

DEPARTMENT DESK

DEPARTMENT OF MCA

HOD DESK

<https://alcmcadept14.blogspot.com/>



Dr.R.P.L.D.B. Poonam, MCA, M.Tech(IT), Ph.D

VISION OF THE DEPARTMENT

To become a worldwide recognized center of excellence in the field of computer science for innovation, learning and entrepreneurship by developing professional leaders to serve society

Mission

- To impart good quality experiential learning to get expertise in modern software tools and to cater the real time requirements of industry.
- To provide a conducive environment for faculty to train students for progressive and convergent innovation.
- To provide students with a positive learning experience by reaching their goals through collaborative learning, professional grooming and a healthy environment based in co-curricular and extracurricular activities

ABOUT THE DEPARTMENT

The Postgraduate Department of Computer Applications was started in 1995, with a three-year full-time MCA program approved by AICTE and affiliated with Krishna University. The Department aims at providing quality computer professionals, besides preparing professionally competent, ethically conscious, and socially responsible students to cater to the present needs of information technology and society.

The objective of this department is to develop exemplary individuals both in profession and in society. Therefore consistent and constant efforts are made to groom each student professionally and individually. The faculty members are ever ready to guide the students in their difficulties. The students find mentoring activities very useful. The department undertakes many Co-curricular & Extracurricular activities on a regular basis encouraging all the students to participate effectively.

The department has an eminently qualified & experienced exuberant faculty representing all significant streams of IT discipline. The department is also assisted by professionals from different areas in the IT sector, who enrich the students to develop into competent professionals in the demanding and dynamic environment.

Mini projects are made mandatory for the students from the third semester which helps them to enhance their analytical skills and programming logic thereby becoming exuberant.

Department of MCA: (Master of Computer Applications)

The Department of MCA was established in the academic year 1994 - 95 with an intake of 60 students (42 from counseling and 18 from management). It was first affiliated with Acharya Nagarjuna University and later with Krishna University, Machilipatnam. From the academic year 2017-2018, Loyola has been granted the status of autonomy for PG courses. We developed a new syllabus (with Python, Android application development, Big Data, Cloud Computing, etc.) for the upcoming batches in order to meet the requirements of the software industry. We offer CBCS (Choice-based Credit System) as part of our curriculum.

MCA is a two-year program with one full semester devoted to project work. In addition to the core courses in Computer Science covering the basic knowledge areas, there are other courses from Management that enable the students to acquire the required skills for a successful future career. The elective courses offered in the emerging areas give them an opportunity to be at the forefront of technology and applications. The whole-semester individual project is expected to give students an experience in tackling many a problem from its specification through design, implementation, and testing to possible deployment and maintenance planning.

Program Objectives:

1. To excel in problem-solving and programming skills in the various computing fields of IT Industries.
2. To develop the ability to plan, analyze, design, code, test, implement & maintain a software product for real-time systems. To promote students' capability to set up their own enterprises in various sectors of Computer Applications.
3. To help students in finding solutions and developing system-based applications for real-time problems in various domains involving technical, managerial, economic & social constraints.
4. We encourage students to do an in-house mini-project under faculty guidance in order to teach them the necessary skills to do the major project in the future.
5. On completion of the mini-project, students will feel competent to complete their major projects.

Program Outcomes:

1. Application of knowledge of mathematical, algorithmic, and computing principles.
2. Analysis and interpretation of data, making inferences from the resulting data and applying technical skills to solve real time problems.
3. Designing a system or module to meet desired needs, which undergoes various phases of software development lifecycle.
4. Investigating, designing, and conducting experiments by applying critical thinking to solve complex problems.
5. Making effective use of modern tools and techniques to develop a software system.
6. Inculcating a professional and ethical attitude.
7. Understanding the need for and having an ability to inculcate quality, timeliness, and continuous improvement.
8. Developing managerial skills in multidisciplinary approach.
9. Preparing technical documents and making effective presentation.
10. Developing teamwork and leadership skills necessary to function productively and professionally towards a common goal.
11. Developing as an entrepreneur in the software domain through innovative approach.

Salient Features:

- Student-friendly College Management with an international exposure and expertise.
- Competent and committed staff with many years of experience in teaching and exposure.
- Foundation Courses for all students to get familiarized with the latest computer technology.
- General electives like communication skills, soft skills, etc., are part of our curriculum.
- Regular field trips, seminars, talks by experts, workshops, etc., for the benefit of students.

- A vast campus with an excellent infrastructure and a well-furnished computer lab.
- All newspapers and magazines available in air-conditioned PG library and Reading Room.
- An eco-friendly green campus serving generations of students for more than 6 decades.
- Spacious playgrounds for all games along with a modern gym for students.
- Free medical service by a resident doctor and a nurse during working hours.
- Campus canteen with reasonable rates for staff and students.
- Separate hostels for men and women with excellent facilities at affordable charges.
- Excellent Placement Cell with a good track record for all professional students.
- Annual Cultural Week BHAVANA for PG students to promote 'Cultures for Unity'.
- A galaxy of eminent and illustrious alumni/ae spreading Loyola culture all over the world.
- One has to be very fortunate to get a golden chance to study at Loyola!

PROGRAMMES OFFERED

- MCA (Master of Computer Application)

SYLLABUS**ANDHRA LOYOLA COLLEGE
DEPARTMENT OF MCA****II SEMESTER**

Course Code	Course Name	Teaching Hours/ week			CORE / IDC/DSE/ SEC/OE C/ MOOCS	Intern al Mark s	Extern al Marks	No. of Credit s
		Lect ure	Practi cal	Tutor ial				
22MCA201	Software Engineering and Design Patterns	4	0	0	Core	50	50	4
22MCA202	Database Management Systems	4	0	0	Core	50	50	4
22MCA203	Computer Networks	4	0	0	Core	50	50	4
22MCA204 COMPULSORY	Research Methodology & IPR	3	1	0	SEC	50	50	3
DOMAIN SPECIFIC ELECTIVE COURSES (CHOOSE ANY ONE)								
22MCA205E1	Design and Analysis of Algorithms	4	0	0	DSE	50	50	4
22MCA205E2	Data warehousing and Data Mining	4	0	0	DSE	50	50	4
22MCA205E3	Cloud Computing	4	0	0	DSE	50	50	4
LAB PRACTICALS								
22MCA206	Data Mining Lab	0	6	0	Core	50	50	3
22MCA207	Database Management Systems Lab	0	6	0	Core	50	50	3
TOTAL FOR SECOND SEMESTER						210	490	25

22MCA 201: Software Engineering and Design Patterns

Course Name	MCA	L	T	P	C	I M	E M	T M
Course Code	22MCA 201	4	0	0	4	5 0	50	10 0

L-Lecture, T-Tutorial, P-Practical, C-Credits, IM-Internal Marks, EM-External Marks, TM-Total Marks

Course Description and Purpose:

Almost every computer science and computer engineering curriculum now includes a required team-based software development project. In some cases, the project is only one semester or quarter in length, but a year-long team based software development project is fast becoming the norm.

In present world, every student would complete a course in software engineering before starting his or her team-based project. In practice, however, many students have to start their projects partway through their software engineering course.

Course Objectives:

Specific objectives include:

- ✓ To understand the basic concepts of Software Engineering and its concepts.
- ✓ To understand various life cycle models.
- ✓ To grasp the knowledge software process and requirements workflow.
- ✓ To apprehend the knowledge of software metrics.
- ✓ To gain the knowledge of Object Oriented Paradigm.

Course Learning Outcomes:

Upon successful completion of the course, the student will be able to:

- ✓ Gain knowledge on the concepts of Software Engineering requirements, analysis and design.
- ✓ Understand different life cycle models.
- ✓ Known the concept of object oriented paradigm .
- ✓ Understand the working of software Architecture and their design patterns

Unit-I

The Scope of Software Engineering- Requirements, Analysis and Design Aspects, Object Oriented Paradigm, Iteration and incrementation, Risks and other aspects of Iteration and Incrementation, Managing Iteration and Incrementation. Code and fix life cycle model, Waterfall life cycle model, Open source life cycle model, Agile processes, spiral life cycle model. Comparison of life cycle models.

Unit-II

The software process- The unified process Iteration and incrementation with in the Object-Oriented Paradigm, The requirements workflow, The Analysis Workflow, The design Workflow, The Implementation workflow, The phases of the Unified Process, Capability Maturity Models.

Unit-III

Software Metrics, CASE, Taxonomy of CASE, Scope of CASE, Software Versions, Configuration Control. Testing quality issues, Non Execution Based Testing, Execution based testing. Unit-IV Modules to Objects- What is a Module?, Cohesion, Coupling, Data Encapsulation, Abstract Data Types, Information Hiding, Objects, Inheritance, Polymorphism, and Dynamic Binding, Object-Oriented Paradigm.

Unit-V

Reuse concepts, Objects and Reuse , during design and implementation, Design Reuse, Application Frameworks, Design Patterns, Software Architecture, More on Design patterns.

Reference Textbooks:

1. Stephen. R. Schach, Object-oriented and classical software Engineering, Eight Edition.
2. Software Engineering: A Practitioner's Approach, Roger S. Pressman, 10th ed, Mc Graw Hill.
3. Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides, Design patterns: Elements of Reusable object-oriented software, Addison-Wesley, 1995.
4. James W Cooper, Java Design Patterns - A Tutorial, Addison-Wesley.
5. Software Engineering, 8/e, Sommerville, Pearson.

22MCA202: Database Management Systems

Course Name	Database Management Systems	L	T	P	C	I M	E M	T M
Course Code	22MCA202	4	0	0	4	5 0	50	10 0

L-Lecture, T-Tutorial, P-Practical, C-Credits, IM-Internal Marks, EM-External Marks, TM-Total Marks

Course Description and Purpose:

This course introduces the core principles and techniques required in the design and implementation of database systems. This course focus on relational database management systems, It also covers essential DBMS concepts such as: Transaction Processing, Concurrency Control and Recovery and various types of databases like distributed database, and intelligent database, Client/Server. It also provides students with theoretical knowledge and practical skills in the use of databases and database management systems in information technology applications.

Course Objectives:

- ☐ To understand basic concepts of databases and database users.
- ☐ To learn the basics of Functional Dependencies and Normalization for Relational Databases & Transaction Processing Concepts.
- ☐ To learn Concurrency Control Techniques and Distributed Database Concepts.
- ☐ To know Querying, Creating, Updating & Deleting Documents in Mongo DB, Data Lakes.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

- ☐ Learn the concepts of databases and database users.
- ☐ Learn the basics of normalization.
- ☐ Learn entity relationship models.
- ☐ To understand relational algebra and relational calculus.
- ☐ To know Querying, Creating, Updating & Deleting documents in SQL.

Course Content:

UNIT-I

Databases and Database Users: Introduction, Characteristics of the Database Approach, Actors on the Scene, Workers behind the scene, Advantages of using the DBMS Approach.

Database System Concepts and Architecture: Data Models, Schemas and Instances, Three Schema architecture and Data Independence, Database Languages and Interfaces, Centralized and Client/Server Architecture for DBMS, Classification of Database Management Systems.

UNIT-II

Data Modeling Using the ER Model: Conceptual Data models, Entity Types, Entity Sets, Attributes and Keys, Relationship types, Relationship sets, roles and structural Constraints, Weak Entity types, Relationship Types of Degree Higher than Two, Refining the ER Design for the COMPANY Database.

The Relational Algebra and Relational Calculus: Unary Relational Operations: SELECT and PROJECT, Relational Algebra Operations from set Theory, Binary Relational Operations: JOIN and DIVISION, Additional Relational Operations, Examples, The Tuple Calculus and Domain Calculus.

UNIT- III

Functional Dependencies and Normalization for Relational Databases: Informal Design Guidelines for Relation Schemas, Functional dependencies, Normal Forms Based in Primary Keys, General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Form, Multivalued Dependencies and Fourth Normal Form, Join Dependencies and Fifth Normal Form, Inclusion Dependencies.

UNIT-IV

Introduction to Transaction Processing Concepts and Theory: Introduction to Transaction Processing, Transaction and System Concepts, Desirable Properties of Transactions, Characterizing Schedules Based on Recoverability, Characterizing Schedules Based on Serializability.

Concurrency Control Techniques: Two Phase Locking Techniques for Concurrency Control, Concurrency Control Based on Timestamp Ordering, Multi version Concurrency control techniques, Validation concurrency control Techniques,

UNIT-V

SQL-99: Schema Definition, Constraints, Queries and Views: SQL Data Definitions and Data Types, Specifying Constraints in SQL, Schema Change Statements on SQL, Basic Queries in SQL, More Complex SQL Queries, INSERT, DELETE and UPDATE statements in SQL, Triggers and Views.

Emerging Database Technologies and Applications- Mobile Databases, Multimedia Databases, Geographic

Reference Text books:

1. Ramez Elmasri & Shamkant B. Navathe, Fundamentals of Database Systems, Pearson, Seventh Edition, 2016.
2. Pramod J.Sadalage & Martin Fowler, No SQL Distilled , Addison-Wesley, Second Edition, 2013
3. Kristina Chodorow, Mongo DB, O'Reilly, Second Edition, 2013
4. Mandy Chessell Ferd Scheepers, Maryna Strelchuk, Ron van der Starre, Seth Dobrin, Daniel Hernandez
From Data Lake to Data Driven Organization, IBM-Red Guide, 201

22MCA203: Computer Networks

Course Name	MCA	L	T	P	C	I M	E M	T M
Course Code	22MCA203	4	0	0	4	5 0	50	10 0

L,Lecture, T,Tutorial, P,Practical, C,Credits, IM,Internal Marks, EM,External Marks, TM,Total Marks

Course Description and Purpose:

This course provides an introduction to computer networks, with a special focus on the Internet architecture and protocols. Topics include layered network architectures, addressing, naming, forwarding, routing, communication reliability, the client-server model, web and email protocols.

Course Objectives:

- ☐ Become familiar with layered communication architectures (OSI and TCP/IP).
- ☐ Understand the client/server model and key application layer protocols.
- ☐ Understand the concepts of reliable data transfer and how TCP implements these concepts.
- ☐ Learn the principles of routing and the semantics and syntax of IP.
- ☐ Understand the basics of error detection including parity, checksums, and CRC.

Course Learning Outcomes:

At the end of this course the students should be able to:

- ☐ Understand and describe the layered protocol model.
- ☐ Describe, analyze and evaluate a number of datalink, network, and transport layer protocols.
- ☐ Program network communication services for client/server and other application layouts.
- ☐ Describe, analyze and evaluate various related technical, administrative and social aspects of specific computer network protocols from standards documents and other primary materials found through research.
- ☐ Design, analyze, and evaluate networks and services for homes, data centers, IoT/IoE, LANs and WANs

Course Content:

UNIT -I

Uses of Computer Networks, Connection Oriented and Connectionless Services, Reference Models: The OSI Reference Model, The TCP/IP Reference Model, A Comparison of OSI and TCP/IP reference Model.

Physical Layer: ALOHA, CSMA, CSMA/CA

Data Link Layer Design Issues: Services Provided to the Network Layer, Framing , Error correcting Codes , Error Detecting Codes. An unrestricted Simplex Protocol , A simplex Stop and wait Protocol , Sliding Window Protocols: A one, bit sliding Window Protocol , A Protocol using Go Back N , A protocol using selective repeat.

UNIT-II

Ethernet : Ethernet Cabling, The Ethernet MAC sublayer Protocol , Bluetooth: Bluetooth Architecture, Bluetooth Applications, Remote Bridges , Repeaters, Hubs,Bridges, Switches, Routers and Gateways , Virtual LANs.

UNIT-III

Network Layer Design Issues : Store and Forward Packet Switching ,Services Provided to the Transport Layer , Implementation of Connectionless Services ,Implementation of Connection Oriented Services , Comparison of Virtual Circuit and Datagram subnets.

Routing Algorithms : The Optimality Principle , Shortest Path Routing , Flooding , Distance Vector Routing , Link State Routing , Hierarchical Routing , Broadcast Routing , Multicast Routing , Routing for Mobile Hosts.

The Network Layer in the Internet IP address, IPV6 features and advantages.

UNIT-IV

The Transport Service: Services provided to the Upper Layers , Transport Services Primitives , Berkeley Sockets. Elements of Transport Protocols : Addressing , Connection Establishment , Connection Release , Flow Control and Buffering , Multiplexing , Crash Recovery.

Transport Protocols TCP : Introduction to TCP , The TCP Service Model , the TCP Protocol , The TCP segment header , TCP connection establishment , TCP connection release , TCP congestion Control , Comparison of TCP and UDP..

UNIT-V

Wireless TCP: Classical improvement in WTCP.

DNS : The Domain Name System : The DNS Name Space , Resource Records , Name Servers.

Electronic Mail : Architecture and Services , The User Agent , Message Formats , Message Transfer , Final Delivery. The World Wide Web: Architecture Overview , Static Web Documents , Dynamic Web Documents.

Reference Text books:

1. Andrew S. Tanenebaum, Computer Networks, PHI
2. James F.Kurose, Keith W Ross, Computer Networking, 3rd edition Pearson Edition
3. Michael A. Gallo, William M. Hancock, Data Communications and Networking, 4th edition, TMH

22MCA204: Research Methodology & Intellectual Property Rights (IPR)

Course Name	MCA	L	T	P	C	I M	E M	TM
Course Code	22MCA204	3	0	1	3	5 0	50	100

L-Lecture, T-Tutorial, P-Practical, C-Credits, IM-Internal Marks, EM-External Marks, TM-Total Marks

Course Description and Purpose:

The aim of this course is to develop a research bent of mind (spirit of inquiry) and impart research skills to all Post graduate students. It also encompasses the series of research methodology contents: from problem formulation, to design, to data collection, analysis, reporting and dissemination. This course also covers intellectual property rights (IPR), and is intended to equip students with conceptual understandings of the current scenario of IPR, and the practical issues encountered in filing patents, trademarks and copyrights.

