MCA (Master of Computer Applications)

MCA SYALLABUS YEAR-II SESSION 2021-22
YEAR-II

1. III-Semester (Second Year)

S No	Category	Credit
1	Theory	18
2	Practical	03
3	SODECA	02
	Total	**23**

III-Semester (Second Year) MCA Year 2 - Semester III								
Theory								
S. No.	**Course Code**	**Course Title**	**Hours**		**Marks**			**Credits**
			L	**P**	**IA**	**ETE**	**Total**	
1	MCA-301	Cloud Computing	3		30	70	100	3
2	MCA-302	Analysis and Design of Algorithm	3		30	70	100	3
3	MCA-303	Artificial Intelligence	3		30	70	100	3
4	MCA-304	Information Security	3		30	70	100	3
5	MCA-305	Mobile Application Development	3		30	70	100	3
6	MCA-306	Elective 1	3		30	70	100	3
Practical								
1	MCA-351	ADA Lab		2	30	70	100	01
2	MCA-352	Mobile Application Development Lab		2	30	70	100	01
3	MCA-353	Summer Industrial Training Presentation		2	30	70	100	01
4		SODECA						02
Total					**270**	**630**	**900**	**23**

L= Lecture, **P** = Practical, **IA** = Internal Assessment, **ETE** = End Term Exam

Elective -1:

a) Data Mining and Warehousing
b) Big Data Technologies
c) Soft Computing

2. IV-Semester (Second Year)

S No	Category	Credit
1	Theory	06
2	Practical	06
3	SODECA	02
	Total	**14**

MCA Year 2 - Semester IV								
Theory								
S. No.	**CourseCode**	**Course Title**	**Hours**		**Marks**			**Credits**
			L	**P**	**IA**	**ETE**	**Total**	
1	MCA-401	Software Project Management	3		30	70	100	3
2	MCA-402	Elective 2	3		30	70	100	3
Practical								
3	MCA-451	Industrial Project		12	30	70	100	06
4		SODECA						02
Total					**90**	**210**	**300**	**14**

L= Lecture, **P** = Practical, **IA** = Internal Assessment, **ETE** = End Term Exam

Note: The industrial project is part of the curriculum will be held in the institute as one of the laboratories. This may be in continuations to the project under taken by the student during industrial training and/or of industrial nature and/or have good industrial significance and/or may be done in collaboration with industry (as per suitability at the institute level).
The evaluation will be done in the institute by one internal examiner and one external examiner (from outside the institute) appointed by RTU.

Elective 2:

a) Principles of Management and Information System
b) Machine Learning
c) Data Science with R

Cloud Computing

[As per Choice Based Credit System (CBCS) Scheme]
SEMESTER-III

Subject Code	**MCA 301**	**INTERNAL ASSESSMENT (IA) MARKS**	**30**
Number of Lecture Hours / Week	**03**	**END TERM EXAM (ETE) MARKS**	**70**
Total Number of Lecture Hours	**40**	**SEMESTER END EXAM HOURS**	**03**

Credits: 03

CONTENTS	**Teaching Hours**
Unit-1	**08 Hours**
Introduction to Cloud: Cloud Computing at a Glance, Vision of Cloud Computing, Defining a Cloud, Cloud Computing Reference Model. Characteristics and Benefits, Challenges Ahead, Historical Developments, Risks and Approaches of Migration into Cloud ,Types of Clouds, Services models, Cloud Reference Model.	
Unit-2	**08 Hours**
Cloud Architecture: cloud architecture, features and benefits of Servive Models: Software as a Service (SaaS),Platform as a Service (PaaS), Infrastructure as a Service (IaaS), Service providers, challenges and risks in cloud adoption. Cloud deployment model: Public clouds – Private clouds – Community clouds - Hybrid clouds - Advantages of Cloud computing.	
Unit-3	**08 Hours**
Virtualization: Introduction, Characteristics of Virtualized Environment, Taxonomy of Virtualization Techniques, Virtualization and Cloud computing, Pros and Cons of Virtualization, Technology Examples- VMware and Microsoft Hyper-V. Virtualization of CPU, Memory, I/O Devices, Virtual Cluster ,datacenterand Resources Management.	
Unit-4	**08 Hours**
Securing the Cloud: Cloud Information security fundamentals, Cloud security services, Design principles, Policy Implementation, Cloud Computing Security Challenges, Cloud Computing Security Architecture. Legal issues in cloud Computing. **Data Security in Cloud**: Risk Mitigation , Understanding and Identification of Threats in Cloud, SLA-Service Level Agreements, Trust Management	
Unit-5	**08 Hours**
Defining the Clouds for Enterprise: Storage as a service, Database as a service, Process as a service, Information as a service, Integration as a service and Testing as a service. **Disaster Management in Cloud:** Disasters in the Cloud, Disaster Recovery Planning.	

Text Books:

- San Murugesan, Irena Bojanova, "Encyclopedia of Cloud Computing", Wiley , 2016
- Kai Hawang , GeofreyC.Fox, Jack J. Dongarra, "Distributed and Cloud Computing: From Parallel Processing to the Internet of Things", Morgan Kaufmann, 2013
- RajkumarBuyya, JemesBroberg, A. Goscinski, "Cloud Computing : Principal and Paradigms", Wiley, 2011

References:

- Krutz , Vines, "Cloud Security " , Wiley Pub, 2014
- Velte, "Cloud Computing- A Practical Approach" ,TMH Pub, 2015

Analysis and Design of Algorithm

[As per Choice Based Credit System (CBCS) Scheme]
SEMESTER-III

Subject Code	**MCA-302**	**INTERNAL ASSESSMENT (IA) MARKS**	**30**
Number of Lecture Hours / Week	**03**	**END TERM EXAM (ETE) MARKS**	**70**
Total Number of Lecture Hours	**40**	**SEMESTER END EXAM HOURS**	**03**

