Radha Govind University, Ramgarh, Jharkhand

DEPARTMENT OF COMPUTER SCIENCE AND APPLICATIONS

CURRICULUM STRUCTURE

&

DETAILED SYLLABUS

For the students admitted to

Master of Computer Applications from the academic year

2020-21

(Under CBCS Guidelines)

Department: Department of Computer Science, RGU

Course: M.C.A. (Master in Computer Applications)

Duration: 2 Years

Total Number of Credits: 89

1. Preamble of the syllabus: This program is offered at the Department of Computer Science, Radha Govind University, Ramgarh, Jharkhand. Master of Computer Applications (M.C.A.) program is of 89 credits. The objective of the M.CA. programme is to train the students to meet the challenges of the Software Industry and R&D Sector with computational techniques. The structure of the program is as follows:

a) In semesters I and II there will be EIGHT courses including ELECTIVE courses per semester and each course will be of 4 credits, 3 credits and 2 credits respectively.
b) In semester III, the students can choose courses and Mini Project to earn 23 credits. These credits can be earned by opting the courses offered in the department or from other departments on the campus as per CBCS guidelines.
c) Semester IV will be full time Industrial training/Internship (18 credits) and a Seminar (2 credits).
d) A student cannot register for the third semester, if he/she fails to complete 50% credits of the total credits expected to be ordinarily completed within two semesters. In this case, a student can seek admission to first or second semester in order to complete the requisite number of credits and to be able to seek admission in the third semester.
e) A student will obtain non-zero credits only on obtaining a pass grade in a course.
f) In addition to CBCS guidelines for classroom delivery hours, 2 hours per subject across the course will be devoted towards outside classroom interactions.

2. Evaluation Rules :

a) 50% of marks as semester-end examination of minimum 30 minutes to maximum 45minutes per credit and
b) 50% marks for internal (i.e. in-semester) assessment.
c) Each credit will have an internal (continuous) assessment of 50% of marks and a teachermust select a variety of procedures for examination such as:
    a. Written Test and/or Mid Term Test (not more than one for each course);

b. Term Paper;

c. Journal/Lecture/Library notes;

d. Seminar presentation;

e. Short Quizzes;

f. Assignments;

g. Extension Work;

h. Research Project by individual students or group of students; or an Open Book Test (with the concerned teacher deciding what books are to beallowed for this purpose.)

d) To pass a course, the student has to obtain forty percent marks in the combined examination of in-semester assessment and semester-end assessment with a minimum of thirty percent in both these separately.

e) Students will be awarded grade/marks upon completion of full time Internship/Industrial Training .Internship/Industrial Training will be completed upon the submission of certificate of completion, duly signed and sealed by the mentor with a rating 1 to 5, where 1 being least and 5 being highest.

f) Topic of the Seminar will be decided by the student in consultation with assigned teacher. This will be evaluated by the respective teacher based on the presentation/submission by the student.

3. Completion of Degree Program:

a) In order to pass the Master of Computer Applications (M.C.A.) course a student has to obtain 89 credit points and complete the audit courses floated by the University time to time.

b) If a student fails in a course then the said course will not be taken into account for calculating GPA and overall grade. Only those courses in which the student has passed will be taken into account for calculating the GPA and overall grade.

c) The policies and procedures determined by the University will be followed for the conduct of examinations and declaration of the result of the candidate.

4. The overall course structure is given below:

MASTER OF COMPUTER APPLICATION

SUBJECT CODE = MCA

CURRICULUM STRUCTURE

MCA - I Semester

S. No	Subject Code	Subject Name	Periods			Internal Exam			End Sem. Exam	Total Marks	Credit
			L	T	P	CT	TA	Total			
1	MCA101	Computer Organization and Architecture	3	1	0	20	10	30	70	100	4
2	MCA102	Elective-I	3	1	0	20	10	30	70	100	4
3	MCA103	Discrete Mathematics	3	0	0	20	10	30	70	100	3
4	MCA104	Computer Network	3	0	0	20	10	30	70	100	3
5	MCA105	Software Engineering	3	0	0	20	10	30	70	100	3
6	MCA106	Computer Organization & Architecture **Lab**	0	0	4	30	10	40	60	100	2
7	MCA107	Elective-I **Laboratory**	0	0	3	30	10	40	60	100	2
8	MCA108	Corporate Communication Skills(Mandatory Course – Only Practical) **Lab**	0	0	2	30	10	40	60	100	2
		Total								800	23

****L/T/P:** Lecture/Tutorial/Practical ****CT**=Class Test, **TA**= Teacher Assessment

MCA - II Semester

S. No	Subject Code	Subject Name	Periods			Internal Exam			End Sem. Exam	Total Marks	Credit
			L	T	P	CT	TA	Total			
1	MCA201	Probability and Statistics	3	0	0	20	10	30	70	100	3
2	MCA202	Elective-II	3	1	0	20	10	30	70	100	4
3	MCA203	Database Management Systems(DBMS)	3	0	0	20	10	30	70	100	3
4	MCA204	Operating Systems	3	0	0	20	10	30	70	100	3
5	MCA205	Data Structures and Algorithms	3	1	0	20	10	30	70	100	4
6	MCA206	Elective-II **Laboratory**	0	0	4	30	10	40	60	100	2
7	MCA207	Database Management Systems(DBMS) **Lab**	0	0	3	30	10	40	60	100	2
8	MCA208	Data Structures and Algorithms **Lab**	0	0	3	30	10	40	60	100	2
		Total								800	23

****L/T/P:** Lecture/Tutorial/Practical ****CT**=Class Test, **TA**= Teacher Assessment

MCA - III Semester

S. No	Subject Code	Subject Name	Periods			Internal Exam			End Sem. Exam	Total Marks	Credit
			L	T	P	CT	TA	Total			
1	MCA301	Elective-III	3	1	0	20	10	30	70	100	4
2	MCA302	Elective-IV	3	1	0	20	10	30	70	100	4
3	MCA303	Elective-V	3	1	0	20	10	30	70	100	4
4	MCA304	Internship / Mini Project	0	0	6	30	20	50	150	200	7
5	MCA305	Elective-III **Laboratory**	0	0	4	30	10	40	60	100	2
6	MCA306	Elective-V **Laboratory**	0	0	3	30	10	40	60	100	2
		Total								700	23

****L/T/P:** Lecture/Tutorial/Practical ****CT**=Class Test, **TA**= Teacher Assessment

MCA - IV Semester

S. No	Subject Code	Subject Name	Periods			Internal Exam			End Sem. Exam	Total Marks	Credit
			L	T	P	CT	TA	Total			
1	MCA401	Major Project	0	0	24	30	20	50	350	400	18
2	MCA402	Seminar	0	2	0	20	10	30	70	100	2
		Total								500	20

****L/T/P:** Lecture/Tutorial/Practical ****CT**=Class Test, **TA**= Teacher Assessment

**********RGU-CS Deprt.**********

Discipline Elective - I

S No	Course Code	Course Name	Credits
1	MCA102-1	Programming in C	**04**
3	MCA102-2	Problem Solving with Python	**04**

Discipline Elective – I Laboratory

S No	Course Code	Course Name	Credits
1	MCA107-1	Programming in C Laboratory	**02**
2	MCA107-2	Problem Solving with Python Laboratory	**02**

Discipline Elective – II

S No	Course Code	Course Name	Credits
1	MCA202-1	Object Oriented Programming	**04**
2	MCA202-2	Web Technologies through Java	**04**
3	MCA202-3	Full Stack Web Development	**04**

Discipline Elective – II Laboratory

S. No	Course Code	Course Name	Credits
1	MCA206-1	Object Oriented Programming C Laboratory	**02**
2	MCA206-2	Web Technologies through Java Laboratory	**02**
3	MCA206-3	Full Stack Web Development Laboratory	**02**

Discipline Elective – III

S.No	Course Code	Course Name	Credits
1	MCA301-1	Deep Learning	**04**
2	MCA301-2	Software Testing	**04**
3	MCA301-3	Cryptography and Network Security	**04**
4	MCA301-4	Fundamentals of Data Science	**04**

Discipline Elective - III Laboratory

S.No	Course Code	Course Name	Credits
1	MCA305-1	Deep Learning Laboratory	**02**
2	MCA305-2	Software Testing Laboratory	**02**
3	MCA305-3	Cryptography and Network Security Laboratory	**02**
4	MCA305-4	Fundamentals of Data Science Laboratory	**02**

Discipline Elective - IV

S. No	Course Code	Course Name	Credits
1	MCA302-1	Artificial Intelligence	**04**
2	MCA302-2	Cloud Computing	**04**
3	MCA302-3	Big Data Analytics	**04**
4	MCA302-4	Cyber Security and Cyber Forensics	**04**

Discipline Elective – V

S No	Course Code	Course Name	Credits
1	MCA303-1	Advanced Data Structures and Algorithms	**04**
2	MCA303-2	.Net Framework and C#	**04**
3	MCA303-3	Internet of Things	**04**
4	MCA303-4	Advanced Java Programming	**04**

Discipline Elective – V Laboratory

S No	Course Code	Course Name	Credits
1	MCA306-1	Advanced Data Structures and Algorithms Laboratory	**02**
2	MCA306-2	.Net Framework and C# Laboratory	**02**
3	MCA306-3	Internet of Things Laboratory	**02**
5	MCA506-4	Advanced Java Programming Laboratory	**02**

Syllabus

MCA 1st Year
1st Semester

MCA – 1st Semester

MCA101 - COMPUTER ORGANIZATION AND ARCHITECTURE

UNIT I: OVERVIEW OF BASIC DIGITAL BUILDING BLOCKS

Basic structure of a digital computer, Number system and representation of information, arithmetic and logical operation, hardware implementation, Real numbers - fixed and floating point, IEEE754 representation. Logic gates, Sequential and combinational circuits, flip flop, adders, multiplexers, encoders, decoders, Registers.

UNIT II: BASIC PROCESSING UNIT

Fundamental concepts, Addressing modes, RISC, CISC, Registers, Instruction formats, ALU design Execution of a complete instruction, Multiple bus organization, Hardwired control , Micro programmed control, Nano programming.

UNIT III: PIPELINING

Basic concepts , Data hazards ,Instruction hazards ,Influence on instruction sets, Data path and control considerations, Performance considerations Exception handling.

UNIT IV: MEMORY SYSTEM

Basic concepts, Semiconductor, Magnetic, Optical memories, Semiconductor RAM ,ROM, Speed Size and cost, Cache memories, Improving cache performance, Virtual memory, Memory management requirements ,Associative memories, Secondary storage devices.

UNIT V: I/O ORGANIZATION

Accessing I/O devices, Programmed Input/output, Interrupts, Direct Memory Access, Buses Interface circuits, Standard I/O Interfaces (PCI, SCSI, USB), I/O devices and processor

Text Books:

1. Computer Organization and Architecture by William Stallings 9th Edition,
2. Computer System Architecture by M. Morris Mano, 4th Edition

Reference Books:

1. Computer Organization, Carl Hamacher , Zaky
2. Computer Architecture and Organization, Miles Murudocca, Vincent Heuring , Wiley
3. Computer System Organization and Architecture, M.Usha, T.S. Srikanth

MCA102 – ELECTIVE-I (Choose from Discipline Elective – I)

MCA103 - DISCRETE MATHEMATICS

UNIT I: FOUNDATIONS OF LOGIC

Introduction, truth tables, statements and notations, propositional logic; Connectives, propositional equivalence; predicate and quantifiers; Normal forms; rules of Inference; methods of proofs.

UNIT II: SET THEORY, RELATIONS & FUNCTIONS

Basics of set theory, set operations, Relations and their properties, representing relations, Properties of binary Relations, Equivalence relations, Lattice and its Properties, Partial ordering, Hasse diagram. Composition of functions, Inverse Function, types of functions, Recursive Functions.

UNIT III: GRAPH THEORY

Graphs and graph models, graph terminology and special types of graphs, representing graphs and graph isomorphism, connectivity, Euler and Hamiltonian paths, shortest path problems, planar graphs, graph coloring, Trees: Introduction to trees, Applications of trees, spanning trees & minimum spanning trees.

UNIT IV: ALGEBRAIC STRUCTURES& ELEMENTARY COMBINATORICS

Definition and elementary properties of groups, semigroups, monoids. Elementary Combinatorics: counting techniques, Pigeonhole Principle and its application. Recursion, Recurrence relation.

UNIT V: NUMBER THEORY & AUTOMATA THEORY

Basic Number theory, prime numbers, modular congruence, Integers and algorithms, Applications of number theory- RSA algorithm. Languages and Grammars, Finite state machines with output, Finite state machines with no output, Language recognition, Turing machines.

Text Book:

1. Discrete Mathematics and its applications, Kenneth Rosen, Seventh Edition,TataMcGrawHill Education Private Limited.
2. Discrete Mathematical Structures with Applications to computer science J.P Tremblay, R. Manohar, TMH.

References:

1. "Discrete mathematics for computer scientists and mathematicians", Mott, Kandel, Baker,PHI
2. Johnson Baugh R, and Carman R, Discrete mathematics, 5th edition, Person Education,2003.
3. Kolman B, Busoy R.C, and Ross S.C, Discrete Mathematical Structures, 5th edition, Pretitice – Hall, 2004.

MCA104 - COMPUTER NETWORKS

UNIT I: INTRODUCTION

Uses of Networks, Categories of Networks -Communication model, Data transmission concepts and terminology, Protocol Architecture – Protocols, OSI, TCP/IP, LAN Topology, Transmission media.

UNIT II - DATA LINK LAYER

The Data Link Layer: Design Issues –Error Detection and Correction – Elementary Data Link Protocol – Sliding Window Protocol – HDLC. Medium Access Control Sub Layer: Multiple Access Protocol: CSMA Protocol – Collision Free Protocol – Data Link Layer Switching- Repeaters, Hub, Bridges, Switches, Router and Gateways - Bluetooth.

UNIT III - NETWORK LAYER

Network layer – Switching concepts – Circuit switching – Packet switching –IP — Datagrams — IP addresses-IPV6– ICMP – Routing Protocols – Distance Vector – Link State- BGP.