Course Objectives:

- ✓ To understand some basic concepts of research and its methodologies
- ✓ To develop an understanding of the basic framework of the research process.
- ✓ To develop an understanding of various research designs and techniques.
- ✓ To identify various sources of information for literature review and data collection.
- ✓ Ability to write a research Proposal, report and thesis
- ✓ To demonstrate knowledge and understanding of IPR Filing and Rights

Course Learning Outcomes:

At the end of this course the students should be able to:

- ☐ Understand some basic concepts of research and its methodologies
- ☐ Identify appropriate research topics
- ☐ Select and define appropriate research problem and parameters
- ☐ Demonstrate the ability to choose methods appropriate to research aims and objectives
- ☐ Have adequate knowledge on measurement & scaling techniques
- ☐ Have basic awareness of data analysis-and hypothesis testing procedures
- ☐ Prepare a project proposal (to undertake a project)
- ☐ Write a research report and thesis

Course Content:

UNIT I

Foundations of Research

Meaning of Research – Definitions of Research – Motivation in Research – General Characteristics of Research – Criteria of Good Research – Types of Research – Research Process – Research Methods vs. Methodology – Defining and Formulating the Research Problem – Review of Literature – Approaches to Critical Literature Review – Importance of Literature Review in Identifying Research Gaps and Defining a Problem – Development of Working Hypothesis.

UNIT II

Research Design, Sampling Concepts, and Data Collection Methods

Meaning, Significance and Characteristics of Good Research Design – Types of Research Design: Exploratory, Conclusive Research and Experimental – Sampling Theory: Types of Sampling and Errors in Sampling – Data Collection: Types of Data – Data Collection Methods and Techniques for Primary and Secondary Data.

UNIT III

Measurement & Scaling Techniques, Hypothesis Formulation and Testing, Overview of Data Analysis and Report Writing

Basic measurement scales – Reliability & Validity – Definition and Types of Hypothesis – Hypothesis Formulation and Testing Procedure – Overview of Data Analysis: Methods, Process and Types – Report Writing: Significance of Report Writing, Different Steps in Writing Report, Layout of the Research Report, Types of Reports, Oral Presentation, Mechanics of Writing a Research Report, Precautions for Writing Research Reports – How to Write a Research Proposal, Research Ethics, Conflict of Interest and Plagiarism.

UNIT IV

Intellectual Property Rights (IPR)

Definition and Nature and Features of Intellectual Property Rights (IPR) – Types of Intellectual Property Rights – Procedure for Grants of Patents – Rights of a Patent – Scope of a Patent Rights – Licensing and Transfer of Technology – Why protection of intellectual property is important? – Enforcement of IPR – Infringement of IPR.

UNIT V

Indian and International Scenario and New Developments in IPR

IPR Developments in India for the past Five Years – Development of IPR Laws in India – International Cooperation on IPR – New Developments in IPR – Administration of Patent System – International Patent

PRACTICAL COMPONENTS:

- ② Students should identify different research problems with examples and describe the characteristics of researchable problems in their academic area/society/community/organization concerned.
- ② Students are to form in groups (a group consists of 4-6 students) and conduct critical literature survey with regard to the identified research problems and prepare a brief literature review coupled with research gaps and working hypotheses.
- ② Students are required to identify and develop good research design to address the defined research problems.
- ② Students are expected to write the research design on Exploratory and Descriptive Research.
- ② Students are required to develop practical experience in writing a research proposal by conducting a thorough critical review of any three research proposals (examples).
- ② Students are expected to develop templates for technical report writing.
- ② Students should conduct a team based mini research project, which is a unified and practical case on a topic of their choice, with approximately 4-6 students per group.
- ② Students are expected to identify types of plagiarism in academic research, and how to avoid plagiarism in research.
- ② Students are asked to identify and submit a brief report on Indian patents of International repute.
- ② Students are asked to write on Patent registration procedure, and visit Official website of Intellectual Property India <https://ipindia.gov.in> to know how to get IPR in India.
- ② Students are asked to identify and summarise remedies available against the infringement of intellectual property rights in Indian and global contexts.
- ② Students are asked to submit any five examples of ethical issues in copyright and patents.

Reference Text Books:

2. Garg, B.L., Karadia, R., Agarwal, F. and Agarwal, U.K., 2002, An introduction to Research Methodology, RBSA Publishers.
3. Cohen, L. Lawrence, M., & Morrison, K. (2005), Research Methods in Education (5th edition). Oxford: Oxford University Press.
4. Kothari, C.R., 1990, Research Methodology: Methods and Techniques, New Age International.
5. Dornyei, Z. (2007). Research Methods in Applied Linguistics. Oxford: Oxford University Press.
6. Anthony, M., Graziano, A.M. and Raulin, M.L., 2009, Research Methods: A Process of Inquiry, Allyn and Bacon.
7. Fink, A., 2009, Conducting Research Literature Reviews: From the Internet to Paper. Sage

Publications.

8. Day, R.A., 1992, How to Write and Publish a Scientific Paper, Cambridge University Press.
9. Wadehra, B.L. 2000, Law relating to patents, trade marks, copyright designs and geographical indications. Universal Law Publishing.
10. Coley, S.M. and Scheinberg, C. A., 1990, Proposal Writing, Sage Publications.
11. Carlos, C.M., 2000. Intellectual property rights, the WTO and developing countries: the TRIPS agreement and policy options, Zed Books, New York.
12. Leedy, P.D. and Ormrod, J.E., 2004, Practical Research: Planning and Design, Prentice Hall.
13. Satarkar, S.V., 2000. Intellectual property rights and Copy right. Ess Publications.
14. Important Websites:
 - www.ipindia.nic.in - Intellectual Property Office, India
 - www.patentoffice.nic.in – Patent office, India
 - <http://copyright.gov.in/> - Copyright Office, India
 - ipr.icegate.gov.in – Automated Recordation & Targeting for IPR Protection
 - <http://www.icegate.gov.in>- E- Commerce portal of Central Board of Excise and Customs
 - www.ipab.tn.nic.in - Intellectual Property Appellate Board, India
 - www.mit.gov.in – Department of Information Technology, India
 - <http://www.mit.gov.in/content/office-semiconductorintegrated-circuits-layout-designregistry>
 - Semiconductor Integrated Circuits Layout-Design Registry (SICLDR)

22MCA205E1: Design and Analysis of Algorithms

Course Name	Design and Analysis of Algorithms	L	T	P	C	IM	EM	TM
Course Code	22MCA205E1	4	0	0	4	50	100	100

L-Lecture, **T**-Tutorial, **P**-Practical, **C**-Credits, **IM**-Internal Marks, **EM**-External Marks, **TM**-Total Marks

Course Description and Purpose:

This course introduces basic methods for the design and analysis of efficient algorithms emphasizing methods useful in practice. Different algorithms for a given computational task are presented and their relative merits evaluated based on performance measures.

Course Objectives:

Upon completion of this course, students will be able to do the following:

- ☐ Analyze the asymptotic performance of algorithms.
- ☐ Write rigorous correctness proofs for algorithms.
- ☐ Demonstrate a familiarity with major algorithms and data structures.
- ☐ Apply important algorithmic design paradigms and methods of analysis.
- ☐ Synthesize efficient algorithms in common engineering design situations.

Course Learning Outcomes:

At the end of this course student will:

- ☐ Understand the basic notation for analyzing the performance of the algorithms.
- ☐ Use divide-and-conquer techniques for solving suitable problems
- ☐ Use greedy approach to solve an appropriate problem for optimal solution.
- ☐ Apply dynamic programming approach to solve suitable problems
- ☐ Understand the limitations of algorithm power and study how to cope with the limitations of algorithm

power for various problems.

Course Content:

UNIT -I

Introduction to Algorithm : Algorithm definition, properties, Different areas to study about algorithms, Pseudo code expressions for an algorithm, Performance Analysis, Time Complexity & Space Complexity, Asymptotic notations.

Elementary Data Structures: Stacks and Queues, Trees: Terminology - Binary Trees, Dictionaries : Binary Search Trees, Heaps, Heapsort, Sets and disjoint set Union: Introduction - union and find operations. ; Graphs: Introduction - Definitions - Graph Representations.

UNIT-II

Introduction to Divide and Conquer : Binary search, Binary search analysis, Quick sort, Quick sort analysis, Merge sort, Merge sort Analysis, Strassen's matrix multiplication, Finding Maximum and minimum. Greedy Method : Introduction, General method, Job sequencing with deadlines, single source shortest path problem, Optimal storage on tapes, Knapsack problem, Minimum cost spanning trees : Prim's Algorithm, Kruskal's Algorithm.

UNIT-III

Dynamic Programming : Single source shortest path problem, Multi stage graphs, All pairs shortest path, Optimal Binary search tree, 0/1 Knapsack problem, Reliability design, Travelling person Problem, Flow shop scheduling.

Basic Traversal and Search Techniques: Techniques for Binary Trees, Techniques for graphs: Breadth First Search and Traversal-Depth First Search; Connected Components and Spanning Trees -Bi- connected components and DFS

UNIT-IV

Introduction to Backtracking: General method, N-queens problem, sum of sub sets problem, Graph coloring, Hamiltonian cycles, Knapsack problem.

Branch and Bound : The Method: Least Cost search -The 15 puzzle - control abstractions for LC search - Bounding - FIFO Branch and Bound - LC Branch and Bound; 0/1 knapsack problem: LC Branch and Bound solution - FIFO

Branch and Bound solution; Traveling Sales person.

UNIT-V

NP-Hard and NP-Complete problems: Basic concepts : Non deterministic algorithms -The classes NP hard and NP complex; Cook's theorem

Reference Text books:

1. Sartaj Sahni ,Fundamentals of Computer Algorithms, 2nd Edition, University Press.
2. Anany Levitin, Introduction to the Design & Analysis of Algorithms, 2nd Edition, Pearson Education
3. I Chandra Mohan, Design and Analysis of Algorithms, PHI
4. Prabhakar Gupta and Vineet Agarwal, Design and Analysis of Algorithms, PHI
5. Parag Himanshu Dave, Design and Analysis of Algorithms, Pearson Education

22MCA205E2: Data Warehousing and Data Mining

Course Name	MCA	L	T	P	C	I M	E M	T M
Course Code	22MCA205E2	4	0	0	4	5 0	50	10 0

L-Lecture, T-Tutorial, P-Practical, C-Credits, IM-Internal Marks, EM-External Marks, TM-Total Marks

Course Description and Purpose:

This course introduces basic methods for the mathematical foundations of data mining, design patterns, algorithms and web mining concepts.

Course Objectives:

- ✓ Be familiar with mathematical foundations of data mining tools..
- ✓ Understand and implement classical models and algorithms in data warehouses and data mining
- ✓ Characterize the kinds of patterns that can be discovered by association rule mining, classification and clustering.
- ✓ Develop skill in selecting the appropriate data mining algorithm for solving practical problems.

Course Outcomes:

At the end of the course, student will be able to

- ✓ Understand the basics of types of data, quality of data, suitable techniques required for preprocessing and measures required to perform data analysis
- ✓ Describe the need of classification, identify suitable technique(s) to perform classification, model building and evaluation
- ✓ Identify the requirements and usage of association rule mining on categorical and continuous data.
- ✓ Compare and Identify suitable clustering algorithm(s) (apply with open source tools), interpret, evaluate and report the result
- ✓ Describe the requirements and the need of web mining

UNIT -I

Introduction to Data mining, types of Data, Data Quality, Data Processing, Measures of Similarity and Dissimilarity, Exploring Data: Data Set, Summary Statistics, Visualization, Data Warehouse, OLAP and multi dimensional data analysis.

UNIT -II

Classification: Basic Concepts, Decision Trees and model evaluation: General approach for solving a classification problem, Decision Tree induction, Model over fitting: due to presence of noise, due to lack of representation samples, Evaluating the performance of classifier. Nearest Neighborhood classifier, Bayesian Classifier, Support vector Machines: Linear SVM, Separable and Non Separable case.

UNIT -III

Association Analysis: Problem Definition, Frequent Item-set generation, rule generation, compact representation of frequent item sets, FP-Growth Algorithms. Handling Categorical, Continuous attributes, Concept hierarchy, Sequential, Sub graph patterns.

UNIT -IV

Clustering: Over view, K-means, Agglomerative Hierarchical clustering, DBSCAN, Cluster evaluation: overview, Unsupervised Cluster Evaluation using cohesion and separation, using proximity matrix, Scalable Clustering algorithm

UNIT -V

Web data mining: Introduction, Web terminology and characteristics, Web content mining, Web usage mining, web structure mining, Search Engines: Characteristics, Functionality,

Architecture, Ranking of WebPages,
Enterprise search.

Reference Text books:

1) Introduction to Data Mining, Tan,
Steinbach and Vipin Kumar, Pearson
Education, 2016

2) Data Mining: Concepts and
Techniques, 2ndEdition, Jiawei Han and
Micheline Kamber,
ELSEVIER

3) Data Mining: The Textbook,
Springer, May 2015, Charu C.
Aggarwal.

22MCA205E3: Cloud Computing

Course Name	MCA	L	T	P	C	IM	EM	TM
Course Code	22MCA205E3	4	0	0	4	50	50	100

L-Lecture, T-Tutorial, P-Practical, C-Credits, IM-Internal Marks, EM-External Marks, TM-Total Marks

Course Description and Purpose:

This course introduces basic methods for the mathematical foundations of data mining, design patterns, algorithms and web mining concepts.

Course Objectives:

Course Outcomes:

At the end of the course, student will be able to

UNIT -I

Era of Cloud Computing : Getting to know the cloud - Peer-To-Peer, Client-Server, and Grid Computing – Cloud

computing versus Client-server Architecture - Cloud computing versus Peer-To-Peer Architecture - Cloud computing versus Grid Computing - How we got to the Cloud - Server Virtualization versus cloud computing - Components of Cloud computing – Cloud Types – Cloud Computing Service delivery Models.

Introducing Virtualization: Introducing Virtualization and its benefits – Implementation levels of Virtualization – Virtualization at the OS Level – Virtualization Structure – Virtualization Mechanisms

UNIT -II

Cloud Computing Services:
Infrastructure as a Service – Platform as a Service – Language and Pass – Software as a Service – Database as a Service.

Open Source Cloud Implementation and Administration: Open-source Eucalyptus Cloud Architecture –

Open-source Open stack Cloud Architecture.

UNIT -III

Data Security in the cloud: Challenges with Cloud Data, Challenge with Data Backup, Challenges with Data Fragmentation, Challenges with Data Transformation, Challenges with data security, Data Confidentiality and Encryption, Data Availability, Data Integrity, Cloud storage Gateways, Advantages of using a CSG, Cloud Firewall, Virtual Firewall.

UNIT –IV

Application Architecture for Cloud: Cloud Application Requirements – Fundamental Requirements for Cloud Application Architecture – Service oriented Architecture for Cloud Applications.

Cloud Programming: Programming support for Google Apps Engine – Big Table as Google’s NOSQL System – Chubby as Google Distributed Lock Service – Programming support for Amazon EC2 – Elastic Block Store (ESB).

UNIT -V

Application development for cloud: Developing On-Premise Versus Cloud Applications. Modifying Traditional Applications for Deployment in the cloud , Stages during the development process of cloud application, Managing a Cloud Application, Using Agile software Development for cloud Applications, Static code analysis for cloud Applications, Developing Synchronous and Asynchronous Cloud Applications.

Mobile Cloud Computing: Definition of Mobile Cloud Computing, Architecture of Mobile Cloud Computing, Benefits of Mobile Cloud Computing.

Reference Text books:

- 1) Cloud Computing, Kailash Jayaswal, Jagannath Kallakurchi, Donald J.Houde, Dr. Deven Shah, dream tech press, 2014 edition.
- 2) Cloud Computing: A Practical Approach. Anthony T.Velte. Toby J.VeFte, Robert Elsenpeter. Tata McGraw Hill. rp2011.
- 3) Enterprise Cloud Computing Gautam Shroif, Cambridge University Press. 2010.
- 4) Cloud Computing: Implementation, Management and Security, John W. Rittinouse, James F Ransome. CRC Press, rp2012.
- 5) Cloud Application Architectures: Building Applications and Infrastructure in the Cloud. George Reese, O'Really SPD, rp2011.

