MASTER OF SCIENCE

IN

COMPUTER SCIENCE

PROGRAMME STRUCTURE AND SYLLABUS

From 2019-2020 Admission Onwards

(UNDER MAHATMA GANDHI UNIVERSITY PGCSS REGULATIONS 2019)

BOARD OF STUDIES IN COMPUTER APPLICATIONS (PG)

MAHATMA GANDHI UNIVERSITY

KOTTAYAM

2019

Board of Studies in Computer Applications (PG)

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1. Aim of the Programme

The Master's programme in Computer Science aims to combine a scientific mind set with specialist technical knowledge, enabling graduates to analyse, design, validate and implement state-of-the-art ICT systems in their operational context. It is a broad-based program that covers concepts from engineering, science and business with the aim of producing high-quality software professionals. The courses are designed so that the students can pursue their research work in the Computer Science field.

2. Eligibility For Admission

The eligibility for admission to M.Sc. Computer Science programme in affiliated institutions under Mahatma Gandhi University is a B.Sc. Degree with Mathematics /Computer Science /Electronics as one of the subjects (Main or Subsidiary) **OR**BCA/B.Tech degree with not less than 55% marks in optional subjects.

Note: Candidates having degree in Computer Science/Computer Application/IT/Electronics shall be given a weightage of 20% in their qualifying degree examination marks considered for ranking for admission to M.Sc.(Computer Science).

3. Programme Structure and Duration

The duration of the programme shall be 4 semesters. The duration of each semester shall be 90 working days. Odd semesters from June to October and even semesters from December to April.

A student may be permitted to complete the programme, on valid reasons, within a period of 8 continuous semesters from the date of commencement of the first semester of the programme.

The programme shall include two types of courses, Core courses and Elective Courses.

There will be five core courses including one practical course for the first two semesters. In the third semester there arefive core courses with one elective courses, one practical and one mini project. In the last semester there are two core courses, two electives and one main project. There are three groups of electives and each group contains three courses. Each college has to select one group of electives for the programme. At the end of the programme, there will be a comprehensive viva-voce .

4. Examinations

There shall be University examination for both theory and practical at the end of each semester. Main Project evaluation and Viva -Voce shall be conducted at the end of the programme only. Comprehensive viva-voce in the fourth semester will cover entire courses in the programme. Project evaluation and Viva-Voce shall be conducted by two external examiners and one internal examiner.End-semester examination of all courses except project will be of three hoursduration.

5. Faculty under which Degree is awarded

Faculty of Science

6. Curriculum Design Abstract

Semester I

CA500101 - Computational Mathematics
CA010101 - Advanced web Technology
CA010102 - Operating Systems
CA500102 - Advanced Java Programming
CA010103 - Lab I [Java& PHP]

Semester II

CA500201 - Advanced Data Structures
CA010201 - Computer Networks
CA010202 - Research Methodology and Technical Writing
CA500202 - Database Management system and SQL
CA010203 - Lab II [DS using Java, SQL]

Semester III

CA010301 - Digital Image Processing
- Elective I

CA010302 - Python Programming
CA500301 - Software Engineering
CA010303 - Lab III [DIP using Python]
CA010304 - Mini Project using IOT

Semester IV

CA010401 - Data Mining
- Elective II
- Elective III

CA010402 - Main Project
CA010403 - Course Viva

Elective Group A

CA800301 - Introduction to Cyber Security
CA800402 - Applied Cryptography
CA800403 - Ethical Hacking

Elective Group B

CA810301 - Statistical Computing for Data Analytics
CA810402 - Big Data Management Using R
CA810403 - Data Analytics

Elective Group C

CA820301 - Soft Computing
CA820402 - Advanced Python Programming

CA820403 - Pattern Recognition

7. Scheme

Semester	Course Code	Type of Course	Teaching Hrs/Week		Credit	Total Credit
			Theory	Practical		
I	CA500101	Core	4		4	19
	CA010101	Core	4		4	
	CA010102	Core	4		4	
	CA500102	Core	3		3	
	CA010103	Core		10	4	
II	CA500201	Core	4		4	19
	CA010201	Core	4		4	
	CA010202	Core	3		3	
	CA500202	Core	4		4	
	CA010203	Core		10	4	
III	CA010301	Core	4		4	20
		Elective I	4		4	
	CA010302	Core	4		4	
	CA500301	Core	4		4	
	CA010303	Core		5	2	
	CA010304	Core		4	2	
IV	CA010401	Core	5		4	22
		ElectiveII	5		4	
		ElectiveIII	5		4	
	CA010402	Project		10	8	
	CA010403	Viva-voce			2	

8. First Semester Courses

CA500101	Computational Mathematics
CA010101	Advanced web Technology
CA010102	Operating System
CA500102	Advanced Java Programming
CA010103	Lab I [Java & PHP]

CA500101--Computational Mathematics

Module I

Mathematical Logic: Propositional Calculus: Statements and notations, Connectives: negation, conjunction, disjunction, statement formulas and truth tables, conditional and biconditional, Well-formed formulas, tautologies, equivalence of formulas, tautological implication. Normal forms: Disjunctive and conjunctive normal forms.

Predicate calculus: Predicates, statement functions, variables and quantifiers, predicate formulas, free & bound variables, universe of discourse.

Module II

Basic Statistics: Measure of central value: Introduction, types of average- arithmetic mean: calculation of arithmetic mean-discrete series, continuous series. Median:calculation of median-discrete series, continuous series. Mode: calculation of mode- discrete series, continuous series.

Measures of dispersion: Absolute and relative measures of dispersion, Range, Mean deviation:calculation of mean deviation-individual observations, discrete series, and continuous series.Standard deviation: calculation of standard deviation- individual observations, discrete series, continuous series, coefficient of variation.

Module III

Correlation& Regression analysis**:** introduction, correlation and causation ,types of correlation, Karl Pearson's coefficient of correlation-direct method of finding out correlation coefficient, calculation of correlation coefficient when change of scale and origin is made.

Regression: introduction, regression equation of y on x, regression equation of x on y.

Module IV

Theory of Automata: Definition, Description of finite automaton, Transition systems and its properties, Acceptability of a string by a finite automata, Non deterministic finite state machines, Equivalence of DFA and NDFA, Minimization of finite automata -construction of minimum automaton. Regular sets and regular grammar: Regular expressions, Transition system containing null moves, construction of finite automata equivalent to a regular expression.

Module V

Fuzzy logic: Introduction, Crisp set an overview, Fuzzy sets basic types, Basic concepts , Characteristics and significance of paradigm shift.

Reference Text

1. J.P. Tremblay & R Manohar- Discrete Mathematical Structures with Applications to Computer Science ,McGraw Hill.
2. S. P. Gupta- " Statistical Methods", Sultan Chand & Sons.
3. K.L.P Mishra & N. Chandrasekaran -Theory of Computer Science(Automata ,Languages and Computation) ,Prentice hall of India.

4. George J Klir& Bo Yuan- Fuzzy sets and Fuzzy logic Theory and applications, Prentice hall of India.

CA010101--Advanced Web Technology

Module I

Internet introduction, WWW, understanding client/server role, web browsers, web servers, HTML 5 core elements and attributes, text formatting and presentational tags, links, adding images, image maps, lists, tables, HTML 5 form controls- text input, check box, radio button, select box, file select box, buttons, number, date, time, calendar, and range, <nav>,<section>, <article>, <header>, <footer>.

CSS Introduction, <link> and <style>, CSS properties, text pseudo classes.

Module II

Javascript, document object model, variables, operators, popup boxes , functions, conditional statements, looping, events, built-in –objects, form validation.

Introduction to PHP, server side scripting, php comments, variables, echo and print, PHP operators, data types, branching statements, loops.

Module III

Arrays, PHP functions, working with forms, $_GET, $_POST, $_REQUEST, String functions, include and require, session and cookie, error handling in PHP.

Module IV

Object Oriented Programming using PHP- classes, objects, constructor, destructor, inheritance, polymorphism, function overriding.

Introduction to MySQL, Database & table creation, database operations-select, insert, update, delete, drop, database connections, functions for managing database connections.

Module V

CodeIgniter (PHP MVC Framework) – MVC Overview, Explaining Models, Views, Controllers, Installation, Setup Dreamweaver/NetBeans IDE, Folder Structure
Configuration -Libraries & Helpers, Active Record Class-- Selecting Data, Inserting Data, Updating Data, Deleting Data , Working with Simple Database Program

Reference Text

1. Steven Holzner, The complete reference PHP 5.2, 5th Edition , Tata McGraw-Hill

2. Steven Holzner, The complete reference HTML5 & CSS, 5th Edition, Tata McGraw-Hill Edition.

3. Steve Suehring, Tim converse and Joyce Park, *PHP6 and MySQL* , Wiley publication

4. IVanBayRoss , HTML, DHTML, JavaScript, Perl CGI, 4th Edition, BPB Publications

CA010102-- Operating Systems

Module I

Computer system architecture – single processor systems , multiprocessor systems , clustered systems.Operating system operations- dual mode and multimode operation. Process management, Memory management, Storage management. Computing Environments- Traditional computing, Mobile computing, Distributed systems, Client Server computing, Peer-to-Peer computing, Virtualization, Cloud computing, Real-time embedded systems.

System structures - Operating system services , System calls , Types of system calls ,Operating system structure-Simple structure, Layered approach, Microkernals ,Modules, Hybrid systems.

Module II

Process management - Process concept - Process state, PCB, Process Scheduling -Scheduling queues, Schedulers, Context switch, Operations on processes - creation, termination, Interprocess Communication- Shared memory systems , MessagePssing systems.

Multithreaded Programming - Overview , Multithreading Models.

Process Scheduling – Basic Concepts, Scheduling criteria , Scheduling algorithms- FCFS, SJF, Priority scheduling, RR scheduling, Multilevel queue scheduling, Multilevel Feedback queue scheduling,

Module III

Process Synchronization - The critical section problem- Peterson'sSolution, Synchronization hardware , MutexLocks , Semaphores, Monitors,Monitor usage

Deadlocks – System model, Deadlock characterisation, Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock.

Module IV

Memory management- Memory management strategies - Basic hardware , Address binding , Logical Vs Physical address space, Dynamic loading , Dynamic linking and shared libraries , Swapping ,Contiguous memory allocation ,segmentation , Paging - Basic method , Hardware support, Protection,Shared pages.

Virtual memory management :- Demand paging - Basic concepts ,Performance of demand paging, Page Replacement, Page Replacement algorithms - FIFO, Optimal page replacement, LRU page replacement .

