

SCHOOL OF ENGINEERING

SYLLABUS ARTIFICIAL INTELLIGENCE

Class	M.Tech. AI	L	T	P	C
Semester/Year	I/I	3	-	-	3
Subject Name	Advances in Artificial Intelligence				
Subject Code	MCSAI20S101				
Paper	English				
	Hindi				
Max. Marks	100				

Course Objective

1. The primary objective of this course is to introduce the basic principles, techniques, and applications of Artificial Intelligence.
2. Emphasis will be placed on the teaching of these fundamentals, not on providing a mastery of specific software tools or programming environments. Assigned projects promote a 'hands-on' approach for understanding, as well as a challenging avenue for exploration and creativity.

Course Outcomes:

- CO1.** To learn the difference between optimal reasoning vs human like reasoning.
- CO2.** To understand the notions of state space representation, exhaustive search, heuristic search along with the time and space complexities
- CO3.** To learn different knowledge representation techniques.
- CO4.** To understand the applications of AI: namely Game Playing, Theorem Proving, Expert Systems.
- CO5.** To understand Machine Learning and Natural Language Processing.

Unit	Syllabus	Periods
UNIT-I	Introduction: to AI. Foundations of AI, History of AI, Agents and environments, The nature of the Environment, Problem solving Agents, Problem Formulation, Search Strategies.	10
UNIT-II	Knowledge and Reasoning: Knowledge-based Agents, Representation, Reasoning and Logic, Propositional logic, First-order logic, Using First-order logic, Inference in First-order logic, forward and Backward Chaining.	12
UNIT-III	Learning: Learning from observations, Forms of Learning, Inductive Learning, Learning decision trees, why learning works, Learning in Neural and Belief networks.	8

UNIT-IV	Natural Language Processing: Practical applications, Efficient parsing, Scaling up the lexicon, Scaling up the Grammar, Ambiguity, Perception, Image formation, Image processing operations for Early vision, Speech recognition and Speech Synthesis.	12
UNIT-V	Robotics: Introduction, Tasks, parts, effectors, Sensors, Architectures, Configuration spaces, Navigation and motion planning, Introduction to AI based programming Tools.	10
<p>TEXT BOOKS</p> <p>1. Stuart Russell, Peter Norvig: “Artificial Intelligence: A Modern Approach”, 2nd Edition, Pearson Education, 2007.</p>		
<p>REFERENCE BOOKS</p> <p>1. Artificial Neural Networks B. Yagna Narayana, PHI 2. Artificial Intelligence, 2nd Edition, E.Rich and K.Knight (TMH). 3. Artificial Intelligence and Expert Systems – Patterson PHI. 4. Expert Systems: Principles and Programming- Fourth Edn, Giarrantana/ Riley, Thomson. 5. PROLOG Programming for Artificial Intelligence. Ivan Bratka- Third Edition – Pearson Education Neural Networks Simon Haykin PHI.</p>		

SYLLABUS
ARTIFICIAL INTELLIGENCE

Class		M.Tech. AI	L	T	P	C
Semester/Year		I/I	3	-	-	3
Subject Name		Problem Solving Methods				
Subject Code		MCSAI20S102				
Paper	English					
	Hindi					
Max. Marks		100				

Course Objective

1. Define what a problem is and the different types of problems recognize the importance of dealing with the cause of a problem.
2. Identify barriers to solving problems and how to overcome them Understand the different techniques to define and resolve simple and complex problems.

Course Outcomes:

- CO1.** To explain problem solving and reasoning strategies in AI systems.
- CO2.** To enable students to analyze a problem so that appropriate problem-solving techniques may be applied
- CO3.** To recognize the importance of dealing with the cause of a problem, rather than just dealing with the effect of a problem
- CO4.** To learn how to generate alternative solutions, using creative thinking and brainstorming
- CO5.** To learn the different stages of the decision-making process and understand the importance of each stage, enable students to apply problem solving and decision-making models to the workplace.

Unit	Syllabus	Periods
UNIT-I	General introduction of AI: What is AI? The foundations of AI, The history of AI, The state of the art. Intelligent agents: Agents and environments, Good behaviour: The concept of reality, The nature of environments, The structure of agents, AI applications.	10
UNIT-II	Solving problems by searching: Problem-solving agents, Example problems, searching for solutions, Uninformed search strategies, avoiding repeated states, Searching with partial information. Informed search and exploration: Informed search strategies, Heuristic functions, Local search algorithms and optimization problems, Local search in continuous spaces, Online search agents and unknown environments.	12

<p>UNIT-III</p>	<p>Constraint satisfaction problems: Backtracking search for CSPs, Local search for constraint satisfaction problems, The structure of problems.</p> <p>Adversarial search: Games, Optimal decisions in games, Alpha-beta pruning, Imperfect real-time decisions, Games that include an element of chance, State-of-the-art game programs.</p>	<p>8</p>
<p>UNIT-IV</p>	<p>Formalized symbolic logics: Introduction, Syntax and semantics for propositional logic, Syntax and semantics for first order propositional logic, Properties of WFFS, Connection to clausal form, Inference rules, the resolution principle, Non-deductive inference methods, Representations using rules.</p> <p>Resolution refutation systems: Production systems for resolution refutations, Control strategies for resolution methods, Simplification strategies, Extracting answers from resolution refutations.</p>	<p>15</p>
<p>UNIT-V</p>	<p>The Planning problem: Planning with state-space search, Partial-order planning, planar graphs, Planning with propositional logic and predicate logic, Analysis of planning approaches.</p> <p>Planning and acting in the real world: Time, schedules, and resources, Hierarchical task network planning, planning and acting in nondeterministic domains, Conditional planning, Execution monitoring and replanning, Continuous planning, Multi-agent planning. AI system architectures, Knowledge acquisition, Representational formalisms.</p>	<p>15</p>
<p>TEXT BOOKS:</p> <ol style="list-style-type: none"> 1. D. W. Patterson: Introduction to AI & Expert System, PHI. 2. S. Russell and P. Norvig. AI: A Modern Approach, 2nd Edn., McGraw-Hill, 2003. 		
<p>REFERENCE BOOKS:</p> <ol style="list-style-type: none"> 1. J. Siekmann, R. Goebel, and W. Wahlster: Problem Solving Methods, Springer, 2000 edition. 2. N.J.Nilsson: Principles of Artificial Intelligence, Narosa Publications. 		

SYLLABUS
ARTIFICIAL INTELLIGENCE

Class	M.Tech. AI	L	T	P	C
Semester/Year	I/I	3	-	-	3
Subject Name	Machine Learning				
Subject Code	MCSAI20S103				
Paper	English				
	Hindi				
Max. Marks	100				

Course Objective:

1. The main goal of this course is to help students learn, understand, and practice big data analytics and machine learning approaches, which include the study of modern computing big data technologies and scaling up machine learning techniques focusing on industry applications.
2. Mainly the course objectives are: conceptualization and summarization of big data and machine learning, trivial data versus big data, big data computing technologies, machine learning techniques, and scaling up machine learning approaches.

Course Outcomes:

- CO1.** To enable students to apply problem solving and decision-making models to the workplace.
- CO2.** Ability to design and implement various machine learning algorithms in a wide range of real-world applications.
- CO3.** To enable students to apply problem solving and decision-making models to the workplace.
- CO4.** Ability to understand what is learning and why it is essential to the design of intelligent machines.
- CO5.** Acquire knowledge deep learning and be able to implement deep learning models for language, vision, speech, decision making, and more.