UNIT IV - APPLICATION &TRANSPORT LAYER

Transport layer –service –Connection establishment – Flow control – Transmission Control Protocol – Congestion control and avoidance – User datagram protocol. -Transport for Real Time Applications (RTP).

Applications - DNS- SMTP–FTP- WWW–SNMP

UNIT V - SECURITY

Introduction – Substitution and Transposition Cipher–Symmetric Key and Asymmetric Key Cryptography – AES, DES, IDEA, RSA, SHA, Types of Attacks Security Services- Firewall andits types.

Text Books:

1. Andrew S. Tanenbaum, “Computer Networks”, 4th Edition, Eastern Economy Edition.
2. Frozen, “Data Communication and Networking”, Fifth Edition, TMH 2012.
3. William Stallings, “Data and Computer Communications”, Tenth Edition, Pearson Education, 2013

References:

1. Achyut S God bole, AtulHahate, “Data Communications and Networks”, Second edition 2011
2. Douglas E. Comer, ―Internetworking with TCP/IP (Volume I) Principles, Protocols and Architecture‖, Sixth Edition, Pearson Education, 2013.
3. James F. Kurose, Keith W. Ross, “Computer Networking: A Top-down Approach, Pearson Education, Limited, sixth edition,2012.
4. John Cowley, “Communications and Networking : An Introduction”, Springer Indian Reprint, 2010.
5. Larry L. Peterson & Bruce S. Davie, “Computer Networks – A systems Approach”, Fifth Edition, Morgan Kaufmann, 2012
6. Wayne Tomasi, “Introduction to Data communications and Networking”, Pearson 2011

MCA105 - SOFTWARE ENGINEERING

UNIT I: SOFTWARE ENGINEERING AND MODELS

Software Engineering Paradigms: Software Characteristics, Software myths, Software Applications, Software Engineering Definitions, Software Process Models, Process iteration, Process activities. Project planning, Project scheduling.

UNIT II: REQUIREMENTS AND MODELING

Understanding Requirements, Requirement Analysis, Scenario Based Modeling, Data Modeling Concepts, Class Based Modeling. Requirement Modeling: Flow based, Creating Behavioural Model, Requirement Modeling for WebApps.

UNIT III: DESIGN AND METRICS

Software Design Concepts: Process, Concepts, Models. Architectural Design, Component levelDesign, User Interface Design, WebApp Design.
Product Metrics: Framework for Product Metrics, Metrics for Requirement Model, DesignModel, Webapps, Source Code, Testing and Maintenance.
Process and Project Metrics: Metrics in Process and Project Domain, Software Measurement,Quality, Integrating metrics with Software Process, Metrics for Small Organization.

UNIT IV:TESTING AND QUALITY ASSURANCE

Software Testing Strategies, Testing Conventional Application, Testing Web Applications
Software Quality Management Quality Concepts Review Techniques, Quality Assurance

UNIT V:SOFTWARE MANAGEMENT

Managing Software Project: Project management Concepts, Estimation for Software Projects, Risk Management, S/w Configuration Management, S/w Maintenance and Re-Engineering

Text Books:

1. Software Engineering,Roger S Pressman, TMH.
2. Software Engineering, Gill N.S.: Khanna Book Publishing Co.(P) Ltd, N. Delhi
3. An Integrated Approach to Software Engineering, Jalote, Pankaj: Narosa Publications.

Reference Books:

1. R. Fairley, “Software Engineering Concepts”, Tata McGraw Hill, 1997.
2. P. Jalote, “An Integrated approach to Software Engineering”, Narosa, 1991.
3. Stephen R. Schach, “Classical & Object Oriented Software Engineering”, IRWIN, 1996.
4. James Peter, W Pedrycz, “Software Engineering”, John Wiley & Sons
5. Sommerville, “Software Engineering”, Addison Wesley, 1999.

MCA106: COMPUTER ORGANIZATION & ARCHITECTURE LAB

LIST OF EXPERIMENTS:

1. Implementing HALF ADDER, FULL ADDER using basic logic gates.
2. Implementing Binary -to -Gray, Gray -to -Binary code conversions.
3. Implementing 3-8 line DECODER. Implementing 4x1 and 8x1 MULTIPLEXERS.
4. Verify the excitation tables of various FLIP-FLOPS.
5. Design of an 8-bit Input/ Output system with four 8-bit Internal Registers.
6. Design of an 8-bit ARITHMETIC LOGIC UNIT.
7. Design the data path of a computer from its register transfer language description.
8. Design the control unit of a computer using either hardwiring or microprogramming based on its register transfer language description.
9. Implement a simple instruction set computer with a control unit and a data path.

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

Discipline Elective – I

MCA102-1 - PROGRAMMING IN C

UNIT-I: C FUNDAMENTALS

The C-Character Set, Identifiers and Keywords, Constants, Data types, Variables, Statements, Symbolic Constants Operators and Expressions, Precedence and Associativity Data Input and Output, Structure of the C Program

UNIT-II: CONTROL STRUCTURES

Branching-go to, Simple if, Simple If- else, Nested if-else, if –else ladder Looping- while, do- while, for – Nested Control Structures Switch and Break Statements, continue Statement, commaOperator

UNIT-III: ARRAYS AND FUNCTIONS

Arrays: Initialization, Declaration, One dimensional, Two dimensional arrays and Multidimensional arrays, Applications of an array, Matrix operations, Searching techniques **Function:** Definition, Declaration, Call by value and Call by reference, Recursion, Storage class.**Strings:** Operations, String arrays,Simple programs with and without string functions

UNIT-IV: POINTERS, STRUCTURES AND UNIONS

P**ointers:** Definition, Initialization, Pointers arithmetic, Pointers and arrays, Array of pointers, Dynamic Memory Allocation.

Structures: Introduction, Need for structure data type, definition, declaration, Structure within a structure.
Union: Need for union datatype, Definition, Declaration, Programs using structures and Unions-Typedef, Enu

UNIT-V: FILE PROCESSING AND RECENT TRENDS

Files, Types of File Processing, Sequential, Random Access, Opening and closing a Data file, Creating and Processing a Data file, Command Line Arguments, Low level Programming

Text Books:

1. Programming with C. Byron S Gottfried Schaum's Outlines, Second Edition, Tata McGraw-Hill, 2006.
2. The C Programming language, Kernighan,B.W and Ritchie,D.M, "", Second Edition, Pearson Education, 2006

Reference Books:

1 Fundamentals of Computing and Programming in C ,PradipDey, Manas Ghosh, First Edition, Oxford University Press, 2009
2 Programming in C ReemaThareja, ǁ, Oxford University Press, Second Edition, 2016.
3. Let Us C ,Yashavant P. Kanetkar, BPB Publications, 2011.
4. Programming in ANSI C ,Balaguruswamy

MCA102-2 - PROBLEM SOLVING WITH PYTHON

UNIT – I COMPUTER PROBLEM SOLVING, FUNDAMENTAL ALGORITHMS

Programs and algorithms, Problem-Solving aspect, top-down design, implementation of algorithms, program verification and efficiency of algorithmsand analysis of algorithms.Exchanging the values of two variables,counting, summation of set of numbers, factorial computation, sine function computation, generation of Fibonacci sequence, reversing thedigits of an integer, base conversion.

UNIT – II BASICS OF PYTHON PROGRAMMING

Introduction to Python, Python Character set, Tokens, Core Data Types, variables, Assignment ofvalues to variables, Writing simple programs in Python, input() and eval() functions. **Operators and Expressions:** Arithmetic Operators, Operator Precedence and Associativity, Bitwise Operators and Boolean Operators

UNIT – III CONTROL FLOW, FUNCTIONS AND STRINGS

Decision Statements: if statement, if-else statement, nested if statement, multi-way if-elif-else statement; **Loop Statements:** while loop, range() function, for loop, nested loops, break and continue statements; **Functions:** Syntax and basics of a function, parameters and arguments in a

function, return statement, recursive functions, Lambda function; **Strings:** Basic Python functions for String, String operators, String Operations

UNIT - IV LISTS, TUPLES AND DICTIONARIES

Lists: Creating Lists, Slicing Lists, List Methods, Lists and Strings, Lists with Functions, Searching and Sorting in lists; **Tuples**: Creating tuples, inbuilt functions for tuples, Lists and Tuples. **Dictionaries**: Basics of dictionaries, Creating a dictionary, Formatting dictionaries,Methods of Dictionary class

UNIT - V FILE HANDLING, MODULES AND PACKAGES

File Handling: Introduction, Working with text files; Modules: Definition, Creating a Module, Standards modules of Python; Packages: Definition, Importing * from packages, Packages in multiple directories

Text Books:

1. How to Solve it by Computer- R G Dromey
2. Programming and Problem Solving with Python by Ashok NamdevKamthane and Amit Ashok Kamthane, McGraw Hill Education; First edition November 2017

Reference Books:

1. Think Python: How to Think Like a Computer Scientist- Allen B. Downey
2. Python Programming – An Introduction to computer science, John Zelle,JimLeisy
3. Programming Python, Mark Lutz, O'Reilly, 3rd Edition, 2006
4. Core Python Programming, Wesley J Chun, PH, 2nd Edition
5. Python Programming: A Compatible Guide for Beginners to Master and Become an Expert in python programming Language, Brain Draper, CreateSpace Independent Publishing Platform, 2016

Discipline Elective – I LABORATORY

MCA107-1 – PROGRAMMING C LABORATORY

LIST OF EXPERIMENTS:

1. I/O Statement

a) A person has deposited an amount in a bank. He / She would like to know the total amount asfollows
   a. With simple of r% interest after 'n' years
   b. With compound interest of r% after 'n' years if compounded annuallyWrite

a program to implement the above.

b) A General Service company hired you to calculate the labour cost and total charge for the services rendered to their client based on the formula given below:

Rate per hour : Rs.45/-
Labour cost : Rate * hours work

Total Charge : Labour cost + Cost of Materials.
Write a program to implement the above.

c) Mr.Bennet bought a new house and he wishes to paint the both sides of rectangular shaped compound wall of that house. He is having the following details: length, breadth, height and cost per square feet to paint the compound wall. Help him out to calculate the cost for painting work.

d) Write a C program to make the following exchange between the variables a-> b -> c->d - > a

2. I/O Statement

a) A farm produces several food grains, namely wheat, barley, oats and flax. The monthly production details (in Kg) and price per Kg (in INR) received during the year are recorded. Read the production details and price of the food grains and print its details through your C program.

b) (BMI) is a measure of body fat based on height (in inches) and weight (in pounds) that applies to adult men and women. Write a C program for the calculation of BMI as BMI = (weight*703)/(height*height) and let the program read your height and weight and displaythe BMI value.

c) ABC company Ltd. is interested to computerize the pay calculation of their employee in the form of Basic Pay, Dearness Allowance (DA) and House Rent Allowance (HRA). DA and HRA are calculated as certain % of Basic pay (For example, DA is 80% of Basic Pay, and HRA is 30% of Basic pay). They have the deduction in the salary as PF which is 12% of Basic pay. Propose a computerized solution for the above said problem.

3. Decision making (IF, IF...ELSE)

a) The Election Commission has decided to organize a special camp to include young people (*age greater than or equal to 16 and less than 18*) in the electoral role. Help the officials to identify theeligible people.

b) Apoorva super market requires an automated program to print the expenses. Quantity and price per item are the inputs and discount of 10% is offered if the expense is more than Rs. 5000. Automate the above scenario using 'C' program.

c) Mr. X goes to a dietician for consulting. The dietician measures the weight in kilogram and height in meters. The dietician calculates the BMI using the following formula BMI = weight / (height) ^{2} Once BMI is calculated the dietician decides whether Mr. X is obese or not. If BMI is greater than 25 then it implies Mr. X is obese else he is Healthy. Write a program depicting the above scenario with displaying the message obese or Healthy.

4. Decision making (ELSE IF Ladder, NESTED IF / Switch …case)

a) Given the previous and current month electricity meter readings, calculate the electricity bill amount for that month. The bill is calculated as follows: first 50 units of electricity are charged at Rs2 for each unit, next 50 units are charged at Rs2.50 for each unit, and units above 100 are charged at Rs. 3.50 for each unit. Each bill amount also has surcharge amount of Rs. 20.

b) The class teacher wants to check the IQ of the students in the class. She is conducting a logical Reasoning, Verbal Reasoning, Arithmetic ability and puzzle logic test. Each of which carries 50 marks. Those who secured 180 and above marks are eligible for taking genius level test. Those who secured below 180 marks are rejected for genius level test. There are two levels of Genius test - Genius level 1 &

Genius level 2. Those who secured above 60% marks for all test are eligible for taking Genius level 1 and for remaining students Genius level -2 will be conducted. Automatethe task to help the class teacher.

c) Write a C program to find the roots of the quadratic equation

5. Looping (FOR / WHILE)

a) Our institution has decided to increase the number of seats from 120 to 180 for the upcoming year. Further, they have also decided to increase the same number of seats every year subsequently. Find out totally how many students will be there, after 'n' years from now.

b) Write a C program for printing the prime numbers between 1 and n

c) Write a C program to construct the multiplication table for a given integer.