Module V

Case study -The Linux System - Features , Advantages,Linux history , Design Principles ,Kernel Modules,Process Management, Scheduling - Process Scheduling, Real-time Scheduling , Virtual Memory , File Systems , Interprocess Communication , Security .

Various types of shells available in Linux - Comparison between various shells - Linux Commands for files and directories - cd, ls, cp ,rm, mkdir, rmdir, pwd, file , more, less . Creating and viewing files using cat .

Reference Text

1. Abraham Silberschatz, Galvin, Gange, Operating SsystemConcepts, 9th Edition ,Wiley Publishers .
2. Milan kovic, Operating Systems, Second Edition .
3. Official Red hat Linux Users Guide- Red hat, Wiley Dreamtech India.
4. Christopher Negus, Red Hat Linux Bible -2005 Edition,Wiley Dreamtech India.
5. YeswantKanethkar, Unix Shell Programming,First Edition, BPB .

CA500102—Advanced Java Programming

ModuleI : Object Oriented Programming Concepts and Basics of Java.

Java Programming Environment – JDK, Java Virtual Machine, Bytecode, Features of Java Flow Control Statements – Conditional Statements, Iteration Statements, Jump Statements Arrays –One Dimensional Array, Multi-dimensional Array , Object Oriented Programming Concepts- (Objects and Classes, Encapsulation, Inheritance, Polymorphism) , Type of Inheritance , Method Overloading, Method Overriding, Dynamic Method Despatch

Module II :Input/Output Handling

Constructors- Constructor Overloading , this, super, final, abstract and static Keywords, Interfaces- Defining an Interface, Implementing Interface, Extending Interfaces. String - String Handling Fundamentals, Comparison of String and StringBuffer Class, Special String Operations- Character Extraction, String Comparison, Searching String, Modifying a String, String Copy ,Input and Output Streams – Byte Stream , Character Stream

ModuleIII:Packages; Exception Handling and Thread

Packages – Defining Packages, Built in Packages(java.lang, java.util, java.io, java.net, javax.swing), Importing Packages, Implementation of User Defined Packages, Access Protection in Java, Exception Handling - try, catch, throw, throws and finally Statements, Java's Built-in Exceptions, Creating User Defined Exceptions. Threads- Thread Lifecycle, Thread Priorities, The Thread Class, Runnable Interface, Creating a Thread – Implementing Runnable, Extending Thread ,Inter Thread Communication, Suspending Resuming and Stopping Threads.

Module IV: GUI Programming

Basic Event Handling – Delegation Event Model, Important Event Classes And Listener Interfaces, Handling Mouse and Keyboard Events,Adapter Classes, Swing -Window Fundamentals – Class Hierarchy, Frame, Creating a Simple Window Based Application, ImageIcon, JLabel, JTextField, JTextArea, JButton, JCheckBox, JRadioButton, JList, JComboBox, JTable, JTabbedPane, JScrollPane, Layout Management – The FlowLayout, BorderLayout, GridLayout, CardLayout

ModuleV : File, Database and Networking

File Management - Reading and Writing Files (FileInputStream and FileOutputStream Classes), Networking Basics- Networking Classes and Interfaces, InetAddress, TCP/IP Client Sockets, URL Connection, TCP/IP ServerSockets, JDBC - The Design of JDBC, JDBC Configuration, Executing SQL Statements- Scrollable and Updatable ResultSets, RowSets, Transactions.

Reference Text

1. Herbert Schildt,Java 2 The Complete Reference, Tata McGraw Hill (5thEdn.)
2. James. P. Cohoon,Programming java5.0, , Jack. W. Davison (Tata McGraw Hill)
3. C Thomas Wu, An introduction to Object Oriented Programming with Java, , Tata McGraw Hill, (2006)
4. Wigglesworth and McMillan ,Java Programming: Advanced Topics, , Cengage Learning India, 3rdEdn.
5. Bernard Van Haecke, JDBC:Java Database Connectivity, , IDG Books India (2000)

CA010103 – **Lab I Advanced Java Programming& PHP**

1. Basic Concepts and File Handling
   1.1. Inheritance, Polymorphism
   1.2. Constructors
   1.3. Interface
   1.4. Package
   1.5. One Dimensional and Two Dimensional Array Manipulation

1.6. String Handling (Character Extraction, String Comparison, Searching String, Modifying a String, String Copy)
1.7. Exception (Built-in and User Defined)
1.8. Thread (Using Runnable Interface and Thread Class)
1.9. File management (File reading, Writing, Appending and Content Replacing)

2. GUI, Database and Networking
   2.1. Event Handling (Keyboard and Mouse Events)
   2.2. Working with Swing (ImageIcon, JTextField, JTextArea, JButton, JCheckBox, JRadioButton, JComboBox, JList, JTable)
   2.3. Layout Management (The FlowLayout, BorderLayout, GridLayout, CardLayout)
   2.4. Simple Programs of Database Connectivity

PHP

1. Create a calendar of the month of January 2019 using HTML.
2. Design a page for the inauguration of your department association using HTML & CSS.
3. Create and validate a bio data form using JavaScript and HTML.
4. Create a JavaScript program to display todays date and current time..
5. Program to check whether the string is palindrome or not using PHP.
6. Create a Login page by using PHP and session.
7. Create a simple online quiz page using PHP and MySQL.
8. Create a simple user registration page in PHP.
9. Create an E- mail registration form using Code igniter.
10. Create an online shopping cart using Code igniter.

9. Second Semester Courses

CA500201	Advanced Data Structure
CA010201	Computer Networks
CA010202	Research Methodology and Technical Writing
CA500202	Database Management system and SQL
CA010203	Lab II [DS using Java, SQL]

CA500201-- Advanced Data Structures

Module I

Concept of data structures, types of data structures, examples.
Introduction to algorithms, Performance analysis-Space complexity, Time complexity, Amortised complexity, Asymptotic notations, Performance measurement; various algorithm designing techniques-Divide and conquer, Greedy method, Dynamic programming, Backtracking, Branch and bound, *Np*-hard and *Np*-completeness problems.

Module II

Arrays: Organization, Representation and implementation of arrays, examples. Implementation of Stacks and Queues, Circular Queues, Priority Queues, Double ended queues, Applications of stacks and queues.

Sorting and Searching techniques: Linear and Binary search, Selection sort, Merge sort, Simple insertion sort, Quick sort, Shell sort, Radix sort.

Module III

Lists: Representation and implementation of singly linked list, Circular linked lists, doubly linked list, Linked list representation of stacks and queues, examples.

Dynamic storage management. Boundary tag system. Garbage collection and compaction.

Module IV

Trees: Representation and Implementation, Binary trees, insertion and deletion of nodes in binary tree, binary tree traversals, Binary search trees, Threaded Binary trees, Balanced trees (AVL trees), B- trees- Insertion and Deletion of nodes, Tree search

Module V

Graphs: Directed Graphs, Shortest Path Problem, Undirected Graph, Spanning Trees, Techniques for graphs –Breadth First Search (BFS) and traversal, Depth First Search (DFS) and traversal

Hashing: Static hashing, hash tables, hash functions, overflow handling.

Reference Text

1. Robert Lafore, Data structures and Algorithms in Java, Pearson Publications
2. Clifford A Shaffer , Data Structures and Algorithm analysis in Java
3. Ellis Horowitz, SartajSahni, SanguthevarRajasekaran, Computer Algorithms/C++, University press publications
4. G S Baluja, Data structures Through C++,

5. Ellis Horowitz and SartajSahni, Fundamentals of Data structure

CA010201--Computer Networks

Module I

The OSI Model- Layered architecture, Peer-to-Peer process, Encapsulation. Layers in the OSI Model- Physical layer, Data link layer, Network layer, Transport layer, Session layer, Presentation layer, Application layer. TCP/IP protocol suite. Addressing- Physical addresses, Logical addresses, Port addresses, Specific addresses. Physical Layer:- Transmission media- Guided media- Twisted pair, Coaxial, Fiber-optic Cables. Unguided Media- Radio waves, microwaves, infrared waves. Switching-Packet switched networks, Datagram Networks, Virtual circuit networks.

Lab- Different types of LAN cables, connectors, Hub, Switch, Router, and Configuration of star LAN (Ethernet LAN)

Module II

Data Link Layer:- Framing, Flow and Error Control, Protocols, Noiseless channels- simplest, stop-and-wait protocols. Noisy channels- Stop and wait ARQ, Go-Back NARQ, Selective Repeat ARQ. Piggybacking. Random access protocols- Aloha (Pure& slotted), CSMA, CSMA/CD, CSMA/CA. Standard Ethernet- MAC sub layer, Frame format. Fast Ethernet, Gigabit Ethernet. Wireless LAN (IEEE 802.11)- Architecture, MAC sub layer, Frame format, Addressing mechanism, Physical layer. Bluetooth- Architecture, Bluetooth layers, Frame format. Connecting Devices- Hubs, Switches, Routers, Gateway.

Lab-connecting two LAN using a switch

Module III

Network Layer: IPv4 Addresses- Address space, Notations, Classful addressing, Classless addressing, NAT. IPv6 Addresses- Structure, Address space. Internet Protocol (IP)- IPv4 Datagram format, IPv6- Advantages, Packet format. Transition from IPv4 to IPv6- Dual stack, Tunneling, Header translation. Address mapping protocols: ARP, RARP, BOOTP, DHCP. Error Reporting protocol: ICMP-Types of Messages, Message format, Error Reporting, Query. Multicasting Protocol: IGMP- Group management, IGMP messages, Message format, IGMP operations. Forwarding- Forwarding Techniques, Forwarding process, Routing table. Unicast routing protocols- Distance vector routing (RIP), Link state routing (OSPF), Path vector routing (BGP).

Lab: Configuring Wireless LAN (WiFi)

Module IV

Transport layer: User Datagram Protocol (UDP)- Well-known ports for UDP, Datagram format, UDP operation, Use of UDP. TCP- TCP services, TCP features, TCP segment format, TCP connection- connection establishment, connection termination. SCTP-SCTP services, SCTP features, SCTP packet format, SCTP association- association establishment, data transfer, association termination. Congestion control- open loop congestion control, closed loop congestion control.

Module V

Application layer: Domain Name System- Name space, Domain name space, Distribution of Name space, DNS in the Internet- Generic domains, Country domains, Inverse domains. Resolution- Resolver, Recursive resolution, iterative resolution. DNS message. Types of records. DDNS (Dynamic Domain Name System). TELNET- Logging, Network virtual terminal, options, mode of operation. E-mail- Architecture, User Agent, Message Transfer Agent (SMTP), Message Access Agent: POP, IMAP. Web-based mail. FTP: Basic model of FTP, Control connection, Data connection, Anonymous FTP. HTTP protocol- HTTP transaction, Message formats, Persistent and Non persistent connection, Proxy server.

