

Syllabus of MCA IV Semester-2021-22

Note :

1. Papers MCA 401, MCA 402, MCA 411, MCA 412 and MCA 413 are compulsory(CCC) and Paper MCA 403 is elective(ECC).
2. Continuous assessment(Internal) will be done by the concerned teacher on the basis of test papers, regularity in the class and performance of the student. Maximum marks in continuous assessment of each paper is 100.

MCA-401 : Analysis and Design of Algorithms

Theory & Tutorial: 4 hours per week (4 Credits)

Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:

1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I

Introduction: Algorithm Definition and Specifications, Design of Algorithms and Complexity of Algorithms, Asymptotic Notations, Growth function, Recurrences and Performance Analysis.

Divide and Conquer Algorithms: General method, Binary search, Merge sort, Quick Sort.

Unit II

Greedy Methods: General method, Knapsack Problem, Job Selection with Deadline problem, A task scheduling problem, Minimum Cost Spanning Tree, Single Source Shortest Path.

Dynamic Programming: General method, Multistage graphs, Optimal Binary Search trees, 0/1 Knapsack, Travel Salesman Problem, Flow Shop Scheduling.

Unit III

Advanced data structure: Red-Black Tree, M-way trees, B-trees, Binomial Trees, Fibonacci Heaps, Data Structure for Disjoint Sets.

Backtracking: General method, 8 Queens Problem, Sum of Subsets, Graph Colouring, Hamiltonian Cycles, Knapsack Problem.

Unit IV

Branch and Bound: 0/1 Knapsack Problem, Travel Salesman Problem.

Randomized Algorithms, String Matching, NP-Hard and NP-Completeness, Approximation Algorithms, Vertex Cover Problem, Set Cover Problem, Hamiltonian Cycle, Clique Problem.

Reference Books:

1. Thomas H Cormen, C.E. Leiserson, R.L. Rivest, C. Stein; Introduction to Algorithms, 3 ed; PHI.
2. E. Horowitz, S. Sahni, S. Raja Sekaran ; Fundamentals of computer Algorithms;
3. Aho A.V , J.D Ulman: Design and analysis of Algorithms, Addison Wesley

Pooja Jain
Dy. Registrar
(Academic)
University of Rajasthan
JAIPUR

Elective Theory Papers for Elective Group-3 of MCA IV Sem

MCA-C01 : Data Science with R

Theory & Tutorial: 4 hours per week (4 Credits)

Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:

1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I

Introduction to Data Science : What is Data Science, Need for Data Science, Components of Data Science, Big data, Facets of data: Structured data, Unstructured data, Natural Language, Machine-generated data, Graph-based or network data, Audio, image and video, Streaming data, The need for Business Analytics, Data Science Life Cycle, Applications of data science.

Unit-II

Data Science Process : Overview of data science process, setting the research goal, Retrieving data, Cleansing, integrating and transforming data, Exploratory data analysis, Data Modeling, Presentation and automation, Types of Analytics: Descriptive analytics, Diagnostic analytics, Predictive analytics, Prescriptive analytics.

Unit-III

Statistics : Basic terminologies, Population, Sample, Parameter, Estimate, Estimator, Sampling distribution, Standard Error, Properties of Good Estimator, Measures of Centers, Measures of Spread, Probability, Normal Distribution, Binary Distribution, Hypothesis Testing ,Chi-Square Test , ANOVA.

Unit-IV

Data Science Tools and Algorithms : Basic Data Science languages- R, Python, Knowledge of Excel, SQL Database, Introduction to Weka, Regression Algorithms: How Regression Algorithm Work, Linear Regression, Logistic Regression, K-Nearest Neighbors Algorithm, K-means algorithm.

Recommended Books :

1. Samuel Burns, "Fundamentals of Data Science: Take the first Step to Become a Data Scientist" , Amazon KDP Printing and Publishing, First Edition, 2019
2. Davy Cielen, Arno D.B. Meysman, Mohamed Ali, "Introducing Data Science", Manning Publications, 2016
3. Cathy O'Neil and Rachel Schutt, "Doing Data Science, Straight Talk From The Frontline", O'Reilly. 2014.

