ARTIFICIAL INTELLIGENCE

III SEMESTER

S. No	Course Code	SUBJECT TITLE
1	EAI-301	Management Information's Systems
2	EAI-302	Principles of Artificial Intelligence
3	EAI-303	Data Structures
4	EAI-304	Systems Analysis and Design
5	EAI-305	Reinforcement Learning

IVSEMESTER

S. No	Course Code	SUBJECT TITLE
1	EAI-401	People Analytics
2	EAI-402	Marketing Analytics
3	EAI 403	Database Management System
4	EAI -404	Artificial Intelligence and Security
5	EAI -405	Project Work & Comprehensive Viva

MANAGEMENT INFORMATION'S SYSTEM (EA1-301)

Course objective: This course is designed to provide students with a basic understanding of how Information Systems are used in organizations for meeting strategic and operational goals. To that end, students will acquire skills using current end-user software for communication, data transformation, collaboration, and problemsolving. The course also covers software and hardware components, information structures, basic business organization and processes, information system security, and networks

UNIT–I

INTRODUCTION TO MANAGEMENT INFORMATION SYSTEMS: Nature of MIS, Scope of MIS, Objectives of MIS, Limitations of MIS, Role of MIS in Business functions and organizations Operating Elements of MIS, Information Systems Pyramid Structure Based and Management Activity Based role of MIS ,MIS Structure Based on Organizational Function, Advantages and Disadvantages

UNIT –II

CLASSIFICATION OF INFORMATION SYSTEMS: TPS: Concepts/Types/Functions/, MIS: concept as management support tool ESS: Concepts/Types/Functions/, DSS: Concepts/Types/Functions/, EIS: Concepts/Types/Functions/ Office Automation Systems: Concepts/Types/Functions /Tools of Office Automation Systems Artificial Intelligence: concepts/components/functions, Concepts/Meaning and Definition Components of Artificial Intelligence, Advantages and Disadvantages Robotics: concepts/functions Expert Systems: concepts/components/functions/ Knowledge Work Systems Concepts/Types/Functions /Activities

UNIT –III

DECISION MAKING PROCESS : TYPES AND MODELS: Concepts of Decision Making, Types of Decisions Decision Making Process, Models of Decision Making UNIT –IV- COMPUTER SYSTEMS: A TOOL FOR MIS: Functions of a computer, Computer Hardware, Computer Software Communication Technology

UNIT –V

CONCEPTS OF INFORMATION: Information: Concepts and Meaning, Data: Concepts and Meaning, Characteristics of Information Source Types: Type of Decisions and source.TELECOMMUNICATIONS AND NETWORKS: Concepts of Networking Internet/Intranet: Concepts/Roles/ Advantages/Disadvantages Types of Telecommunication Networks Problems of Networked Enterprise

Reference Books::
1. Introduction to Information Systems- James A O'brien
2. Management Information Systems- Gorden B. Davis &MargrettheH.Olson
3. Management Information Systems-Dharminder Kumar and Sangeeta Gupta
4. Management Information Systems in Knowlwdge Economy- Joseph S.J. Mahapatra
5. Fundamentals of Computers- Peter Norton

PRINCIPALES OF ARTIFICIAL INTELLIGENCE (EAI-302)

OBJECTIVES: • To understand the various characteristics of Intelligent agents • To learn about the different search strategies in AI • To learn to represent knowledge in solving AI problems • To understand the different ways of designing software agents • To know about the various applications of AI.

UNIT I INTRODUCTION - Introduction–Definition - Future of Artificial Intelligence – Characteristics of Intelligent Agents– Typical Intelligent Agents – Problem Solving Approach to Typical AI problems.

