical complexity classes. Deutsch's algorithm, Deutsch's-Jozsa algorithm, Shor's factorization algorithm, Grover's search algorithm.

UNIT – 5 **10**

Noise and error correction: Graph states and codes, Quantum error correction, fault-tolerant computation. Quantum Information and Cryptography: Comparison between classical and quantum information theory. Quantum Cryptography, Quantum teleportation.

TEXT BOOK:

1. Nielsen M. A., Quantum Computation and Quantum Information, Cambridge.

REFERENCE BOOKS:

1. Quantum Computing for Computer Scientists by Noson S. Yanofsky and Mirco A. Mannucci

2. Benenti G., Casati G. and Strini G., Principles of Quantum Computation and Information, Vol.I: Basic Concepts, Vol II.

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Engineering tool usage	The engineer and the world	Ethics	Individual and Collaborative Team work	Communication	Project management and finance	Life-long learning	PSO1	PSO2	PSO3
24ACSE5DT.1	3	2	-	-	1	-	-	-	-	-	-	2	2	-
24ACSE5DT.2	3	2	1	1	2	-	-	-	-	-	-	2	2	-
24ACSE5DT.3	3	3	2	2	2	-	-	-	1	1	-	2	3	-
24ACSE5DT.4	3	2	1	1	1	2	-	2	-	1	-	2	2	-
24ACSE5DT.5	3	3	2	2	2	1	-	1	-	1	-	3	3	-

Title of the Course:	Software Testing Methodologies
Category:	PE
Couse Code:	24ACSE5AT
Year:	III
Semester:	I
Branch:	CSE, AI&ML, CSE(AI)

Lecture Hours	Tutorial Hours	Practice Hours	Credits	Total Hours
3	0	0	3	52

Course Objectives:

1. To understand the fundamental concepts of software testing, including software testing objectives, the taxonomy of bugs
2. To analyze testing techniques such as path testing and transaction flow testing
3. To understand the concepts of data flow testing and its applications
4. To build the paths and decision tables for a software project
5. To apply the concepts of State Graphs, Transition testing and Graph Testing

Course Outcomes:

1. Understand the concepts of software testing and taxonomy of bugs.
2. Construct control flow graphs for different programs.
3. Apply and Test the applications using different testing methods and automation tools.
4. Build paths and decision tables for various problems
5. Analyze state graphs for different problems and apply transition testing on them.

Unit 1: Introduction **10**

Purpose of testing, Dichotomies, model for testing, consequences of bugs, taxonomy of bugs.

Unit 2: Flow Graphs and Path Testing **10**

Basics concepts of path testing, predicates, path predicates and achievable paths, path sensitizing, path instrumentation, application of path testing.

Unit 3: Transaction Flow Testing & Domain Testing **12**

Transaction flows, transaction flow testing techniques. Dataflow testing: Basics of dataflow testing, strategies in dataflow testing, application of dataflow testing.

Domain Testing: Domains and paths, Nice & ugly domains, domain testing, domains.

Unit 4: Paths, Path Products and Regular Expressions **10**

Path Products & Path Expression, Reduction Procedure, Applications, Regular Expressions & Flow Anomaly.

Detection. Logic Based Testing: Overview, Decision Tables, Path Expressions, KV Charts and Specifications.

Unit 5 State, State graphs and Transaction Testing **10**

State Graphs, Good & Bad State Graphs, State Testing, Testability Tips.

Graph Matrices and Application: Motivational Overview, Matrix of Graph, Relations, Power of a Matrix, Node Reduction Algorithm, Building Tools.

Text Book:

1. Baris Beizer, *Software testing techniques*. Dreamtech, 2nd Ed.

Reference books:

1. Dr.K.V.K.K.Prasad, Software Testing Tools. Dreamtech.

2. Brian Marick,The craft of software testing. Pearson Education.

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Engineering tool usage	The engineer and The world	Ethics	Individual and Collaborative team work	Communication	Project management and finance	Life-long learning	PSO1	PSO2	PSO3
24ACSE5AT.1	3	2	1	2	2	–	–	–	–	–	3	2	2	–
24ACSE5AT.2	3	2	1	2	2	–	–	–	–	–	3	2	2	–
24ACSE5AT.3	3	3	3	3	2	–	–	–	–	–	3	2	2	–
24ACSE5AT.4	3	3	3	3	2	–	–	–	–	–	3	2	2	–
24ACSE5AT.5	3	3	3	3	2	–	–	–	–	–	3	2	2	–

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RAJAMPET, Annamayya District, AP – 516126, INDIA

Title of the Course	:	AGILE METHODOLOGIES
Category	:	PE
Year	:	III
Semester	:	I
Course Code	:	24ACAI5AT
Branch/es	:	CSE(AI)

Lecture Hours	Tutorial Hours	Practice Hours	Credits	Total Hours
3	0	0	3	50

Course Objectives:

- Knowledge on concepts of Agile development, releasing, planning and developing.

Course Outcomes:

At the end of the course, the student will be able to

1. Explain agile principles and Extreme Programming concepts, roles, life cycle, and adoption practices.
2. Demonstrate effective collaboration through customer involvement, team communication, and standard agile practices.
3. Execute reliable software releases using version control, continuous integration, and quality-focused practices.
4. Organize agile planning activities including releases, iterations, risk management, and estimation.
5. Construct software using XP development practices such as TDD, refactoring, and incremental design.

Unit 1 Introduction Extreme Programming (XP) - Agile Development **12**

Why Agile - Understanding Success, Beyond Deadlines, Importance of Organizational Success, Introduction to Agility How to Be Agile - Agile methods, Don't make your own method, Road to mastery Understanding XP (Extreme Programming) - XP life cycle, XP team, XP Concepts Adopting XP - Knowing whether XP is suitable, Implementing XP, assessing Agility Practicing XP - Thinking - Pair Programming, Energized work, Informative Workspace, Root cause Analysis, Retrospectives

Unit 2 Collaborating 9

Trust, Sit together, Real customer involvement, Ubiquitous language, meetings, coding standards, Iteration demo, Reporting

Unit 3 Releasing 9

Bugfree Release, Version Control, fast build, continuous integration, Collective ownership, Documentation

Unit 4 Planning **9**

Version, Release Plan, Risk Management, Iteration Planning, Slack, Stories, Estimating.

Unit 5 Developing 11

Incremental requirements, Customer tests, Test driven development, Refactoring, Incremental design and architecture, spike solutions, Performance optimization, Exploratory testing.

Textbook:

1. The art of Agile Development, James Shore and Shane Warden, 11th Indian Reprint, O'Reilly,2018.

Reference Books:

1. Learning Agile, Andrew Stellman and Jennifer Greene, O'Reilly, 4th Indian Reprint, 2018.
2. Practices of an Agile Developer, Venkat Subramaniam and Andy Hunt, SPD, 5th Indian Reprint, 2015.
3. Agile Project Management - Jim Highsmith, Pearson Low price Edition 2004.

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Engineering tool usage	The engineer and the world	Ethics	Individual and Collaborative Team work	Communication	Project management and finance	Life-long learning
24ACAI5AT.1	3	2	-	-	-	3	-	-	-	2	2
24ACAI5AT.2	2	2	2	-	1	-	-	-	-	-	2
24ACAI5AT.3	2	2	3	2	3	-	-	-	-	-	2
24ACAI5AT.4	2	3	2	2	-	2	-	2	-	3	2
24ACAI5AT.5	2	3	3	2	3	2	-	2	-	2	3

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RAJAMPET, Annamayya District, AP – 516126, INDIA

Title of the Course: **Object Oriented Analysis and Design**
Category: PE
Year: III
Semester: I
Course Code: 24ACSE5BT
Branch/es: CSE, AI&ML, CSE(AI), CSE(AIML) & CSE (IoTCSBCT)

Lecture Hours	Tutorial Hours	Practice Hours	Credits	Total Hours
3	0	0	3	54

Course Objectives:

1. Describe the activities in the different phases of the object-oriented development lifecycle.
2. Understand the concepts of object-oriented model with the E-R and EER models.
3. Model a real-world application by using UML diagram.
4. Design architectural modelling.
5. Describing an application of UML.

Course Outcomes:

At the end of the course, the student will be able to

1. The importance of modelling in UML.
2. Compare and contrast the object-oriented model with the E-R and EER models.
3. Design use case diagram. Design an application using deployment diagram.
4. Apply UML diagrams to build library application.
5. Demonstrate the ability to implement standard design patterns.

Unit 1 10

Introduction to UML: Importance of modelling, principles of modelling, object-oriented modelling, conceptual model of the UML, Architecture, Software Development Life Cycle.

Unit 2 12

Basic Structural Modelling: Classes, Relationships, common Mechanisms, and diagrams. Advanced Structural Modelling: Advanced classes, advanced relationships, Interfaces, Types and Roles, Packages. Class & Object Diagrams: Terms, concepts, modelling techniques for Class & Object Diagrams.

Unit 3 10

Basic Behavioural Modelling-I: Interactions, Interaction diagrams.
Basic Behavioural Modelling-II: Use cases, Use case Diagrams, Activity Diagrams.

Unit 4 12

Advanced Behavioral Modelling: Events and signals, state machines, processes and Threads, time and space, state chart diagrams.

Unit 5 10

Architectural Modelling: Component Deployment, Component diagrams and Deployment diagrams. Case Study: The Unified Library application, ATM.