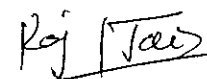
MCA-C02 : Machine Learning

Theory & Tutorial: 4 hours per week (4 Credits)

Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:

1. Candidate has to attempt five questions in all. All questions carry equal marks.


Dy. Registrar
(Academic)
University of Rajasthan
JAIPUR

45

2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I

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, Designing a learning system.

Concept Learning : Introduction, a concept learning task, concept learning as search, Find-S algorithm, Version space and Candidate-Elimination algorithm, Inductive bias

Unit-II

Supervised Learning : Introduction, Linear Models of Classification – Decision Trees, Naïve Bayes Classification, Linear Regression – Logistic Regression, Bayesian Logistic Regression, Probabilistic Models, Artificial Neural Network- perceptron, multilayer networks and back propagation algorithm, Ensemble Methods – Random Forest – Bagging – Boosting.

Evaluating Hypothesis : estimating hypothesis accuracy, basics of sampling theory, comparing learning algorithms.

Unit-III

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. Challenges for Big Data Analytics.


Unit-IV

Instance based Learning-Nearest neighbor classification, k-nearest neighbor, locally weighted regression, lazy and eager learner

Reinforcement Learning-Introduction, Elements of Reinforcement Learning, Difference between Reinforcement Learning and Supervised Learning, Applications of Reinforcement Learning, The Learning Task, Q learning, Nondeterministic rewards and actions, Temporal difference learning. Model based learning, Semi-Supervised Learning, Computational Learning Theory.

Recommended Text / Reference Books:

1. Christopher Bishop, "Pattern Recognition and Machine Learning", Springer 2006
2. Ethem Alpaydin, "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
5. Stephen MarsLand, "Machine Learning-An Algorithmic Perspective", CRC Press, 2009
6. Kevin P. Murphy, "Machine Learning: A Probabilistic Perspective", MIT Press, 2012
7. M. Gopal, "Applied MACHINE LEARNING", McGraw-Hill, 2018
8. Mark Summerfield, "Programming in Python 3: A Complete Introduction to the Python Language", Addison Wesley, 2010


Dr. Registrar 46
(Academic)
University of Rajasthan
JAIPUR

MCA-C03 : Digital Marketing

Theory & Tutorial: 4 hours per week (4 Credits)

Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:

1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I

Digital Marketing Fundamentals : Marketing v/s Sales, Marketing Mix and 4 Ps, What is Digital Marketing, CRM platform, CRM models, CRM platform, Marketing Automation, Inbound vs Outbound Marketing, Content Marketing, Understanding Traffic, Understanding Leads, Strategic Flow for Marketing Activities.

Unit-II

Website Planning and Structure : WWW, Domains, Buying a Domain, Website Language & Technology, Core Objective of Website and Flow, One Page Website, Google Analytics, Tracking Code, Website Auditing.

Search Engine Optimization: Basic Concepts, how Search Engine works, Keywords, Keywords, titles, meta tags, On page optimization techniques, Off page Optimization techniques, SEO Audit & Future of SEO.

Unit-III

Email Marketing: Content Writing, Email Machine – The Strategy, Email Frequency, Triggers in Email using 4Ps, Sequence of Email Triggers, Email Software and Tools, Importing Email Lists, Planning Email Campaign, Email Templates and Designs, Sending HTML Email Campaigns, WebForms Lead Importing, Integrating Landing Page Forms Campaign Reports and Insights, Segmentation Strategy Segmentation, Lists Auto-Responder Series Triggering Auto – Responder Emails

Google Adwords : Basics, Google Ad Types, Pricing Models, PPC Cost Formula, Ad Page Rank, Billing and Payments, Adwords User Interface, Keyword Planning, Keywords Control, Creating Ad Campaigns, Creating Text Ads, Creating Ad Groups, Bidding Strategy for CPC.

