



DEPARTMENT OF MASTER OF COMPUTER APPLICATIONS

Course Structure

Program– PG-Master of Computer Applications

(Applicable from the academic year 2025-2026 to 2028-2029)

Program: PG-MCA

Regulation: R25

II Year I Semester - Course Structure

S. No	Category	Course Code	Course Title	Hours per Week			
				Lecture	Tutorial	Practical	Credits
1	PC	R25MCA2101	Enterprise Cloud Concepts	3	0	0	3
2	PC	R25MCA2102	Full Stack Development	3	0	0	3
3	PC	R25MCA2103	Machine Learning	3	0	0	3
4	PE	R25MCA2104A R25MCA2104B R25MCA2104C	Professional Elective - I A. Artificial Intelligence B. Information Retrieval Systems C. Ad-hoc and Sensor Networks	3	0	0	3
5	PE	R25MCA2105A R25MCA2105B R25MCA2105C	Professional Elective - II A. Cyber Security B. Mobile Computing C. Software Testing Methodologies	3	0	0	3
6	PC	R25MCA2106	Enterprise Cloud Concepts Lab	0	0	3	1.5
7	PC	R25MCA2107	Full Stack Development Lab	0	0	3	1.5
8	PC	R25MCA2108	Machine Learning Lab	0	1	2	2
Total				15	1	8	20

Category	Courses	Credits
PC-Professional Courses	06	14
PE- Professional Elective	02	06
Total	08	20



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Program– PG-Master of Computer Applications

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II Year II Semester - Course Structure

S.No	Category	Course Code	Course Title	Hours per Week			
				Lecture	Tutorial	Practical	Credits
1	PE	R25MCA2201A R25MCA2201B R25MCA2201C	Professional Elective - III A. Internet of Things B. Mobile Application Development C. Big Data Analytics	3	0	0	3
2	OE	R25MCA2202A R25MCA2202B R25MCA2202C R25MCA2202D	Open Elective - I A. E-Commerce B. Cyber Laws & Ethics C. Management Information System 4. Entrepreneurship	3	0	0	3
3	PC Seminar	R25MCA2203	Seminar	3	0	4	2
4	PC Project	R25MCA2204	Project Work Review - III	0	0	4	2
5	PC Project	R25MCA2205	Project Viva-Voce	0	0	20	10
Total				06	0	28	20

***Note: Please refer to Academic Regulations for Project Work Review – I & II.**

Category	Courses	Credits
PC-Professional Courses	3	14
PE-Professional Elective	1	03
OE-Open Elective	1	03
Total	05	20

**Chairperson
Board of Studies (CSE)**

R25MCA2101

Enterprise Cloud Concepts (Master of Computer Applications)

3 0 0 3

MCA II Year I Sem.

Course Objectives: Knowledge on significance of cloud computing and its fundamental concepts and models.

Course Outcomes:

- Understand importance of cloud architecture
- Illustrating the fundamental concepts of cloud security
- Analyze various cloud computing mechanisms
- Understanding the architecture and working of cloud computing.

UNIT-I

Understanding Cloud Computing: Origins and influences, Basic Concepts and Terminology, Goals and Benefits, Risks and Challenges.

Fundamental Concepts and Models: Roles and Boundaries, Cloud Characteristics, Cloud Delivery Models, Cloud Deployment Models.

UNIT-II

Cloud-Enabling Technology: Broadband Networks and Internet Architecture, Data Center Technology, Virtualization Technology.

Cloud Computing Mechanisms, Cloud Infrastructure Mechanisms: Logical Network Perimeter, Virtual Server, Cloud Storage Device, Cloud Usage Monitor, Resource Replication.

UNIT-III

Cloud Management Mechanisms: Remote Administration System, Resource Management System, SLA Management System, Billing Management System, Case Study Example

Cloud Computing Architecture

Fundamental Cloud Architectures: Workload Distribution Architecture, Resource Pooling Architecture, Dynamic Scalability Architecture, Elastic Resource Capacity Architecture, Service Load Balancing Architecture, Cloud Bursting Architecture, Elastic Disk Provisioning Architecture, Redundant Storage Architecture, Case Study Example.

UNIT-IV

Cloud-Enabled Smart Enterprises: Introduction, Revisiting the Enterprise Journey, Service-Oriented Enterprises, Cloud Enterprises, Smart Enterprises, The Enabling Mechanisms of Smart Enterprises
Cloud-Inspired Enterprise Transformations: Introduction, The Cloud Scheme for Enterprise Success, Elucidating the Evolving Cloud Idea, Implications of the Cloud on Enterprise Strategy, Establishing a Cloud- Incorporated Business Strategy

UNIT-V

Transitioning to Cloud-Centric Enterprises: The Tuning Methodology, Contract Management in the Cloud.

Cloud-Instigated IT Transformations: Introduction, Explaining Cloud Infrastructures, A Briefing on Next- Generation Services, Service Infrastructures, Cloud Infrastructures, Cloud Infrastructure

Solutions, Clouds for Business Continuity, The Relevance of Private Clouds, The Emergence of Enterprise Clouds.

TEXT BOOKS:

1. Erl Thomas, Puttini Ricardo, Mahmood Zaigham, Cloud Computing: Concepts, Technology & Architecture 1st Edition,
2. Pethuru Raj, Cloud Enterprise Architecture, CRC Press

REFERENCE:

1. James Bond, The Enterprise Cloud, O'Reilly Media, Inc.

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R25MCA2102

Full Stack Development
(Master of Computer Applications)

3 0 0 3**MCA II Year I Sem.****Course Objectives:**

- To learn the core concepts of both the frontend and backend programming course.
- To get familiar with the latest web development technologies.
- To learn all about databases.
- To learn complete web development process
- To provide an in-depth study of the various web development tools

Course Outcomes:

- Develop a fully functioning website and deploy on a web server.
- Gain Knowledge about the front end and back-end Tools
- Find and use code packages based on their documentation to produce working results in a project.
- Create web pages that function using external data.

UNIT-I

Web Development Basics: Web development Basics - HTML & Web servers Shell - UNIX CLI
 Version control - Git & Github HTML, CSS.