6. Looping (FOR / WHILE / DO..WHILE)

a) Write a program to print the calendar for a month given the first Week- day of the month. Input the first day of the month (Sun=0,Mon=1,Tue=2,Wed=3,.) :: 3 Total number of days in the month : 31 Expected output

b) A Novice user tries to sign up in Gmail. Gmail does not allow users of age less than 13 years old for sign up. Write a Program to validate the user age and allow the user to sign in Gmail only when the age is above 13. Otherwise display appropriate error message and provide another chanceto sign in again.

c) Write a C program to reverse the digits of a given integer

7. Looping (FOR / WHILE / DO..WHILE)

a) Write a c program to find the sum of the digits of a positive integer

b) Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.

c) Write a C Program to print the pyramid of numbers

d) Write a C program to print the pascal triangle

8. Single dimensional arrays

a) Write a program to store and display the array elements

b) Write C code to compute the frequency table of survey responses given by 20 users. The survey responses range from 1 to 5 and are stored in an array. For example, 10 responses are stored in the array [1,1,5,2,3,3,5,5,2,2]. The frequency table will be as shown below:

a. 1 = 2
b. 2 = 3
c. 3 = 2
d. 4 = 0

e. 5 = 3

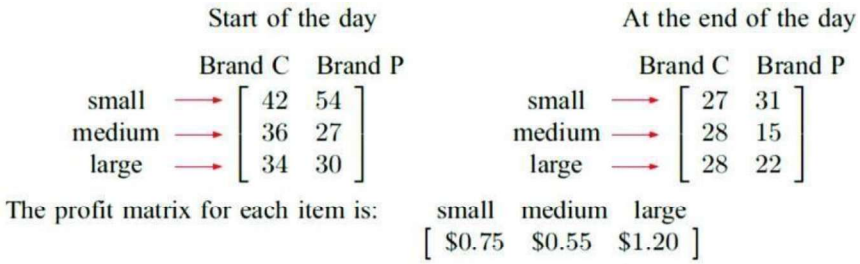
b) Write C code to reverse the contents of the array. For example, [1,2,3,4,5] should become [5,4,3,2,1]

c) Write a program that will search and find out the position where the given key element exist in a user chosen array and print it as output.

9) Two dimensional arrays

a) Write a C program that uses functions to perform the following: i) Addition of Two Matrices ii) Multiplication of Two Matrices

b) A cafe sells two types of cola drinks. The drinks each come in three sizes: small, medium and large. At the beginning of the day the fridge was stocked with the number of units shown in the matrix below. At the end of the day the stock was again counted.



Implement the program to calculate the total profit made for the day from the sale of these drinks.

10. Sorting

a) Write a program to sort the array elements using exchange sort

b) There are 'n' employees working in an organization. The employer need to allocate the work based on the years of experience of the employees. Use an appropriate logic to help the employer to order the employees according to their years of experience.

11 Programs based on string Manipulations

a) MITS University Academic Section is maintaining student's details with full name (First name and Last name separated by space) in the database. Due to inconvenience in printing thenames, they have decided to display it in short, as follows:

Full form: **First Name** **Last Name**

Arunkumar Tiwari

Short Form: Arunkumar T

Write a program to implement the above.

b) Principal of a school has been decided to divide the students into two houses (teams) namely Fire and Water based on their name. If the total count of their name is odd then they will be in the Fire house, else Water house. The total count is calculated by adding ASCII value of individual alphabet in their name. Help the Principal to complete the task.

c) Write a program to check whether the given string is a palindrome or not with or withoutusingstring

handling functions

d)Write a program to accept a string from user and display number of vowels, consonants, digitsand special characters present in each of the words of the given string

12. Program using Functions

a) An application developer wants to read a list of '**n'** fixed-point quantities in a 1-D array. The developer is assigned a task to search out a value in the array. Write a program using functions to search an item in 1-D array.

b) Develop a C program to implement a calculator. The program should request the user toinputtwo numbers and display one of the following as per the desire of the user:

i. Sum of the numbers ii. Difference of the numbers

iii.Product of the numbers iv. Division of the numbers

Provide separate functions for performing various tasks such as reading, calculating and displayingthe results.

c) Write a program to find the factorial of the function without using recursion and using recursion

d) Write a program to find the gcd of the two numbers with and without using recursion

13. Program using Functions and pointers

a) The user-defined function chkprime() accepts an integer as parameter and returns True if thenumber is Prime. Write a program that prints sum of first 'n' prime numbers using chkprime().

b) Write a C program to demonstrate on call by value and call by reference funtions

c) Write a program to read and display values of an integer array. Allocate space dynamically forthe array using the malloc().

14. Programs using structures

a) Mr. John runs a pizza-analysis service. For each pizza, he needs to record the following information: The name of the pizza company, which can consist of more than one word, The weight of the pizza(in gms), price of the pizza d**evise a structure in C that can hold this information and write a program to get the information about pizza from the user and then it should display the pizza details.**

b) A Departmental store is maintaining sales details (product code, product name, unit-rate, selling-date, quantity-sold and amount) of 'n' customers as a single logic unit (structure). Write a program to generate the bill for the customer.

c) The results of a survey of 'n' households in a township have been made available. Each record contains data for one household, including a 4 digit integer identification number, the annual income for the household and the number of family members of the household. Write a program to store the survey results into an array of user-defined structures of type **household**.

Then perform the following:

i) Print a three column table displaying the data

ii) Calculate the average household income and list the identification number and income of each household whose income exceeds the average.

iii)Determine the percentage of households having incomes below the poverty level using theformula given below:

P=$7500.00 + $950.00 x (m-2) where 'm' is the number of members of each household.

15. Files

a)Two text files are given with the names text1 and text2. These files have several lines of text. Write a program to merge (first line of text1 followed by first line of text2 and so on until both the files reach the end of the file) the lines of text1 and text2 and write the merged text to a new file text3.

b) Write a program to split a given text file into n parts. Name each part as the name of the original file followed by .part<n> where n is the sequence number of the part file.

MCA107-2 - PYTHON LABORATORY

LIST OF EXPERIEMENTS:

1. Develop flow charts using Raptor tool
   a. To exchange the values of two variables
   b. To find factorial of a given number
   c. To find the sum of set of numbers
   d. To count the number of students that passed the examination
2. Develop flow charts using Raptor tool
   a. To compute sine function
   b. To generate Fibonacci sequence
   c. To reverse the digits of a number
   d. To convert a decimal integer to its octal representation
3. (a) Python installation for WINDOWS/LINUX
   (b) Working with interactive and script modes in IDLE
   (c) Exploring IDLE(Python Help docs etc.)
4. Write Python scripts
   (a) To read two numbers and perform an arithmetic operation based on the option chosen bythe user.
   (b) To find the grade of a student based on the marks given for all subjects in a semester
   (c) To find the GST of a given item
5. (a) Write a program to generate a multiplication table for a given number

   (b) Write a program using loop that asks the user to enter an even number. If the number entered is not even then display an appropriate message and ask them to enter a number again. Do not stop until an even number is entered. Print a Congratulatory message at end.

6. Write Python scripts for the tasks given in Exercise/Week #1
7. Write Python scripts for the tasks given in Exercise/Week #2
8. Write functions in Python
   (a) To find the distance between two points
   (b) To find the area of a circle
   (c) To find the factorial of a number using recursion
   (d) To find the GCD of two numbers using recursion
9. Consider the string str="Global Warming". Write statements in Python to implement the following
   (a) To display the last four characters.
   (b) To display the substring starting from index 4 and ending at index 8.
   (c) To check whether string has alphanumeric characters or not.
   (d) To trim the last four characters from the string.
   (e) To trim the first four characters from the string.
   (f) To display the starting index for the substring "Wa".
   (g) To change the case of the given string.
   (h) To check if the string is in title case.
   (i) To replace all the occurrences of letter "a" in the string with "*"
10. Write a program to find the sum of two matrices using lists.
11. We can use list to represent polynomial. For Example p (x) = -13.39 + 17.5 x + 3 x^2 + x^3 can be stored as [-13.39, 17.5, 3, 1.0] Here "index" is used to represent power of "x" and value at the index used to represent the coefficient of the term. Write a function to evaluate the polynomial for a given "x".
12. Create a list that contains the names of5 students of your class. (Do not ask for input to do so)
   (i) Print the list
   (ii) Ask the user to input one name and append it to the list
   (iii) Print the list
   (iv) Ask user to input a number. Print the name that has the number as index (Generate error message if the number provided is more than last index value).
   (v) Add "Kamal" and "Sanjana" at the beginning of the list by using "+".
   (vi) Print the list
   (vii) Ask the user to type a name. Check whether that name is in the list. If exist, delete thename, otherwise append it at the end of the list.
   (viii) Create a copy of the list in reverse order
   (ix) Print the original list and the reversed list.
   (x) Remove the last element of the list.
13. Write a python program to create telephone directory.Input 10 names and phone numberstostore it in a dictionary and do the following:
   (a) Input any name and print the phone number of that particular name.
   (b) Add a new contact
   (c) Update an existing contact

   (d) Delete a contact

(e) Sort the directory according to names.

14. Write a program to input 'n' employees' salary and find minimum & maximum salaryamong 'n' employees using Tuples.
15. (a) Write a program to create a file "Story.txt" with the history of MITS
    (b) Write a program to read a file 'Story.txt' and create another file, storing an index of Story.txt telling which line of the file each word appears in. If word appears more than once,then index should show all the line numbers containing the word.

Case Study#1/ Creating Modules

Case Study#2/ Working with NumPy package

Text Books:

1. Python Programming – An Introduction to computer science, John Zelle,JimLeisy
2. Programming and Problem Solving with Python by Ashok NamdevKamthane and AmitAshok Kamthane, McGraw Hill Education; First edition (1 November 2017)

Reference Books:

1. Programming Python, Mark Lutz, O'Reilly, 3rd Edition, 2006
2. Core Python Programming, Wesley J Chun, PH, 2nd Edition
3. Python Programming: A Compatible Guide for Beginners to Master and Become an Expert in python programming Language, Brain Draper, CreateSpace Independent Publishing Platform, 2016

Syllabus

MCA 1st Year
2nd Semester

MCA201 - PROBABILITY AND STATISTICS

UNIT- I: Probability and Random variables: [3.1 - 3.8, 4.1, 4.2, 4.4, 4.5, 4.6, 4.8]
Introduction to probability, theorems on probability, conditional probability, multiplication theorem and independence of events, Bayes theorem. Random Variables - types of random Variables - Probability mass Function - Probability density function- Distribution function and its properties- Expectation,Variance and their Properties

UNIT-II Bi-variate random variables [4.3, 4.3.1, 4.3.2, 4.5.1, 4.7, 2.6, 9.1 & 9.2]

Joint Densities and Independence - Marginal Distributions (discrete & continuous)- Transformation ofRandom Variables - Conditional Distributions and Expectations –Covariance- Correlation - MultipleLinear Regression Models.

UNIT-III Probability Distributions [5.1, 5.1.1, 5.2, 5.2.1, 5.3, 5.4, 5.5, 5.6, 5.7 & 5.8.1]

Discrete Distributions: Bernoulli trail, Binomial distribution, Poisson approximation to the binomial distribution , Poisson distribution and Hyper geometric distribution –properties.

Continuous Distributions: Uniform distribution, Exponential distribution, Gamma distribution,Normal distribution.

UNIT-IV Hypothesis Testing [8.1, 8.2, 8.3, 8.4, 8.6] (12 hours)

Hypothesis Testing- Introduction, Significance Levels, Tests Concerning the Mean of a Normal Population (σ know and unknown), Testing the Equality of Means of Two Normal Populations , Case of Unknown and Unequal Variances , The Paired *t*-Test , Hypothesis Tests Concerning proportions.

UNIT-V Analysis of Variance (ANOVA) [10.1-10.5] (12 hours)

Analysis of variance (ANOVA); one way classification and two-way classifications. Latin square Design and RBD.

Text Books:

1. Sheldon M. Ross: Introduction to Probability and Statistics for Engineers and Scientists, 4th Edition, Elsevier,Academic Press, 2010.
2. J.S. Milton and J.C. Arnold, Introduction to Probability and Statistics, 4th edition, 2003 Tata McGraw-Hill Publications.

Reference Books:

1) Walpole, R.E., Myers R.H., Myer S.L., Ye. K: Probability and Statistics for Engineers and Scientists, 8th ed.,Pearson Education, 2008.
2) Johnson, R.A. Miller Freund's: Probability and Statistics, 7th Edition, PHI, 2005.
3) Sheldon Ross: A First Course in Probability, 6th Edition, Pearson Education, 2002.

MCA202 – ELECTIVE-II (Choose from Discipline Elective – II)

MCA203 - DATABASE MANAGEMENT SYSTEMS

UNIT I: INTRODUCTION

Introduction to data bases, Database system Vs File system, Data abstraction, Instances and Schemas, Database users, Database system structure, Entities, Attributes, Entity sets, Relationships and Relationship sets, Database design and ER diagrams, Specialization and Generalization and participation features of ER model.

UNIT II: THE RELATIONAL MODEL, SQL & RELATIONAL ALGEBRA

The Relational model: Introduction, Codd's rules, Various types of Integrity constraints.

SQL: Structured Query Language, data types, DDL, DML, TCL, views, NULL Values, Set operations, aggregate functions, character functions, Date functions, String functions, Nested queries, correlated nested queries.

Relation Algebra: Fundamental operations, Additional operations.

UNIT III: NORMALIZATION

Problems Caused by redundancy, Decompositions, Reasoning about FDS , FIRST, SECOND,THIRD Normal forms, BCNF, Lossless-join Decomposition, Dependency preserving, Multi valued Dependencies , Fourth Normal Form and Fifth Normal form.

UNIT IV:TRANSACTION MANAGEMENT, CONCURRENCY CONTROL & RECOVERY SYSTEMS

Transaction Management: ACID properties, Transactions and Schedules, Concurrent Execution of transactions, Serializability, Conflict serializability, View serializability, Testing for serializability.
Concurrency Control: Two Phase Locking protocol, Time stamp ordering protocol, Multiple Granularity.

Recovery Systems: Deferred database modification, Immediate data base modification, check pointing and Shadow paging.

UNIT V: PL/SQL & NO SQL

PL/SQL: Functions, procedures, triggers, cursors and exceptional handling in PL/SQL.
NO SQL:No SQL Introduction and properties, NO SQL Columnar families, NOSQL_different NoSQL Systems.

Text Books:

1. Data Base Management Systems, Raghurama Krishnan, Johannes Gehrke, TMH
2. Data Base System Concepts, 6/e, Silberschatz, Korth, TMH.

References:

1. Data Base Management System, 5/e, ElmasriNavathe, Pearson
2. An Introduction to Database Systems, 8th Edition, C J Date, Pearson

MCA204 - OPERATING SYSTEMS

UNIT I: OPERATING SYSTEM INTRODUCTION

Operating Systems objectives and functions, OS Structure, OS Operations, Evolution of Operating Systems - Simple Batch, Multi programmed, time-shared, Personal Computer, Parallel, Distributed Systems, Real-Time Systems, Special -Purpose Systems, Operating System services, User OS Interface, System Calls, Types of System Calls, System Programs, Operating System Design and Implementation, OS Structure, Virtual Machines.