Unit-IV

Social Media Optimization (SMO) : Introduction , Advanced Facebook Marketing, Word Press Blog Creation, Twitter Marketing, LinkedIn Marketing, Google Plus Marketing, Instagram, Social Media Analytical Tools, Scheduling Posts, Social media Events, Reply and Message. Social media Ad Campaigns: Organic v/s Paid, Ad Objective Performance Matrix , Ad Components, Youtube Marketing: Channel Links, Channel Keywords, Branding Watermark, Uploading Videos, Featured Contents on Channel

Raj / Jain

Dy. Registrar
(Academic)
University of Rajasthan
JAIPUR

Recommended Text / Reference Books:

1. Ian Dodson, "The Art of Digital Marketing", Wiley, 2018
2. Seema Gupta, "Digital Marketing" Mc-Graw Hill, 1st Edition, 2017
3. **References:** Puneet Singh Bhatia, "Fundamentals of Digital Marketing", Pearson, 1st Edition, 2017
4. Vandana Ahuja, "Digital Marketing", Oxford University Press
5. Philip Kotler, "Marketing 4.0: – Moving from Traditional to Digital", Wiley, 2017

MCA-C04 : Open Source Operating System

Theory & Tutorial: 4 hours per week (4 Credits)

Examination: Theory Paper – 3 hours; Max. Marks – 100

Note:

1. Candidate has to attempt five questions in all. All questions carry equal marks.
2. Question No. 1 covering whole syllabus will consists of 10 short answer questions carrying 2 marks each.
3. Question No. 2 to 5, each of 20 marks, will be framed by taking one question from each unit. There will be an internal choice within the unit.

Unit-I

Introduction to concept of Open Source Software: Introduction to Linux , Evolution of Linux, Linux vs. UNIX, Different Distributions of Linux, Installing Linux, Linux Architecture, **Linux file system** (inode, Super block, Mounting and Unmounting), Essential Linux Commands (Internal and External Commands), Kernel, Process Management in Linux, Signal Handling, System call, System call for Files, Processes and Signals.

Unit-II

Filter-The grep family, advanced filters-sed and awk vi editor: General startup of vi editor and its modes, Creating and editing files, features of vi, screen movement, cursor movement insertion, deletion searching, submitting operations, yank put, delete commands reading & writing files, advance editing techniques vim (improved vi).

Shell: meaning and purpose of shell, introduction to types of shell. the command line, standard input and standard output, redirection pipes, filters special characters for searching files and pathnames.

Unit-III

Shell Programming: Shell Programming – Introduction to Shell, Various Shell of Linux, Shell Commands, I/O Redirection and Piping, Vi and Emacs editor, Shell control statements, Variables, if-then-else, case-switch, While, Until, Find, Shell Meta characters, Shell Scripts, Shell keywords, Tips and Traps, Built in Commands, Handling documents, C language programming, Prototyping, Coding, Compiling, Testing and Debugging, Filters.

Unit-IV

Linux System Administrations: File listings, Ownership and Access Permissions, File and Directory types, Managing Files, User and its Home Directory, Booting and Shutting down (Boot Loaders, LILO, GRUB, Bootstrapping, init Process, System services)

Raj (Tain)

48

Dy. Registrar

(Acad. In-charge)

University of Rajasthan
Jaipur

Networking : Networking tools, E-mail Remote login, FTP, Network and Server setup LAN, Connection with Internet Setting-up routers, Proxy Servers, Print-Server, File server, mail Server, Web server and Database server.

Recommended Text / Reference Books:

1. Peterson Richard, " The Complete Reference Linux " Tata McGraw Hill.
2. Simitabha Das, "Unix/Linux Concepts & Applications". Tata McGraw Hill,2008
3. Forouzan B. A., Gilberg R. R., "UNIX and Shell Programming", TMH, 2nd edition, 2008.
4. Beginning Linux Programming N, Mathew, R. Stones, Wrox, Wiley India Ed.
5. Yshavant P, Kanetkar, Shell Programming
6. Linux System Programming, Robert Love, O" Reilly SPD.
7. Vijay Shekhar; Red hat Linux study guide firewall media.
8. Richard Petersen: The Complete Reference ; Linux; TMH
9. Practical Guide to Linux Commands, Editors, and Shell Programming, Sobell, Pearson, 2nd Edition, 2010.
10. A Practical Guide to Fedora and Red Hat Enterprise Linux, Sobell, Pearson, 5th Edition, 2010.

