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Programme:- MCA (AIML) **Semester - III** **wef: July 2025**

Name of Paper	Paper Code	Theory					
		Credit			Marks		
		L	T	J	EST	CAT	Total
Data Mining and Online Transaction Processing	MAI-301	3	1	0	80	20	100

Course Objective	To make students learn different data mining techniques and enable them to draw pattern of the data to apply for decision making.

Units	Contents (*Theory*)	Hours /week
I	**Motivation, importance, Data type for Data Mining:** relation Databases, Data Warehouses, Transactional databases, advanced database system and its applications, Data mining Functionalities: Concept/Class description, Association Analysis classification & Prediction, Cluster Analysis, Outlier Analysis, Evolution Analysis, Classification of Data Mining Systems, Major Issues in Data Mining.	8
II	**Data Warehouse and OLAP Technology for Data Mining:** Differences between Operational Database Systems and Data Warehouses, a multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Architecture, Data Warehouse Implementation, Data Cube Technology.	8
III	**Data Preprocessing:** Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and Concept Hierarchy Generation. Data Mining Primitives, Languages, and System Architectures, Concept Description: Characterization and Comparison, Analytical Characterization.	8
IV	**Mining Association Rules in Large Databases:** Association Rule Mining: Market Basket Analysis, Basic Concepts, Mining Single -Dimensional Boolean Association Rules from Transactional Databases: the Apriori algorithm, Generating Association rules from frequent items, improving the efficiency of Apriori, Mining Multilevel Association Rules, Multidimensional Association Rules, Constraint -Based Association Mining.	8
V	**Classification & Prediction and Cluster Analysis:** Issues regarding classification & prediction, Different Classification Methods, Prediction, Cluster Analysis, Major Clustering Methods, and Applications & Trends in Data Mining: Data Mining Applications, currently available tools.	8

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Text Books/Reference Books:-			
Name of Authors	**Titles of the Book**	**Edition**	**Name of the Publisher**
J. Han and M. Kamber	Data Mining: Concepts and Techniques	1st	Morgan Kaufmann Publication
Berson	Dataware housing, Data Mining &DLAP	1st	TMH
W.H. Inmon	Building the Datawarehouse	3rd	Wiley India
Anahory	Data Warehousing in Real World	1st	Pearson Education
Adriaans	Data Mining	1st	Pearson Education
S.K. Pujari	Data Mining Techniques	1st	University Press, Hyderabad

COURSE OUTCOMES: Students will be able to	
CO1	Illustrate data mining functionalities and cluster analysis.
CO2	Reframe data warehouse architecture.
CO3	Characterize various steps of data mining process.
CO4	Learn multilevel and multidimensional association rules.
CO5	Write major clustering methods and their analysis.

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Name of Paper	Paper Code	Theory					
		Credit			Marks		
		L	T	J	EST	CAT	Total
Natural Language Processing & Generative AI	MAI-302	3	1	0	80	20	100

Course Objective	• To understand foundational NLP concepts, linguistic structures, and tasks like sentiment analysis, NER, and POS tagging. • To explore machine learning and deep learning methods including Naive Bayes, SVM, Decision Trees, RNNs, LSTMs, and Transformers. • To implement an end-to-end NLP pipeline including data collection, preprocessing, modeling, evaluation, and deployment. • To apply and compare text representation methods such as Bag of Words, TF-IDF, Word2Vec, GloVe, FastText, and contextual embeddings like BERT and ELMo. • To evaluate large language models and text generation techniques while addressing issues like hallucination, bias, and toxicity using prompt engineering and decoding strategies.