Unit	Syllabus	Periods
UNIT-I	Learning problems – perspectives and issues – concept learning – version spaces and candidate eliminations – inductive bias – decision tree learning – representation – algorithm – heuristic space search.	8
UNIT-II	Neural Networks and Genetic Algorithms Neural network representation – problems – perceptron – multilayer networks and back propagation algorithms – advanced topics – genetic algorithms – hypothesis space search – genetic programming – models of evolution and learning.	10

UNIT-III	Bayesian And Computational Learning Bayes theorem – concept learning – maximum likelihood – minimum description length principle – bayes optimal classifier – gibbs algorithm – naïve bayes classifier – bayesian belief network – em algorithm – probability learning – sample complexity – finite and infinite hypothesis spaces – mistake bound model.	12
UNIT-IV	Instant Based Learning K- nearest neighbour learning – locally weighted regression – radial bases functions – case based learning.	8
UNIT-V	Advanced Learning Learning sets of rules – sequential covering algorithm – learning rule set – first order rules – sets of first order rules – induction on inverted deduction – inverting resolution – analytical learning – perfect domain theories – explanation base learning – focl algorithm – reinforcement learning – task – q-learning – temporal difference learning.	12
TEXT BOOKS: 1. Machine Learning – Tom M. Mitchell, - MG.		
REFERENCE BOOKS 1. Machine Learning: An Algorithmic Perspective, Stephen Marsl and, Taylor & Francis		

SYLLABUS
ARTIFICIAL INTELLIGENCE

Class	M.Tech. AI	L	T	P	C
Semester/Year	I/I	3	-	-	3
Subject Name	Pattern Recognition				
Subject Code	MCSAI20S104				
Paper	English				
	Hindi				
Max. Marks	100				

Course Objective:

1. To equip students with basic mathematical and statistical techniques commonly used in **pattern recognition**.
2. To introduce students to a variety of **pattern recognition** algorithms. Enable students to apply machine **learning** concepts in real life problems.

Course Outcomes:

- CO1.** Understand the fundamental pattern recognition and machine learning theories
CO2. Able to design and implement certain important pattern recognition techniques .Capable of applying the pattern recognition theories to applications of interest.
CO3. Understand the fundamental pattern recognition and machine learning theories
CO4. Able to design and implement certain important pattern recognition techniques
CO5. Capable of applying the pattern recognition theories to applications of interest.

Unit	Syllabus	Periods
UNIT-I	Introduction to Pattern Recognition: data sets for pattern recognition, different paradigms for pattern recognition, Pattern Representation: data structures for pattern representation, representation of clusters, proximity measures, size of patterns, abstractions of the data set, feature, feature selection, evaluation of classifiers, evaluation of clustering.	12
UNIT-II	Nearest Neighbour Based Classifiers: nearest neighbour algorithm, variants of the nn algorithm, use of the nearest neighbour algorithm for transaction databases, efficient algorithms, data reduction, prototype selection, bayes classifier: bayes theorem, minimum error rate classifier, estimation of probabilities, comparison with the nnc, naive bayes classifier, bayesian belief network.	12
UNIT-III	Hidden Markov Models: markov models for classification, hidden markov models, classification using hmms, classification of test patterns. Decision trees: introduction, decision trees for pattern	8

	classification, construction of decision trees, splitting at the nodes, over fitting and pruning, example of decision tree induction.	
UNIT-IV	<p>Support Vector Machines: introduction, linear discriminant functions, learning the linear discriminant function, neural networks, svm for classification, linearly separable case, non-linearly separable case.</p> <p>Combination of Classifiers: introduction, methods for constructing ensembles of classifiers, methods for combining classifiers, evaluation of classifiers, evaluation of clustering.</p>	8
UNIT-V	<p>Clustering: clustering and its importance, hierarchical algorithms, partitional clustering, clustering large data sets, an application to handwritten digit recognition: description of the digit data, pre-processing of data, classification algorithms, selection of representative patterns.</p>	10
<p>Text Books:</p> <ol style="list-style-type: none"> 1. Pattern Recognition an Introduction, V. Susheela Devi M. Narasimha Murty, University Press. 2. Pattern Recognition, Segrios Theodoridis, Konstantinos Koutroumbas, Fourth Edition, Elsevier 		
<p>Reference Books:</p> <ol style="list-style-type: none"> 1. Pattern Recognition and Image Analysis, Earl Gose, Richard John Baugh, Steve Jost, PHI 2004. 2. C. M. Bishop, 'Neural Networks for Pattern Recognition', Oxford University Press, Indian Edition, 2003. 3. Pattern Classification, R.O.Duda, P.E.Hart and D.G.Stork, Johy Wiley, 2002 		

SYLLABUS
ARTIFICIAL INTELLIGENCE

Class	M.Tech. AI	L	T	P	C
Semester/Year	I/I	3	-	-	3
Subject Name	Digital Image Processing				
Subject Code	MCSAI20S105				
Paper	English				
	Hindi				
Max. Marks	100				

Course Objective:

1. To study the image fundamentals and mathematical transforms necessary for image processing.
2. To study the image enhancement techniques
3. To study image restoration procedures.
4. To study the image compression procedures

Course Outcomes:

- CO1.** Develop an overview of the field of image processing.
- CO2.** Understand the Image segmentation, enhancement, compression etc., approaches and how to implement them.
- CO3.** Prepare to read the current image processing research literature.
- CO4.** Gain experience in applying image processing algorithms to real problems.
- CO5.** Analyze general terminology of digital image processing.

Unit	Syllabus	Periods
UNIT-I	Digital Image Fundamentals: basics of digital image processing, examples of fields that use digital image processing, fundamental steps in digital image processing, components of an image processing system, image sampling and quantization, some basic relationships between pixels, linear and nonlinear operations.	12
UNIT-II	Image Enhancement: image enhancement in the spatial domain: some basic gray level transformations, histogram processing, enhancement using arithmetic and logic operations, basics of spatial filters, smoothing and sharpening spatial filters, combining spatial enhancement methods.	12
UNIT-III	Segmentation: thresholding, edge based segmentation: edge image thresholding, region based segmentation, matching, Representation and Description: representation, boundary descriptors, regional descriptors.	8

UNIT-IV	Image Compression: fundamentals, image compression models, elements of information theory, error-free compression, lossy compression, image compression standards.	8
UNIT-V	Morphological Image Processing: preliminaries, dilation, erosion, open and closing, hit transformation, basic morphologic algorithms. Color Image Processing: color fundamentals, color models and basics of full-color image processing.	10

TEXT BOOKS:

1. "Digital Image Processing", Rafael C. Gonzalez and Richard E. Woods, Third Edition, Pearson Education, 2007.
2. "Digital Image Processing", S.Sridhar, Oxford University Press.

REFERENCE BOOKS:

1. "Fundamentals of Digital Image Processing", S. Annadurai, Pearson Edun, 2001.
2. "Digital Image Processing and Analysis", B.Chanda and D. Dutta Majumdar, PHI, 2003.
3. "Image Processing", Analysis and Machine Vision, Milan Sonka, Vaclav Hlavac and Roger Boyle, 2nd Edition, Thomson Learning, 2001.
4. "Digital Image Processing" Vipula Singh, Elsevier.

SYLLABUS
ARTIFICIAL INTELLIGENCE

Class	M.Tech. AI	L	T	P	C
Semester/Year	I/I	3	-	-	3
Subject Name	Logic Programming Using Prolog & Lisp				
Subject Code	MCSAI20S106				
Paper	English				
	Hindi				
Max. Marks	100				

Course Objective:

1. Understand how write programs in Prolog using techniques such as accumulators and difference structures.
2. Know how to model the backtracking behaviour of program execution.
3. Appreciate the unique perspective prolog gives to problem solving and algorithm design.
4. Understand how larger programs can be created using the basic programming techniques used in this course.

Course Outcomes:

Students will become familiar with:

- CO1.** Writing programs in prolog language.
- CO2.** Giving a declarative and procedural reading of a prolog program.
- CO3.** Pursuing any course that makes use of predicate calculus or Prolog.
- CO4.** Programming concepts like variable binding, memory allocation and de allocation, scope, The run-time stack etc.
- CO5.** The basic syntax of prolog language.