UNIT II: UNIX INTRODUCTION TO SHELL & LINUX UTILITIES

UNIX Features and Environment, UNIX Structure, Accessing UNIX, File handling utilities, Security by file permissions, Process utilities, Disk utilities, Networking commands. Grep command, Vi Editor, SED – scripts, operation, addresses, commands, applications. awk – execution, fields and records, scripts, operation, patterns, actions, functions, uses system commands in awk.

UNIT III: WORKING WITH THE BOURNE AGAIN SHELL (BASH)

Introduction, shell responsibilities, pipes and input Redirection, output redirection, command Execution, command line editing, quotes, command substitution, shell variables, Filters, shell meta characters, shell programming-control structures, arithmetic in shell, shell script examples, interrupt processing, functions, debugging shell scripts.

UNIT IV: PROCESS

Overview of Process, Process Scheduling, scheduling Algorithm, Multiple-Processor Scheduling, The Critical Section Problem, Synchronization Hardware, Semaphores, Classic Problems of Synchronization. Deadlocks - System Model, Deadlock Characterization, Methods for Handling

Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection and Recovery from Deadlock.

UNIT V: MEMORY MANAGEMENT & STORAGE MANAGEMENT

Logical & Physical Address Space, Swapping, Contiguous Allocation, Paging, Structure of Page Table, Segmentation, Segmentation with Paging., File System – File Concept, Access methods, Directory Structure, File System Mounting, File Sharing, Protection. Mass Storage Structure – Overview of Mass Storage Structure, Disk Structure, Disk Attachment, Disk Scheduling, Disk Management, Swap space Management, Free-space Management.

Text Books:

1. Operating System Principles , Abraham Silberchatz, Peter B. Galvin, Greg Gagne8th Edition, Wiley Student Edition
2. Unix and Shell programming, B.A. Forouzan and R.F.Gilberg, Cengage Learning

Reference Books:

1. Modern Operating Systems, Andrew S Tanenbaum, 3rd Edition, Pearson/PHI
2. Operating Systems – Internals and Design Principles, W. Stallings, 6th Edition, Pearson Education.
3. Beginning Linux Programming, 4th Edition, N. Matthew, R. Stones, Wrox, Wiley IndiaEdition, rp-2008.

MCA205 - DATA STRUCTURES AND ALGORITHMS

UNIT-I: INTRODUCTION, BASIC DATA STRUCTURES AND HASH TABLE REPRESENTATION

Introduction: Algorithm, Performance Analysis-Space complexity, Time complexity, Asymptotic Notations

Basic Data Structures: Stack, Queue, Applications of stacks- Infix to postfix conversion, Evaluation of postfix expression, linked list, doubly linked list, Circular list representation- operations - insertion, deletion and searching.

Hash Table representation: Hash functions, collision resolution-separate chaining, openaddressing-linear probing, quadratic probing

UNIT-II: SEARCHING, SORTING & DIVIDE AND CONQUER STRATEGY

Searching: Linear Search and Binary Search

Sorting: Bubble sort, Selection sort, Insertion sort, Radix sort, Heap sort Divide

and conquer: General method, Applications- Quick sort, Merge sort

UNIT-III: TREES AND GRAPHS

Trees: Definition, Types of trees, Binary Trees, Binary Tree Traversal Methods, Binary search tree operations, operations of AVL tree, B-Tree

Graphs: Definition, Representation of graphs, Graph Traversal Methods.

UNIT-IV: DISJOINT SETS AND GREEDY METHOD

Disjoint Sets: Disjoint set operations, Union and Find algorithms

Greedy Method: General method, Applications- knapsack problem, Minimum cost spanning trees, Prim's algorithm, Kruskal's algorithm, Single source shortest path problem

UNIT-V: DYNAMIC PROGRAMMING AND BACKTRACKING

Dynamic Programming: General method, Applications- Optimal binary search trees, knapsack problem, all pair's shortest path problem, Travelling Sales Person Problem Backtracking: General method, Applications- N queen's problem, Graph colouring.

Text Books:

1. Fundamentals of Data structures in C, 2nd Edition, E. Horowitz, S. Sahni andSusan Anderson-Freed, Universities Press.
2. Fundamentals of Computer Algorithms,Ellis Horowitz,Sartaj Sahni,Sanguthevar Rajasekharan, Galgotia publications.

Reference Books:

1. Data structures A Programming Approach with C, D. S. Kushwaha and A.K. Misra, PHI.
2. Data Structures using C, R. Thareja, Oxford University Press.
3. Data Structures, S. Lipscutz, Schaum's Outlines, TMH.
4. Data Structures and Algorithms ,Alfred Aho,John E. Hop Croft, Ullman, Addision_Wesley.
5. Data Structures using C & C++, R. Shukla, Wiley India.
6. Classic Data Structures, D. Samanta, 2nd edition, PHI.

Discipline Elective – II

MCA202-1 – Object Oriented Programming

UNIT I: INTRODUCTION TO OOPS CONCEPTS AND CLASSES

Introduction to Object Oriented Programming, Java Buzzwords, Java Programming Basics, Sample programs, Data types and operators, Control statements, Arrays, Strings, String Handling. **Classes:** Classes, Objects, Methods, Constructors, this and static keywords, Method Overloading and Constructor Overloading, Access modifiers, Polymorphism, Inner Class.
Java 8 in Action: Lambdas, Streams and Functional Style Programming

UNIT II: INHERITANCE, INTERFACES, PACKAGES & EXCEPTION HANDLING

Inheritance: Basics, Usage of Super, Multilevel Inheritance, Hierarchical Inheritance, Method overriding, Abstract Class, Wrapper Classes, Final keyword.
Interfaces: Creation and Implementation of Interfaces, Usage of interfaces.
Packages: Defining a Package, Finding and Importing packages, Member Access.
Exception Handling: Fundamentals, Types, Multiple catch clauses, Nested try blocks, ThrowClass, Using Finally and Throws, Built-in exceptions, User-defined exceptions.

UNIT III: MULTI-THREADING, STREAMS AND FILES

Multi-threading: Thread Class, Runnable interface, creating multiple threads, life cycle of thread, thread

priorities, synchronization, thread communication, suspending, resuming and stopping threads.
Streams and Files: Stream, creating a File using File Output Stream, Reading Data from a File using File Input Stream, Creating a File using File Writer, Reading a file using File Reader, Serialization of Objects, File Copy, File Class, Zip File Class

UNIT IV: COLLECTION FRAMEWORK, NETWORKING

Collection Framework: Collection Objects, Retrieving Elements from Collections, Collection Interfaces, Hash Set Class, Linked Hash Set, Stack, Linked List, Array List, Vector, Hash Map, Arrays, Using Comparator to sort an Array, String Tokenizer, Calendar, Date.
Networking: Basics, Networking classes and Interfaces.

UNIT V: SWINGS AND EVENT HANDLING

Swings– Introduction, limitations of AWT, Components, Containers, Swing Components- JLabel and JImageIcon**,** JTextField, Swing Buttons, JTabbePane, JScrollPane, JList, JComboBox, JMenu, JTable, JTree
Event Handling: Events, Event sources, Event classes, Event Listeners, Delegation event model, Handling mouse and keyboard events, Adapter classes.

Text Books:

1. , "Java Complete Reference", Robert Schildt Mc Graw Hill, 9th, 2016
2. Java for Programmers, P.J.Deitel and P.J.Deitel, Pearson education
3. Java: How to Program ,P.J.Deitel and P.J.Deitel, 8th edition, PHI.

Reference Books:

1. K. Somasundaram, "Programming in Java 2", Jaico Publications, 2005.
2. Programming with Java" T.V.Suresh Kumar, B.Eswara Reddy, P.Raghavan Pearson Edition

MCA202-2 - WEB TECHNOLOGIES THROUGH JAVA

UNIT I - WEB INTRODUCTION, HTML, and CSS & JAVASCRIPT

Introduction, World Wide Web, Web Browsers, Web Page, Java and its Web Applications – an Overview, Search Engines HTML: Basic and Advanced Tags. CSS, Java Script:Introduction to Java Script – Objects in Java Script – Dynamic HTML with Java Script

UNIT II - EXTENDED MARKUP LANGUAGE

Introduction to Dynamic HTML – Introduction to XML – Document type definition – XML Schemas - Document Object Model – Presenting XML – XML processors

UNIT III - JAVA BEANS

Introduction to Java Beans, Advantages of Java Bans, BDK Introspection, Using Bound properties, Bean

Info Interface, Constrained properties, Persistence, Customizes, Java Beans API

UNIT IV - JSP APPLICATION DEVELOPMENT

Generating Dynamic Content, Using Scripting Elements Implicit JSP Objects, Conditional Processing – Displaying Values Using an Expression to Set an Attribute, Declaring Variables and Methods Error Handling and Debugging Sharing Data Between JSP pages, Requests, and Users

Passing Control and Date between Pages – Sharing Session and Application Data – Memory Usage Considerations

UNIT V - DATABASE ACCESS

Database Programming using JDBC, Studying Javax.sql.* package, Accessing a Database from a JSP Page, Application – Specific Database Actions, Deploying JAVA Beans in a JSP Page, Introduction to struts

Text Books:

1. Web Programming, building internet applications, Chris Bates 2nd edition, WILEY Dreamtech
2. The complete Reference Java 2 Fifth Edition, Patrick Naughton and Herbert Schildt. TMH
3. Java Server Pages –Hans Bergsten, SPD O'Reilly

Reference Books:

1. Programming world wide web-Sebesta, Pearson Education
2. Core Servlets And Java Server Pages Volume 1: Core Technologies, Marty Hall and LarryBrown Pearson
3. Internet and World Wide Web – How to program, Dietel and Nieto PHI/Pearson EducationAsia.

MCA 202-3 FULL STACK WEB DEVELOPMENT

UNIT – I WEB DESIGN BASICS

The Design Process- Introduction to Product Design- Introduction to User Experience (UX)- Elements of Visual Design- Building and Using Mockups-Agile Web Development- Pseudo coding- SOLID Design Principles

UNIT – II MARKUP AND STYLING – HTML AND CSS

HTML Basics HTML Elements --HTML Attributes - HTML Formatting - HTML Links and Images HTML Lists, Blocks, Classes - HTML Layout and Forms. CSS: Introduction CSS3

- CSS3Colours - Backgrounds, Borders, Padding, Height/Width - CSS3 Gradients, Shadows - CSS3 Text, Fonts - CSS3 2D &3D Transforms - CSS Links – CSS Lists & Tables - C- S Box Model, Outline, Display, Max-width, Position - CSS Float, Inline-block – CSS Align – CSS Pseudo-class, Pseudo-element - CSS Navigation, Dropdowns, Tooltips, Images – CSS Selectors - CSS Forms, Buttons - CSS3 Multiple

Columns - CSS3 User Interface: Box Sizing, Filters, Responsive CSS

UNIT III: BOOTSTRAP AND JAVASCRIPT

Introduction to Bootstrap - Bootstrap Basics - Bootstrap Grids - Bootstrap Themes - Bootstrap with CSS Introduction to JavaScript - Java Script Language Basics -Scope - JavaScript Events - Strings JavaScript Math - Arrays – Boolean – Comparisons - JavaScript Loops & Decisions - JavaScript Objects and Method - JavaScript Errors - Debugging - JavaScript Functions - JavaScript Forms - JavaScript DOM

UNIT - IV DATA MODELING AND SQL

Data Relationships-Designing a Data Model-Relational Databases- Alternative Databases- Data Normalization- Entity Relationship Modeling (ERM) SQL- Working with Database Schemas- Create-Read-Update-Destroy (CRUD) -Joins- Aggregate Functions and Groups- Sub Queries- NoSQL-Serialization -Modeling NoSQL data-Document Databases (PostGrey)

UNIT - V

NODE JS , AUTHENTICATION & SECURITY

NodeJS- Server-Side JavaScript- NPM- JavaScript Build Processes-Event Loop and Emitters-File System Interaction-Modules-Intro to Security and Authentication-Basic and Digest Authentication- Session-Based Authentication Document Databases

Text Books:

1. Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, andNode 1st ed. Edition, Vasan Subramanian
2. Exploring Visual Design: The Elements and Principles, Joseph A.Gatto, Albert W.Porter, Teachers Edition, Davis publishers
3. HTML & CSS: The Complete Reference, Fifth Edition, Thomas Powell, McGrawHill
4. JavaScript Applications with Node Js, React, React Native and MongoDB, Eric Bush,Blue Sky Production Incorporated, 2018

Reference Books:

1. Complete Bootstrap: Responsive Web Development with Bootstrap 4, Matt Lambert,Bass Johnson, David Cochran, Ian Whitley, PACKT publishing
2. Getting Started with NoSQL, Gaurav Vaish, 2013, PACKT publishing
3. Beginning Node JS, Basarath Ali Syed, Apress, 2014
4. Secure Your Node Js Web Application: Karl Duanna, Pragmatic Bookshelf, 2016

Discipline Elective – II Laboratory

S. No	Course Code	Course Name	Credits

1	MCA206-1	Object Oriented Programming C Laboratory	**02**
2	MCA206-2	Web Technologies through Java Laboratory	**02**
3	MCA206-3	Full Stack Web Development Laboratory	**02**

MCA206-1 - OBJECT ORIENTED PROGRAMMING LABORATORY

List of Experiments:

1.
   a. Fibonacci sequence is defined by the following rule: The first two values in the sequence are 1 and 1. Every subsequent value is the sum of the two values preceding it. Write a Java program that print the nth value in the Fibonacci sequence.
   b. Write a Java program that find prime numbers between 1 to n.
2. Write a Java program to perform String Operations.
3.
   a. Write a Java program for sorting a given list of names in ascending order
   b. Write a java program to perform linear search.
4. Write a Java program to process the employee retirement schemes. Employee wants to retire from organization. Organization has to give money to employee and employee will deposit that in a Bank. Bank will pay monthly interest if sufficient amount is available in the organization then it will be given to the employee otherwise employee has to wait until the sufficient amount is generator. Use looping concepts to process the above scenario.
5. Write a Java program that uses functions to perform the following operations:
   a. Inserting a sub-string in to the given main string from a given position.
   b. Deleting n characters from a given position in a given string.
      i. Write a Java program that checks whether a given string is palindrome or not.
      Ex: MADAM is a palindrome
6. Write a case Study: we will be creating two classes. They are Employee and Employeetest. Employeetest is the main class which keeps program entry i.e., main () method. First open notepad and the following code. Remember this is the Employee class and the class is a public class. Now save this Employee.java. The Employee class has 4 instance variables name, age, designation and salary. The class has explicitly defined constructor, which takesa parameter.
7. Write a Java Program demonstrates object construction
   a. Overloaded Constructors
   b. A call to another constructor with this(…)
   c. A default constructor
   d. An object initialization block
   e. A static initialization block
   f. An instance field initialization

8. Write a java program to demonstrates parameter passing in Java

9. Write a Java program to Perform Matrix Operations Addition, Subtraction, and Multiplications.

10. Write a Java program to demonstrate Interfaces.

11. Write a java program to demonstrate Packages.

12.

a. Write a java program to split a given text file into n parts. Name each part as the name of the original file followed by .part<n> where n is the sequence number of thepart file
b. Write a java program to convert an ArrayList to an Array.
c. Write a Java program to make frequency count of vowels, consonants, special symbols, digits, words in a given text.