Units	Contents (*Theory*)	Hours /week
I	**Natural Language Processing & Learning Approaches :** What is NLP? NLP in the real world: assistants, search, chatbots, translation, Key NLP tasks: sentiment analysis, NER, POS tagging, summarization, Linguistic Foundations, Phonemes, Morphemes, Lexemes, Syntax, Semantics, and Context Language ambiguity and complexity Challenges in NLP, Ambiguity in interpretation, Sarcasm, idioms, and figurative language, Language diversity and code-switching, Naive Bayes, Support Vector Machine (SVM), Decision Trees, Deep Learning for NLP Neural Networks, RNNs, LSTMs, GRUs, Convolutional Neural Networks for text, Introduction to Transformers (BERT, GPT), Transfer learning in NLP, Limitations of Deep Learning.	8
II	**NLP Project Pipeline** : The NLP Workflow Define task, Collect data, Preprocess, Model, Evaluate, Deploy, Data Acquisition Using public datasets (e.g., Kaggle, Hugging Face), Web scraping for NLP (BeautifulSoup, newspaper3k), Data Augmentation in NLP, Synonym, replacement, Back translation, TF-IDF-based word substitution ,Bigram flipping, Named Entity perturbation, Text Cleaning & Preprocessing, Removing HTML, Unicode normalization, Lowercasing, punctuation, stopword removal, Spelling correction and noise injection, Tokenization & Segmentation Sentence segmentation, Word tokenization (spaCy, Hugging Face Tokenizers).	8
III	**Data Processing :**Subword methods: BPE, WordPiece, Text Representation, Bag of Words, TF-IDF Word Embeddings: Word2Vec, GloVe, FastText, Contextual Embeddings: BERT, ELMo, N-gram language models, Masked Language Modeling	8

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	(MLM), Causal Language Modeling (CLM)	
IV	**Deep Dive into Transformers and LLM Architectures :** Why Transformers? Self-Attention Mechanism, Multi-Head Attention overview, Encoder vs Decoder, Positional Encoding, Residual Connections + Layer Norm, Evolution from Transformer → BERT → GPT, BERT Architecture:, Encoder-only, Masked Language Modeling (MLM), GPT Architecture: Decoder-only, Causal Language Modeling (CLM), Fine-tuning Concepts, Fine-tuning vs Pretraining, Why Fine-tuning is important (adapt LLMs to tasks), Introduction to LoRA / PEFT ideas, Evaluating Language Models + Challenges, Perplexity, BLEU, ROUGE, Issues in LLMs: Hallucination, Bias, Computation C.	8
V	**Text Generation and Evaluation in Generative AI :** How AI generates Text, Autoregressive Gereration, Conditional Generation, Strategies for Text Generation, Greedy Search, Beam Search, Top-k sampling, Top-p sampling, Evaluating Generated Text, Human evaluation, Fluency, Coherence, Relevance, Automatic metrics, Perplexity, BLEU Score, ROUGE Score, Bias, Hallucinations, and Toxicity in LLMs, Techniques to Control AI Behavior, Prompt Engineering, Conditioning, Safe Decoding Methods.	8

Text Books/Reference Books:-

Name of Authors	Titles of the Book	Edition	Name of the Publisher
Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani	Introduction to Statistical Learning	2nd	Springer
Christopher M. Bishop	Pattern Recognition and Machine Learning	1st	Springer
Kevin P. Murphy	Machine Learning: A Probabilistic Perspective	1st	MIT Press
Trevor Hastie, Robert Tibshirani, Jerome Friedman	The Elements of Statistical Learning	2nd	Springer
Tom M. Mitchell	Machine Learning	1st	McGraw-Hill

COURSE OUTCOMES: Students will be able to

CO1	Illustrate the fundamentals of machine learning, including learning systems, applications, and basic terminology.
CO2	Explore and differentiate between supervised, unsupervised, and reinforcement learning techniques.
CO3	Analyze key machine learning concepts such as model selection, overfitting, bias-variance trade-off, and the curse of dimensionality.
CO4	Apply and evaluate linear and multiple linear regression models for predictive analysis.
CO5	Implement classification algorithms including logistic regression, linear discriminant analysis, and quadratic discriminant analysis using Bayes' theorem.

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Name of Paper	Paper Code	Theory					
		Credit			Marks		
		L	T	J	EST	CAT	Total
Machine Learning and Pattern Recognition	**MAI-303**	3	1	0	80	20	100

Course Objective	• To introduce the fundamentals of machine learning, including learning systems, real-world applications, and key terminologies. • To understand different types of machine learning approaches such as supervised, unsupervised, and reinforcement learning. • To explore important concepts in model evaluation and selection including bias-variance trade-off, overfitting, and the curse of dimensionality. • To develop the ability to implement and evaluate linear regression and multiple linear regression models. • To gain knowledge in classification techniques such as logistic regression, linear and quadratic discriminant analysis, and apply Bayes' theorem in classification tasks