Credits: 03

CONTENTS	**Teaching Hours**
Unit-1	**08 Hours**
Introduction - Algorithm definition and specification – Design of Algorithms, and Analysis of Algorithms, Asymptotic Notations, Growth of function: Asymptotic notations Performance Analysis Space complexity, Time complexity, Divide and conquer- General method, applications – Binary search, Merge sort, Quick sort	
Unit-2	**08 Hours**
The Greedy method General method – knapsack problem – minimum cost spanning tree (Prims and Kruskal algorithm) – single source shortest path-DijkastraAlgorithm .	
Unit-3	**08 Hours**
Dynamic Programming – general method – multistage graphs – all pair shortest path – 0/1 Knapsack – traveling salesman problem – flow shop scheduling.	
Unit-4	**08 Hours**
Backtracking: General method – 8-Queens problem – sum of subsets – graph coloring – Hamiltonian cycles– knapsack problem. Branch and bound:- The Method – 0/1 Knapsack problem – traveling sales person.	
Unit-5	**08 Hours**
Parallel models Basic concepts, performance Measures, Parallel Algorithms: Parallel complexity, Analysis ofParallel Addition, Parallel Multiplication and division, parallel Evaluation of GeneralArithmetic Expressions, First-Order Linear recurrence. **NP-hard and NP-complete problems:** Basic Concepts, non-deterministic algorithms, Np-hard graph problems and scheduling problems.	

Text Books:

- AnanyLevitin, "Introduction to the Design and Analysis of Algorithms", Third Edition, Pearson Education, 2012.
- Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", Third Edition, PHI Learning Private Limited, 2012.

References:

- Donald E. Knuth, "The Art of Computer Programming", Volumes 1& 3 Pearson Education,2009.
- Steven S. Skiena, "The Algorithm Design Manual", Second Edition, Springer, 2008.

Artificial Intelligence

[As per Choice Based Credit System (CBCS) Scheme]

SEMESTER-III

Subject Code	**MCA-303**	**INTERNAL ASSESSMENT (IA) MARKS**	**30**
Number of Lecture Hours / Week	**03**	**END TERM EXAM (ETE) MARKS**	**70**
Total Number of Lecture Hours	**40**	**SEMESTER END EXAM HOURS**	**03**

Credits: 3

CONTENTS	**Teaching Hours**
Unit-1	**08 Hours**
General Issues and overview of AI Concept of AI, AI technique, Characteristics of AI applications Problem Solving, Search and Control Strategies General Problem solving, Production systems, and Control strategies, forward and backward chaining Exhaustive searches: Depth first and Breadth first search.	
Unit-2	**08 Hours**
Heuristic Search Techniques Hill climbing, Branch and Bound technique, Best first search and A* algorithm, AND/OR Graphs,Problem reduction and AO* algorithm, Constraint Satisfaction problems, Game Playing Min Max Search procedure.	
Unit-3	**08 Hours**
Knowledge Representation First Order Predicate Calculus, Resolution Principle and Unification, Inference Mechanisms Horn'sClauses, Semantic Networks, Frame Systems , Scripts, ConceptualDependency AI Programming Languages.	
Unit-4	**08 Hours**
Natural Language Processing: Origins and challenges of NLP – Language Modeling: Grammar-based LM, Statistical LM – RegularExpressions, Finite-State Automata – English Morphology, Tokenization, Part-of-Speech Tagging, Issues in Part-of-Speech tagging.Semantics and pragmatics-Requirements for representation, Syntax-Driven Semantic analysis, Introduction to syntactic analysis.	
Unit-5	**08 Hours**
Expert Systems Introduction to Expert Systems, Architecture of Expert Systems, Expert System Shells, Knowledge Acquisition, Case Studies of Expert System. **Learning**: Concept of learning, Types of learning.	

Text Books:

1. Elaine Rich and Kevin Knight, "Artificial Intelligence", Tata McGraw Hill, 3 rd edition, 2009.
2. Dan W. Patterson, "Introduction to Artificial Intelligence and Expert Systems", Prentice Hall of India, 1 st edition, 1997.
3. Winston, Patrick, Henry, "Artificial Intelligence", Pearson Education, 3 rd edition, 2004
4. SubhasreeBhattacharjee, "Artificial Intelligence for Student" Shroff Publishers and Distributors Pvt.LTD., 1 st Edition, 2016

ReferenceBooks:

1. Nils J. Nilsson, "Principles of Artificial Intelligence (Symbolic Computation / Artificial Intelligence)", reprint edition, 2014.
2. Stuart Russell, Peter Norvig, "Artificial Intelligence: A Modern Approach", Pearson Education, 3 rd edition, 2010.
3. Daniel Jurafsky, James H. Martin Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, Pearson Publication, 2014.

Information Security

[As per Choice Based Credit System (CBCS) Scheme]
SEMESTER-III

Subject Code	**MCA 304**	**INTERNAL ASSESSMENT (IA) MARKS**	**30**
Number of Lecture Hours / Week	**03**	**END TERM EXAM (ETE) MARKS**	**70**
Total Number of Lecture Hours	**40**	**SEMESTER END EXAM HOURS**	**03**

Credits: 03

CONTENTS	**Teaching Hours**
Unit-1	**08 Hours**
Introduction to Information Security : Attacks, Vulnerability, Security Goals, Security Services and mechanisms. Conventional substitution and transposition ciphers, One-time Pad, Block cipher and Stream Cipher, Steganography. Classical Encryption Techniques.	
Unit-2	**08 Hours**
Symmetric and Asymmetric Cryptographic Techniques: DES, AES, RSA algorithms. Hash Functions Message Authentication & Hash Functions: Authentication Requirements, Authentication Functions, Message Authentication Codes, Hash Functions, Birthday Attacks, Security Of Hash Function & MACS, MD5 Message Digest Algorithm, Secure Hash Algorithm (SHA), Digital Signatures: Digital Signatures, Authentication Protocol, Digital Signature Standard (DSS), Proof Of Digital Signature Algorithm.	
Unit-3	**08 Hours**
Program Security : Nonmalicious Program errors – Buffer overflow, Incomplete mediation, Time-of-check to Time-of- use Errors, Viruses, Trapdoors, Salami attack, Man-in-the- middle attacks, Covert channels.	
Unit-4	**10 Hours**
Security in Networks : Threats in networks, Network Security Controls – Architecture, Encryption, Content Integrity, Strong Authentication, Access Controls, Wireless Security, Honeypots, Traffic flow security, Firewalls – Design and Types of Firewalls, Personal Firewalls, IDS, Email Security – PGP,S/MIME	
Unit-5	**06 Hours**
Administering Security: Security Planning, Risk Analysis, Organizational Security policies. Legal Privacy and Ethical Issues in Computer Security: Protecting Programs and data, Information and the law, Rights of Employees and Employers, Software failures, Computer Crime, Ethical issues in Computer Security, case studies of Ethics.	