22MCA206: Data Mining Lab

Course Name	MCA	L	T	P	C	I M	E M	T M
Course Code	22MCA206	0	0	6	3	5 0	50	10 0

L,Lecture, T,Tutorial, P,Practical, C,Credits, IM,Internal Marks, EM,External Marks, TM,Total Marks

List of Programs

- 1.Matrix Operations
- 2.Linear Algebra On Matrices
- 3.Understanding Data
- 4.Correlation Matrix
- 5.Data Preprocessing – Handling Missing Values
- 6.Association Rule Mining - Apriori
- 7.Classification – Logistic Regression
- 8.Classification - Knn
- 9.Classification - Decision Trees
10. Classification – Bayesian Network
11. Classification – Support Vector Machines (Svm)

22MCA207: Database Management Systems Lab

Course Name	MCA	L	T	P	C	I M	E M	T M
Course Code	22MCA207	0	0	6	3	5 0	50	10 0

L,Lecture, T,Tutorial, P,Practical, C,Credits, IM,Internal Marks, EM,External Marks, TM,Total Marks

List of Experiments

1. Concept design with E-R Model
2. Relational Model
3. Normalization
4. Practicing DDL Commands
5. Practicing DML Commands
6. Querying (using ANY, ALL, IN, Exists, NOT EXISTS, UNION, INTERSECT, Constraints etc.)
7. Queries using Aggregate functions, GROUP BY, HAVING clauses
8. Creation and dropping of Views
9. Triggers (Creation of insert trigger, delete trigger, update trigger)
10. Procedures
11. Usage of Cursors

IV SEMESTER

Course Code	Course Name	Teaching Hours/ week			CORE / IDC/ DSE/ SEC/ OEC/ MOOCS	Internal Marks	External Marks	No. of Credits
		Lecture	Practical	Tutorial				
22MCA401	Big Data Analytics	4	0	0	Core	50	50	4
DOMAIN SPECIFIC ELECTIVE COURSES (CHOOSE ANY ONE)								
22MCA402E1	Dynamic Web programming	4	0	0	DSE	50	50	4
22MCA402E2	Fog Computing for IOT	4	0	0	DSE	50	50	4
22MCA402E3	Technical Report writing	4	0	0	DSE	50	50	4
22MCA402E4	Machine Learning	4	0	0	DSE	50	50	4
LAB PRACTICALS								
22MCA403	Big Data Analytics Lab	0	6	0	Core	50	50	3

ENTREPRENEURIAL & INNOVATION/IT SKILL RELATED TO DOMAIN SPECIFIC ELECTIVE COURSES (CHOOSE ANY ONE)								
22MCA404E1	Social Networking	3	0	0	SEC	50	50	3
22MCA404E2	Deep Learning	3	0	0	SEC	50	50	3
22MCA404E3	NO SQL Databases	3	0	0	SEC	50	50	3
* CHOOSE MOOCs FROM SWAYAM/NPTEL SOURCES								
MOOCS								4
PROJECT WORK EVALUATION AND VIVA-VOCE							200	12
TOTAL FOR IV SEMESTER						120	480	30

IV Semester

22MCA401: Big Data Analytics

Course Name	MCA	L	T	P	C	I M	E M	T M
Course Code	22MCA401	4	0	0	4	50	50	10 0

L-Lecture, T-Tutorial, P- Practical, C- Credits, IM-Internal Marks, EM- External Marks,

TM-Total Marks

Course descriptive and Purpose:

The primary objective of a course in Big Data Analytics is to help learners understand the fundamental principles and concepts of Big Data Analytics. Upon completion of the course, learners will be able to extract insights from raw data using various statistical techniques and tools.

A course in Big Data Analytics aims to provide learners with an understanding of the fundamental principles and concepts of Big Data Analytics. The course covers topics such as data extraction, wrangling, and pre-processing, exploratory data analysis, predictive modeling, machine learning, deep learning, and more

Course Objectives:

- To provide an understanding of the fundamental principles and concepts of Big Data Analytics.
- To teach learners how to extract insights from raw data using various statistical techniques and tools.
- To equip learners with the skills required to build predictive models using machine learning algorithms.

Course Outcomes:

- Gain insights about fundamental Big Data Analytics concepts and its underlying mechanism.
- Extract insights from raw data using various statistical techniques and tools.
- Build predictive models using machine learning algorithms.
- Communicate findings effectively through reports and visualization

UNIT I

Types of Digital Data: Classification of Digital Data.

Introduction to Big Data: Characteristics of Data, Evolution of Big Data, Definition of Big Data, Challenges with Big Data, What is Big Data?, Other Characteristics of Data, Why Big Data?, Traditional Business Intelligence versus Big Data, Typical Data Warehouse Environment, Typical Hadoop Environment, Coexistence of Big Data and Data Warehouse, What is Changing in the realms of Big Data.

Big Data Analytics: What is Big Data Analytics, What Big Data Analytics Isn't?, Why this sudden Hype around Big Data Analytics?, Classification of Analytics, Greatest Challenges that Prevent Business from Capitalizing Big Data, Top Challenges facing Big Data, Why Big Data Analytics Important?, What Kind of Technologies are we looking toward to help meet the challenges posed by

Big Data?, Data Science, Data Scientist, Terminologies used in Big Data Environments.

UNIT II

Hadoop: Features of Hadoop, Key advantages of Hadoop, Versions of Hadoop, Overview of Hadoop Ecosystem, Hadoop Distributions, Why Hadoop?, Why not RDBMS, RDBMS versus Hadoop, Distribution Computing Challenges, History of Hadoop, Hadoop Overview, Hadoop Distributed File System.

UNIT III

Processing Data with Hadoop, Managing Resource and Applications with Hadoop with YARN (Yet Another Recourse Negotiator), Interfacing with Hadoop Ecosystem.

Introduction to Map Reduce Programming: Introduction, Mapper, Reducer, Combiner, Partitioner, Searching, Sorting, Compression,

NoSQL: Where it is used?, What is it?, Types of NoSQL Databases, Why NoSQL?, Advantages of NoSQL, What we miss with NoSQL?, Use of NoSQL in Industry, SQL versus NoSQL.

MongoDB: What is MongoDB, Why MongoDB, Using JavaScript, Script Object Notation, Generating Unique Key, Support for Dynamic Queries, Storing Binary Data, Relocation, Sharding, Updating Information in Place, Terms used in RDBMS and MongoDB, Data Types in MongoDB, MongoDB Query Language?

UNIT IV

Hadoop Eco System Hive: What is Hive, Hive Architecture, Hive Data Types, Hive File Format, Hive Query Language (HQL), RC File Implementation, User Defined Function.

PIG: What is PIG, Anatomy of Pig, Pig on Hadoop, Pig Philosophy, Use Case for Pig, Pig Latin, Data type in Pig, Running Pig, Execution Mode of Pig, HDFS Commands, Relational Operators, EvalFuntions, Complex Data Types, User Defined Functions, Parameter Substitution.

HBase: HBasics, Concepts, Clients, HBasevs RDBMS

UNIT V

Introduction to Tableau: What is Tableau? Opening Existing Workbooks, Creating New Workbooks, Tableau.

Basic Visualization Design: Using Show Me, Choosing Mark Types, Color, Size, Shape, and Label Options, Choosing Color Options, Setting Mark Size, Choosing Shapes, Text Tables and Mark Labels, Formatting Options, Evaluating Multiple Measures, Shared Axis Charts, Measure Names and Measure Values, Dual Axis Charts.

Connecting to Data: Connecting to Various Data Sources, The Data Source Page.

Customizing Your View of the Data: Changing Data Type, Modifying Dimension/ Measure Assignment, Hiding, Renaming, and Combining Fields, Splitting Fields, Changing the Default Field Appearance, Organizing Dimensions in Hierarchies Using Table or Folder View, Saving and Sharing Metadata

Extracting Data, Data Blending, Moving from Test to Production Databases (Top 10 Chart Types): Bar Chart, Line/Area Chart, Pie Chart, Text Table/Crosstab, Scatter Plot, Bubble Chart, Bullet Graph, Box Plot, Tree Map, Word Cloud.

Test Book:

1. Seema Acharya, Subhashini Chellappan, Big Data and Analytics 2nd edition, Wiley Publications.

Reference Text Book:

Tom White, Hadoop: The Definitive guide, O'Reilly 4e

2. Nathan, Marz James, Big Data Principles and Best Practices of Scalable Real Time Data Systems, MANNING Publications 2015
3. Stirrup, Nandeshwar, Ohmann, Floyd, Tableau: Creating Interactive Data Visualizations, Packt Publishing 2016
4. Visual Analytics with Tableau, Alexander Loth, Wiley 2019
5. Data Analytics and Visualization in Quality Analysis Using Tableau, Jaejin Hwang and Youngjin Yoon, CRC Press-Taylor & Francis Group

Websites of Interest :

1. Big Data Computing (noc19-cs33 – NPTEL videos): Prof Rajiv Misra, Dept of CSE, IIT Patna
2. Tableau Training for Beginners | Edureka <https://www.youtube.com/watch?v=aHaOlvR00So>
3. Tableau Training for Beginners | Simplilearn <https://www.youtube.com/watch?v=Wh4sCCZjOwo>

22MCA402E1: Dynamic Web Programming

Course Name	MCA	L	T	P	C	I M	E M	T M
Course Code	22MCA402E1	4	0	0	4	50	50	10 0

L-Lecture, T-Tutorial, P- Practical, C- Credits, IM-Internal Marks, EM- External Marks,

TM-Total Marks

Course description and purpose:

The primary objective of a course in Big Data Analytics is to help learners understand the fundamental principles and concepts of Big Data Analytics. Upon completion of the course, learners will be able to extract insights from raw data using various statistical techniques and tools

- To provide an understanding of the fundamental principles and concepts of dynamic web programming.
- To teach learners how to develop dynamic web applications using various web technologies.
- To equip learners with the skills required to design and implement databases for web applications.

Course Objective:

- To provide an understanding of the fundamental principles and concepts of Big Data Analytics.
- To teach learners how to extract insights from raw data using various statistical techniques and tools.
- To equip learners with the skills required to build predictive models using machine learning algorithms.

Course Outcomes:

- Gain insights about fundamental Big Data Analytics concepts and its underlying mechanism.
- Extract insights from raw data using various statistical techniques and tools.
- Build predictive models using machine learning algorithms.
- Communicate findings effectively through reports and visualizations

UNIT –I

The World’s Smallest Django Project

Basic Steps for Installing Django, Creating the View, the URL Patterns, the Settings, Running the Example and Hello World Program in Django.

UNIT-II:

Templates in Django

Templates in Django, Static Templates in Django , Dynamic Templates in Django , Integrating Variables in Django , Filters, Dry Url’s in Django .

UNIT-III:

Databases & Models in Django

MVT Architecture, Databases in Django, Admin Module, Creating Simple Model, Creating Super User in Django , Establish the Connection between Django and MySQL, Program to insert the value in to Database using Models.

UNIT-IV:

Forms in Django

Forms in Django, Uses of Forms, Develop Student Feedback Form in Django , Django Model Forms, Develop Student Marks Submission Form in Django .

UNIT-V:

Session & Authentication

Django Rest api, Session Management, Session Management using Cookies, Develop Page Count application using Session Management, limitations of Cookies, Develop an Authentication and Authorization application in Django .

Reference Books:

1. “Lightweight Django ” using Rest and WebSockets & Backbone by Julia Elman & Mark Lavin
Oreilly Publications.
2. ‘Django Web Development with python’ by Samuel Dauzon,Aidas Bendoraitis
From Packt Publications.
3. The Definitive Guide to Django : Web Development Done Right by Adrian Holovaty and
Jacob Kaplan-

22MCA402E2: Fog Computing

Course Name	MCA	L	T	P	C	I M	E M	TM
Course Code	22MCA402E2	4	0	0	4	50	50	100

L-Lecture, T-Tutorial, P- Practical, C- Credits, IM-Internal Marks, EM- External Marks, TM- Total Marks

Course description and purpose:

It aims to bring intelligence, processing, and storage closer to the network’s edge to provide quicker and more localized computing services for the connected smart devices that make up the IoT.

The purpose of fog computing is to reduce the amount of data that needs to be sent to the cloud, thereby saving network bandwidth, improving response time, and enhancing security and privacy.

Fog computing also enables more efficient data management and analysis, as well as real-time decision making for critical applications.

Course Objectives:

- To understand the basic principles and concepts of fog computing systems and their relation to other models such as cloud computing and edge computing
- To understand the challenges of developing fog based applications and middleware, and the possible solutions to deal with them
- To understand the issues mostly related to fog computing, such as security, offloading, SDN, load balancing, communication, containers and orchestration, application areas, etc.
- To be able to design and implement fog computing systems using containers and other technologies

Course Outcomes:

- To be able to design and implement fog computing systems using containers and other technologies
- To be able to measure and analyze the performance of fog computing applications
- To be familiar with the current and future applications and use cases of fog computing in various domains

UNIT I:

Industrial Regulations revolution I, II, III, IV. Automation of machines, limitations of Automations of machines need of network controlled automation system.

UNIT II:

Computer Network –LAN, VAN, WIRED AND Wireless networks, automation of Machines

UNIT III:

Embedded Systems, Heterogeneous hardware interface & heterogeneous machine Controlled languages, Development of standard interfaces –RS232, Centronics interface VGI Interface, PS2 interface, USB RGF 45 Network Interface. Intersystem communication using sock Programming.

UNIT IV:

IOT ,cloud based IOT data processing , issues in cloud based in IOT , Need of middleware systems , fog computing middle ware , advantages of fog computing middle ware , IOT base Computer system

UNIT V:

Architecture of fog computing, Architecture of fog integrated cloud computing system, fog Computing concepts, local processing in fog computing

REFERENCE:

1. <https://www.britannica.com/technology/social-network>
2. <https://www.techtarget.com/iotagenda/post/IoT-data-in-the-cloud-and-on-the-edge>
3. <https://www.computer.org/publications/tech-news/trends/edge-computing-for-cloud-solutions>
4. <https://www.sciencedirect.com/science/article/pii/S2405959521000606>

22MCA402E3: Technical Report Writing

Course Name	MCA	L	T	P	C	I M	E M	T M
Course Code	22MCA402E3	4	0	0	4	50	50	10 0

L-Lecture, T-Tutorial, P- Practical, C- Credits, IM-Internal Marks, EM- External Marks, TM- Total Marks

Course description and purpose:

A technical report writing course is a course that teaches you how to write clear, concise, and effective reports for various purposes and audiences. The purpose of technical report writing is to communicate technical information and research in a professionally written format using recognized conventions. Technical report writing can help you to:

- Convince the reader of your position
- Persuade them to act, or
- Inform them of your findings

Course Objectives:

- To prepare students to produce instructive, informational, and persuasive documents based on well-defined and achievable outcomes
- To teach students how to communicate technical information and research in a professionally written format using recognized conventions
- To help students develop skills in critical thinking, research, analysis, organization, style, format, and design of written materials
- To expose students to various types of technical writing genres, such as reports, feasibility studies, proposals, specifications, etc.

Course Outcome:

- To demonstrate rhetorical knowledge to create effective technical writing documents for end-users
- To apply and adapt flexible writing process strategies to produce clear, high-quality deliverables in a multitude of technical writing genres
- To use professional technical writing conventions of clean and clear design, style, and layout of written materials
- To write clear and concise technical reports and research articles
- To communicate effectively through written reports, oral presentations and discussion

UNIT- I

Communicating in Science and Technology, Writers and Experts, General versus Scientific/technical writing

UNIT- II

Scientific and technical style, pit falls in scientific/technical writing, Scientific and technical documents

UNIT -III

Reports and Proposals: Specific types of reports **Research Articles and Papers:** Structure of Research papers, Writing for Readers and Writing for listeners

UNIT -IV

Instructions and Manuals: The audience, the writers, structure and layout, logic development

UNIT -V

Language and rapport, A writing-editing sequence to maximize usability

References:

1. "Communicating in the 21st century", Baden Eunson, 3rd Edition, Wiley publications

22MCA402E4: MACHINE LEARNING

Course Name	MCA	L	T	P	C	I M	E M	T M
Course Code	22MCA402E4	4	0	0	4	50	50	10 0

L-Lecture, T-Tutorial, P- Practical, C- Credits, IM-Internal Marks, EM- External Marks, TM- Total Marks

Course description and purpose:

- Introduce the principles, algorithms, and applications of machine learning from the point of view of modeling and prediction
- Teach how to formulate learning problems and concepts of representation, over-fitting, and generalization
- Cover various types of machine learning methods, such as supervised learning, unsupervised learning, reinforcement learning, deep learning, etc.
- Demonstrate how machine learning can solve complex problems in various domains, such as computer vision, natural language processing, speech recognition, etc.

Course Objectives:

The course objectives of machine learning are the learning outcomes that a student is expected to achieve after completing a course on this topic.

- To understand the basic theory underlying machine learning
- To be able to formulate machine learning problems corresponding to different applications
- To understand a range of machine learning algorithms along with their strengths and weaknesses
- To be able to apply machine learning algorithms to solve problems of moderate complexity

Course Outcome:

The course outcomes of machine learning are the learning outcomes that a student is expected to achieve after completing a course on this topic.

- To demonstrate rhetorical knowledge to create effective technical writing documents for end-users
- To apply and adapt flexible writing process strategies to produce clear, high-quality deliverables in a multitude of technical writing genres
- To use professional technical writing conventions of clean and clear design, style, and layout of written materials

UNIT- I

Introduction to Machine Learning: Human Learning and Machine Learning - Types of Machine Learning - Languages and Tools in Machine Learning - Framework for Developing Machine Learning Models - Preparing to Model - Modeling and Evaluation Metrics.

UNIT- II

Basics of Data Pre processing and Feature Engineering: Feature Transformation - Feature Scaling- Feature Construction and Feature Subset Selection - Dimensionality Reduction - Explorative Data Analysis - Hyper Parameter Tuning - Introduction to SK Learn Package.

UNIT -III

Supervised Learning: Introduction - Classification (Common Classification Algorithms): NaïveBayes, KNN, Decision Trees, Random Forest, Support Vector Machines, XGBoost.

Regression(Common Regression Algorithms): Simple Linear Regression and Multiple Linear Regression - Polynomial Regression - Logistic Regression-Regularisation: Lasso and Ridge.

UNIT- IV

Unsupervised Learning: Introduction - Unsupervised Vs Supervised Learning - Unsupervised Learning Models - Dimensionality Reduction - Clustering : Association Rule Mining - Applications of Unsupervised Learning.