UNIT-II

Frontend Development: Javascript basics OOPS Aspects of JavaScript Memory usage and Functions
 in JS AJAX for data exchange with server jQuery Framework jQuery events, UI components etc.
 JSON data format.

UNIT-III

REACT JS: Introduction to React React Router and Single Page Applications React Forms, Flow
 Architecture and Introduction to Redux More Redux and Client-Server Communication.

UNIT-IV

Java Web Development: JAVA PROGRAMMING BASICS, Model View Controller (MVC) Pattern
 MVC Architecture using Spring RESTful API using Spring Framework Building an application using
 Maven.

UNIT-V

Databases & Deployment: Relational schemas and normalization Structured Query Language (SQL)
 Data persistence using Spring JDBC Agile development principles and deploying application in
 Cloud.

TEXT BOOKS:

1. Web Design with HTML, CSS, JavaScript and JQuery Set Book by Jon Duckett Professional
 JavaScript for Web Developers Book by Nicholas C. Zakas
2. Learning PHP, MySQL, JavaScript, CSS & HTML5: A Step-by-Step Guide to Creating Dynamic
 Websites by Robin Nixon
3. Full Stack JavaScript: Learn Backbone.js, Node.js and MongoDB. Copyright © 2015 BY Azat
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REFERENCES:

1. Full-Stack JavaScript Development by Eric Bush.
2. Mastering Full Stack React Web Development Paperback – April 28, 2017 by Tomasz Dyl, Kamil Przeorski, Maciej Czarnecki

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R25MCA2103

Machine Learning
(Master of Computer Applications)

3 0 0 3**MCA II Year I Sem.****Course OBJECTIVES:**

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

Course Outcomes: Upon completion of the course, the students will be able to:

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

UNIT I: 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.

UNIT II: 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 Vector Machines

UNIT III: 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 – Basic Statistics – Gaussian Mixture Models – Nearest Neighbor Methods – Unsupervised Learning – K means Algorithms

UNIT IV: Dimensionality Reduction and Evolutionary Models:

Dimensionality Reduction – Linear Discriminant Analysis – Principal Component Analysis – Factor Analysis – Independent Component Analysis – Locally Linear Embedding – Isomap – Least Squares Optimization – Evolutionary Learning – Genetic algorithms – Genetic Offspring: - Genetic Operators – Using Genetic Algorithms – Reinforcement Learning – Overview – Getting Lost Example

UNIT V: Graphical Models:

Markov Chain Monte Carlo Methods – Sampling – Proposal Distribution – Markov Chain Monte Carlo – Graphical Models – Bayesian Networks – Markov Random Fields – Hidden Markov Models – Tracking Methods.

TEXT BOOKS:

1. Stephen Marsland, —Machine Learning – An Algorithmic Perspective, Second Edition, Chapman and Hall/ CRC Machine Learning and Pattern Recognition Series, 2014.
2. Tom M Mitchell, —Machine Learning, First Edition, McGraw Hill Education, 2013.

REFERENCES:

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
3. Ethem Alpaydin, —Introduction to Machine Learning 3e (Adaptive Computation and Machine Learning Series), Third Edition, MIT Press, 2014

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R25MCA2104A

Artificial Intelligence (PE-I) (Master of Computer Applications)

3 0 0 3

MCA II Year I Sem.

Prerequisites:

- A course on “Computer Programming and Data Structures”.
- A course on “Advanced Data Structures”.
- A course on “Design and Analysis of Algorithms”.
- A course on “Mathematical Foundations of Computer Science”.
- Some background in linear algebra, data structures and algorithms, and probability will all be helpful.

Course Objectives:

- To learn the distinction between optimal reasoning Vs. human like reasoning.
- To understand the concepts of state space representation, exhaustive search, heuristic search together with the time and space complexities.
- To learn different knowledge representation techniques.
- To understand the applications of AI, namely game playing, theorem proving, and machine learning.

Course Outcomes:

- Ability to formulate an efficient problem space for a problem expressed in natural language.
- Select a search algorithm for a problem and estimate its time and space complexities.
- Possess the skill for representing knowledge using the appropriate technique for a given problem.
- Possess the ability to apply AI techniques to solve problems of game playing, and machine learning.

UNIT-I**Problem Solving by Search-I:** Introduction to AI, Intelligent Agents

Problem Solving by Search –II: Problem-Solving Agents, Searching for Solutions, Uninformed Search Strategies: Breadth-first search, Uniform cost search, Depth-first search, Iterative deepening Depth-first search, Bidirectional search, Informed (Heuristic) Search Strategies: Greedy best-first search, A* search, Heuristic Functions, Beyond Classical Search: Hill-climbing search, Simulated annealing search.

UNIT-II

Problem Solving by Search-II: Games, Optimal Decisions in Games, Alpha–Beta Pruning, Imperfect Real-Time Decisions.

Constraint Satisfaction Problems: Defining Constraint Satisfaction Problems, Constraint Propagation, Backtracking Search for CSPs, Local Search for CSPs, The Structure of Problems.

UNIT-III

Propositional Logic: Knowledge-Based Agents, The Wumpus World, Logic, Propositional Logic, Propositional Theorem Proving: Inference and proofs, Proof by resolution, Horn clauses and definite clauses, Forward and backward chaining, Effective Propositional Model Checking, Agents Based on Propositional Logic.

Logic and Knowledge Representation First-Order Logic: Representation, Syntax and Semantics of First-Order Logic, Using First-Order Logic, Knowledge Engineering in First-Order Logic.

Inference in First-Order Logic: Propositional vs. First-Order Inference, Unification and Lifting, Forward Chaining, Backward Chaining, Resolution.

UNIT-IV

Knowledge Representation: Ontological Engineering, Categories and Objects, Events. Mental Events and Mental Objects, Reasoning Systems for Categories, Reasoning with Default Information.

Planning - Classical Planning: Definition of Classical Planning, Algorithms for Planning with State-Space Search, Planning Graphs, other Classical Planning Approaches, Analysis of Planning approaches.

UNIT-V

Learning: Forms of Learning, Supervised Learning, Learning Decision Trees.

Knowledge in Learning: Logical Formulation of Learning, Knowledge in Learning, Explanation-Based Learning, Learning Using Relevance Information, Inductive Logic Programming.