Text Books:

- William Stallings, Network Security Essentials: Applications and Standards, Prentice Hall, 4th edition, 2010.
- Michael T. Goodrich and Roberto Tamassia, Introduction to Computer Security, Addison Wesley, 2011.
- William Stallings, Network Security Essentials: Applications and Standards, Prentice Hall,4th edition, 2010.

References:

- Alfred J. Menezes, Paul C. van Oorschot and Scott A. Vanstone, Handbook of AppliedCryptography, CRC Press, 2011.

Mobile Application Development

[As per Choice Based Credit System (CBCS) Scheme]

SEMESTER-III

Subject Code	**MCA-305**	**INTERNAL ASSESSMENT (IA) MARKS**	**30**
Number of Lecture Hours / Week	**03**	**END TERM EXAM (ETE) MARKS**	**70**
Total Number of Lecture Hours	**40**	**SEMESTER END EXAM HOURS**	**03**

Credits: 03

CONTENTS	**Teaching Hours**
Unit-1	**08 Hours**
INTRODUCTION Introduction to mobile applications, Market and business drivers for mobile applications, Difficulties in Mobile Development, Mobile Myths, When to Create an App, Types of Mobile App. Design Constraints for mobile applications, both hardware and software related, Architecting mobile applications, user interfaces for mobile applications, touch events and gestures.	
Unit-2	**08 Hours**
ADVANCED DESIGN Designing applications with multimedia and web access capabilities. Integration with GPS and social media networking applications, Accessing applications hosted in a cloud computing environment, Design patterns for mobile applications, Understanding Application users, Information Design, Achieving quality constraints.	
Unit-3	**08 Hours**
TECHNOLOGY I ANDROID Establishing the development environment Android architecture Android Application Structure, Emulator, Android virtual device, UI design, Fragments, Activity, Services, broadcast receiver, Intents/Filters, Content provider-SQLite Programming, SQLITE open, Helper, SQlite Database, Interaction with server side applications	
Unit-4	**08 Hours**
Advanced ANDROID Using Google Maps, GPS and Wi-Fi Integration, Android Notification, Audio Manager, Bluetooth, Camera and Sensor Integration, Sending SMS, Phone Calls, Publishing Android Application.Introduction to KOTLIN	
Unit-5	**08 Hours**
TECHNOLOGY II IOS Introduction to Objective C iOS features UI implementation Touch frameworks Data persistence using Core Data and SQLite, Action and Outlets, Delegates and Storyboard, Location aware applications using Core Location and Map Kit, Integrating calendar and address book with social media application Using Wifi iPhone marketplace.	

Text Books:

RetoMeier , “Professional Android app development”, Wiley, 2019.

Matt Neuburg, “IOS 13 Programming Fundamentals with Swift: Swift, Xcode, and Cocoa Basics”, O’Reilly, 2019.

Michael Dippery, ”Professional Swift”, Wiley, 2015.

Jeff McWherter and Scott Gowell, "Professional Mobile Application Development", Wrox, 2012.

Charlie Collins, Michael Galpin and Matthias Kappler, “Android in Practice”, DreamTech, 2012.

Reference Books:

Reto Meier, Ian Lake,”Professional Android, 4th Edition”, Wiley, 2018.

Neil Smyth “Android studio 2.2 Development Essentials 7th Edition” Payload Media 2017.

Murat Yener, OnurDundar, ”Expert Android Studio”, Wiley, 2016.

Jerome Dimarzio “Beginning Android Programming with Android Studio” Wiley Publication, 2016.

David Mark, Jack Nutting, Jeff LaMarche and Frederic Olsson, “Beginning iOS 6 Development: Exploring the iOS SDK”, Apress, 2013.

James Dovey and Ash Furrow, “Beginning Objective C”, Apress, 2012.

Paul Deitel, Harvey Deitel, Abbey Deitel and Michel Morgano, “Android for Programmers an App-Driven Approach”, Pearson, 2012.

Data Mining and Data Warehousing

Elective I(a)

As per Choice Based Credit System CBCS)Scheme)

SEMESTER-III

Subject Code	**MCA-306-I(a)**	**INTERNAL ASSESSMENT (IA) MARKS**	**30**
Number of Lecture Hours / Week	**03**	**END TERM EXAM (ETE) MARKS**	**70**
Total Number of Lecture Hours	**40**	**SEMESTER END EXAM HOURS**	**03**

Credits: 03

CONTENTS	**Teaching Hours**
Unit-1	**08 Hours**
Data Warehousing: Introduction to Data Warehouse and OLAP ,Data Warehouse and DBMS Multidimensional data model ,OLAP operations. Data preprocessing ,Data cleaning ,Data transformation ,Data reduction ,Discretization and generating concept hierarchies.	
Unit-2	**08 Hours**
Data Mining: Introduction, Definition, KDD vs. DM, DBMS vs. DM, DM Techniques, Issues and Challenges in DM, DM Applications. DM algorithms: Classification and Prediction - Parametric and non-parametric technology: Bayesian classification, two class and generalized class classification, classification error.	
Unit-3	**08 Hours**
Association rules:Association Rules: Apriori Algorithm, Partition, FP-tree growth algorithms, Generalized association rule. Motivation and terminology,Correlation analysis. **Clustering:** Basic issues in clustering ,Partitioning methods: k-means, K-MEDOID Algorithm ,Hierarchical methods: distance-based agglomerative and divisible clustering , non-hierarchical techniques.	
Unit-4	**08 Hours**
Decision Trees: Decision tree introduction, Tree pruning, Extracting classification rules from decision trees, Decision tree construction algorithms, Decision tree construction with presorting.	
Unit-5	**08 Hours**
Techniques for Data mining: Data Mining software and applications: Introduction to Text mining: extracting attributes (keywords), structural approaches (parsing, soft parsing). Introduction to Web mining: classifying web pages, extracting knowledge from the web Data Mining software and applications.	