Units	Contents (*Theory*)	Hours /week
I	I**ntroduction**: Learning systems, real world applications of machine learning, why machine learning, variable types and terminology, function approximation Types of machine learning: Supervised learning, unsupervised learning, reinforcement learning Important concepts of machine learning: Parametric vs non-parametric models, the trade-off between prediction accuracy and model interpretability, the curse of dimensionality, measuring the quality of fit, bias-variance trade off, overfitting, model selection, no free lunch theorem	8
II	**Linear Regression**: Linear regression, estimating the coefficients, accessing the accuracy of coefficient estimates, accessing the accuracy of the model, multiple linear regression, qualitative predictors Classification: Logistic regression, estimating regression coefficients, making predictions, multiple logistic regressions, linear discriminant analysis, bayes' theorem of classification, LDA for p=1, LDA for p>1, quadratic discriminant analysis	8
III	**Resampling Methods, Model Selection and Regularization**: Cross-validation, leave-one-out cross- validation, k-fold cross-validation, the bootstrap, subset selection, shrinkage methods, ridge and lasso regression, dimension reduction methods, principal components regression, partial least square Tree Based Methods: Advantages and disadvantages of trees, regression Trees, classification trees, bagging, random forest, boosting	8
IV	**Support Vector Machine**: Maximum margin classifier, classification using a	8

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	separating hyperplane, the maximal margin classifier, support vector classifier, support vector machines, classification with non-linear decision boundaries, support vector machine, one-versus-one classification, one- versus- many classification	
V	**Unsupervised Learning:** Principle component analysis, what are principal components, clustering methods, k-means clustering, hierarchical clustering, Independent component analysis, latent semantic indexing, Markov Models, Hidden Markov Models.	8

Text Books/Reference Books:-

Name of Authors	Titles of the Book	Edition	Name of the Publisher
Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani	Introduction to Statistical Learning	2nd	Springer
Christopher M. Bishop	Pattern Recognition and Machine Learning	1st	Springer
Kevin P. Murphy	Machine Learning: A Probabilistic Perspective	1st	MIT Press
Trevor Hastie, Robert Tibshirani, Jerome Friedman	The Elements of Statistical Learning	2nd	Springer
Tom M. Mitchell	Machine Learning	1st	McGraw-Hill

COURSE OUTCOMES: Students will be able to

CO1	Understand the fundamentals of machine learning, including learning systems, applications, and basic terminology.
CO2	Explore and differentiate between supervised, unsupervised, and reinforcement learning techniques.
CO3	Analyze key machine learning concepts such as model selection, overfitting, bias-variance trade-off, and the curse of dimensionality.
CO4	Apply and evaluate linear and multiple linear regression models for predictive analysis.
CO5	Implement classification algorithms including logistic regression, linear discriminant analysis, and quadratic discriminant analysis using Bayes theorem.

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Name of Paper	Paper Code	Theory					
		Credit			Marks		
		L	T	J	EST	CAT	Total
Cyber Security and Law	MAI-304 (E-I (1))	3	1	0	80	20	100

Course Objective	The objectives of this course are to enable students to understand, explore, and acquire a critical understanding cyber law. Develop competencies for dealing with frauds and deceptions (confidence tricks, scams) and other cybercrimes that are taking place via the internet.

Units	Contents (*Theory*)	Hours /week
I	**Introduction**: Cyber Security – Cyber Security policy – Domain of Cyber Security Policy – Laws and Regulations – Enterprise Policy – Technology Operations – Technology Configuration - Strategy Versus Policy – Cyber Security Evolution – Productivity – Internet – E-commerce – Counter Measures - Challenges.	8
II	**Application Security:** Data Security Considerations, Backups, Archival Storage and Disposal of Data. Security Threats: Viruses, Worms, Trojan Horse, Bombs, Trapdoors, Spoofs, E-mail Viruses, Macro Viruses, Malicious Software, Network and Denial of Services Attack, Security Threats to E-Commerce, Electronic Payment System, E-Cash, Credit/Debit Cards, Digital Signature.	8
III	**Internet Security:** Security Issues on Web, Importance of Firewall, Components of Firewall, Transaction Security, Emerging Client Server, Security Threats, Network Security, Factors to Consider in Firewall Design, Limitation of Firewalls, Introduction to Biometric Security and its Challenges, Finger Prints.	8
IV	**Fundamentals of Cyber Laws:** Security Policies, WWW Policies, E-mail Security Policies, Corporate Policies, Publishing and Notification Requirement of the Policies. Intellectual Property Law: Copyright Act, Patent Law, Software Piracy and Software License, Semiconductor Law and Patent Law, Cyber Laws in India: IT Act 2000 Provisions.	8
V	**Investigation and Ethics:** Cyber Crime, Cyber Jurisdiction, Cyber Crime and Evidence Act, Treatment of Different Countries of Cyber Crime, Ethical Issues in Data and Software Privacy, Plagiarism, Pornography, Tampering Computer Documents, Data Privacy and Protection, Domain Name System, Software Piracy, Issues in Ethical Hacking.	8