UNIT II PROBLEM SOLVING METHODS - Problem solving Methods - Search Strategies-Uninformed - Informed - Heuristics - Local Search Algorithms and Optimization Problems - Searching with Partial Observations - Constraint Satisfaction Problems – Constraint Propagation - Backtracking Search - Game Playing - Optimal Decisions in Games – Alpha - Beta Pruning - Stochastic Games

UNIT III KNOWLEDGE REPRESENTATION - First Order Predicate Logic – Prolog Programming – Unification – Forward Chaining-Backward Chaining – Resolution – Knowledge Representation - Ontological Engineering-Categories and Objects – Events - Mental Events and Mental Objects - Reasoning Systems for Categories - Reasoning with Default Information

UNIT IV SOFTWARE AGENTS - Architecture for Intelligent Agents – Agent communication – Negotiation and Bargaining – Argumentation among Agents – Trust and Reputation in Multi-agent systems.

UNIT V APPLICATIONS - AI applications – Language Models – Information Retrieval-Information Extraction – Natural Language Processing - Machine Translation – Speech Recognition – Robot – Hardware – Perception – Planning – Moving

REFERENCES:

1 S. Russell and P. Norvig,‖Artificial Intelligence: A Modern Approach‖, Prentice Hall, Third Edition, 2009.
 2 I. Bratko, ―Prolog: Programming for Artificial Intelligence‖, Fourth edition, Addison-Wesley Educational Publishers Inc., 2011.:
1. M. Tim Jones, ―Artificial Intelligence: A Systems Approach(Computer Science)‖, Jones and Bartlett Publishers, Inc.; First Edition, 2008
2. Nils J. Nilsson, ―The Quest for Artificial Intelligence‖, Cambridge University Press, 2009.
3. William F. Clocksin and Christopher S. Mellish,‖ Programming in Prolog: Using the ISO Standard‖, Fifth Edition, Springer, 2003.
4. Gerhard Weiss, ―Multi Agent Systems‖, Second Edition, MIT Press, 2013.
5. David L. Poole and Alan K. Mackworth, ―Artificial Intelligence: Foundations of Computational Agents‖, Cambridge University Press, 2010.

DATA STRUCTURES (EAI-303)

OBJECTIVES: • To design, analyze and implement of basic data structures and algorithms using C. • To solve problems using linear and Non-linear data Structures. • To judge efficiency trade-offs among alternative data structure implementations or combinations.

UNIT I C POINTERS - Pointers – Arrays and Pointers - Pointers and strings - Pointer and Address Arithmetic - TwoDimensional Arrays and Pointers - Pointers to Functions - Dynamic Memory Allocation - Unions - Enumeration Types - Bit fields - Files.

UNIT II ARRAY BASED LINEAR DATA STRUCTURES - Data abstraction - Abstract Data Types (ADT) - Array ADT - Linear List ADT (Polynomials) - Stack ADT - Queue ADT - Evaluation of expressions. 31

UNIT III LINKED LIST BASED LINEAR DATA STRUCTURES - Singly Linked Lists - Linked Stacks and Queues - Polynomial ADT - Circularly Linked Lists - Doubly Linked Lists

UNIT IV NON LINEAR DATA STRUCTURES - Trees - Binary Trees - Traversals - Operations - Threaded Binary Trees - Binary Search Trees - Disjoint Sets

UNIT V SORTING - Insertion Sort – Shell Sort – Heap Sort - Merge Sort – Bucket Sort – External Sorting – Multiway Merge – Polyphase Merge – Replacement Selection

REFERENCES

1. Pradip Dey and Manas Ghosh, ―Programming in C‖, Second Edition, Oxford University Press, 2011.
2. Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, ―Fundamentals of Data Structures in C‖, Second Edition, University Press, 2008.
3. Mark Allen Weiss, ―Data Structures and Algorithm Analysis in C‖, Second Edition, Pearson Education, 1996
4. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, ―Data Structures and Algorithms‖, Pearson Education, 1983.
5. Robert Kruse, C.L.Tondo, Bruce Leung, Shashi Mogalla , ― Data Structures and Program Design in C‖, Second Edition, Pearson Education, 2007
6. Jean-Paul Tremblay and Paul G. Sorenson, ―An Introduction to Data Structures with Applications‖, Second Edition, Tata McGraw-Hill, 1991.