Reference Text

1. Behrouz Forouzan- Data Communication & Networking – Fourth Edition - The McGraw-Hill Companies, Inc.
2. James F. Kurose & Keith W. Ross - Computer Network – Top down approach – 7th Edition - Pearson Education, Limited
3. Behrouz A. Forouzan - TCP/IP Protocol Suite – 4th Edition - McGraw-Hill

CA010202-Research Methodology and Technical Writing

Module -I

Research Methodology**:** Meaning of Research, Objectives of Research, Motivation in Research, Types of Research, Research Approaches, Significance of Research, Research Methods versus Methodology, Research and Scientific Method, Research Process, Criteria of Good Research.

Module -II

Research Design**:**

Reading and Reviewing-Research literature, Finding Research Papers, Critical Reading, Developing a literature Review, Guidelines for Research Skills and Awareness, Validity of Research, Reliability in Research.Meaning of Research Design, Need for Research Design, Features of good design, Different Research Designs.

Module -III

Data Collection and Analysis**:** Introduction, Need for Data Collection**,** Methods ofData Collection, Principles for Accessing Research Data, Data Processing, Data Analysis, Presentation of Data, Error Analysis, Scientific Models. Scientific Methodology - Introduction Rules and Principles of Scientific Method, Hypothesis,Testing of Hypothesis, Basic concepts, Procedure,Important parametric tests: z-test ,t-test, χ^2-square test, F test.

Module -IV

Reporting and thesis writing

Presentation of algorithms, Environment of Algorithms, Asymptotic Cost. Graphs. Technical Reports- Structuring General format, Report-Bibliography referencing and footnotes.Research in Practice- Literature Review, Journals, Conference Proceedings, journal Impact Factor, citation Index, h Index .Application of Computer in Research --MS office and its application in Research, Use of Internet in Research – Websites, search Engines, E-journal and E-Library.

Module -V (10 Hours)

Ethics in Research –Research Ethics, Importance of Ethics in Research, Ethics values and Principles, Some Ethical issues ,Plagiarism, Misuse of Privileged Information, Misuse of Data, Authorship and other publication issues, meaning of Copy Right, Copy Right and Information Technology

Reference Text

1. Kothari, C.R., 1990. Research Methodology: Methods and Techniques. New Age International. Publishers(Second revised edition)
2. Justin Zobel,Writing For Computer Science, Springer (Third Edition)
3. K Prathapan,Research Methodology for Scientific Writing ,I.K International Publishing House Pvt.Ltd
4. Garg, B.L., Karadia, R., Agarwal, F. and Agarwal, U.K., 2002. An introduction to Research Methodology, RBSA Publishers.
5. S.P Satarkar, S.V., 2000. Intellectual Property Rights and Copy right. Ess Publications.

Additional reading

1. Carlos, C.M., 2000. Intellectual property rights, the WTO and developing countries: the TRIPS agreement and policy options. Zed Books, New York.
2. Day, R.A., 1992.How to Write and Publish a Scientific Paper, Cambridge University Press.
3. Fink, A., 2009. Conducting Research Literature Reviews: From the Internet to Paper. Sage Publications

4. Leedy, P.D. and Ormrod, J.E., 2004 Practical Research: Planning and Design, Prentice Hall.

5. Sinha, S.C. and Dhiman, A.K., 2002. Research Methodology, Ess Publications. 2 volumes.

6. Trochim, W.M.K., 2005. Research Methods: the concise knowledge base, Atomic Dog Publishing. 270p.

CA500202--Database Management System and SQL

Module I

Database, need for DBMS, users, DBMS architecture, data models, views of data, data independence, database languages, Relational Model-Basic concepts, keys, integrity constraints, ER model-basic concepts, ER diagram, weak entity set, ER to Relational, relationships, generalization, aggregation, specialization

Module II

Codd's rules, Relational model concepts , Relational algebra- Select, Project, Join, Relational calculus-tuple relational calculus and domain relational calculus, Specifying constraints management systems, Anomalies in a database, Functional dependencies, Normalization-First, Second, Third, Boyce Codd normal forms, multi-valued dependency and Fourth normal form, Join dependency and Fifth normal form.

Relational database query languages-Basics of SQL, Data definition in SQL- Data types, Creation, Insertion, Viewing, Updation, Deletion of tables, Modifying the structure of the tables, Renaming, Dropping of tables, Data constraints-I/O constraints, ALTER TABLE command.

Module III

Database manipulation in SQL- Computations done on the table- Select command, Logical operators, Range searching, Pattern matching, Grouping data from tables in SQL, GROUP BY, HAVING clauses, Joins-Joining multiple tables, Joining tables to itself, DELETE, UPDATE, Views-Creation, Renaming the column of a view, Destroys view- Program with SQL, Security-locks, Types of locks, Levels of locks, Cursors - working with cursors, error handling, Developing stored procedures,-Creation, Statement blocks, Conditional execution, Repeated execution, Cursor-based repetition, Handling Error conditions, Implementing triggers, Creating triggers, Multiple trigger interaction.

Module IV

Concept of transaction, ACID properties, serializability, states of transaction, Concurrency control, Locking techniques, Time stamp based protocols, Granularity of data items, Deadlock, Failure classifications, storage structure, Recovery & atomicity, Log base recovery,

Recovery with concurrent transactions, Database backup & recovery, Remote Backup System, Database security issues

Module V

Object Oriented Database Management Systems (OODBMS) - concepts, need for OODBMS, composite objects, issues in OODBMSs, advantages and disadvantages of OODBMS. Distributed databases - motivation - distributed database concepts, types of distribution, architecture of distributed databases, the design of distributed databases, distributed transactions, commit protocols for distributed databases

Reference Text

1. Elmasri and Navathe, Fundamentals of Database Systems, 5th Edition, Pearson

2. Abraham Silbersehatz, Henry F. Korth and S.Sudarshan, Database System Concepts, 6 th Edition, Tata McGraw-Hill.

3.JamesR.Groff and Paul N. Weinberg The complte reference SQL Second edition,Tata McGraw Hill

CA010203-Lab-II-DS & SQL

Advanced Data Structures (Using Java)

1. Array implementation – Insertion of new element into a specified position, Deletion of an element from the specified position within the array
2. Stack implementation – PUSH, POP and Traverse
3. Queue implementation –Insertion, deletion and Traverse
4. Circular Queue implementation –Insertion, deletion and Traverse
5. Deque (Double ended queue) implementation –Insertion, deletion and Traverse
6. INFIX to POSTFIX Conversion
7. INFIX to PREFIX conversion
8. POSTFIX evaluation
9. Searching - Linear and Binary search using arrays
10. Sorting – Selection sort, Merge sort, Simple insertion sort, Quick sort, Shell sort, Radix sort
11. Lists implementation - Singly linked list, Circular linked list, Doubly linked list

12. Dynamic array implementation- Linked list representation and implementation of stack and queue operations
13. Creation of binary tree, counting no. of nodes and display the nodes in a tree
14. Searching a node in a binary tree
15. Insertion and deletion of nodes in a B-Tree
16. Graphs – Implementation of BFS and DFS

SQL

1. Creating database tables and using data types (create table, modify table, drop table).

2. Data Manipulation (adding data with INSERT, modify data with UPDATE, deleting records with DELETE).

3. Implementing the Constraints (NULL and NOT NULL, primary key and foreign key Constraint, unique, check and default constraint).

4. Retrieving Data Using SELECT (simple SELECT, WHERE, IN, BETWEEN, ORDERED BY, DISTINCT and GROUP BY).

5. Aggregate Functions (AVG, COUNT, MAX, MIN, SUM).

6. String functions.

7. Date and Time Functions.

8. Use of union, intersection, set difference.

9. Implement Nested Queries & JOIN operation.

10. Performing different operations on a view.

11. Stored Procedure Programming – Simple Procedures – decision making – Loops – Error handlers – Cursors – Functions - Triggers – Calling Stored Procedure from Triggers.

10. Third Semester Courses

CA010301	Digital Image Processing
	Elective I
CA010302	Python Programming
CA500301	Software Engineering
CA010303	Lab III [DIP using Python]
CA010304	Mini Project using IOT

CA010301--Digital Image Processing

Module-I

Fundamentals of Image Processing –Definition of Image, Digital Image and Digital Image Processing, Examples of fields that use Digital Image Processing, Fundamental steps in image processing, Components of Image Processing system, Elements of Visual perception, Image sensing and acquisition, Image sampling and quantization, Relationships between pixels– Color image fundamentals – Color Models-RGB, CMY, HSI

Module-II

Image Enhancement in spatial domain – Basic Intensity transformation functions – Image Negatives, Log Transformations, Power Law Transformations, Piecewise Linear Transformations, Histogram processing, Enhancement using arithmetic, logic operations-Image Subtraction and Image averaging – Fundamentals of spatial filtering ,Smoothing spatial Filters.

Module-III

Image Enhancement in Frequency domain – Introduction to Fourier transform: 1- D, 2 –D DFT and its Inverse Transform, Properties of 2-D DFT, Image Smoothing and Sharpening using Frequency Domain Filters- Ideal, Butterworth and Gaussian filters and Homomorphic filtering.

Module-IV

Image restoration and Compression: A Model of Image degradation and restoration process – Noise models-Gaussian Noise, Rayleigh Noise, Gamma Noise, Exponential Noise, Impulse Noise, Restoration using Mean Filters, Order Statistics filters, Adaptive filters. Compression-Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, JPEG standard, MPEG.

Module-V

Image Segmentation –Fundamentals, Edge detection-Gradient operator, Marr-Hildreth edge detector, canny edge detector, Thresholding- Global Thresholding using otsu's method, Variable Thresholding, Region based segmentation – Region growing, Region splitting and merging, Segmentation using morphological watersheds.

Reference Text

1. Rafael C. Gonzalez, Richard E. Woods, Digital Image Processing, Pearson, Third Edition, 2014.
2. Kenneth R. Castleman, Digital Image Processing Pearson, 2006.
3. Anil K Jain, Fundamentals of Digital Image Processing, Prentice Hall, Fourth Edition,1989.
4. William K. Pratt, Digital Image Processing, John Wiley, Fourth Edition, New York, 2002.
5. Milan Sonka et al, Image processing, analysis and machine vision Brookes/Cole, Vikas Publishing House, Fourth edition, 2007.

