MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE
Madanapalle
(UGC-AUTONOMOUS)
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Estd 1998

DEPARTMENT OF COMPUTER APPLICATIONS

Course Structure
And
Detailed Syllabus (R20)

For the students admitted to
Master of Computer Applications from the academic year 2020-21 batch onwards

MCA I Year I Semester

S.No	Course Code	Course Title	L	T	P	C
1	20MATP101	Mathematical Foundations for Computer Applications	2	1	0	3
2	20MCAP101	Programming with C++	3	0	0	3
3	20MCAP102	Computer Organization and Architecture	2	1	0	3
4	20MCAP103	Operating Systems	2	1	0	3
5	20MCAP104	Object Oriented Software Engineering	2	1	0	3
6	20MCAP105	Computer Networks	3	0	0	3
7	20ENGP201	Speaking through Listening Laboratory	0	0	4	2
8	20MCAP201	Programming with C++ Laboratory	0	0	4	2
9	20MCAP202	Python Programming Laboratory	0	0	4	2
		Total	**14**	**04**	**12**	**24**

MCA I Year II Semester

S.No	Course Code	Course Title	L	T	P	C
1	20MCAP106	Java Programming	3	0	0	3
2	20MCAP107	Database Management Systems	3	0	0	3
3	20MCAP108	Data Structures and Algorithms	3	0	0	3
4	20MCAP109	Blockchain Technology	3	0	0	3
5	20MCAP110	AI Techniques and Applications	3	0	0	3
6		**Open Elective - I**	3	0	0	3
7	20MCAP203	Java Programming Laboratory	0	0	4	2
8	20MCAP204	Database Management Systems Laboratory	0	0	4	2
9	20MCAP205	Data Structures and Algorithms Laboratory	0	0	4	2
10	20MCAP901	Research Methodology	2	0	0	0
		Total	**20**	**0**	**12**	**24**

MCA II Year I Semester

S.No	Course Code	Course Title	L	T	P	C
1	20MCAP111	Full Stack Web Development	3	0	0	3
2	20MCAP112	Data Science	3	0	0	3
3	20MCAP113	Cloud Computing	2	1	0	3
4		Discipline Elective-I	3	0	0	3
5		Discipline Elective-II	3	0	0	3
6		Discipline Elective-III	3	0	0	3
7	20MCAP206	Full Stack Web Development Laboratory	0	0	4	2
8	20MCAP207	Data Science Laboratory	0	0	4	2
9	20MCAP208	Android Application Development laboratory	0	0	4	2
10	20MCAP701	Mini Project	0	0	4	2
		Total	**17**	**01**	**16**	**26**

MCA II Year II Semester

S.No	Course Code	Course Title	L	T	P	C
1	20MCAP601	Technical Seminar	0	0	2	1
2	20MCAP702	Internship/Major Project	0	0	30	15
		Total	**0**	**0**	**32**	**16**

DISCIPLINE ELECTIVES

Discipline Elective – I

S.No	Course Code	Course Title	L	T	P	C
1	20MCAP401	Cryptography and Network Security	3	0	0	3
2	20MCAP402	Data warehousing and Data Mining	3	0	0	3
3	20MCAP403	IoT Technology and Applications	3	0	0	3
4	20MCAP404	Agile Software Development Process	3	0	0	3
5	20MCAP405	Web Programming	3	0	0	3
6	20MCAP406	Image Processing	3	0	0	3

Discipline Elective – II

S.No	Course Code	Course Title	L	T	P	C
1	20MCAP407	Biometric Security	3	0	0	3
2	20MCAP408	Machine Learning	3	0	0	3
3	20MCAP409	Wireless Sensor Networks	3	0	0	3
4	20MCAP410	Software Quality Assurance and Testing	3	0	0	3
5	20MCAP411	Computer Graphics and Multimedia	3	0	0	3
6	20MCAP412	Video Analytics	3	0	0	3

