SYLLABUS FOR M.C.A. ELECTIVE - 3

PAPER :EC-31 : CLOUD 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 concept of cloud computing.
2.	To appreciate the evolution of cloud from the existing technologies.
3.	To have knowledge on the various issues in cloud computing.
4.	To be familiar with the lead players in cloud.
5.	To appreciate the emergence of cloud as the next generation computing paradigm.

Course Outcomes

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

A.	Articulate the main concepts, key technologies, strengths and limitations of cloud computing.
B.	Learn the key and enabling technologies that help in the development of cloud.
C.	Develop the ability to understand and use the architecture of compute and storage cloud, service and delivery models.
D.	Explain the core issues of cloud computing such as resource management and security
E.	Be able to install and use current cloud technologies.
F.	Evaluate and choose the appropriate technologies, algorithms and approaches for implementation and use of cloud.

Module 01 (Lectures – 07)

Introduction: Introduction to Cloud Computing – Definition of Cloud – Evolution of Cloud Computing – Underlying Principles of Parallel and Distributed Computing – Cloud Characteristics – Elasticity in Cloud – On-demand Provisioning.

Module 02(Lectures 10)

Cloud Enabling Technologies: Service Oriented Architecture – REST and Systems of Systems – Web Services – Publish-Subscribe Model – Basics of Virtualization – Types of Virtualization – Implementation Levels of Virtualization – Virtualization Structures – Tools and Mechanisms – Virtualization of CPU – Memory – I/O Devices –Virtualization Support and Disaster Recovery.

Module 03(Lectures 08)

Cloud Architecture, Services and Storage: Layered Cloud Architecture Design – NIST Cloud Computing Reference Architecture – Public, Private and Hybrid Clouds - laaS – PaaS – SaaS – Architectural Design Challenges – Cloud Storage – Storage-as-a-Service – Advantages of Cloud Storage – Cloud Storage Providers – S3.

Module 04 (Lectures 05)
Resource Management In Cloud: Inter Cloud Resource Management – Resource Provisioning and Resource Provisioning Methods – Global Exchange of Cloud Resources.

Module 05 (Lectures 05)
Security in Cloud: Security Overview – Cloud Security Challenges – Software-as-a-Service Security – Security Governance – Virtual Machine Security – IAM – Security Standards.

Module 06 (Lectures 07)
Cloud Technologies and Advancements: Hadoop – MapReduce – Virtual Box -- Google App Engine – Programming Environment for Google App Engine — Open Stack – Case studies from the leading distributed computing vendors such as Amazon, Microsoft, and Google– Federation in the Cloud – Four Levels of Federation – Federated Services and Applications – Future of Federation.

Text Books: -

1. Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers,2017.
2. Rittinghouse, John W., and James F. Ransome, ―Cloud Computing: Implementation, Management and Security‖, CRC Press,2017.

Reference Books: -

1. Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, “Mastering Cloud Computing”, Tata Mcgraw Hill,2017.
2. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing - A Practical Approach”, Tata Mcgraw Hill,2017.

PAPER :EC-32 : COMPUTER VISION
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 learn fundamental knowledge about Computer Vision.
2.	To understand the foundation of image formation, measurement, and analysis.
3.	To understand of image process formation.
4.	To provide the exaction of features from images and do analysis of images
5.	To develop applications using computer vision techniques

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

A.	Develop the practical skills necessary to build computer vision applications.
B.	Describe the object and scene recognition and categorization from images
C.	Generate 3D model from images
D.	To develop applications using computer vision techniques
E.	Understand video processing, motion computation and 3D vision and geometry applications.

Module 01(Lecture 08)

Introduction: Image Processing, Computer Vision and Computer Graphics, What is Computer Vision - Low-level, Mid-level, High-level, Overview of Diverse Computer Vision Applications: Document Image Analysis, Biometrics, Object Recognition, Tracking, Medical Image Analysis, Content-Based Image Retrieval, Video Data Processing, Multimedia, Virtual Reality and AugmentedReality.

Module 02(Lecture 06)

Image Formation Models: Monocular imaging system, Radiosity: The 'Physics' of Image Formation, Radiance, Irradiance, BRDF, color etc, Orthographic & Perspective Projection, Camera model and Camera calibration, Binocular imaging systems, Multiple views geometry, Structure determination, shape from shading, Photometric Stereo, Depth from Defocus, Construction of 3D model from images

Module 03(Lecture 06)

Image Processing with Feature Extraction and Motion Estimation: Image preprocessing, Image representations (continuous and discrete), Edge detection, Regularization theory, Optical computation, Stereo Vision, Motion estimation, Structure from motion.