UNIT -V

Introduction to Neural Networks: Artificial Neural Networks - Hand Digit Classification - Convolution Neural Networks - Image Classification - Hyper Parameter Tuning - Recurrent Neural Networks - Building Recurrent NN - Long Short Term Memory.

Reference Text Books:

1. Hastie, T., R. Tibshirani, and J. H. Friedman. , *The Elements of Statistical Learning: Data Mining, Inference and Prediction*, New York, NY: Springer, 2011, ISBN: 97803879
2. EthemAlphaydin, An introduction to Machine Learning, PHI Learning Private Limited, 2020
3. AurelienGeron, Hands-On Machine Learning with Scikit Learn, Keras and Tensor Flow, O'REILY -2019
4. Tom Mitchell, Machine Learning, Tata McGraw Hill, 2013
5. Francois Chollet, Deep Learning with Python, Manning , 2019

22MCA404E1: Social Networks

Course Name	MCA	L	T	P	C	I M	E M	T M
Course Code	22MCA404E1	4	0	0	4	30	70	10 0

L-Lecture, T-Tutorial, P- Practical, C- Credits, IM-Internal Marks, EM- External Marks, TM- Total Marks

Course description and purpose:

This course introduces students to the concepts and techniques of social network analysis, which is the study of the structure and dynamics of social relationships. Students will learn how to collect, analyze, and visualize social network data using various tools and methods. Students will also explore the applications and implications of social network analysis in various domains, such as business, politics, media, health, etc.

Course Objectives:

The purpose of this course is to provide students with a theoretical and practical understanding of social networks and their role in society. Students will learn how to use social network analysis to answer questions such as: How are social networks formed and maintained? How do they influence individual and collective behavior? How do they affect social outcomes such as cooperation, diffusion, contagion, etc.? How can they be leveraged for social good or harm?

Course Outcomes:

- Acquired a solid foundation in social network theory and methods
- Gained experience in conducting social network analysis projects on real-world data sets
- Enhanced their ability to think analytically and creatively about social phenomena
- Appreciated the relevance and impact of social networks in various contexts

UNIT -I

Social Network Analysis

Introduction to Web: Limitations of current Web Development of Semantic Web, Emergence of the Social Web Statistical, Properties of Social Networks, Network analysis Development of Social Network Analysis.

UNIT -II

MODELING AND VISUALIZATION: Visualizing Online Social Networks. A Taxonomy of Visualizations - Graph Representation-Centrality Clustering - Node-de Diagrams-Visualizing Social Networks with Matrix-Based Representations- Node-Link Diagrams Hybrid Representations- Modelling and aggregating social network data. Random Walks and their Applications se of Hadoop and Map Reduce - Ontological representation of social individuals and relationships

UNIT -III

MINING COMMUNITIES: Aggregating and reasoning with social network data. Advanced Representations - Extracting evolution of Web Community from a Series of Web Archive - Detecting Communities in Social Networks - Evaluating Communities. Core Methods for Community Detection & Mining - Applications of Community Mining Algorithms Node Classification in Social Networks.

UNIT- IV

EVOLUTION: Evolution in Social Networks Framework - Tracing Smoothly Evolving Communities - Models and Algorithms for Social Influence Analysis - Influence Related Statistics - Social Similarity and Influence - Influence Maximization in Viral Marketing Algorithms and Systems for Expert Location in Social Networks Expert location without Graph Constraints with Score Propagation Expert Team Formation Link Prediction in Social Networks - Feature based Link Prediction Bayesian Probabilistic Models- Probabilistic Relational Models.

UNIT -V

APPLICATIONS: A Learning Based Approach for Real Time Emotion, Classification of Tweets. A New Linguistic Approach to Assess the Opinion of Users in Social Network Environments. Explaining Scientific and Technical Emergence I recasting. Social Network Analysis for Biometric Template Protection

Text Books:

1. Ajith Abraham, Aboul Ella Hassanien, Václav Snášel. Computational Social Network Analysis Trends, Tools and Research Advance, Springer, 2012

References:

2. Borko Fürht-Handbook of Social Network Technologies and Applications Springer. 1st edition, 2011
3. Charu C. Aggarwal. -Social Network Data Analytics. Springer: 2014
4. Giles, Mark Smith, John Yen. -Advances in Social Network Mining and Analysis, Springer, 2010
5. Guandong Xu. Yanchun Zhang and Lin Li-Weh Mining and Social Networking Techniques applications. Springer, 1st edition. 2012
6. Peter Mika. -Social Networks and the Semantic Web, Springer. 1st edition, 2007. 7. Przemyslaw Kazienko, Nitesh Chawla, Applications of Social Media and Social Network Analysis Springer 2015

22MCA404E2: Deep Learning

Course Name	MCA	L	T	P	C	I M	E M	T M
Course Code	22MCA404E2	4	0	0	4	30	70	10 0

L-Lecture-Tutorial, P- Practical ,C- Credits, IM-Internal Marks, EM- External Marks, TM- Total Marks

Course description and Purpose:

The purpose of this course is to provide students with a theoretical and practical understanding of deep learning and its role in solving complex problems. Students will learn how to use deep learning to model and predict data, to extract features and representations, to generate and synthesize data, to optimize and fine-tune models, etc. Students will also gain experience in conducting deep learning projects on real-world data sets.

Course Objectives:

This course introduces students to the fundamental concepts and techniques of deep learning, which is a branch of artificial intelligence that enables algorithms to automatically learn from data without being explicitly programmed. Students will learn how to use popular tools and frameworks, such as TensorFlow and PyTorch, to build and train various types of neural networks, such as artificial neural networks, convolutional neural networks, recurrent neural networks, etc.

Course Outcomes:

Upon completing this course, students will be able to:

- Explain the basic theory and principles of deep learning
- Identify and describe different types of neural networks and their architectures
- Apply appropriate methods and tools to implement and train neural networks
- Evaluate and compare the performance and accuracy of different neural network models
- Apply deep learning techniques to solve problems in various domains
- Critically analyze the strengths and limitations of deep learning

UNIT- I

Introduction to Deep Learning: Deep Learning Vs Machine Learning, Inspiration of Neural Networks from Brain,

The Perceptron: The Simple Idea Behind Neural Networks, Artificial Neuron and its Architecture, Input and Output Layers in Neural Networks, Activation Functions, Loss Functions, Optimizers, Data Representation for Neural Networks, The Gears of Neural Networks.

UNIT- II

Artificial Neural Networks: Architecture, Input and Output Layers in Neural Networks, Activation Functions, Loss Functions, Optimizers, Training a Neural Net. Feed Forward Mechanism, Back Propagation in Neural Networks, Gradient Descent Algorithm, Updating Weights and Biases, Vanishing/Exploding Gradients Problems, Reusing Pre Trained Layers, Faster Optimizers.

UNIT- III

Introduction to Tensor flow and Keras: Building ANN with Keras, Problems of Vanishing Gradient and Exploding Gradient, Modifications to Neural Networks, Regularization, Normalization, Dropouts. Hand Digit Recognition in Keras, Regression with Neural Networks, Classification with Neural Networks, Building Image Classifier Using Sequential API, Building Regression MLP using Sequential API, Building Complex Models using Sequential API, Building Dynamic Models using Sequential API, Virtualizing using Tensor Board.

UNIT -IV

Convolution Neural Networks (CNN): Meaning of Convolution. Architecture of CNN. Filters, Padding, Data Preprocessing in CNN, Alexnet, Google net, LeNet-5, VGGNet, ResNet, Xception, SENet, Image Classification with CNN using Keras, Transfer Learning in CNN, Using Pre Trained Models from Keras, Pre Trained Models for Transfer Learning, Classification and Localization.

UNIT -V

Recurrent Neural Networks(RNN): A Recurrent layer in Keras, Understanding the LSTM and GRU Layers, A LSTM example in Keras, A Temperature Forecasting Problem, Preparing The Data, First Recurrent Baseline, Using Recurrent Dropout to Fight Over Fitting, Stacking Recurrent layers, Using Bidirectional RNN's

Text Book:

1. Francois Chollet, Deep Learning with python, Second Edition paperback-Manning, 2017

Reference Text Book:

1. Peter Bruce, practical Statistics for Data Scientists: 50+ Essential Concepts Using R and Python, O Reilly

22MCA404E3: NO SQL Database

Course Name	MCA	L	T	P	C	I M	E M	T M
Course Code	22MCA404E3	4	0	0	4	50	50	10 0

L-Lecture, T-Tutorial, P- Practical, C- Credits, IM-Internal Marks, EM- External Marks, TM- Total Marks

Course description and Purpose:

This course will provide students with an introduction, overview and history of NoSQL databases (non-relational databases). the purpose of this course is to provide students with a theoretical and practical understanding of NoSQL databases and their role in the database landscape. Students will learn how to use NoSQL databases to effectively handle scalability and flexibility issues raised by modern applications. Students will also learn how to compare and contrast NoSQL databases with relational databases and other models such as cloud computing and polyglot persistence

Course Objectives:

Upon completion of this course, students will be able to:

- Define, compare and use the four types of NoSQL Databases (Document-oriented, Key Value Pairs, Column-oriented and Graph)
- Demonstrate an understanding of the detailed architecture, define objects, load data, query data and performance tune Column-oriented NoSQL databases
- Explain the detailed architecture, define objects, load data, query data and performance tune Document-oriented NoSQL databases
- Demonstrate an understanding of the detailed architecture, define objects, load data, query data and performance tune Key-Value Pair NoSQL databases
- Explain the detailed architecture, define objects, load data, query data and performance tune Graph NoSQL databases
- Evaluate NoSQL database development tools and programming languages

Course Outcomes:

- Acquired a solid foundation in NoSQL database theory and methods
- Gained experience in conducting NoSQL database projects on real-world data sets
- Enhanced their ability to think analytically and creatively about database problems
- Appreciated the relevance and impact of NoSQL databases in various contexts

UNIT-I

Overview and History of NoSQL Databases: Types of NoSQL Database, The Value of Relational Databases, Getting at Persistent Data, Concurrency, Integration, Impedance Mismatch, Application and Integration Databases, Attack of the Clusters, The Emergence of NoSQL, Key Points.

UNIT- II

Comparison of relational databases to new NoSQL stores, MongoDB, Cassandra, HBASE, Neo4j use and Deployment, Application, RDBMS approach, Challenges NoSQL approach, Key-Value and Document Data Models, Column-Family Stores, Aggregate Data Models, Replication and Sharding, Distribution Models, Single Server, Master-Slave Replication, Peer-to-Peer Replication, Combining Sharding and Replication.

UNIT- III

Document Databases, Document Database Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Web Analytics, Real Time Analytics, E-Commerce Applications.

UNIT- IV

Column Oriented NoSQL databases using Apache HBASE, Column-oriented NoSQL databases using Apache Cassandra, Architecture of HBASE, Column-Family Data Store Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Counters, Expiring Usage.

UNIT- V

Creating, Updating and Deleting Documents: Inserting and Saving Documents, Removing Documents, Updating Documents, Querying, Query Criteria, Type-Specific Queries, Where Queries, Cursors, Triggers.

Reference Books:

1. Sadalage, P. & Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Wiley Publications, 1st Edition, 2019.
2. Polyglot Persistence, Wiley Publications, 1st Edition, 2019.

WEB REFERENCES:

1. <https://www.ibm.com/cloud/learn/nosql-databases>
2. <https://www.coursera.org/lecture/nosql-databases/introduction-to-nosql-VdRNp>
3. <https://www.geeksforgeeks.org/introduction-to-nosql/>
4. <https://www.javatpoint.com/nosql-database>

22MCA403: Big Data Analytics Lab

List of Experiments

R Programming Lab List

- 1) Programs in data types in R.**
- 2) Built in Functions in R**
- 3) Creating and Manipulating a vector in R**
- 4) Creating matrix and manipulating matrix in R**
- 5) Creating and Operations on Factors in R**
- 6) Operations on Data Frames in R**
- 7) Operations on lists in R.**
- 8) Programs on operators in R**
- 9) Comparison of matrices and vectors in R**
- 10) Programs on If-else statements in R**
- 11) Programs on For loops in R**
- 12) Programs on while loops in R**
- 13) Customizing and saving to Graphs in R**
- 14) PLOT function in R to customize graphs**
- 15) 3D Plot in R to customize graphs**

ANDHRA LOYOLA COLLEGE

DEPARTMENT OF MCA

I SEMESTER SYLLABUS

(Revised CBCS 2022-2023 Batch onwards)

I SEMESTER

Course Code	Course Name	Teaching Hours/ week			COR E/ IDC/DS E/ SEC/OE C / MOOCS	Intern al Mark s	Extern al Marks	No. of Cred it s
		Lectu re	Practic al	Tutori al				
22MCA101	Programm ing and Problem Solving using Python	4	0	0	Core	50	50	4
22MCA102	Data Structures	4	0	0	Core	50	50	4
22MCA103	Mathemati cal and Statistical Foundatio ns	4	0	0	Core	50	50	4
22MCA104	Operating Systems	4	0	0	Core	50	50	4
22MCA105 COMPULSO RY	Personality Development through Life Enlightenment Skills	3	1	0	Core	50	50	3
22MCA106	Data Structures Lab	0	6	0	Core	50	50	3
22MCA107	Python Lab	0	6	0	Core	50	50	3
22MCA108	Soft Skills - GE(AI Tools)	4						2
22MCA109	Foundation Course - UNIX							2
TOTAL FOR FIRST SEMESTER						350	350	29

22MCA101: Programming and Problem Solving Using Python

Course Name	MCA	L	T	P	C	IM	EM	TM
Course Code	22MCA101	4	0	0	4	50	50	100

L,Lecture, T,Tutorial, P,Practical, C,Credits, IM,Internal Marks, EM,External Marks, TM,Total Marks

Course Description and Purpose:

The course is designed to provide basic knowledge of Python. Python programming is intended for Software Engineers, system analysts, program managers and user support personnel who wish to learn the Python Programming Language.

Course Objectives:

- Master the fundamentals of writing Python scripts
- Learn core Python scripting elements such as variables and flow control structures
- Discover how to work with lists and sequence data
- Write Python functions to facilitate code reuse
- Use Python to read and write files
- Make their code robust by handling errors and exceptions properly
- Work with the Python standard library
- Explore Python's object-oriented features

Course Learning Outcomes:

At the end of this course the students should be able to:

- Understand computer architecture and data representations (variables, representation of numbers and character strings).
- Learn basic algorithmic problem, solving techniques (decision structures, loops, functions).
- Use and understand objects used in programming.
- Design, document, implement and test solutions to programming problems.
- Identify and repair coding errors in a program.

Course Content:

UNIT -I

Introduction: What is a programming language, Abstractions in programming languages, Computational paradigms, Language definition, Language translation, Language design. Principles of Programming Languages: Attributes, binding and semantic functions, Declarations, blocks and scope, The symbol table, Name resolution and overloading, Allocation, Lifetimes and the environment, Variables and Constants, Aliases, Dangling

references and garbage.

UNIT-II

Basics of Python Programming, Features of Python, History of Python, The Future of Python, Writing and Executing First Python Program, Literal Constants, Variables and Identifiers, Data Types, Input Operation, Comments, Reserved Words, Indentation, Operators and Expressions, Expressions in Python, Operations on Strings, Other Data Types, Type Conversion.

Decision Control Statements, Conditional Branching Statements, Basic Loop Structures, Nested Loops, The break statement, The continue statement, The pass statement. The else statement used with loops.

UNIT-III

Functions and Modules, Function Definition, Function Call, Variable Scope and Lifetime, The return statement, More on Defining Functions, Recursive functions, Modules, Packages in Python, Standard Library Modules.

Python Strings Revisited, Concatenating, Appending and Multiplying Strings, String formatting operator, Built in String Methods and Functions, Comparing Strings, Regular Expressions. Sequence, Lists, Functional Programming, Tuple, Sets, Dictionaries.

UNIT-IV

Classes and Objects, Class Method and self Argument, Class variables and Object Variables, Public and Private Data Members, Private Methods, Calling a Class Method from Another Class Method, Built-in Class Attributes, Class Methods, Static Methods.

UNIT-V

Inheritance, Inheriting Classes in Python, Types of Inheritance, Abstract Classes and Interfaces. Error and Exception Handling, Introduction to Errors and Exceptions, Handling Exceptions, Raising Exceptions, Built, in and User defined Exceptions

Operator Overloading, Concept of Operator Overloading, Advantage of Operator Overloading, Implementing Operator Overloading.

Reference Textbooks:

1. Kenneth C. Louden, Programming Languages Principles and Practice, Second Edition, Cengage Learning(2008).
2. Reema Thareja, Python Programming using Problem Solving Approach, Oxford University Press
3. Wesley Chun, Core Python Programming, Prentice Hall

22MCA102–Data Structures

Course Name	MCA	L	T	P	C	IM	EM	TM
Course Code	22MCA102	4	0	0	4	50	50	100

L,Lecture, **T**,Tutorial, **P**,Practical, **C**,Credits, **IM**,Internal Marks, **EM**,External Marks, **TM**,Total Marks

Course Description and Purpose:

An overview of data structure concepts, arrays, stack, queues, trees, and graphs. Discussion of various implementations of these data objects, programming styles, and run, time representations. Course also examines algorithms for sorting, searching and some graph algorithms. Algorithm analysis and efficient code design is discussed.

Course Objectives:

- Exploring basic data structures such as stacks and queues.
- Introduces a variety of data structures such as search trees, and graphs.
- Introduces sorting and pattern matching algorithms

Course Learning Outcomes:

At the end of this course the students should be able to:

- Ability to select the data structures that efficiently model the information in a problem.
- Ability to assess efficiency trade, offs among different data structure implementations or combinations.
- Implement and know the application of algorithms for sorting and pattern matching.
- Design programs using a variety of data structures, including hash tables, binary and general treestructures, search trees, , graphs, and AVL,trees.