CA010302 --Python Programming

Module I

Introduction-Features of Python, Installation, Basic Syntax, Variables and Datatypes, Operators- Arithmetic operators, Assignment operators, Comparison operators, Logical operators, Identity operators, Membership operators, Bitwise operators, Casting. Conditional Statements-if, if-else, Nested if-else. Looping Statements-for, while, Nested loops. Control Statements-break, continue, Pass.

Module II

Strings and text files; manipulating files and directories, os and sys modules; text files: reading/writing text and numbers from/to a file; creating and reading a formatted file (csv or tab-separated).

String Manipulations-Accessing Strings, Basic Operations-extract, replace, len, lower, upper, split, substrings, String slices,strings and number system: converting strings to numbers and vice versa, String Methods.

Module III

Lists, tuples, and dictionaries; basic list operators, replacing, inserting, removing an element; searching and sorting lists; dictionary literals, adding and removing keys, accessing and replacing values; traversing dictionaries.

Functions: hiding redundancy, complexity; arguments and return values; formal vs actual arguments, named arguments, Recursive functions.

Module IV

Modules & Packages: Creating Modules, import Statement, Locating Modules, Namespaces and Scope, Packages, Date and Time Modules.

Simple Graphics and Image Processing: “turtle” module; simple 2d drawing - colors, shapes; digital images, image file formats, image processing Simple image manipulations with 'image' module.

Module V

File Operations-Reading config files in python ,Writing log files in python ,Understanding read functions, read(), readline() and readlines(), Understanding write functions, write() and writelines() ,Manipulating file pointer using seek Programming using file operations

Reference Text

1. Kenneth A. Lambert,The Fundamentals of Python: First Programs, 2011, Cengage Learning, ISBN: 978-1111822705.
2. Mark Summerfield,Programming in python 3:second edition.
3. Charles Dierbach, “Introduction to Computer Science using Python”, Wiley, 2015
4. R Nageswara Rao, Python Programming

CA500301--Software Engineering

Module I

Introduction-Software engineering, Software process, SE practices, Process models-Generic process models, Prescriptive process model, Specialised process model, The unified process model.

Module II

Agile Development-Agility, Agility and cost of change, Agile process, Extreme programming, Adaptive software development, Scrum, Dynamic system development method ,Feature driven development, Agile Modeling, Agile Unified Process.

Introduction to UML: Class Diagram, Deployment Diagram, Use-Case Diagram, Sequence Diagram, Communication Diagram, Activity Diagram, State Diagram.

Module III

Understanding Requirements-Requirement engineering ,Building the Requirement model-Requirement modeling approaches-Scenario based modelling, UML Model that supplement the Use Case, Data modelling concepts Class Based modeling -Class responsibility collaborator modelling, Flow oriented modelling, Creating a behavioural model.

Module IV

Software Design-Design concepts-The Design Model, Architectural Design- Architectural styles and design, Architectural mapping using data flow, Component level design-Design guidelines, Conducting component level design, Component based development, User Interface Design-Golden rules, Interface design steps.

Testing- Software testing strategy-A Strategic Approach to software testing.Testing conventional applications-White box testing, Black box testing, Testing object-oriented applications-Object-oriented testing methods.

Module V

Software project management-Software measurement, Metrics for software quality, Software project estimation-Decomposition technique ,Empirical estimation model-The COCOMO11 Model. Project scheduling-basic principles-Defining a task set, Defining a task network, scheduling .Risk management-Software Risks, Risk identification, Risk projection, Risk refinement, THE RMMM PLAN.

Reference Text

1. Roger S. Pressman, "Software Engineering: A Practitioner's Approach" .McGrawHill International Edition. 7th Edition.
2. Carlo Ghezzi, Mehdi Jazayeri. Dino Mandrioli : "Fundamentals of software Engineering" , Second Edition.
3. Richard Fairley : Software Engineering Concepts", Tata McGraw Hill Edition 1997.
4. Martin I. Shooman : "Software Engineering – Design Reliability and Management",McGraw Hill International Edition.

CA010303—**Lab III DIP &Python**

Python

1. Programs using elementary data items, lists, dictionaries and tuples
2. Programs using conditional branches, loops.
3. Programs using functions

4. Programs using exception handling
5. Programs using classes and objects
6. Programs using inheritance
7. Programs using polymorphism
8. Programs to implement file operations.
9. Programs using modules.

Digital Image Processing

Program to input gray scale image and color image, convert image to array of numbers and perform rotations on the image.

1. Program for conversion between colour spaces RGB, CMY, HSI.

Program to find histogram value and display histogram of a grayscale and color image.

2. Program to apply basic intensity transformations.
3. Program to Implement 2-D DFT and Transform domain Filtering.
4. Program to read a grayscale image, corrupt the image using any noise models and apply mean filters or adaptive median filters to remove the noise.

Program for edge detection using gradient operators.

5. Program to Segment the image using Thresholding.

CA010304—Mini Project using IOT

CA010305--Internet of Things

Module I:

Advanced Programming with Python: Basic operators and variables, Decision Making and Loops, Modules, Exception Handling, Classes, Function, Multithreading, GUI Programming, email using SMTP.
Introduction to IoT**:**
Evolution of internet, Components and architecture of IoT, Types and requirements of IoT network, Protocols, Standards and Communication Technologies., IoT application areas.

Module II:

Arduino IDE**:** Arduino Software Development, Interaction of Arduino board With Computers, GPIO Programming with Arduino, ADCs, Custom Library for Arduino IDE.
Sensor Interfacing with Arduino IDE**:** Temperature sensor LM 35, Humidity sensor DHT-11., PIR sensor, Distance Measurement using HC SR 04, Gas Sensor interfacing using MQxx Series, LCD interfacing, SMS using GSM Module, Weight measurement using load cell.

Module III:

Raspberry Pi**:** Linux basics, Linux commands, RPi models, RPi programming languages and Operating Systems, , GPIO Interfacing, 1 wire driver, SPI and I^2C protocol, MCP3008 ADC.
Sensor Interfacing with RPi**:** Remote desktop of RPi Using SSH and VNC, LED and switch Interfacing, DS18B20 temperature sensor, Heart beat sensor, RPi FM Radio, Stepper motor, Servo motor, Gas sensor interfacing, Relay interfacing, Arduino and RPi.

Module IV:

Image Processing: Introduction to OpenCV, GUI Features, Image Processing in open CV: Image thresholding, Smoothing images, Image Edge Detection, Template Matching, Foreground Extraction using GrabCut Algorithm. Rpi camera interfacing: Camera Calibration, Face Detection using Haar Cascades, Feature Matching.
Cloud: Deployment models of cloud, Cloud configuration using Amazon cloud/thingspeak.

Module V:

Project:

1. Real time patient monitoring system using IoT and Cloud
2. Real time remote user authentication using face recognition
3. Implementation of a smart vehicle using IoT
4. IoT base waste management/ smart city application
5. Barcode/QR code based library access system
6. Implementation of a smart home using sensors and open CV model
7. Weather station Using IoT and OpenCV
8. Traffic monitoring using IoT and OpenCV
9. Real time video streaming to thingspeak / youtube using RPi
10. Cloud based attendance monitoring using face recognition

Reference Text

1. Internet of Things: architecture and design principles, TRaj Kamal, McGraw Hill Company

2. Internet of Things: Architectures, Protocols and Standards, By Simone Cirani, Gianluigi Ferrari, Marco Picone, Luca Veltri, Wiley and sons

3. The Internet of Things: How Smart TVs, Smart Cars, Smart Homes, and Smart cities are changing the world By Michael Miller

4. K M Abubeker et al , “IoT based real time patient monitoring and analysis using Raspberry Pi 3, ieeexplore digital library, ICECDS-2017, DOI: 10.1109/ICECDS.2017.8389932

11. Fourth Semester Courses

CA010401	Data Mining
	Elective II
	Elective III
CA010402	Project
CA010403	Viva-voce

CA010401-- Data Mining

Module I

Introduction**:** What is Data mining? Data Mining Tasks, KDD process, Data Mining Functionalities, Mining Frequent Patterns, Associations and Correlations, Classification and Prediction, Cluster Analysis, Classification of Data Mining systems, Major issues in Data Mining, Data objects and Attribute types- Nominal, Binary, Ordinal and Numeric attributes, Measuring the central tendency- Mean, Median and Mode. Data Warehouse, Multidimensional Data Model-Data Cubes, Schemas for multidimensional models-Stars, Snowflakes and Fact Constellations.

Module II

Data Preprocessing: Needs of Pre-processing the Data, Data Cleaning- Missing Values, Noisy Data, Data Cleaning as a Process. Data Integration- Redundancy and correlation analysis, Data Reduction- Attribute Subset Selection, Dimensionality Reduction, Numerosity Reduction, PCA. Data Transformation strategies, Data transformation by Normalization, Discretization by Binning, Histogram Analysis

Module III

Association Analysis- Frequent patterns, Basic terminology in association analysis- Binary representation, Itemset and support count, Association Rule, Support and Confidence, Frequent Item set generation- The Apriori Algorithm, Generating Association Rules from Frequent Itemsets, FP Growth algorithm, Pattern evaluation Methods- How strong association rules can be uninteresting and misleading, From Association Analysis to Correlation Analysis, Constraint-Based Frequent pattern Mining, Metarule-Guided Mining of Association Rules.

Module IV

Classification :- Basic concepts, General approach to classification, Decision Tree Induction, Basic Decision Tree algorithm, Attribute Selection Measures- Information Gain, Gain Ratio, Gini Index, Tree Pruning. Bayes Classification methods- Bayes‘ Theorem, Naïve Bayesian Classification, Rule-based Classification - Using IF-THEN Rules for Classification, Rule Extraction from a Decision Tree, Rule Induction Using a Sequential Covering Algorithm. Metrics for evaluating classifier performance, Cross validation. Classification by Back propagation- A Multilayer Feed-Forward Neural Network, Defining a Network Topology, Backpropagation, Inside the Black Box: Backpropagation and Interpretability.

Module V

Cluster Analysis: Introduction, Basic Clustering methods- Partitioning methods- k-Means and k-Medoid. Hierarchical Methods - Agglomerative and Divisive Hierarchical Clustering. Density Based Methods - DBSCAN, OPTICS, DENCLUE. Grid Based- STING, CLIQUE, Outlier Analysis- what are outliers, Types of outliers, Outlier detection methods - Statistical Distribution-Based Outlier Detection, Distance-Based Outlier Detection.