TEXT BOOK:

1. Artificial Intelligence: A Modern Approach, Stuart Russell and Peter Norvig, 3rd Edition, Pearson Education.

REFERENCES:

1. Artificial Intelligence, 3rd Edn, E.Rich and K.Knight (TMH).
2. Artificial Intelligence, 3rd Edn, Patrick Henry Winston, Pearson Education.
3. Artificial Intelligence, Shivani Goel, Pearson Education.
4. Artificial Intelligence and Expert systems – Patterson, Pearson Education.

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R25MCA2104B

Information Retrieval Systems (PE-I)3 0 0 3
(Master of Computer Applications)

MCA II Year I Sem.**Prerequisites:**

1. Data Structures.

Course Objectives:

- To learn the important concepts and algorithms in IRS
- To understand the data/file structures those is necessary to design, and implement information retrieval (IR) systems.

Course Outcomes:

- Ability to apply IR principles to locate relevant information large collections of data
- Ability to design different document clustering algorithms
- Implement retrieval systems for web search tasks.
- Design an Information Retrieval System for web search tasks.

UNIT - I

Introduction to Information Retrieval Systems: Definition of Information Retrieval System, Objectives of Information Retrieval Systems, Functional Overview, Relationship to Database Management Systems, Digital Libraries and Data Warehouses

Information Retrieval System Capabilities: Search Capabilities, Browse Capabilities, Miscellaneous Capabilities

UNIT - II

Cataloging and Indexing: History and Objectives of Indexing, Indexing Process, Automatic Indexing, Information Extraction

Data Structure: Introduction to Data Structure, Stemming Algorithms, Inverted File Structure, N-Gram Data Structures, PAT Data Structure, Signature File Structure, Hypertext and XML Data Structures, Hidden Markov Models

UNIT - III

Automatic Indexing: Classes of Automatic Indexing, Statistical Indexing, Natural Language, Concept Indexing, Hypertext Linkages

Document and Term Clustering: Introduction to Clustering, Thesaurus Generation, Item Clustering, Hierarchy of Clusters

UNIT - IV

User Search Techniques: Search Statements and Binding, Similarity Measures and Ranking, Relevance Feedback, Selective Dissemination of Information Search, Weighted Searches of Boolean Systems, Searching the INTERNET and Hypertext

Information Visualization: Introduction to Information Visualization, Cognition and Perception, Information Visualization Technologies

UNIT - V

Text Search Algorithms: Introduction to Text Search Techniques, Software Text Search Algorithms, Hardware Text Search Systems

Multimedia Information Retrieval: Spoken Language Audio Retrieval, Non-Speech Audio Retrieval, Graph Retrieval, Imagery Retrieval, Video Retrieval.

TEXT BOOK:

1. Information Storage and Retrieval Systems – Theory and Implementation, Second Edition, Gerald J. Kowalski, Mark T. Maybury, Springer.

REFERENCES:

1. Frakes, W.B., Ricardo Baeza-Yates: Information Retrieval Data Structures and Algorithms, Prentice Hall, 1992.
2. Information Storage & Retrieval By Robert Korfhage – John Wiley & Sons.
3. Modern Information Retrieval By Yates and Neto Pearson Education.

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R25MCA2104C**Ad-hoc and Sensor Networks (PE-I)**
(Master of Computer Applications)**3 0 0 3****MCA II Year I Sem.****Prerequisites:**

- Computer Networks
- Distributed Systems
- Mobile Computing

Course Objectives:

- To understand the concepts of sensor networks
- To understand the MAC and transport protocols for adhoc networks
- To understand the security of sensor networks
- To understand the applications of adhoc and sensor networks.

Course Outcomes:

- Understand challenges of MANETs and routing in MANETs in ad hoc and wireless sensor networks (ASN)
- Analyze data transmission and geocasting in ad hoc and wireless sensor networks (ASN)
- Understand basics of Wireless, Sensors and Lower Layer Issues and Upper Layer Issues of WSN

UNIT - I**Introduction to Ad Hoc Networks:**

Characteristics of MANETs, Applications of MANETs and Challenges of MANETs.

Routing in MANETs:

Criteria for classification, Taxonomy of MANET routing algorithms, Topology-based routing algorithms- Proactive: DSDV, WRP; Reactive: DSR, AODV, TORA; Hybrid: ZRP; Position- based routing algorithms- Location Services-DREAM, Quorum-based, GLS; Forwarding Strategies Greedy Packet, Restricted Directional Flooding-DREAM, LAR; Other routing algorithms-QoS Routing, CEDAR.

UNIT - II**Data Transmission:**

Broadcast Storm Problem, Rebroadcasting Schemes-Simple-flooding, Probability-based Methods, and Area- based Methods, Neighbour Knowledge-based: SBA, Multipoint Relaying, AHBP. Multicasting: Tree-based: AMRIS, MAODV; Mesh-based: ODMRP, CAMP; Hybrid: AMRoute, MCEDAR and Geocasting: Data- transmission Oriented-LBM; Route Creation Oriented-GeoTORA, MGR.

UNIT - III**Geocasting:**

Data-transmission Oriented-LBM; Route Creation Oriented-GeoTORA, MGR. TCP over Ad Hoc TCP protocol overview, TCP and MANETs, Solutions for TCP over Ad hoc

UNIT - IV**Basics of Wireless, Sensors and Lower Layer Issues:**

Applications, Classification of sensor networks, Architecture of sensor network, Physical layer, MAC layer, Link layer, Routing Layer.

UNIT - V**Upper Layer Issues of WSN:**

Transport layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs, Sensor Networks and mobile robots.

TEXT BOOKS:

1. Ad Hoc and Sensor Networks – Theory and Applications, *Carlos Corderio Dharma P. Aggarwal*, World Scientific Publications, March 2006, ISBN – 981-256-681-3
1. Wireless Sensor Networks: An Information Processing Approach, Feng Zhao, Leonidas Guibas, Elsevier Science, ISBN – 978-1-55860-914-3 (Morgan Kauffman)

REFERENCES:

1. C. Siva Ram Murthy, B.S. Manoj Ad Hoc Wireless Networks: Architectures and Protocols
2. Taieb Znati Kazem Sohraby, Daniel Minoli, Wireless Sensor Networks: Technology, Protocols and Applications, Wiley

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R25MCA2105A

CYBER SECURITY PE-II) (Master of Computer Applications)

3 0 0 3

MCA II Year I Sem.

