SYLLABUS FOR M.C.A. ELECTIVE - I

PAPER :EC-11 : ARTIFICIAL INTELLIGENCE AND ITS APPLICATIONS

Full marks: 75, Pass Marks: 30, Time : 3 Hrs. Credits: 3

12 Questions will be set two from each module and students will be required to answer six (06) question one from each module.

Course Objectives

This course enables the students:

1.	To learn the overview of artificial intelligence principles and approaches.
2.	To understand the basic areas of artificial intelligence including problem solving, knowledge representation, reasoning, decision making, planning, perception and action.
3.	To describe the strengths and limitations of various search algorithms and to choose the appropriate algorithm.
4.	To develop a basic understanding of the building blocks of AI as presented in terms of intelligent agents.
5.	To learn the concepts of Artificial Intelligence, with illustrations of current state of the art research and applications.

Course Outcomes

After the completion of this course, students are expected to

A.	Understand the concepts of Artificial intelligence.
B.	Interpret the modern view of Artificial intelligence as the study of agents that receive precepts from the environment and perform actions.
C.	Represent knowledge of the world using logic and infer new facts from that Knowledge
D.	Build awareness of AI facing major challenges and the complexity of typical problems within the field.
E.	Develop self-learning and research skills to tackle a topic of interest on his/her own or as part of a team.

Module 01(Lecture 06)

Overview of Artificial intelligence- Problems of AI, AI technique, Tic - Tac - Toe problem, Agents & environment, nature of environment, structure of agents, goal-based agents, utility-based agents, learning agents, Forms of learning, inductive learning, learning decision trees, explanation-based learning, learning using relevance information, neural net learning & genetic learning.

Module 02 (Lecture 08)

Problems, Problem Space & search: Defining the problem as state space search, production system, constraint satisfaction problems, issues in the design of search programs. Search techniques, solving problems by searching: Problem solving agents, searching for solutions; uniform search strategies: breadth first search, depth first search, depth limited search, bidirectional search, comparing uniform search strategies.

Module 03 (Lecture 08)
Heuristic search strategies, Greedy best-first search, A* search, memory bounded heuristic search: local search algorithms & optimization problems: Hill climbing search, simulated annealing search, local beam search, genetic algorithms; constraint satisfaction problems, local search for constraint satisfaction problems. Adversarial search, Games, optimal decisions & strategies in games, the minimax search procedure, alpha-beta pruning, additional refinements, iterativedeepening.

Module 04 (Lecture 07)
Knowledge & Reasoning, Knowledge representation issues, representation & mapping, approaches to knowledge representation, issues in knowledge representation, using predicate logic, representing simple fact in logic, representing instant & ISA relationship, computable functions & predicates, resolution, natural deduction.

Module 05 (Lecture 07)
Representing knowledge using rules, Procedural verses declarative knowledge, logic programming, forward verses backward reasoning, matching, control knowledge. Probabilistic reasoning, Representing knowledge in an uncertain domain, the semantics of Bayesian networks, Dempster Shafer theory, Fuzzy sets, and fuzzy logics.

Module 06 (Lecture 06)
Natural Language Processing, Introduction, Syntactic processing, semantic analysis, discourse, and pragmatic processing. Expert Systems, Representing and using domain knowledge, expert system shells, and knowledge acquisition. Basic knowledge of programming language likeProlog

Text book:

1. Artificial Intelligence, Ritch & Knight,TMH
2. Artificial Intelligence, A Modern Approach, Stuart Russel, Peter Norvig,Pearson

Reference books:

1. Introduction to Artificial Intelligence & Expert Systems, Patterson,PHI.
2. Prolog Programming for A.I. by Bratko,TMH

PAPER :EC-12 : NETWORK SECURITY AND CRYPTOGRAPHY.

Fullmarks: 75, Pass Marks: 30, Time : 3 Hrs. Credits:3

12 Questions will be set two from each module and students will be required to answer six (06) question one from eachmodule.