Text Books:

1. Alex Berson, Stephen J. Smith, Data Warehousing, Data Mining and OLAP, McGrawHill, 2014
2. D. Hand, H. Mannila, and P. Smyth, Principles of Data Mining, MIT Press, 2011
3. Jiawei Han, MichelineKamber, Data Mining: Concepts and Techniques, Harcourt India Pvt., 2011

References:

1. W. H. Innmon, Building the Data Warehouse, Wiley Computer Publishing, 2005

Big Data Technologies

MCA_306_Elective I(b)

As per Choice Based Credit System (CBCS) Scheme)

SEMESTER-II

Subject Code	**MCA-306-I(b)**	**INTERNAL ASSESSMENT (IA) MARKS**	**30**
Number of Lecture Hours / Week	**03**	**END TERM EXAM (ETE) MARKS**	**70**
Total Number of Lecture Hours	**40**	**SEMESTER END EXAM HOURS**	**03**

Credits: 03

CONTENT	**Teaching Hours**
Unit-1	**08 Hours**
Understanding Big Data: Introduction, Need, Importance of Big data, Classification of Digital Data, Four Vs, Drivers for Big data, Big data Terminology, Industry examples and Top Challenges Facing Big Data, Responsibilities of data scientists, Technology Challenges for Big data, Convergence of key trends, Big data Architecture. **Big data Applications:** Healthcare, Finance, Advertising, Marketing, Transportation, Education, Government, Cyber Security etc.	
Unit-2	**08 Hours**
Web Analytics: Big data and Marketing, fraud and big data, risk and big data, credit risk management, big data and algorithmic trading, Open source technologies, cloud and big data, Crowd Sourcing Analytics, inter and trans firewall analytics.	
Unit-3	**08 Hours**
Hadoop Ecosystem: Introduction to Hadoop, Features of Hadoop, Hadoop Versions, Hadoop Architecture, Introduction to Data Management and Data Access tools: Data Management using Flume, Oozie, Zookeeper; Hive, Pig, Avro, SQOOP for data access. Introduction to Data Processing and Data Storage tools: MapReduce, YARN, HDFS, HBase.	
Unit-4	**08 Hours**
HDFS: HDFS concepts, NameNode, Design working of Hadoop distributed file system (HDFS). **MapReduce:** Introduction, MapReduce workflows, Split, map, combine, scheduling, shuffle and sort YARN. Problems & examples in MapReduce.	
Unit-5	**08 Hours**
NO SQL Data Management: Problem with Relational Database Systems. Introduction to NOSQL, Advantages of NOSQL, SQL versus NOSQL. Aggregate data models, key-value and document data models, relationships, graph databases, schemaless databases.	

Text Books:

- Michele Chambers, Michael Minelli, AmbigaDhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013
- Anil Maheshwari, " Big Data", McGraw-Hill; Second edition, 2019
- SubhashiniChellappanSeemaAcharya, "Big Data and Analytics", Wiley, 2019

References:

- ArshdeepBahga, Vijay Madisetti, "Big Data Analytics: A Hands-On Approach", VPT, 2018
- NandhiniAbirami R, SeifedineKadry, Amir H. Gandomi, BalamuruganBalusamy, "Big Data: Concepts, Technology, and Architecture", Wiley, 1st edition 2021
- EMC Education Services, " Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", 2015

Soft Computing

Elective I(c)

As per Choice Based Credit System (CBCS) Scheme)

SEMESTER-III

Subject Code	**MCA-306-I(c)**	**INTERNAL ASSESSMENT (IA) MARKS**	**30**
Number of Lecture Hours / Week	**03**	**END TERM EXAM (ETE) MARKS**	**70**
Total Number of Lecture Hours	**40**	**SEMESTER END EXAM HOURS**	**03**

Credits: 3

CONTENT	**Teaching Hours**
Unit-1	**08 Hours**
Introduction to Soft Computing Introduction of Hard and Soft Computing, Unique features of Soft computing, Components of Soft computing, Fuzzy Computing, Evolutionary Computation, Genetic Algorithm, Swarm Intelligence, Ant Colony Optimizations, Neural Network, Machine Learning , Associative Memory, Adaptive Resonance Theory, Introduction to Deep Learning.	
Unit-2	**08 Hours**
Neural Networks Introduction and Architecture: Neuron, Nerve structure and synapse, Artificial Neuron and its model, Neural network architecture: single layer and multilayer feed forward networks, recurrent networks. Back propagation networks architecture: perceptron model, solution, single layer artificial neural network, multilayer perception model; back propagation learning methods, back propagation algorithm, applications.	
Unit-3	**08 Hours**
Fuzzy Logic Basic concepts of fuzzy logic, Fuzzy sets and Crisp sets, Fuzzy set theory and operations, Properties of fuzzy sets, Fuzzy and Crisp relations, Fuzzy to Crisp conversion, Membership functions, interference in fuzzy logic, fuzzy if-then rules, Fuzzy implications and Fuzzy algorithms, Fuzzyfications & Defuzzificataions, Fuzzy Inference Systems, applications.	
Unit-4	**08 Hours**
Genetic Algorithms Traditional optimization and search techniques, Genetic Algorithms: Basic concepts of GA, working principle, procedures of GA, Process flow of GA, Genetic representations, (encoding) Initialization and selection, Genetic operators, Mutation, Generational Cycle, applications.	
Unit-5	**08 Hours**
Hybrid Systems Integration of neural networks, fuzzy logic and genetic algorithms. GA Based Back Propagation Networks, Fuzzy Back Propagation Networks, Fuzzy Associative Memories, Simplified Fuzzy ARTMAP.	

Text Books:

1. S. Rajasekaran and G.A.VijaylakshmiPai.. Neural Networks Fuzzy Logic, and Genetic Algorithms, Prentice Hall of India 2007.
2. K.H.Lee.. First Course on Fuzzy Theory and Applications, Springer-Verlag.
3. D. K. Pratihar, Soft Computing, Narosa, 2008.
4. J.-S. R. Jang, C.-T. Sun, and E. Mizutani,Neuro-Fuzzy and soft Computing, PHI Learning, 2009.

ReferenceBooks:

1. J. Yen and R. Langari.. Fuzzy Logic, Intelligence, Control and Information, Pearson Education.
2. N.P.Padhy,"Artificial Intelligence and Intelligent Systems" Oxford University Press.
3. Melanie Mitchell, An Introduction to Genetic Algorithms, MIT Press, 2000.
4. Simon Haykin, Neural Networks and Learning Machines, (3rd Edn.), PHI Learning, 2011.