Unit	Syllabus	Periods
UNIT-I	Prolog Representation: introduction, logic-based representation, prolog syntax, creating, changing, and tracing a prolog computation, lists and recursion in prolog. Structured Representation and Inheritance Search: abstract data types and search, using cut, control search in prolog, abstract data types (ADTs) in prolog.	12
UNIT-II	Depth-First, Breadth-First and Best-First Search: production system search, designing alternative search strategies. Meta-Linguistic Abstraction, Types and Meta-Interpreters: meta-interpreters, types, and unification, types in prolog, unification, variable binding, and evaluation.	10

UNIT-III	Machine Learning Algorithms in Prolog: Machine Learning: Version Space Search, Explanation Based Learning in Prolog. Programming in Lisp: s-expressions, syntax of lisp, lists and recursive search, variables, datatypes, high order functions, logic programming in lisp, lisp-shell.	12
UNIT-IV	Semantic Networks, Inheritance and Machine Learning: semantic nets, inheritance, object-oriented lisp, learning id3 algorithm, implementing id3 algorithm.	8
UNIT-V	Java, representation and object-oriented programming, problem spaces and search, a logic- based reasoning system, an expert system shell	8

TEXT BOOKS

1. Prolog Programming for Artificial Intelligence (4th Edition) (International Computer Science Series) by Ivan Bratko (Aug 31, 2011).
2. Paradigms of Artificial Intelligence Programming: Case Studies in Common Lisp by Peter Norvig (Oct 15, 1991).
3. Common LISP, The Language by Guy L. Steele (Mar 16, 1984).
4. Lisp 3rd Edition, Bertbold Klaus Paul Horn, Patrick Henry Winston.
5. Artificial Intelligence Common LISP 1st Edition (Hardcover) by Noyes, James S. Noyer, James L. Noyes.

REFERENCE BOOKS:

1. Logic, Programming and Prolog by Ulf Nilsson, Jan Maluszynski. Wiley; 2 edition (August 1995).
2. The Art of Prolog: Advanced Programming Techniques (Mit Press Series in Logic Programming) by Leon Sterling and Ehud Shapiro (Oct 1986).

SYLLABUS
ARTIFICIAL INTELLIGENCE

Class	M.Tech. AI	L	T	P	C
Semester/Year	I/I	3	-	-	3
Subject Name	Expert Systems				
Subject Code	MCSAI20S107				
Paper	English				
	Hindi				
Max. Marks	100				

Course Objective:

1. Explain and describe the concepts central to the creation of knowledge bases and expert systems.
2. Study about the tools and the processes used for the creation of an expert system.
3. Know about methods used to evaluate the performance of an expert system.
4. To conduct an in-depth examination of an existing expert system with an emphasis on basic methods of creating a knowledge base.

Course Outcomes:

CO1. Acquire knowledge on fundamentals of knowledge representation.

CO2. Analyse Probabilistic Reasoning for knowledge.

CO3. Able to understand expert systems architecture.

CO4. Be able to design a knowledge-based system.

CO5. Be familiar with terminology used in this topical area.

Unit	Syllabus	Periods
UNIT-I	Overview of Artificial Intelligence: Definition & Importance of AI. Knowledge: General Concepts: Introduction, Definition and Importance of Knowledge, Knowledge-Based Systems, And Representation of Knowledge, Knowledge Organization, Knowledge Manipulation, And Acquisition of Knowledge.	12
UNIT-II	Knowledge Representation: Introduction, Syntax and Semantics for Propositional logic, Syntax and Semantics for FOPL, Properties of Wffs, Conversion to Clausal Form, Inference Rules, The Resolution Principle, no deductive Inference Methods, Representations Using Rules.	12
UNIT-III	Dealing with Inconsistencies and Uncertainties: Introduction, Truth Maintenance Systems, Default Reasoning and the Closed World Assumption, Predicate Completion and Circumscription, Modal and Temporal Logics. Probabilistic Reasoning: Introduction, Bayesian Probabilistic	12

	Inference, Possible World Representations, Dumpster-Shafer Theory, Ad-Hoc Methods.	
UNIT-IV	Structured Knowledge: Graphs, Frames and Related Structures: Introduction, Associative Networks, Frame Structures, Conceptual Dependencies and Scripts. Object-Oriented Representations: Introduction, Overview of Objects, Classes, Messages and Methods, Simulation Example using an OOS Program	12
UNIT-V	Knowledge Organization and Management: Introduction, Indexing and Retrieval Techniques, Integrating Knowledge in Memory, Memory Organization Systems. Expert Systems Architectures: Introduction, Rule Based System Architecture, Non-Production System Architecture, dealing with uncertainty, Knowledge Acquisition and Validation, Knowledge System Building Tools.	12
TEXT BOOKS:		
<ol style="list-style-type: none"> 1. E. Rich & K. Knight - Artificial Intelligence, 2/e, TMH, New Delhi, 2005. 2. P.H. Winston - Artificial Intelligence, 3/e, Pearson Edition, New Delhi, 2006. 3. D.W. Rolston - Principles of AI & Expert System Development, TMH, New Delhi. 		
REFERENCE BOOKS:		
<ol style="list-style-type: none"> 1. Dan W. Patterson - Introduction to Artificial Intelligence and Expert Systems, PHI, New Delhi, 2006. 		

SYLLABUS
ARTIFICIAL INTELLIGENCE

Class	M.Tech. AI	L	T	P	C
Semester/Year	I/I	3	-	-	3
Subject Name	Intelligent system				
Subject Code	MCSAI20S108				
Paper	English				
	Hindi				
Max. Marks	100				

Course Objective:

1. Study about knowledge representation.
2. Understand rule based system.
3. Study of architecture of real time system.
4. Study of tools for representation.

Course Outcomes:

- CO1.** Able to understand of Intelligent Systems is to make the computer systems on which we rely so much more “intelligent”.
- CO2.** Able to understand a whole range of methods, from logical, symbol manipulation, methods with attached semantics to statistical and heuristic techniques.
- CO3.** Able to understand the fine structure or deeper origin.
- CO4.** Able to generate intelligent behavior on the basis of statistical evidence.
- CO5.** Able to understand Software Engineering of Expert System.

Unit	Syllabus	Periods
UNIT-I	Knowledge Representation: Data and knowledge: Data representation and data items in traditional databases, Data representation and data items in relational databases. Rules: Logical operations, Syntax and semantics of rules, Data log rule sets, The dependence graph of data log rule sets, Objects, Frames ,Semantic nets, Solving problems by reasoning: The structure of the knowledge base, The reasoning algorithm, Conflict resolution, Explanation of the reasoning.	12
UNIT-II	Rule Based Systems: Forward reasoning: The method of forward reasoning, A simple case study of forward reasoning. Backward reasoning: Solving problems by reduction, The method of backward reasoning, A simple case study of backward reasoning, Bidirectional reasoning. Search Methods: Depth-first search, Breadth-first search, Hill climbing search, A* search. Contradiction freeness: The notion of	15

	contradiction freeness, Testing contradiction freeness, The search problem of contradiction freeness .Completeness: The notion of completeness, Testing Completeness, The search problem of completeness .Decomposition of knowledge bases: Strict decomposition, Heuristic decomposition.	
UNIT-III	Tools For Representation And Reasoning: The Lisp programming language: The fundamental data types in Lisp, Expressions and their evaluation, Some useful Lisp primitives, Some simple examples in Lisp, The Prolog programming language: The elements of Prolog programs, The execution of Prolog programs, Built-in predicates, and Some simple examples in Prolog. Expert system shells: Components of an expert system shell, Basic functions and services in an expert system shell.	15
UNIT-IV	Real-Time Expert Systems: The architecture of real-time expert systems: The real-time subsystem, The intelligent subsystem Synchronization and communication between real-time and intelligent subsystems: Synchronization and communication primitives, Priority handling and time-out. Data exchange between the real-time and the intelligent subsystems: Loose data exchange, The blackboard architecture. Software engineering of real-time expert systems: The software lifecycle of real-time expert systems, Special steps and tool, An Example of A Real-Time expert system.	12
UNIT-V	Qualitative Reasoning and Petri Nets: Sign and interval calculus, Qualitative simulation: Constraint type qualitative differential equations, The solution of QDEs: the qualitative simulation algorithm: Initial data for the simulation, Steps of the simulation algorithm, Simulation results. Qualitative physics, Signed directed graph (SDG) models, The Notion of Petri nets, The firing of transitions, Special cases and extensions, The state-space of Petri nets The use of Petri nets for intelligent control, the analysis of Petri nets: Analysis Problems for Petri Nets, Analysis techniques.	12
TEXT BOOKS:		
1. Intelligent Control Systems-An Introduction with Examples by Katalin M. Hangos, Rozália Lakner, Miklós Gerzson, Kluwer Academic Publishers.		
REFERENCE BOOKS:		
1. Intelligent Systems and Control, Principles and Applications Paper back–12 Nov 2009 By <u>Laxmidhar Behera</u> , <u>Indrani Kar</u> by OXFORD.		
2. Intelligent Systems and Technologies Methods and Applications by Springer publications.		
3. Intelligent Systems - Modeling, Optimization and Control, by Yung C. Shin and Chengying Xu, CRC Press, Taylor & Francis Group, 2009.		