Practical Examination

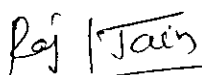
Each practical paper shall be of 3 hours duration on one day and carry 100 marks for the practical examination. The practical examination will involve 3 exercises, each of 20 marks, practical record of 15 marks and viva-voce examination of 25 marks.

MCA 411 : ADA Lab

Practical Lab : Examination : Practical Examination
Lab Exercise based on Theory Paper MCA 401.

List of Experiments:

1. Linear search & binary search , Sorting Techniques
2. Stacks and queues operations (with arrays and pointers)
3. Link List and Trees operations (with arrays and pointers)
4. graphs – basic traversal and search techniques
5. Greedy method:-knapsack problem
6. Greedy method minimum cost spanning tree
7. Dynamic Programming – 0/1 Knapsack
8. Dynamic Programming – traveling salesman problem
9. Backtracking 8-Queens problem
10. Backtracking Sum of Subsets
11. Branch and Bound -0/1 Knapsack problem
12. Sequential and Dynamic Implementations


Dy. Registrar
(Academic)
University of Rajasthan
JAIPUR

Elective Lab Papers for Elective Group-4 of MCA IV Sem

MCA D01 : Data Science with R Lab

Practical Lab : Examination : Practical Examination
Lab Exercise based on Theory Paper MCA C01.

R Programming: Fundamentals, Properties & Characteristics, Data Types, Operators, Control & Looping Structures, Array & String handling, Functions, Vector & Matrices processing, Factors, Data Frames, Packages, Data Reshaping, Data and File management, Charts and Graphs.

Data science with R/Python : Overviews, data visualisation using graphics in R, GGplot 2, File format of graphics output, introduction to hypotheses, types of hypothesis, data sampling, confidence and significance level, hypothesis tests, parametric test, non-parametric test,

Regression Algorithms in R/Python : How Regression Algorithm Work, Linear Regression, Logistic Regression, K-Nearest Neighbors Algorithm, K-means algorithm.

MCA D02 : Machine Learning Lab

Practical Lab : Examination : Practical Examination
Lab Exercise based on Theory Paper MCA C02.

List of Experiments(Contents):

1. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training samples. Read the training data from a .csv file.
2. Implement working of the decision tree based ID3 algorithm using appropriate data set to classify it.
3. Develop an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data set.
4. Implement the naïve Bayesian classifier using appropriate data set and compute its accuracy, considering few data sets.
5. Implement Bayesian network considering medical data. Use this model to demonstrate the diagnosis of Heart Disease Data Set.
6. Implement EM algorithm to cluster a set of data stored in a .CSV file.
7. Implement k-means algorithm to cluster same set of data as in experiment 6 and compare the results of these two algorithms and comment on the quality of clustering.
8. Implement k-Nearest Neighbor algorithm to classify the iris data set and display both correct and incorrect predictions.
9. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Apply it on an appropriate data set and draw graph.

MCA D03 : Digital Marketing Lab

Practical Lab :
Examination : Practical Examination
Lab Exercise based on Theory Paper MCA C03.

List of Experiments(Contents):

1. Search Engine Optimization

Raj Jain
Dy. Registrar
(Academic)
University of Rajasthan
JAIPUR

2. Blogs Creation
3. Website Analytics and Auditing
4. Social media Ad Structure
5. FaceBook Campaigns
6. YouTube Marketing
7. Email Marketing
8. Google Adwords

MCA D04 : Open Source OS Lab

Practical Lab :

Examination : Practical Examination

Lab Exercise based on Theory Paper MCA C04.

List of Experiments(Contents):

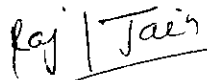
1. Basic Shell Commands
2. Study of Unix/Linux
 - General purpose utility command
 - File system navigation
 - File attributes
 - System's environment
 - Simple and advanced filters
3. I/O Redirections
4. Working with vi editor

Shell Programs:

5. Implementation of Shell Programming Concepts:
 - Shell programming in bash
 - Shell Variables Input concepts
 - Expression
 - Decisions and repetition
 - Special parameters and variables
 - Command line arguments
 - Case statements
 - Changing positional parameters and argument validation
 - String manipulation
 - File Operations
 - Base conversion
6. User defined functions.