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Text Books/Reference Books:-			
Name of Authors	**Titles of the Book**	**Edition**	**Name of the Publisher**
Rick Howard	Cyber Security Essentials	1st	Auerbach Publications
Mayank Bhushan	Fundamentals of Cyber Security	1st	BPB Publications
Gupta & Gupta	Information Security & Cyber Laws	1st	Khanna Publishing House
Farooq Ahmad	Cyber Law in India	3rd	Pioneer Books.
Harish Chander	Cyber Law and IT Protection	2014	PHI Publication.

COURSE OUTCOMES: Students will be able to	
CO1	Understand the concept of cybercrime and its effect on outside world
CO2	Learn various threats to data.
CO3	Interpret and apply IT law in various legal issues
CO4	Distinguish different aspects of cyber law
CO5	Apply Information Security Standards compliance during software design and development

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Name of Paper	Paper Code	Theory					
		Credit			Marks		
		L	T	J	EST	CAT	Total
Compiler Design	MAI-304 (E-I (2))	3	1	0	80	20	100

Course Objective	The objective this course is to understand the basic principles of compiler design, its various constituent parts, algorithms and data structures required to be used in the compiler.

Units	Contents (*Theory*)	Hours /week
I	**Introduction**: Objective, Compiler, Translator, Interpreter definition, Phase of compiler, Bootstrapping, Review of Finite automata lexical analyzer, Input, Recognition of tokens, Idea about LEX: A lexical analyzer generator, Error handling	8
II	**Review of CFG Ambiguity of grammars:** Introduction to parsing, Top down parsing, LL grammars & passers error handling of LL parser, Recursive descent parsing predictive parsers, Bottom up parsing, Shift reduce parsing, LR parsers, Construction of SLR, Conical LR & LALR parsing tables, parsing with ambiguous grammar. Operator precedence parsing, Introduction of automatic parser generator: YACC error handling in LR parsers	8
III	**Syntax directed definitions;** Construction of syntax trees, SAttributed Definition, L-attributed definitions, Top down translation. Intermediate code forms using postfix notation, DAG, Three address code, TAC for various control structures, Representing TAC using triples and quadruples, Boolean expression and control structures	8
IV	**Storage organization;** Storage allocation, Strategies, Activation records, Accessing local and non-local names in a block structured language, Parameters passing, Symbol table organization, Data structures used in symbol tables	8
V	**Definition of basic block control flow graphs;** DAG representation of basic block, Advantages of DAG, Sources of optimization, Loop optimization, Idea about global data flow analysis, Loop invariant computation, Peephole optimization, Issues in design of code generator, A simple code generator, Code generation from DAG.	8

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Text Books/Reference Books:-			
Name of Authors	**Titles of the Book**	**Edition**	**Name of the Publisher**
Mishra and Chandrashekaran	Theory of Computer Science – Automata languages and computation	2nd	PHI
John C Martin	Introduction to Languages and The Theory of Computation	1st	TMH
Tremblay	Theory and Practice of compiler writing	1st	Mc Graw Hill
Holuv	Compiler Design in C	1st	PHI

COURSE OUTCOMES: Students will be able to	
CO1	Use compiler construction tools and describes the Functionality of each stage of compilation process
CO2	Analyze different representations of intermediate code.
CO3	Construct new compiler for new languages
CO4	Design and implement LL and LR parsers
CO5	Understand control flow graph with examples

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Name of Paper	Paper Code	Theory					
		Credit			Marks		
		L	T	J	EST	CAT	Total
Introduction to Data Science and Big Data	MAI-304 (E-I (3))	3	1	0	80	20	100

Course Objective	To make students learn about big data and their analysis techniques to use in decision making and designing applications.