ADA Lab

As per Choice Based Credit System (CBCS) Scheme)
SEMESTER-III

Subject Code	**MCA-351**	**INTERNAL ASSESSMENT (IA) MARKS**	**30**
Number of Lecture Hours / Week	**02**	**END TERM EXAM (ETE) MARKS**	**70**
Total Number of Lecture Hours	**40**	**SEMESTER END EXAM HOURS**	**03**

Credits: 01

Objective: The course is designed to develop skills to design and analyze various algorithms. It aims to strengthen the ability of the students to identify and apply suitable concepts of Analysis and Design of algorithms for the given real world problems. It enables them to gain knowledge in practical applications of various algorithms.

Contents

1. Linear search & binary search, Sorting Techniques
2. Single source shortest path-Dijkastra Algorithm
3. Greedy method:-knapsack problem
4. Greedy method minimum cost spanning tree
5. Traveling salesman problem – flow shop scheduling.
6. Dynamic Programming – 0/1 Knapsack
7. Dynamic Programming – traveling salesman problem
8. Backtracking 8-Queens problem
9. Backtracking Sum of Subsets
10. Backtracking – graph coloring – Hamiltonian cycles– knapsack problem

Mobile Application Development Lab

As per Choice Based Credit System (CBCS) Scheme)

SEMESTER-III

Subject Code	**MCA-352**	**INTERNAL ASSESSMENT (IA) MARKS**	**30**
Number of Lecture Hours / Week	**02**	**END TERM EXAM (ETE) MARKS**	**70**
Total Number of Lecture Hours	**40**	**SEMESTER END EXAM HOURS**	**03**

Credits: 01

Lab Experiments

1. Develop an application that uses GUI components, Font and Colours.
2. Write an android program to implement activity life cycle using toast messageswith proper positioning
3. Develop an application that uses Layout Managers and event listeners.
4. Write an application that draws basic graphical primitives on the screen.
5. Write an application that basic graphical primitives and animations.
6. Develop an application that makes use of databases.
7. Develop an application that makes use of Notification Manager.
8. Develop a native application that uses GPS location information.
9. Implement an application that creates an alert upon receiving a message
10. Write a mobile application that makes use of feed.
11. Develop a mobile application to send an email.
12. Mini Project using Android Studio

Summer Industrial Training Presentation

As per Choice Based Credit System (CBCS) Scheme)

SEMESTER-III

Subject Code	**MCA-353**	**INTERNAL ASSESSMENT (IA) MARKS**	**30**
Number of Lecture Hours / Week	**02**	**END TERM EXAM (ETE) MARKS**	**70**
Total Number of Lecture Hours	**40**	**SEMESTER END EXAM HOURS**	**03**

Credits: 01

Mandatory Summer Training: **45 Working Days Summer Training** during Semester Break, of 100 Marks. Evaluation will be done in Semester-III Examinations.

GENERAL INSTRUCTIONS FOR PREPRATION OF SUMMER INDUSTRIAL TRAINNING PRESENTATION/ REPORT

(i) Cover Page
(ii) Title Page
(iii) Certificate
(iv) Acknowledgement
(v) Table of Contents

1. Introduction

2. Project Specifications
- 2.1 Project Need
- 2.2 Project Overview

3. Specific Requirements
- 3.1 External Interface Requirements
- 3.2 Hardware Interfaces
- 3.3 Software Interfaces
- 3.4 Communications Protocols (Networking Protocols)
- 3.5 Security / Maintainability / Performance

4. Software Product Features
- 4.1 System Architecture
- 4.2 Database Requirements
- 4.3 ER Diagram
- 4.4 Data Flow Diagram
- 4.5 Use Case Diagrams
- 4.6 User Interfaces (Input Forms / Processing Forms/ Search Forms/ Output Forms)
- 4.7 Report Formats

5. Drawbacks and Limitations
6. Proposed Enhancements
7. Conclusion
8. Bibliography
9. Annexure:
- 9.1 User Interface Screens (Optional)
- 9.2 Output Reports with Data (if any)
- 9.3 Sample Program Code

Software Project Management

As per Choice Based Credit System (CBCS) Scheme)

SEMESTER-IV

Subject Code	**MCA-401**	**INTERNAL ASSESSMENT (IA) MARKS**	**30**
Number of Lecture Hours / Week	**03**	**END TERM EXAM (ETE) MARKS**	**70**
Total Number of Lecture Hours	**40**	**SEMESTER END EXAM HOURS**	**03**

Credits: 03

CONTENTS	**Teaching Hours**
Unit-1	**08 Hours**
Project Management: The management spectrum, the people, the product, the process, the project, critical practices Metrics for Process and Project: Metrics in the process and project Domains, software measurements, metrics for software quality, integrating metrics within software process, metrics for small organizations, establishing a software metrics program. Introduction of Project Management tool: Trello, Jira, Asana, Zoho, Wrike.	
Unit-2	**08 Hours**
Estimation: Project planning Process, software scope and feasibility, resources, software project estimation, empirical estimation models, estimation for object oriented projects, estimation for Agile development and web engineering projects, the make/buy decision.	
Unit-3	**08 Hours**
Project Scheduling: Basic concepts, project scheduling, defining a task set and task network, scheduling, earned value analysis. Risk Management: Reactive V/S proactive Risk Strategies, software risks, Risk identification, Risk projection, risk refinement, risk mitigation, monitoring and management, the RMMM plan Quality Planning: Quality Concepts, Procedural Approach to Quality Management, Quantitative Approaches to Quality Management, Quantitative Quality Management Planning, Setting the Quality Goal, Quality Process Planning, Defect Prevention Planning.	
Unit-4	**08 Hours**
Quality Management: Quality Concepts, Software Quality assurances, software reviews, formal technical reviews, Formal approaches to SQA, Statistical Software Quality assurances, Change Management: software Configuration Management, The SCM repository, SCM Process, Configuration Management for Web Engineering	
Unit-5	**08 Hours**
Project Execution And Closure: Reviews. The Review Process, Planning, Overview and Preparation, Group Review Meeting, Rework and Follow-up, One-Person Review, Guidelines for Reviews in Projects, Project Closure: Project Closure Analysis, The Role of Closure Analysis, Performing Closure Analysis. **Project Monitoring and Control:** Project Tracking, Activities Tracking, Defect Tracking, Issues Tracking, Status Reports, Milestone Analysis, Actual Versus Estimated Analysis of Effort and Schedule, Monitoring Quality.	