Course objectives:

- To understand various types of cyber-attacks and cyber-crimes
- To learn threats and risks within context of the cyber security
- To have an overview of the cyber laws & concepts of cyber forensics
- To study the defensive techniques against these attacks.

Course Outcomes:

- Analyze and evaluate the cyber security needs of an organization.
- Understand Cyber Security Regulations and Roles of International Law
- Design and develop security architecture for an organization.
- Understand fundamental concepts of data privacy attacks.

UNIT-I

Introduction to Cyber Security: Basic Cyber Security Concepts, layers of security, Vulnerability, threat, Harmful acts, Internet Governance – Challenges and Constraints, Computer Criminals, CIA Triad, Assets and Threat, motive of attackers, active attacks, passive attacks, Software attacks, hardware attacks, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, etc., Comprehensive Cyber Security Policy.

UNIT-II

Cyberspace and the Law & Cyber Forensics: Introduction, Cyber Security Regulations, Roles of International Law. The INDIAN Cyberspace, National Cyber Security Policy. Introduction, Historical background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Forensics Investigation, Challenges in Computer Forensics

UNIT-III

Cybercrime: Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Organizational security Policies and Measures in Mobile Computing Era, Laptops.

UNIT-IV

Cyber 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.

UNIT-V

Privacy Issues: Basic Data Privacy Concepts: Fundamental Concepts, Data Privacy Attacks, Data linking and profiling, privacy policies and their specifications, privacy policy languages, privacy in different domains- medical, financial, etc

Cybercrime: Examples and Mini-Cases

Examples: Official Website of Maharashtra Government Hacked, Indian Banks Lose Millions of Rupees, Parliament Attack, Pune City Police Bust Nigerian Racket, e-mail spoofing instances. **Mini-Cases:** The Indian Case of online Gambling, An Indian Case of Intellectual Property Crime, Financial Frauds in Cyber Domain.

TEXT BOOKS:

1. Nina Godbole and Sunit Belpure, Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley
2. B.B. Gupta, D.P. Agrawal, Haoxiang Wang, Computer and Cyber Security: Principles, Algorithm, Applications, and Perspectives, CRC Press, ISBN 9780815371335, 2018.

REFERENCES:

1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.
2. Introduction to Cyber Security, Chwan-Hwa(john) Wu, J. David Irwin, CRC Press T & F Group.

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R25MCA2105B**MOBILE COMPUTING (PE-II)**
(Master of Computer Applications)**3 0 0 3****MCA II Year I Sem.****Prerequisites:**

- Computer Networks, Distributed Systems / Distributed Operating Systems

Course Objectives:

- To make the student understand the concept of mobile computing paradigm, its novel applications and limitations, the typical mobile networking infrastructure through a popular GSM protocol, the issues and solutions of various layers of mobile networks.

Course Outcomes:

- Understand the concept of mobile computing paradigm, its novel applications and limitations.
- Analyze and develop new mobile applications
- Understand the protocols and platforms related to mobile environment
- Classify data delivery mechanisms.

UNIT -I**Introduction**

Mobile Communications, Mobile Computing – Paradigm, Promises/Novel Applications and Impediments and Architecture; Mobile and Handheld Devices, Limitations of Mobile and Handheld Devices.

GSM – Services, System Architecture, Radio Interfaces, Protocols, Localization, Calling, Handover, Security, New Data Services, GPRS, CSHSD, DECT.

UNIT -II

(Wireless) Medium Access Control (MAC): Motivation for a specialized MAC (Hidden and exposed terminals, Near and far terminals), SDMA, FDMA, TDMA, CDMA, Wireless LAN/(IEEE 802.11)

Mobile Network Layer: IP and Mobile IP Network Layers, Packet Delivery and Handover Management, Location Management, Registration, Tunneling and Encapsulation, Route Optimization, DHCP.

UNIT -III

Mobile Transport Layer: Conventional TCP/IP Protocols, Indirect TCP, Snooping TCP, Mobile TCP, Other Transport Layer Protocols for Mobile Networks.

Database Issues: Database Hoarding & Caching Techniques, Client-Server Computing & Adaptation, Transactional Models, Query processing, Data Recovery Process & QoS Issues.

UNIT -IV

Data Dissemination and Synchronization: Communications Asymmetry, Classification of Data Delivery Mechanisms, Data Dissemination, Broadcast Models, Selective Tuning and Indexing Methods, Data Synchronization – Introduction, Software, and Protocols.

UNIT -V

Mobile Ad hoc Networks (MANETs): Introduction, Applications & Challenges of a MANET, Routing, Classification of Routing Algorithms, Algorithms such as DSR, AODV, DSDV, Mobile Agents, Service Discovery.

TEXT BOOKS:

1. Jochen Schiller, “Mobile Communications”, Addison-Wesley, Second Edition, 2009.
2. Raj Kamal, “Mobile Computing”, Oxford University Press, 2007, ISBN: 0195686772

REFERENCE:

1. Asoke K Talukder, Hasan Ahmed, Roopa Yavagal Mobile Computing: Technology, Applications and Service Creation, McGraw Hill Education

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R25MCA2105C

SOFTWARE TESTING METHODOLOGIES (PE-II)

3 0 0 3

(Master of Computer Applications)

MCA II Year I Sem.

Prerequisites:

- A course on “Software Engineering”.

Course Objectives:

- To provide knowledge of the concepts in software testing such as testing process, criteria, strategies, and methodologies.
- To develop skills in software test automation and management using latest tools.

Course Outcomes:

- Design and develop the best test strategies in accordance to the development model.

UNIT - I

Introduction: Purpose of testing, Dichotomies, model for testing, consequences of bugs, taxonomy of bugs **Flow graphs and Path testing:** Basics concepts of path testing, predicates, path predicates and achievable paths, path sensitizing, path instrumentation, application of path testing.