Units	Contents (*Theory*)	Hours /week
I	**INTRODUCTION TO DATA SCIENCE AND BIG DATA :**Introduction to Data Science – Data Science Process – Exploratory Data analysis – Big data: Definition, Risks of Big Data, Structure of Big Data – Web Data: The Original Big Data – Evolution Of Analytic Scalability – Analytic Processes and Tools – Analysis versus Reporting – Core Analytics versus Advanced Analytics – Modern Data Analytic Tools – Statistical Concepts: Sampling Distributions – Re-Sampling – Statistical Inference – Introduction to Data Visualization.	8
II	**DATA ANALYSIS USING R:** Univariate Analysis: Frequency, Mean, Median, Mode, Variance, Standard Deviation, Skewness and Kurtosis – Bivariate Analysis: Correlation – Regression Modeling: Linear and Logistic Regression – Multivariate Analysis – Graphical representation of Univariate, Bivariate and Multivariate Analysis in R: Bar Plot, Histogram, Box Plot, Line Plot, Scatter Plot, Lattice Plot, Regression Line, Two-Way cross Tabulation.	8
III	**DATA MODELING:** Bayesian Modeling – Support Vector and Kernel Methods – Neuro – Fuzzy Modeling – Principal Component Analysis – Introduction to NoSQL: CAP Theorem, MongoDB: RDBMS Vs MongoDB, Mongo DB Database Model, Data Types and Sharding – Data Modeling in HBase: Defining Schema – CRUD Operations	8
IV	**DATA ANALYTICAL FRAMEWORKS:** Introduction to Hadoop: Hadoop Overview – RDBMS versus Hadoop – HDFS (Hadoop Distributed File System): Components and Block Replication – Introduction to MapReduce – Running Algorithms Using MapReduce – Introduction to HBase: HBase Architecture, HLog and HFile, Data Replication – Introduction to Hive, Spark and Apache Sqoop.	8
V	**STREAM ANALYTICS:** Introduction To Streams Concepts – Stream Data Model and Architecture – Stream Computing – Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating Moments – Counting Oneness in a Window – Decaying Window.	8

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Text Books/Reference Books:-

Name of Authors	Titles of the Book	Edition	Name of the Publisher
Bill Franks	Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics	1st	John Wiley & sons
Rachel Schutt, Cathy O'Neil,	Doing Data Science	1st	O'Reilly

COURSE OUTCOMES: Students will be able to

CO1	Understand data science and Modern Data Analytic Tools
CO2	Illustrate various data analysis tools.
CO3	Learn and understand data modelling tools.
CO4	Differentiate various big data technologies like Hadoop MapReduce, Pig, Hive, Hbase.
CO5	Understand stream computing and filtering streams.

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Name of Paper	Paper Code	Theory					
		Credit			Marks		
		L	T	J	EST	CAT	Total
Internet of Things	MAI-304 (E-I (4))	3	1	0	80	20	100

Course Objective	This course enables student to understand the basics of Internet of things and protocols. It introduces some of the application areas where Internet of Things can be applied.

Units	Contents (*Theory*)	Hours /week
I	Introduction: Definition, Characteristics of IOT, IOT Conceptual framework, IOT Architectural view, Physical design of IOT, Logical design of IOT, Application of IOT.	8
II	Machine-to-machine (M2M), SDN (software defined network ing) and NFV (network function virtualization) for IOT, data storage in IOT, IOT Cloud Based Services.	8
III	Design Principles for Web Connectivity: Web Communication Protocols for connected devices, Message Communication Protocols for connected device s, SOAP, REST, HTTP Restful and Web Sockets. Internet Connectivity Principles: Internet Connectivity, Internet based communication, IP addressing in IOT, Media Access control.	8
IV	Sensor Technology , Participatory Sensing, Industrial IOT and Automotive IOT, Actuator, Sensor data Communication Protocols ,Radio Frequency Identification Technology, Wireless Sensor NetworkTechnology.	8
V	IOT Design methodology: Specification -Requirement, process, model, service, functional & operational view. IOT Privacy and security solutions, Raspberry Pi & arduino devices. IOT Case studies: smart city streetlights control & monitoring.	8

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Text Books/Reference Books:-			
Name of Authors	**Titles of the Book**	**Edition**	**Name of the Publisher**
Rajkamal	Internet of Things	-	Tata McGraw Hill
Vijay Madisetti and ArshdeepBahga	Internet of things (A - Hand-on-Approach)	1st Edition	Universal Press
HakimaChaouchi	The Internet of Things: Connecting Objects	1st Edition	Wiley publication.
Charless Bell	MySQL for the Internet of things	-	A press publications
Francis dacosta	Rethinking the Internet of things: A scalable Approach to connecting everything	1st edition	Apress publications2013
Donald Norris	The Internet of Things: Do – It - Yourself at Home Projects for Arduino, Raspberry Pi and BeagleBone Black	1st Edition	McGraw Hill publication.