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Module 04(Lecture 06)

Shape Representation and Segmentation: Contour based representation, Region based representation, Deformable curves and surfaces, Snakes and active contours, Level set representations, Fourier and wavelet descriptors, Medial representations, Multiresolution analysis

Module 05(Lecture06)

Object recognition and Image Understanding: Hough transforms and other simple object recognition methods, Shape correspondence and shape matching, Principal component analysis,
Shape priors for recognition, Pattern recognition methods, HMM, GMM and EM

Module 06(Lecture08)

Applications: Photo album – Face detection – Face recognition – Eigen faces – Active appearance and 3D shape models of faces Application: Surveillance – foreground-background separation – particle filters – Chamfer matching, tracking, and occlusion – combining views from multiple cameras – human gait analysis Application: In-vehicle vision system: locating roadway – road markings – identifying road signs – locating pedestrians.

Text Books: -

1. D.ForsythandJ.Ponce,"ComputerVision-Amodernapproach",PrenticeHallRobotVision,byB. K. P. Horn, McGraw-Hill, 2E, 2011
2. E. R. Davies, Computer & Machine Vision, 4E, Academic Press,2012

Reference Books: -

7. E. Trucco and A. Verri, "Introductory Techniques for 3D Computer Vision", Prentice Hall,2002
8. Simon J. D. Prince, "Computer Vision: Models, Learning, and Inference", Cambridge University Press,2012

PAPER :EC-33 : NATURAL LANGUAGE PROCESSING AND INFORMATION RETRIEVAL
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.	To understand the fundamental knowledge about natural language processing.
2.	To understand the language modeling.
3.	To provide the knowledge of Part-of-speech tagging.
4.	To provide the concepts parsing and semantics.
5.	To provide the different approaches of NLP applications.

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

A.	Define NLP problems and their importance.
B.	Understanding the relationship between NLP and statistics & machine learning
C.	Improve the innovation or creativity skills in NLP system.
D.	Analyse NLP problems to decompose them into appropriate components.
E.	To compare and contrast use of different statistical approaches for different types of NLP applications.

Module 01(Lecture 06)
Introduction to NLP: Introduction and applications, NLP phases, Difficulty of NLP including ambiguity; Spelling error and Noisy Channel Model; Concepts of Parts-of-speech and Formal Grammar of English.

Module 02(Lecture 08)
Language Modeling: N-gram and Neural Language Models Language Modeling with N-gram, Simple N-gram models, smoothing (basic techniques), Evaluating language models; Neural Network basics, Training; Neural Language Model, Case study: application of neural language model in NLP system development**.**

Module 03(Lecture 07)
Parts-of-speech Tagging: basic concepts; Tagset; Early approaches: Rule based and TBL; POS tagging using HMM, POS Tagging using Maximum EntropyModel.

Module 04(Lecture 08)
Parsing Basic concepts: Top down and bottom-up parsing, Treebank; Syntactic parsing: CKY parsing; Statistical parsing basics: Probabilistic Context Free Grammar (PCFG); Probabilistic CKY Parsing of PCFGs.

Module 05(Lecture 07)
Semantics: Vector Semantics; Words and Vector; Measuring Similarity; Semantics with dense vectors; SVD and Latent Semantic Analysis; Embeddings from prediction: Skip-gram and CBOW; Concept of Word Sense; Introduction to WorldNet

Module 06(Lecture 07)
Applications of NLP- Spell-checking, Summarization, Information Retrieval- Vector space model, term weighting, homonymy, polysemy, synonymy, improving user queries. Machine Translation– Overview.

Text Books: -

1. Jurafsky Dan and Martin James H., "Speech and Language Processing", 3E, Pearson Education2018
2. Akshar Bharati, Vineet Chaitanya and Rajeev Sangal, "Natural Language Processing: A Paninian Perspective" PHI New Delhi,2013.

Reference Books: -

1. Siddiqui T., Tiwary U. S., "Natural language processing and Information retrieval", OUP, 2008.
2. Steven Bird, Ewan Klein and Edward Loper, "Natural Language Processing with Python", 1E Edition, O'Reilly Media, 2009.

PAPER : EC-34 : BIG DATA ANALYTICS
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 computational approaches to Modelling, Feature Extraction
2.	To understand the need and application of Map Reduce
3.	To understand the various search algorithms applicable to Big Data
4.	To analyse and interpret streaming data
5.	To learn how to handle large data sets in main memory

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

A.	Design algorithms by employing Map Reduce technique for solving Big Data problems
B.	Design algorithms for Big Data by deciding on the apt Features set
C.	Design algorithms for handling petabytes of datasets
D.	Design algorithms and propose solutions for Big Data by optimizing main memory consumption
E.	Design solutions for problems in Big Data by suggesting appropriate clustering techniques.

Module 01(Lecture10)
Data Mining and Large-Scale Files: Introduction to Statistical modeling – Machine Learning – Computational approaches to modeling – Summarization – Feature Extraction – Statistical Limits on Data Mining - Distributed File Systems – Map-reduce – Algorithms using Map Reduce – Efficiency of Cluster ComputingTechniques.