Administration:

7. Installing Linux through bootable media/ through NFS
8. Creating & Managing User Accounts
9. Creating & Managing Groups.


Dy. Registrar
(Academic)
University of Rajasthan
JAIPUR

MCA 413 : Industrial Training (Major Project)

Practical Lab : Examination : Practical Examination

Guidelines for Preparation the Project Report:

1. **Objective :** Student should able to develop a small real time application using programming languages which is part of their course curriculum or any new upcoming programming languages/technology.
2. **Project Report Formulation:**
 - a. **The project report should contain the following:**
 - Original copy of the Approved Performa and Project Proposal.
 - Bio-data of the guide with her/his signature and date.
 - Certificate of Originality (Format given).
 - Project documentation.
 - A CD consisting of the executable file(s) of the complete project should be attached on the last page of the project report. In no case, it should be sent separately. The student needs to retain the identical copy of the CD that should be carried while appearing for the viva-voce along with the project report.
 - b. **Project Documentation:**
 - Project documentation may be about 100 to 125 pages (excluding coding).
 - The project documentation details should not be too generic in nature.
 - Appropriate project report documentation should be done, like, how you have done the analysis, design, coding, use of testing techniques/strategies, etc., in respect of your project.
 - The project report should normally be printed with single line spacing on A4 paper (one side only). All the pages, tables and figures must be numbered. Tables and figures should contain titles.
 - **Two copies** of the original project report in the bound form along with the CD (containing the executable file(s) of the project should be enclosed in the last page) is to be prepared at the time of final viva. One copy of the same Project Report and the CD containing the executable file(s) shall be retained by the student, which should be produced before the examiner at the time of viva-voce.
3. **MANUAL FOR PREPARATION OF MCA Project (Prescribed Format and Specification)**
4. **Essential Components of Project Report :**
 - a. Title Page
 - b. Certificate from Company
 - c. Certificate from Guide
 - d. Acknowledgement
 - e. Index with printed Page Numbers

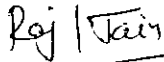
CHAPTER 1 : INTRODUCTION

- 1.1 Company/Educational Institute Profile
- 1.2 Existing System and Need for System
- 1.3 Scope of Work
- 1.4 Operating Environment – Hardware and Software

CHAPTER 2: PROPOSED SYSTEM

- 2.1 Proposed System
- 2.2 Objectives of System
- 2.3 User Requirements

CHAPTER 3: ANALYSIS & DESIGN


Dy. Registrar
(Academic)
University of Rajasthan
JAIPUR

- 3.1 Entity Relationship Diagram (ERD)
- 3.2 System Architecture
- 3.3 Database Requirements & User Interfaces
- 3.4 Data Flow Diagram (DFD)

- 3.5 Data Dictionary

- 3.6 Table Design
- 3.7 Code Design

- 3.6 Menu Screens
- 3.7 Input Screens
- 3.8 Report Formats
- 3.9 Test Procedures and Implementation

CHAPTER 4: User Manual

- 4.1 User Manual
- 4.2 Operations Manual / Menu Explanation
- 4.3 Forms and Report Specifications

Drawbacks and Limitations

Proposed Enhancements

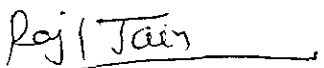
Conclusions

Bibliography

Annexure:

- Annexure 1: Input Forms with data
- Annexure 2: Output Reports with Data
- Annexure 3: Sample Code

Helpstudentpoint.com


Dy. Registrar
(Academic)
University of Rajasthan
JAIPUR

Format of Cover Page:

Major Project / Industrial Training

MCA-413

[UNIVERSITY LOGO]

Session: <Session>

A Project Report on

Title of the Project

Submitted for partial fulfillment of requirement for award of the degree of

Master of Computer Application (MCA 2021)

BY STUDENT

Under the Supervision

Name-

Name of the guide

Enrollment No.-

Batch-

To

University Centre for Computer Science & Information Technology (UCCS & IT)

University of Rajasthan

Jaipur

Raj Nais

Dy. Registrar

(Academic)

University of Rajasthan

JAIPUR