CourseObjectives
This course enables the students:

1.	To understand basics of Cryptography and Network Security.
2.	To be able to secure a message over insecure channel by various means.
3.	To learn about how to maintain the Confidentiality, Integrity and Availability of a data.
4.	To understand various protocols for network security to protect against the threats in the networks.

Course Outcomes

After the completion of this course, students are expected to

A.	Provide security of the data over the network.
B.	Do research in the emerging areas of cryptography and network security.
C.	Implement various networking protocols.
D.	Protect any network from the threats in the world.

Module 01(Lecture 06)

Introduction to security attacks - services and mechanism - introduction to cryptography - Conventional Encryption: Conventional encryption model - classical encryption techniques - substitution ciphers and transposition ciphers – cryptanalysis – steganography - stream and block ciphers - Modern Block Ciphers: Block ciphers principals - Shannon's theory of confusion and diffusion - fiestal structure - data encryption standard(DES) - strength of DES - differential and linear crypt analysis of DES - block cipher modes of operations - triple DES – AES.

Module 02(Lecture 06)

Confidentiality using conventional encryption - traffic confidentiality - key distribution - random number generation - Introduction to graph - ring and field - prime and relative prime numbers - modular arithmetic - Fermat's and Euler's theorem - primality testing - Euclid's Algorithm - Chinese Remainder theorem - discrete algorithms.

Module 03(Lecture 06)

Principles of public key crypto systems - RSA algorithm - security of RSA - key management – Diffle-Hellman key exchange algorithm - introductory idea of Elliptic curve cryptography – Elgamel encryption - Message Authentication and Hash Function: Authentication requirements - authentication functions - message authentication code - hash functions - birthday attacks – security of hash functions and MACS..

Module 04(Lecture 08)

MD5 message digest algorithm - Secure hash algorithm (SHA) Digital Signatures: Digital Signatures - authentication protocols - digital signature standards (DSS) - proof of digital signature algorithm - Authentication Applications: Kerberos and X.509 - directory authentication service - electronic mail security-pretty good privacy (PGP) - S/MIME.

Module 05(Lecture 06)

IP Security: Architecture - Authentication header - Encapsulating security payloads - combining security associations - key management.

Module 06(Lecture 08)

Web Security: Secure socket layer and transport layer security - secure electronic transaction (SET) - System Security: Intruders - Viruses and related threads - firewall design principals – trustedsystems.

Text Books: -

1. William Stallings, "Crpyptography and Network security Principles and Practices",Pearson/PHI.
2. Wade Trappe, Lawrence C Washington, " Introduction to Cryptography with codingtheory",Pearson.

Reference Books: -

1. W. Mao, "Modern Cryptography – Theory and Practice",PearsonEducation.
2. Charles P. Pfleeger, Shari Lawrence Pfleeger – Security in computing – Prentice HallofIndia.

PAPER : EC-13 : COMPUTER GRAPHICS AND MULTIMEDIA

Fullmarks: 75, Pass Marks: 30, Time: 3 Hrs. Credits:3

12 Questions will be set two from each module and students will be required to answer six (06) question one from eachmodule.

CourseObjectives

This course enables the students:

1.	This course covers basics of computer graphics & Multimedia.
2.	Computer graphics are pictures and films created using computers. Usually, the term refers to computer-generated image data created with the help of specialized graphical hardware and software.
3.	Computer graphics is responsible for displaying art and image data effectively and meaningfully to the consumer.
4.	Computer graphics is used for processing image data received from the physical world.
5.	Computer graphics development has had a significant impact on many types of media and has revolutionized animation, movies, advertising, video games, and graphic design in general

After the completion of this course, students are expected to

A.	Understand the basics of computer graphics, different graphics systems and applications of computer graphics.
B.	Discuss various algorithms for scan conversion and filling of basic objects and their comparative analysis.
C.	Use of geometric transformations on graphics objects and their application in composite form.
D.	Extract scene with different clipping methods and its transformation to graphics display device.
E.	Render projected objects to naturalize the scene in 2D view and use of illumination models for this.

Module 01(Lecture 04)

Introduction to computer graphics and graphics systems. Raster and vector graphics systems, video display devices, physical and logical input devices, simple color models.

