SYLLABUS FOR M.C.A. ELECTIVE - 2

PAPER :EC-21 : MACHINE LEARNING

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 introduce students to the basic concepts and techniques of Machine Learning.
2.	To have a thorough understanding of the Supervised and Unsupervised learning techniques.
3.	To study the various probabilities-based learning techniques.
4.	To understand graphical models of machine learning algorithms.

Course Outcomes

After the completion of this course, students are expected to:

A.	Distinguish between, supervised, unsupervised and semi-supervised learning.
B.	Apply the apt machine learning strategy for any given problem.
C.	Suggest supervised, unsupervised or semi-supervised learning algorithms for any given problem.
D.	Design systems that use the appropriate graph models of machine learning
E.	Modify existing machine learning algorithms to improve classification efficiency.

Module 01(Lectures 10)

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

Module 02(Lectures 10)

Linear Models: Multi-layer Perceptron – Going Forwards – Going Backwards: Back Propagation Error – Multi-layer Perceptron in Practice – Examples of using the MLP – Overview – Deriving Back-Propagation – Radial Basis Functions and Splines – Concepts – RBF Network – Curse of Dimensionality – Interpolations and Basis Functions – Support VectorMachines.

Module 03 (Lectures 10)

Tree and Probabilistic Models: Learning with Trees – Decision Trees – Constructing Decision Trees – Classification and Regression Trees – Ensemble Learning – Boosting – Bagging – Different ways to Combine Classifiers – Probability and Learning – Data into Probabilities – Basic Statistics – Gaussian Mixture Models – Nearest Neighbour Methods – Unsupervised Learning – K means Algorithms – Vector Quantization – Self Organizing Feature Map.

Module 04 (Lectures 03)
Dimensionality Reduction: Dimensionality Reduction – Linear Discriminant Analysis – Principal Component Analysis – Factor Analysis – Independent Component Analysis – Locally Linear Embedding – Isomap – Least Squares Optimization.

Module 05 (Lectures 03)
Evolutionary Models: Evolutionary Learning – Genetic algorithms – Genetic Offspring: - Genetic Operators – Using Genetic Algorithms – Reinforcement Learning – Overview – Getting Lost Example – Markov Decision Process

Module 06 (Lectures 06)
Graphical Models: Markov Chain Monte Carlo Methods – Sampling – Proposal Distribution – Markov Chain Monte Carlo – Graphical Models – Bayesian Networks – Markov Random Fields – Hidden Markov Models – TrackingMethods.

Text Books: -

1. Stephen Marsland, "Machine Learning – An Algorithmic Perspective", Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2015.
2. Tom M Mitchell, "Machine Learning", First Edition, McGraw Hill Education,2017.

Reference Books:-

1. Peter Flach, "Machine Learning: The Art and Science of Algorithms that Make Sense of Data", First Edition, Cambridge University Press, 2012.
2. Jason Bell, "Machine learning – Hands on for Developers and Technical Professionals", First Edition, Wiley,2014.

PAPER :EC-22 : DIGITAL FORENSIC.
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 each module.

Course Objectives
This course enables the students:

1.	Understand the fundamental of forensics
2.	Have in depth knowledge of relationship between IT and Forensics
3.	Study different aspects of digital evidences

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

A.	Develop computer forensic awareness
B.	Utilizing the knowledge for investigations in order to solve computer crime
C.	Perform best practices for incidence response
D.	Apply computer forensic tools for investigation

Module 01(Lectures 04)
Introduction: Introduction of Cyber Crime, Computer roles in Crime, Introduction to Digital Forensics and its uses. Forensics Evidence, Collection, Processing and the phases of forensics investigation, Types of Computer Forensics

Module 02(Lectures 06)
Data Recovery: Encryption and Decryption, Recovery deleted files, identifying false images and Steganography methods for media data including text, image and audio data

Module 03(Lecture 07)
Digital Evidence Controls: Uncovering attacks that evade detection by event viewer and task manager. Memory image acquisition techniques and their limitations

Module 04(Lectures 07)
Network Forensics: Different attacks in network, collecting and analyzing network-based evidence in windows and Unix environment, Email forensics for standard protocols

Module 05(Lectures 08)
Crime and mobile phones, evidences, forensic procedures, files present in SIM Card, Device data, External memory dump and evidences in memory card, Android forensic fundamental, Data extraction techniques, screen lock bypassing techniques