Module 02(Lecture06)
Similar Items: Nearest Neighbour Search – Shingling of Documents – Similarity preserving summaries – Locality sensitive hashing for documents – Distance Measures – Theory of Locality Sensitive Functions – LSH Families – Methods for High Degree of Similarities.

Module 03(Lecture 06)
Mining Data Streams: Stream Data Model – Sampling Data in the Stream – Filtering Streams – Counting Distance Elements in a Stream – Estimating Moments – Counting Ones in Window – Decaying Windows

Module 04(Lecture 06)
Link Analysis and Frequent Item sets: Page Rank –Efficient Computation - Topic Sensitive Page Rank – Link Spam – Market Basket Model – A-priori algorithm – Handling Larger Datasets in Main Memory – Limited Pass Algorithm – Counting Frequent Item sets.

Module 05(Lecture 08)
Clustering: Introduction to Clustering Techniques – Hierarchical Clustering –Algorithms – K-Means – Cure – Clustering in Non – Euclidean Spaces – Streams and Parallelism.

Module 06 (Lecture 04)
Case Study: Advertising on the Web – Recommendation Systems.

Text Books:

1. Jure Leskovec, Anand Rajaraman, Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, 3rd Edition,2020.
2. Jiawei Han, Micheline Kamber, Jian Pei, "Data Mining Concepts and Techniques", Morgan Kaufman Publications, Third Edition,2011.

Reference Books:

1. Ian H.Witten, Eibe Frank "Data Mining – Practical Machine Learning Tools and Techniques", Morgan Kaufman Publications, 4thEdition,
2. David Hand, HeikkiMannila and Padhraic Smyth, "Principles of Data Mining", MIT PRESS,2001

PAPER : EC- 35 : CYBER SECURITY.
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 cyber security.
2.	To define difference between threat, risk, attack and vulnerability.
3.	To provide the concepts of how threats materialize into attacks.
4.	To provide the information that where to find information about threats, vulnerabilities and attacks.
5.	To provide the brief concepts of typical threats, attacks and exploits and the motivations behind them.

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

A.	Develop and improve the analytical skills.
B.	Establish the security in computer, network and applications.
C.	Improve the innovation or creativity skills.

D.	Develop problem solving techniques.
E.	Help to protect from cyber-Crime.

Module 01 (Lecture 07)
Introduction to Cyber Security: Introduction -Computer Security - Threats –Harm-Vulnerabilities - Controls - Authentication -Access Control and Cryptography - Web—User Side - Browser Attacks - Web Attacks Targeting Users - Obtaining User or Website Data - Email Attacks

Module 02 (Lecture 07)
Security In Operating System & Networks: Security in Operating Systems - Security in the Design of Operating Systems -Rootkit - Network security attack- Threats to Network Communications - Wireless Network Security - Denial of Service - Distributed Denial-of-Service.

Module 03 (Lecture 06)
Defenses - Security Countermeasures: Cryptography in Network Security - Firewalls - Intrusion Detection and Prevention Systems - Network Management - Databases - Security Requirements of Databases - Reliability and Integrity - Database Disclosure - Data Mining and Big Data.

Module 04 (Lecture 08)
Privacy in Cyberspace: Privacy Concepts -Privacy Principles and Policies -Authentication and Privacy - Data Mining -Privacy on the Web - Email Security - Privacy Impacts of Emerging Technologies - Where the Field IsHeaded.

Module 05 (Lecture 06)
Management and Incidents: Security Planning - Business Continuity Planning - Handling Incidents - Risk Analysis - Dealing with Disaster - Emerging Technologies - The Internet of Things - Economics - Electronic Voting - Cyber Warfare- Cyberspace and the Law - International Laws - Cybercrime - Cyber Warfare and Home LandSecurity.

Module 06 (Lecture 08)
Cybercrime and Forensics: Introduction to Cybercrime, Classifications of Cyber Crimes, Local and Global perspectives on Cybercrime, Cyber offences, Cyberstalking, Cybercrime and cloud computing, cybercrimes through hand held devices., Tools and Methods used in Cybercrime, phishing, steganography,
attacks on wireless network. Understanding Digital forensic, Forensics science, computer forensics, and digital forensics.

Text Books: -

1. Godbole Nina, BelapureSunit, “Cyber Security”, Wiley Indian Print,2014.
2.Michael E Whitman and Herbert J Mattord, Principles of Information Security, Vikas Publishing House, New Delhi,2003

Reference Books: -

1.Deva Vasu, “Cyber Crimes and Law Enforcement”, Commonwealth Publishers, New Delhi, 2003.
2.Charles P. Pfleeger Shari Lawrence Pfleeger Jonathan Margulies, “Security in Computing”, 5th Edition , Pearson Education ,2015