UNIT - II

Transaction Flow Testing: transaction flows, transaction flow testing techniques. Dataflow testing: Basics of dataflow testing, strategies in dataflow testing, application of dataflow testing. **Domain Testing:** domains and paths, Nice & ugly domains, domain testing, domains and interfaces testing, domain and interface testing, domains and testability.

UNIT - III

Paths, Path products and Regular expressions: path products & path expression, reduction procedure, applications, regular expressions & flow anomaly detection.

Logic Based Testing: overview, decision tables, path expressions, kv charts, specifications.

UNIT - IV

State, State Graphs and Transition testing: state graphs, good & bad state graphs, state testing, Testability tips.

UNIT - V

Graph Matrices and Application: Motivational overview, matrix of graph, relations, power of a matrix, node reduction algorithm, building tools. (Student should be given an exposure to a tool like JMeter or Win- runner).

TEXT BOOKS:

1. Software Testing techniques - Baris Beizer, 2nd edition, Dreamtech.
2. Software Testing Tools – Dr. K.V.K.K. Prasad, Dreamtech.

REFERENCES:

1. The craft of software testing - Brian Marick, Pearson Education.
2. Software Testing Techniques – SPD(Oreille)
3. Software Testing in the Real World – Edward Kit, Pearson.
4. Effective methods of Software Testing, Perry, John Wiley.
5. Art of Software Testing – Meyers, John Wiley.

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R25MCA2106**Enterprise Cloud Concepts Lab
(Master of Computer Applications)****0 0 3 1.5****MCA II Year I Sem.****Course Objectives:**

- Knowledge on significance of cloud computing and its fundamental concepts and models.

Course Outcomes:

- Understand importance of cloud architecture
- Illustrating the fundamental concepts of cloud security
- Analyze various cloud computing mechanisms
- Understanding the architecture and working of cloud computing.

List of Experiments:

1. Install Virtualbox/VMware Workstation with different flavors of linux or windows OS on top of windows7 or 8.
2. Install a C compiler in the virtual machine created using virtual box and execute Simple Programs
3. Install Google App Engine. Create a hello world app and other simple web applications using python/java.
4. Find a procedure to transfer the files from one virtual machine to another virtual machine.
5. Find a procedure to launch virtual machine using trystack (Online Openstack Demo Version)
6. Install Hadoop single node cluster and run simple applications like word count.

E-Resources:

1. <https://www.iitk.ac.in/nt/faq/vbox.htm>
2. <https://www.google.com/urlsa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKewjqrNG0za73AhXZt1YBHZ21DWEQFnoECAMQAQ&url=http%3A%2F%2Fwww.cs.columbia.edu%2F~sedwards%2Fclasses%2F2015%2F1102-fall%2Flinuxvm.pdf&usg=AOvVaw3xZPuF5xVgk-AQnBRsTtHz>
3. <https://www.cloudsimtutorials.online/cloudsim/>
4. <https://edwardsamuel.wordpress.com/2014/10/25/tutorial-creating-openstack-instance-in-trystack/>
5. <https://www.edureka.co/blog/install-hadoop-single-node-hadoop-cluster>

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R25MCA2107

Full Stack Development Lab
(Master of Computer Applications)

0 0 3 1.5**MCA II Year I Sem.****Course Objectives:** The students should be able:

- To implement Forms, inputs and Services using AngularJS
- To develop a simple web application using Nodejs; Angular JS and Express
- To implement data models using MongoDB

Course Outcomes:

- Develop a fully functioning website and deploy on a web server.
- Gain Knowledge about the front end and back end Tools
- Find and use code packages based on their documentation to produce working results in a project.
- Create web pages that function using external data.

List of Experiments:

1. Develop a Form and validate using AngularJS
2. Create and implement modules and controllers in AngularJS
3. Implement Error Handling in AngularJS
4. Create and implement Custom directives
5. Create a simple web application using Express, Node JS and Angular JS
6. Implement CRUD operations on MongoDB
7. Create a react application for the student management system having registration, login, contact, about pages and implement routing to navigate through these pages.
8. Create a service in react that fetches the weather information from openweathermap.org and the display the current and historical weather information using graphical representation using chart.js
9. Create a TODO application in react with necessary components and deploy it into github.
10. **A.** Develop an express web application that can interact with REST API to perform CRUD operations on student data. (Use Postman)
B. For the above application create authorized end points using JWT (JSON Web Token).

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R25MCA2108

Machine Learning Lab (Master of Computer Applications)

0 1 2 2

MCA II Year I Sem.

Course Objective:

- The objective of this lab is to get an overview of the various machine learning.
- Techniques and can demonstrate those using python.

Course Outcomes:

- Understand modern notions in predictive data analysis.
- Select data, model selection, model complexity and identify the trends.
- Understand a range of machine learning algorithms along with their strengths and weaknesses
- Build predictive models from data and analyze their performance.

List of Experiments:

1. Write a python program to compute Central Tendency Measures: Mean, Median, Mode
Measure of Dispersion: Variance, Standard Deviation
2. Study of Python Basic Libraries such as Statistics, Math, Numpy and Scipy
3. Study of Python Libraries for ML application such as Pandas and Matplotlib
4. Write a Python program to implement Simple Linear Regression
5. Implementation of Multiple Linear Regression for House Price Prediction using sklearn
6. Implementation of Decision tree using sklearn and its parameter tuning
7. Implementation of KNN using sklearn
8. Implementation of Logistic Regression using sklearn
9. Implementation of K-Means Clustering.
10. Performance analysis of Classification Algorithms on a specific dataset (Mini Project)

TEXT BOOK:

1. Machine Learning – Tom M. Mitchell, - MGH

REFERENCE:

1. Machine Learning: An Algorithmic Perspective, Stephen Marshland, Taylor & Francis

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R25MCA2201A**INTERNET OF THINGS (PE-III)
(Master of Computer Applications)****3 0 0 3****MCA II Year II Sem.****Course Objectives:**

- To introduce the terminology, technology and its applications
- To introduce the concept of M2M (machine to machine) with necessary protocols
- To introduce the Python Scripting Language which is used in many IoT devices
- To introduce the Raspberry PI platform, that is widely used in IoT applications
- To introduce the implementation of web-based services on IoT devices.