Module 02(Lecture 08)

Points & lines, Line drawing algorithms; DDA algorithm, Bresenham's line algorithm, Circle generation algorithm; scan line polygon, fill algorithm, boundary fill algorithm, flood fill algorithm.

Module 03(Lecture 08)

2D Transformation: Basic transformations: translation, rotation, scaling; Matrix representations & homogeneous coordinates, transformations between coordinate systems; reflection shear; Transformation of points, lines, parallel lines, intersecting lines.

Module 04(Lecture 06)
Viewing pipeline, Window to Viewport co-ordinate transformation, clipping operations, point clipping, line clipping, clipping circles, polygons & ellipse.

Module 05(Lecture 10)
Hidden Surfaces: Depth comparison, Z-buffer algorithm, Back face detection, BSP tree method, the Printer's algorithm, scan-line algorithm; Hidden line elimination, wire frame methods, fractal - geometry. Rendering of a polygonal surface; Flat, Gouraud, and Phong shading; Texture mapping, bump texture, environment map; Introduction to ray tracing; Image synthesis, sampling techniques, andanti-aliasing.

Module 06(Lecture 04)
Multimedia, concepts, design, hardware, standards – MPEG, JPEG, MIDI, multimedia design methodology, development and testing.

Text Books:

1. Donald Hearn and Pauline Baker Computer Graphics, Prentice Hall, New Delhi,2012
2. Fundamentals of Computer Graphics &Multimedia,Mukherjee,PHI

Reference Books:

1. Foley J.D.,VanDamA, "Fundamentals of Interactive Computer Graphics",AddisonWesley,19932.Krishnamurthy N., Introduction to Computer Graphics,1st Edition,TMH,2002

PAPER :EC-14 : SOFT COMPUTING
Fullmarks: 75, Pass Marks: 30, Time : 3 Hrs. Credits:3

12 Questions will be set two from each module and students will be required to answer six (06) question one from eachmodule.

CourseObjectives
This course enables the students:

1.	To understand the knowledge about Artificial Intelligent and its parts.
2.	To understand the functions of Neural Network.
3.	To know the applications of Fuzzy Logic.
4.	To know the basic functionalities of optimizations through soft computing
5.	To understand the basic functions of soft computing.

Course Outcomes
After the completion of this course, students are expected to

A.	To learn the fundamentals of non-traditional technologies and approaches to solving hardreal-world problems.
B.	Develop Fuzzy Inference System.
C.	Explain concepts of neural networks.
D.	Solve problems on Genetic Algorithms.
E.	Develop knowledge of soft computing theories fundamentals and so they will be able to design program systems using approaches of these theories for solving various real-world problems.

Module 01(Lecture 06)
Introduction to Artificial Intelligence, Neural Network, Fuzzy Logic & Genetic Algorithm. Fuzzy Set Theory: Fuzzy Versus Crisp, Crisp Set, Fuzzy Set, Crip Relation, Fuzzy Relations.

Module 02(Lecture 06)
Fuzzy Logic: Crisp Logic, Predicate Logic, Fuzzy Logic, Fuzzy Rule Based System, Defuzzification Methods, and Applications.

Module 03(Lecture 08)
Genetic Algorithms, Basic Concepts, Creation of Offspring, Working Principle, Encoding, Fitness Function, Reproduction. Genetic Modelling, Inheritance Operations, Cross Over, Inversion and Deletion, Mutation Operator, Bit Wise Operators, Generation Cycle, Convergence of Genetic Algorithm, Application, Multi-Level Optimization, Real Life Problems, Difference and Similarities Between GA and Other Traditional Methods, Advanced in GA.

Module 04(Lecture 07)
Fundamentals of Neural Networks, Basic Concepts of Neural Network, Human Brain, Model of An Artificial Neuron, Neural Network Architectures, Characteristic of Neural Networks, Learning Method, Taxonomy Of Neural Network Architectures, History Of Neural Network Research, Early Neural Network Architectures, Some Application Domains.