COURSE OUTCOMES: Students will be able to	
CO1	Describe IOT architecture and its physical/logical design.
CO2	Understand M2M and SDN networking.
CO3	Learn design principles for web connectivity.
CO4	Evaluate the wireless technologies for IOT.
CO5	Implement basic IOT applications on embedded platform

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Name of Paper	Paper Code	Theory					
		Credit			Marks		
		L	T	J	EST	CAT	Total
Design and Analysis of Algorithms	MAI-305 (E-II (1))	3	1	0	80	20	100

Course Objective	The objectives of this course are to apply important algorithmic design paradigms and methods of analysis.

Units	Contents (*Theory*)	Hours /week
I	**Introduction to Algorithms and Analysis:** Overview and importance of algorithms and data structures. Fundamentals of algorithm analysis, Space and time complexity of an algorithm, Types of asymptotic notations and orders of growth, Algorithm efficiency – best case, worst case, average case, Mathematical Analysis of non-recursive and recursive algorithms, Asymptotic analysis for recurrence relation – Recursive Tree Method.	8
II	**Divide and conquer:** Structure of divide-and-conquer algorithms: examples; Binary search, quick sort, Strassen's Multiplication; Analysis of divide and conquer run time recurrence relations. Graph searching and Traversal: Overview, Traversal methods (depth first and breadth first search)	8
III	**Greedy Method:** Overview of the greedy paradigm examples of exact optimization solution (minimum cost spanning tree), Approximate solution (Knapsack problem), Single source shortest paths. Branch and bound: LC searching Bounding, FIFO branch and bound, LC branch and bound application: 0/1 Knapsack problem, Traveling Salesman Problem, searching & sorting algorithms.	8
IV	**Dynamic Programming:** Overview, difference between dynamic programming and divide and conquer, Applications: Shortest path in graph, Matrix multiplication, Traveling salesman Problem, longest Common sequence. Back tracking: Overview, 8-queen problem, and Knapsack problem	8
V	**Computational Complexity:** Complexity measures, Polynomial Vs Non-polynomial time complexity; NP-hard and NP-complete classes, examples. Combinational algorithms, string processing algorithm, Algebric algorithms, set algorithms	8

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Text Books/Reference Books:-

Name of Authors	Titles of the Book	Edition	Name of the Publisher
Ullman	"Analysis and Design of Algorithm"	1st	TMH
Goodman	"Introduction to the Design & Analysis of Algorithms	2nd	TMH-2002
Sara Basse, A. V. Gelder	Computer Algorithms	1st	Addison Wesley
T. H. Cormen, Leiserson , Rivest and Stein	Introduction of Computer algorithm	3rd	PHI
E. Horowitz, S. Sahni, and S. Rajsekaran	Fundamentals of Computer Algorithms	2008	Galgotia Publication

COURSE OUTCOMES: Students will be able to	
CO1	Describe the fundamental of an Algorithm with recurrence relation.
CO2	Design algorithms using divide and conquer, greedy and dynamic programming.
CO3	Solve knapsack problem and apply branch and bound techniques.
CO4	Apply the dynamic programming technique to solve real world problems such as knapsack and TSP, 8 Queens problem etc.
CO5	Illustrate NP hard problems.

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Name of Paper	Paper Code	Theory					
		Credit			Marks		
		L	T	J	EST	CAT	Total
SOFT COMPUTING	MAI-305 (E-II (2))	3	1	0	80	20	100

Course Objective	The objective of the course is to expose the students to soft computing, various types of soft computing techniques, and applications of soft computing.