Text Book:

1. Grady Booch, James Rumbaugh, Ivar Jacobson: The Unified Modelling Language User Guide, Pearson Education 2nd Edition.

Reference Books:

1.Object-Oriented Analysis and Design with the Unified Process By John W. Satzinger, Robert B Jackson and Stephen D Burd, Cengage Learning

2. Meilir Page-Jones: Fundamentals of Object-Oriented Design in UML, Pearson Education.

3. Pascal Roques: Modelling Software Systems Using UML2, WILEY-Dreamtech India Pvt. Ltd.

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Engineering tool usage	The engineer and The world	Ethics	Individual and Collaborative team work	Communication	Project management and finance	Life-long learning	PSO1	PSO2	PSO3
24ACSEBT.1	3	2	1	1	1	–	–	–	–	–	2	2	1	–
24ACSEBT.2	3	3	2	2	3	–	–	–	–	–	2	3	2	–
24ACSEBT.3	3	3	2	2	1	–	–	–	–	–	3	2	2	–
24ACSEBT.4	3	3	3	3	2	–	–	–	–	–	3	2	2	–
24ACSEBT.5	3	3	3	3	3	–	–	2	2	2	3	3	3	1

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RAJAMPET, Annamayya District, AP – 516126, INDIA

Title of the Course:	**Computer Networks Lab**
Category:	PC
Year:	III
Semester:	I
Course Code:	24ACSE52L
Branch/es:	CSE, AI&ML, CSE(AI), CSE(AIML) & CSE (IoTCSBCT)

Lecture Hours	Tutorial Hours	Practice Hours	Credits
0	0	3	1.5

Course Objectives: This course is designed to

1. Understand the basic concepts of Computer Networks.
2. Introduce the layered approach for design of computer networks.
3. Expose the network protocols used in Internet environment.
4. Explain the format of headers of IP, TCP and UDP Familiarize with the applications of Internet
5. Familiarize with the applications of Internet

Course Outcomes:

After completion of the course, students will be able to

1. Understand the working principle of various communication protocols.
2. Understand the network simulator environment and visualize a network topology and observe its performance.
3. Analyze the traffic flow and the contents of protocol frames.
4. Critique the existing routing protocols.

Exercise 1 3

Simulate network topologies Star, Bus, Mesh and Ring using Packet Tracer Tool.

Exercise 2 3

Implement the data link layer framing methods such as character, character stuffing and bit stuffing.

Exercise 3 3

Implement on a data set of characters the three CRC polynomials – CRC 12, CRC 16 and CRC CCIP.

Exercise 4 3

Implement Dijkstra_s algorithm to compute the Shortest path through a graph.

Exercise 5 3

Implement and simulate algorithm for Distance vector routing protocol.

Exercise 6 3

Implement and simulate algorithm for Link state routing protocol.

Exercise 7 3

Install network simulator NS-2 in any of the Linux operating system and simulate wired and Wireless scenarios.

Exercise 8 3

Using Wireshark observe data transferred in client server communication using UDP and identify the UDP datagram

Exercise 9 3

Using Wireshark observe Three Way Handshaking Connection Establishment, Data Transfer and Three-Way Handshaking Connection Termination in client server communication using TCP.

Exercise 10 3

Design and configure a network with multiple subnets with wired and wireless LANs using required network devices. Configure the following services in the network- TELNET, SSH, FTP server, Web server, File server, DHCP server and DNS server.

Exercise 11 3

Implement Simple Mail Transfer Protocol.

Exercise 12 3

Create a simple LAN connection between two PCs using a switch in Packet Tracer and test connectivity using the ping command.

Exercise 13 3

Configure IP addresses manually for hosts in different subnets and verify communication between them using a router.

Exercise 14 3

Observe and analyze basic network packets such as ARP, ICMP, TCP, and UDP using Wireshark.

Note: All the prescribed laboratory exercises shall be completed by the students within a duration of fourteen (14) weeks during the semester.

Textbook:

1. Andrew S.Tanenbaum, David j.wetherall, Computer Networks, 6th Edition, PEARSON.

Reference Books:

1. James F.Kurose, Keith W. Ross, Computer Networking: A Top-Down 6th edition, Pearson, 2019.
2. Computer Networks: A Systems Approach-Bruce Davie, VMware-Larry Peterson, Princeton University-2019.
3. Computer Networks–B. K. MathanNagan, T. Mahalakshmi- Charulatha Publications PrivateLimited-2019.
4. Computer Networks-Dr.Amol V. Dhumane Nitin N. Sakhare-NiraliPrakashan Publishers-2024 5. Data Communications and Networking with TCPIP Protocol Suite-Behrouz A. Forouzan-McGraw Hill-6th Edition.

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Engineering tool usage	The engineer and The world	Ethics	Individual and Collaborative team work	Communication	Project management and finance	Life-long learning	PSO1	PSO2	PSO3
24ACSE52L.1	3	2	1	1	2	-	-	-	1	-	2	-	3	3
24ACSE52L.2	2	3	2	2	3	-	-	1	1	-	2	1	3	-
24ACSE52L.3	3	2	2	3	2	1	-	-	1	-	2	-	3	3
24ACSE52L.4	3	3	3	2	2	1	1	-	2	-	3	-	3	3

Title of the Course:	**PREDICTIVE ANALYTICS LAB**
Category:	PC
Year	III
Semester:	I
Course Code:	24ACAI51L
Branch/es:	CSE(AI)

Lecture Hours	Tutorial Hours	Practice Hours	Credits
0	0	3	1.5

Course Objectives: This course will be able to

- The objective of this lab is to get an overview of the various machine learning techniques and can demonstrate them using python.

Course Outcomes:

At the end of the course, the student will be able to

1. Understand the principles and importance of predictive analytics.
2. Apply regression and classification models for predictive tasks.
3. Perform data preprocessing, feature selection, and transformation.
4. Evaluate and validate models using standard metrics.
5. Design predictive solutions to solve domain-specific challenges

Exercise 1: 3

Write a python program to compute Central Tendency Measures: Mean, Median, Mode, Measure of Dispersion: Variance, Standard Deviation

Exercise 2 3

Study of Python Basic Libraries such as Statistics, Math, Numpy and Scipy

Exercise 3 3

Study of Python Libraries for ML application such as Pandas and Matplotlib

Exercise 4 3

Write a Python program to implement Simple Linear Regression

Exercise 5 3

Implementation of Multiple Linear Regression for House Price Prediction using sklearn

Exercise 6 3

Implementation of Decision tree using sklearn and its parameter tuning

Exercise 7 3

Implementation of KNN using sklearn

Exercise 8 3

Implementation of Logistic Regression using sklearn

Exercise 9 3

Implementation of K-Means Clustering

Exercise 10 3

Performance analysis of Classification Algorithms on a specific dataset (Case Studies)

Note: All the prescribed laboratory exercises shall be completed by the students within a duration of fourteen (14) weeks during the semester.

Text Book:

1. Machine Learning – Tom M. Mitchell, - MGH.

Reference Book:

1. Machine Learning: An Algorithmic Perspective, Stephen Marshland, Taylor & Francis.

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Engineering tool usage	The Engineer and world	Ethics	Individual and Collaborative teamwork	Communication	Project management and finance	Life-long learning
24ACAI51L.1	3	2	-	-	1	3	-	-	-	-	2
24ACAI51L.2	2	3	2	2	3	-	-	-	-	-	2
24ACAI51L.3	2	3	3	3	3	-	-	-	-	-	2
24ACAI51L.4	2	3	2	2	3	-	-	1	-	-	2
24ACAI51L.5	2	3	3	2	3	3	-	1	-	2	3

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RAJAMPET, Annamayya District, AP – 516126, INDIA

Title of the Course:	**DEEP LEARNING & MACHINE LEARNING MODEL OPTIMIZATION LAB**
Category:	PC
Year	III
Semester:	I
Course Code:	24ACAI52L
Branch/es:	CSE(AI)

Lecture Hours	Tutorial Hours	Practice Hours	Credits
0	0	3	1.5

Course Objectives: This course will be able to

- To provide practical exposure to model optimization techniques for improving performance and efficiency of machine learning models.
- To explore various hyperparameter tuning methods and optimization algorithms.
- To apply regularization techniques to control overfitting and improve generalization.
- To evaluate model performance through various metrics and validation strategies.
- To learn pruning, quantization, and deployment strategies for optimized models in real-world applications.