Reference Text

1. Jiawei Han & Micheline Kamber,Data Mining, Concepts and Techniques, , 3rd Edition.
2. Pang Ning Tan, Michael Steinbach and Vipin Kumar,Introduction to Data Mining, Pearson India Education Services
3. Arun K Pujari, Data Mining Techniques, , University Press
4. Sam Anahory& Dennis Murray,Data Warehousing in the Real World, Pearson Education, Asia.
5. PaulrajPonnaiah, Data Warehousing Fundamentals,Wiley Student Edition

12. Electives

Group A

CA800301-Introduction to Cyber Security

Module 1

What Is Computer Security?, Values of Assets, Threats, Confidentiality, Integrity, Availability,, Types of Threats, Types of Attackers, Harm, Risk and Common Sense, Method–Opportunity–Motive, Controls, Authentication, Identification Versus Authentication, Authentication Based on Phrases and Facts: Something You Know, Authentication Based on Biometrics: Something You Are, Authentication Based on Tokens: Something You Have.

Module 2

Access Control, Access Policies, Implementing Access Control, Procedure-Oriented Access Control, Role-Based Access Control.Cryptography, Problems Addressed by, Encryption, Terminology.Malicious Code—Malware, Malware—Viruses, Trojan Horses, and Worms,

Technical Details: Malicious Code.Countermeasures for Users.Email Attacks, Fake Email, Fake Email Messages as Spam, Fake (Inaccurate) Email Header Data Phishing, Protecting Against Email Attacks.

Module 3

Security in Operating Systems, Security Features of Ordinary Operating Systems, Protected Objects, Operating System Tools to Implement Security, Functions, Security in the Design of Operating Systems ,Simplicity of Design, Layered Design, Kernelized Design Reference Monitor, Correctness and Completeness, Secure Design Principles Trusted Systems, Trusted System Functions.

Module 4

Threats to Network Communications Interception: Eavesdropping and Wiretapping, Modification, Fabrication: Data Corruption, Interruption: Loss of Service, Port Scanning.

Denial of Service, How Service Is Denied, Flooding Attacks in Detail, Distributed Denial-of-Service, Scripted Denial-of-Service Attacks ,Bots, Botnets, Firewalls, What Is a Firewall?, Design of Firewalls Types of Firewalls, Intrusion Detection Systems, Types of IDSs.

Module 5

Security Requirements of Databases, Integrity of the Database, Element Integrity, Auditability, Access Control, User Authentication,Availability, Integrity/Confidentiality/Availability.

Information Technology Act 2000, Cyber Crimes- Computer Crime, Nature of Crimes, Penalty for damage to computer, Computer system, Tampering with Computer source documents, Hacking, Computer related offences.

Reference Text

1.Charles P. Pfleeger ,Shari Lawrence Pfleeger ,Jonathan Margulies - Security in Computing, Fifth Edition

2.Barkhs and U. Rama Mohan, "Cyber Law Crimes", Asia Law House, New Edition

3. Sood,"Cyber Laws Simplified", Mc Graw Hill

CA800402 – Cryptography

Module 1

Classical Encryption Techniques-Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Steganography. Traditional Block Cipher Structure, The Data Encryption Standard, The Strength of DES, Block Cipher Design Principles.

Module 2

Advanced Encryption Standard-AES Structure, AES Transformation Functions, AES Key Expansion, AES Implementation. Multiple Encryption and Triple DES. Principles of Pseudorandom Number Generation, Pseudorandom Number Generators, Stream Ciphers, RC4, True Random Number Generators.

Module 3

Principles of Public-Key Cryptosystems, The RSA Algorithm, Diffie-Hellman Key Exchange, Cryptographic Hash Functions, Applications of Cryptographic Hash Functions, Secure Hash Algorithm (SHA).

Module 4

Message Authentication Codes, Message Authentication Requirements, Message Authentication Functions, Requirements for Message Authentication Codes, MACs Based on Hash Functions: HMAC.

Module5

Key Management and Distribution, Symmetric Key Distribution Using Symmetric Encryption, Symmetric Key Distribution Using Asymmetric Encryption, Distribution of Public Keys, X.509 Certificates, Public-Key Infrastructure, Digital Signatures- Digital Signatures.

Reference Text

1.William Stallings, Cryptography and Network Security-Principles and Practice, Sixth Edition 2014.
2. BruiceSchneier, Applied Cryptography, Second edition, Wiley publications, 2006

CA800403- Ethical Hacking

Module 1

Ethics of Ethical Hacking, Ethical Hacking and the Legal System, Proper and Ethical Disclosure, Social Engineering Attacks, Physical Penetration Attacks, Insider Attacks.

Module 2

Vulnerability Analysis- Passive Analysis, Advanced Static Analysis with IDA Pro, Advanced Reverse Engineering, Client-Side Browser Exploits, From Vulnerability to Exploit.

Module 3

Hacking windows – Network hacking – Web hacking – Password hacking. A study on various attacks – Input validation attacks – SQL injection attacks – Buffer overflow attacks - Privacy attacks.

Module 4

TCP / IP – Checksums – IP Spoofing port scanning, DNS Spoofing. Dos attacks – SYN attacks, Smurf attacks, UDP flooding, DDOS – Models. Firewalls – Packet filter firewalls, Packet Inspection firewalls – Application Proxy Firewalls. Batch File Programming.

Module 5

Basic Linux Exploits, Advanced Linux Exploits, Collecting Malware and Initial Analysis, Hacking Malware.

Reference Text

1. Ankit Fadia“ Ethical Hacking” 2nd Edition Macmillan India Ltd

2. Allen Harper, Shon Harris, Jonathan Ness, Chris Eagle, Gideon Lenkey, and Terron Williams Gray Hat Hacking The Ethical Hacker’s Handbook ,, Third Edition.

Group B

CA810301 – Statistical Computing for Data Analytics

Module – I Data Analytics Life Cycle

Introduction to Big data Business Analytics - State of the practice in analytics role of data scientists - Key roles for successful analytic project - Main phases of life cycle - Developing core deliverables for stakeholders.

Module – II Statistics

Sampling Techniques - Data classification, Tabulation, Frequency and Graphic representation -

Measures of central value - Arithmetic mean, Geometric mean, Harmonic mean, Mode, Median, Quartiles, Deciles, Percentile - Measures of variation – Range, IQR, Quartile deviation, Mean deviation, standard deviation, coefficient variance, skewness, Moments & Kurtosis.

Module – III Probability And Hypothesis Testing

Random variable, distributions, two dimensional R.V, joint probability function, marginal density function. Random vectors - Some special probability distribution - Binomial, Poison, Geometric, uniform, exponential, normal, gamma and Erlang. Multivariate normal distribution - Sampling distribution – Estimation - point, confidence - Test of significance, 1& 2 tailed test, uses of t-distribution, F-distribution, $\chi 2$ distribution.

Module – IV Predictive Analytics

Predictive modeling and Analysis - Regression Analysis, Multicollinearity , Correlation analysis, Rank correlation coefficient, Multiple correlation, Least square, Curve fitting and good ness of fit.

Module – V Time Series Forecasting And Design Of Experiments

Forecasting Models for Time series : MA, SES, TS with trend, season - Design of Experiments, one way classification, two way classification, ANOVA, Latin square, Factorial Design.

Reference Text

1. Chris Eaton, Dirk Deroos, Tom Deutsch et al., "Understanding Big Data", McGrawHIll, 2012.
2. Alberto Cordoba, "Understanding the Predictive Analytics Lifecycle", Wiley, 2014.
3. Eric Siegel, Thomas H. Davenport, "Predictive Analytics: The Power to Predict Who Will Click, Buy, Lie, or Die", Wiley, 2013.
4. James R Evans, "Business Analytics- Methods, Models and Decisions", Pearson 2013
5. R N Prasad, Seema Acharya, Fundamentals of Business Analytics, Wiley 2015

CA810402 – **Big data Management using R**

Module I

Introduction to Big DataAnalytics Big Data Overview - Data Structures-Analyst Perspective on Data Repositories. State of the Practice in Analytics – BI versus Data Science-Current

analytical architecture. Drivers of big data Emerging big data Ecosystem and a new approach to Analytics. Key Roles for the New Big Data Ecosystem, Examples of Big Data Analytics.

Module II

Data Analytics Lifecycle **:**Data Analytics Lifecycle Overview – Key roles for a successful Analytics project. Background and overview of data analytics life cycle. Phase 1: Discovery - Learning the business domain-resources-framing the problem-identifying key stakeholders-Interviewing the analytics sponsor-developing initial hypotheses-Identifying Potential Data sources. Phase 2: Data Preparation - Preparing the Analytic Sandbox-performing ETLT-Learning about the data. Data conditioning-Survey and visualize-Common tools for the data preparation phase. Phase 3: Model Planning: Data exploration and variable selection. Model selection – common tools for the model planning phase- Phase 4: Model Building – common tools Phase 5: Communicate Results - Phase 6: Operationalize.

Module III

Text Analysis: Text Analysis Steps - A Text Analysis Example - Collecting Raw Text - Representing Text - Term Frequency - Inverse Document Frequency (TFIDF) Categorizing Documents by Topics. **Advanced analytics**: Analytics for unstructured data. Use cases –Map reduce-Apache Hadoop. The Hadoop echosystem: Pig-Hive-HBase-Mahout-NoSQL.

Module IV

Communicating and Operationalizing an analytics project. Creating the final deliverables. Developing core material for multiple Audiences-Project goals- Main findings – approach-Model description- Key points supported with data. Model details- Recommendations-Additional tips on final presentation-Providing technical specification and code. Data visualization basics: Key Points Supported with data. Evaluation of a graph-Common representation methods-How to clean up a graphic - Additional considerations.

Module V

Introduction to R **–** Basics - Download & Install R, RStudio - R Data Types: Arithmetic & Logical Operators - R Matrix: Create, Print, add Column, Slice - Data Frame: Create, Append, Select, Subset, Factor in R: Categorical & Continuous Variables - **Data Preparation** - R Data Frame: Create, Append, Select, Subset - List in R: Create, Select Elements - R Sort a Data Frame using Order() - R Dplyr: Data Manipulation(Join) & Cleaning(Spread) - Merge Data Frames in R: Full and Partial Match - Functions in R Programming, IF, ELSE, ELSE IF, For Loop in R using List and Matrix - While Loop in R - apply(), lapply(), sapply(), tapply() Function in R - Import Data into R: Read CSV, Excel - Replace Missing Values(NA) in R - R Exporting Data to Excel, CSV, Text File - Correlation in R: Pearson & Spearman with Matrix Example - R Aggregate Function: Summarise &Group_by() - R Select(), Filter(), Arrange(), Pipeline - **Data Analysis** - Scatter Plot in R using ggplot2 - Boxplot in R - Bar Chart & Histogram in R.