Course Content:

UNIT-I

Introduction and Overview: Elementary Data Organization, Data Structures, Data Structure Operations, and Algorithms: Complexity, Time, and Space Tradeoff. Linear Arrays, Representation and Traversing Linear Arrays, Inserting and Deleting, Linear Search, Binary Search, Multidimensional Arrays, Pointer Arrays, Record Structures, Representation of records in memory, Parallel Arrays, Matrices, Sparse Matrices.

UNIT-II

Stacks: Stacks, Array representation, Linked List representation, Evaluation of Arithmetic Expressions, Quick sort, Recursion, Towers of Hanoi. Queues: Linked representation of Queues, Deques, Priority Queues.

Linked Lists: Representation, Traversing, Searching, Memory Allocation: Garbage Collection, Insertion, Deletion, Header Linked Lists, Two Way Lists.

UNIT-III

Trees : Binary trees, Representing and traversing binary trees, Traversal algorithms using stacks, Binary Search Trees, Searching, Insertion and Deletion in Binary Search Trees, AVL Search Trees,

Insertion and Deletion in AVL trees, Heap: Heap Sort, Huffman's Algorithms, General Trees

UNIT-IV

Multi-way Search Trees: M-Way Search Trees, Definition and Properties, Searching an M-Way Search Tree, B-Trees, Definition and Properties, Number of Elements in a B-tree, Insertion into B-Tree, Deletion from a B-Tree, B+-Tree Definition, Searching a B+-Tree, Insertion into B+-tree, Deletion from a B+-Tree.

UNIT-V

Graphs Algorithms – Elementary Graph Algorithms: Topological sort, Single Source Shortest Path Algorithms: Dijkstra's, Bellman-Ford, All-Pairs Shortest Paths: Floyd-Warshall's Algorithm

Reference Textbooks:

1. Seymour Lipschutz, Data Structures, Mc Graw Hill(Schaums Outlines), First Edition
2. Seymour Lipschutz, Theory and problems of Data Structures, Mc Graw Hill(Schaums Outlines)
4. John R Hubbard, Second Edition, Data Structures with Java, Mc Graw Hill(Schaums Outlines)
- Robert Lafore, Data Structures & Algorithms in Java, Second Edition, Pearson Education.
5. Fundamentals of DATA STRUCTURES in C: 2nded, , Horowitz , Sahani, Anderson-freed, Universities Press
6. Data Structures, a Pseudocode Approach, Richard F Gilberg, Behrouz A Forouzan, Cengage.

22MCA103–Mathematical and Statistical Foundations

CourseName	MCA	L	T	P	C	IM	EM	TM
CourseCode	22MCA103	4	0	0	4	50	50	100

L,Lecture,**T**,Tutorial,**P**,Practical,**C**,Credits,**IM**,InternalMarks,**EM**,ExternalMarks,**TM**,TotalMarks

Course Description and Purpose:

To develop the understanding of the mathematical and logical basis to many modern techniques in computer science technology like machine learning, programming language design, and concurrency.

Course Objectives:

Understand the mathematical fundamentals that is prerequisites for variety of courses like Data mining, Network protocols, analysis of Web traffic, Computer security, Software engineering, Computer architecture, operating systems, distributed systems bioinformatics, Machine learning.

Study various sampling and classification problems.

Course Learning Outcomes:

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

- Apply the basic rules and theorems of probability theory such as Baye's Theorem, determine probabilities that help to solve engineering problems and to determine the expectation and variance of a random variable from its distribution.
- Able to perform and analyze of sampling, means, proportions, variances and estimates the maximum likelihood based on population parameters.
- Learn how to formulate and test hypotheses about sample means, variances and proportions and to draw conclusions based on the results of statistical tests.
- Design various ciphers using number theory.

Course Content:

UNIT-I

The Foundations: Logic and Proofs: Propositional Logic – Propositional Equivalences – Predicates and Quantifiers – Nested Quantifiers.

Introduction and Recursion: Mathematical Induction – Strong Induction and Well-Ordering – Recursive Definitions and Structural Induction – Recursive Algorithms – Program Correctness

UNIT-II

Advanced Counting Techniques: Recurrence Relations – Solving Linear Recurrence Relations – Divide and Conquer Algorithms and Recurrence Relations – Generating Functions – Inclusion – Exclusion – Applications of Inclusion & Exclusion

UNIT-III

Relations : Relations and Their Properties –Equivalence Relations – Partial Orderings
Graphs: Graphs and Graph Models – Graph Terminology and Special Types of
Graphs – Representing Graphs and Graph Isomorphism's – Connectivity – Euler and
Hamilton Paths – Shortest Path Problems – Planar Graphs - Graph Coloring

UNIT-IV

Some probability laws: Axioms of Probability, Conditional Probability, Independence
of the Multiplication Rule, Bayes' theorem.

Discrete Distributions: Random Variables, Discrete Probability Densities, Expectation
and distribution parameters, Binomial distribution, Poisson distribution, simulating a
Discrete distribution.

UNIT-V

Inferences on the mean and the Variance of a distribution: Hypothesis Testing,
significance testing, Hypothesis and significance test on the mean, Hypothesis tests on
the Variance.

Inferences on proportions: estimating proportions, testing hypothesis on a proportion,
comparing two proportions: estimation, comparing two proportions: hypothesis
testing.

Reference Textbooks:

1. Susan Milton and Jesse C. Arnold, Introduction to Probability and Statistics, Fourth
edition.
2. William Mendenhall, Robert J Beaver, Barbara M Beaver, Introduction to Probability
and Statistics, Twelfth edition, Thomson.
3. Kenneth H Rosen, Discrete Mathematics and its Applications, 6th Edition, McGraw-Hill
(2007) Chapters(1-10)
4. Ralph P. Grimaldi, B.V. Ramana, Discrete and Combinational Mathematics, 5th
Edition, Pearson Education (2008).
5. Swapan Kumar Sarkar, A Text Book of Discrete Mathematics, S.Chand (2008)
6. D.S.Malik and M.K.Sen, Discrete Mathematical Structures, Thomson (2006)

22MCA104: Operating Systems

Course Name	MCA	L	T	P	C	IM	EM	TM
Course Code	22MCA104	4	0	0	4	50	50	100

L-Lecture, T-Tutorial, P-Practical, C-Credits, IM-Internal Marks, EM-External
Marks, TM-Total Marks

Course Description and Purpose:

Covers the classical internal algorithms and structures of operating systems, including CPU scheduling, memory management, and device management. Considers the unifying concept of the operating system as a collection of cooperating sequential processes. Covers topics including file systems, virtual memory, disk request scheduling, concurrent processes, deadlocks, security, and integrity.

Course Objectives:

- To understand the services provided by and the design of an operating system.
- To understand the structure and organization of the file system.
- To understand what a process is and how processes are synchronized and scheduled.
- To understand different approaches to memory management.
- Students should be able to use system calls for managing processes, memory and the file system.
- Students should understand the data structures and algorithms used to implement an OS.

Course Learning Outcomes:

At the end of this course the students should be able to:

- Understand fundamental operating system abstractions such as processes, threads, files, semaphores, IPC abstractions, shared memory regions, etc.,
- Analyze important algorithms eg. Process scheduling and memory management algorithms.
- Categorize the operating system's resource management techniques, dead lock management techniques, memory management techniques

Course Content:

UNIT- I

Introduction to Operating System Concept: Types of Operating Systems, Operating Systems Concepts, Operating System Operations. Operating Systems Structures- Operating System Services, User Operating-System Interface, Introduction to System calls, Types of System Calls.

Processes Management: Process Management: Process concept, Process State Diagram, Process control block, Process Scheduling, Inter process Communication, Threads- Threading Issues, Scheduling- Basic Concepts,

Scheduling Criteria, Scheduling Algorithms.

UNIT- II

Process Synchronization: The Critical-Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Classic Problems of Synchronization, Monitors.

Principles of deadlock: System Model, Deadlock characterization, Deadlock handling, Deadlock Prevention, Detection and Avoidance, Recovery Starvation, Critical Regions form Deadlock.

UNIT –III

Memory Management: Swapping, Contiguous Memory Allocation, Paging, structure of the Page Table, Segmentation.

Virtual Memory Management- Demand Paging, Page-Replacement Algorithms.

UNIT- IV

File-System Interface: File Concept, Access Methods, Directory structure, File-System mounting, Files Sharing, Protection.

File-System implementation- File-System Structure, Allocation Methods, Free-Space Management, Disk Structure, Disk Scheduling.

UNIT –V

Distributed Operating Systems- Types of network based Operating systems, Network Structure, Network Topology, Communication Structure, Communication Protocols, Robustness, Design Issues

A review of Mobile Operating Systems, Features of Android Operating Systems.

Reference Text books:

1. Abraham Silberschatz, & Peter Baer Galvin, Gagne, Operating System Concepts, Ninth Edition, Wiley, 2015
2. William Stallings, Operating Systems-Internals and Design Principles, Fifth Edition, Pearson Education, 2007
3. Achyut S Godbole, Operating Systems, Second Edition, TMH, 2007
4. Flynn/McHoes, Operating Systems, Cengage Learning, 2008.
5. Deitel & Deitel, Operating System, Third Edition, Pearson Education, 2008

22MCA105: Personality Development through Life Enlightenment Skills

Course Name	MCA	L	T	P	C	IM	EM	TM
Course Code	22MCA105	3	0	1	3	50	50	100

L,Lecture, T,Tutorial, P,Practical, C,Credits, IM,Internal Marks, EM,External Marks, TM,Total Marks

Course Description and Purpose:

Personality development is the development of your behavior patterns and attitude. It is the result of where we are born, the circle we interact with and our personal temperament. Every person is different. There are some characteristics traits that make you „you“. Personality development through life enlightenment course aims to help students identify negative behaviors which may be stopping them from reaching their desired goals. This course will help students both in their personal and desired professional life. The other purposes of personality development through life enlightenment course are to enable you lead stress-free and healthier life, ethical decision making ability, enhanced confidence level, and building a more pleasing personality.

Course Objectives:

The Course will introduce the students to

- Learn to achieve the highest goal happily.
- Become a person with stable mind, pleasing personality and determination.
- Learn to build positive attitude, self-motivation, enhancing self-esteem and emotional intelligence
- Learn to develop coping mechanism to manage stress through Yoga and meditation techniques
- Awaken wisdom among them.

Course Learning Outcomes:

At the end of this course the students should be able to:

- Develop their personality and achieve their highest goals of life.
- Lead the nation and mankind to peace and prosperity
- Practice emotional self regulation.
- Develop a positive approach to work and duties
- Develop a versatile personality

Course Content:

UNIT- I

Introduction to Personality Development

The concept of personality - Dimensions of Personality – Theories of Personality development (Freud & Erickson) – The concept of Success and Failure – Factors responsible for Success – Hurdles in achieving Success and Overcoming Hurdles — Causes of failure – Conducting SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis.

UNIT- II

Attitude, Motivation and Self-esteem

Conceptual overview of Attitude – Types of Attitudes – Attitude Formation – Advantages/Disadvantages of Positive/Negative Attitude - Ways to Develop Positive Attitude Concept of motivation: Definition and Nature of Motivation/Motive – Internal and external motives – Theories of Motivation – Importance of self- motivation- Factors leading to de- motivation.

Self-esteem - Definition and Nature of self-esteem – Do's and Don'ts to develop positive self- esteem – Low self esteem - Personality having low self esteem - Positive and negative self esteem.

UNIT- III

Other Aspects of Personality Development

Body language - Problem-solving - Conflict Management and Negotiation skills - Decision-making skills - Leadership and qualities of a successful leader – Character building -Team-work – Time management - Work ethics – Good manners and etiquette – Emotional Ability/Intelligence – Dimensions of Emotional Intelligence – Building Emotional Intelligence.

UNIT- IV

Neetisatakam-Holistic Development of Personality

Verses- 19,20,21,22 (wisdom) – Verses- 29,31,32 (pride and heroism) – Verses- 26,28,63,65 (virtue)

Personality of Role Model – Shrimad Bhagwadgeeta

Chapter2-Verses 17 – Chapter 3-Verses 36,37,42 – Chapter 4-Verses 18, 38,39 – Chapter18 – Verses 37,38,63

UNIT- V

Yoga & Stress Management

Meaning and definition of Yoga - Historical Perspective of Yoga - Principles of Astanga Yoga by Patanjali – Meaning and Definition of Stress - Types of Stress - Eustress and Distress –Stress Management – Pranayama- Pranayama: Anulom and Vilom Pranayama - Nadishudhi Pranayama

– Kapalabhati-Pranayama - Bhramari Pranayama - Nadanusandhana Pranayama – Meditation techniques: Om Meditation - Cyclic meditation : Instant Relaxation technique (QRT), Quick Relaxation Technique (QRT), Deep Relaxation Technique (DRT) (Theory & Practical).

PRACTICAL COMPONENTS:

- Students should identify different types of personality to know their own personality. Students are to describe the characteristics of their personalities and submit the same for assessment.
- Students are to form in groups (a group consists of 4-6 students) to identify and write a brief note on famous personalities of India and World.
- Students are required to identify different types of attitudes and give any five examples of each.
- Students are expected to check their attitudes and develop ways to improve their attitudes at work place and home.
- Students are required to identify keys to self-motivation to achieve their goals.
- Students are expected to identify at least seven types of body language and conduct activities with the following:

S. No.	Pose	Possible Interpretations
1	Standing with your hands on your hips	Aggressive, disgusted
2	Standing upright	Confidence
3	Arms crossed on your chest	Defensive
4	Resting your hand on your cheek	Thinking
5	Touching or rubbing your nose	Doubt, lying
6	Resting your head in your hands	Boredom, tired
7	Tapping your fingers	Impatience
8	Biting your nails	Nervous, insecure
9	Playing with your hair	Insecure
10	Rubbing your eyes	Disbelief, doubt

- Conduct the following exercise to develop communication skills – Negotiation Skills and Empathy

Exercise: Card Pieces

In this activity, team members trade pieces of playing cards to put together complete cards. Uses -This exercise is useful for showing team members others' perspectives. It builds communication and negotiation skills , and helps people to develop empathy .

People and Materials

- Enough people for at least three teams of two.
- Playing cards – use between four and six for each person.
- A private room.

Time -15 minutes. Instructions:

1. Cut each playing card into half diagonally, then in half diagonally again, so you have four triangular pieces for each card.
2. Mix all the pieces together and put equal numbers of cards into as many envelopes as you have teams.

3. Divide people up into teams of three or four. You need at least three teams. If you're short of people, teams of two will work just as well.
4. Give each team an envelope of playing card pieces.

Conduct following Time management activity - Ribbon of Life

Take a colored ribbon length of approximately 1 meter/100 cm. and scissors. Start with the following questions:

- If the life span of an individual is say, 100 years. Consider that each cm represents one year. The response will be that few live that long. Assuming a life of 75 to 90 years, cut 10 to 25 cm off the ribbon, accordingly.
- What is the average age of the participants sitting here, the response would be 25 to 30 depending on the group, in that case, cut another 25 cms of the ribbon and say that is gone you cannot do anything.
- What is left is 50 years? People will say, "Yes," but the answer is NO.
- Every year we have 52 weeks, that is 52 Sundays. If we multiply that by 50 years, it comes to 7.14 years. Reduce the ribbon by another 7.14 cm.
- We also usually have Saturdays off, so reduce another 7. cms.
- Public/National holidays are 10 multiple with 50 years. That comes to another 1.5 years. Reduce ribbon by another 1.5 cms.
- Your casual leave, sick leave, and annual holidays approx. 40 days a year, multiplied by 50. Cut off another 5 cms. Now you are left with about 29.5 years. But, the calculation is not over yet.
- You sleep an average of 8 hours daily; multiply that by 365 days and again by 50 years (i.e. 122 days X 50 = almost 17 years). Cut off another 17 cm.
- You spend time eating lunch, breakfast, snacks, and dinner total 2 hours daily (i.e. 30 days a year X 50 years= 4 years or so). Cut off another 4 cm.
- Last, let's figure we spend about 1 hour a day traveling from place to place for activities and such. (that's about 2 more years). We're down to 6 (SIX) years of life to make it or break it.

What You'll Need

Advice for the Teacher/Facilitator:

- Students are asked to recite verses: 26,28,63,65 (virtue) of Neetisatakam-Holistic development of personality.
- Students are asked to identify personality of role Mmodels from Shrimad Bhagwadgee ta and portray the roles of the same.
- Students are asked to practice Yoga and meditation techniques.

.Reference Textbooks:

1. Hurlock, E.B. Personality Development, 28th Reprint. New Delhi: Tata McGraw Hill, 2006.
2. Gopinath, Rashtriya Sanskrit Sansthanam P, Bhartrihari's ThreeSatakam, Niti-sringar- vairagya, New Delhi, 2010
3. Swami Swarupananda, Srimad Bhagavad Gita, Advaita Ashram, Publication Department, Kolkata, 2016.
4. Lucas, Stephen. Art of Public Speaking. New Delhi. Tata - Mc-Graw Hill. 2001
5. Mile, D.J Power of positive thinking. Delhi. Rohan Book Company, (2004).
6. Pravesh Kumar. All about Self- Motivation. New Delhi. Goodwill Publishing House. 2005.
7. Smith, B. Body Language. Delhi: Rohan Book Company. 2004
8. Yogic Asanas for Group Training - Part-I: Janardhan Swami Yogabhyasi Mandal, Nagpur.
9. Rajayoga or Conquering the Internal Nature by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata.
10. Nagendra H.R nad Nagaratna R, Yoga Perspective in Stress Management, Bangalore, Swami Vivekananda Yoga Prakashan.