Course Outcomes:

At the end of the course, the student will be able to

1. Demonstrate the mathematical foundation of neural network
2. Describe the machine learning basics
3. Differentiate architecture of deep neural network
4. Build a convolution neural network
5. Build and train RNN and LSTMs

Exercise 1: 3

Implementing Grid Search and Random Search

- Hyperparameter tuning using Scikit-learn's Grid Search CV and Randomized Search CV

Exercise 2 3

Bayesian Optimization using Hyperopt / Optuna

- Optimize model hyperparameters using probabilistic approaches

Exercise 3 3

Early Stopping in Training Deep Learning Models

- Implement early stopping to avoid overfitting with TensorFlow/Keras

Exercise 4 3

Regularization Techniques (L1, L2, Dropout)

- Apply different regularization methods to improve model generalization

3

Exercise 5

Cross-Validation Techniques

- K-Fold, Stratified K-Fold, and Leave-One-Out Cross-Validation

Exercise 6 3

Model Performance Evaluation

- Use confusion matrix, precision, recall, F1-score, AUC-ROC for performance

Exercise 7 3

Model Pruning

- Prune unimportant weights in a trained neural network using PyTorch/TensorFlow

Exercise 8 3

Quantization Aware Training (QAT)

- Train a quantized model to reduce memory usage without losing accuracy

Exercise 9 3

Knowledge Distillation

- Transfer knowledge from a large model to a small one (student-teacher model)

Exercise 10 3

Optimizing Model Inference Time

- Use ONNX, TensorRT, or OpenVINO for faster model inference

Exercise 11 3

Automated Machine Learning (AutoML)

- Use Auto-Sklearn, Google AutoML, or TPOT for full pipeline optimization

Exercise 12 **3**

Model Deployment Optimization

- Optimize model for deployment using TFLite/ONNX in edge devices

TEXT BOOKs:

1. Aurélien Géron, Hands-On Machine Learning with Scikit-Learn, Keras & TensorFlow, O'Reilly.

Reference Book:

1. Sebastian Raschka, Python Machine Learning, Packt Publishing.
2. Ian Goodfellow, Yoshua Bengio, Aaron Courville, Deep Learning, MIT Press.
3. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning.
4. Vijay Madisetti, Machine Learning and Optimization Models for Real-Time Applications, Springer.
5. Francois Chollet, Deep Learning with Python, Manning.

ONLINE COURSES

1. Model Optimization Techniques – Coursera (DeepLearning.AI)
2. Hyperparameter Tuning in Python – Udacity

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning
23A3364L.1	3	3	2	2	3	-	-	-	2	-	-	2
23A3364L.2	3	3	3	3	3	-	-	-	-	-	-	2
23A3364L.3	3	3	3	2	3	-	-	-	2	-	2	3
23A3364L.4	3	3	3	2	3	-	-	-	2	-	2	3
23A3364L.5	3	3	2	2	2	-	-	-	1	-	1	1

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RAJAMPET, Annamayya District, AP – 516126, INDIA

Title of the Course: GENDER SENSITIZATION
Category : MC
Couse Code : 24AAUD51T
Branch/es : Common to all branches
Year : III
Semester : I

Lecture Hours	Tutorial Hours	Practice Hours	Credits	Total Hours
2	0	0	0	32

Course Objectives:

1. To enable students to understand the gender related issues, foster humane attitude and creative thinking
2. To familiarize them about constitutional safeguard for gender equality
3. To expose students to debates on the politics and economics of work and disclination
4. To help students reflect critically on gender violence
5. To make them understand that gender identities and gender relations are part of culture as they shape the way daily life is lived in the family as well as wider community and the workplace.

Course Outcomes:

At the end of the course, the student will be able to

1. Understand the basic concepts of gender and its related terminology.
2. Identify the biological, sociological, psychological and legal aspects of gender.
3. Use the knowledge in understanding how gender discrimination works in our society and how to counter it.
4. Analyze the gender division of labour and its relation to politics and economics.
5. Appraise how gender-role beliefs and sharing behavior are associated with more well-being

Unit 1 UNDERSTANDING GENDER 6

Introduction: Definition of Gender-Basic Gender Concepts and Terminology-Exploring Attitudes towards Gender-Socialization: Making Women, Making Men - Preparing for Womanhood. Growing up Male. First lessons in Caste.

Unit 2 GENDER ROLES AND RELATIONS 6

Struggles with Discrimination-Gender Roles and Relations-Types of Gender Roles- Gender Roles and Relationships Matrix-Missing Women-Sex Selection and its Consequences- Declining Sex Ratio-Demographic Consequences-Gender Spectrum.

Unit 3 GENDER AND LABOUR 7

Division and Valuation of Labour-Housework: The Invisible Labor- “My Mother doesn‘t Work”. “Share the Load”- Unrecognized and Unaccounted work -Gender Development Issues-Gender, Governance and Sustainable Development-Gender and Human Rights-Gender and Mainstreaming

Unit 4 GENDER-BASED VIOLENCE 7

The Concept of Violence- Types of Gender-based Violence- Human Rights Perspective-Sexual Harassment - Domestic Violence - Different forms of violence against women - Causes of violence, impact of violence against women - Consequences of gender-based violence

Unit 5 GENDER AND CULTURE 6

Gender and Films-Gender and Electronic Media-Gender and Advertisement-Gender and Popular Literature- Gender Development Issues-Gender-Gender Sensitive Language- Just Relationships

Textbooks:

1. A.Suneetha, Uma Bhrugubanda, et al. Towards a World of Equals: A Bilingual Textbook on Gender‖, Telugu Akademi, Telangana, 2015.
2. Butler, Judith. Gender Trouble: Feminism and the Subversion of Identity. UK Paperback Edn. March 1990

Reference Books:

1. Wtatt, Robin and Massood, Nazia, Broken Mirrors: The dowry Problems in India,London : Sage Publications, 2011.
2. Datt, R. and Kornberg, J.(eds), Women in Developing Countries, Assessing Strategies for Empowerment, London: Lynne Rienner Publishers, 2002.
3. Brush, Lisa D., Gender and Governance, New Delhi, Rawat Publication, 2007.
4. Singh, Direeti, Women and Politics World Wide, New Delhi, Axis Publications, 2010 5.
5. Raj Pal Singh, Anupama Sihag, Gender Sensitization: Issues and Challenges (English, Hardcover), Raj Publications, 2019.
6. A.Revathy& Murali, Nandini, A Life in Trans Activism(Lakshmi Narayan Tripathi). The University of Chicago Press, 2016.

Online Learning Resources():

1. Understanding Gender chrome-extension:

//kdpelmjpfafjppnhbloffcjpeomlnpah/https://www.arvindguptatoys.com/arvindgupta/kamla-gender1.pdf
https://onlinecourses.swayam2.ac.in/nou24_hs53/preview

2. Gender Roles and Relations
https://www.plannedparenthood.org/learn/gender-identity/sex-gender-identity/what-are-gender-roles-and-stereotypes
https://www.verywellmind.com/understanding-gender-roles-and-their-effect-on-our-relationships-7499408
https://onlinecourses.swayam2.ac.in/cec23_hs29/preview
3. Gender and Labour
https://www.economicsobservatory.com/what-explains-the-gender-division-of-labour-and-how-can-it-be-redressed
https://onlinecourses.nptel.ac.in/noc23_mg67/preview
4. GENDER-BASED VIOLENCE
https://eige.europa.eu/gender-based-violence/what-is-gender-based
violence?language_content_entity=en
https://www.worldbank.org/en/topic/socialsustainability/brief/violence-against-women-and-girls
https://onlinecourses.swayam2.ac.in/nou25_ge38/preview
5. GENDER AND CULTURE
https://gender.study/psychology-of-gender/culture-impact-gender-roles-identities/
https://sociology.iresearchnet.com/sociology-of-culture/gender-and-culture/
https://archive.nptel.ac.in/courses/109/106/109106136/

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RAJAMPET, Annamavva District, AP – 516126, INDIA

Title of the Course:	**NATURAL LANGUAGE PROCESSING**
Category:	PC
Year:	III
Semester:	II
Course Code:	24ACSM62T
Branch/es:	CSE, AIML, CSE(AI), CSE(AIML) & CSE (IoTCSBCT)

Lecture Hours	Tutorial Hours	Practice Hours	Credits	Total Hours
3	0	0	3	54

COURSE OBJECTIVES:

1. To provide a strong foundation in the principles and techniques of Natural Language Processing (NLP).
2. To introduce classical and deep learning-based approaches to NLP tasks.
3. To enable students to build and evaluate models for various NLP applications such as text classification, sentiment analysis, and machine translation.
4. To expose students to modern tools and libraries used in NLP such as NLTK, SpaCy, and Hugging Face Transformers.
5. To provide insights into the challenges of multilingual NLP and ethical concerns.

COURSE OUTCOMES:

Upon successful completion of the course, students will be able to:

1. Understand the fundamentals and challenges of natural language understanding.
2. Apply linguistic preprocessing techniques such as tokenization, stemming, POS tagging, and parsing.
3. Implement NLP algorithms for tasks like classification, translation, and information retrieval.
4. Develop deep learning models using RNNs, LSTMs, and Transformer-based architectures for NLP.
5. Use NLP tools and libraries to analyze and interpret natural language data in real-world scenarios.

UNIT 1: Fundamentals of Natural Language Processing **10**

Introduction to NLP: Definitions, Applications, Challenges, Linguistic Essentials: Syntax, Semantics, Pragmatics, Text Processing: Tokenization, Lemmatization, Stemming, Stopword Removal, Normalization, and N-gram Generation, POS Tagging and Named Entity Recognition, NLP Libraries: NLTK, SpaCy Overview.

UNIT 2: Text Representation and Statistical NLP **12**

Bag of Words and TF-IDF, Language Modeling: Unigrams, Bigrams, N-gram Models, Word Embeddings: Word2Vec, GloVe, FastText, Cosine Similarity and Distance Measures, Text Classification using Naive Bayes and SVM, Evaluation Metrics: Accuracy, Precision, Recall, F1.

UNIT 3: Deep Learning for NLP **12**

Neural Network Basics for NLP, Recurrent Neural Networks (RNNs) and Limitations, LSTM and GRU Networks, Sequence Labeling: POS Tagging, NER using Bi-LSTM, Text Classification using CNNs and RNNs, Model Evaluation and Hyperparameter Tuning.