Module 05(Lecture 06)
Back Propagation Network Architecture of Back Propagation Network, Back Propagation Learning, Illustration, Applications, Effect of Tuning Parameters of The Back Propagation Neural Network, Selection Of Various Parameters In BPN, Variations Of Standard Back Propagation Algorithm.

Module 06 (Lecture 08)
Associative Memory and Adaptive Resonance Theory, Autocorrelations, Hetrocorrelators, Multiple Training Encoding Strategy, Exponential BAM, Associative Memory for Real Coded Pattern Pairs, Applications, Introduction to Adaptive Resonance Theory, ARTI, Character Recognition UsingARI1

Text Books:

1. S. Rajasekaran and G.A. Vijayalakshmi Pai, ―Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications‖, Prentice Hall of India,2003.
2.J.S.R. Jang, C.T. Sun and E. Mizutani, ―Neuro-Fuzzy and Soft Computing‖, Pearson Education, 2004.

Reference Books:

1. Bart Kosko, ―Neural Networks and Fuzzy Systems: Dynamical Systems Application to Machine Intelligence‖, Prentice Hall,1992.
2. Jang JyhShing R, Sun C. T., Mizutani E. "Neuro Fuzzy and Soft Computing –AComputational Approach to Learning and Machine Intelligence", Prentice Hall of India, 1997.

PAPER : EC- 15 : BLOCK CHAIN TECHNOLOGY.
Full marks: 75, Pass Marks: 30, Time : 3 Hrs. Credits: 3

12 Questions will be set two from each module and students will be required to answer six (06) question one from eachmodule.

CourseObjectives
This course enables the students:

1.	Understand how blockchain systems (mainly Bitcoin and Ethereum) work.
2.	To securely interact with them.
3.	Design, build, and deploy smart contracts and distributed applications.
4.	Integrate ideas from blockchain technology into their own projects.

Course Outcomes
After the completion of this course, students are expected to

A.	Explain design principles of Bitcoin and Ethereum.
B.	Explain Nakamoto consensus.
C.	Explain the Simplified Payment Verification protocol.
D.	List and describe differences between proof-of-work and proof-of-stake consensus.
E.	Interact with a blockchain system by sending and reading transactions.

Module 01 (Lecture 10)
Introduction: Distributed Database, Two General Problem, Byzantine General problem and Fault Tolerance, Hadoop Distributed File System, Distributed Hash Table, ASIC resistance, Turing Complete. Cryptography: Hash function, Digital Signature - ECDSA, Memory Hard Algorithm, Zero Knowledge Proof.

Module 02 (Lecture 10)
Block Chain: Introduction, Advantage over conventional distributed database, Blockchain Network, Mining Mechanism, Distributed Consensus, Merkle Patricia Tree, Gas Limit, Transactions and Fee, Anonymity, Reward, Chain Policy, Life of Blockchain application, Soft & Hard Fork, Private and Public blockchain

Module 03 (Lecture 06)
Distributed Consensus: Nakamoto consensus, Proof of Work, Proof of Stake, Proof of Burn, Difficulty Level, Sybil Attack, Energy utilization and alternate.

Module 04 (Lecture 06)
Cryptocurrency: History, Distributed Ledger, Bitcoin protocols - Mining strategy and rewards, Ethereum - Construction, DAO, Smart Contract, GHOST, Vulnerability, Attacks, Sidechain, Name coin.

Module 05 (Lecture 06)
Cryptocurrency Regulation: Stakeholders, Roots of Bitcoin, Legal Aspects – Crypto-currency Exchange, Black Market and Global Economy.

Module 06 (Lecture 04)
Blockchain Applications: Internet of Things, Medical Record Management System, Domain Name Service and future of Blockchain.

Text books:

1. S. Desikan, G. Ramesh, Software Testing: Principles and Practices, (2e) Pearson Education,2007.
2. A. P. Mathur, Fundamentals of Software Testing, (2e)

Pearson Education, 2008. Reference books:

1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University Press (July 19, 2016). Reference Books
2. Satoshi Nakamoto, Bitcoin: A Peer-to-Peer Electronic CashSystem