SYSTEM ANALYSIS AND DESIGN (EAI -304)

Course objective: This to as to introduce variety of new software used by analysts, designers to manage projects, analyze and document systems, design new systems and implement their plans. It introduces also a recent coverage of UML, wireless technologies and ERP; web based systems for e-commerce and expanded coverage on RAD and GUI design. Course Components • System Analysis Fundamentals • Information requirements analysis • The analysis process • The essentials of design • Software engineering and implementation

Unit 1: Introduction to System: Introduction: Definition of a System, Types of Systems, Delineating Systems, Products, and Tools, Precedented versus Unprecedented Systems: Analytical Representation of a System: Systems that require engineering: Data and Information: Types of information: operational, tactical, strategic and statutory – why do we need information systems – management structure – requirements of information at different levels of management – functional allocation of management – requirements of information for various functions – qualities of information-small case studies.

Unit 2: System Attributes, Properties, and Characteristics: Introduction: Overview of Attributes, Properties, Characteristics and elements of system: Every System has its own unique identity: Understanding System Performance: System Characteristics: The System's State of Equilibrium: The Architecture of Systems: Introduction: Introducing the System Architecture Construct: Introduction of the System Elements: Understanding System Element Entity Relationships: Guiding Principles- Systems analysis and design in the era of electronic commerce: B2B, B2C and C2C; e-commerce – advantages and disadvantages of e-commerce. Ecommerce system architecture – physical networks, logical network, World Wide Web, web-services – html, XML.

Unit 3: The Systems Development Life Cycle: Feasibility: Analysis: Planning and Design: Implementation: Testing, Maintenance. Requirements determination, requirements specifications, Feasibility analysis, final specifications, hardware and software study, Role of systems analyst – attributes of a systems analyst – tools used in system analysis- System Design: System design, system implementation, system evaluation, system modification, Structured Design, Input design, and Output design, Form Design. Object oriented systems modelling: What are objects? – Why objects? – Objects and their properties – classes – inheritance – polymorphism – how to identify objects in an application – how to model systems using objects – some cases of object oriented system modeling

Unit 4: Systems Development Methodologies: Rapid Application Development, Newer (current) methodologies, selecting the Appropriate Development Methodology-

System Analysis-I: Introduction to System analysis, Problem Definition, Information requirements, Information gathering tools, Tools of structured Analysis – Data Flow Diagrams, Data Dictionary, Decision Tree, Decision tables and structured English. Project Team Skills and Roles: Skills and Roles of a Project Team, Business Analyst, Systems Analyst, Infrastructure Analyst, Change Management Analyst, Project Manager

Unit5: System Analysis-II: File Organization, Sequential Indexed Sequential, Chaining and Inverted list organization. System Testing: Test Plan AND test data, types of system test. System Implementation: Implementation Plan, activity network for conversion, combating resistance to change. Hardware/Software Selection: Procedure for selection, Major phases in selection, Make v/s buy decision, Criteria for software selection.-: Data oriented systems design: Entity relationship model – E-R diagrams – relationships cardinality and participation – normalizing relations – various normal forms and their need – some examples of relational data base design.

Reference Books:

1. KENNETH E KENDALL – JULIE E KENDALL – System Analysis and Design Fifth Edition, Prentice Hall of India, New Delhi, 2002.
2. JAMES A. SENN, Analysis and design of Information System McGraw Hill International Edition.
3. R.G. MURCLICK, Misconcepts and Design – Prentice Hall of India, New Delhi.
4. AWARD, System Analysis and Design – Galgotia Publicaiton.
5. C.S. PARKEN, Management Information System – McGraw Hill Book Co.
6. V.RAJARAMAN, Analysis and Design of Information Systems – Prentice Hall of India (P) Ltd., New Delhi, 2002.
7. MARVN GURE and J. STUBBE Elements of System Analysis Galgotia Book Source Publication.
8. IGOR HAWRYSZKIEWYCZ – Systems Analysis and Design – Fourth Edition – Prentice Hall of India, New Delhi.