UNIT 4: Transformers and Advanced NLP **10**

Attention Mechanism and Self-Attention, Transformer Architecture: Encoder-Decoder Models, Pretrained Language Models: BERT, RoBERTa, GPT, Fine-tuning Transformers for Text Classification, Question Answering and Text Summarization using Transformers, Sentiment Analysis and Zero-shot Classification.

UNIT 5: Applications, Ethics, and Multilingual NLP **10**

Machine Translation: Rule-based vs Neural MT, Chatbots and Conversational AI, Information Retrieval and Question Answering, Speech-to-Text and Text-to-Speech Overview, Multilingual NLP and Low-Resource Languages, Bias, Fairness, and Ethics in NLP.

TEXTBOOKS:

1. Daniel Jurafsky and James H. Martin, Speech and Language Processing, Pearson Education.
2. Steven Bird, Ewan Klein, Edward Loper, Natural Language Processing with Python, O'Reilly Media.
3. Yoav Goldberg, Neural Network Methods in NLP, Morgan & Claypool.

REFERENCE BOOKS:

1. Jacob Eisenstein, Introduction to Natural Language Processing, MIT Press.
2. Delip Rao and Brian McMahan, Natural Language Processing with PyTorch, O'Reilly.
3. Thushan Ganegedara, Transformers for Natural Language Processing, Packt Publishing.

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Engineering tool usage	The engineer and The world	Ethics	Individual and Collaborative team work	Communication	Project management and finance	Life-long learning	PSO1	PSO2	PSO3
24ACSM62T.1	3	2	–	–	–	–	–	–	–	–	2	2	-	-
24ACSM62T.2	3	3	2	–	2	–	–	–	–	–	2	3	2	2
24ACSM62T.3	3	3	3	2	3	–	–	–	–	–	2	3	2	2
24ACSM62T.4	3	3	3	3	3	–	–	–	–	–	3	2	-	3
24ACSM62T.5	3	3	3	3	3	2	–	2	2	–	3	3	3	2

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RAJAMPET, Annamayya District, AP – 516126, INDIA

Title of the Course: **Generative AI**
Category : **PC**
Year : **III**
Semester : **II**
Course Code : **24ACAI61T**
Branch/es : **CSE(AI)**

Lecture Hours	Tutorial Hours	Practice Hours	Credits	Total Hours
3	0	0	3	54

Course Objectives:

1. Understand core concepts of Generative AI and LLMs across domains.
2. Explain LangChain architecture and its components.
3. Compare LangChain with other LLM frameworks.
4. Develop LLM-powered applications using LangChain.
5. Apply advanced techniques like prompt engineering, fine-tuning, agents, and RAG.
6. Design, deploy, and evaluate responsible and production-ready AI solutions.

Course Outcomes:

At the end of the course, the student will be able to

1. Explain Generative AI, LLMs, LangChain, and RAG concepts.
2. Build basic AI applications using LangChain and LLM APIs.
3. Implement document retrieval, vector stores, and reasoning techniques.
4. Evaluate prompt engineering, fine-tuning, and hallucination mitigation methods.
5. Design and deploy production-ready LLM applications with RAG, agents, and monitoring.

Unit 1 **10**

What Is Generative AI: Introducing generative AI, what are generative models, why now, Understanding LLMs, what are text-to-image models, what can AI do in other domains.

LangChain for LLM Apps: Going beyond stochastic parrots, what is LangChain, Exploring key components of LangChain, How does LangChain work? Comparing LangChain with other frameworks.

Unit 2 12

Getting Started with LangChain: How to set up the dependencies, Exploring API model integrations-Fake LLM, OpenAI, Hugging Face, Google Cloud Platform, Jina AI, Replicate, Others, Azure, Anthropic, exploring local models, Building an application for customer service.

Building Capable Assistants: Mitigating hallucinations through fact-checking, summarizing information, extracting information from documents, answering questions with tools, Exploring reasoning strategies

Unit 3 10

Building a Chatbot like ChatGPT using LangChain: What is a chatbot? Understanding retrieval and vectors, Loading and retrieving in LangChain, Document loaders, Retrievers in LangChain, Implementing a chatbot.

Developing Software with Generative AI: Software development and AI, Code LLMs, writing code with LLMs, Automating software development, Summary, Questions.

Unit 4 10

LLMs for Data Science: The impact of generative models on data science, Automated data science, AutoML, using agents to answer data science questions, Data exploration with LLMs.

Customizing LLMs and Their Output: Conditioning LLMs, Fine-tuning, Prompt engineering, Prompt techniques -Zero-shot prompting, Few-shot learning, Chain-of-thought prompting, Self-consistency, Tree-of-thought.

Unit 5 12

Building Advanced Q& A and Search Applications Using Retrieval-Augmented Generation (RAG): Importance of RAG, How Does RAG Work, Document Loaders, Text Splitters, Vector Stores, Text Embedding Models, Retrievers, Indexing.

Generative AI in Production: How to get LLM apps ready for production, how to evaluate LLM apps, how to deploy LLM apps, how to observe LLM apps.

The Future of Generative Models: The current state of generative AI, Economic consequences, Societal implications.

Textbook:

1. Generative AI with LangChain: Build Large Language Model (LLM) Apps with Python, ChatGPT, and Other LLMs, Ben Auffarth, Packt Publishing.

Reference Books:

1. Generative AI Apps with LangChain and Python: A Project-Based Approach to Building Real-World LLM Apps, Raby Jay, Apress Publications.
2. Deep Learning, Ian Goodfellow, Yoshua Bengio & Aaron Courville — MIT Press
3. Natural Language Processing with Transformers, Lewis Tunstall, Leandro von Werra, Thomas Wolf O'Reilly, 2022

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Engineering tool usage	The engineer and the world	Ethics	Individual and Collaborative Team work	Communication	Project management and finance	Life-long learning
24ACAI61T.1	3	2	-	-	1	2	-	-	-	-	2
24ACAI61T.2	2	3	3	-	3	-	-	1	-	-	2
24ACAI61T.3	2	3	3	2	3	-	-	2	-	-	2
24ACAI61T.4	3	3	2	2	3	-	-	-	-	-	3
24ACAI61T.5	2	3	3	2	3	3	-	1	-	2	3

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RAJAMPET, Annamayya District, AP – 516126, INDIA

Title of the Course: **AI FOR CLOUD COMPUTING**
Category : **PC**
Year : **III**
Semester : **II**
Course Code : **24ACAI62T**
Branch/es : **AI&ML, CSE(AI)**

Lecture Hours	Tutorial Hours	Practice Hours	Credits	Total Hours
3	0	0	3	52

Course Objectives:

1. To introduce the concepts, models, and services of cloud computing and its role in AI.
2. To explore the architecture and deployment of AI applications on cloud platforms.
3. To equip students with skills in using cloud-based tools and services for AI/ML workloads.
4. To understand data storage, processing, and security in cloud for AI tasks.
5. To apply cloud computing principles to real-world AI-based solutions.

Course Outcomes:

At the end of the course, the student will be able to

1. Explain cloud computing architecture, services, and deployment models.
2. Utilize cloud platforms (AWS, GCP, Azure) for training and deploying AI models.
3. Handle large-scale data storage and processing in the cloud environment.
4. Integrate AI workflows using serverless and container-based architectures.
5. Analyze challenges in security, cost, scalability, and performance of cloud-based AI systems.

Unit 1 INTRODUCTION TO CLOUD COMPUTING AND AI INTEGRATION **10**

Basics of Cloud Computing: Characteristics, Models, and Services, Cloud Service Models: IaaS, PaaS, SaaS, Deployment Models: Public, Private, Hybrid, Community, AI and Cloud Convergence: Benefits and Challenges, Use Cases of AI in Cloud: NLP, Vision, Analytics, Overview of Cloud Providers for AI: AWS, Azure, GCP.

Unit 2 STORAGE, COMPUTING, AND DATA PROCESSING IN THE CLOUD 10

Cloud Storage Services: S3, Blob, BigQuery, Virtualization and Elastic Computing, Distributed Computing with Hadoop and Spark, Data Ingestion and Processing Pipelines, Data Lakes and Warehousing in the Cloud, Cost Optimization for Storage and Compute Resources.

Unit 3 CLOUD-BASED MACHINE LEARNING AND DEEP LEARNING 10

ML Services on AWS (SageMaker), Azure ML, GCP Vertex AI, Training and Deploying Models on Cloud, AutoML and Custom ML Model Workflows, GPUs/TPUs for Model Training, Experiment Tracking and Model Evaluation, Integration of Notebooks (Jupyter, Colab) with Cloud Storage.

Unit 4 ADVANCED CLOUD CONCEPTS FOR AI APPLICATIONS 12

Containers and Docker for AI Applications, Kubernetes and Cloud-native AI Workflows, Serverless Computing: AWS Lambda, Azure Functions, CI/CD Pipelines for AI Models in Cloud, Scaling AI Applications using Load Balancers and Auto-Scaling. Monitoring and Logging in Cloud for AI Workflows.

Unit 5 SECURITY, ETHICS, AND CASE STUDIES IN CLOUD AI 10

Security and Privacy in Cloud-based AI, Identity and Access Management (IAM) in Cloud, Cost Management and Billing for AI Services, Ethical Issues and Fairness in Cloud AI, Case Study: AI in Healthcare Cloud Solutions, Case Study: Real-Time Analytics in Financial Cloud Services.