SYLLABUS
ARTIFICIAL INTELLIGENCE

Class	M.Tech. AI	L	T	P	C
Semester/Year	I/I	-	-	4	2
Subject Name	Artificial Intelligence and Functional Programming Lab				
Subject Code	MCSAI20S109				
Paper	English				
	Hindi				
Max. Marks	50				

Course Objective:

1. Study & Perform the different problem in Area of Artificial Intelligence.

Course Outcomes:

- CO1.** Able to understanding of the major areas and challenges of AI.
- CO2.** Ability to apply basic AI algorithms to solve problems.
- CO3.** Able to describe search strategies and solve problems by applying a suitable search method.
- CO4.** Able to describe and apply knowledge representation.
- CO5.** Able to describe and apply knowledge of Expert System.

List of Experiment

1. Write a program to implementation of DFS.
2. Write a program to implementation of BFS.
3. Write a Program to find the solution for traveling salesman Problem.
4. Write a program to implement Simulated Annealing Algorithm.
5. Write a program to find the solution for wampus world problem.
6. Write a program to implement 8 puzzle problems.
7. Write a program to implement Tower of Hanoi problem.
8. Write a program to implement A* Algorithm.
9. Write a program to implement Hill Climbing Algorithm.
10. To Study JESS expert system.
11. To Study RVD expert system.
12. Write a Program to Perform Fibonacci Series.
13. Write a Program to Check Sides of a Triangle
14. Write a Program to Perform Length of List.
15. Write a Program to Perform Reverse in List.
16. Write a Prolog program to perform Arithmetic Mean.
17. Write a Program to Check Vowels or Not.

SCHOOL OF ENGINEERING

SYLLABUS ARTIFICIAL INTELLIGENCE

Class	M.Tech. AI	L	T	P	C
Semester/Year	I/I	2	-	-	-
Subject Name	English for Research Paper Writing(AE*)				
Subject Code	MCSER20S110				
Paper	English				
	Hindi				
Max. Marks					

Course Objective:

1. Understand that how to improve your writing skills and level of readability.
2. Learn about what to write in each section.
3. Understand the skills needed when writing a Title Ensure the good quality of paper at very first-time submission.

Course Outcomes:

After completion of course, students would be able to:

- CO1. Students will heighten their awareness of correct usage of English grammar in writing and speaking.
- CO2. Students will improve their speaking ability in English both in terms of fluency and comprehensibility.
- CO3. Students will give oral presentations and receive feedback on their performance.
- CO4. Students will increase their reading speed and comprehension of academic articles.
- CO5. Students will improve their reading fluency skills through extensive reading.

Unit	Syllabus	Periods
UNIT-I	Planning and Preparation, Word Order, breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness.	10
UNIT-II	Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction.	15
UNIT-III	Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.	10

UNIT-IV	key skills needed when writing a Title, key skills needed when writing an Abstract, key skills needed when writing an Introduction, skills needed when writing a Review of the Literature, skills needed when writing the Methods, skills needed when writing the Results, skills needed when writing the Discussion, skills are needed when writing the Conclusions.	15
UNIT-V	Useful phrases, how to ensure paper is as good as it could possibly be the first- time submission.	10
<p>TEXT BOOKS:</p> <ol style="list-style-type: none"> 1. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book. 2. Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011. 		
<p>REFERENCE BOOKS:</p> <ol style="list-style-type: none"> 1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books). 2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press. 		

SYLLABUS
ARTIFICIAL INTELLIGENCE

Class	M.Tech. AI	L	T	P	C
Semester/Year	I/I	2	-	-	2
Subject Name	Research Methodology and IPR				
Subject Code	MMAT20S111				
Paper	English				
	Hindi				
Max. Marks	100				

Course Objective:

After completing this module, you should be able to:

1. To understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

Course Outcomes:

After completion of course, students would be able to:

CO1: Understand research problem formulation.

CO2. Analyze research related information.

CO3. Follow research ethics.

CO4. Understand that today's world is controlled by Computer, Information Technology, but tomorrow

world will be ruled by ideas, concept, and creativity.

CO5. Understanding that when IPR would take such important place in growth of individuals & nation,

it is needless to emphasis the need of information about Intellectual Property Right to be promoted

among students in general & engineering in particular.

Unit	Syllabus	Periods
UNIT-I	Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations	12

UNIT-II	Effective literature studies approach, analysis Plagiarism, and Research ethics.	10
UNIT-III	Effective technical writing, how to write report, Paper. Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee.	12
UNIT-IV	Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.	12
UNIT-V	Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications. : New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.	12

TEXT BOOKS:

1. Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students".
2. Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction".
3. Ranjit Kumar, 2nd Edition, "Research Methodology: A Step-by-Step Guide for beginners".
4. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd, 2007.

SYLLABUS
ARTIFICIAL INTELLIGENCE

Class	M.Tech. AI	L	T	P	C
Semester/Year	I/I	-	-	4	2
Subject Name	Advances in Artificial Intelligence Lab				
Subject Code	MCSAI20S112				
Paper	English				
	Hindi				
Max. Marks	50				

List of Experiment

1. Study of facts, objects, predicates and variables in PROLOG.
2. Study of Rule and Unification in PROLOG.
3. Study of “cut” and “fail” predicate in PROLOG.
4. Study of arithmetic operators, simple input/output and compound goals in PROLOG.
5. Study of recursion in PROLOG.
6. Study of Lists in PROLOG.
7. Study of dynamic database in PROLOG.
8. Study of string operations in PROLOG. Implement string operations like substring, string position, palindrome etc.)
9. Write a prolog program to maintain family tree.
10. Write a prolog program to implement all set operations (Union, intersection, complement etc.)
11. Write a prolog program to implement Library Management system.
12. Write a prolog program to solve “Water Jug Problem”.

SYLLABUS
ARTIFICIAL INTELLIGENCE

Class	M.Tech. AI	L	T	P	C
Semester/Year	II/I	3	-	-	3
Subject Name	Artificial Neural Networks				
Subject Code	MCSAI20S201				
Paper	English				
	Hindi				
Max. Marks	100				

Course Objective:

- The objective of this subject is to provide students with a sound and comprehensive understanding of artificial neural networks and machine learning, including subjects of the McCulloch-Pitts Model, activation functions, feed-forward and feed-back network structures, approximation of nonlinear functions, supervised and unsupervised machine learning algorithms, logic networks, recurrent networks, finite automata, finite state machines, harmonic analysis, weighted networks, pattern recognition, linear separability, perceptron learning algorithms, accelerating convergence, Markov Decision Processes, Dynamic Programming, and deep-learning techniques.

Course Outcomes:

- CO1.** To Survey of attractive applications of Artificial Neural Networks.
- CO2.** To practical approach for using Artificial Neural Networks in various technical, organizational and economic applications.
- CO3.** Know and apply the methods of training neural networks.
- CO4.** Know the application of artificial neural networks.
- CO5.** To be able to formalize the problem, to solve it by using a neural network.