Units	Contents (*Theory*)	Hours /week
I	Overview of Soft Computing, Difference between Soft and Hard computing, Brief descriptions of different components of soft computing including Artificial intelligence systems Neural networks, fuzzy logic, genetic algorithms. Artificial neural networks Vs Biological neural networks, ANN architecture, Basic building block of an artificial neuron, Activation functions, Introduction to Early ANN architectures (basics only) -McCulloch & Pitts model, Perceptron, ADALINE, MADALINE	8
II	Artificial Neural Networks: Supervised Learning: Introduction and how brain works, Neuron as a simple computing element, The perceptron, Back-propagation networks: architecture, multilayer perceptron, back-propagation learning-input layer, accelerated learning in multilayer perceptron, The Hopfield network, Bidirectional associative memories (BAM), RBF Neural Network.	8
III	Artificial Neural Networks: Unsupervised Learning: Hebbian Learning, Generalized Hebbian learning algorithm, Competitive learning, Self-Organizing Computational Maps: Kohonen Network.	8
IV	Fuzzy Logic Crisp & fuzzy sets fuzzy relations fuzzy conditional statements fuzzy rules fuzzy algorithm. Fuzzy logic controller.	8
V	Genetic algorithms basic concepts, encoding, fitness function, reproduction-Roulette wheel, Boltzmann, tournament, rank, and steady state selections, Convergence of GA, Applications of GA case studies. Introduction to genetic programming- basic concepts.	8

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Text Books/Reference Books:-			
Name of Authors	**Titles of the Book**	**Edition**	**Name of the Publisher**
R. Rajasekaran and G. A and Vijayalakshmi Pa	Neural Networks, Fuzzy Logic, and Genetic Algorithms	1st	Prentice Hall of India
D. E. Goldberg	Genetic Algorithms in Search, Optimization, and Machine Learning ,Addison-Wesley supplementary reading G . L. Fausett, Fundamentals of Neural Networks	1st	Prentice Hall
T. Ross,	Fuzzy Logic with Engineering Applications	2004	Tata McGraw Hill

COURSE OUTCOMES: Students will be able to	
CO1	Write about soft computing techniques and their applications.
CO2	Illustrate supervised learning concepts and back propagation networks.
CO3	Learn unsupervised learning and kohonen network.
CO4	Understand fuzzy sets and fuzzy relations.
CO5	Apply genetic algorithms to combinatorial optimization problems.

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Name of Paper	Paper Code	Theory					
		Credit			Marks		
		L	T	J	EST	CAT	Total
Computer Graphics	MAI-305 (E-II (3))	3	1	0	80	20	100

Course Objective	The objective of this subject is to introduce the students the concepts of computer graphics.it presents the important drawing algorithm, polygon fitting, clipping and 2D transformation curves and an introduction to 3D transformation.

Units	Contents (*Theory*)	Hours /week
I	Introduction to Computer Graphics and its applications, Components and working of Interactive Graphics; Video Display Devices: Raster scan and Random Scan displays, Display Processors; Resolution, Aspect Ratio, Refresh CRT, interlacing; Color CRT monitors, LookUp tables, Plasma Panel and LCD monitors, Interactive Input and Output Devices: keyboard, mouse, trackball, joystick, light pen, digitizers; image scanners, Touch Panels; Voice systems; printers, plotters; Graphics Software; Coordinate Representations;	8
II	**Drawing Geometry:** Symmetrical and Simple DDA line drawing algorithm, Bresenham's line Algorithm; loading frame buffer; Symmetrical DDA for drawing circle, Polynomial method for circle drawing; circle drawing using polar coordinates, Bresenham's circle drawing; Generation of ellipse; parametric representation of cubic curves, drawing Bezier curves; Filled-Area Primitives: Flood fill algorithm, Boundary fill algorithm, Scan-line polygon fill algorithm	8
III	**2-D Transformations:** translation, rotation, scaling, matrix representations and homogeneous coordinates, composite transformations, general pivot point rotation, general fixed point scaling, Shearing; Reflection ; Reflection about an arbitrary line; 2-D Viewing: window, viewport;	8
IV	2-D viewing transformation, zooming, panning; Clipping operations: point and line clipping, Cohen-Sutherland line clipping, mid-point subdivision line clipping, Liang-Barsky line clipping, Sutherland-Hodgman polygon clipping; Weiler-Atherton polygon Clipping Pointing and positioning techniques; rubber band technique; dragging;	8
V	**3-D Graphics:** 3-D modeling of objects, 3D transformation matrices for translation, scaling and rotation, parallel projection: Orthographic and oblique projection; perspective projection; Hidden surface removal: Zbuffer, depth-sorting, area subdivision, BSP-Tree method; Ray casting; Shading: Modelling light intensities, Gouraud shading, Phong shading; Introduction to Animation, Tweening, Morphing, Fractals;	8