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc16_ge04/preview
2. <https://freevidelectures.com/course/3539/indian-philosophy/11>

22MCA106: Data Structures Lab

Course Name	MCA	L	T	P	C	IM	EM	TM
Course Code	22MCA106	0	0	6	3	50	50	100

L,Lecture, T,Tutorial, P,Practical, C,Credits, IM,Internal Marks, EM,External Marks, TM,Total Marks

List of Programs

1. Java program to implement Stack operations using Arrays
2. Java program to implement Queue operations using Arrays
3. Java program to implement linked list operations using Arrays
4. Java Program to implement tree traversal techniques
5. Java program to convert infix expression to postfix expression
6. Java program to evaluate postfix expression
7. Java program to implement Binary search.
8. Java program to implement Selection sort
9. Java program to implement Insertion sort
10. Java program to implement quick sort
11. Java program to implement Merge Sort

12. Java Program to perform the following operations:
 - a. Insertion into a B-Tree
 - b) Searching in a B-Tree.

22MCA107: Python Lab

Course Name	MCA	L	T	P	C	IM	EM	TM
Course Code	22MCA107	0	0	6	3	50	50	100

L,Lecture, **T**,Tutorial, **P**,Practical, **C**,Credits, **IM**,Internal Marks, **EM**,External Marks, **TM**,Total Marks

List of Programs

1. Write Python program to reverse a number and also find the sum of digits in the reversed number. Prompt the user for input.
2. Write Python code to check the given year is leap year or not.
3. Write Python code to determine whether the given string is Palindrome or not using slicing
4. Write Python code to add two matrices and also find the transpose of the resultant matrix.
5. Write Python code to swap two numbers without using intermediate variable.
6. Consider a rectangle class and create two rectangle objects. Write a python program to check whether the area of first rectangle is greater than the second by overloading greater than operator.
7. Write Python program to count the number of times an item appears in the list.
8. Write Python code to convert uppercase letters to lowercase and vice versa
9. Write Python code to perform a linear search for a given key number in the list and report success or failure.
10. Write Python code to sort numbers in a list in ascending order using Bubble sort by passing the list as an argument to the function call.
11. Write Python code to calculate the area and perimeter of different shapes using polymorphism.

III SEMESTER

Course Code	Course Name	Teaching Hours/week			CORE / IDC/DS E/ SEC/OEC/MOOC S	Internal Marks	External Marks	No. of Credits
		theoretical	practical	total				
22MCA301	Data Science	4	0	0	Core	50	50	4
DOMAIN SPECIFIC ELECTIVE COURSES (CHOOSE ANY THREE)								
22MCA302 E1	Principles of Programming Languages	4	0	0	DSE	50	50	4
22MCA302 E2	Artificial Intelligence	4	0	0	DSE	50	50	4
22MCA302 E3	Block Chain Technologies	4	0	0	DSE	50	50	4
22MCA302 E4	Information Security	4	0	0	DSE	50	50	4
22MCA302 E5	Applied Data Analytics	4	0	0	DSE	50	50	4
22MCA302 E6	Web Technologies	4	0	0	DSE	50	50	4
LAB PRACTICALS								
22MCA303	Data Science lab	0	6	0	Core	50	50	3
22MCA304	Web Technologies Lab	0	6	0	Core	50	50	3
OPEN ELECTIVE (INTERDISCIPLINARY/MULTIDISCIPLINARY) COURSES (CHOOSE ANY ONE)								
22MCAOE1	R Programming	3	0	0	OEC	50	50	3
22MCAOE2	Mobile Networks	4	0	0	OEC	50	50	3
22MCAOE3	Unix Programming	3	0	0	OEC	50	50	3
22MCAOE4	Office Tools	3	0	0	OEC	50	50	3
22MCAOE5	Python Programming	3	0	0	OEC	50	50	3
TOTAL FOR III SEMESTER						350	350	26

**MCA R22 Regulations
III Semester**

22MCA301: Data Science

Course Name	MCA	L	T	P	C	IM	EM	TM
Course Code	22MCA301	4	0	0	4	50	50	100

L-Lecture, T-Tutorial, P- Practical ,C-Credits, IM-Internal Marks, EM- External Marks, TM-Total Marks

Course Description and Purpose:

A Data Science course aims to provide learners with an understanding of the fundamentals and core concepts of data science, which are essential for working in any industry. The course covers topics such as data extraction, wrangling, and pre-processing, exploratory data analysis, predictive modeling, machine learning, deep learning, and more

The purpose of a Data Science course is to equip learners with the skills and knowledge required to become proficient in data science. Upon completion of the course, learners will be able to extract insights from raw data using various statistical techniques and tools. They will also be able to build predictive models using machine learning algorithms and communicate their findings effectively through reports and visualizations

Course Objective:

The primary objective of Data Science is to extract useful insights from data that can be profitable to the company's business. It combines math and statistics, specialized programming, advanced analytics, artificial intelligence (AI), and machine learning with specific subject matter expertise to uncover actionable insights hidden in an organization's data'. These insights can be used to guide decision making and strategic planning.

Course Learning Outcomes:

- **I python and Jupiter:** provide computational environments for data scientists using python
- **NumPy :** includes the ND array for efficient storage and manipulation of dense data arrays in python
- **pandas:** features the Data Frame for efficient storage and manipulation of labeled/columnar data in python
- **Matplotlib:** includes capabilities for a flexible range of data visualizations in python
- **Scikit-learn:** for efficient and clean python implementations of the most important and established machine learning algorithms

UNIT- I:

Introduction to NumPy - Understanding Data Types in Python, The Basics of Numpy Arrays, Computation on NumPy Arrays, Aggregations, Computation on Arrays, Comparisons, Masks and Boolean Logic, Fancy Indexing, Sorting Arrays, Structured Data.

UNIT- II:

Data Manipulation with Pandas – Installing and Using Pandas, Introducing Pandas Objects, Data Indexing and Selection, Operating on Data in Pandas, Handling Missing Data, Hierarchical Indexing, Combining Datasets, Aggregation and Grouping, Pivot Tables, Vectorized String operations, High-Performance Pandas.

UNIT- III:

Visualization with Matplotlib – General Matplotlib Tips, Simple Line Plots, Simple Scatter Plots, Visualizing Errors, Density and Contour Plots, Histograms, Binnings, and Density.

UNIT- IV:

Customizing Matplotlib – Customizing Plot Legends, Customizing Colorbars, Text and Annotation, Customizing Matplotlib, Three-Dimensional Plotting in Matplotlib, Visualization with Seaborn.

UNIT-V:

Machine Learning – What is Machine Learning, Categories of Machine Learning, Qualitative Examples of Machine Learning Applications, Introducing Scikit-Learning, Feature Engineering, Naive Bayes Classification, Linear Regression, Decision Trees and Random Forests, In Depth: Principal Component Analysis

Introducing Principal Component Analysis, PCA as Noise Filtering, Example: Eigen faces, Principal Component Analysis Summary, In Depth: k-Means Clustering, k-Means Algorithm, Examples.

Text books :

1. Jake VanderPlas- Python Data Science Handbook||OReilly

Reference books :

1. Peters Morgan, Data Analysis From Scratch With Python: Beginner Guide using Python, Pandas, NumPy, Scikit-Learn, IPython, TensorFlow and Matplotlib, AI Sciences LLC

III Semester
22MCA302E1: PRINCIPLES OF PROGRAMMING LANGUAGE

(Domain Specific Elective Course)

Course Name	MCA	L	T	P	C	IM	EM	TM
Course Code	22MCA302E1	4	0	0	4	50	50	100

L-Lecture, T-Tutorial, P- Practical, C- Credits, IM-Internal Marks , EM- External Marks, TM-Total Marks

Course description and outcomes:

Principles of Programming Languages is a course that introduces the theory and design of programming languages. The course aims to provide learners with an understanding of the fundamental principles and concepts of programming languages, which are essential for working in any industry.

The purpose of a Principles of Programming Languages course is to equip learners with the skills and knowledge required to become proficient in programming languages. Upon completion of the course, learners will be able to understand the syntax and semantics of programming languages. They will also be able to design and implement high-assurance software using formal descriptions of the meaning and behavior of programs.

Course Objective:

- To introduce several different paradigms of programming.
- To gain experience with these paradigms by using example programming languages.
- To understand concepts of syntax, translation, abstraction, and implementation

Course Outcomes:

- Acquire the skills for expressing syntax and semantics in formal notation.
- Identify and apply a suitable programming paradigm for a given computing application.
- Gain knowledge of and able to compare the features of various programming languages.
- Define the semantics of a programming language using a definitional interpreter.
- Investigate semantic issues in programming languages by studying implementations in an interpreter

UNIT- I:

Preliminary Concepts: Reasons for studying concepts of programming languages, Language categories- Imperative, Functional, Logic and Object Oriented. Programming Language Implementation Methods.

Describing Syntax: General Problem of describing Syntax, Formal methods of describing syntax - BNF, EBNF for common programming languages features, Parse trees, Ambiguous grammars, Attribute grammars.

UNIT- II:

Names, Bindings, Type Checking and Scopes: Names, Variables, The Concept of Binding, Type Checking, Strong Typing, Type Compatibility, Scope and Lifetime.

Data types: Introduction, Primitive Data Types, Character String Type, User Defined Ordinal Types, Array Types, Associative Arrays, Record Types, Union Types, Pointer and Reference Types.

UNIT- III:

Statement-Level Control Structures: Selection Statements, Iterative Statements, Unconditional Branching, Guarded Commands.

Subprograms: Fundamentals of Subprograms, Design issues of Subprograms, Local Referencing Environments, Parameter Passing Methods, Parameters that are Subprogram Names, Overloaded Subprograms, Design Issues for Functions, User Defined Overloaded Operators , Co-routines.

UNIT- IV:

Exception Handling and Event Handling: Introduction to exception handling, Exception Handling in Ada, Exception Handling in C++, Exception Handling in Java, Introduction to event Handling, Event Handling with Java, Event Handling in C#.

UNIT-V:

Concurrency: Introduction, Introduction to subprogram-level concurrency, Semaphores, Monitors, Message Passing, Ada Support for Concurrency, Java Threads, C# Threads, Concurrency in Functional Languages, Statement-Level Concurrency.

TEXTBOOK:

Robert .W. Sebesta ——Concepts of Programming Languages| Pearson Education, 10th edition.

REFERENCES

1. Ghezzi,— Programming languages |, John Wiley,3rd edition.
2. Pratt and Zelkowitz——Programming Languages Design and Implementation |PHI/PearsonEducation,4th edition.
3. <http://nptel.ac.in/courses/106102067/>
4. <https://perso.telecom-paristech.fr/pautet/Ada95/a95list.html>
5. <http://www.pascal-programming.info/index.php>
6. <https://www.fortrantutorial.com/>

III Semester
22MCA302E2: ARTIFICIAL INTELLIGENCE

Course Name	MCA	L	T	P	C	IM	EM	TM
Course Code	22MCA302E2	4	0	0	4	50	50	100

L-Lecture, T-Tutorial, P- Practical, C- Credits, IM-Internal Marks, EM- External Marks, TM-Total Marks

Course Description and Purpose:

The course is designed to provide basic knowledge in various topics in AI, including machine learning, deep learning, natural language processing, computer vision, robotics, and data analytics.

Course Objectives:

Specific objectives include:

- To gain a historical perspective of Artificial Intelligence and its foundations
- To familiarize the basic principles of Artificial Intelligence towards problem solving Inference, Perception, Knowledge representation and Learning
- To understand advanced topics of AI such as learning, natural language processing, agents and robotics, expert systems.

Course Learning Outcomes:

Upon successful completion of the course, the student will be able to:

- To Understand the history of Artificial Intelligence and its foundations.
- Apply various Artificial Intelligence Techniques for problem solving.
- Formalization of knowledge using the framework of predicate logic.
- Ability to apply knowledge representation and reasoning to real world problems.
- Derive conclusions from uncertain knowledge and quantify the uncertainty in the conclusions obtained.

SYLLABUS

UNIT- I:

Introduction, history, intelligent systems, foundations of AI, applications, tic-tac-toe game playing, development of AI languages, current trends.

UNIT-II:

Problem Solving: State-space search and control strategies: Introduction, general problem solving, characteristics of problem, exhaustive searches, heuristic search techniques, iterative deepening A*, constraint satisfaction.

UNIT-III:

Logic Concepts: Introduction, propositional calculus, propositional logic, natural deduction system, axiomatic system, semantic tableau system in propositional logic, predicate logic.

UNIT-IV:

Knowledge representation: Introduction, approaches to knowledge representation, knowledge representation using semantic network, extended semantic networks for KR, knowledge representation using frames.

UNIT-V:

Expert system and applications: Introduction phases in building expert systems, expert system versus traditional systems.

Uncertainty measure: probability theory: Introduction, probability theory, Bayesian belief networks, certainty factor theory, Dempster-Shafer theory, Fuzzy sets and fuzzy logic: Introduction, fuzzy sets, fuzzy set operations, types of Membership functions.

TEXT BOOKS:

1. Artificial Intelligence- Saroj Kaushik|| CENGAGE Learning

REFERENCES:

1. Artificial Intelligence- Deepak Khemani||TMH, 2013
2. Introduction to Artificial Intelligence, Patterson||PHI
3. Artificial intelligence, structures and Strategies for Complex problem solving -George F Lugar|| 5thed, PEA
4. Artificial intelligence, A Modern Approach, 2nded, Stuart Russel, Peter Norvig, PEA

III Semester
22MCA302E3: Block chain Technologies
(Domain Specific Elective Course)

Course Name	MCA	L	T	P	C	IM	EM	TM
Course Code	22MCA302E3	4	0	0	4	50	50	100

L-Lecture, T-Tutorial, P- Practical, C- Credits, IM-Internal Marks, EM- External Marks, TM-Total Marks

Course description and purpose:

Blockchain Technologies is a course that introduces the theory and design of blockchain technology. The course aims to provide learners with an understanding of the fundamental principles and concepts of blockchain technology, which are essential for working in any industry. The course covers topics such as the structure of a blockchain, mining, hashing, proof-of-work, public key cryptography, smart contracts, and more.

The purpose of a Blockchain Technologies course is to equip learners with the skills and knowledge required to become proficient in blockchain technology. Upon completion of the course, learners will be able to understand the structure of a blockchain and why/when it is better than a simple distributed database. They will also be able to design and implement smart contracts and develop decentralized applications on the blockchain

Course Objective:

- To provide conceptual understanding of the function of blockchain as a method of securing distributed ledgers, how consensus on their contents is achieved, and the new applications that they enable.
- To cover the technological underpinnings of blockchain operations as distributed data structures and decision-making systems, their functionality and different architecture types.
- To provide a critical evaluation of existing “smart contract” capabilities and platforms, and examine their future directions, opportunities, risks and challenges.

Course Outcomes:

- Gain insights about fundamental Blockchain concepts and its underlying mechanism.
- Implement the workflow behind bitcoin and various consensus mechanisms.
- Design and implement smart contracts.
- Develop decentralized applications on the Blockchain.
- Identify and analyse the ongoing application models in industry-wide Blockchain frameworks

UNIT-I:

Fundamentals of Cryptography:

Introduction to Cryptography, Symmetric cryptography – AES, Asymmetric cryptography – RSA, Elliptic Curve Cryptography (ECC), Digital Signatures, Cryptographic hash function, Merkle tree.

UNIT-II:

Fundamentals of Block chain Technology:

Defining Blockchain and Distributed Ledger, Centralized, Decentralized and Distributed Systems, Decentralization vs Distributed Systems, P2P Architecture, History of Blockchain, Blockchain Properties- Decentralized, Transparent, Immutable, and Secure. Architecture of Blockchain, Elements of Blockchain, Benefits, and Limitations, Types of Blockchain: Public, private, and consortium based blockchain.

UNIT-III:

Introduction to Bitcoin:

Introduction to Bitcoin, Hash pointer, Bitcoin transaction, Block structure, Proof of Work (PoW) in detail, Mining and reward, Limitations of Bitcoin, Consensus mechanism: Proof of Stake (PoS), Byzantine Fault Tolerance(BFT), Proof of Authority (PoA) and Proof of Elapsed Time (PoET).

UNIT-IV:

Ethereum and Hyperledger Fabric

Public Blockchain: Ethereum Blockchain, Smart Contracts, Ethereum Structure, Operations, Consensus Model, Incentive Model.

Permissioned Blockchain: Hyperledger Fabric, Architecture of Hyperledger Fabric Blockchain. Components: Certificate Authority, Nodes, Chain codes, Channels and Consensus.

UNIT-V:

Use cases of Blockchain

Use cases of Block chain technology –Health care, Finance, Supply chain management.

Uses of Blockchain in E-Governance, Land Registration, Agriculture, Voting

Textbooks

1. Imran Bashir, Mastering Block chain: A deep dive into distributed ledgers, consensus protocols, smart contracts, DApps, cryptocurrencies, Ethereum, and more, Packt Publishing, Third edition, 2020.
2. Hyperledger Fabric In-Depth: Learn, Build and Deploy Blockchain Applications Using Hyperledger Fabric, Ashwani Kumar, BPB publications.