Reference Text

1. EMC Education Services, “Data Science and Big Data Analytics”, WILEY
2. Bart Baesens – “Analytics in a Big Data World “, WILEY
3. Mark Hornick, Tom Plunkett - “Using R to Unlock the Value of Big Data “
4. R programming for Data Science – Roger D Peng

CA810403 – **Data Analytics**

Module I: Introduction to Big Data

Introduction to Data Analytics Platforms–Traits of Big data -Challengesof Conventional Systems - Web Data – Evolution Of Analytic Scalability - Analytic Processes and Tools - Analysis vs Reporting - Modern Data Analytic Tools - Statistical Concepts: Sampling Distributions - Re- Sampling - Statistical Inference - Prediction Error, Ethics in Big Data Analytics.

Module II: Data Analysis

Regression Modeling - Multivariate Analysis - Bayesian Modeling - Inference

and Bayesian Networks - Support Vector and Kernel Methods - Analysis of Time Series: Linear Systems Analysis -

Nonlinear Dynamics - Rule Induction - Neural Networks: Learning And Generalization - Competitive Learning - Principal Component Analysis and Neural Networks - Fuzzy Logic: Extracting Fuzzy Models from Data - Fuzzy Decision Trees - Stochastic Search Methods.

Module III: Mining Data Streams

Introduction To Streams Concepts–Stream Data Model andArchitecture - Stream Computing - Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating Moments – Counting Oneness in a Window – Decaying Window - Real time Analytics Platform (RTAP) Applications.

Module IV: Frequent Itemsets

Mining Frequent Itemsets - Market Based Model–Apriori Algorithm–Handling Large Data Sets in Main Memory – Limited Pass Algorithm – Counting Frequent Itemsets in a Stream **Module V: Clustering (16 Hours)** Clustering Techniques–Hierarchical–K-Means–Clustering High DimensionalData – CLIQUE And PROCLUS – Frequent Pattern based Clustering Methods – Clustering in Non- Euclidean Space

– Clustering for Streams and Parallelism.

Reference Text

1. Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.
2. AnandRajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, 2012.
3. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", John Wiley & sons, 2012.
4. Glenn J. Myatt, "Making Sense of Data", John Wiley & Sons, 2007
5. Pete Warden, "Big Data Glossary", O'Reilly, 2011.
6. Jiawei Han, MichelineKamber "Data Mining Concepts and Techniques", Second Edition, Elsevier, Reprinted 2008.

Group C

CA820301 – SoftComputing.

Module I

Introduction :- Neural networks, Artificial network, Advantages of networks, Application scope of neural networks, Fuzzy logic, genetic algorithm, Hybrid systems – classification soft computing. Artificial neural network, Fundamental concept, Artificial neural network, biological neural network, Brains Vs computer comparison between biological neuron and artificial neuron

Module II

,Evolution of neural networks, Basic models of ANN, important terminologies of ANNS, McCulloch-Pitts neuron, Hebb network. Supervised learning network – perception networks, Adaline, multiple Adaptive linear neurons (Madaline),Functional link networks ,tree neural networks,wavelet neural networks.

Module III

Back propagation networks, radial basis function network,time delay neural network,Associative memory networks. Auto associative memory network, Hetero associative memory network BAM, Hop filed network, unsupervised Learning networks,Fixed weight competitive nets, Kohonenself organising maps, Learning vector quantization.

Module IV

Introduction to Fuzzy logic ,classical relations and fuzzy relations,tolerance and equivalence relations,non interactive fuzzy sets,membership functions, features of membership functions ,fuzzification,methods of membership value assignments,defuzzification, lambda- cuts , defuzzificationmethods,fuzzy arithmetic and fuzzy measures,fuzzyintegrals,fuzzyrulebaseand approximate reasoning,truthvalues and tables in fuzzylogic,fuzzy proposition,formation of rules, fuzzy reasoning,fuzzy inference systems,**overview** of fuzzyexpert system.

Module V

Genetic algorithm, Applications of GA, Biological background ,Genetic algorithms Vs traditional algorithms, Basic terminologies in genetic algorithm, simple GA ,General GA, operators in GA ,Encoding, selection, crossover, mutation.

Reference Text

1. S.N.SivanandamS.N.Deepa ,"Principles of soft computing " second edition, Wiley India Pvt. Ltd .

2. J.S.R Jang, C.T. son ,E. MIZUTANI "Neuro Fuzzy and soft computing" first edition, ,pearson education.

3 .**S**Rajasekaran, G. A.Vijayalakshmi **"**Neural networks, Fuzzy logic and genetic Algorithms : synthesis and application", second edition ,prentice Hall of India.

CA820402– Advanced Python Programming

Module I

Python Object Oriented Programming-Concept of class, object and instances, Constructor, class attributes and destructors, Real time use of class in live projects, Inheritance , overlapping and overloading operators, Adding and retrieving dynamic attributes of classes ,Programming using Oops support.

Module II

Python Regular Expression-Powerful pattern matching and searching Power of pattern searching using regex in python Real time parsing of networking or system data using regex Password, email, url validation using regular expression Pattern finding programs using regular expression

Module III

Python Exception Handling-Avoiding code break using exception handling, Safe guarding file operation using exception handling, Handling and helping developer with error code, Programming using Exception handling.

Module IV

Python Database Interaction -SQL Database connection using python, Creating and searching tables, Reading and storing config information on database, Programming using database connections.

Graphical user interfaces; event-driven programming paradigm; tkinter module, creating simple GUI; buttons, labels, entry fields, dialogs; widget attributes - sizes, fonts, colors layouts, nested frames.

Module V

Python Multithreading-Understanding threads, Forking threads, Synchronizing the threads, Programming using multithreading.

Contacting User through Emails Using Python- installing smtp python module, Sending email, Reading from file and sending emails to all users addressing them directly for marketing

Python CGI Introduction -Writing python program for CGI applications, Creating menus and accessing files, Server client program

Reference Text

1. Mark Summerfield, Programming in python 3, second edition.
2. Clinton W Brownley, Foundations for Analytics with Python.

CA820403– Pattern Recognition

Module I

Introduction – Pattern recognition systems – The design cycle –Learning and Adaptation - Bayesian Decision theory - Introduction - Continuous features - two-category classification - Minimum error rate classification - Classifiers, Discriminant functions and Decision Surfaces – The normal density - Discriminant Functions for the Normal Density- Error probabilities and Integrals

Module II

Parameter estimation and supervised learning - Maximum likelihood estimation - Bayesian estimation – Bayesian Parameter Estimation Gaussian case and general theory - Nonparametric techniques – Density estimation - Parzen Windows - k_n-Nearest Neighbour Estimation - Nearest-Neighbour Rule – k-Nearest Neighbour Rule.

Module III

Linear Discriminant Functions - Linear discriminant functions and decision surfaces – Generalized linear discriminant functions – Two-category linearly separable case - Non-separable behavior - Linear programming algorithms - Support vector machines - Multilayer neural networks – Feedforward operation and classification - Backpropagation algorithm - Error surfaces - Backpropagation as feature mapping.

Module IV

Stochastic methods – Stochastic search- Boltzmann learning – Nonmetric methods - Decision trees – CART – Other tree methods - Grammatical methods - Grammatical inference.

Module V

Unsupervised learning and clustering – Mixture densities and identifiability – Maximum-likelihood estimates - Applications to normal mixtures - Unsupervised Bayesian learning - Data description and clustering.

Reference Text

1. R.O.Duda, P.E.Hart and D.G.Stork, Pattern Classification, Second edition, John Wiley, 2006

2. Gonzalez R.C. & Thomson M.G., Syntactic Pattern Recognition - An Introduction, Addison Wesley.

3. Fu K.S., Syntactic Pattern Recognition And Applications, Prentice Hall

4. RajanShinghal, Pattern Recognition: Techniques and Applications, Oxford University Press, 2008.

13. Common Courses for M.Sc. CS & M.Sc. IT

Semester	Course Code
I	CA500101 CA500102
II	CA500201 CA500202
III	CA500301

14. Common Elective Group for M.Sc. CS & M.Sc.IT

Elective Code
CA800301
CA800402
CA800403

15. Model Question Papers

M.Sc.Computer Science Degree (C.S.S) Examination,

First Semester

CA500101--COMPUTATIONAL MATHEMATICS

(2019 admission onwards)

Time : Three hours Maximum Weight : 30

Section-A

(Answer any **eight** questions-Each question carries a weight of **1**)

1. What are connectives? Give examples.
2. What is universe of discourse?
3. Define a tautology? Give an example.
4. What is a mode? Give an example.
5. What is a range?
6. What are the different types of correlations?
7. What are regular expressions? Give an example.
8. Define a transition system.
9. What are fuzzy sets?
10. Define normal of a fuzzy set?

Section-B

(Answer any **six** questions-Each question carries a weight of **2**)

11. Show that $A \rightarrow (P \vee C) \Leftrightarrow (A \wedge \sim P) \rightarrow C$

12. What are quantifiers? Discuss Universal and Existential quantifiers with examples.

13. From the following data calculate arithmetic mean by direct method:

Marks	:	0-10	10-20	20-30	30-40	40-50	50-60
No. of Students	:	5	10	25	30	20	10

14. From the following data obtain the regression equation Y on X.

X	6	2	10	4	8
Y	9	11	5	8	7

15. Describe the method for the minimization of finite automata.

16. Discuss the features of finite automata.

17. Differentiate ordinary sets and fuzzy sets?

18. Describe various types of fuzzy sets.

Section-C

(Answer any **two** questions-Each question carries a weight of **5**)

19. Distinguish conjunctive and disjunctive normal forms.

Find the CNF of $\sim(P \vee Q) \leftrightarrow (P \wedge Q)$

20. Calculate the mean deviation and its coefficient from the following data:

Class	Frequency	Class	Frequency
0-10	5	40-50	20
10-20	8	50-60	14
20-30	12	60-70	12
30-40	15	70-80	6

21. Calculate Karl Pearson's coefficient of correlation from the following data.

Roll no. of students	:	1	2	3	4	5
Marks in accountancy	:	48	35	17	23	47
Marks in statistics	:	45	20	40	25	45

22. How can you construct a finite automata equivalent to a regular expression? Give an example.

M.Sc. Computer Science Degree (CSS) Examination

First Semester

CA010101 - Advanced Web Technology

Time: 3 Hrs Maximum Weight: 30

PART A

(Answer any **8** questions, carries weight of **1**)

1. Explain the role of client/server in Internet.
2. Explain the different text formatting tags in HTML.
3. What is document object model in JavaScript?
4. What is the difference between for and for-each loops in php?
5. Explain any four string functions in php.
6. Compare include and require functions?
7. Explain destructor in php.
8. What are the features of MySQL?
9. What is the default URL pattern used in Codeigniter framework?
10. What is_cli() method does in Codeigniter?