13.

a. Write a Java program that reads a file name from the user, then displays information about whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file in bytes.

b. Write a Java program that reads a file and displays the file on the screen, with a line number before each line.

c. Write a Java program that displays the number of characters, lines and words in a text file.

14.

a. Write a java program to make rolling a pair of dice 10,000 times and counts the number of times doubles of are rolled for each different pair of doubles. Hint: Math.random()

b. Write java program that inputs 5 numbers, each between 10 and 100 inclusive. As each number is read display it only if it is not a duplicate of any number already read display the complete set of unique values input after the user enters each new value.

c. Write a java program to read the time intervals (HH:MM) and to compare system time if the system time between your time intervals print correct time and exit else try again to repute the same thing. By using String Tokenizer class.

15

a. Write java program to create a super class called Figure that receives the dimensions of two dimensional objects. It also defines a method called area that computes the area of anobject. The program derives two subclasses from Figure. The first is Rectangle and second is Triangle. Each of the sub class overridden area() so that it returns the area of a rectangle and a triangle respectively.

b. Write a Java program that creates three threads. First thread displays —Good Morning every one second, the second thread displays —Hello every two seconds and the third thread displays —Welcome every three seconds

16.

a. Write a Java program that correctly implements producer consumer problem using theconcept of inter thread communication.

b. Use inheritance to create an exception super class called EexceptionA and exception sub class ExceptionB and ExceptionC, where ExceptionB inherits from ExceptionA and ExceptionC inherits from ExceptionB. Write a java program to demonstrate that the catch block for type ExceptionA catches exception of type ExceptionB and ExceptionC

17. Write a program that creates a user interface to perform integer divisions. The user enters two numbers in the JtextFields, Num1 and Num2. The division of Num1 and Num2 is displayed in the Result field when the Divide button is clicked. If Num1 or Num2 were not an integer, the program would throw a NumberFormatException. If Num2 were Zero, the program would throw an ArithmeticException Display the exception in a message dialog box.

18. Write a Java program that implements a simple client/server application. The client sends data to a server. The server receives the data, uses it to produce a result, and then sends the result back to the client. The client displays the result on the console. For ex: The data sent from the client is the radius of a circle, and the result produced by the server is the area of the circle. (Use java.net)

References:

1. "Programming with Java" T.V.Suresh Kumar, B.Eswara Reddy, P.Raghavan Pearson Edition.
2. "Java Fundamentals - A Comprehensive Introduction", Herbert Schildt and Dale Skrien, Special Indian Edition, McGrawHill, 2013.

MCA206-2 - WEB TECHNOLOGIES THROUGH JAVA LABORATORY

List of Experiments:

1. Design a web page on your own to demonstrate the usage of Basic and Advanced HTMLTags
2. Create a web page for a shopping portal using CSS and HTML tags
3. Creating animations using CSS3
4. Create a registration form for an examination portal and validate the fieldsusing JavaScript
   Validation criteria:
   i. Name should be in capital letters only and length must be of at least 10 characters
   ii. Username must be the same name in the name field along with the date of birth
   iii. Password must be of at least 10 characters and must contain atleast two special symbols with first character must be capital letter only
   iv. Email must satisfy the email criteria
   v. Phone number should contain only 10 digits
5. Write a JavaScript program to perform the arithmetic operations
6. Developing application using DHTML Filters
7. Create an XML page to display the username and password of the registered users

8. Create a web page for book information. Write an XML page to display the book information created using the web page
9. Implement Client and Server Socket program to send and receive messages
10. Create a simple visual bean with a area filled with a color. The shape of the area dependson the property shape. If it is set to true then the shape of the area is Square and it is Circle, if it is false. The color of the area should be changed dynamically for every mouseclick. The color should also be changed if we change the color in the "property window "
11. Designing a scientific calculator using java script
12. Install a database (Mysql or Oracle). Create a table which should contain at least the following fields: name, password, email-id, phone number Write a java program/servlet/JSP to connect to that database and extract data from the tables and display them. Insert the details of the users who register with the web site, wheneveranew user clicks the submit button in the registration page.
13. Write a JSP which insert the details of the 3 or 4 users who register with the web site by using registration form. Authenticate the user when he submits the login form using theuser name and password from the database

References:

1. HTML & CSS-Design and Build Websites, John Duckett, John Wiley,
2. An Introduction to XML and Web Technologies, Anders Mallar, Michal Schwartzback,Pearson Education, 2005
3. Speaking JavaScript-An indepth guide for Programmars, Axel Rauschmayer, 2013
4. Mastering JSP; A Server side Technology, Anil Barnwal, VS. Dixit, Alpha Science International Limited, 2015
5. JDBC – Practical Guide for Programmars, Gregory D.Speegle, Morgann Kaufmann Publishers, 2002

MCA206-3 - FULL STACK WEB DEVELOPMENT LABORATORY

List of Experiments:

1. Write a HTML Program to create one Website using all HTML tags.
2. Write a Java Script program using Arithmetic Operators
3. Write a Java Script Program to Sort an Array of Strings
4. Write a Java Script Program
5. To print the array values using for loop
6. To find Fibonacci Series lessthan of a given number using while loop
7. To print the Even Numbers lessthan of a given number using do-while loop

8. Write a Java Script Program
9. To check the person is eligible for vote or not using if statement
10. To print the message Good Morning if hours is lessthan 12 otherwise it prints Good Afternoon using if-else
11. To perform relational operators using else-if
12. Write a Java Script Program
13. To count the Vowels of the given string using functions
14. To find the arithmetic operations using functions
15. Write a Java Script Program to create JS Form Validation Page
16. Write a Java Script Program using DOM Events
17. Create a multiplication table asking the user the number of rows and columns he wants.
18. Create a form that collects the first name, last name, email, user id, password and confirm password from the user. All the inputs are mandatory and email address entered should be in correct format. Also, the values entered in the password and confirm password textboxes should be the same. After validating using JavaScript, display proper error messages in red color just next to the textbox where there is an error.
19. Write a Java Script Program to compute the average and grade of the students
20. Write a Java Script Program
21. To get the name of the Day
22. To get the name of the Month
23. Write an XML file which will display the book information. Validate it using DTD.
24. Implement simple AJAX Application
    a. Create a simple XMLHttpRequest and retrieve data from a text file
25. Implement AJAX application with a callback function

Reference Book:

1. Java Script for ProgrammersPaul J. Deitel, Deitel& Associates, Inc.Harvey M. Deitel,Deitel& Associates, Inc.

MCA207 - DATABASE MANAGEMENT SYSTEMS LABORATORY

List of Experiments:

1. Implement DDL Commands. (use constraints while creating tables).
2. Implement DML commands.
3. Implement Unique, NULL, NOT NULL, Primary key, Foreign key, Check constraints.
4. Queries (along with sub Queries) using ANY, ALL, IN, EXISTS, NOT EXISTS, UNION, INTERSET.
5. Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING.
6. Queries using Conversion functions (to_char, to_number and to_date), string functions (Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substr and instr)
7. Queries using date functions (Sysdate, next_day, add_months, last_day, months_between) .
8. Implement all types of joins.
9. Implement functions,procedures and triggers .
10. Implement User defined and System defined exceptions.

Text Books:

1. ORACLE PL/SQL by example, Benjamin Rosenzweig, Elena Silvestrova, Pearson Education 3rd Edition
2. SQL & PL/SQL for Oracle 10g, Black Book, Dr.P.S. Deshpande.

References:

1. Introduction to SQL, Rick F.VanderLans, Pearson Education.
2. Oracle PL/SQL Programming,StevenFeuerstein,SPD.
3. The Database Book, N.Gehani, Universities Press.
4. Database Systems using Oracle: A Simplified Guide to SQL and PL/SQL, Shah, PHI.

MCA208 - DATA STRUCTURES AND ALGORITHMS LABORATORY

List of Experiments:

1. Create a Stack and do the following operations.
   a. Push b. Pop c. Peep
2. Create a queue and do the following operations.
   a. Add b. Delete c. Display

3. Implement the operations on singly linked list.
4. Implement the operations on circular linked list.
5. Implement the operations on doubly linked list.
6. Write a C program to convert from infix to postfix expression.
7. Write a C program to evaluate postfix expression.
8. Write C program that use both recursive and non-recursive functions to perform the following
    a. Linear search b. Binary search
9. Implement Insertion and Selection sort.
10. Implement Bubble sort technique.
11. Implement Quick sort using Divide and Conquer strategy.
12. Implement Merge sort using Divide and Conquer strategy.
13. Write a C program for traversing tree in
    a. Pre order b. In order c. Post order
14. Implement the operations on Binary Search tree.
15. Implement knapsack problem using greedy method.
16. Calculate minimum spanning tree using Prim's method.
17. Calculate minimum spanning tree using Kruskal's method.
18. Implement single source shortest path problem.
19. Implement all pairs shortest path problem.
20. Implement N-queen's problem using backtracking.

Text Books:

1. C & Data Structures by V.V. Muniswamy. I K International Publishing House Pvt. Ltd
2. Data Structures through C in depth ,S.K. Srivastava, BPB publications
3. Data Structures and Algorithms made Easy by NarasimhaKarumanchi.

Reference Books:

1. Data Structures, S. Lipscutz, Schaum's Outlines, TMH.
2. Data Structures and Algorithms ,Alfred Aho,John E. Hop Croft, Ullman, Addision_Wesley.
3. Data Structures using C & C++, R. Shukla, Wiley India.

Syllabus

MCA 2nd Year
3rd Semester

Discipline Elective – III

S.No	Course Code	Course Name	Credits
1	MCA301-1	Deep Learning	04
2	MCA301-2	Software Testing	04

3	MCA301-3	Cryptography and Network Security	**04**
4	MCA301-4	Fundamentals of Data Science	**04**

MCA301-1 - DEEP LEARNING

UNIT I: DIGITAL IMAGE FUNDAMENTALS

Image Formation and types – Basic geometric transformations – Fourier Transforms – Walsh – Hadamard – Discrete Cosine Transforms.

UNIT II: IMAGE ENHANCEMENT AND RESTORATION

Histogram Modification Techniques – Image Smoothening – Image Sharpening – Image Restoration – Degradation Model – Noise Models – Spatial Filtering – Frequency Domain Filtering.

UNIT III: DEEP LEARNING IN COMPUTER VISION

Detection of Discontinuities – Edge Linking and Boundary Detection – Thresholding – Region Based Segmentation – Morphology operations - Pattern classification - Clustering and Matching - Knowledge representation in scene analysis - image understanding (2D and 3D) - Object recognition and identification – Case study of various applications.

UNIT IV: DEEP LEARNING IN CNN

Introduction to NLP - Classification using Convolution Neural Networks – Convolution and Pooling– Deep supervised Learning - Natural Language Processing using Deep Learning - Applications of Dynamic Memory Networks in NLP

UNIT V: DEEP LEARNING IN RNN

Parsing – Sentiment Analysis Using Recursive Neural Networks –LSTM - Multiclass discrimination- Language modeling –Soft Attention - Training procedures- localized network structure- dimensionality reduction interpretation.

Text Books:

1. Milan Sonka, Vaclav and Roger Boyle, “Image Processing, Analysis and Machine Vision”, Thomson, 2012.
2. Bengio, Yoshua, Ian J. Goodfellow, and Aaron Courville. "Deep learning." An MIT Pressbook in preparation. 2015.
3. Aaron Courville, Ian Goodfellow, and Yoshua Bengio “Deep Learning”, MIT Press, 2017.

Reference Books:

1. R. Szeliski, "Computer Vision: Algorithms and Applications", Springer 2011.
2. AP Dawan, "Medical Image Analysis", Wiley 2011.

MCA301-2 - SOFTWARE TESTING

UNIT- I BASICS OF SOFTWARE TESTING

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, pathpredicates 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 data flow testing, strategies in data flow testing, application of dataflow testing.

UNIT-III DOMAINTESTING

Domains and paths, Nice &ugly domains, domain testing, domain and interface testing, domains and testability.

UNIT-IV PATH AND REGULAR EXPRESSIONS

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

UNIT –VLOGICBASED TESTING

Overview, decision tables, path expressions, kv charts, specifications. State, State Graphs and Transition testing: state graphs, good &bad state graphs, state testing, Testability tips.

Text Books:

1. Software testing techniques –Baris Beizer, Dreamtech, second edition

Reference Books:

1. Software Testing Tools–Dr.K.V.K.K.Prasad, Dreamtech.
2. The craft of software testing- Brian Marick, Pearson Education.

3. Software Testing, 3rdedition, P.C. Jorgensen, Aurbach Publications(Dist.bySPD).
4. Software Testing in the Real World–EdwardKit,Pearson.
5. Effective methods of Software Testing, Perry, John Wiley,2nd Edition,1999.