Reference Books

1. Bellaj Badr, Richard Horrocks, Xun (Brian) Wu, “Blockchain By Example: A developer's guide to creating decentralized applications using Bitcoin, Ethereum, and Hyperledger”, Packt Publishing Limited, 2018.
2. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, “Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction”, Princeton University Press, 2016.
3. Andreas M. Antonopoulos, Gavin Wood, “Mastering Ethereum: Building Smart Contracts and DApps”, O'Reilly Media, First edition, 2018.
4. Kumar Saurabh, Ashutosh Saxena, “Blockchain Technology: Concepts and Applications”, First Edition, Wiley Publications, First edition, 2020.
5. Chandramouli Subramanian, Asha A George, et al, “Blockchain Technology”, Universities Press (India) Pvt. Ltd, First edition, August 2020.

Online References:

1. NPTEL courses:
 - a. Blockchain and its Applications,
 - b. Blockchain Architecture Design and Use Cases
2. Hyperledger Tutorials - <https://www.hyperledger.org/use/tutorials>
3. Ethereum Development Resources - <https://ethereum.org/en/developers>

4. Udemy Courses:
 - a. Blockchain A-Z™: Learn How To Build Your First Blockchain
 - b. Ethereum Blockchain Developer: Build Solidity Projects (2020)
 - c. Blockchain 2020 - Complete Blockchain Course for Beginners
5. Coursera Courses:
 - a. Introduction to Blockchain Technologies
 - b. Blockchain: Foundations and Use Cases
 - c. Smart Contracts

III Semester
22MCA302E4: Information Security
(Domain Specific Elective Course)

Course Name	MCA	L	T	P	C	IM	EM	TM
Course Code	22MCA302E4	4	0	0	4	50	50	100

L-Lecture, T-Tutorial, P- Practical, C- Credits, IM-Internal Marks, EM- External Marks, TM- Total Marks

Course description and purpose:

Information Security is a field that deals with protecting information from unauthorized access, use, disclosure, disruption, modification, or destruction. The primary objective of Information Security is to ensure the confidentiality, integrity, and availability of information. It involves the use of various techniques and technologies to protect information from threats and vulnerabilities.

The purpose of a course in Information Security is to equip learners with the skills and knowledge required to become proficient in Information Security. Upon completion of the course, learners will be able to understand the structure of a secure network and how to design one. They will also be able to identify threats and vulnerabilities in an organization's information systems and implement appropriate countermeasures

Course objectives:

- To provide an understanding of the fundamental principles and concepts of Information Security.
- To teach learners how to identify threats and vulnerabilities in an organization's information systems.
- To equip learners with the skills required to design secure networks.
- To provide hands-on experience with tools such as Python, R, SQL, Tableau, and other data science libraries

Course Outcomes:

- Gain insights about fundamental Information Security concepts and its underlying mechanism.
- Identify threats and vulnerabilities in an organization's information systems.
- Design secure networks using firewalls, tunnelling, encryption, honeypots, network sniffers, packet capturing.
- Implement cryptography techniques for data protection.
- Secure operating systems using patching, logging, antivirus, antimalware tools

UNIT-I:

Introduction: History, What is Information Security? Critical Characteristics of Information, NSTISSC Security Model, Components of an Information System, Securing the Components, Balancing Security and Access, The SDLC, The Security SDLC

UNIT-II:

Security Investigation: Need for Security, Business Needs, Threats, Attacks, Legal, Ethical and Professional Issues - An Overview of Computer Security - Access Control Matrix, Policy-Security policies, Confidentiality policies, Integrity policies and Hybrid policies

UNIT-III:

Security Analysis: Risk Management: Identifying and Assessing Risk, Assessing and Controlling Risk-Systems: Access Control Mechanisms, Information Flow and Confinement Problem

UNIT-IV:

Logical Design: Blueprint for Security, Information Security Policy, Standards and Practices, ISO 17799/BS 7799, NIST Models, VISA International Security Model, Design of Security Architecture, Planning for Continuity.

UNIT-V:

Physical Design: Security Technology, IDS, Scanning and Analysis Tools, Cryptography, Access Control Devices, Physical Security, Security and Personnel

Reference text books:

1. Michael E Whitman and Herbert J Mattord, —Principles of Information Securityll, Vikas Publishing House, New Delhi, 2003.
2. Micki Krause, Harold F. Tipton, — Handbook of Information Security Managementll, Vol 1-3 CRCPress LLC, 2004.
3. Stuart McClure, Joel Scrambray, George Kurtz, —Hacking Exposedll, Tata McGraw- Hill, 2003.
4. Matt Bishop, Computer Security Art and Science, Pearson/PHI, 2002.

22MCA302E5: Applied Data Analysis
(Domain Specific Elective Course)

Course Name	MCA	L	T	P	C	IM	EM	TM
Course Code	22MCA302E5	4	0	0	4	50	50	100

L-Lecture, T-Tutorial, P- Practical, C- Credits, IM-Internal Marks, EM- External Marks, TM-Total Marks

Course description and purpose:

Applied Data Analysis is a course that teaches the basic techniques, methodologies, and practical skills required to draw meaningful insights from a variety of data. The course covers topics such as data wrangling, data acquisition, data manipulation, data frames, statistics in practice, machine learning in practice, text mining, social network analysis, and more

The purpose of an Applied Data Analysis course is to equip learners with the skills and knowledge required to become proficient in data analysis. Upon completion of the course, learners will be able to extract insights from raw data using various statistical techniques and tools. They will also be able to build predictive models using machine learning algorithms and communicate their findings effectively through reports and visualizations

Course Objectives:

- To provide an understanding of the fundamental principles and concepts of Data Analysis.
- To teach learners how to extract insights from raw data using various statistical techniques and tools.
- To equip learners with the skills required to build predictive models using machine learning algorithms.

Course Outcomes:

- Gain insights about fundamental Data Analysis concepts and its underlying mechanism.
- Extract insights from raw data using various statistical techniques and tools.
- Build predictive models using machine learning algorithms.
- Communicate findings effectively through reports and visualizations

UNIT - I

Introduction to R: Why use R?, R Environment, Working with R Packages, Understanding Datasets, Data Types, Data Structures (Operations on Data Structures), Missing Values, Sorting Data, Merging Datasets, Sub setting Datasets, Control Flow Statements, Aggregation and Restructurings.

UNIT- II

Descriptive Statistics: Introduction to Descriptive Statistics (Measures of Central Tendency, Measures of Dispersion of Variability, Measures of Shapes (Skewness and Kurtosis)), Introduction to Sampling(

Sampling Types), Hypothesis Testing with R(One Sample Test, One Sample Sign Test, Two Samples Test), Parametric Test(Correlations, Z-Test, T-Test), Non Parametric Tests (Wilcoxon Signed- Rank Test, Chi Square Test).

UNIT- III

Basic Graphs: Bar Plots, Pie Charts, Histograms, Line, Dot Plots, Kernel Density Plots and Dot Plots.

The Advanced Graphics: The ggplot2 Package.

Analysis of Variance: Fitting ANOVA Models, One-way ANOVA, One-way ANCOVA, Two-way factorial ANOVA, Repeated measures ANOVA, Multivariate Analysis of Variance (MANOVA)

UNIT -IV

Basic Multivariate Analysis: Regression (Simple Linear Regression, Multiple Linear Regression, Logistic Regression), Time Series Analysis (Creating Time Series, Components of Time Series Analysis, Seasonal Decomposition, Exponential Models), Forecasting (Simple Moving Averages, Weighted Moving Averages, Single Exponential Smoothing.)

UNIT -V

Connecting R to External Interfaces: CSV Files (Reading From a CSV File, Writing to a CSV File), Microsoft Excel (Reading from XLSX File, Writing to XLSX File), Databases (Connecting R to MYSQL , Creating Tables, Inserting Rows, Updating Rows, Deleting Rows, Querying Rows, Querying Tables, Dropping Tables), XML Files (Reading From XML Files, JSON Files, Reading From JSON Files), Binary Files (Writing to Binary Files, Reading From Binary Files).

Text Book

1. Dr. Rob Kabacoff - R in Action :Data Analysis and Graphics with R.|| Manning Publications Co, Edition 2011.
2. Dr.Jeeva Jose- A Beginners Guide For Data Analysis Using R Programming. (UNITIV and UNITV)|| Khanna Book Publishing Co.(P) Ltd, Edition 2019.

Reference Text Books

1. Dr.Dhaval Maheta- Data Analysis using R|| Notion Press, September
2. Michael J.Crawley- The R Book|| Wiley, Edition: 2007
3. Ken Black John- Business Statistics for Contemporary Decision Making|| John Wiley & Sons, Inc., Edition 2013

III Semester
22MCA302E6: WEB TECHNOLOGIES
(Domain Specific Elective Course)

Course Name	MCA	L	T	P	C	IM	EM	TM
Course Code	22MCA302E6	4	0	0	4	50	50	100

L-Lecture, T-Tutorial, P- Practical, C- Credits, IM-Internal Marks, EM- External Marks, TM-Total Marks

Course descriptive and purpose:

Web Technologies refer to the various tools and techniques that are utilized in the process of communication between different types of devices over the Internet. A course in Web Technologies aims to provide learners with an understanding of the fundamental principles and concepts of Web Technologies. The course covers topics such as World Wide Web (WWW), web browsers, Hypertext Markup Language (HTML), Cascading Style Sheets (CSS), JavaScript, server-side programming, database management systems, and more.

The purpose of a course in Web Technologies is to equip learners with the skills and knowledge required to become proficient in Web Technologies. Upon completion of the course, learners will be able to design and develop websites using fundamental web languages, technologies, and tools. They will also be able to distinguish between server-side and client-side web technologies and describe various web technology and application development issues and trends

Course Objectives:

- To provide an understanding of the fundamental principles and concepts of Web Technologies.
- To teach learners how to design and develop websites using fundamental web languages, technologies, and tools.
- To equip learners with the skills required to distinguish between server-side and client-side web technologies.
- To provide hands-on experience with tools such as HTML, CSS, JavaScript, PHP, MySQL, etc

Course Outcomes

- Gain insights about fundamental Web Technologies concepts and its underlying mechanism.
- Design and develop websites using fundamental web languages, technologies, and tools.
- Distinguish between server-side and client-side web technologies.
- Describe various web technology and application development issues and trends

UNIT I

Introduction: What is Internet, History of Internet, Internet Services and Accessibility, Uses of the Internet, Protocols, Web Concepts – The Client/Server Model, Retrieving Data from the Web, How the Web Works?, Web Browsers: Navigation Features, Searching information on the Web, Internet Standards.

HTML: Outline of an HTML Document, Head Section – Prologue, Link, Base, Meta, Script, Style, Body Section – Headers, Paragraphs, Text Formatting, Linking, Internal Linking, Embedded Images, Lists, Tables, Frames, Other Special Tags and Characters, HTML Forms.

UNIT II

Java Script: Introduction – Need of a Scripting Language, Language Elements – Identifiers, Expressions, JavaScript Keywords, Operators, Statements, Functions, Objects of JavaScript – The Window Object, The Document Object, Forms Object, Text-boxes and Text-areas, Buttons, Radio-buttons and Checkboxes, The Select Object, Other Objects – The Date Object, The Math Object, The String Object, Regular Expressions, Arrays.

Dynamic HTML (DHTML): Introduction, Cascading Style Sheets (CSS) – Coding CSS, Properties of Tags, Property Values, Other Style Properties, In Line Style Sheets, Embedded Style Sheets, External Style Sheets, Grouping, Inheritance, Class as Selector, ID as Selector, Contextual Selector, Pseudo Classes and Pseudo Elements, Positioning, Backgrounds, Element Dimensions, DHTML Document Object Model and Collections – Using the Collections All, Moving Object around the Document, Event Handling – Assigning Event Handlers, Event Bubbling, Filters and Transition – Filters, Transitions, Data Binding – Using Tabular Data Control, Sorting Data, Dynamic Sorting, Filtering.

UNIT III

XML: Introduction, HTML vs. XML, Syntax of XML Document, XML Attributes – Use of elements vs. Use of Attributes, XML Validation – ‘Well Formed’ XML Documents, ‘Valid’ XML Documents, XML DTD – Internal DTD, External DTD, The Building blocks of XML Documents, DTD Elements – Declaring an Element, Empty Elements, Elements with Data, Elements with Children, Wrapping, Declaring only one Occurrence of the Same Elements, Declaring Minimum one Occurrence of the Same Element, Defining Zero or One Occurrence of the Same Element, Declaring Mixed Content, DTD Attributes – Declaring Attributes, Default Attribute Value, Implied attribute, required attribute, fixed attribute value, enumerated attribute values, DTD Entries – DTD Validation, XSL, XSL Transformation – Transforming XML to HTML, The `<xsl:template >` Element, The `<xsl:value-of>` Element, The `<xsl:for-each>` Element, Filtering the Output, Sort Operation, XSLT Elements, XML NameSpaces, XML Schema.

UNIT IV

Common Gateway Interface (CGI): Introduction, Server-Browser Interaction – The Request Sent by the Client, The Response Returned by the Server, The Status Codes, The Response Header Fields, CGI Script Structure, The CGI.pm Module, Perl Variables, CGI Environment Variables, Processing Forms, Sending Mail, Validating the Form Data, Handling Checkboxes, Server Side Includes (SSI), CGI Server Side and Client Side Applets, CGI Security Issues. Servlets: Introduction, Advantages of Servlets over CGI, Installing Servlets, The Servlet Life Cycle, Servlets API – The javax. servlet Package, The javax. servlet. http Package, Servlet Interface, HttpServlet Class, HttpServlet Request Class, HttpServlet Response Class, A Simple Servlet, Handling HTTP Get Requests, Handling HTTP Post Requests, Cookies, Session Tracking, Multi-tier Applications using Database Connectivity, Servlet Chaining.

UNIT V

Java Server Pages (JSP): Introduction, Advantages of JSP, Developing first JSP, Components of JSP – Directives, JSP Declaratives, Scriptlets, Expressions, Standard Action, Custom Tags, Reading Request Information, Retrieving the Data Posted from a HTML File to a JSP File, JSP Sessions, Cookies – Cookie Class, Examples Regarding the Use of Cookies, Disabling Sessions. JDBC: Introduction to JDBC, Connections, Internal Database Connections, Statements, Results Sets, Prepared Statements, Callable Statements.

Reference Books:

1. N.P.Gopalan, J.Akilandeswari, Web Technologies – A Developer’s Perspective, PHI(2008)
2. Java Programming with JDBC: Donald Bales, O’Reilly
3. Harvey M.Deitel and Paul L. Deitel, Internet and World Wide Web How To Program, Prentice Hall, 5 th Edition.

OPEN ELECTIVE COURSE (Choose One)
22MCAOE1: R Programming

Course Name	MCA	L	T	P	C	IM	EM	TM
Course Code	22MCAOE1	4	0	0	4	50	50	100

L-Lecture, T-Tutorial, P- Practical, C- Credits, IM-Internal Marks, EM- External Marks, TM-Total Marks

Course Descriptive and purpose:

R is a popular programming language used for statistical computing and graphics. It is widely used in data analysis, machine learning, and scientific research. A course in R programming aims to provide learners with an understanding of the fundamental principles and concepts of R programming purpose of a course in R programming is to equip learners with the skills and knowledge required to become proficient in R programming. Upon completion of the course, learners will be able to write R scripts and execute them. They will also be able to install, load, and deploy the required packages and build new packages for sharing and reusability. Additionally, they will be able to extract data from different sources using APIs and use it for data analysis. Finally, they will be able to visualize and summarize the data.

Course Objectives:

- To provide an understanding of the fundamental principles and concepts of R programming.
- To teach learners how to write R scripts and execute them.
- To equip learners with the skills required to install, load, and deploy the required packages and build new packages for sharing and reusability.

Course Outcomes:

- Write R scripts and execute them.
- Install, load, and deploy the required packages and build new packages for sharing and reusability.
- Extract data from different sources using APIs and use it for data analysis.
- Visualize and summarize the data
- Gain insights about fundamental R programming concepts and its underlying mechanism.

UNIT - I

Introduction, How to run R, R Sessions and Functions, Basic Math, Variables, Data Types, Vectors, Conclusion, Advanced Data Structures, Data Frames, Lists, Matrices, Arrays, Classes.

UNIT - II

R Programming Structures, Control Statements, Loops, - Looping Over Non vector Sets,- If-Else, Arithmetic and Boolean Operators and values, Default Values for Argument, Return Values, , Functions are Objective, No Pointers in R, Recursion

UNIT - III

Doing Math and Simulation in R, Math Function, Extended Example Calculating Probability- Cumulative Sums and Products-Minima and Maxima- Calculus, Functions For Statistical Distribution

UNIT - IV

Graphics, Creating Graphs, The Workhorse of R Base Graphics, the plot() Function – Customizing Graphs, Saving Graphs to Files.

UNIT - V

Probability Distributions, Normal Distribution- Binomial Distribution- Poisson Distributions Other Distribution, Basic Statistics, Correlation and Covariance, T-Tests, -ANOVA.

Text Books

1. The Art of R Programming, Norman Matloff, Cengage Learning
2. R for Everyone, Lander, Pearson
3. The Art of R Programming Norman Matloff, No starch Press

Reference Books

1. R Cookbook, Paul Teetor, O'Reilly.
2. R in Action, Rob Kabacoff, Manning

III Semester
22MCAOE2: Mobile Networks

Course Name	MCA	L	T	P	C	IM	EM	TM
Course Code	22MCAOE2	4	0	0	4	50	50	100

L-Lecture, T-Tutorial, P- Practical, C- Credits, IM-Internal Marks, EM- External Marks, TM-Total Marks

Course descriptive and purpose:

The primary objective of the Mobile Network course is to help learners understand the fundamental principles and concepts of mobile computing and telecommunication systems. Upon completion of the course, learners will be able to understand the basics of mobile telecommunication systems, network layer protocols, transport and application layer protocols, and different mobile platforms. They will also be able to develop applications for mobile platforms

Course Objectives:

- To provide an understanding of the basic concepts of mobile computing and telecommunication systems.
- To teach learners about network layer protocols, transport and application layer protocols, mobile platforms, and application development.
- To equip learners with the skills required to develop applications for mobile platforms

Course outcomes:

- Gain insights about fundamental Mobile Network concepts and its underlying mechanism.
- Understand the basics of mobile telecommunication systems, network layer protocols, transport and application layer protocols, and different mobile platforms.
- Develop applications for mobile platforms

Syllabus:

UNIT -I

Computer networks-LAN, VAN, Network Device, Hubs, NETWORKS TOPOLOGIES.