Text Books:

- Bob Hughes , Mike Cotterell and Rajib Mall "Software Project Management", 6th Edition, McGraw Hill Edition, 2017.
- PankajJalote, "Software Project Management in practice", 5th Edition, Pearson Education, 2017.
- Murali K. Chemuturi ,Thomas M. Cagley Jr." Mastering Software Project Management: Best Practices, Tools and Techniques", J. Ross Publishing, 2010
- Sanjay Mohapatra, " Software Project Management" , Cengage Learning, 2011

References:

- Dr. P. Rizwan Ahmed, " Software Project Management", 1st Edition, Margham Publications, 2016
- Walker Royce, "Software Project Management, A Unified Framework", 1st Edition, 2006.
- Joel Henry, "Software Project Management", 1st Edition, Pearson Education, 2006.
- PradeepPai, "Project Management",, First Edition, Pearson, 2019

Principles of Management and Information System [Elective-2(a)]

As per Choice Based Credit System (CBCS) Scheme)

SEMESTER-IV

Subject Code	**MCA-402-2(a)**	**INTERNAL ASSESSMENT (IA) MARKS**	**30**
Number of Lecture Hours / Week	**03**	**END TERM EXAM (ETE) MARKS**	**70**
Total Number of Lecture Hours	**40**	**SEMESTER END EXAM HOURS**	**03**

Credits: 03

CONTENTS	**Teaching Hours**
Unit-1	**08 Hours**
Management:An Overview Definition, Concept, Functions, Process, Scope and Significance of Management. Nature of Management, Managerial Roles, Managerial Skills and Activities, Difference between Management and Administration. Significance of Values and Ethics in Management.	
Unit-2	**08 Hours**
Planning & Organizing: Nature and purpose of planning, Significance of Planning, Elements and Steps of Planning, Types of planning, Objectives and Policies Decision Making, Organizing Principles, Span of Control, Departmentalization, Line and Staff Authority &Relationship, Authority, Delegation and Decentralization. Formal and Informal Organizations	
Unit-3	**08 Hours**
Directing & Controlling: Effective Directing, Supervision, motivation theories, motivational techniques, Job Satisfaction, Job Enrichment, Leadership-Concept, Styles and Theories System and Process of Controlling, Concept, Types and Process, Techniques of Controlling, Coordination-Concept, Importance, Principles and Techniques of Coordination, use of computers and IT in Management control	
Unit-4	**08 Hours**
Information System: Data vs. Information vs. Knowledge, Information Systemsmeaning, functions and dimensionsand need. Categorization of Organizational InformationSystems –hierarchical and functional perspective, Interdependence between organization and IS, IS strategies for competitive advantageusing Porter's Five Forces Model and Value Chain Model	
Unit-5	**08 Hours**
Information Systems Management: Planning the Use of IT, Managing the Computing Infrastructure, Enterprise Applications, Developing Business/IT Solutions, Outsourcing, User Rights and Responsibilities, Implementation and Controlling of Information System.	

Text Books:

1.Kenneth Laudon, JaneLaudonEssentials ofManagement Information Systems, PHI Publication, 10th Edition
2.Terry and Franklin, Principles of Management, AITBS Publishers & Distributors, Delhi, Eighth Edition.
3.Joseph L Massie "Essentials of Management", Prentice Hall of India, Fourth Edition, 2003.
4. W.S. Jawadekar, "Management Information Systems", TMH Publication, Latest Edition

Reference Books:

1.PC Tripathi and PN Reddy, "Principles of Management", Tata McGraw-Hill, Fourth Edition 2008.
2.Koontz. Essentials for Management: An International Perspective. Tata McGraw-Hill.
3.Peter Ferdinand Drucker, The Practice of Management, HarperCollins Publishers, 2010.

Machine Learning [Elective-2(b)]

[As per Choice Based Credit System (CBCS) Scheme]

SEMESTER-IV

Subject Code	**MCA-402-2(b)**	**INTERNAL ASSESSMENT (IA) MARKS**	**30**
Number of Lecture Hours / Week	**03**	**END TERM EXAM (ETE) MARKS**	**70**
Total Number of Lecture Hours	**40**	**SEMESTER END EXAM HOURS**	**03**

Credits: 3

CONTENTS	**Teaching Hours**
Unit-1	**08 Hours**
Introduction Machine Learning – Machine Learning Foundations,Overview,Applications, Types of Machine Learning – Basic Concepts in Machine Learning – Examples of Machine Learning, Perspectives/Issues in Machine Learning, AI vs. Machine Learning.	
Unit-2	**08 Hours**
Supervised Learning Introduction, Linear Models of Classification – Linear Regression – Logistic Regression – Bayesian Logistic Regression – Probabilistic Models Neural Network-Feed Forward Network Functions – Error Back Propagation – Regularization - Bayesian Neural Networks – Radial Basis Function Networks, Ensemble Methods – Random Forest – Bagging – Boosting.	
Unit-3	**08 Hours**
Unsupervised Learning Clustering – K-Means Clustering – EM (Expectation Maximization) – Mixtures of Gaussians – EM algorithm in General – The Curse of Dimensionality – Dimensionality Reduction – Factor Analysis – Principal Component Analysis – Probabilistic PCA – Independent Component Analysis.	
Unit-4	**08 Hours**
Probabilistic Graphical Models Directed Graphical Models – Bayesian Networks – Exploiting Independence Properties – From Distributions to Graphs – Examples – Markov Random Fields – Inference In Graphical Models – Learning - Naïve Bayes Classifiers – Markov Models – Hidden Markov Models. Undirected graphical Models – Conditional Independence Properties.	
Unit-5	**08 Hours**
Advanced Learning Basic Sampling Method – Monte Carlo, Reinforcement Learning-Introduction-The Learning Task, and Elements of Reinforcement Learning. Computer Vision: Applications of Computer Vision Using Machine Learning: Speech Processing, Natural Language Processing.	