Unit	Syllabus	Periods
UNIT-I	Introduction: History of Neural Networks, Structure and Functions Of Biological And Artificial Neuron, Neural Network Architectures, Characteristics Of ANN, Basic Learning Laws and Methods.	15
UNIT-II	Supervised Learning: Single Layer Neural Network and architecture, McCulloch-Pitts Neuron Model, Learning Rules, Perceptron Model, Perceptron Convergence Theorem, Delta learning rule, ADALINE, Multi-Layer Neural Network and architecture, MADALINE, Back Propagation learning, Back	10

	Propagation Algorithm.	
UNIT-III	Unsupervised Learning-1: Out star Learning, Kohonen Self Organization Networks, Hamming Network and MAXNET, Learning Vector Quantization, Mexican hat.	8
UNIT-IV	Unsupervised Learning-2: Counter Propagation Network -Full Counter Propagation network, Forward Only Counter Propagation Network, Adaptive Resonance Theory (ART) - Architecture, Algorithms.	10
UNIT-V	Associative Memory Networks: Introduction, Auto Associative Memory ,Hetero Associative Memory, Bidirectional Associative Memory(BAM) -Theory And Architecture, BAM Training Algorithm, Hopfield Network: Introduction, Architecture Of Hopfield Network.	15

TEXT BOOKS:

1. S.Rajasekaran and G.A. Vijayalakshmi pai “Neural Networks. Fuzzy Logic and genetic algorithms”.
2. James A Freeman and Davis Skapura” Neural Networks Algorithm, applications and programming Techniques ”, Pearson Education, 2002.
3. Simon Hakins “Neural Networks “, Pearson Education.

REFERENCE BOOKS:

1. B.Yegnanarayana” Artificial neural networks” PHI, New Delhi.
2. S.N.Sivanandam ,S.N.Deepa, “Introduction to Neural Networks using MATLAB 6.0“, TATA MCGraw- Hill publications.
3. J .M. Zurada ,”Introduction to Artificial neural systems”, Jaico publishing.

SYLLABUS ARTIFICIAL INTELLIGENCE

Class	M.Tech. AI	L	T	P	C
Semester/Year	II/I	3	-	-	3
Subject Name	Speech Processing				
Subject Code	MCSAI20S202				
Paper	English				
	Hindi				
Max. Marks	100				

Course Objective:

1. Focuses on methods for recording speech and other vocal signals, for processing and modifying such recordings, and for synthesizing artificial speech. Necessary background in speech science is provided. In addition to class discussion and short, hands-on exercises, each student develops, executes, and presents a hands-on term project.

Course Outcomes:

- CO1.** To analyze a speech signal in terms of its frequency content.
CO2. To understand the basics of human speech production mechanism.
CO3. To understand which speech coding methods are used for what reasons.
CO4. To implement LPC Analysis.
CO5. Design, execute, interpret, and evaluate simple studies that utilize speech processing methods.

Unit	Syllabus	Periods
UNIT-I	Fundamentals of Digital Speech Processing: Anatomy & physiology of speech organs, The process of speech production, The acoustic theory of speech production, Digital models for speech signals.	10
UNIT-II	Time Domain Models for Speech Processing: Introduction-Window. considerations, Short time energy and average magnitude short time average zero crossing rate, Speech Vs Silence discrimination using Average energy and zero crossing, Pitch period estimation using parallel processing approach, the short time autocorrelation function, the short time average magnitude difference function, Pitch period estimation using the autocorrelation function.	15
UNIT-III	Linear Predictive Coding (Lpc) Analysis: Basic principles of linear predictive analysis: The Autocorrelation method, the covariance method, solution of LPC equations: Cholesky Decomposition, solution for covariance method, Durbin's	15

	<p>recursive solution for the Autocorrelation equations, Comparison between the methods of solution of the LPC parameters, Formant analysis using LPC parameters.</p> <p>Homomorphic Speech Processing: Introduction, Homomorphic systems for convolution: Properties of the complex cepstrum, computational considerations, The complex cepstrum of speech, pitch detection, Formant estimation, The homomorphic vocoder.</p> <p>Speech Synthesis Formant Speech Synthesis –Concatenative Speech Synthesis – Prosodic Modification of Speech– Source Filter Models For Prosody Modification.</p>	
UNIT-IV	<p>Automatic Speech Recognition: Basic pattern recognition approaches, parametric representation of speech, Evaluating the similarity of speech patterns, isolated digit recognition system, continuous digit Recognition System.</p> <p>Hidden Markov Model (Hmm) For Speech: Hidden markov model (HMM) for speech recognition, Viterbi algorithm, Training and testing using HMMS, Adapting to variability in speech, Language models.</p>	12
UNIT-V	<p>Speaker Recognition: Recognition techniques, features that distinguish speakers, speaker recognition systems: speaker verification system, Speaker identification system.</p> <p>Speech Enhancement: Nature of interfering sounds, speech enhancement techniques, spectral subtraction, Enhancement by re-synthesis.</p>	10
TEXT BOOKS:		
<ol style="list-style-type: none"> 1. Discrete Time Speech Signal Processing-Thomas F.Quateri1/e, Pearson. 2. Speech & Audio signal processing- Ben Gold & NelsonMorgan,1/e,Wiley. 		
REFERENCE BOOKS:		
<ol style="list-style-type: none"> 1. L.R.Rabiner and S.W.Schafer. Digital processing of speech signals, Pearson. 2. Douglas. O. Shaughnessy, speech communication, second edition Oxford university press, 2000. 3. Fundamentals of speech recognition- L.R. Rabinar and B.H.Juang. 		

SYLLABUS ARTIFICIAL INTELLIGENCE

Class	M.Tech. AI	L	T	P	C
Semester/Year	II/I	3	-	-	3
Subject Name	Natural Language Processing				
Subject Code	MCSAI20S203				
Paper	English				
	Hindi				
Max. Marks	100				

Course Objective:

1. This subject introduces the fundamental concepts and techniques of natural language processing (NLP).
2. Students will gain an in-depth understanding of the computational properties of natural languages and the commonly used algorithms for processing linguistic information.

Course Outcomes:

CO1: Able to explain and apply fundamental algorithms and techniques in the area of natural language processing (NLP)

CO2: Understand approaches to syntax and semantics in NLP.

CO3: Understand current methods for statistical approaches to machine translation.

CO4: Understand language modelling.

CO5: Understand machine learning techniques used in NLP.

Unit	Syllabus	Periods
UNIT-I	Introduction to Natural language The Study of Language, Applications of NLP, Evaluating Language Understanding Systems, Different Levels of Language Analysis, Representations and Understanding, Organization of Natural language Understanding Systems, Linguistic Background: An outline of English Syntax.	10
UNIT-II	Grammars and Parsing- Top- Down and Bottom-Up Parsers, Transition Network Grammars, Feature Systems and Augmented Grammars, Morphological Analysis and the Lexicon, Parsing with Features, Augmented Transition Networks.	10
UNIT-III	Grammars for Natural Language, Movement Phenomenon in Language, Handling questions in Context Free Grammars, Hold Mechanisms in ATNs, Gap Threading, Human Preferences in Parsing, Shift Reduce Parsers, Deterministic Parsers.	10