Textbook:

1. Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, Mastering Cloud Computing, McGraw-Hill.

Reference Books:

1. Judith Hurwitz et al., Cloud Computing for Dummies, Wiley.
2. Aurélien Géron, Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, O'Reilly.

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Engineering tool usage	The engineer and the world	Ethics	Individual and Collaborative Team work	Communication	Project management and finance	Life-long learning
24ACAI62T.1	3	2	-	-	1	3	-	-	-	-	2
24ACAI62T.2	2	3	2	2	3	-	-	-	-	3	2
24ACAI62T.3	2	2	3	2	3	-	-	-	-	-	3
24ACAI62T.4	2	2	3	2	3	-	-	2	-	2	2
24ACAI62T.5	2	2	2	-	2	3	-	-	-	3	2

ANNAMACHARYA UNIVERSITY

(ESTD UNDER AP PRIVATE UNIVERSITIES (ESTABLISHMENT AND REGULATION) ACT,
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RAJAMPET, Annamayya District, AP – 516126, INDIA

Title of the Course Internet of Things
Category PE
Year: III
Semester II
Couse Code 24ACSM6AT
Branch AI&ML, CSE(AI), CSE(AIML)

Lecture Hours	Tutorial Hours	Practice Hours	Credits	Total Hours
3	0	0	3	50

Course Objectives:

1. Understand the terminology, technology and its applications of IoT.
2. Know the concept of M2M (machine to machine) with necessary protocols.
3. Memorize the software platforms which are used for developing the applications.
4. Learn the concepts of python programming language which is used to develop the IoT projects.
5. Know the hardware platforms which are necessary to develop the IoT applications.

Course Outcomes:

At the end of the course, the student will be able to

1. Understand the vision of IoT from a global context
2. Identify the difference between IoT and M2M communication.
3. Determine the usage of 6LoWPAN and select the appropriate network protocols for IoT project.
4. Develop the IoT experiments with the help of Python programs.
5. Design the IoT applications using Raspberry Pi kit.

Unit 1 Introduction to Internet of Things **10**

Introduction to Internet of Things, History of IoT, Physical Design of IoT, Logical Design of IoT, IoT Enabling Technologies, IoT Levels & Deployment Templates, Applications of IoT.

Unit 2 IoT and M2M & IoT Platforms Design Methodology **9**

IoT and M2M: Introduction, M2M, Difference between IoT and M2M, SDN and NFV for IoT. IoT Platforms Design Methodology: Introduction, IoT Design Methodology.

Unit 3 The Wireless Embedded Internet **10**

Introduction to 6LoWPAN, the 6LoWPAN Architecture, The Basic 6LoWPAN Format, Addressing MQ telemetry transport for sensor networks (MQTT-S), ZigBee compact application protocol, Contiki and uIPv6, Wireless RFID Infrastructure.

Unit 4 IoT Systems- Logical Design Using Python **11**

Introduction, Installing Python, Python Data Types and Data Structures, Control Flow, Functions, Modules, Packages and File Handling.

Unit 5 IoT Physical Devices and Endpoints **10**

What is an IoT Device, Exemplary Device: Raspberry Pi, About the Board, Linux on Raspberry Pi, Raspberry Pi Interfaces, Programming Raspberry Pi with Python, Other IoT Devices.

Text Books:

1. Internet of Things, A Hands-On Approach, Arshdeep Bahga, Vijay Madisetti, University Press, 2015.
2. 6LoWPAN: The WirelessEmbedded Internet, Zach Shelby and Carsten Bormann,Wiley publications, first edition,2009.(Unit III).

Reference Books:

1. The Internet of Things Connecting Objects to the Web, Hakima Chaouchi,Wiley publications,2010.
2. Designing the Internet of Things, Adrian McEwen, Hakim Cassimally, Wiley 2014.
3. Enterprise IoT, A Definitive Handbook by Naveen Balani.

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Engineering tool usage	The engineer and The world	Ethics	Individual and Collaborative team work	Communication	Project management and finance	Life-long learning	PSO1	PSO2	PSO3
24ACSM6AT.1	2	2	2	3	3	–	–	2	–	–	3	3	2	–
24ACSM6AT.2	2	3	2	3	3	–	–	2	–	–	3	3	2	–
24ACSM6AT.3	2	3	3	3	3	–	–	2	–	–	3	2	2	–
24ACSM6AT.4	3	3	3	2	3	–	–	2	–	–	3	3	3	–
24ACSM6AT.5	3	3	3	3	3	–	–	3	–	–	3	3	3	2

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RAJAMPET, Annamayya District, AP – 516126, INDIA

Title of the Course: Software Project Management
Category: PE
Year: III
Semester: II
Course Code: 24ACSE6AT
Branch/es: CSE, AI&ML, CSE(AI), CSE(AIML) & CSE (IoTCSBCT)

Lecture Hours	Tutorial Hours	Practice Hours	Credits	Total Hours
3	0	0	3	54

Course Objectives:

1. Understand the basics of the project management and requirements management throughout the product development cycle.
2. To Know the distinction between conventional and modern approaches for developing a software project.
3. Learn about the life cycle phases and artifacts in software development process.
4. Understand the importance of Work breakdown structures and responsibilities while working in a real time projects.
5. Know how to measure the software quality and risk management in a modern project profiles

Course Outcomes:

After completion of the course, students will be able to

1. Understand the conventional software Management and Software Economics factors that affect the development of a software project.
2. Recognize Artifacts of the software process and can also use artifacts in Software Development lifecycle.
3. Analyze the workflows and can create check points of process in a project management
4. Organize the work breakdown structures and assign the roles & responsibilities in a project organization for establishing an active network.
5. Apply project metrics in managing software project

Unit 1 12

Conventional Software Management: The water fall model, conventional software Management performance Evolution of Software Economics: Software Economics. Pragmatic Software Cost Estimation Improving Software Economics: Reducing Software Product Size, Improving Software Processes, Improving Team Effectiveness, Improving Automation, Achieving Required Quality, Peer Inspections.

Unit 2 **10**

The old way and the new: The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process.

Lifecycle phases: Engineering and production stages, inception, Elaboration, construction, transition phases.

Artifacts of the process: The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts

Unit 3 **12**

Workflows of the process: Software process workflows, Inter Trans workflows.
Check points of the Process: Major Mile Stones, Minor Milestones, Periodic status assessments.
Iterative Process Planning: work break down structures, planning guidelines, cost and schedule estimating, Iteration planning process, Pragmatic planning

Unit 4 10

Process Automation: Automation Building Blocks, The Project Environment. Project Control and **Process instrumentation:** The seven core Metrics, Management indicators, quality indicators **Tailoring the Process:** Process discriminants. Managing people and organizing teams.

Unit 5 10

Project Organizations and Responsibilities: Line-of-Business Organizations, Project Organizations, evolution of Organizations.
Future Software Project Management: modern Project Profiles, Next generation Software economics, modern process transitions.
Case Study: The Command Center Processing and Display System-Replacement (CCPDS-R)

Text books:

1. Software Project Management, Walker Royce, Pearson Education,2012
2. Bob Hughes, Mike Cotterell and RajibMall–SoftwareProjectManagement,6thEdition, Mc Graw Hill Edition, 2017

Reference Books:

1. Pankaj Jalote, –SoftwareProjectManagementinpractice,5th Edition, Pearson Education, 2017.
2. Murali K.Chemuturi, Thomas M.Cagley Jr.Mastering Software Project Management: Best Practices, Tools and Techniques‖, J.Ross Publishing, 2010
3. Sanjay Mohapatra, –Software Project Management, Cengage Learning,2011

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Engineering tool usage	The engineer and the world	Ethics	Individual and Collaborative Team work	Communication	Project management and finance	Life-long learning	Core Computing Skills	Emerging Technologies
24ACSE6AT.1	3	2	-	-	-	-	-	-	-	-	2	2	2
24ACSE6AT.2	3	2	1	1	1	-	-	-	-	-	2	2	2
24ACSE6AT.3	2	3	2	2	1	-	-	-	1	1	2	2	3
24ACSE6AT.4	2	2	3	1	1	1	-	1	3	2	3	2	2
24ACSE6AT.5	3	3	2	2	2	1	-	1	1	2	3	3	3

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RAJAMPET, Annamayya District, AP – 516126, INDIA

Title of the Course: **CRYPTOGRAPHY & NETWORK SECURITY**
Category: PC
Couse Code: 24ACSM6BT
Year: III
Semester: II
Branch: CSE, AI&ML, CSE(AI), CSE (IoTCSBCT)

Lecture Hours	Tutorial Hours	Practice Hours	Credits	Total Hours
3	0	0	3	51

Course Objectives: This course aims at training students to master the:

1. The concepts of classical encryption techniques and concepts of finite fields and number theory
2. Working principles and utilities of various crypto graphic algorithms including secret key cryptography, hashes, and message digests, and public key algorithms
3. Design issues and working principles of various authentication protocols, PKI standards
4. Various secure communication standards including Kerberos, I Psec, TLS and email
5. Concepts of cryptographic utilities and authentication mechanisms to design secure applications

Course Outcomes:

After completion of the course, students will be able to

1. Identify information security goals, classical encryption techniques and acquire fundamental knowledge on the concepts off in it fields and number theory
2. Compare and apply different encryption and decryption techniques to solve problems related to confidentiality and authentication
3. Apply the knowledge of crypto graphic check sums and evaluate the performance of different message digest algorithms for verifying the integrity of varying message sizes.
4. Demonstrate the ability to apply user authentication principles including Kerberos for secure authentication
5. Gain proficiency in securing web communications using TLS and HTTPS, manage secure remote access with SSH, and design firewall policies

Unit 1 Computer and Network Security Concepts 11

Computer and Network Security Concepts: Computer Security Concepts, The OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms, A Model for Network Security.