PART B

(Answer any **6** questions, carries weight of **2**)

11. Explain tags and attributes used for creating table in html with suitable example.
12. Explain text pseudo class.
13. What are the different types of loops in JavaScript?
14. Explain error handling in PHP.
15. Write down the different types of popup boxes in JavaScript.
16. Explain the different database operations.
17. Explain the Folder Structure of CodeIgniter framework.
18. How to Create Libraries in CodeIgniter.

PART C

(Answer any **2** questions, carries weight of **5**)

19. Explain session and cookie management in php with suitable examples.
20. Explain the different functions used for database connectivity.
21. Explain built in objects in JavaScript.
22. Explain CSS properties.

M.Sc. Computer Science Degree (CSS) Examination

First Semester

CA010102 - Operating Systems

(2019 Admission Onwards)

Time: 3 Hrs. Max. Weight: 30

Section A

(Answer any Eight questions. Each question carries a weight of 1)

1. What are the advantages of mobile computing ?
2. What is the difference between computer server system and file server system ?
3. What is meant by system call ?
4. What is PCB ?
5. Define multithreading .
6. What is semaphore ?
7. Define virtual memory .
8. How the page fault occurs ?
9. Write the features of Linux system .
10. Discuss the function of ls command in Linux .

(8X1 = 8)

Section B

(Answer any Six questions. Each question carries a weight of 2)

11. Differentiate single processor system and multiprocessor system .
12. Explain the term ‘cloud computing ‘ .
13. Briefly explain , different types of system calls .
14. Explain the process states with necessary diagram .
15. Describe the process scheduling criteria .

16. Write note on mutexlock .
17. Explain demand paging.
18. What are the various types of shells available in Linux ?

(6X2 = 12)

Section C

(Answer any Two questions. Each question carries a weight of 5)

19. Explain process scheduling algorithms .
20. Describe the Deadlock avoidance methods .
21. Explain the page replacement algorithms .
22. What is meant by file system in Linux system ? And also explain various Linux commands for files and directories .

(2X5 =10)

M.Sc. Computer Science Degree (C.S.S) Examination,

First Semester

CA500102 - Advanced Java Programming

(2019 admissions onwards)

Time: Three hours Max. Weight: 30

Section- A

(Answer any **eight** questions. Each question carries a weight of 1)

1. What are the features of Java?
2. What are the different conditional statements in java?
3. What is the use of 'this' keyword?
4. Describe constructor overloading with an example?
5. What is a built-in package? Describe the use of any two built-in pacakges.
6. Describe access protection in java.
7. Describe delegation event model.
8. Describe mouse event handling.
9. What is a ServerSocket in Java?
10. What are the different methods in the InetAddress class?

(8 x 1 = 8)

Section B

(Answer any **six** questions. Each question carries a weight of 2)

11. Explain different types of inheritance in Java with suitable example.

12. Distinguish method overloading and method overriding.

13. Differentiate between String and StringBuffer class.

14. What is an interface in Java? Implement multiple inheritance using interface in Java.

15. Distinguish throw and throws statements.

16. Describe two different ways to create a thread in java?

17. Write short note on Frame.

18. What is the use of JDBC DriverManager class? (**6 x 2 = 12**)

Section C

(Answer any **two** questions. Each question carries a weight of 5.)

19. Explain input/output streams in Java. Write a java program to read a matrix from the user and check whether the matrix is a diagonal matrix or not.

20. Explain Thread lifecycle and inter thread communication in Java.

21. What are the different methods in ImageIcon and JButton class? Explain layout management with suitable examples.

22. Explain JDBC configuration. What are the different types of ResultSet? How to rollback a JDBC transaction?

(**2 x 5 = 10)**

M.Sc. Computer Science Degree (C.S.S.) Examination
Second Semester
CA010201 - Computer Networks
(2019 admission onwards)

Time: Three Hours **Max. Weight: 30**

Section-A

(Answer any ***eight*** questions. Each question carries a weight of 1.)

1. How does sky propogation differ from line-of-sight propogation?
2. What is the difference between a port address, a logical address and a physical address?
3. What are the advantages of optical fiber over twisted-pair and coaxial cable?
4. Define Piggybacking and its usefulness.
5. What is the difference between a switch and a bridge?
6. What is NAT?
7. What is the purpose of RIP?
8. Explain the TCP connection establishment procedure.
9. How does recursive resolution differ from iterative resolution?
10. What are the tree FTP transmission modes?

(8 x 1 = 8)

Section-B

(Answer any ***six*** questions. Each question carries a weight of 2.)

11. Explain the services provided by a user agent of an e-mail system.
12. Explain closed-loop congestion control techniques.
13. Explain Border Gateway Protocol.
14. Explain IGMP Protocol in detail.
15. Explain IPv4 Datagram format.
16. What are the common Standard Ethernet implementations? Explain.
17. Explain random access protocols in detail.
18. Compare and contrast a circuit-switched network and a packet-switched network.

(6 x 2 = 12)

Section-C

(Answer any ***two*** questions. Each question carries a weight of 5.)

19. Explain in detail the network model created by International Standards Organization.
20. Compare and explain Wireless LAN Architecture with Bluetooth Architecture.
21. Explain Link state routing protocol in detail.
22. Explain the working of DNS in the Internet.

(2 x 5 = 10)

M.Sc. Computer Science Degree (C.S.S) Examination,

Second Semester

CA010202- Research Methodology and Technical Writing

(2019 admissions onwards)

Time: Three hours Max. Weight: 30

Section- A

(Answer any **eight** questions. Each question carries a weight of 1)

1. What is the significance of research?
2. Describe the basic methods of descriptive statistics.
3. Explain the importance of graph in resesrch.
4. What is hypothesis?
5. What is mean by asymptotic analysis?
6. Define proscode?
7. What is descriptive Statstics ?
8. What is h-index?
9. Define Plagiarism.
10. What is ethics in research?

(8 x 1 = 8)

Section B

(Answer any **six** questions. Each question carries a weight of 2)

11. Describe the different types of research .
12. Explain difference between experiment and survey.

13 What are objectives of research?

14. Distinguish between Research method and Research methodology.

15. Briefly explain the various aspects of reliability in research.

16. Discuss thedifference between harmonic mean and geometric mean.

17. Describe the types of errors in measurement.

18. What is the impact factor of a journal? How it is calculated? (6X2=12)

Section C

(Answer any **two** questions. Each question carries a weight of 5.)

19. Briefly describe the different steps in research process.

20. What is need for data collection in research? Explain the various methods of data collection

21. What is meant by literature review ? Describe various sources of literature and explain How to write a literature review

22. Explain the importance of algorithm in computer science research? Describe the various formalisms for algorithm presentation.

(2 x 5 = 10)

M.Sc. Computer Science Degree (C.S.S) Examination,

Second Semester

CA500202- Database Management system with SQL

(2019 admissions onwards)

Time: Three hours Max. Weight: 30

Section- A

(Answer any **eight** questions. Each question carries a weight of 1)

1. Define Database and explain its needs.

2. Explain database languages.

3. What are Codd'srules.

4. Define Generalization, aggregation and specialization

5. What you mean by data independence.

6. Define ACID properties.

7. Define OODBMS.

8. What are the states of transaction.

9. Write a note on triggers in SQL.

10. List the SQL data types.

(8 x 1 = 8)

Section B

(Answer any **six** questions. Each question carries a weight of 2)

11. With a neat diagram, explain the DBMS architecture in detail.

12. Explain join operations on tables with examples.

13. What you mean by stored procedures, give an example.

14. Write a short note on anomalies in a database.

15. Explain deadlock with example.

16. Why we need OODBMS, explain with its advantages.

17. What are the failure classifications in database.

18. Explain domain relational calculus.

(**6 x 2 = 12**)

Section C

(Answer any **two** questions. Each question carries a weight of 5.)

19. Define Normalization, explain different forms of normalization.
20. What are the Relational algebra operations in SQL? Write SQL statement for each operation.
21. Explain two phase locking. How does it guarantee serializability.
22. Write a note on distributed databases.

(**2 x 5 = 10)**

M.Sc. Computer Science Degree (CSS) Examination
Third Semester
CA010301 - Digital Image Processing
(2019 admission onwards)

Time:3 hrs. Max wt:30

Section A
(**Answer any 8 questions. Each question carries a weight of 1)**

1. Distinguish between Image Sampling and quantisation.
2. What is image negative?
3. Define Histogram.
4. What do you mean by colormodels. List any two.
5. Give the properties of 2D Discrete Fourier Transform.
6. What is homomorphic filtering?

7. Explain noise models.
8. What is run length encoding?
9. What is gradient operator?
10. What is thresholding? **(8 x 1 =8)**

Section B

(Answer any 6 questions. Each question carries a weight of 2)

11. List the steps involved in Digital Image Processing.
12. Explain the relationship between pixels.
13. Explain Basic Intensity transformation Functions.
14. Explain 2D Discrete Fourier Transform.
15. Explain the restoration of an image using mean filters.
16. Explain image subtraction and image averaging.
17. Explain arithmetic coding.
18. Explain Region growing segmentation. **(6 x 2 =12)**

Section C

(Answer any 2 questions. Each question carries a weight of 5)

19. Explain the elements of visual perception.
20. Explain spatial filtering.
21. Explain image sharpening using frequency domain filters.
22. Distinguish between Marr-Hildreth edge detector and canny edge detector.

(2 x 5 =10)

M.Sc. Computer Science Degree (C.S.S) Examination

Third Semester

CA010302 - PYTHON PROGRAMMING

(2019 admissions onwards)

Time: Three hours Max. Weight: 30

Section- A

(Answer any **eight**questions. Each question carries a weight of 1)

1. Write the rules for choosing names of variables.

2. Write in brief about any 5 keywords in Python

3. What is a dictionary in Python?

4. Can a Python function return multiple values? If yes, how it works?

5. Define the scope and lifetime of a variable in Python.

6. What are the features of tuple data structure?

7. What is cloning of List?

8. What is the purpose of tracer() method of turtle

9. What is the use of all(), any(), cmp() and sorted() in dictionary?

10. Give an example for List comprehension.

(8 x 1 = 8)

Section B

(Answer any **six** questions. Each question carries a weight of 2)

11. Describe the features of Python.

12. Write a Python program to illustrate the comparison operators in tuple.

13. What are the different function prototypes? Explain with suitable examples.

14. Discuss the basic Tuple operations with examples.

15. Explain the concept of namespaces with an example.

16. List out the types of Modules and Explain any two types in detail.

17. Describe Python jump statements with examples.

18. Write a Python program that interchanges the first and last characters of a given string.

(**6 x 2 = 12**)

Section C

(Answer any **two** questions. Each question carries a weight of 5.)