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Programme:- MCA (AIML) **Semester - III** **wef: July 2025**

Text Books/Reference Books:-

Name of Authors	Titles of the Book	Edition	Name of the Publisher
D.P. Mukherjee	Fundamentals of Computer Graphics and Multimedia	1st	PHI
Newmann&Sproull	Principles of Interactive Computer Graphics	1st	McGraw Hill
Apurva A. Desai,	Computer Graphics	2018	PHI
Rogersl	Procedural Elements of Computer Graphics	2nd	McGraw Hill

COURSE OUTCOMES: Students will be able to

CO1	Describe various I/O devices.
CO2	Use various graphical design algorithms.
CO3	Frame 2-D transformation methods.
CO4	Illustrate various clipping methods.
CO5	Write 3-D transformation methods and projection methods.

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Programme:- MCA (AIML) **Semester - III** **wef: July 2025**

Name of Paper	Paper Code	Theory					
		Credit			Marks		
		L	T	J	EST	CAT	Total
Distributed Systems	MAI-305 (E-II (4))	3	1	0	80	20	100

Course Objective	Objective of this Course is to provide hardware and software issues in modern distributed systems. To get knowledge in distributed architecture, naming, synchronization, consistency and replication, fault tolerance, security, and distributed file systems.

Units	Contents (*Theory*)	Hours /week
I	Introduction to Distributed Systems: Goals of Distributed Systems, Hardware and Software concepts, the client server model, Remote procedure call, remote object invocation, message and stream oriented communications	8
II	Process and synchronization in Distributed Systems: Threads, clients, servers, code migration, clock synchronization, mutual exclusion, Bully and Ring Algorithm, Distributed transactions.	8
III	Consistency, Replication, fault tolerance and security: Object replication, Data centric consistency model, client-centric consistency models, Introduction to fault tolerence, process resilience, recovery, distributed security architecture, security management, KERBEROS, secure socket layer, cryptography.	8
IV	Distributed Object Based and File Systems: CORBA, Distributed COM, Goals a nd Design Issues of Distributed file system, types of distributed file system, sun network file system,.	8
V	Distributed shared memory, DSM servers, shared memory consistency model, distributed document based systems : the world wide web, distributed co-ordination based systems: JINI Implementation: JAVA RMI, OLE, ActiveX, Orbix, Visbrokes, Object oriented programming with SOM	8

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Text Books/Reference Books:-			
Name of Authors	**Titles of the Book**	**Edition**	**Name of the Publisher**
Andrew S. Tanenbaum, Maarten Van Steen	Distributed Systems Principles and Paradigms	3rd	Pearson Education Inc. 2002.
Lui	Distributed Computing Principles and Applications	-	
Harry Singh	Progressing to Distributed Multiprocessing	1st	Prentice -Hall Inc
B.W. Lampson	Distributed Systems Architecture Design & Implementation	1st	1985 Springer Varlag.
Parker Y. Verjies J. P.	Distributed computing Systems, Synchronization, control & Communications	1st	PHI
Robert J. &Thieranf	Distributed Processing Systems	-	Prentice Hall
George Coulios	Distribute System: Design and Concepts	3rd	Pearson Education

COURSE OUTCOMES: Students will be able to	
CO1	Describe hardware and software issues in modern distributed systems.
CO2	Explain clock synchronization and mutual exclusion.
CO3	Illustrate synchronization, consistency and replication, fault tolerance, security.
CO4	Explain goal and design issues in distributed systems.
CO5	Understand distributed shared memory management.

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Name of Paper	Paper Code	Practical				
		Credit		Marks		
		P	J	ESP	CAP	Total
Minor Project on NLP	MAI-306	0	8	120	80	200

A complete application is to be designed using front end and back end tools to fulfill the requirements of any company/firm/office with report generation modules.

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Programme:- MCA (AIML) **Semester - III** **wef: July 2025**

Name of Paper	Paper Code	Practical				
		Credit		Marks		
		P	J	ESP	CAP	Total
Lab in Data Mining	MAI-307	2	0	30	20	50

Note: Content provided by faculty.