Module 06(Lectures 10)
Cloud Forensics: Fundamentals of cloud forensics, Cloud crimes, Uses of cloud forensics and its challenges, Interaction of Email system with local and cloud storage
Real forensic Case and Its Tools: Processing a complete forensic case and preparing a forensic report and Introduction of some forensic tools- Helix, FTK, Autopsy and FIRE

Text books:

1. Digital Evidence and Computer crime 3rd Edition: Forensics Science, Computers and the Internet by Eoghan Casey,2011
2. Computer Forensic and Cyber Crime: An Introduction 3rd Edition by Marjie T. Britz,2013

Reference books:

1. Digital Forensics with open source tools. Cory Altheide and Harlan Carvey, ISBN: 978- 1-59749-586-8, Elsevier Publications, April2011
2. Network Forensics: Tracking Hackers through Cyber Space, Sherri Davidoff, Jonathan Ham Prentice Hall2012

PAPER :EC-23 : IMAGE PROCESSING.
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 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.

After the completion of this course, students are expected to

A.	Review the fundamental concepts of a digital image processing system
B.	Analyse images in the frequency domain using various transforms.
C.	Evaluate the techniques for image enhancement and image restoration.
D.	Categorize various compression techniques
E.	Interpret Image compression standards and interpret image segmentation and representation techniques.

Module 01(Lectures 06)
Introduction: Examples of fields that use digital image processing, fundamental steps in digital image processing, components of image processing system.
Digital Image Fundamentals: A simple image formation model, image sampling and quantization, basic relationships between pixels

Module 02(Lectures 06)
Image enhancement in the spatial domain: Basic gray-level transformation, histogram processing, enhancement using arithmetic and logic operators, basic spatial filtering, smoothing and sharpening spatial filters, combining the spatial enhancement methods

Module 03(Lectures 08)
Image restoration: A model of the image degradation/restoration process, noise models, restoration in the presence of noise–only spatial filtering, Weiner filtering, constrained least squares filtering, geometric transforms; Introduction to the Fourier transform and the frequency domain, estimating the degradation function.

Module 04(Lectures 08)
Color Image Processing: Color fundamentals, color models, pseudo color image processing, basics of full–color image processing, color transforms, smoothing and sharpening, color segmentation
Image Compression: Fundamentals, image compression models, error-free compression, lossypredictive coding, image compression standards

Module 05(Lectures 09)
Morphological Image Processing: Preliminaries, dilation, erosion, open and closing, hitor miss transformation, basic morphologic algorithms
Image Segmentation: Detection of discontinuous, edge linking and boundary detection, thresholding, region–based segmentation

Module 06(Lecture 05)
Object Recognition: Patterns and patterns classes, recognition based on decision–theoretic methods, matching, optimum statistical classifiers, neural networks, structural methods – matching shape numbers, string matching

Text Books:

5. RafealC.Gonzalez, Richard E.Woods "Digital Image Processing,", 4th Edition, Pearson ,2018
6. Anil k Jain, "Fundamentals of Digital Images Processing" 1st Edition Pearson2015

Reference Books:

5. S Jayaraman "Digital Image Processing" 2nd Edition, MC GRAW HILL,2020
6. Munesh Chandra Trivedi , "Digital Image Processing" 1st Edition , Khanna PublishingHouse,2014

PAPER :EC-24 : OPTIMIZATION TECHNIQUES.
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 each module.

Course Objectives
This course enables the students:

1.	To appropriately formulate Linear Programming (LP) models for service and manufacturing systems, and apply optimization techniques (OTs) to solve these LP problems.
2.	Identify a Linear Programming Problems i.e., Use graphical method to solve simple LP Method problems, Use Simplex Method to solve general LP problems, Use Revised Simplex on LP problems and Solve Transportation Problem.
3.	To appropriately formulate Integer Programming (IP) models for service and manufacturing systems, and apply OTs to solve these IP problems.
4.	Game Theory is a mathematical framework which makes possible the analysis of the decision-making process of interdependent subjects. It is aimed at explaining and predicting how individuals behave in a specific strategic situation, and therefore helping to improve decision making.
5.	After going through this course, the student gets knowledge on Real World Optimization Problems through optimization techniques.

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

A.	Attain problem solving attitude in systematic and timely manner.
B.	Apply knowledge of mathematics, algorithm and computing principles to solve real world problems and understand importance of optimization of industrial process management.
C.	Identify modern tools and techniques through critical thinking for solving complex problems.
D.	Able to use optimization techniques for simple structures.