19. Explain about iteration statements with examples.
20. Write a Python program that creates a GUI with a textbox, Ok button and Quit button. On clicking Ok, the text entered in textbox is to be printed in Python shell; on clicking Quit, the program should terminate.
21. Explain about colors and filled shapes.
22. Tabulate and explain the different modes for opening a file.

(**2 x 5 = 10)**

M. Sc. Computer Science Degree (C.S.S) Examination,

Third Semester

CA500301Software Engineering

(2019 admissions onwards)

Time: Three hours Max. Weight: 30

Section- A

(Answer any **eight** questions. Each question carries a weight of 1)

1. What are the objectives of Software Engineering?
2. What is unified process?
3. What is Agility?
4. What is use case?
5. What is a DFD?
6. What is Data Modelling?
7. What is cohesion?
8. What is System Testing?
9. What is Basis path testing?
10. What is a risk ?

(8 x 1 = 8)

Section B

(Answer any **six** questions. Each question carries a weight of 2)

11. Compare prototyping and spiral model.
12. Write a note on Scrum.
13. Discuss the use of sequence diagram with an example.
14. Explain requirement engineering.
15. Discuss various design concepts for software development.

16. Explain component based development.
17. Explain the testing methods for object oriented applications.
18. How do you estimate the cost of a software?

(**6 x 2 = 12**)

Section C

(Answer any **two** questions. Each question carries a weight of 5)

19. Describe linear sequential model for software development
20. Explain sequence diagram with an example.
21. Describe class based modelling
22. Explain the methods for project scheduling.

(**2 x 5 = 10)**

M.Sc. Computer Science Degree (CSS) Examination

Fourth Semester

(From 2019 Admission Onwards)

CA010401 DATA MINING

Time: 3 Hours **Max.Weight: 30**

Section A

Answer any eight Questions. Each question carries a weight of 1.

1. Define Data Warehouse?
2. What is a data cube?
3. What are the different measures for identifying various significant rules?
4. What is cluster analysis?
5. What is binning?
6. What are outliers?
7. Define support and confidence
8. Define classification.
9. What is DBSCAN?
10. What is PCA? (8 x 1 = 8)

Section B

Answer any six Questions. Each question carries a weight of 2.

11. Discuss about Data Warehouse architecture?
12. Describe various stages in KDD process.
13. Compare OLTP and OLAP systems.
14. Why multidimensional data mining is important.
15. Explain the different normalization techniques.
16. Explain about tree pruning.
17. Explain various methods for filling in missing values.
18. Explain schemas for various multidimensional data models (6 x2 =12)

Section C

Answer any two Questions. Each question carries a weight of 5.

19. Explain Apriori association Rule Mining algorithm
20. Describe various data preprocessing methods.
21. Explain with an example Naïve Bayesian classification.
22. Explain classification by decision tree induction. (2x5=10)

M.Sc. Computer Science Degree (C.S.S) Examination

CA800301 - Introduction to Cyber Security (Elective)

(2019 admissions onwards)

Time: Three hours Max. Weight: 30

Section- A

(Answer any **eight**questions. Each question carries a weight of 1)

1. What is computer security?

2. What is biometrics?

3. Define access control.

4. What is VIRUS.

5. What you mean by protected objects?

6. What is trusted system?

7. What is DOS?

8. What is botnet?

9. Define is CIA.

10. What you mean by element integrity?

(8 x 1 = 8)

Section B

(Answer any **six** questions. Each question carries a weight of 2)

11. Write a note on threats.

12. Give a brief about cryptography.

13. Explain layered design of OS.

14. Write a note on email attacks.

15. What are threats to network communication?

16. Write note on IDS.

17. Explain security requirements of database.

18. What you mean by computer related offences?

(**6 x 2 = 12**)

Section C

(Answer any **two** questions. Each question carries a weight of 5.)

19. Explain authentication.
20. Explain malicious code.
21. Explain firewall.
22. Write overview of IT Act 2000.

(**2 x 5 = 10)**

M.Sc. Computer Science Degree (CSS) Examination

CA800402 – Cryptography (Elective)

(2019 admissions onwards)

Time: Three hours Max. Weight: 30

Section- A

(Answer any **eight** questions. Each question carries a weight of 1)

1. What is cryptography?
2. What is steganography?
3. Define stream cipher.
4. What is PRNG?
5. What you mean by digest?
6. What is SHA?
7. Define MAC.
8. What is HMAC?
9. What you mean by public key infrastructure?
10. What is digital signature?

(8 x 1 = 8)

Section B

(Answer any **six** questions. Each question carries a weight of 2)

11. What are classical encryption techniques?
12. Compare symmetric vs asymmetric cryptography.
13. What is Triple DES?
14. Write a note on RC4
15. Explain diffie-hellman key exchange.
16. Write a note on Requirements for Message Authentication Codes.
17. Explain public key infrastructure.
18. Write a note on X.509.

(**6 x 2 = 12**)

Section C

(Answer any **two** questions. Each question carries a weight of 5.)

19. Explain DES.
20. Explain AES.

21. Explain RSA with example.

22. Write a note on key distribution using symmetric and asymmetric encryption.

(2 x 5 = 10)

M.Sc. Computer Science Degree (C.S.S) Examination,

CA800403 - Ethical Hacking

(2019 admissions onwards)

Time: Three hours Max. Weight: 30

Section- A

(Answer any **eight**questions. Each question carries a weight of 1)

1. What is vulnerability?
2. What is DMCA?
3. What is Source code analysis?
4. What is debuggers?
5. What you mean by network?
6. What you mean by an attack?
7. What is TCP?
8. Define DOS.
9. What is malware?
10. What is local buffer? **(8 x 1 = 8)**

Section B

(Answer any **six** questions. Each question carries a weight of 2)

11. Explain physical penetration attacks.

12. What is OIS?

13. Explain input validation attack.

14.What is IDA.

15. What you mean by buffer overflow?

16. What is spoofing?

17. Explain firewall?

18. What is SQL injection ? (**6 x 2 = 12**)

Section C

(Answer any **two** questions. Each question carries a weight of 5.)

19. Explain social engineering attacks.
20. Write a note on passive analysis
21. Explain network hacking.
22. Explain malware hacking. (**2 x 5 = 10)**

M.Sc (Computer Science) Degree (C. S.S) Examination

Third semester

CA820301 - Soft computing

Time: Three Hours **Max. Weight: 30**

Section A

(Answer anyeight Questions. Each question carries a weight of 1)

1. Define an artificial neural network.
2. Explain advantages of neural networks.
3. Explain Hebb network.
4. What is Adaline?
5. Write short note on time delay neural network.
6. Explain wavelet neural network.
7. Define classical sets and fuzzy sets.
8. Explain the features of membershipfunctions.
9. What are genetic algorithms?
10. Explain the advantages of GA over traditional algorithms **(8 x 1 = 8)**

Section B

(Answer anySix Questions. Each question carries a weight of 2)

11. Explain the scope of neural networks.
12. Explain Hybrid systems.
13. Discuss important terminologies of ANNs.
14. Explain perception network.
15. Discuss back propagation network.
16. What are fuzzy measures?
17. Explain fuzzy relations.
18. Explain basic terminologies in GA **(6x 2 = 12)**

Section C

(Answer anytwo Questions. Each question carries a weight of 5)

19. Explain fixed weight competitive networks.
20. Discuss auto associative,hetero associative and bidirectional associative memory networks.
21. Explain basic models of ANN.
22. Explain operators in Genetic algorithms. **(2 x 5 = 10)**

M.Sc. Computer Science Degree (C.S.S) Examination,

CA820402 Advanced Python Programming

Elective

(2019 admissions onwards)

Time: Three hours Max. Weight: 30

Section- A

(Answer any **eight**questions. Each question carries a weight of 1)

1. What is class instantiation?

2. Give the advantages of multi-threading.

3. What are coroutines?

4. How to make a Python class member variable hidden from outside the class?

5. Is it possible to convert a class object into a floating type value?

6. Differentiate between class variables and instance variables.

7. Write steps to run a Python script.

8. How to make collection classes?

9. Write the advantages of operator overloading.

10.What is a descriptor?

(8 x 1 = 8)

Section B

(Answer any **six** questions. Each question carries a weight of 2)

11. How to declare a constructor method in python? Explain.

12. What are regular expressions? How to find whether an email id entered by user is valid or not using Python‘re’ module?

13. Explain how to implement inheritance in Python.

14. How to implement method overriding in Python? Explain.

15.. Why testing is required? Explain in detail.

16. How to create a user defined exception?

17. Write a Python program to move the turtle forward and then backward after a delay of 2 seconds.

18. Define error and exception. Distinguish between these two features.

(**6 x 2 = 12**)

Section C

(Answer any **two** questions. Each question carries a weight of 5.)

19. Write a program for basic web browser using Tkinter which should have a Text widget where the user can enter a URL and a Canvas to display the contents of the page.
20. Explain the following: i) Calendar module ii) Synchronizing threads
21. Discuss about unit testing in Python.
22. Explain the following: i) TopLevel widgets ii) Scale widget

(2 x 5 = 10)

M.Sc.Computer Science Degree (C S S) Examination

CA820403 - Pattern Recognition

(2019 Admission Onwards**)**

Time : Three hrs **Max. Weight: 30**

SECTION A

Answer any eight questions. Each question carries a weight of 1

1. What are the various forms of learning?
2. What do you mean by Bayes risk?
3. What is maximum a posteriori estimator?
4. What is the Parzen window approach to density estimation
5. What is the k- Nearest –Neighbor rule?
6. What is the linear discriminant function?
7. What are the advantages of backpropagation algorithm.
8. Write a brief note on Boltzman factor?
9. What is a twoing criterion?
10. What is meant by mixture density?

Section B

Answer any six questions. Each question carries a weight of 2

11. Briefly explain the design cycle of a pattern recognition system.
12. Explain univariate density.

13. When do maximum likelihood and Bayes methods differ?
14. Compare the performance of k_n– Nearest and Parzen window estimation.
15. Explain Newton's algorithm.
16. Explain representation of weights at the hidden layers.
17. Write Stochastic simulated annealing algorithm.
18. What are the various measures of node impurity?

Section C

Answer any two questions. Each question carries a weight of 5

19. Discuss the operations of each component of a pattern recognition system.
20. Describe the maximum likelihood method for parameter estimation
21. Explain in detail support vectors.
22. Explain backpropagation algorithm