Course Outcomes:

- Interpret the impact and challenges posed by IoT networks leading to new architectural models.
- Compare and contrast the deployment of smart objects and the technologies to connect them to the network.
- Appraise the role of IoT protocols for efficient network communication.
- Elaborate the need for Data Analytics and Security in IoT.
- Illustrate different sensor technologies for sensing real world entities and identify the applications of IoT in Industry.

UNIT - I

Introduction to Internet of Things –Definition and Characteristics of IoT,
Physical Design of IoT – IoT Protocols, IoT communication models, IoT Communication APIs
IoT enabled Technologies – Wireless Sensor Networks, Cloud Computing, Big data analytics,
Communication protocols, Embedded Systems, IoT Levels and Templates
Domain Specific IoTs – Home, City, Environment, Energy, Retail, Logistics, Agriculture, Industry,
health and Lifestyle

UNIT - II

IoT and M2M – Software defined networks, network function virtualization, difference between SDN
and NFV for IoT
Basics of IoT System Management with NETCOZF, YANG- NETCONF, YANG, SNMP
NETOPEER

UNIT - III

Introduction to Python - Language features of Python, Data types, data structures, Control of flow,
functions, modules, packaging, file handling, data/time operations, classes, Exception handling
Python packages - JSON, XML, HTTPLib, URLLib, SMTPLib

UNIT - IV

IoT Physical Devices and Endpoints - Introduction to Raspberry PI-Interfaces (serial, SPI, I2C)
Programming – Python program with Raspberry PI with focus of interfacing external gadgets,
controlling output, reading input from pins.

UNIT - V

IoT Physical Servers and Cloud Offerings – Introduction to Cloud Storage models and communication
APIs Webserver – Web server for IoT, Cloud for IoT, Python web application framework
Designing a RESTful web API

TEXT BOOKS:

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madiseti, Universities Press, 2015, ISBN: 9788173719547
2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759.

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R25MCA2201B

MOBILE APPLICATION DEVELOPMENT (PE-III) 3 0 0 3
(Master of Computer Applications)

MCA II Year II Sem.**Prerequisites:**

- Acquaintance with JAVA programming
- A Course on DBMS

Course Objectives:

- To demonstrate their understanding of the fundamentals of Android operating systems
- To improve their skills of using Android software development tools
- To demonstrate their ability to develop software with reasonable complexity on mobile platform
- To demonstrate their ability to deploy software to mobile devices
- To demonstrate their ability to debug programs running on mobile devices

Course Outcomes:

- Students understand the working of Android OS Practically.
- Student will be able to develop Android user interfaces
- Students will be able to develop, deploy and maintain the Android Applications.

UNIT - I

Introduction to Android Operating System: Android OS design and Features – Android development framework, SDK features, Installing and running applications on Android Studio, Creating AVDs, Types of Android applications, Best practices in Android programming, Android tools Android application components – Android Manifest file, Externalizing resources like values, themes, layouts, Menus etc, Resources for different devices and languages, Runtime Configuration Changes
 Android Application Lifecycle – Activities, Activity lifecycle, activity states, monitoring state changes

UNIT - II

Android User Interface: Measurements – Device and pixel density independent measuring UNIT - s
 Layouts – Linear, Relative, Grid and Table Layouts
 User Interface (UI) Components –Editable and non-editable TextViews, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and pickers
 Event Handling – Handling clicks or changes of various UI components
 Fragments – Creating fragments, Lifecycle of fragments, Fragment states, Adding fragments to Activity, adding, removing and replacing fragments with fragment transactions, interfacing between fragments and Activities, Multi-screen Activities

UNIT - III

Intents and Broadcasts: Intent – Using intents to launch Activities, Explicitly starting new Activity, Implicit Intents, Passing data to Intents, Getting results from Activities, Native Actions, using Intent to dial a number or to send SMS
 Broadcast Receivers – Using Intent filters to service implicit Intents, Resolving Intent filters, finding and using Intents received within an Activity
 Notifications – Creating and Displaying notifications, Displaying Toasts.

UNIT - IV

Persistent Storage: Files – Using application specific folders and files, creating files, reading data from files, listing contents of a directory Shared Preferences – Creating shared preferences, saving and retrieving data using Shared Preference.

UNIT - V

Database – Introduction to SQLite database, creating and opening a database, creating tables, inserting retrieving and etindelg data, Registering Content Providers, Using content Providers (insert, delete, retrieve and update)

TEXT BOOKS:

1. Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox), 2012
2. Android Application Development for Java Programmers, James C Sheusi, Cengage Learning, 2013

REFERENCE:

1. Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India (Wrox), 2013

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R25MCA2201C

Big Data Analytics (PE-III)
(Master of Computer Applications)

3 0 0 3

MCA II Year II Sem.

Course Objectives:

- The purpose of this course is to provide the students with the knowledge of Big data Analytics principles and techniques.
- This course is also designed to give an exposure of the frontiers of Big data Analytics

Courses Outcomes:

- Ability to explain the foundations, definitions, and challenges of Big Data and various Analytical tools.
- Ability to program using HADOOP and Map reduce, NOSQL
- Ability to understand the importance of Big Data in Social Media and Mining.

UNIT- I**Getting an Overview of Big Data**

What is Big Data? History of Data Management – Evolution of Big Data, Structuring Big Data, Elements of Big Data, Big Data Analytics, Careers in Big Data, Future of Big Data

Technologies for Handling Big Data

Distributed and Parallel Computing for Big Data, Introducing Hadoop, Cloud Computing and Big Data, In- Memory Computing Technology for Big Data.

