TKR COLLEGE OF ENGINEERING AND TECHNOLOGY
AN AUTONOMOUS INSTITUTION
Accredited by NAAC with 'A⁺' Grade.
(Sponsored by TKR Educational Society, Approved by AICTE, Affiliated to JNTU H)
Medbowli, Meerpet, Balapur, Hyderabad, Telangana – 500 097
Phone: 9100377790, email: info@tkrcet.ac.in, web site: www.tkrcet.ac.in

COMPUTER SCIENCE AND ENGINEERING
(ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING)

L T P C
3 0 0 3

FUNDAMENTALS OF AI
(OPEN ELECTIVE)

Course Objective:

learn the difference between optimal reasoning Vs human like reasoning understand the notions of state space representation, exhaustive search, heuristic search along with the time and space complexities.

Course Outcomes:

After completion of the course student will be able to

1. Apply the knowledge of what is AI, risks and benefits of AI, limits of AI and the ethics involved in building an AI application. L3
2. Apply the nature of environments and the structure of agents. L3
3. Make use of the ability to select a search algorithm for a problem and characterize its time and space complexities. L4
4. Analyze the skill for representing knowledge using the appropriate technique. L4
5. Make use of the understanding of the applications of AI. L3

UNIT - I
Foundations of AI: Introduction to AI, History of AI, Strong and Weak AI, the State of the Art, Risks and Benefits of AI
Philosophy, Ethics and Safety of AI: The Limits of AI, Machine thinking capability, The Ethics of AI **Intelligent Agents:** Agents and Environments, Good Behavior: The Concept of Rationality, The Nature of Environments, The Structure of Agents.

UNIT - II
Solving Problems by Searching: Problem – Solving Agents
Uninformed Search Strategies: Best-First Search, Breadth-First Search, Uniform-Cost Search, Depth-First Search, Iterative Deepening Search and Bidirectional Search
Informed Search Strategies: Greedy Best-First Search, A* Search

UNIT - III
Logical Agents: Knowledge-based agents, Propositional Logic, Propositional Theorem Proving **First-Order Logic:** Syntax and Semantics of First-Order Logic
Inference in First-Order Logic: Propositional Vs. First-Order Inference, Unification and First-OrderInference, Forward Chaining, Backward Chaining
Knowledge Representation: Ontological Engineering, Categories and Objects, Events

UNIT - IV
Quantifying Uncertainty: Basic Probability Notation, Inference Using Full-Joint Distributions,Independence, Bayes' Rule and its Use, Naive Bayes Models
Probabilistic Reasoning: Representing Knowledge in an Uncertain Domain, The semantics ofBayesian Networks, Exact Inference in Bayesian Networks

UNIT - V
Learning from Examples: Forms of Learning, Supervised Learning, Learning Decision Trees, ModelSelection, Linear Regression and Classification, Ensemble Learning
Natural Language Processing: Language Models, Grammar, Parsing, Complications of Real NaturalLanguage, Natural Language Tasks
Robotics: Robots, Robot Hardware, Kind of Problems solved, Application Domains
Computer Vision: Simple Image Features, Using Computer Vision

TEXT BOOK:
1. "Artificial Intelligence a Modern Approach", Fourth Edition, Stuart J. Russell & Peter Norvig –Pearson.

REFERENCE BOOKS:
1. "Artificial Intelligence", Elaine Rich, Kevin Knight & Shivashankar B Nair — McGraw HillEducation.
2. Artificial Intelligence, 3rd Edn, E. Rich and K. Knight (TMH)
3. Artificial Intelligence, 3rd Edn., Patrick Henny Winston, Pearson Education.
4. Artificial Intelligence, Shivani Goel, Pearson Education.
5. Artificial Intelligence and Expert systems – Patterson, Pearson Education

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MACHINE LEARNING BASICS
(OPEN ELECTIVE)

Course Objective:

Introduce the basic concepts and techniques of Machine Learning and have a thorough understanding of the Supervised and Unsupervised learning techniques.

Course Outcomes:

After completion of the course student will be able to
1. Distinguish between, supervised, unsupervised and semi-supervised learning. L3
2. Apply algorithms for building classifiers applied on datasets of non-linearly separable classes. L3
3. Apply the principles of evolutionary computing algorithms. L3
4. Design an ensemble to increase the classification accuracy L4
5. Apply Reinforcement Learning algorithm for different real world application. L3

UNIT - I

Learning – Types of Machine Learning – Supervised Learning – The Brain and the Neuron – Design a Learning System – Perspectives and Issues in Machine Learning – Concept Learning Task – Concept Learning as Search – Finding a Maximally Specific Hypothesis – Version Spaces and the Candidate Elimination Algorithm – Linear Discriminants: – Perceptron – Linear Separability – Linear Regression.

UNIT - II

Multi-layer Perceptron– Going Forwards – Going Backwards: Back Propagation Error – Multi-layer Perceptron in Practice – Examples of using the MLP – Overview – Deriving Back-Propagation

UNIT - III

Learning with Trees – Decision Trees – Constructing Decision Trees – Classification and Regression Trees – Ensemble Learning – Boosting – Bagging – Different ways to Combine Classifiers – Nearest Neighbor Methods – Unsupervised Learning – K means Algorithms

UNIT - IV

Support Vector Machines Evolutionary Learning – Genetic algorithms – Genetic Offspring:
- Genetic Operators – Using Genetic Algorithms

UNIT - V

Reinforcement Learning – Overview – Getting Lost Example Markov Chain Monte Carlo
Methods – Sampling – Proposal Distribution – Markov Chain Monte Carlo
– Hidden Markov Models

TEXT BOOK:
1. Stephen Marsland, ―Machine Learning ― An Algorithmic Perspective,
   Second Edition,Chapman and Hall/CRC Machine Learning and Pattern Recognition
   Series, 2014.