Module 01(Lectures 12)
Linear Programming Problem: Introduction, Mathematical Formulation of the problem, Graphical Solution Method, some Exceptional Cases, General LPP, Canonical and Standard forms of LPP, Simplex Method, Introduction, Fundamental properties of solutions, the Computational Procedure, Use of Artificial variables, Solution to simulation Linear Equations.

Module 02(Lectures 06)
Duality in LPP: Introduction, General Primal-Dual Pair, Formulating a Dual Problem, Primal Dual pair in Matrix form, Duality theorems, Dual Simplex method.

Module 03(Lectures 08)
Transportation Problem: Concept, Formulation of Transportation Problem, Balanced and Unbalanced Problems, North West Corner Rule, Least Cost Method, Vogel's Approximation Method, Modi Method, Degeneracy in Transportation Problem.

Module 04(Lectures 06)
Integer Programming Problems: Introduction, Importance of Integer Programming Problems, Construction of Gomory's constraints, Gomory's cutting Plane Method and Branch and Bound method.

Module 05(Lectures 04)
Revised Simplex Method: Introduction and Computational Procedure

Module 06 (Lectures 08)
Game Theory: Introduction**,** Two-person zero sum game, Maximin and Minimax principles, Game without saddle points, Graphical Method for 2 × n and m× 2 Games.

Text Book:

1. KantiSwarup, P. K. Gupta, ManMohan, OpeationsReasearch", SultanChand&Sons, New Delhi-2001.
2. S. Kalavathy OPERATIONS RESEARCH - 4THEDN, 2013

Reference Books:

1. Ronald L. Rardin "Optimization in operations Research", Pearson Education,NewDelhi-2003
2. S.S. Rao, "Optimization Theory & Application", Wiley Eastern Ltd,1979.

PAPER :EC-25 : INTRUSION AND DETECTION SYSTEMS.
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 when, where, how, and why to apply Intrusion Detection tools and techniques in order to improve the security posture of an enterprise.
2.	Apply knowledge of the fundamentals and history of Intrusion Detection in order to avoid common pitfalls in the creation and evaluation of new Intrusion Detection Systems.
3.	Analyze intrusion detection alerts and logs to distinguish attack types from false alarms.

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

A.	Explain the fundamental concepts of Network Protocol Analysis and demonstrate the skill to capture and analyze network packets.
B.	Use various protocol analyzers and Network Intrusion Detection Systems as security tools to detect network attacks and troubleshoot network problems.

Module 01 (Lecture 08)
History of Intrusion detection, Audit, Concept and definition, Internal and external threats to data, attacks, Need and types of IDS, Information sources Host based information sources.

Module 02 (Lecture 08)
Intrusion Prevention Systems, Network IDs protocol-based IDs, Hybrid IDs, Network based information sources. Analysis schemes, thinking about intrusion. A model for intrusion analysis, techniques Responses requirement of responses, types of responses mapping responses to policy Vulnerability analysis, credential analysis non credential analysis

Module 03 (Lecture 08)
Introduction to Snort, Snort Installation Scenarios, Installing Snort, Running Snort on Multiple Network Interfaces, Snort Command Line Options. Step-By-Step Procedure to Compile and Install Snort Location of Snort Files, Snort Modes Snort Alert Modes.

Module 04 (Lecture 08)
Working with Snort Rules, Rule Headers, Rule Options, The Snort Configuration File etc. Plugins, Pre-processors and Output Modules,

Module 05(Lecture 08)
Using ACID and Snort Snarf with Snort, Using Snort with MySQL.

Module 06(Lecture 08)
Agent development for intrusion detection, Architecture models of IDs and IPs.

Text Books:

1. RafeeqRehman : " Intrusion Detection with SNORT, Apache, MySQL, PHP and ACID," 1st Edition, Prentice Hall ,2003.
2. Christopher Kruegel,FredrikValeur, Giovanni Vigna: "Intrusion Detection and Correlation Challenges and Solutions", 1st Edition, Springer,2005.

Reference Books:

1. Carl Endorf, Eugene Schultz and Jim Mellander" Intrusion Detection & Prevention", 1st Edition, Tata McGraw-Hill,2004.

T. Fahringer, R. Prodan, "A Text book on Grid Application Development and Computing Environment". 6th Edition.