UNIT -II**Understanding Hadoop Ecosystem**

Hadoop Ecosystem, Hadoop Distributed File System, MapReduce, Hadoop YARN, Hbase, Hive, Pig and Pig Latin, Sqoop, ZooKeeper, Flume, Oozie

Understanding MapReduce Fundamentals and HBase

The MapReduce Framework, Techniques to Optimize MapReduce Jobs, Uses of MapReduce, Role of HBase in Big Data Processing

UNIT -III**Understanding Analytics and Big Data**

Comparing Reporting and Analysis, Types of Analytics, Points to Consider during Analysis, Developing an Analytic Team, Understanding Text Analytics

Analytical Approaches and Tools to Analyze Data: Analytical Approaches, History of Analytical Tools Introduction to Popular Analytical Tools, Comparing Various Analytical Tools, Installing R

UNIT -IV**Data Visualization-I**

Introducing Data Visualization, Techniques Used for Visual Data Representation, Types of Data Visualization, Applications of Data Visualization, Visualizing Big Data, Tools Used in Data Visualization, Tableau Products

Data Visualization with Tableau (Data Visualization-II): Introduction to Tableau Software, Tableau Desktop Workspace, Data Analytics in Tableau Public, Using Visual Controls in Tableau Public

UNIT -V**Social Media Analytics and Text Mining**

Introducing Social Media, Introducing Key Elements of Social Media, Introducing Text Mining, Understanding Text Mining Process, Sentiment Analysis, Performing Social Media Analytics and Opinion Mining on Tweets

Mobile Analytics: Introducing Mobile Analytics, Introducing Mobile Analytics Tools, Performing Mobile Analytics, Challenges of Mobile Analytics.

TEXT BOOKS:

1. Big data, blackbook, dreamtech press, 2015
2. Big Data Analytics, SeemaAcharya, Subhashini Chellappan, Wiley 2015.
3. Simon Walkowiak, Big Data Analytics with R, Packt Publishing, ISBN: 9781786466457

REFERENCES:

1. Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Business, Michael Minelli, Michehe Chambers, 1st Edition, AmbigaDhiraj, Wiley CIO Series, 2013.
2. Hadoop: The Definitive Guide, Tom White, 3rd Edition, O'Reilly Media, 2012.
3. Big Data Analytics: Disruptive Technologies for Changing the Game, Arvind Sathi, 1st Edition, IBM Corporation, 2012.

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R25MCA2202A

E-COMMERCE (OE-I) 3 0 0 3

(Master of Computer Applications)

MCA II Year II Sem.

Course Objectives:

- Identify the major categories and trends of e-commerce applications.
- Identify the essential processes of an e-commerce system.
- Identify several factors and web store requirements needed to succeed in e-commerce.
- Discuss the benefits and trade-offs of various e-commerce clicks and bricks alternatives.
- Understand the main technologies behind e-commerce systems and how these technologies interact.
- Discuss the various marketing strategies for an online business.
- Define various electronic payment types and associated security risks and the ways to protect against them.

Course Outcomes:

- Ability to identify the business relationships between the organizations and their customers.
- Ability to perform various transactions like payment, data transfer and etc.

UNIT-I

Electronic Commerce: Frame work, anatomy of E-Commerce applications, E-Commerce Consumer applications, E-Commerce organization applications. Consumer Oriented Electronic commerce - Mercantile Process models.

UNIT-II

Electronic payment systems: Digital Token-Based, Smart Cards, Credit Cards, Risks in Electronic Payment systems. Inter Organizational Commerce - EDI, EDI Implementation, Value added networks. Intra Organizational Commerce - work Flow, Automation Customization and internal Commerce, Supply chain Management.

UNIT-III

Corporate Digital Library: Document Library, digital Document types, corporate Data Warehouses. Advertising and Marketing - Information based marketing, Advertising on Internet, on-line marketing process, market research. Consumer Search and Resource Discovery - Information search and Retrieval, Commerce Catalogues, Information Filtering. Multimedia - key multimedia concepts, Digital Video and electronic Commerce, Desktop video processing's, Desktop video conferencing

UNIT-IV

Web Marketing Strategies: Communicating with Different Market Segments, Beyond Market Segmentation: Customer Behavior and Relationship Intensity, Advertising on the Web, EMail Marketing, Search Engine Positioning and Domain Names, Selling to Businesses Online, Electronic Data Interchange, Supply Chain Management Using Internet Technologies, Electronic Marketplaces and Portals

UNIT-V

E-Business Revenue Models: Revenue Models for Online Business, Changing Strategies: Revenue Models in Transition, Revenue Strategy Issues for Online Businesses, Creating an Effective Business Presence Online, Web Site Usability, Virtual Communities, Mobile Commerce, Online Auctions.

TEXT BOOKS:

1. Frontiers of electronic commerce – Kalakata, Whinston, Pearson. (UNITS 1, 2, 3)
2. E-Business by Gary P. Schneider, - Cengage India Learning (UNITS 4, 5).

REFERENCES:

1. E-Commerce fundamentals and applications Hendry Chan, Raymond Lee, Tharam Dillon, Elizabeth Chang, John Wiley.
2. E-Commerce, S. Jaiswal – Galgotia.
3. E-Commerce, Efrain Turbon, Jae Lee, David King, H. Michael Chang.
4. Electronic Commerce – Gary P. Schneider – Thomson.

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R25MCA2202B**CYBER LAWS & ETHICS (OE-I)**
(Master of Computer Applications)**3 0 0 3****MCA II Year II Sem.****Course Objectives:**

- To make the students understand the types of roles they are expected to play in the society as practitioners of the civil engineering profession
- To develop some ideas of the legal and practical aspects of their profession.

Course Outcomes:

- Understand the importance of professional practice, Law and Ethics in their personal lives and professional careers.
- Learn the rights and responsibilities as an employee, team member and a global citizen
- Understand the information processing and secure program administration
- Understand the fundamentals of Organizational and Human security standards.

UNIT-I

Introduction to Computer Security: Definition, Threats to security, Government requirements, Information Protection and Access Controls, Computer security efforts, Standards, Computer Security mandates and legislation, Privacy considerations, International security activity.

UNIT-II

Secure System Planning and administration, Introduction to the orange book, Security policy requirements, accountability, assurance and documentation requirements, Network Security, The Red book and Government network evaluations.

UNIT-III

Information security policies and procedures: Corporate policies- Tier 1, Tier 2 and Tier3 policies - process management-planning and preparation-developing policies-asset classification policy-developing standards.

UNIT-IV

Information security: fundamentals-Employee responsibilities- information classification- Information handling- Tools of information security- Information processing-secure program administration.

UNIT-V

Organizational and Human Security: Adoption of Information Security Management Standards, Human Factors in Security- Role of information security professionals.