<p>UNIT-IV</p>	<p>Semantic Interpretation Semantic & Logical form, Word senses & ambiguity, The basic logical form language, Encoding ambiguity in the logical Form, Verbs & States in logical form, Thematic roles, Speech acts & embedded sentences, Defining semantics structure model theory.</p> <p>Language Modelling Introduction, n-Gram Models, Language model Evaluation, Parameter Estimation, Language Model Adaption, Types of Language Models, Language-Specific Modelling Problems, Multilingual and Cross lingual Language Modelling.</p>	<p>15</p>
<p>UNIT-V</p>	<p>Machine Translation Survey: Introduction, Problems of Machine Translation, Is Machine Translation Possible, Brief History, Possible Approaches, Current Status. Language Accessor: Background, Cutting the Gordian Knot, The Problem, Structure of Anusaraka System, User Interface, Linguistic Area, Giving up Agreement in Anusarsaka Output, Language Bridges.</p> <p>Multilingual Information Retrieval Introduction, Document Pre-processing, Monolingual Information Retrieval, CLIR, MLIR, Evaluation in Information Retrieval, Tools, Software and Resources.</p> <p>Multilingual Automatic Summarization Introduction, Approaches to Summarization, Evaluation, How to Build a Summarizer, Competitions and Datasets.</p>	<p>17</p>
<p>TEXT BOOKS:</p> <ol style="list-style-type: none"> 1. Charniack, Eugene, Statistical Language Learning, MIT Press, 1993. 2. Jurafsky, Dan and Martin, James, Speech and Language Processing, 2nd Edition, Prentice Hall, 2008. 3. Manning, Christopher and Henrich, Schutze, Foundations of Statistical Natural Language Processing, MIT Press, 1999. 		
<p>REFERENCE BOOKS:</p> <ol style="list-style-type: none"> 1. James Allen, Natural Language Understanding, 2nd Edition, 2003, Pearson Education. 2. Multilingual Natural Language Processing Applications: From Theory To Practice-Daniel M.Bikel and Imed Zitouni , Pearson Publications. 3. Natural Language Processing, a paninian perspective, Akshar Bharathi,Vineet chaitanya, Prentice – Hall of India. 		

SYLLABUS
ARTIFICIAL INTELLIGENCE

Class	M.Tech. AI	L	T	P	C
Semester/Year	III/I	3	-	-	3
Subject Name	Advanced Data Mining				
Subject Code	MCSAI20S204				
Paper	English				
	Hindi				
Max. Marks	100				

Course Objective:

1. To Understand Data Warehouse fundamentals, Data Mining Principles.
2. Identify appropriate data mining algorithms to solve real world problems. And Compare and evaluate different data mining techniques like classification, prediction, clustering and association rule mining.

Course Outcomes:

- CO1.** To develop the abilities of critical analysis to data mining systems and applications.
CO2. To implement practical and theoretical understanding of the technologies for datamining
CO3. To understand the strengths and limitations of various data mining models.
CO4. Design a data mart or data warehouse for any organization.
CO5. Develop skills to write queries using DMQL.

Unit	Syllabus	Periods
UNIT-I	Introduction about data mining, Need of data mining, Business data mining, data mining tools, Data Mining Process: CRISP Data Mining, Business Understanding, data understanding and data preparation, modelling, evaluation and deployment, SEMMAS Process, Data mining applications, comparison of CRISP & SEMMA.	10
UNIT-II	Memory-Based Reasoning Methods, Matching ,Weighted Matching, Distance Minimization Data Mining Methods As Tools X Contents, Association Rules in Knowledge Discovery, Market-Basket Analysis, Market Basket Analysis Benefits Demonstration on Small Set of Data, Real Market Basket Data The Counting Method Without Software.	10

UNIT-III	<p>Fuzzy Sets in Data Mining, Fuzzy Sets and Decision Trees, Fuzzy Sets and Ordinal Classification, Fuzzy Association Rules, Demonstration Model, Computational Results, Testing Inferences.</p> <p>Rough Sets: Theory of Rough Sets , Information System, Decision Table, Applications of Rough Sets, Rough Sets Software Tools, The Process of Conducting Rough Sets Analysis, Data Pre- Processing, Data Partitioning, Discretization, Redact Generation, Rule Generation and Rule Filtering, Apply the Discretization Cuts to Test Dataset, Score the Test Dataset on Generated Rule set , Deploying the Rules in a Production System.</p>	15
UNIT-IV	<p>Support Vector Machines, Formal Explanation of SVM, Primal Form, Dual Form, Soft Margin, Non-linear Classification, Regression, implementation, Kernel Trick.</p> <p>Use of SVM–A Process-Based Approach, Support Vector Machines versus Artificial Neural Networks, Disadvantages of Support Vector Machines, Genetic Algorithm Support to Data Mining, Demonstration of Genetic Algorithm, Application of Genetic Algorithms in Data Mining.</p>	15
UNIT-V	<p>Performance Evaluation for Predictive Modelling, Performance Metrics for Predictive Modelling, Estimation Methodology for Classification Models, Simple Split, The <i>k</i>-Fold Cross Validation Bootstrapping and Jack-knifing, Area Under the ROC Curve.</p> <p>Applications: Applications of Methods Memory-Based Application, Association Rule Application Fuzzy Data Mining, Rough Set Models, Support Vector Machine Application, Genetic Algorithm Applications-Product Quality Testing Design, Customer Targeting .</p>	15

TEXT BOOKS:

1. Advances in data mining and modeling by Wai-Ki Ching Michael Kwok-PoNg.
2. Advanced Techniques in Knowledge Discovery and Data Mining edited by Nikhil R. Pal, Lakhmi C Jain.
3. Dynamic and Advanced Data Mining for progressing technological development: Innovations and Systemic Approaches A B M Shawkat Ali (Central Queensland University, Australia) and Yang Xiang (Central Queensland University, Australia).

REFERENCE BOOKS:

1. Advanced Data Mining Techniques Authors: David L. Olson (Author), Dursun Delen.

SYLLABUS
ARTIFICIAL INTELLIGENCE

Class	M.Tech. AI	L	T	P	C
Semester/Year	II/I	3	-	-	3
Subject Name	Big Data Analytics				
Subject Code	MCSAI20S205				
Paper	English				
	Hindi				
Max. Marks	100				

Course Objective:

1. The main goal of this course is to help students learn, understand, and practice big data analytics and machine learning approaches, which include the study of modern computing big data technologies and scaling up machine learning techniques focusing on industry applications.
2. Mainly the course objectives are: conceptualization and summarization of big data and machine learning, trivial data versus big data, big data computing technologies, machine learning techniques, and scaling up machine learning application.

Course Outcomes:

- CO1.** To gain knowledge about working of Hadoop File System.
- CO2.** Ability to analyse Big Data using different tools.
- CO3.** Ability to identify the characteristics of datasets and compare the trivial data and big data for various applications.
- CO4.** Ability to select and implement machine learning techniques and computing environment that are suitable for the applications under consideration.
- CO5.** Ability to recognize and implement various ways of selecting suitable model parameters for different machine learning techniques.

Unit	Syllabus	Periods
UNIT-I	Introduction to Big Data. What is Big Data? Why Big Data is Important. Meet Hadoop Data, Data Storage and Analysis, Comparison with other systems, Grid Computing. A brief history of Hadoop. Apache hadoop and the Hadoop Ecosystem. Linux refresher, VMWare Installation of Hadoop.	10
UNIT-II	The design of HDFS. HDFS concepts. Command line interface to HDFS. Hadoop File systems. Interfaces. Java Interface to Hadoop. Anatomy of a file read. Anatomy of a file writes. Replica placement and Coherency Model. Parallel copying with distcp, keeping an HDFS cluster balanced	15

UNIT-III	Introduction. Analysing data with Unix tools. Analysing data with hadoop. Java MapReduce classes (new API). Data flow, combiner functions, Running a distributed MapReduce Job. Configuration API. Setting up the development environment. Managing configuration. Writing a unit test with MR Unit. Running a job in local job runner. Running on a cluster, Launching a job. The Map Reduce Web UI.	15
UNIT-IV	Classic Map Reduce. Job submission. Job Initialization. Task Assignment. Task execution. Progress and status updates. Job Completion. Shuffle and sort on Map and reducer side. Configuration tuning. Map Reduce Types. Input formats. Output formats. Sorting. Map side and Reduce side joins.	10
UNIT-V	The Hive Shell. Hive services. Hive clients. The meta store. Comparison with traditional databases. Hive QL. H basics. Concepts. Implementation. Java and Map reduce clients. Loading data, web queries.	10
TEXT BOOKS: 1. Big Data and Health Analytics Hardcover Katherine Marconi (Editor),Harold Lehmann(Editor) 2. Analytics in a Big Data World: The Essential Guide to Data Science and its Applications by Bart Baesens, Wiley publications.		
REFERENCE BOOKS: 1. Tom White, Hadoop, "The Definitive Guide", 3rd Edition, O'Reilly Publications,2012. 2. Dirk de Roos, Chris Eaton, George Lapis, Paul Ziko poulos, Tom Deutsch , "Understanding Big Data".		