Classical Encryption Techniques: Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Steganography.

Unit 2 Number Theory **10**

The Euclidean Algorithm, Modular Arithmetic, Fermat's and Euler's Theorems, The Chinese Remainder Theorem, Discrete Logarithms.

Finite Fields: Finite Fields of the Form GF(p), Finite Fields of the Form GF(2n).

Public Key Cryptography: Principles, Public Key Cryptography Algorithms, RSA Algorithm, Diffie Hellman Key Exchange, Elliptic Curve Cryptography.

Block Ciphers: Traditional Block Cipher Structure, The Data Encryption Standard, Advanced Encryption Standard: AES Structure, AES Transformation Functions.

Unit 3 Cryptographic Hash Functions 10

Cryptographic Hash Functions: Application of Cryptographic Hash Functions, Requirements & Security, Secure Hash Algorithm, Message Authentication Functions, Requirements & Security, HMAC &CMAC. Digital Signatures: NIST Digital Signature Algorithm, Distribution of Public Keys, X.509 Certificates, Public- Key Infrastructure

Unit 4 User Authentication 10

User Authentication: Remote User Authentication Principles, Kerberos. Electronic Mail Security: Pretty Good Privacy (PGP) And S/MIME.

IP Security: IP Security Overview, IP Security Policy, Encapsulating Security Payload, Combining Security Associations, Internet Key Exchange.

Unit 5 Transport Level Security 10

Transport Level Security: Web Security Requirements, Transport Layer Security (TLS), HTTPS, Secure Shell (SSH).

Firewalls: Fire wall Character is tics and Access Policy, Types of Fire walls, Fire wall Location and Configurations.

Textbook:

1. Cryptography and Network Security – William Stallings, Pearson Education, 8th Edition.

Reference Books:

1. Cryptography, Network Security and Cyber Laws–Bernard Menezes,Cengage Learning, 2010 edition
2. Cryptography and Network Security-BehrouzA Forouzan, Debdeep Mukhopadhyaya, Mc-Graw Hill, 3rd Edition, 2015.
3. Network Security Illustrated, Jason Albanese and Wes Sonnenreich, MGH Publishers, 2003.

Online Learning Resources:

1. https://nptel.ac.in/courses/106/105/106105031/lecture
2. https://nptel.ac.in/courses/106/105/106105162/lecturebyDr.SouravMukhopadhyayIIT Kharagpur[Video Lecture]
3. https://www.mitel.com/articles/web-communication-cryptography-and-network-securityweb articles by Mitel Power Connections

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Engineering tool usage	The engineer and The world	Ethics	Individual and Collaborative team work	Communication	Project management and finance	Life-long learning	PSO1	PSO2	PSO3
24ACSM6BT.1	3	2	1	1	2	-	-	-	-	-	2	2	2	-
24ACSM6BT.2	3	3	2	2	2	-	-	-	-	-	2	2	2	-
24ACSM6BT.3	3	3	3	3	2	-	-	-	-	-	2	3	2	-
24ACSM6BT.4	3	2	2	2	2	1	1	-	-	-	2	2	3	-
24ACSM6BT.5	3	3	3	2	3	2	1	-	-	-	3	3	3	-

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RAJAMPET, Annamayya District, AP – 516126, INDIA

Title of the Course: DATA SCIENCE USING PYTHON
Category : PE
Year : III
Semester : II
Course Code : 24ACAI6AT
Branch/es : CSE(AI)

Lecture Hours	Tutorial Hours	Practice Hours	Credits	Total Hours
3	0	0	3	51

Course Objectives:
This course introduces the basic concepts of data science. This course makes students familiar with python libraries to handle various datasets and the methods for cleaning, transforming and enrichment of data. In addition, this course enables the students to train the applications of data science and perform data transformations.

Course Outcomes:
At the end of the course, the student will be able to
1. Understand the fundamentals of Data Science, its interdisciplinary relationships, problem-solving steps, computational thinking, data organization, data models, and Big Data concepts.
2. Acquire data from multiple sources using Pandas, databases, APIs, web scraping, and diverse file formats.
3. Apply data sub-setting, filtering, grouping, and aggregation techniques for structured data preparation.
4. Analyze missing values, outliers, and duplicate records and handle them appropriately.
5. Enhance datasets through integration, encoding, scaling, and feature enrichment techniques.

Unit 1 INTRODUCTION TO DATA SCIENCE **10**
Steps in doing Data Science - Data Science relation to other fields- Data Science and Information Science- Computational Thinking - Skills and tools needed to do Data Science - Storing data - Combining bytes into larger structures - Creating data sets - Identifying data problem - Understanding data sources - Exploring data models- Introduction to Big Data.

Unit 2 DATA ACQUISITION 10
Import data into Pandas from various data sources: Fetching stored data- CSV, Excel, Pdf, text, multiple text files, RDBMS (SQL Tables), pickle and JSON; importing data from clipboards, working with binary data formats, Web scraping-beautiful soup for reading and parsing of web pages, reading data from XML, reading data from an API, Reading Image files using PIL, read multiple files using Glob.

Unit 3 DATA CLEANING 10
Sub-Setting, Filtering, And Grouping: Sub-setting the Data Frame, the unique Function, Conditional Selection and Boolean Filtering, Setting and Resetting the Index, The Group By Method, Aggregating.

Unit 4 Detecting Outliers and Handling Missing Values 10
Outlier detection, Missing Values in Pandas, Filling and dropping missing Values in Pandas, Outlier Detection and removing duplicates.

Unit 5 DATA ENRICHMENT 11

Data Integration and transformation: Combining, merging, and joining data sets, string and text processing using regular expressions, Transforming Numerical features – power transformation, binning, binarization, data transformation based on mappings, Encoding Categorical data- One-hot encoding, Ordinal encoding, Label encoding of the target variable; Scaling- Normalization, Standardization, Robust scaling.

Textbook:

1. Jeffrey S. Saltz, Jeffrey M. Stanton, "An Introduction to Data Science", SAGE Publications, 2018.

Reference Books:

1. Wes McKinney, "Python for data analysis", 1st Edition, O'Reilly Media, 2012.
2. Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython by Wes McKinney, 2017.
3. Chirag Shah, "A Hands-On Introduction to Data Science", Cambridge University Press, 2020.

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Engineering tool usage	The engineer and the world	Ethics	Individual and Collaborative Team work	Communication	Project management and finance	Life-long learning
24ACAI6AT.1	3	2	1	2	1	1	-	-	-	-	2
24ACAI6AT.2	2	2	2	2	3	-	-	-	-	-	2
24ACAI6AT.3	2	3	2	2	3	-	-	-	-	-	1
24ACAI6AT.4	2	3	2	3	3	-	-	1	-	-	2
24ACAI6AT.5	2	2	3	2	3	-	-	1	-	-	2

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RAJAMPET, Annamayya District, AP – 516126, INDIA

Title of the Course: NATURAL LANGUAGE PROCESSING LAB
Category: PC
Year: III
Semester: II
Course Code: 24ACSM62L
Branch/es: CSE, AI&ML, CSE(AI)CSE(AIML) & CSE, AI&ML, CSE(AI), CSE (IoTCSBCT)

Lecture Hours	Tutorial Hours	Practice Hours	Credits
0	0	3	1.5

Course Objectives

1. Understand fundamental NLP techniques such as tokenization, stemming, lemmatization, and stopword removal using Python.
2. Apply syntactic and semantic analysis methods including POS tagging, chunking, and Named Entity Recognition.
3. Implement statistical NLP approaches such as n-grams, TF-IDF, and probabilistic language models.
4. Develop parsing and grammar-based models like CYK and chart parsing for sentence structure analysis.
5. Build real-world NLP applications such as sentiment analysis, spam detection, and fake news classification.

Course Outcomes

1. Perform text preprocessing and normalization using various NLP techniques.
2. Analyze linguistic structures through POS tagging, chunking, and named entity recognition.
3. Apply statistical methods like TF-IDF and n-gram models for text representation and probability estimation.
4. Design and implement NLP-based models for parsing and information extraction tasks.
5. Develop practical NLP applications including sentiment analysis, spam filtering, and fake news detection using Python.