REINFORCEMENT LEARNING (EAI-305)

Objectives:

• Learn how to define RL tasks and the core principals behind the RL, including policies, value functions, deriving Bellman equations, Implement in code common algorithms following code standards and libraries used in RL , Understand and work with tabular methods to solve classical control problems, Understand and work with approximate solutions (deep Q network based algorithms Learn the policy gradient methods from vanilla to more complex cases. Explore imitation learning tasks and solutions. Recognize current advanced techniques and applications in RL

Unit 1: Introduction and Basics of RL: Defining RL Framework and Markov Decision Process. Polices, Value Functions and Bellman Equations. Exploration vs. Exploitation. Code Standards and Libraries used in RL (Python/Keras/Tensorflow)

Unit-2: Tabular methods and Q-networks: Planning through the use of Dynamic Programming and Monte Carlo. Temporal-Difference learning methods (TD (0), SARSA, Q-Learning). Deep Q-networks (DQN, DDQN, Dueling DQN, Prioritized Experience Replay)

Unit-3: Policy optimization. Introduction to policy-based methods. Vanilla Policy Gradient. REINFORCE algorithm and stochastic policy search. Actor-critic methods (A2C, A3C). Advanced policy gradient (PPO, TRPO, DDPG)

Unit-4: Model based RL. Model-based RL approach Recent Advances and Applications. Meta-learning. Multi-Agent Reinforcement Learning. Partially Observable Markov Decision Process.

Unit-5: Ethics in RL: Applying RL for real-world problems. **Policy Gradients:** Getting started with policy gradient methods, Log-derivative trick, Naive REINFORCE algorithm. Reducing variance in policy gradient estimates.

Reference Books:

• Richard S. Sutton and Andrew G. Barto, "Reinforcement learning: An introduction", Second Edition, MIT Press, 2019

• Li, Yuxi. "Deep reinforcement learning." arXiv preprint arXiv:1810.06339 (2018).

• Wiering, Marco, and Martijn Van Otterlo. "Reinforcement learning." Adaptation, learning, and optimization 12 (2012): 3..

• Russell, Stuart J., and Peter Norvig. "Artificial intelligence: a modern approach."Pearson Education Limited, 2016.

• Goodfellow, Ian, Yoshua Bengio, and Aaron Courville. "Deep learning." MIT press, 2016.

• David Silver's course on Reinforcement Learning (link)

PEOPLE ANALYTICS (EAI-401)

Course objective: This course, you'll understand how and when hard data is used to make soft-skill decisions about hiring and talent development, so that you can position yourself as a strategic partner in your company's talent management decisions. This course is intended to introduced you to Organizations flourish when the people who work in them flourish. Analytics can help make both happen. This course in People Analytics is designed to help you flourish in your career, too.

Unit -1

Introduction to People Analytics, and Performance Evaluation-Performance Evaluation. Performance evaluation plays an influential role in our work lives, whether it is used to reward or punish and/or to gather feedback. Yet its fundamental challenge is that the measures we used to evaluate performance are imperfect: we can't infer how hard or smart an employee is working based solely on outcomes.

Unit 2

Staffing -the staffing cycle: hiring, internal mobility and career development, and attrition. You'll explore different analytic approaches to predicting performance for hiring and for optimizing internal mobility, to understanding and reducing turnover, and to predicting attrition. You'll also learn the critical skill of understanding causality so that you can avoid using data incorrectly

Unit -3

Collaboration-collaboration between employees inside an organization so they can work together more successfully. You'll explore how data is used to describe, map, and evaluate collaboration networks, as well as how to intervene in collaboration networks to improve collaboration using examples from real-world companies. By the end of this module, you'll know how to deploy the tools and techniques of organizational network analysis to understand and improve collaboration patterns inside your organization to make your organization, and the people working within in it, more productive, effective, and successful.