SYLLABUS

ARTIFICIAL INTELLIGENCE

Class	M.Tech. AI	L	T	P	C
Semester/Year	II/I	3	-	-	3
Subject Name	Text Processing				
Subject Code	MCSAI20S206				
Paper	English				
	Hindi				
Max. Marks	100				

Course Objective:

1. Teach students the leading trends and systems in natural language processing.
2. Make them understand the concepts of morphology, syntax, semantics and pragmatics of the language and that they are able to give the appropriate examples that will illustrate the above mentioned concepts.
3. Teach them to recognize the significance of pragmatics for natural language understanding.
4. Enable students to be capable to describe the application based on natural language processing and to show the points of syntactic, semantic and pragmatic processing.

Course Outcomes:

- CO1.** Various static methods of the character wrapper class.
CO2. Additional methods of the String class.
CO3. The difference between a string object and a string buffer object.
CO4. The use of a String Tokenizer object that extracts tokens from a string.
CO5. The processing of delimited values read in from a text file.

Unit	Syllabus	Periods
UNIT-I	The Information Environment- Automatic information processing, Types of information. The Automated Office - The Office Environment, Analyzing Office Systems, File Management Systems, Office Display Systems, Office-Information Retrieval. Text Editing and Formatting- Introduction, Approaches to word Processing, Text Editing & Formatting, Typical processing systems, Automatic typesetting systems.	15
UNIT-II	Text Compression-Statistical language characteristics, rationale for text compression, Text compression methods. Text Encryption- Basic cryptographic concepts, Conventional cryptographic systems, DES. File Accessing Systems- Basic concepts, Sequential search, single key Indexed searches, Tree searching, Balanced Search Trees, Multiway Search Trees, Hash-Table Access, Indexed Searches for Multikey Access, Bitmap Encoding for Multikey Access.	15

UNIT-III	Conventional Text-Retrieval Systems- Database Management and Information Retrieval, Text Retrieval Using Inverted Indexing Methods, Typical File Organization, Text-scanning systems, Hardware aids to text searching. Automatic Indexing - Indexing Environment, Indexing Aims, Single – term Indexing Theories, Term Relationships in Indexing, Term-phrase Formation, Thesaurus-Group Generation, A blue print for Automatic indexing.	10
UNIT-IV	Advanced Information-Retrieval Models- The Vector Space Model, Automatic Document Classification, Probabilistic Retrieval Model, Extended Boolean Retrieval Model, Integrated System for Processing Text and Data, Advanced Interface Systems. Language Analysis and Understanding- The Linguistic Approach, Dictionary Operations, Syntactic Analysis, Knowledge-based Processing, Specialized Language Processing.	10
UNIT-V	Automatic Text Transformations- Text transformations, Automatic writing Aids, Automatic abstracting systems, Automatic Text Generation, Automatic Translation. Paperless Information Systems- Paperless Processing, Processing Complex Documents, Graphics Processing, Speech Processing, Electronic Mail and Messages, Electronic Information Services, Electronic Publications and the Electronic Library.	15
TEXT BOOKS: <ol style="list-style-type: none"> 1. Bran Boguraev, Ted Briscoe (Eds), “Computational Lexicography for Natural Language Processing”, Longman, 1989. 2. A V Aho, Ravi Sethi, J D Ullman, "Compilers: Principles, Techniques and Tools", Addison-Wesley. 3. Robert Sedgewick, "Algorithms in C", Addison Wesley, 1990. 		
REFERENCE BOOKS: <ol style="list-style-type: none"> 1. Gerald Salton, "Automatic Text Processing", Addison-Wesley, 1989. 		

SYLLABUS
ARTIFICIAL INTELLIGENCE

Class	M.Tech. AI	L	T	P	C
Semester/Year	II/I	3	-	-	3
Subject Name	Genetic Algorithms & Applications				
Subject Code	MCSAI20S207				
Paper	English				
	Hindi				
Max. Marks	100				

Course Objective:

1. Introduce students to soft computing concepts and techniques and foster their abilities in designing and implementing soft computing based solutions for real-world and engineering problems.
2. Introduce students to fuzzy systems, fuzzy logic and its applications.
3. Explain the students about Artificial Neural Networks and various categories of ANN.

Course Outcomes:

- CO1.** An ability to understand and the fundamental concepts of genetic algorithms.
- CO2.** An ability to understand and the fundamental concepts of genetic algorithms Understand the consequence of applying various genetic operators.
- CO3.** An ability to understand and the fundamental concepts of genetic algorithms and Ability to analyze GA operators and implement them to solve different types of GA problems.
- CO4.** An ability to understand and the fundamental concepts of genetic algorithms, creating and understanding about the way the GA is used and the domain of application.
- CO5.** An ability to understand and the fundamental concepts of genetic algorithms, analyse and integrate various soft computing techniques in order to solve problems effectively and efficiently.

Unit	Syllabus	Periods
UNIT-I	Introduction to Genetic Algorithm – Robustness of Traditional Optimization and Search methods – Goals of optimization-GA versus Traditional methods – Simple GA – GA at work – Similarity templates (Schemata) – Learning the lingo - Mathematical foundations: The fundamental theorem - Schema processing at work. – The 2-armed & k-armed Bandit problem. – The building Block Hypothesis. – Minimal deceptive problem.	15

UNIT-II	GA Operators Data structures – Reproduction- Roulette-wheel Selection – Boltzman Selection – Tournament Selection-Rank Selection – Steady –state selection –Crossover mutation – A time to reproduce, a time to cross. – Get with the Main program. – How well does it work. – Mapping objective functions to fitness forum. – Fitness scaling. Coding – A Multi parameter, Mapped, Fixed – point coding – Discretization – constraints.	10
UNIT-III	Applications of GA The rise of GA – GA application of Historical Interaction. – Dejung & Function optimization – Current applications of GA - Advanced operators & techniques in genetic search: Dominance, Diploidy & abeyance – Inversion & other reordering operators. – other mine-operators – Niche & Speciation – Multi objective optimization – Knowledge-Based Techniques. – GA & parallel processes – Real life problem.	15
UNIT-IV	Introduction to Genetics-Based Machine Learning Genetics – Based Machine learning – Classifier system – Rule & Message system – Apportionment of credit: The bucket brigade – Genetic Algorithm – A simple classifier system in Pascal. – Results using the simple classifier system.	10
UNIT-V	Applications Of Genetics-Based Machine Learning The Rise of GBMC – Development of CS-1, the first classifier system. – Smitch’s Poker player.– Other Early GBMC efforts. – Current Applications.	8

TEXT BOOKS:

1. Kalyanmoy Deb, “Optimization for Engineering Design, algorithms and examples”, PHI 1995.
2. An Introduction to Genetic Algorithm by Melanie Mitchell.
3. The Simple Genetic Algorithm Foundation & Theores by Michael P.Vosk.

REFERENCE BOOKS:

1. David E. Gold Berg, “Genetic Algorithms in Search, Optimization & Machine Learning”, Pearson Education, 2001.
2. S.Rajasekaran, G.A.Vijayalakshmi Pai, “ Neural Networks, Fuzzy Logic and Genetic Algorithms “ PHI , 2003.