Week1	1. Write a python program to perform tokenization by word and sentence using nltk. 2. Write a python program to eliminate stopwords using nltk. 3. Write a python program to perform stemming using nltk.	3
Week2	a. Write a python program to perform Parts of Speech tagging using nltk. b. Write a python program to perform lemmatization using nltk.	3
Week3	a. Write a python program for chunking using nltk. b. Write a python program to perform Named Entity Recognition using nltk.	3

Week4	a. Write a python program to find Term Frequency and Inverse Document Frequency (TF-IDF). b. Write a python program for CYK parsing (Cocke- Younger-Kasami Parsing) or Chart Parsing.	3
Week5	a. Write a python program to find all unigrams, bigrams and trigrams present in the given corpus. b. Write a python program to find the probability of the given statement "This is my cat" by taking the an exmple corpus into consideration.	3
Week6	Use the Stanford named Entity recognizer to extract entities from the documents. Use it programmatically and output for each document which named entities it contains and of which type.	3
Week7	Choose any corpus available on the internet freely. For the corpus, for each document, count how many times each stop word occurs and find out which are the most frequently occurring stop words. Further, calculate the term frequency and inverse document frequency as The motivation behind this is basically to find out how important a document is to a given query. For e.g.: If the query is say: "The brown crow". "The" is less important. "Brown" and "crow" are relatively more important. Since "the" is a more common word, its tf will be high. Hence we multiply it by idf, by knowing how common it is to reduce its weight.	3
Week8	Write the python code to perform sentiment analysis using NLP	3
Week9	Write the python code to develop Spam Filter using NLP	3
Week10	Write the python code to detect Fake News using NLP	3
Week 11	Write a python program to perform text preprocessing techniques such as tokenization, stop word removal, stemming, and lemmatization on a given text document.	3
Week 12	Write a python program to implement Word Frequency Analysis and display the top most frequent words from a given corpus using nltk.	3
Week 13	Write a python program to generate Word Cloud visualization for a given text corpus and analyze the important terms.	3
Week 14	Write a python program to classify text documents using Machine Learning algorithms such as Naive Bayes or Logistic Regression with TF-IDF features.	3

Note: All the prescribed laboratory exercises shall be completed by the students within a duration of fourteen (14) weeks during the semester.

TEXTBOOKS:

1. Speech and Language Processing – Daniel Jurafsky and James H. Martin, Pearson Education.
2. Natural Language Processing with Python – Steven Bird, Ewan Klein, Edward Loper, O'Reilly Media.

REFERENCE BOOKS:

1. Introduction to Natural Language Processing – Jacob Eisenstein, MIT Press.
2. Natural Language Processing with PyTorch – Delip Rao and Brian McMahan, O'Reilly.
3. Transformers for Natural Language Processing – Thushan Ganegedara, Packt Publishing.

CO-PO Mapping:

.	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Engineering tool usage	The engineer and The world	Ethics	Individual and Collaborative team work	Communication	Project management and finance	Life-long learning	PSO1	PSO2	PSO3
24ACSM62L.1	3	2	–	–	–	–	–	–	–	–	2	2	-	-
24ACSM62L.2	3	3	2	–	2	–	–	–	–	–	2	3	2	2
24ACSM62L.3	3	3	3	2	3	–	–	–	–	–	2	3	2	2
24ACSM62L.4	3	3	3	3	3	–	–	–	–	–	3	2	-	3
24ACSM62L.5	3	3	3	3	3	2	–	2	2	–	3	3	3	2

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RAJAMPET, Annamayya District, AP – 516126, INDIA

Title of the Course: GENERATIVE AI LAB
Category: PC
Year III
Semester: II
Course Code: 24ACAI61L
Branch/es: CSE(AI)

Lecture Hours	Tutorial Hours	Practice Hours	Credits
0	0	3	1.5

Course Objectives: This course will be able to

- Understand core concepts of Generative AI and LLMs across domains.
- Explain LangChain architecture and its components.
- Compare LangChain with other LLM frameworks.
- Develop LLM-powered applications using LangChain.
- Apply advanced techniques like prompt engineering, fine-tuning, agents, and RAG.
- Design, deploy, and evaluate responsible and production-ready AI solutions.

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

1. Explain Generative AI, LLMs, LangChain, and RAG concepts.
2. Build basic AI applications using LangChain and LLM APIs.
3. Implement document retrieval, vector stores, and reasoning techniques.
4. Evaluate prompt engineering, fine-tuning, and hallucination mitigation methods.
5. Design and deploy production-ready LLM applications with RAG, agents, and monitoring.

Exercise 1: Setup, Installation and testing of LangChain 3

a) Install LangChain by setting up the environment and running a basic LangChain LLM script that generates text from a prompt.
b) Implementation and Analysis of Text Tokenization Techniques Using GPT Tokenizers and LangChain

Exercise 2: Demonstration of various OpenAI Models 3

a) Build and test a LangChain pipeline using Fake LLM for offline experimentation.
b) Integrate OpenAI model with LangChain and generate structured text output
c) Connect Hugging Face Hub models to LangChain and run text generation tasks chat- style prompting
d) Compare outputs from OpenAI, Hugging Face, and Anthropic using the same Prompt Template
e) Connect Anthropic Claude models and test

Exercise 3: Chat Models 3

Designing and Interacting with Chat Models in LangChain for Structured Conversational AI Applications.

Exercise 4: LLM PromptTemplate 3

a) Composing Prompt Chains in LangChain with Google Gemini for Text Generation and Evaluation
b) Build LLM model using PromptTemplate
c) Build Chat models using ChatPromptTemplate

Exercise 5: Fact-Checked Assistant with Retrieval + Verification 3

Design an assistant that answers user questions using a document knowledge base and adds a fact-checking step. Implement retrieval (RAG) + secondary verification prompt to reduce hallucinations and compare answers before/after verification.

Exercise 6: Multi-Document Summarization and Structured Information Extraction 3

Build a pipeline that ingests multiple documents, generates layered summaries (short + detailed), and extracts structured fields (entities, dates, key facts) using prompt templates and output parsers.

Exercise 7: Tool-Augmented QA with Step-by-Step Reasoning 3

Create a question-answering assistant that selects external tools search/calculator/database) and uses guided reasoning prompts to produce traceable, tool-supported answers instead of pure model guesses.

Exercise 8: Loading text documents 3

a) Load text documents using LangChain document loaders and build a vector store for semantic search.
b) Build a Q&A chatbot that answers only from uploaded documents using RAG (Retrieval Augmented Generation).

3

Exercise 9: Code LLM

Use a Code LLM to generate, explain, and improve Python functions for software development tasks.

Exercise 10: Customizing LLMs 3

a) Design and test different prompt engineering styles to control the tone and format of LLM responses.
b) Implement zero-shot prompting to solve unseen tasks and compare outputs across different prompt wordings.
c) Build a few-shot prompting setup by providing examples in the prompt and measure improvement in answer accuracy.

Exercise 11: Retrieval-Augmented Generation 3

a) Build a basic Retrieval-Augmented Generation (RAG) Q&A system using document loaders and retrievers.
b) Implement indexing and semantic search to answer user questions from stored documents.

Exercise 12: Indexing and Semantic Search 3

Implement indexing and semantic search to answer user questions from stored documents.

Note: All the prescribed laboratory exercises shall be completed by the students within a duration of fourteen (14) weeks during the semester.

Text Book:

1. Generative AI with LangChain: Build Large Language Model (LLM) Apps with Python, ChatGPT, and Other LLMs, Ben Auffarth, Packt Publishing.

Reference Books:

1. Generative AI Apps with LangChain and Python: A Project-Based Approach to Building Real-World LLM Apps, Raby Jay, Apress Publications.
2. Deep Learning, Ian Goodfellow, Yoshua Bengio & Aaron Courville — MIT Press
3. Natural Language Processing with Transformers, Lewis Tunstall, Leandro von Werra, Thomas Wolf — O'Reilly, 2022

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Engineering tool usage	The Engineer and world	Ethics	Individual and Collaborative teamwork	Communication	Project management and finance	Life-long learning
24ACAI61L.1	3	2	2	2	1	–	–	–	1	1	–
24ACAI61L.2	2	3	2	3	2	–	–	–	1	2	–
24ACAI61L.3	2	2	3	2	2	–	–	–	1	2	–
24ACAI61L.4	2	3	2	3	3	–	–	–	1	3	–
24ACAI61L.5	2	3	3	3	2	–	–	–	1	3	–

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RAJAMPET, Annamayya District, AP – 516126, INDIA

Title of the Course: AI FOR CLOUD COMPUTING LAB
Category: PC
Year: III
Semester: II
Course Code: 24ACAI62L
Branch/es: CSE(AI)

Lecture Hours	Tutorial Hours	Practice Hours	Credits
0	0	3	1.5

Course Objectives: This course will be able to

1. To introduce the concepts, models, and services of cloud computing and its role in AI.
2. To explore the architecture and deployment of AI applications on cloud platforms.
3. To equip students with skills in using cloud-based tools and services for AI/ML workloads.
4. To understand data storage, processing, and security in cloud for AI tasks.
5. To apply cloud computing principles to real-world AI-based solutions.

Course Outcomes:

At the end of the course

1. Explain cloud computing architecture, services, and deployment models.
2. Utilize cloud platforms (AWS, GCP, Azure) for training and deploying AI models.
3. Handle large-scale data storage and processing in the cloud environment.
4. Integrate AI workflows using serverless and container-based architectures.
5. Analyze challenges in security, cost, scalability, and performance of cloud-based AI systems.

Exercise 1: Exploring Cloud Service Models (IaaS, PaaS, SaaS) 3

a) Study IaaS, PaaS, SaaS models using AWS/Azure/GCP.
b) Explore Public, Private, Hybrid, and Community cloud models.
c) Deploy a basic cloud service or virtual machine.
d) Compare cloud providers for AI applications.

Exercise 2: AI Services in Cloud Platforms 3

a) Explore NLP, Vision, and Analytics services in AWS/Azure/GCP.
b) Test one AI cloud API service.
c) Analyze benefits and challenges of AI-cloud integration.