UNIT- II

TCP/IP protocol stack, uses & functions of TCP protocols, difference between IPV4 and IPV6

UNIT -III

Cellular Network 1G, 2G, 3G, 4G and 5G. And features of these networks GSM architecture, GPS architecture.

UNIT -IV

MANETS, Examples of MANETS, issues and challenges of MANETS, application of MANETS

UNIT- V

Wireless sensor networks, advantages and uses of wireless sensor networks IOT, Integration of IOT with wireless sensor networks

TEXT BOOKS:

1. Computer Networks, Andrew S.Tanenbaum,5th edition

REFERENCES:

1. Itu -t recommendations networks 2.0-3.0
2. Itu-t recommendation for next network 2030
3. Itu-t recommendation aloha

OPEN ELECTIVE COURSE (Choose One)

22MCAOE3: Unix Programming

Course Name	MCA	L	T	P	C	IM	EM	TM
Course Code	22MCAOE3	4	0	0	4	50	50	100

L-Lecture, T-Tutorial, P- Practical, C- Credits, IM-Internal Marks, EM- External Marks, TM- Total Marks

Course descriptive and purpose:

The primary objective of the Mobile Network course is to help learners understand the fundamental principles and concepts of mobile computing and telecommunication systems. Upon completion of the course, learners will be able to understand the basics of mobile telecommunication systems, network layer protocols, transport and application layer protocols, and different mobile platforms. They will also be able to develop applications for mobile platforms

Course objective:

- To provide an understanding of the basic concepts of mobile computing and telecommunication systems.
- To teach learners about network layer protocols, transport and application layer protocols, mobile platforms, and application development.
- To equip learners with the skills required to develop applications for mobile platforms

Course Outcomes:

- Gain insights about fundamental Mobile Network concepts and its underlying mechanism.
- Understand the basics of mobile telecommunication systems, network layer protocols, transport and application layer protocols, and different mobile platforms.
- Develop applications for mobile platforms

UNIT -I

Introduction to Unix : Brief History-What is Unix-Unix components-Using Unix-Commands in Unix-Some Basic Commands-command Substitution-Giving Multiple Commands.

The File system –The Basics of Files-What’s in a File-directories and File Names-Permissions-INodes-The Directory Hierarchy, File Attributes and Permissions-The File Command knowingtheFileType-TheChmodCommandChangingFilePermissions-TheChownCommandChangingthe Owner of a File-The Chgrp Command Changing the Group of a File.

UNIT -II

Using the Shell-Command Line Structure-Met characters-relating New Commands-CommandArgumentsandParameters-ProgramOutputasArguments-ShellVariables--MoreonI/ORedirection-LoopinginShellPrograms.

UNIT- III

Filters-The Grep Family-Other Filters-The Stream Editor Sed-The AWK Pattern Scanning and processing Language-Good Files and Good Filters

UNIT -IV

Shell Programming-Shell Variables-The Export Command-The Profile File a Script Run During Starting-the first Shell Script-The read Command-Positional parameters-The\$?Variable knowing the

exit Status-More about the Set Command-The Exit Command-Branching Control Structures-Loop Control Structures-The Continue and Break Statement-The Expr Command: Performing Integer Arithmetic-Real Arithmetic in Shell Programs-The here Document(<<)-TheSleepCommand-DebuggingScripts-TheScriptCommand-TheEvalCommand-The Exec Command

UNIT-V

The Process-The Meaning-Parent and Child Processes-Types of Processes-More about Foreground and Background processes -Internal and External Commands-Process Creation-The Trap Command-The Stty Command-The Kill Command-Job Control

Reference text books:

1. W. Kernighan & RobPike, The Unix programming Environment by Brain, Pearson
2. M.G.Venkatesh murthy, Introduction to Unix Shell Programming, Pearson
3. B.M.Harwani, Unix and shell programming, OXFORD university press

III Semester
OPEN ELECTIVE COURSE (Choose One)

22MCAOE4 :Office Tools

Course Name	MCA	L	T	P	C	IM	EM	TM
Course Code	22MCAOE4	4	0	0	4	50	50	100

L-Lecture, T-Tutorial, P- Practical, C- Credits, IM-Internal Marks, EM- External Marks, TM-Total Marks

Course Descriptive and purpose:

The primary objective of these courses is to help learners understand the fundamental principles and concepts of office tools. Upon completion of the course, learners will be able to use office tools effectively for their work. They will also be able to develop professional documents, spreadsheets, and presentations using the Microsoft suite of office tools

Courses Objectives:

- To provide an understanding of the fundamental principles and concepts of office tools.
- To teach learners how to use office tools effectively for their work.
- To equip learners with the skills required to develop professional documents, spreadsheets, and presentations using the Microsoft suite of office tools

Course Outcomes:

- Gain insights about fundamental office tool concepts and its underlying mechanism.
- Use office tools effectively for their work.
- Develop professional documents, spreadsheets, and presentations using the Microsoft suite of office tools

UNIT I

MS word: Word processing-Features-Advantages and Applications-parts of word window-Toolbar, Creating, saving, closing, opening and editing of a document-Moving and Coping a text, Formatting of Text and paragraph-bullets and Numbering-Find and Replace-Insertion of objects, Headers and footers-page formatting-auto correct-spelling and grammar-mail merge-macros

UNIT II

MS Power point: Introduction – Starting-parts-Creating of tables-create presentation-templates-Auto content Wizard-Slide show-Editing of presentation-Inserting objects and charts

UNIT III

MS Power point: Introduction – Starting-parts-Creating of tables-create presentation-templates-Auto content Wizard-Slide show-Editing of presentation-Inserting objects and charts

UNIT IV

MS Power point: Introduction – Starting-parts-Creating of tables-create presentation-templates-Auto content Wizard-Slide show-Editing of presentation-Inserting objects and charts

UNIT V

MS Access: Creating a Simple Database and Tables: Features of Ms-Access, Creating a Database, Parts of Access. **Tables:** table creation using design view, table wizard, data sheet view, import table, link table. **Forms:** The Form Wizard, design view, columnar, tabular, data sheet, chart wizard.

Finding, Sorting and Displaying Data: Queries and Dynasts, Creating and using select queries, Returning to the Query Design, Multi-level sorts, Finding incomplete matches, showing All records after a Query, saving queries - Crosstab Queries. **Printing Reports:** Form and Database Printing.

Reference text books:

1. Ron Mansfield, Working in Microsoft Office, Tata McGraw Hill(2008)
2. Ed Bott, Woody Leonhard, Using Microsoft Office 2007, Pearson Education(2007)
3. Sanjay Saxena, Microsoft Office, TMH BPBPublications

III Semester
OPEN ELECTIVE COURSE (Choose One)

22MCAOE5: Python Programming

Course Name	MCA	L	T	P	C	IM	EM	TM
Course Code	22MCAOE5	4	0	0	4	50	50	100

L-Lecture, T-Tutorial, P- Practical, C- Credits, IM-Internal Marks, EM- External Marks,

TM-Total Marks

Course descriptive and Puurpose:

The primary objective of a course in Python programming is to help learners understand the fundamental principles and concepts of Python programming. Upon completion of the course, learners will be able to write Python scripts and execute them. They will also be able to install, load, and deploy the required packages and build new packages for sharing and reusability. Additionally, they will be able to extract data from different sources using APIs and use it for data analysis. Finally, they will be able to visualize and summarize the data

It provides support for automatic memory management, multiple programming paradigms, and implements the basic concepts of object-oriented programming (OOP)

Course Objective:

- To teach learners how to write Python scripts and execute them.
- To equip learners with the skills required to install, load, and deploy the required packages and build new packages for sharing and reusability.
- To provide hands-on experience with tools such as RStudio, ggplot2, dplyr, and other data science libraries
- To provide an understanding of the fundamental principles and concepts of Python programming.

Course Outcomes:

- Gain insights about fundamental Python programming concepts and its underlying mechanism.
- Write Python scripts and execute them.
- Install, load, and deploy the required packages and build new packages for sharing and reusability.

UNIT I

Basics of Python Programming-Features of Python, History of Python, The Future of Python, Writing and Executing First Python Program, Literal Constants, Variables and Identifiers, Data Types, Input Operation, Comments, Reserved Words, Indentation, Operators and Expressions, Expressions in Python, Operations on Strings, Other Data Types, Type Conversion.

UNIT II

Decision Control Statements-Conditional Branching Statements, Basic Loop Structures, Nested Loops, The break statement, The continue statement, The pass statement. The else statement used with loops.

Functions and Modules- Function Definition, Function Call, Variable Scope and Lifetime, The return statement, More on Defining Functions, Recursive functions, Modules, Packages in Python, Standard Library Modules.

UNIT III

Python Strings Revisited-Concatenating, Appending and Multiplying Strings, String formatting operator, Built in String Methods and Functions, Comparing Strings, Regular Expressions.
Data Structures- Sequence, Lists, Functional Programming, Tuple, Sets, Dictionaries.

UNIT IV

Classes and Objects- Classes and Objects, Class Method and self Argument, Class variables and Object Variables, Public and Private Data Members, Private Methods, Calling a Class Method from Another Class Method, Built-in Class Attributes, Class Methods, Static Methods.

UNIT V

Inheritance- Inheriting Classes in Python, Types of Inheritance, Abstract Classes and Interfaces.

Error and Exception Handling- Introduction to Errors and Exceptions, Handling Exceptions, Raising Exceptions, Built- in and User defined Exceptions

Operator Overloading- Concept of Operator Overloading, Advantage of Operator Overloading, Implementing Operator Overloading.

Text books

1. Reema Thareja, Python Programming Using Problem Solving Approach, Oxford University Press

Reference books

1. Wesley Chun, Core Python Programming, Prentice Hall

22MCA303: Data Science Lab

1. Write a python program to perform various computational Operations using NumPy.
2. Write a python program to demonstrate fancy index.
3. Write a python program to demonstrate data indexing and selection using pandas.
4. Write a python program to demonstrate aggregation and grouping operations using pandas.
5. Write a python program to generate line plots from the given data.
6. Write a python program to generate Scatter plots from the given data
7. Write a python program to display plot legends using matplotlib
8. Write a python program to classify given data set using regression
9. Write a python program to demonstrate navy based classification
10. Write a python program to read excel sheet containing student data with columns, roll no, name, subject 1 marks, subject 2 marks, subject 3 marks into data frames in pandas and find out whether the total marks and avg each student should be generate and also at their normal distribution curve for total marks

22MCA304: WEB TECHNOLOGIES LAB
(List of Programs)

1. Develop and demonstrate a HTML document that illustrates the use external style sheet, ordered list, table, borders, padding, color, and the `` tag.
2. Write HTML code to provide intra document linking.
3. Create a form with the following specifications:
 - a) Our form uses frames, one to hold the links bar at the top of the browser window.
 - b) Other is a larger frame that provides the main view.
- c) The links bar should contain 5 links, which when clicked, should display the appropriate HTML file in the larger frame.
4. To create a webpage with the following using html
 - a) To embed an image in web page
 - b) To fix the hot spots
 - c) Show all the related information when a hot spot is clicked in the map
5. Develop a HTML Form, which accepts any Mathematical expression. Write JavaScript code to Evaluates the expression and Displays the result.
6. Create a HTML form that has number of Textboxes. When the form runs in the Browser fill the textboxes with data. Write JavaScript code that verifies that all textboxes has been filled. If a textboxes has been left empty, popup an alert indicating which textbox has been left empty.
7. Write a JavaScript code to find the sum of N natural Numbers. (Use user-defined function)
8. Write a JavaScript code to find factorial of N. (Use recursive function)
9. Write a JavaScript code block using arrays and generate the current date in words, this should include the day, month and year.
10. Create a web page using two image files, which switch between one another as the mouse pointer moves over the images. Use the on Mouse Over and on Mouse Out event handlers.
11. Design an XML document to store information about a student in an engineering college affiliated to KRU. The information must include college id, Name of the College, Brach, Year of Joining, and e-mail id. Make up sample data for 3 students. Create a CSS style sheet and use it to display the document.
12. Create an XML document, which contains 10 users information. Implement a program, which takes User Id as an input and returns the user details by taking the user information from the XML document
13. Write a program for implementing student information using XML
14. Write a java program to illustrate java to database connectivity using JDBC
15. Write a html program for invoking servlet from applet
16. Write a java servlet program to conduct online examination and to display student mark list available in a database
17. Create a java program to create an airline reservation service and a travel agent and the travel agent is searching for an airline using web services and database.
18. Write a JSP program to calculate income tax, login and data capture.

ACADEMIC ACTIVITIES

Academic activities: 2017-2018

1. Seminar on normalization in DBMS
2. Guest lecturer on trends and Techniques in IT
3. Awareness program on hardware parts of a computer system
4. Seminar on skill development
5. Traffic awareness program
6. Guest talk on Data Sciences
7. Industrial visit to NRT TECH PARK(MANGALAGIRI)
8. Two Days workshop on Android App
9. Guest lecturer on Advancements by Programming languages

Academic activities: 2019-2020

1. Guest lecturer on Cloud Computing
2. Two days workshop on BIG DATA(HADOOP)
3. Land to lab programme
4. Workshop on android
5. Seminar on IOT
6. Moral values Campaign Lab to Land
7. One Day Seminar on block chain bit coin
8. Guest talk by senior software engineer from tcs
9. Webinar On CLOUD INFRASTRUCTURE
10. Webinar Was Conducted With Topic DEVOPS AND ANGULAR FRAMEWORK
11. Webinar was conducted with the topic Veritas Net Backup Administration Fundamentals

Academic activities : 2020-2021- COVID -19

- Webinars conducted

Academic activities : 2021-2022

- Webinars conducted

Academic activities: 2022-2023

1. Awareness on disha app
2. Guest lecturer on android application development
3. Guest lecturer on research methodology
4. National conferences
5. Optimizing datasets of cloud using normalizations
6. Star insurances training program
7. Seminar on Emotional well being and fostering social harmony
8. Seminar on World Entrepreneurship Day
9. Industrial Visit to Vincyty
10. Rubicon Placement training program for three days

11. Guest lecture on Prompt Engineering
12. Seminar on DataScience
13. Guest lecturer on Research Perspectives of Computer Science
14. Seminar on Career Guidance
15. Workshop on intellectual Property Rights

ASSOCIATION ACTIVITIES

ASSOCIATIVE ACTIVITY : 2017-18

- 1.Samiksha 2k17 IT event
2. MCA students win prize at AFOSEC2017
3. MCA students Participated in SAMALOCHANA an Intellectual forum at NAVYANDHRA PUSTHAKA SAMBARALU organized by department of language and culture-GOVT.of AP, VIJAYAWADA.
- 4.MCA students got academic prizes winners
5. Samiksha 2K18 IT event.
6. our student receive AP PG Prathibha Award -2018 by CM NARA CHANDRA BABU NAIDU.
7. our students blood donation camp at Maris stella college
8. MCA Students have done SRAMADANAM programme.

9.BHAVANA CULTURAL ACTIVITIES

ASSOCIATIVE ACTIVITIES : 2019-2020

1. MCA Students got prizes from ARVUTHI
2. MCA students got prizes from VIBHAVA 2K19
3. Our students won prizes in AFOSEC2K19
4. BHAVANA CULTURAL ACTIVITIES

ASSOCIATIVE ACTIVITIES: 2020-2021- COVID -19

ASSOCIATIVE ACTIVITIES: 2021-2022

1. Samiksha 2K22

ASSOCIATIVE ACTIVITIES: 2023-24

1. SAMIKSHA 2K23
2. ANTI RAGGING CAMPAIGN Held Over in ANDHRA LOYOLA COLLEGE by the department of MCA





GPS Map Camera

Vijayawada, Andhra Pradesh, India
GM66+MFW, Anul Nagar, Vijayawada, Andhra Pradesh 520006, India
Lat 16.511427°
Long 80.861136°
16/08/23 03:04 PM GMT +05:30

Google

**ANDHRA LOYOLA COLLEGE
(AUTONOMOUS)**
 A college with potential for excellence reaccredited at 'A+' grade with 3.66/4.00 points
VIJAYAWADA

SAMIKSHA 2K23
 UNLEASHING POTENTIAL, CELEBRATING ACHIEVEMENT

Organised by Department of
MCA

TECHNICAL EVENTS
 IDEA TECH
 TECH TALK
 BLIND TECH
 WEB DESIGN
 CODE & DEBUG
 TECHNICAL QUIZ
 PAPER PRESENTATION
 POSTER PRESENTATION

NON - TECHNICAL EVENTS
 DANCE
 SELFIE STAR
 BEST FROM WASTE
 MR & MS SAMIKSHA

GET YOUR OVERALL CHAMPIONSHIP AND BE THE WINNER OF WINNERS

BDPS COMPUTER EDUCATION
VXL ACADEMY
Cheyat Computers
SJC we serve you...
PADMAJA SUZUKI

Sarat Chandra IAS Academy

Date : 11th & 12th of AUGUST Time : 09:30 AM TO 04:30 PM