REFERENCE BOOKS:
1. Tom M Mitchell, ―Machine Learning, First Edition, McGraw Hill Education, 2013.
2. Peter Flach, ―Machine Learning: The Art and Science of Algorithms that Make
   Sense of Data‖,First Edition, Cambridge University Press, 2012.
3. Jason Bell, ―Machine learning – Hands on for Developers and Technical
   Professionals‖, FirstEdition, Wiley, 2014
4. Ethem Alpaydin, ―Introduction to Machine Learning 3e (Adaptive Computation
   and MachineLearning Series), Third Edition, MIT Press, 2014.

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INTRODUCTION TO NATURAL LANGUAGE PROCESSING
(OPEN ELECTIVE)

Course Objective:
Introduction to some of the problems and solutions of NLP and their relation to linguistics andstatistics.

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

1. Compare and Contrast sensitivity to linguistic phenomena and an ability to model them with formal grammars. L3
2. Make use of the proper experimental methodology for training and evaluating empirical NLP systems. L3
3. Apply manipulate probabilities, construct statistical models over strings and trees, andestimate parameters using supervised and unsupervised training methods. L3
4. Design, implement, and analyze NLP algorithms; and design different language modeling Techniques. L4
5. Compare and contrast N-Gram Models, Language Model Evaluation, Bayesian parameterestimation. L3

UNIT - I
Finding the Structure of Words: Words and Their Components, Issues and Challenges, Morphological Models
Finding the Structure of Documents: Introduction, Methods, Complexity of the Approaches, Performances of the Approaches, Features

UNIT- II
Syntax I: Parsing Natural Language, Treebanks: A Data-Driven Approach to Syntax, Representation of Syntactic Structure, Parsing Algorithms

UNIT - III
Syntax II: Models for Ambiguity Resolution in Parsing, Multilingual Issues
Semantic Parsing I: Introduction, Semantic Interpretation, System Paradigms, Word Sense

UNIT- IV
Semantic Parsing II: Predicate-Argument Structure, Meaning Representation Systems

UNIT - V
Language Modeling: Introduction, N-Gram Models, Language Model Evaluation, Bayesian parameter estimation, Language Model Adaptation, Language Models- class based, variable length, Bayesian topic based, Multilingual and Cross Lingual Language Modeling

TEXT BOOK:
1. Multilingual natural Language Processing Applications: From Theory to Practice – Daniel M.Bikel and Imed Zitouni, Pearson Publication.

REFERENCE BOOKS:
1. Speech and Natural Language Processing - Daniel Jurafsky& James H Martin, PearsonPublications.
2. Natural Language Processing and Information Retrieval: Tanvier Siddiqui, U.S. Tiwary.

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CHATBOTS
(OPEN ELECTIVE)

Course Objective:
Knowledge on concepts of chatbots and understanding the developer environment bot framework.

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

1. Apply basic concepts of chatbots. L3
2. Analyze different entities in building bots. L4
3. Make use of the concepts of advanced bot building. L3
4. Discuss different types of chatbot use cases L3
5. Compare and Contrast Business and Monetization Analytics, Chatbot Use Cases-Modes of Communication. L3

UNIT - I
Introduction to Chatbots: Definition of chatbots, Journey of Chatbots, Rise of Chatbots, Messaging Platforms

UNIT - II
Setting Up the Developer Environment Botframework
Local Installation, Installing NodeJS, Following the Development Pipeline, Storing Messages in Database.

UNIT - III
Basics of Bot Building- Intents, Entities

UNIT - IV
Advanced Bot Building
Design Principles, Showing Product Results, Saving Messages, Building Your Own Intent Classifier

UNIT - V
Business and Monetization
Analytics, Chatbot Use Cases- Modes of Communication- Business-to-Business (B2B), ChapBusiness- to-Consumer (B2C) Consumer-to-Consumer (C2C) Business-to-Employee (B2E), Employee-to- Employee (E2E), Chatbots by Industry Vertical

TEXT BOOK:

1. Rashid Khan, Anik Das, Build Better Chatbots: A Complete Guide to Getting Started with Chatbots, Apress

REFERENCE BOOKS:

1. Drexen Braxley, Chat GPT #1 Bible - 10 Books in 1: A Comprehensive Guide to AI: Elevate Your Daily Life, Increase Work Output, Secure Financial Gains, Foster Career Growth, and Cultivate Modern Talents Paperback
2. D. Nardo Publications, ChatGPT Made Simple How Anyone Can Harness AI To Streamline Their Work, Study & Everyday Tasks To Boost Productivity & Maintain Competitive Edge By Mastering Prompt Engineering
3. Robert E. Miller,Prompt Engineering Bible Join and Master the AI Revolutions Profit Online with GPT-4 & Plugins for Effortless Money Making!
4. Lucas Foster, Chat GPT Bible Developer and Coder Special Edition: Enhancing Coding Productivity with AI-Assisted Conversations.