MCA301-3 - CRYPTOGRAPHY AND NETWORK SECURITY

UNIT – I: SYMMETRIC CIPHERS

Introduction to security attacks, services and mechanisms, Classical Encryption Techniques – Substitution Ciphers and Transposition Ciphers, cryptanalysis, Steganography, Stream and Block Ciphers. Modern Block Ciphers: Block cipher principles, Shannon's theory of confusion and diffusion, fiestal structure, modular arithmetic, Data encryption standard (DES), Advanced Encryption Standard (AES).

UNIT – II: ASYMMETRIC CIPHERS

Prime and Relative Prime numbers, Extended Euclidean Algorithm, Fermat's and Euler's theorem, primality testing, Chinese Remainder Theorem, Discrete Logarithmic Problem, Principle of Public key crypto systems, RSA algorithm, security of RSA.

UNIT – III: MESSAGE AUTHENTICATION

Message Authentication Codes: Authentication requirements, authentication functions, message authentication code, hash functions, birthday attacks, security of hash functions, Secure hash algorithm

(SHA). Digital Signatures: Digital Signatures, Elgamal Digital Signature Techniques, Digital signature standards (DSS).

UNIT – IV: KEY DISTRIBUTION & AUTHENTICATION APPLICATIONS

Key Management and distribution: Symmetric key distribution, Diffie-Hellman Key Exchange, Public key distribution, X.509 Certificates, Public key Infrastructure (PKI). Authentication Applications: Kerberos, Electronic mail security: pretty good privacy (PGP), Secure Multipurpose Internet Mail Extensions (S/MIME).

UNIT – V: NETWORK & TRANSPORT LAYER SECURITY

IP Security: Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management. Introduction to Secure Socket Layer, Secure electronic transaction (SET)System Security: Introductory idea of Intrusion, Intrusion detection systems, Viruses and related threats.

Text Books:

1. William Stallings, "Cryptography and Network security Principles and Practices", Pearson/PHI, 4th Edition.
2. Behrouz A. Frouzan, "Cryptography and Network Security", Tata McGraw Hill, 2nd Edition.

References Books:

1. Bruce Schiener, "Applied Cryptography". John Wiley & Sons
2. Bernard Menezes," Network Security and Cryptography", Cengage Learning.
3. Atul Kahate, "Cryptography and Network Security", TMH

MCA301-4 - FUNDAMENTALS OF DATA SCIENCE

UNIT – I: INTRODUCTION

What is Data Science? – Big data and Data Science –Facets of Data – Data fication – Current landscape of perspectives – Statistical Inference: Population – Samples – Statistical Modelling – Probability: Discrete and Continuous, Distributions: Binomial, Poison and Normal distributions – Fitting a Model – Introduction to R Language: Data Types – Vectors – Sorting – Indexing - R Markdown

UNIT – II: EXPLORATORY DATA ANALYSIS AND DATA SCIENCE

Basic Tools: Plots, Graphs, The Data Science Process: Goals, Data Retrieval, Cleansing, Integrating and Transforming Data – Machine Learning: Introduction to Machine Learning – Applications of Machine Learning in Data Science - Machine Learning Algorithms: Linear Regression – k-Nearest Neighbor (k-NN) – k –means – Filtering Span – Drawbacks of Linear Regression and k-NN in Filtering Span - Naïve Bayes and Filtering Span

UNIT–III: DATA WRANGLING, FEATURE GENERATION AND SELECTION, RECOMMENDATION SYSTEMS

Data Wrangling: API's and other tools for Web scrapping – Feature Generation: Role of domain expertise – Imagination – Feature Selection – Feature Selection Algorithms: Filters, Wrappers, Decision Trees, Random Forests – Recommendation Systems: Algorithmic Ingredients of Recommendation Engine – Dimensionality Reduction – Singular Value Decomposition – Principal Component Analysis

UNIT – IV: TEXT MINING AND TEXT ANALYTICS, GRAPH DATABASES

Text mining in the real world – Text Mining Techniques: Stemming and lemmatization – Decision Tree Classifier – Case Study: Classifying Reddit Posts - Graph Databases: Introducing connected data and Graph databases – Neo4j Graph database – Case Study: A recipe recommendation engineexample

UNIT – V: DATA VISUALIZATION, DATA SCIENCE AND ITS ETHICS

Basic Principles – Ideas and Tools for Data Visualization – Crossfilter, JavascriptMadReduce Library – Interactive dashboard – Dashboard development tools – Privacy, Security, Ethics – Next Generation Data Scientists.

Text Books:

1. Introduction to Data Science, Davy Cielen, Arno D.B. Meysman, Mohamed Ali, Manning publications, 2016
2. Doing Data Science, Straight Talk From The Frontline. Cathy O'Neil and Rachel Schutt. O'Reilly. 2014.

Reference Books:

1. Jure Leskovek, AnandRajaraman and Jeffrey Ullman. Mining of Massive Datasets. v2.1, Cambridge University Press. 2014. (free online)
2. Kevin P. Murphy. Machine Learning: A Probabilistic Perspective. ISBN 0262018020.2013.
3. Foster Provost and Tom Fawcett. Data Science for Business: What You Need to Knowabout Data Mining and Data-analytic Thinking. ISBN 1449361323. 2013.
4. Trevor Hastie, Robert Tibshirani and Jerome Friedman. Elements of Statistical Learning,Second Edition. ISBN 0387952845. 2009. (free online)
5. Avrim Blum, John Hopcroft and RavindranKannan. Foundations of Data Science.
6. Mohammed J. Zaki and Wagner Miera Jr. Data Mining and Analysis: Fundamental Concepts and Algorithms. Cambridge University Press. 2014.
7. Jiawei Han, MichelineKamber and Jian Pei. Data Mining: Concepts and Techniques, ThirdEdition. ISBN 0123814790. 2011.

Discipline Elective - IV

S. No	Course Code	Course Name	Credits
1	MCA302-1	Artificial Intelligence	04
2	MCA302-2	Cloud Computing	04
3	MCA302-3	Big Data Analytics	04
4	MCA302-4	Cyber Security and Cyber Forensics	04

MCA302-1 - ARTIFICIAL INTELLIGENCE

UNIT I: INTRODUCTION TO AI:

AI Problem formulation, Foundations of AI - Problem definition – Production systems - Graphsearch - of A* search algorithm - AO* algorithm.

UNIT II: SEARCHING AND GAME TREES:

Optimal decisions in Games - Minimax procedure - Alpha-beta pruning – Alternative approaches

UNIT III: KNOWLEDGE REPRESENTATION:

Proportional Theorem – First order Inference rule – Baye's Rule in knowledge representation - Representing knowledge in Uncertain Domain.

UNIT IV: INTRODUCTION TO EXPERT SYSTEMS:

Inference - Forward chaining - Backward chaining - Knowledge acquisition – Dynamic Bayesian Networks – Robotic Perception

UNIT V: AI ON AUTONOMOUS SYSTEMS:

Early Systems and Current Systems – Automatic Systems to Autonomous Systems – Imaging and Intelligence in Autonomous Systems - Ethical principles and democratic prerequisites in AI

Text Books:

1. Stuart J.Russell and Peter Norvig, "Artificial Intelligence", Third Edition, Pearson, 2015.
2. G. Luger, W. A. Stubblefield, "Artificial Intelligence", Third Edition, Addison-Wesley Longman, 1998.
3. Kevin, Elaine and Nair, "Artificial Intelligence", Third Edition, McGraw Hill, 2017

Reference Books:

1. David L Pool and Alan K Mackworth, "Artificial Intelligence", Cambridge University Press, 2017
2. Wolfgang Ertal, "Introduction to Artificial Intelligence", Springer, 2017.

MCA302-2 - CLOUD COMPUTING

UNIT- I SYSTEMS MODELING, CLUSTERING AND VIRTUALIZATION

Distributed System Models and Enabling Technologies. Computer Clusters for Scalable Parallel Computing. Virtual Machines and Virtualization of Clusters and Data centers.

UNIT-II FOUNDATIONS

Introduction to Cloud Computing, migrating into a Cloud, Enriching the 'Integration as a Service' Paradigm for the Cloud Era. The Enterprise Cloud Computing Paradigm.

UNIT- III IAAS, PAAS & SAAS

Virtual machines provisioning and Migration services, On the Management of Virtual machines for Cloud Infrastructures, Enhancing Cloud Computing Environments using a cluster as a Service.

UNIT- IV MONITORING, MANAGEMENT AND APPLICATIONS

Architecture for Federated Cloud Computing, SLA Management in Cloud Computing, Performance Production for HPC on Clouds, Best Practices in Architecture Cloud Applications inthe AWS cloud.

UNIT – V GOVERNANCE AND CASE STUDIES

Organizational Readiness and Change management in the Cloud age. Data Security in the Cloud, Legal issues in Cloud computing. Achieving Production Readiness for Cloud Services

Text Books:

1. Cloud Computing: Principles and Paradigms by Rajkumar.
2. Distributed and Cloud Computing. Kal Hwang. GeoffeiyC.Fox. Jack J. Dongarra. Elsevier. 2012.

Reference Books

1. Cloud Computing: A Practical Approach. Anthony T.Velte. Toby J.VeFte, Robert Elsenpeter. Tata McGraw Hill. rp2Oll.
2. Enterprise Cloud Computing Gautam Shroif, Cambridge University Press. 2010.
3. Cloud Computing: Implementation, Management and Security, John W. Rittinouse,James F Ransome. CRC Press, rp2012.

4. Cloud Application Architectures: Building Applications and Infrastructure in the Cloud. George Reese, O'RedI SPD, rp2Oll.
5. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, Tim Mather, SubraKtriaraswamy, ShahedLatif, O'Redç SPD, rp2Oll.

MCA302-3 - BIG DATA ANALYTICS

UNIT – I INTRODUCTION TO BIG DATA

Different types of Data: Structured, Semi structured, Unstructured and Metadata – Definition and Evolution of Big Data – Elements of Big Data - What is Big Data Analytics – Differences between Traditional Analysis and Big Data Analytics, Advantages of Big Data Analytics –Classification of Analytics - Big Data Analytics Life Cycle–Tools and Methods of Analytic Processing – Analysis Vs Reporting – Modern Data Analytic Tools

UNIT – II UNDERSTANDING HADOOP

Introduction to Hadoop – History of Hadoop – RDBMS Vs Hadoop – Functionality of Hadoop – Hadoop Ecosystems – Hadoop Distributed File Systems: HDFS Architecture and Features – MapReduce Features - MapReduce Execution – Algorithms using MapReduce–Matrix Vector Multiplication – Relational Algebra Operations - Hadoop YARN

UNIT – III MONGODB AND NOSQL

MongoDB Introduction – Necessity of MongoDB – Datatypes – MongoDB Query Language – Introduction to NoSQL – NoSQL Data Architecture Pattern – ACID and SQL – The BASE property of NoSQL- The CAP Theorem - NoSQL to Manage Big Data –Big Data Problems usingNoSQL– NoSQL Databases

UNIT IV MINING DATA STREAMS

Stream Data Model and Architecture - Data Stream Management Systems – Data Stream Mining and Examples of Data Stream Applications - Mining Time Series Data –Stream Queries – Issues in Data Stream Query Processing – Sampling in Data Streams –Filtering Streams – Counting Distinct Elements in a Stream. Counting Ones in a Window

UNIT V HIVE AND PIG, HBASE

Introduction to Hive – Hive Data Types – File Formats – Query Language – User Defined Functions – Introduction to Pig – Anatomy of Pig – Pig Data Models - Hadoop on Pig – Data Types – HDFS Commands – Operators –Piggy Bank - User Defined Functions – Pig Vs Hive – Hbase Introduction – Hbase Clients

Case Studies

1. **Product Placements and Store layout**

Business Challenge:

A major omni-channel retailer knew that in-store layout, merchandising and product placement affected sales. Yet the company's brick-and-mortar stores lacked "pre-cash register" visibility into how its customers shopped before they made decisions. The company wanted the same level of customer path visibility and analysis that its clickstream data gave for customers visiting its website. In-store sensors, RFID tags and QR codes could fill that data gap, but thosetechnologies generate data in formats and volumes that the company's legacy systems were illequipped to handle. The retailer became a relatively early adopter of Hadoop because the platform did not enforce a schema-onload paradigm that would have hampered ingestion and storage of the locationdata needed for the program.

Solution:

The company began testing iBeacon technology in its flagship stores. iBeacons capture in-store location data from the shoppers' iPhones and Android devices. The data then streams into Big data, revealing how customers move through the retail stores (which can be compared to the location of particular product categories). As the iBeacon program grows, Big data can store and process that huge volume of sensor and micro-location data.

Results:

Though the results of this specific pilot are not public, the retailer's big data analytics program boosted store sales by 10 percent. As data in Big data helps the company optimize its in-store experience, it sees the potential for additional programs that reduce unnecessary inventory and improve customer satisfaction through smarter product placement and updates to store layouts.