Text Books:

1. Christopher Bishop, “Pattern Recognition and Machine Learning”, Springer 2006
2. EthemAlpaydin, “Introduction to Machine Learning”, Prentice Hall of India, 2005
3. Joel Grus, “Data Science from Scratch- First Principles with Python”, O’Reilly, 2015
4. Tom Mitchell, “ Machine Learning”, McGraw-Hill, 1997

ReferenceBooks:

1. Stephen MarsLand, “Machine Learning-An Algorithmic Perspective”, CRC Press, 2009
2. Kevin P. Murphy, “Machine Learning: A Probabilistic Perspective”, MIT Press, 2012
3. M. Gopal, “Applied MACHINE LEARNING”, McGraw-Hill, 2018
4. Mark Summerfield, “Programming in Python 3: A Complete Introduction to the Python Language”, Addison Wesley, 2010

Data Science with R [Elective-2(c)]

[As per Choice Based Credit System (CBCS) Scheme]

SEMESTER-IV

Subject Code	**MCA-402-2(c)**	**INTERNAL ASSESSMENT (IA) MARKS**	**30**
Number of Lecture Hours / Week	**03**	**END TERM EXAM (ETE) MARKS**	**70**
Total Number of Lecture Hours	**40**	**SEMESTER END EXAM HOURS**	**03**

Credits: 03

CONTENTS	Teaching Hours
Unit-1	**08 Hours**
Introduction R: Concept, Advantages of R over Other Programming Languages - R Studio: R command Prompt, R script file, comments – Handling Packages in R: Installing a R Package, Few commands to get started: installed.packages(), package Description(), help(), find.package(), library() - Input and Output – Entering Data from keyboard – Printing fewer digits or more digits – Special Values functions : NA, Inf and –inf.	
Unit-2	**08 Hours**
R Data Types: Vectors, Lists, Matrices, Arrays, Factors, Data Frame – R – Variables, Data types of Variable, R Operators,R Decision Making: if statement, if – else statement, if – else if statement, switch statement – R Loops: repeat loop, while loop, for loop - Loop control statement: break statement, next statement.	
Unit-3	**08 Hours**
R-Function : function definition, Built in functions: mean(), paste(), sum(), min(), max(), seq(), user-defined function, calling a function, calling a function without an argument, calling a function with argument values - R-Strings – Manipulating Text in Data: substr(), strsplit(), paste(), grep(), toupper(), tolower() - R Vectors – Sequence vector, rep function, vector access, vector names, vector math, vector recycling, vector element sorting - R List - Creating a List, List Tags and Values, Add/Delete Element to or from a List, Size of List, Merging Lists, Converting List to Vector - R Matrices – Accessing Elements of a Matrix, Matrix Computations: Addition, subtraction, Multiplication and Division- R Arrays: Naming Columns and Rows, Accessing Array Elements, Manipulating Array Elements, Calculation Across Array Elements - R Factors –creating factors, generating factor levels gl().	
Unit-4	**08 Hours**
Data Frames –Create Data Frame, Data Frame Access, Understanding Data in Data Frames: dim(), nrow(), ncol(), str(), Summary(), names(), head(), tail(), edit() functions - Extract Data from Data Frame, Expand Data Frame: Add Column, Add Row - Joining columns and rows in a Data frame rbind() and cbind() – Merging Data frames merge() – Melting and Casting data melt(), cast(). Loading and handling Data in R: Getting and Setting the Working Directory – getwd(), setwd(), dir() - R-CSV Files - Input as a CSV file, Reading a CSV File, Analyzing the CSV File: summary(), min(), max(), range(), mean(), median(), apply() - Writing into a CSV File – R -Excel File – Reading the Excel file.	
Unit-5	**08 Hours**
Descriptive Statistics: Data Range, Frequencies, Mode, Mean and Median: Mean Applying Trim Option, Applying NA Option, Median - Mode - Standard Deviation – Correlation - Data Visualization: visually Checking Distributions for a single Variable - R – Pie Charts: Pie Chart title and Colors – Slice Percentages and Chart Legend, 3D Pie Chart – R Histograms – Density Plot - R – Bar Charts: Bar Chart Labels, Title and Colors.	
Text Books: • SandipRakshit, R Programming for Beginners, McGraw Hill Education (India), 2017, ISBN : 978-93-5260-455-5. • SeemaAcharya, Data Analytics using R, McGrawHill Education (India), 2018, ISBN: 978-93-5260-524-8.	

Reference Books: • Foster Provost & Tom Fawcett, " Data Science for Business", O' Reilly, 2013 • James Warren and Nathan Marz, "Big Data: Principles and Best Practices of Scalable Realtime Data Systems", Manning Publications, 2015 • Anil Maheshwari, " Data Analytics", McGrawHill Publications, 2017	

Industrial Project

[As per Choice Based Credit System (CBCS) Scheme)
SEMESTER-IV

Subject Code	**MCA-451**	**INTERNAL ASSESSMENT (IA) MARKS**	**30**
Number of Lecture Hours / Week	**12**	**END TERM EXAM (ETE) MARKS**	**70**
Total Number of Lecture Hours	**40**	**SEMESTER END EXAM HOURS**	**03**

Credits: 06

The industrial project as part of the curriculum will be held in the institute as one of the laboratories. This may be in continuationto the project under taken by the student during industrial training and/or of industrial nature and/or have good industrial significance and/or may be done in collaboration with industry (as per suitability at the institute level).

The evaluation will be done in the institute by one internal examiner and one external examiner (from outside the institute) appointed by RTU.

Guidelines for Submission of Industrial Project

All the candidates of MCA are required to submit a **Final Project Report** based on the work done by him/her during the project period.

THE GUIDE

The Guide for MCA would be a person having MCA with 3 years' experience in academic/Industry.

PROJECT TIME
The MCA Major Projects would be at list 12 Weeks and carries a total of 100 marks. The Project topics should be based on syllabus or as per the requirement of specific industry in sync with the course. Every student has to prepare and submit the project work in a group or separately (Max two students). Plagiarism would not be accepted under any circumstances.

Project Report should compulsorily include the software development/ soft copy should also be submitted in CD along with Hard Bound Project report.

Project Evaluation Guidelines.

The project is evaluated on the basis of following aspects:

Presentation & Software execution: 40% of total marks.

Project report (documentation): 30% of total marks.

Viva-Voce: 30% of total marks.