Unit -4

Talent Management and Future Directions-talent assessment and development to maximize employee ability. You'll learn how to use data to move from performance evaluation to a more deeper analysis of employee evaluation so that you may be able to improve the both the effectiveness and the equitability of the promotion process at your firm. By the end of this module, you'll will understand the four major challenges of talent analytics: context, interdependence, self-fulfilling prophecies, and reverse causality, the challenges of working with algorithms, and some practical tips for incorporating data sensitively, fairly, and effectively into your own talent assessment and development processes to make your employees and your organization more successful

Unit 5

Challenges- the challenges of working with algorithms, and some practical tips for incorporating data sensitively, fairly, and effectively into your own talent assessment and development processes to make your employees and your organization more successful. In the course conclusion, you'll also learn the current challenges and future directions of the field of people analytics, so that you may begin putting employee data

Reference Books:

1. Michael Mineli, Michele Chambers, Ambiga Dhiraj, "Big Data, Big Analytics:
2. Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley Publications, 2013.
3. Anderson, Sweeney and Williams —Statistic Learning, 2021

MARKETING ANALYTICS (EAI-402)

Objective of course: The field of marketing analytics is witnessing worldwide growth. Demand for knowledgeable managers with ability to use big data analysis to make effective decisions is growing rapidly

Unit- 1
Customer Analytics - introduces statistical modeling and coding techniques that help individuals manage the customer relationship from acquisition to development to retention. Special attention is directed to models that help firms appropriately value customers and target them with the right offer at the right time.

Unit-2 Analytics for Marketing Decisions - identifies analytic models that can be applied to real, large-scale databases to improve and automate firm-level marketing decisions. In particular, analytics are used to improve decisions around product design, pricing, promotion/advertising, and digital and mobile channel management.

Unit -3 Digital Marketing Analytics- covers search and display advertising, email marketing, attribution models, social media strategies, and two-sided platforms. The course takes a quantitative and data-driven approach for analyzing and improving digital marketing strategies.

Unit -4 Strategic Pricing - blends marketing strategy, micro-economic theory, and data analytics to formulate actionable pricing strategies. The course combines cases and data analytics assignments to teach students how to design and execute pricing decisions and co-ordinate these decisions with other marketing decisions

Unit-5 McKinsey & Company forecast a shortage- analytics skills and business knowledge-practices in analytics such as Amazon, Microsoft, Expedia, and Starbucks.

Reference Books:

1. Stephan Sorger, ――MarkStrategicng ModelsAnalyticsand Metri 2013.
2. Mark Jeffery, ―Data Driven Marketing:should The know‖, Wiley, 2013.
3. Paul W. Farris, Neil T. Bendle, Phillip E. The Definitive Guide to Measuring Marketin

DATABASE MANAGEMENT SYSTEMS (EAT-403)

Course Objective : • As the end user applications has changed significantly in last few decades, there is a challenge to store the large amount of information, retrieve and manage this information in timely manner. This can be achieving today by making use of services of Database Management System (DBMS).

Unit: I
Introduction – Data Models – Database languages – Transaction – Storage management – Database administrator – Users – overall system structure – Entity – Relationship Model – Basic concepts – Mapping constraints – keys – E-R Diagram – Weak Entity Sets – reduction of E-R Diagram to tables.

Unit: II
Relational Model – structure – relational algebra – extended operations – Modifications on a database – views – SQL – basic structure – set operations – aggregate functions – Nested Sub queries – derived relations, views.

Unit: III
Integrity constraints – Domain constraints – referential integrity – assertions – triggers – functional dependencies – relational database design – decomposition – normalization using functional, multi valued, Join dependencies – Domain – Key Normal form – alternative approaches.