2. Product Recommendation Engine

Business Challenge:

A major specialty department store wanted to improve its product marketing precision. The marketing team wanted to roll out personalized promotions, coupons and product recommendations over multiple customer touch points: in-store, kiosk, web and mobile apps. The company was particularly interested in enabling in-store, real-time product promotion among its shoppers. But the company's customer data was fragmented, and this prevented it from developing those data-driven marketing promotions. For example, the website or a kiosk should not recommend a product that the same shopper had already purchased in the store. Financial obstaclesblocked proposals for an IT project to modernize the data architecture

Solution:

Now a Big data data lake integrates all the raw data from customers across different product lines. The company ingests and integrates data in real-time and batch, in both structured and unstructured formats. An ETL process transform the raw data, which is then consumed bylearning algorithms. The retailer can now deliver real-time recommendations and promotions through all channels, including its website, store kiosks and mobile apps

Results:

This retailer built an omni-channel recommendation engine similar to what Amazon does online. Thirty-five percent of what consumers purchase on Amazon and seventy-five percent of what they watch on Netflix comes from such product recommendations based on that type of analysis. This retailer can vary

recommendations based on weather, loyalty, purchase history, abandoned carts or life stage triggers—and deliver those to shoppers in its stores

Course Outcomes:

After completion of the above course the student will be able to

1. Classify necessary tools for analyzing Big Data
2. Work with the concepts in Hadoop, algorithms related to Hadoop and how to apply themin respective areas.
3. Execute MongoDB and NoSQL commands and apply them in applications.
4. Apply the ideas on Mining Data Streams
5. Identify the usage of HIVE, Pig and Hbase, classify them to do analysis based on given applications

Text Books:

1. Hadoop – The Definitive Guide, .Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis,Paul Zikopoulos,3rd Edition, O'Reilly Media, 2012
2. Big Data Analytics, Radhashankarmani, M.Vijayalakshmi, Wiley

Reference Books:

1. Big Data – Black Book, DT Editorial Services, Dreamtech Press, 2015
2. Big Data Analytics, VenkatAnkarm, Packt publishers
3. Big Data Analytics, Seema Acharya, SubhashiniChellappan, Wiley
4. Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics, Bill Franks, Wiley, 2012
5. Big data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's businesses, Wiley, 2013
6. Big Data Analytics – Made Easy, Y.Lakshmi Prasad, Notion Press, 2016
7. NoSQL For Dummies, Adam Fowler, Wiley, 2015
8. NoSQL Distilled – A Brief Guide to the Emerging World of Polyglot Persistence, P.J.Sadalage and M.Fowler, Addison Wesley, 2012
9. Intelligent Data Analysis, Michael Berthold, David J. Hand, Springer 2007
10. Practical Big Data Analytics, NatarajDasgupta, Packt publishing, 2018

MCA302-4 - CYBER SECURITY AND CYBER FORENSICS

UNIT –I INTRODUCTION

Cyber Attacks, Viruses, Worms and other Malware, Intrusion Detection and Prevention Introduction to Cyber Security, Domains of Cyber Security Policies, Cyber Security Evolution- Productivity, Internet, E-commerce, Counter Measures, Challenges

UNIT-II CYBER SECURITY OBJECTIVES AND DECISION MAKING

Cyber Security Objectives – Cyber Security Management – Metrics, Security Managementgoals, Counting Vulnerabilities, Security Frame work, Security Policy Objectives, Guidance for decisionMakers, Catalogue Approach

UNIT-III CYBER SECURITY POLICIES

Cyber Governance Issues – Cyber user Issues –Cyber Conflict Issues –Cyber Infrastructure Issues
- Cyber security's role in National Security

UNIT-IV INTRODUCTION TO CYBER FORENSICS

Cyber Forensics, Computer Forensics and Investigations as a Profession- Understanding Computer Forensics-Preparing for Computer Investigations, Understanding Computer Investigations-Preparing a Computer Investigation-Taking a Systematic Approach-Procedures for Corporate High-Tech Investigations-Understanding Data Recovery Workstations and Software,

Data Acquisition-Understanding Storage Formats for Digital Evidence-Determining the Best Acquisition Method-Validating Data Acquisitions-Performing RAID Data Acquisitions

UNIT – V CYBER FORENSICS INVESTIGATION AND LAW

The Complex World of Corporate CyberForensics Investigations, Investigating Large-Scale DataBreach Cases, Insider Threat Investigations, Accounting Forensics, Cyber Law and Crime

Course Outcomes:

After completion of the course the student will be able to

1. Understand the importance of cyber security
2. Obtain knowledge on objectives of cyber security
3. Become familiar with cyber security policies
4. Explain the cyber forensics investigation process
5. Understand the laws of cyber forensics

Text Books:

1. Cyber Security Policy Guidebook, Jennifer L. Bayuk, Jason Healey, Paul Rohmeyer andMarcus Sachs John Wiley & Sons, Kindle Edition, 2012. References
2. Cyber Forensics, Albert J Marcella, Jr. Doug Menendez, AuerbachPublicaitons, SecondEdition

Reference Books:

1. Cyber Security and Cyberwar, P.W.Singer and Allan Friedman Oxford UniversityPress,Kindle Edition, 2014.
2. Cyber Security Essentials, James Graham, Ryan Olson and Rick Howard , CRC Press,Kindle Edition, 2014.
3. Network Security and Cryptography, Bernard Menezes , Cengage Learning

Discipline Elective – V

S No	Course Code	Course Name	Credits
1	MCA303-1	Advanced Data Structures and Algorithms	**04**
2	MCA303-2	.Net Framework and C#	**04**
3	MCA303-3	Internet of Things	**04**
4	MCA303-4	Advanced Java Programming	**04**

MCA303-1 - ADVANCED DATA STRUCTURES AND ALGORITHMS

UNIT- I ROLE OF ALGORITHMS IN COMPUTING

Algorithms, Algorithms as a Technology Insertion Sort, Analysing Algorithms , Designing Algorithms, Growth of Functions: Asymptotic Notation , Standard Notations and Common Functions-, Recurrences: The Substitution Method , The Recursion-Tree Method

UNIT -II TREES AND GRAPHS

Basics of trees and binary trees, Representation of trees and Binary trees, Binary tree Traversals, Threaded binary trees, Graphs, representation and traversals. Binary Search Trees, AVL Trees and B Trees - Binary Search Trees: Definition, Operations and applications. AVL Trees: Definition, Operations and applications. B Trees: Definition, Operations and applications.

UNIT -III RED- BLACK TREES, SPLAY TREES AND HASHING

Red–Black Trees, Splay Trees and their applications, Hash Tables, Hash Functions, Collision Resolution Techniques, Double Hashing, File Organizations

UNIT-IV ALGORITHM DESIGN TECHNIQUES

Dynamic Programming: Matrix-Chain Multiplication, Elements of Dynamic Programming, Longest Common Subsequence, Greedy Algorithms: An Activity-Selection Problem, Elements of the Greedy Strategy, Huffman Codes

UNIT-V NP COMPLETE AND NP HARD

NP-Completeness: Polynomial Time, Polynomial-Time Verification, NP-Hard Graph Problems, NP-Completeness and Reducibility, NP-Completeness Proofs, NP-Complete Problems

Text Books:

1. Fundamentals of Computer Algorithms by Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, 2nd edition, University Press.
2. Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, ―Data Structures and Algorithms‖, Pearson Education, Reprint 2006

Reference Books:

1. Design and Analysis of Algorithms‖, First Edition,S.SridharOxford University Press. 2014
2. Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest,Clifford Stein, , Third Edition, Prentice-Hall, 2011.

MCA303-2 - .NET FRAMEWORK AND C#

UNIT -I THE .NET FRAMEWORK

Introduction, The Origin of .Net Technology, Common Language Runtime (CLR), Common Type System (CTS), Common Language Specification (CLS), Microsoft Intermediate Language (MSIL), Just-In –Time Compilation, Framework Base Classes and Library, Introduction toWindows Form

UNIT- II FUNDAMENTALS OF C- SHARP LANGUAGE (C#)

Data Types, Identifiers, Variables, Constants, Literals, Conditionals and Loops: Enumerations and Data Types Conversion, Arrays and Dynamic Arrays, Operators Decision Making statements, select case, Switch and choose statement, Looping Statements. Procedures, Scope and Exception Handling

UNIT-III OBJECT ORIENTED PROGRAMMING

Classes and Objects, Fields, properties, methods, Abstraction, Encapsulation Inheritance, Polymorphism, Overloading, Overriding, Shadowing, Constructors and Destructors, Interfaces.

UNIT -IV C# USING LIBRARIES

Multi-Threading, Networking and sockets, Managing Console I/O Operations, File Handling,Error Handling. Delegates and Events

UNIT -V ADVANCED FEATURES USING C#

Web Services, Window Services, Asp.net Web Form Controls, ADO.Net. Distributed Applicationin C#, Unsafe Mode, Graphical Device interface with C#.

Text Books:

1. Herbert Schildt (2009), C# 3.0: The Complete Reference, McGraw-Hill, New Delhi
2. Wiley," Beginning Visual C# 2008",Wrox
3. Balagurusamy," Programming with C#", (TMH)
4. ShibiParikkar, " C# with .Net Frameork" , Firewall Media.

Reference Books:

1. Jesse Liberty (2002), Programming C#, Second edition, O'Reilly Media Inc, Cambridge,USA

2. Paul Deitel, Harvey Deitel (2011), C# 2010 For Programmers, Deitel Developer Series,Fourth Edition, Pearson Education, New Delhi.
3. Fergal Grimes," Microsoft .Net for Programmers". (SPI)
4. Mark Michaelis, "Essential C# 3.0: For .NET Framework 3.5, 2/e, Pearson Education

MCA303-3 - INTERNET OF THINGS

UNIT-I INTRODUCTION TO IoT

Internet of Things - Physical Design- Logical Design- IoT Enabling Technologies - IoT Levels & Deployment Templates - Domain Specific IoTs - IoT and M2M - IoT System Management with NETCONF-YANG- IoT Platforms Design Methodology

UNIT-II IoT ARCHITECTURE

M2M high-level ETSI architecture - IETF architecture for IoT - OGC architecture - IoT reference model - Domain model - information model - functional model - communication model - IoT reference architecture

UNIT -III IoT PROTOCOLS

Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFID Protocols – Unified Data Standards – Protocols – IEEE 802.15.4 – BACNet Protocol – Modbus– Zigbee Architecture – Network layer – 6LowPAN - CoAP – Security

UNIT- IV BUILDING IoT WITH RASPBERRY PI & ARDUINO

Building IOT with RASPBERRY PI- IoT Systems - Logical Design using Python – IoT Physical Devices & Endpoints - IoT Device -Building blocks -Raspberry Pi -Board - Linux on Raspberry Pi - Raspberry Pi Interfaces -Programming Raspberry Pi with Python - Other IoT Platforms - Arduino.

UNIT- V CASE STUDIES AND REAL-WORLD APPLICATIONS (12)

Real world design constraints - Applications - Asset management, Industrial automation, smart grid, Commercial building automation, Smart cities - participatory sensing - Data Analytics for IoT – Software & Management Tools for IoT Cloud Storage Models & Communication APIs - Cloud for IoT - Amazon Web Services for IoT.

Text Books:

1. Arshdeep Bahga, Vijay Madisetti, "Internet of Things – A hands-on approach", Universities Press, 2015
2. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), "Architecting the Internetof Things", Springer, 2011.

Reference Books:

1. Jan Ho¨ ller, Vlasios Tsiatsis , Catherine Mulligan, Stamatis , Karnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things - Introduction to a New Age of Intelligence", Elsevier, 2014.
2. Honbo Zhou, "The Internet of Things in the Cloud: A Middleware Perspective", CRC Press, 2012.
3. Olivier Hersent, David Boswarthick, Omar Elloumi , "The Internet of Things – Key applications and Protocols", Wiley, 2012
4. The DevOps Handbook by Gene Kim, Jez Humble, Patrick Debois and John Willis.
5. Agile Software Development, Principles, Patterns, and Practices by Robert C. Martin
6. Effective DevOps, by Jennifer Davis, Ryn Daniels.
7. DevOps for Web Development by MiteshSoni.

MCA303-4 - ADVANCED JAVA PROGRAMMING

UNIT -I JAVA DATABASE CONNECTIVITY

JDBC Fundamentals, Database server, Database Client, working with Oracle Database, working with MySQL Database, Stages in a JDBC program, Types of JDBC Drivers, Retrieving Data from MySQL Database, Retrieving Data from MS Access Database, Improving the Performance of a JDBC Program, Types of Result Sets, storing a file into Database, Retrieving a File from the Database, Types of JDBC Drivers.

UNIT-II SERVLETS

Introduction to Servlets: Lifecycle of a Servlet, JSDK, The Servlet API, The javax.servlet Package, Reading Servlet parameters, Reading Initialization parameters. The javax.servlet HTTP package, Handling Http Request & Responses, Using Cookies-Session Tracking,Security Issues

UNIT- III WEB SERVERS & INTRODUCTION TO JSP

The Problem with Servlet. Introduction to Java Server Pages(JSP), Advantages of JSP, Life Cycle of JSP , JSP Processing. JSP Application Design with MVC Setting Up and JSP Environment: Installing the Java Software Development Kit, Tomcat Server & Testing Tomcat

UNIT-IV JSP APPLICATION DEVELOPMENT

Components of a JSP: Expressions, Scriptlets, Comments, Declaratives, Directives, (Page, Include, Taglib) Implicit Objects, JSTL,JSP Standard Actions (usebean, setproperty, getproperty, param)

UNIT-V JAVA SPRING FRAMEWORK

Spring Introduction: What is Spring-It's Features, How Spring Fits in to Enterprise Edition,

Spring Beans: What is Spring Bean-Bean Scope-Bean Lifecycle,IOC Containers :Core Container- J2EE Container-Web Container, Dependency Injection -Setter DI and Constructor DI,

Auto wiring: ByType- ByName

Text Books:

1. J2EE – The Complete Reference- Jim Keogh, Tata McGraw Hill, 2007
2. Mahesh P. Matha JSP and Servlets, 1st Edition, PHI, 2013.
3. Java Servlet Programming, Second Edition by Jason Hunter, William Crawford, O'Reilly
4. Spring in Action –Craig walls 4th edition, Dreamtech publisher

Reference Books:

1. The J2EE Tutorial – Stephanie Bodoff et al, 2nd Edition, Pearson Education, 2004.
2. Java Server Pages –Hans Bergsten, SPDO"Reilly ,2008
3. Learning Spring 5.0: Build enterprisegrade applications using Spring MVC, ORM Hibernate and RESTful APIs – Tejaswini Mandar Jog,Packt Publisher
4. Spring in Action –Craig walls 4th edition,Dreamtech publisher

Discipline Elective - III Laboratory

S.No	Course Code	Course Name	Credits
1	MCA305-1	Deep Learning Laboratory	**02**
2	MCA305-2	Software Testing Laboratory	**02**
3	MCA305-3	Cryptography and Network Security Laboratory	**02**
4	MCA305-4	Fundamentals of Data Science Laboratory	**02**

MCA305-1 - DEEP LEARNING LABORATORY

List of Experiments:

1. Collect the number of words in a paragraph and find out positive and negative terms in it.
2. Read a curriculum vitae and find whether the candidate completed post-graduation degree
3. Read an Image and change its dimensions
4. Read an Image and change it to Binary Image
5. Read an Image and Find the Histogram for it
6. Read an Image and cluster different colors available in it
7. Read an Image and detect boundaries in it
8. Read an Image and detect face in it
9. Read an Image and detect specific shapes in it
10. Read a paragraph identify and count the alphabets and numerical values using NLP
11. Read an audio file find the smallest and highest frequencies in them
12. Read known inputs and practice an output format. Apply Neural Network and do the samefor unknown inputs
13. Read marks of few students and practice a grade value. Apply Neural Network and try fornew grade values in them

Text Books:

1. Phil Kim, "Matlab Deep Learning: with Machine Learning, Neural Networks and Artificial Intelligence" APress, 2017.
2. AP Dawan, "Medical Image Analysis", Wiley, 2011.