Exercise 3: Cloud Storage Services 3

a) Manage objects in Amazon S3 and Azure Blob Storage.
b) Query datasets using Google BigQuery.
c) Compare storage performance and pricing.

Exercise 4: Data Ingestion and Processing Pipelines 3

a) Create a cloud-based data ingestion pipeline.
b) Store and process data in cloud platforms.
c) Generate analytics reports using Spark.

Exercise 5: Distributed Computing using Hadoop and Spark 3

a) Setup Hadoop pseudo-distributed mode.
b) Execute MapReduce and Spark jobs.
c) Compare distributed and local processing performance.

Exercise 6: Cost Optimization for Cloud Resources 3

a) Monitor compute/storage usage and billing.
b) Apply cost optimization techniques.
c) Analyze pricing for cloud services.

Exercise 7: ML Model Training and Deployment using Cloud Services 3

a) Train ML models using SageMaker/Azure ML/Vertex AI.
b) Deploy and test ML models in cloud platforms.
c) Evaluate model performance.

Exercise 8: AutoML and Notebook Integration 3

a) Train models using AutoML platforms.
b) Integrate Jupyter/Colab with cloud storage.
c) Compare AutoML and custom ML workflows.

Exercise 9: Deep Learning using GPUs/TPUs 3

a) Train deep learning models using GPU/TPU acceleration.
b) Compare CPU and GPU/TPU performance.
c) Track experiments and results..

Exercise 10: Containerization and Kubernetes Deployment 3

a) Create Docker containers for AI applications.
b) Deploy applications using Kubernetes.
c) Implement auto-scaling and monitoring.

Exercise 11: Serverless Computing and CI/CD for AI Applications 3

a) Create serverless functions using AWS Lambda/Azure Functions. 3
b) Integrate storage triggers and inference APIs.
c) Build CI/CD pipelines for automated deployment.

Exercise 12: IAM, Security, Ethics, and Case Study Implementation

a) Configure IAM users, roles, and policies.
b) Implement cloud security and privacy controls.
c) Study ethical issues in cloud AI systems.
d) Develop and deploy a cloud-based AI mini project with monitoring and billing analysis.

Note: All the prescribed laboratory exercises shall be completed by the students within a duration of fourteen (14) weeks during the semester.

Text Book:

1. Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, Mastering Cloud Computing, McGraw-Hill.

Reference Books:

1. Judith Hurwitz et al., Cloud Computing for Dummies, Wiley.
2. Aurélien Géron, Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, O'Reilly.

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Engineering tool usage	The Engineer and world	Ethics	Individual and Collaborative teamwork	Communication	Project management and finance	Life-long learning
24ACAI62L.1	3	2	-	-	1	3	-	-	-	-	2
24ACAI62L.2	2	3	2	2	3	-	-	-	-	3	2
24ACAI62L.3	2	2	3	2	3	-	-	-	-	-	3
24ACAI62L.4	2	2	3	2	3	-	-	2	-	2	2
24ACAI62L.5	2	2	2	-	2	3	-	-	-	3	2

Title of the Course	:	Soft Skills
Category	:	SEC
Year	:	III
Semester	:	II
Couse Code	:	24AENG61S
Branch	:	CE, ME, ECE, CSE, AIDS, AIML, CSE(AI), CSE(DS), CSE(AIML), CSE(ICB)

Lecture Hours	Tutorial Hours	Practical	Credits	Total Hours
1	0	2	2	48

Course Objectives:

1. To encourage all round development of the students by focusing on soft skills
2. To make the students aware of critical thinking and problem-solving skills
3. To enable appropriate communication in socio-cultural and professional contexts
4. To Enhance students' skills of making presentations confidently.
5. To suggest some measures to function effectively with heterogeneous teams

Course Outcomes: Student will be able to

1. Express himself/herself fluently in societal and professional contexts.
2. Describe methods for building professional image
3. Evaluate the situation and take necessary decisions.
4. Make presentations assertively and confidently
5. Create a productive workplace atmosphere using social and work-life skills.

Unit 1 Soft Skills & Resume Preparation 12

Soft Skills - Introduction, Need - Mastering Techniques of Soft Skills Structure, formats and styles of Resumes_ projecting one's strengths and skills - creative self-marketing—sample resumes - cover letter

Unit 2 Critical Thinking & Interview Skills 9

Active Listening – Observation - Analytical Thinking – Open-mindedness – Creative Thinking - Positive Thinking – Reflection Concept and process of Interviews - Body language - Answering strategies — FAQs

Unit 3 Problem Solving & Decision-Making 9

Effective decision making in teams – Methods & Styles: GD Skills: communicating views and opinions — discussing — intervening — agreeing and disagreeing —asking for and giving clarifications - substantiating one's views/points- arriving at a consensus on any given topic across a cross-section of individuals - modulation of voice and clarity - body language

Unit 4 Oral Presentations (Individual and Team) 9

Collection of data from various sources —planning, preparation and practice — attention grabbing strategies -transition — handling questions from audience. Appropriate use of visual aids — Using PowerPoint for presentations

Unit 5 Corporate Etiquette 9

Etiquette- Introduction, Concept, Significance - Corporate Etiquette - meaning, modern etiquette, benefits - Global and Local Culture Sensitivity - Gender Sensitivity - Etiquette in Interaction- Cell phone Etiquette - Dining Etiquette - Netiquette - Job Interview Etiquette - Corporate Grooming tips -Overcoming challenges

MINIMUM REQUIREMENTS: Advanced English Language Communication Skills Lab

Text Books:

1. Dr Shikha Kapoor, Personality Development and Soft Skills: Preparing for Tomorrow, I K International Publishing House, 2018)
2. Advanced English Communication Skills Laboratory by Dr.Sudha Rani, Pearson Pub.

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Engineering tool usage	The engineer and society	Ethics	Individual and Collaborative team work	Communication	Project management and finance	Life-long learning
24AENG61.1	-	-	-		-	-	1	-	3	-	3
24AENG61.2	-	-	-	-	-	-	1	-	3	-	3
24AENG61.3	-	-	-	-	-	-	1	-	3	-	3
24AENG61.4	-	-	-	-	-	-	1	-	3	-	3
24AENG61.5	-	-	-	-	-	-	1	-	3	-	3

Title of the Course	:	Technical Paper Writing and Intellectual Property Rights
Category	:	MC
Year	:	III
Semester	:	II Semester
Couse Code	:	24AMBA61T
Branch	:	EEE, ECE, CSE & CSE Allied Branches

Lecture Hours	Tutorial Hours	Practical	Credits	Total Hours
1	0	2	2	30

Course Objectives:

1. To enable the students to practice the basic skills of research paper writing.
2. To make the students understand the importance of IP and to educate them on the basic concepts of Intellectual Property Rights.
3. To practice the basic skills of performing quality literature review.
4. To help them in knowing the significance of real-life practice and procedure of Patents.
5. To enable them learn the procedure of obtaining Patents, Copyrights, & Trade Marks.

Course Outcomes: Student will be able to

1. Identify key secondary literature related to their proposed technical paper writing.
2. Explain various principles and styles in technical writing.
3. Use the acquired knowledge in writing a research/technical paper.
4. Analyze rights and responsibilities of holder of Patent, Copyright, Trademark, International Trademark etc.
5. Evaluate different forms of IPR available at national & international level and search of various forms of IPR by using modern tools and techniques.

Unit 1 Principles of Technical Writing 6

Principles of Technical Writing: styles in technical writing; clarity, precision, coherence and logical sequence in writing-avoiding ambiguity- repetition, and vague language -highlighting your findings-discussing your limitations -hedging and criticizing -plagiarism and paraphrasing.

Unit 2 Research Paper Writing 6

Technical Research Paper Writing: Abstract- Objectives-Limitations-Review of Literature- Problems and Framing Research Questions- Synopsis.

Unit 3 Process of research 6

Process of research: publication mechanism: types of journals- indexing-seminars- conferences-proof reading –plagiarism style; seminar & conference paper writing; Methodology-discussion-results-citation rules.

Unit 4 Introduction to Intellectual property 6

Introduction, types of intellectual property, International organizations, agencies and treaties, importance of intellectual property rights Trade Marks: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting and evaluating trade mark, trade mark registration processes.

Unit 5 Fundamentals of copy right law 6

Fundamentals of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law. Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer. Patent law, intellectual property audits.

Text Book:

1. Deborah. E. Bouchoux, Intellectual Property Rights, Cengage Learning India, 2013

Reference Books:

1. R.Myneni, Law of Intellectual Property, 9th Ed, Asia law House, 2019.
2. Prabuddha Ganguli,Intellectual Property Rights Tata McGraw Hill, 2001.

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Engineering Tool usage	The Engineer and The World	Ethics	Individual and Collaborative team work	Communication	Project management and finance	Life-long learning	PSO1	PSO2
24AMBA61T-1	3	2	2	2	1	2	-	-	-	1	-	2	1
24AMBA61T-2	2	3	3	2	2	1	-	-	-	-	-	2	2
24AMBA61T-3	3	2	3	2	2	1	1	-	-	-	-	1	1
24AMBA61T-4	2	3	2	2	2	1	1	-	-	-	-	1	2
24AMBA61T-5	2	2	2	1	3	1	1	-	-	1	1	1	2