Unit: IV
Object Oriented data Model – Languages – Object Relational databases: Nested Relations – Complex types and object Orientation – Querying with complex types – creation of complex values and objects – comparison.

Unit: V
Database System Architectures : Centralized Systems, Client server systems, Distributed systems, Parallel databases – introduction – inter query – intra query, intra-operation – interoperation parallelism –distributed databases – distributed data storage – network transparency – Query processing – Transaction model – Commit protocols – coordinator selection – concurrency control – deadlock handling – multi database systems.

Text Book
1. Henry F. Korth and Abraham Silberschatz, S. Sudarshan, Database System Concepts, 3rd edition, McGraw-Hill, 1997.

Reference Books
1. Bipin C. Desai, An Introduction to Database Systems, West Publications, 6th edition, 1995.
2. C.J.Date, An introduction to database systems, Addison Wesley publications, 6th edition 1995.
3. Gary W.Hansen and James V.Hansen, "Database Management and Design" Prentice Hall, 1996.
4. Jeffrey A. Hoffer, Mary B. Prescott, Fred R. Mcfadden, "Modern Database Management", Prentice Hall, 6th edition, 2002, 7th edition.
5. Ronald J.Norman, 'Object Oriented Systems Analysis and Design', Prentice Hall 1996.

ARTIFICIAL INTELLIGENCE AND SECURITY (EAI- 404)

Course Objectives: To train the students to understand different types of AI agents, various AI search algorithms, fundamentals of knowledge representation, building of simple knowledge-based systems and to apply knowledge representation, reasoning. Study of Markov Models enable the student ready to step into applied AI.

UNIT - I Introduction: AI problems, Agents and Environments, Structure of Agents, Problem Solving Agents Basic Search Strategies: Problem Spaces, Uninformed Search (Breadth-First, Depth-First Search, Depth-first with Iterative Deepening), Heuristic Search (Hill Climbing, Generic Best-First, A*), Constraint Satisfaction (Backtracking, Local Search)

UNIT - II Advanced Search: Constructing Search Trees, Stochastic Search, A* Search Implementation, Minimax Search, Alpha-Beta Pruning Basic Knowledge Representation and Reasoning: Propositional Logic, First-Order Logic, Forward Chaining and Backward Chaining, Introduction to Probabilistic Reasoning, Bayes Theorem

UNIT - III Advanced Knowledge Representation and Reasoning: Knowledge Representation Issues, Nonmonotonic Reasoning, Other Knowledge Representation Schemes Reasoning Under Uncertainty: Basic probability, Acting Under Uncertainty, Bayes' Rule, Representing Knowledge in an Uncertain Domain, Bayesian Networks

UNIT - IV Learning: What Is Learning? Rote Learning, Learning by Taking Advice, Learning in Problem Solving, Learning from Examples, Winston's Learning Program, Decision Trees. Expert Systems: Representing and Using Domain Knowledge, Shell, Explanation, Knowledge Acquisition.

Unit –V Security: Organizational Implications: Introduction cost of cybercrimes and IPR issues, web threats for organizations, security and privacy implications, social media marketing: security risks and perils for organizations, social computing and the associated challenges for organizations. Cybercrime and Cyber terrorism: Introduction, intellectual property in the cyberspace, the ethical dimension of cybercrimes the psychology, mindset and skills of hackers and other cyber criminals

REFERENCE BOOKS:

1. Russell, S. and Norvig, P, Artificial Intelligence: A Modern Approach, Third Edition, PrenticeHall, 2010.
2. Artificial Intelligence, Elaine Rich, Kevin Knight, Shivasankar B. Nair, The McGraw Hill publications, Third Edition, 2009.
3. George F. Luger, Artificial Intelligence: Structures and Strategies for Complex Problem Solving, Pearson Education, 6th ed., 2009.