SYLLABUS
ARTIFICIAL INTELLIGENCE

Class	M.Tech. AI	L	T	P	C
Semester/Year	II/I	3	-	-	3
Subject Name	Logic and Engineering				
Subject Code	MCSAI20S208				
Paper	English				
	Hindi				
Max. Marks	100				

Course Objective:

1. Understand basic knowledge of fuzzy sets and fuzzy logic.
2. Apply basic fuzzy inference and approximate reasoning. Understand principles of neural networks. Apply basic fuzzy system modelling methods.

Course Outcomes:

- CO1.** To understand fuzzy logic basics and operations.
CO2. To understand fuzzy arithmetic and representations and classical logic.
CO3. Able to understand automated methods for fuzzy systems.
CO4. Able to apply fuzzy logic for engineering problems.
CO5. Apply basic fuzzy system modelling methods.

Unit	Syllabus	Periods
UNIT-I	Introduction: The Case for Imprecision, A Historical Perspective, The Utility of Fuzzy Systems, Limitations of Fuzzy Systems, The Illusion: Ignoring Uncertainty and Accuracy, Uncertainty and Information, The Unknown, Fuzzy Sets and Membership, Chance Versus Fuzziness, Sets as Points in Hypercubes.	10
UNIT-II	Logic and Fuzzy Systems: Logic, Fuzzy Systems.	6
UNIT-III	Classical Sets and Fuzzy Sets: Classical Sets, Fuzzy Sets.	6
UNIT-IV	Classical Relations and Fuzzy Relations: Cartesian Product, Crisp Relations, Fuzzy Relations, Tolerance and Equivalence Relations, Fuzzy Tolerance and Equivalence Relations, Value Assignments, Other Forms of the Composition Operation.	10
UNIT-V	Properties of Membership Functions, Fuzzification, and Defuzzification: Features of the Membership Function, Various Forms, Fuzzification, Defuzzification to Crisp Sets, λ -Cuts for Fuzzy Relations, Defuzzification to Scalars.	10

TEXT BOOKS:

1. Gerald Salton, "Automatic Text Processing", Addison-Wesley, 1989.

REFERENCE BOOKS:

1. Bran Boguraev, Ted Briscoe (Eds), "Computational Lexicography for Natural Language Processing", Longman, 1989.
2. A V Aho, Ravi Sethi, J D Ullman, "Compilers: Principles, Techniques and Tools", Addison-Wesley.
3. Robert Sedgewick, "Algorithms in C", Addison Wesley, 1990.

SYLLABUS
ARTIFICIAL INTELLIGENCE

Class	M.Tech. AI	L	T	P	C
Semester/Year	II/I	-	-	4	2
Subject Name	Natural Language Processing & Genetic Algorithms Lab				
Subject Code	MCSAI20S209				
Paper	English				
	Hindi				
Max. Marks	50				

Course Objective:

1. Explain and apply fundamental algorithms and techniques in the area of natural language processing(NLP)
2. Study language modelling.

Course Outcomes:

- CO1.** Able to Design and apply fundamental algorithms and techniques in the area of natural language processing (NLP).
- CO2.** Able to apply language modelling.
- CO3.** Able to implement the reproduction concepts.
- CO4.** Able to design the techniques of dominance in genetic algorithms.
- CO5.** Able to Write Program for different problem.

List of Experiments

Part A:

1. Write a program given a piece of text, we want to split the text at all spaces (including new line characters and carriage returns) and punctuation marks.
2. Write a program to remove the first and last characters if they are not letters or numbers from a given sentence.
3. Write a program to split a word into pair's at all possible positions. For example, carried will be split into {c, arried, ca, rried, car, ried, carr, Ied, carri, ed, carri,d}.
4. Write a program to find out the frequencies of distinct words, given a sentence.
5. Write a program to remove digits from a given sentence using GreedyTokenizer.

Part B: Genetic Algorithms

1. Write a program that generates a pseudorandom integer between some specified lower limit and some specified upper limit. Test the program by generating 1000 numbers

between 3 and 12.

2. Create a procedure that receives two binary strings and a crossing site value, performs simple crossover, and returns two offspring strings. Test the program by crossover the following strings of length 10: 1011101011, 0000110100. Try crossing site values of -3, 1, 6 and 20.
3. For the function $f(x)=x^2$ on the interval [0,31] coded as a five-bit, unsigned binary integer. Calculate the average fitness values for all 3^5 schemata.
4. Improve the efficiency of the selection procedure by implementing a binary search using cumulative selection probability distribution values.
5. Implement a coding routine to implement a floating-point code with specified mantissa and exponent.
6. Develop a ranking procedure that gives one copy to the population mean, MAX copies to the population best, with linear variation of copies assumed everywhere else (use stochastic remainder selection after ranking and assignment).
7. Develop a multiple-point crossover procedure similar to De Jong's with parameter CP (no. of cross overpoints).
8. Write a program and test the cycle crossover operator for a permutation string representation.
9. Write a program to test the order crossover operator for permutation coding.
10. a) Write a program to demonstrate the genetic operator mutation.
b) Write a program to demonstrate the crossover genetic operator.
11. Write a program to evolve a word with non-repetitive character (eg 'computer') by taking a population size of say 5 and performing mutation and crossover.

SYLLABUS
ARTIFICIAL INTELLIGENCE

Class	M.Tech. AI	L	T	P	C
Semester/Year	II/I	-	-	4	2
Subject Name	Mini Project				
Subject Code	MCSAI20S210				
Paper	English				
	Hindi				
Max. Marks	50				

Syllabus:

Mini Project will have mid semester presentation and end semester presentation. Mid semester presentation will include identification of the problem based on the literature review on the topic referring to latest literature available.

End semester presentation should be done along with the report on identification of topic for the work and the methodology adopted involving scientific research, collection and analysis of data, determining solutions highlighting individuals 'contribution.

Continuous assessment of Mini Project at Mid Sem and End Sem will be monitored by the departmental committee.

SYLLABUS
ARTIFICIAL INTELLIGENCE

Class	M.Tech. AI	L	T	P	C
Semester/Year	II/I	2	-	-	-
Subject Name	Stress Management by Yoga				
Subject Code	MCSAI20S211				
Paper	English				
	Hindi				
Max. Marks	-				

Course Objective:

1. To achieve overall health of body and mind.
2. To overcome stress.

Course Outcomes:

After completion of course, students would be able to:

CO1. Develop healthy mind in a healthy body thus improving social health.

CO2. Improve efficiency.

Unit	Syllabus	Periods
UNIT-I	Definitions of Eight parts of yog. (Ashtanga)	15
UNIT-II	Yam and Niyam. Do`s and Don`t sin life. i) Ahinsa, Satya, Astheya, Bramh Acharya and Aparigraha. ii) Shaucha, Santosh, Tapa, Swadhyay, Ishwar Pranidhan.	10
UNIT-III	Asanand Pranayam i) Various yog poses and their benefits for mind & body ii) Regularization of breathing techniques and its effects-Types of pranayama.	15

REFERENCE BOOKS:

1. Yogic Asanas for Group Tarining-Part-I :Janardan SwamiYoga bhyasi Mandal, Nagpur.
2. Rajayoga or conquering the Internal Nature” by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata.

SYLLABUS
ARTIFICIAL INTELLIGENCE

Class	M.Tech. AI	L	T	P	C
Semester/Year	II/I	-	-	4	2
Subject Name	Artificial Neural Networks Lab				
Subject Code	MCSAI20S212				
Paper	English				
	Hindi				
Max. Marks	50				

List of Experiment

1. To Write a program to implement Perceptron.
2. To write a program to implement AND OR gates using Perceptron.
3. To implement Crab Classification using pattern net.
4. To write a program to implement Wine Classification using Back propagation.
5. To write a MatLab Script containing four functions Addition, Subtraction, Multiply and Divide functions.
6. Write a program to implement classification of linearly separable Data with a perceptron.
7. To study Long Short Term Memory for Time Series Prediction.
8. To study Convolutional Neural Network and Recurrent Neural Network.
9. To study ImageNet, GoogleNet, ResNet convolutional Neural Networks.
10. To study the use of Long Short Term Memory / Gated Recurrent Units to predict the stock prices based on historic data.