Reference Books:

1. R. Szeliski, "Computer Vision: Algorithms and Applications", Springer 2011.
2. Valentino zocco, "Python Deep Learning", PackT press, 2017.

MCA305-2 - SOFTWARE TESTING LABORATORY

LIST OF EXPERIMENTS:

1. Write programs in 'C' Language to demonstrate the working of the followingconstructs:
   a. do...while
   b. while….do
   c. if…else
   d. switch
   e. for
2. "A program written in 'C' language for Matrix Multiplication fails" Introspect the causes forits failure and write down the possible reasons for its failure.
3. Take any system (e.g. ATM system) and study its system specifications andreport the various bugs.
4. Write the test cases for any known application (e.g. Banking application)
5. Create a test plan document for any application (e.g. Library Management System)
6. Study of any testing tool (e.g. Winrunner)
7. Study of any web testing tool (e.g. Selenium)
8. Study of any bug tracking tool (e.g. Bugzilla, bugbit)
9. Study of any test management tool (e.g. Test Director)
10. Study of any open source-testing tool (e.g. Test Link)
11. Take a mini project (e.g. University admission, Placement Portal) and execute it. During the
12. Lifecycle of the mini project create the various testing documents* and final test report document
13. Test the following using JUnit and CPPUnit:
    a. Sorting problems
    b. Searching problems

c. Finding gcd of two integers

d. Finding factorial of a number.

14. Test web based forms using HTML Unit.

15. Test database stored procedures using SQL Unit.

Reference Books:

1. Software Testing Tools–Dr.K.V.K.K.Prasad, Dreamtech.
2. The craft of software testing- Brian Marick, Pearson Education.
3. Software Testing, 3rdedition, P.C. Jorgensen, AurbachPublications(Dist.bySPD).
4. Software Testing in the Real World–EdwardKit,Pearson.
5. Effective methods of Software Testing, Perry, John Wiley,2nd Edition,1999.

MCA305-3 - CRYPTOGRAPHY AND NETWORK SECURITY LABORATORY

LIST OF EXPERIMENTS

1. Write a C Program to find the frequency of occurrence of characters
2. Write a C Program to reverse a given without using built in function
3. Write a C Program to read a given string and print the ASCII value of each character
4. Write a C program to implement the concept of Ceaser Cipher
5. Write a C program to implement the concept of Playfair Cipher
6. Write a C program to implement the concept of Hill Cipher
7. Write a C program to implement the concept of Vigenere Cipher
8. Write a C program to implement the concept of Rail fence – row & Column Transformation
9. Write a Java program to implement the concept of DES algorithm
10. Write a Java program to implement the concept of AES algorithm
11. Write a Java program to implement the concept of RSA algorithm
12. Write a Java program to implement the concept of Diffie- Hellman Key Exchange Algorithm
13. Write a Java program to implement the concept of MD5
14. Write a Java program to implement the concept of SHA-1
15. Write a C program to implement the signature scheme named digital signature standard
16. Setup a honey pot and monitor the honeypot on network (KF Sensor)
17. Demonstrate intrusion detection system (ids) using any tool (snort or any other s/w)
18. Select a Network device, Analyze and Capture the network packets using Wireshark tool.
19. Identify the MAC Addresses, IPV4 and Port Addresses using Wireshark tool.

Reference Books:

1. Bruce Schiener, "Applied Cryptography". John Wiley & Sons
2. Bernard Menezes," Network Security and Cryptography", Cengage Learning.
3. Atul Kahate, "Cryptography and Network Security", TMH

MCA305-4 - FUNDAMENTALS OF DATA SCIENCE LABORATORY

LIST OF EXPERIMENTS:

1. Take a set of Data and use chi square test to analyze the data
2. Taka a set of Data and analyze and apply T-test and F-test for the same
3. Demonstrate the concept of if … else constructs and for …. Loop structures using R Language
4. Demonstrate the concepts of Argument matching in R
5. Take a data set and perform regression analysis
6. Generate a histogram for the rainfall for every 3 days in a winter season and plot this in a DataFrame
7. Perform the following operations in PLSQL: Creating tables, Distribution and Partitioning, Indexes and Creation of External Tables.
8. Take a set of Time Series data (for example, No. of packets arrival per second from the server and number of packets sent from server) of a computer center and perform the regression time series analysis for high data rates and low data rates
9. Prepare a report on the orders of 5 years of data of any organization using RandomForests
10. Perform some basic operations on MongoDB Query Language

Text Books:

1. Mining of Massive Datasets. v2.1, Cambridge University Press. 2014, Jure Leskovek, AnandRajaraman and Jeffrey Ullman.
2. Elements of Statistical Learning, Second Edition. ISBN 0387952845. 2009, Trevor Hastie,Robert Tibshirani and Jerome Friedman

Reference Books:

1. Data Mining and Analysis: Fundamental Conceptsand Algorithms. Cambridge UniversityPress. 2014. Mohammed J. Zaki and Wagner Miera Jr.
2. NoSQL For Dummies, Adam Fowler, Wiley, 2015
3. Big data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's businesses, Wiley, 2013

Discipline Elective – V Laboratory

S No	Course Code	Course Name	Credits
1	MCA306-1	Advanced Data Structures and Algorithms Laboratory	**02**
2	MCA306-2	.Net Framework and C# Laboratory	**02**
3	MCA306-3	Internet of Things Laboratory	**02**
5	MCA506-4	Advanced Java Programming Laboratory	**02**

MCA306-1 - ADVANCED DATA STRUCTURES AND ALGORITHMS LABORATORY

List of Experiments

1. Implementation of Merge Sort and Quick Sort-Analysis
2. Multi Stack
3. Double ended Queues and Circular Queues
4. Implementation of a Binary Search Tree
5. Min Heap and Max Heap
6. AVL Trees
7. B- Trees
8. Red-Black Tree Implementation
9. Heap Implementation
10. Fibonacci Heap Implementation
11. Graph Traversals
12. Spanning Tree Implementation
13. Shortest Path Algorithms (Dijkstra's algorithm, Bellmann Ford Algorithm)
14. Implementation of Matrix Chain Multiplication
15. Activity Selection and Huffman Coding Implementation.

Text Books:

1. Fundamentals of Computer Algorithms by Ellis Horowitz, SartajSahni and Sanguthevar Rajasekaran, 2nd edition, University Press.
2. Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, ―Data Structures and Algorithms‖, Pearson Education, Reprint 2006

Reference Books:

1. Design and Analysis of Algorithms‖, First Edition, S.Sridhar Oxford University Press.2014

2. Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest,Clifford Stein, , Third Edition, Prentice-Hall, 2011.

MCA306-2 - .NET FRAMEWORK AND C# LABORATORY

List of Experiments:

1. Write a C# Sharp program to read age of a candidate and determine whether it is eligiblefor casting his/her own vote.
2. Write a C# Sharp program to accept a coordinate point in an XY coordinate system and determine in which quadrant the coordinate point
3. Write a C# Sharp program to calculate root of Quadratic Equation.
4. Write a program in C# Sharp to calculate and print the Electricity bill of a given customer. The customer id., name and unit consumed by the user should be taken from the keyboard and display the total amount to pay to the customer. The charge are as follow :
   Unit Charge/unit
   upto 199 @1.20
   200 and above but less than 400 @1.50 400
   and above but less than 600 @1.80 600 and
   above @2.00
   If bill exceeds Rs. 400 then a surcharge of 15% will be charged and the minimum bill should be of Rs. 100/-
5. Write a program in C# Sharp to make such a pattern like a pyramid with numbers increased by 1.
   The pattern is as follows:
   1
   2 3
   4 5 6
   7 8 9 10
6. Write a C# program to implement Encapsulation concept using public, private and protected access specifiers
7. Write a C# program to implement function overloading and function overriding
8. Write a C# program to implement Multiple Interfaces having same method namein .NET environment
9. Write a C# program to sort the elements in the following List elements using console application
   a. 1,5,6,2,4,3 b. A,I,G,B,H,F,C,
10. Write a program to simple calculator using windows application.
11. Write a windows forms application for creating a login form. After the successful login user can perform addition, multiplication, subtraction and division by the user. Controls can be added to the Windows forms via the Toolbox in Visual Studio. Controls such as labels, checkboxes, radio buttons, etc. can be added to the form via the toolbox
12. Write a C# program to implement the concept of Single threaded model
13. Write a C# program to implement the concept of Multi-threaded model
14. Write a C# program to implement Socket Programming. In this process, create a socket and setup a listener server node that starts listening to any messages coming to it via the predefined IP and

protocol. Create a client application that will send message to the listenerserver and read it.

15. Write a program in C# to create and copy the file to another name and display the content.
16. Write a program in C# program to implement the concept of Exception Handling in the following case:
    Let's assume that we are calculating the average grades for students. Further, we'll assume that for a particular subject not a single student sat for the exam. In this case, the divisor would become zero. If this situation occurs and there is no handler, the program would crash. However, developers usually foresee this possibility and check for zero divisors. A developer would enter code to handle the error by displaying an error message and bringingthe program to a logical end.

Text Books:

1. Herbert Schildt (2009), C# 3.0: The Complete Reference, McGraw-Hill, New Delhi
2. Wiley," Beginning Visual C# 2008",Wrox
3. Balagurusamy," Programming with C#", (TMH)
4. ShibiParikkar, " C# with .Net Frame Work" , Firewall Media.

Reference Books:

1. Jesse Liberty (2002), Programming C#, Second edition, O'Reilly Media Inc, Cambridge, USA
2. Paul Deitel, Harvey Deitel (2011), C# 2010 For Programmers, Deitel Developer Series,Fourth Edition, Pearson Education, New Delhi.
3. Fergal Grimes," Microsoft .Net for Programmers". (SPI)
4. Mark Michaelis, "Essential C# 3.0: For .NET Framework 3.5, 2/e, Pearson Education

MCA306-3 - INTERNET OF THINGS LABORATORY

LIST OF EXPERIMENTS

1. Start Raspberry Pi and try various Linux commands in command terminal window: ls, cd, touch, mv, rm, man, mkdir, rmdir, tar, gzip, cat, more, less, ps, sudo, cron, chown, chgrp, pingetc.
2. Read your name and print Hello message with name
3. Read two numbers and print their sum, difference, product and division.
4. Word and character count of a given string
5. Area of a given shape (rectangle, triangle and circle) reading shape and appropriate valuesfrom standard input
6. Print name 'n' times, where name and n are read from standard input, using for andwhile loops.
7. Print current time for 10 times with an interval of 10 seconds.
8. Read a file line by line and print the word count of each line.
9. Light an LED through Python program

10. Get input from two switches and switch on corresponding LEDs
11. Flash an LED at a given on time and off time cycle, where the two times are taken from a file.
12. Flash an LED based on cron output (acts as an alarm)
13. Switch on a relay at a given time using cron, where the relay's contact terminals are connected to a load.
14. Access an image through a Pi web cam.
15. Control a light source using web page.
16. Implement an intruder system that sends an alert to the given email.
17. Get the status of a bulb at a remote place (on the LAN) through web.
18. Get an alarm from a remote area (through LAN) if smoke is detected.

Course Outcomes:

After completion of the above courses the student will be able to

1. Execute the various Linux commands in command terminal window
2. Gain real time IoT experience by implementing python programs on Rasperry Pi platform
3. Implement the functionalities of various Actuators on Rasperry Pi and integrate the sensors & actuators in Raspberry Pi using Python Programming

Reference Books:

1. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), "Architecting the Internet of Things", Springer, 2011.
2. Jan Ho¨ ller, Vlasios Tsiatsis , Catherine Mulligan, Stamatis , Karnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things - Introduction to a New Age of Intelligence", Elsevier, 2014.
3. Olivier Hersent, David Boswarthick, Omar Elloumi , "The Internet of Things – Key applications and Protocols", Wiley, 2012

MCA306-4 - ADVANCED JAVA PROGRAMMING LABORATORY

List of Experiments

1. Write a java program to connect oracle database and perform basic SQL operations.
2. Write a java program to connect with MS-Access database and perform basic Query operations.
3. Write a java program to create Callable Statement to call the stored procedure and retrieve the result from oracle Server.
4. Write a java program to connect with MySQL database and perform basic MySQL operations.
5. Install Tomcat Web Server and Apache
6. Design and create registration form with all necessary fields using Servlets and JDBCto demonstrate the storage of data in the database.
7. Develop a web application to process student information.

8. Write a JSP program for arithmetic calculations
9. Write a JSP program to create checkboxes
10. Develop a web application using Servlet, JSP and JDBC
11. Implement Spring Dependency Injection via setter and constructor
12. Develop simple application using spring

Course Outcomes:

After successful completion of this course, students will be able to:

1. Differentiate between DDL and DML
2. Implement Database connectivity and web based applications
3. Develop Simple Application using Spring

Reference Books:

1. The J2EE Tutorial – Stephanie Bodoff et al, 2nd Edition, Pearson Education, 2004.
2. Java Servlet Programming, Second Edition by Jason Hunter, William Crawford, O'Reilly

Syllabus

MCA 2nd Year
4th Semester

MCA - IV Semester

S. No	Subject Code	Subject Name	Periods			Internal Exam			End Sem. Exam	Total Marks	Credit
			L	T	P	CT	TA	Total			
1	MCA401	**Major Project**	0	0	24	30	20	50	350	400	18
2	MCA402	**Seminar**	0	2	0	20	10	30	70	100	2
		Total								500	20

****L/T/P:** Lecture/Tutorial/Practical ****CT**=Class Test, **TA**= Teacher Assessment

**********END**********