SUMMARY/ABSTRACT
All students must submit a summary/abstract separately with the project report. Summary, preferably, should be of about 3-4 pages. The content should be as brief as is sufficient enough to explain the objective and implementation of the project that the candidate is going to take up. The write up must adhere to the guidelines and should include the following :

- Name / Title of the Project and about the Problems
- Why is the particular topic chosen?
- Objective and scope of the Project
- Methodology (including a summary of the project)
- Hardware & Software to be used
- Testing Technologies used
- What contribution would the project make?

TOPIC OF THE PROJECT- This should be explicitly mentioned at the beginning of the Synopsis. This being the overall impression on the future work, the topic should be able to corroborate the work.

OBJECTIVE AND SCOPE: This should give a clear picture of the project. Objective should be clearly specified. What the project ends up to and in what way this is going to help the end user has to be mentioned.

PROCESS DISCRIPTION: The process of the whole software system proposed, to be developed, should be mentioned in brief. This may be supported by DFDs / Flowcharts to explain the flow of the information.

RESOURCES AND LIMITATIONS: The requirement of the resources for designing and developing the proposed system must be given. The resources might be in form of the hardware/software or the data from the industry. The limitation of the proposed system in respect of a larger and comprehensive system must be given.

CONCLUSION: The write-up must end with the concluding remarks-briefly describing innovation in the approach for implementing the Project, main achievements and also any other important feature that makes the system stand out from the rest.

The following suggested guidelines must be followed in preparing the Final Project Report:

The industrial project as part of the curriculum will be held in the institute as one of the laboratories. This may be in continuation to the project under taken by the student during industrial training and/or of industrial nature and/or have good industrial significance and/or may be done in collaboration with industry (as per suitability at the institute level). The evaluation will be done in the institute by one internal examiner and one external examiner (from outside the institute) appointed by RTU.

The Project study and development should be on the following lines:

FORMAT OF THE STUDENT PROJECT REPORT ON COMPLETION

1. Cover Page as per specifiedformat
2. Declaration Certificate
3. Acknowledgement
4. Certificate of the Company /Institute
5. Main Report

1. Introducton

    1.1 Objectives
    1.2 Problem description
    1.3 About Organization

2. System Study

2.1 System with limitations
2.2 Significance of the Project
2.3 Beneficiaries of the System
2.4 Feasibility study

3. System Analysis

Requirement Specification

i. Functional Requirement.
ii. Non Functional Requirement.
iii. User Requirement
iv. System Requirement

4. System Design

a) Data Flow Diagram

b) E-R Diagrams

c) Use Case Diagrams

d) Flow Charts

e) Database Tables

f) Input output Forms

5. Development

a) Environment
b) Coding Style
c) Coding Techniques
d) Coding

6. Testing

a. Test cases

7. System Security

b. Checks and Control
c. Encryption, secure

8. Conclusion/Future Enhancement

9. Bibliography

The reports prepared by the students MUST NOT have only definitions of the above mentioned topics but should explicitly state these in the context of the project undertaken. They should submit the actual work done in details.

General instructions about preparation of report

Paper: A4

Font: Times New Roman, Bookman Old Style

Chapter Heading: 16pt, Sub heading: 14, Sub-Sub Headings: 12

Bold Running Matter: 12 pt

Paragraph Gap: 6 Pt Maximum

Line Gap: 1.5

Margins: Left 1.5, Right, Top and Bottom 1 inch

All diagrams/figures and tables should be appropriately numbered.

Submission of Project Report to the University:

The student will submit his/her project report in the prescribed format. The Project Report should include:

- Copy of the Summary/Abstract. To be mailed to college/Institute well in advance mentioning the about future project which would be undertaken.
- Two Hard Bound Copies of the Project Report which is around 80 to 120 pages.
- Soft copy of project on CD/DVD/Pen Drive pasted inside of the back cover of the project report.

Binding & Color code of the report/Thesis

For MCA – IV Semester (Industrial Project work)
Hard Bound Report
Cover/Background of the Page of Project Report – **Sky Blue**
Letters in Black

Cover page

An
Industrial Project Report
on
<"Write title of Project>

SubmittedtotheRajasthanTechnicalUniversity,Kotain

Partialfulfillmentoftherequirementforthedegreeof

MASTER OF COMPUTER APPICATIONS

<Logo of your college> **<RTUlogo>**

Supervisor

<Name>

Designation

Submitted By:

<Name of Candidate >

Enrolment No.: .....

<Nameofyour college>

Affiliatedto

Rajasthan Technical University,
Kota(Rajasthan)-324010

Month and Year

Candidate's Declaration

I hereby declare that the work, which is being presented in the MCA-451, Instrial Project , entitled **"**.....(Title).....**"**in partial fulfilment for the award of Degree of "Master of Computer Applications" in Deptartment of Computer Applications **submitted to the** .....(Name of College)....., Rajasthan Technical University is a record of my own work carried under the Guidance of Shri/ Dr. ....., Deptartment of Computer Applications,.....(Name of College)..... .

I have not submitted the matter presented in this Project Report any where for the award of any other Degree.

<Name and Signature of Candidate>

Enrolment No.: .....

.....(Name of College)....,

Name(s) of Supervisor(s)

.....

.....

<college Name>
<name of Department >

Certificate

Date:

This is to certify that the Industrial Project (MCA-451) work entitled "*name of the project*'' submitted by "*name of student***"** (RTU Roll No. ……)to the Department Of Computer Science and Application of <college name> has been examined and evaluated.

The Project work has been prepared as per the regulations of Rajasthan Technical University, Kota and qualifies to be accepted in partial fulfillment of the requirement for the degree of MCA (Master of Computer Applications).

Signature of the student

Supervisor/Guide
(Name with Designation)

External Examiner
(Name with Designation)

Head of Institution/Principal

On Original Company Letter Head

Ref No…….. Date:

Certificate

This is to certify that **your name (RTU Roll No.)** is/was undertraining from _____ (**startdate**) to _____(**enddate**)undermysupervisioninpartialfulfillmentof therequirementforthe award of the Degree of **Master of Computer Applications**.

Duringthis period he /she has workedon……. ("**Project Name**") as a …..(**Role of student**).

TrainingIncharge/Project Leader/HR

(Seal/Sign and Name with Designation)