TEXT BOOKS:

1. Debby Russell and Sr. G. T Gangemi, "Computer Security Basics (Paperback)", 2nd Edition, O' Reilly Media, 2006.
2. Thomas R. Peltier, "Information Security policies and procedures: A Practitioner's Reference", 2nd Edition Prentice Hall, 2004.

REFERENCES:

1. Kenneth J. Knapp, "Cyber Security and Global Information Assurance: Threat Analysis and Response Solutions", IGI Global, 2009.
2. Thomas R Peltier, Justin Peltier and John blackley," Information Security Fundamentals", 2nd Edition, Prentice Hall, 1996
3. Jonathan Rosenoer, "Cyber law: the Law of the Internet", Springer-verlag, 1997 James Graham, "Cyber Security Essentials" Averbach Publication T & F Group.

R25MCA2202C MANAGEMENT INFORMATION SYSTEMS (OE-I) 3 0 0 3
(Master of Computer Applications)

MCA II Year II Sem.

Prerequisites----NIL----

Course Objectives:

- To introduce Information Systems Models
- Topics include Types of Information Systems, ERP Modules etc.,

Course Outcomes:

- To understand different Types of Information Systems
- To gain good knowledge of ERP Modules and ERP Implementation and Maintenance.

UNIT - I

Introduction to IS Models: Nolan Stage Hypothesis, IS Strategic Grid, Wards Model, Earl's Multiple Methodology, Critical Success Factors, Soft Systems Methodology, Socio-Technical Systems Approach (Mumford), System Develop Life Cycle, Prototype and End User Computing, Application Packages, Outsourcing, Deciding Combination of Methods.

UNIT - II

Types of Information Systems: Transactions Processing System, Knowledge Work Systems, Office Automation System, Management Information System, Decision Support System, Expert System, Strategic Information System. IS Security, Control and Audit - System Vulnerability and Abuse, business value of security and control, Need for Security, Methods of minimizing risks, IS Audit, ensuring system quality.

UNIT - III

Induction to ERP: Overview of ERP, MRP, MRPII and Evolution of ERP, Integrated Management Systems, Reasons for the growth of ERP, Business Modeling, Integrated Data Model, Foundations of IS in Business, Obstacles of applying IT. Advantages and limitations of ERP.

UNIT - IV

ERP Modules: Finance, Accounting Systems, Manufacturing and Production Systems, Sales and Distribution Systems, , Human Resource Systems, Plant Maintenance System, Materials Management System, Quality Management System, ERP System Options and Selection, ERP proposal Evaluation.

UNIT - V

ERP Implementation and Maintenance: Implementation Strategy Options, Features of Successful ERP Implementation, Strategies to Attain Success, User Training, Maintaining ERP & IS. Case Studies.

TEXT BOOK:

1. Information systems for modern management, 3rd Edition by R.G Murdick, J.E Ross and J. R clagget, PHI-1994.

REFERENCES:

1. C Laudon and Jane P.Laudon, et al: Management Information Systems, Pearson Education, 2009.
2. Alexis Leon, ERP (Demystified), 5/E, Tata McGraw-Hill, 2009.

3. David L Olson, Managerial Issues of Enterprise Resource Planning Systems, McGraw Hill, International Edition-2009.
4. Vaman, ERP in Practice, Tata McGraw-Hill, 2009
5. Gordon B. Davis & Margrethe H. Olson: Management Information Systems, Tata McGraw-Hill, 2009.
6. W S Jawadekar: Management Information Systems, Tata McGraw-Hill, New Delhi, 2009
7. James A. Obrein: Management Information Systems, Tata McGraw-Hill, 2008.
8. Gerald V.Post, David L Anderson: Management Information Systems, Irvin McGraw Hill, 2009.

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R25MCA2202D

ENTREPRENEURSHIP (OE-I) 3 0 0 3
(Master of Computer Applications)

MCA II Year II Sem.

Course Objectives:

- The aim of this course is to have a comprehensive perspective of inclusive learning, ability to learn and implement the Fundamentals of Entrepreneurship.

Course Outcomes:

- It enables students to learn the basics of Entrepreneurship and entrepreneurial development which will help them to provide vision for their own Start-up.

UNIT-I

Entrepreneurial Perspectives: Introduction to Entrepreneurship – Evolution - Concept of Entrepreneurship - Types of Entrepreneurs - Entrepreneurial Competencies, Capacity Building for Entrepreneurs. Entrepreneurial Training Methods - Entrepreneurial Motivations - Models for Entrepreneurial Development - The process of Entrepreneurial Development.

UNIT-II

New Venture Creation: Introduction, Mobility of Entrepreneurs, Models for Opportunity Evaluation; Business plans – Purpose, Contents, Presenting Business Plan, Procedure for setting up Enterprises, Central level - Startup and State level - T Hub, Other Institutions initiatives.

UNIT-III

Management of MSMEs and Sick Enterprises: Challenges of MSMEs, Preventing Sickness in Enterprises – Specific Management Problems; Industrial Sickness; Industrial Sickness in India – Symptoms, process and Rehabilitation of Sick Units.

UNIT-IV

Managing Marketing and Growth of Enterprises: Essential Marketing Mix of Services, Key Success Factors in Service Marketing, Cost and Pricing, Branding, New Techniques in Marketing, International Trade.

UNIT-V

Strategic perspectives in Entrepreneurship: Strategic Growth in Entrepreneurship, The Valuation Challenge in Entrepreneurship, The Final Harvest of New Ventures, Technology, Business Incubation, India way – Entrepreneurship; Women Entrepreneurs – Strategies to develop Women Entrepreneurs, Institutions supporting Women Entrepreneurship in India.

TEXT BOOKS:

1. Entrepreneurship Development and Small Business Enterprises, Poornima M. Charantimath, 2nd edition, Pearson, 2014.
2. Entrepreneurship, a South – Asian Perspective, D.F. Kuratko and T.V.Rao, 3rd edition, Cengage, 2012.

REFERENCES:

1. Entrepreneurship, Arya Kumar, 4th edition, Pearson 2015.
2. The Dynamics of Entrepreneurial Development and Management, Vasant Desai, Himalaya Publishing House, 2015.

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