Discipline Elective – III

S.No	Course Code	Course Title	L	T	P	C
1	20MCAP413	Cyber Security	3	0	0	3
2	20MCAP414	Deep Learning	3	0	0	3
3	20MCAP415	Privacy and Security in IoT	3	0	0	3
4	20MCAP416	Software Project Management	3	0	0	3
5	20MCAP417	XML and Web Services	3	0	0	3
6	20MCAP418	Computer Vision	3	0	0	3

OPEN ELECTIVE

Open Elective – I

S.No	Course Code	Course Title	L	T	P	C
1	20MBAP301	Management and Organizational Behavior	3	0	0	3
2	20MBAP302	Design Thinking	2	1	0	3
3	20MBAP303	Management Information Systems	3	0	0	3
4	20MBAP304	E-Commerce and Digital Markets	3	0	0	3
5	20MBAP305	Entrepreneurship Development and Project Management	3	0	0	3

MCA I Year I Semester

MCA I Year I Semester

20MATP101 MATHEMATICAL FOUNDATIONS FOR COMPUTER APPLICATIONS

L	T	P	C
2	1	0	3

Course Prerequisite: Basic Mathematics

Course Description:

This course introduces the concepts of set theory, relations, functions, logic and rules of inference. It illustrates the structured approach to graph theory models. It provides the valuable basic information on mathematical statistics. It explains about key concepts of probability and random variables in detail. It includes a discussion on probability distributions of discrete and continuous random variables.

Course Objectives:

Students will be able to:

1. Understand the mathematical reasoning to construct mathematical and logical arguments.
2. Illustrate the different terminologies of graph theory and construct graphs.
3. Identify the fundamentals of mathematical statistics.
4. Gather the key concepts of probability, random variables and their importance in probabilistic framework
5. Examine the discrete and continuous probability distributions.

UNIT-I INTRODUCTION TO MATHEMATICAL REASONING (9)

Set Theory, Functions and Relations, POSETS and Lattices, Pigeon-hole principle, Propositions, connectives, conditionals and biconditionals, well-formed formulae, tautologies, equivalence of formulas, duality law, normal forms, Rules of inference.

UNIT-II GRAPH THEORY (9)

Basic terminology for undirected and directed graphs, multigraphs and weighted graphs, paths and circuits, Eulerian paths and circuits, Hamiltonian paths and circuits, Planar Graphs, Graph Coloring, Cut sets. Trees: Introduction to Trees, Tree terminology, Prefix codes.

UNIT-III DESCRIPTIVE STATISTICS (9)

Measures of central tendencies and Dispersion, Coefficient of variation, Skewness, Kurtosis, Data visualization, Grouped data, Histograms, Ogives, Percentiles, Box-Plot, Correlation, Scatter diagram, Rank correlation and Linear Regression.

UNIT-IV PROBABILITY AND RANDOM VARIABLE (9)

Introduction to Probability, Sample spaces, Events, Axioms of probability, Conditional Probability, Independence and Multiplication Rule, Bayes theorem, Random Variable, discrete and continuous probability densities, cumulative distribution, Expectation, variance and standard deviation.

UNIT-V PROBABILITY DISTRIBUTIONS (9)

Moment generating function, Discrete distributions: Bernoulli, Binomial, Poisson, Geometric, Negative Binomial. Continuous distributions: Uniform, Exponential, Gamma, Normal, Chebyshev's inequality and Central Limit Theorem.

Course Outcomes:

After completion of the course the student will be able to

1. Evaluate elementary mathematical arguments and identify fallacious reasoning and rules of inference.
2. Applying graph theory models to solve different communication network problems.
3. Analyzing the data and characterize the nature of the distribution.
4. Determine the posterior probabilities and the moments of the random variables.
5. Solving the real time problems through the probability distributions.

Text Books:

1. Kenneth H Rosen, Discrete Mathematics and Its Applications, 7th Edition, 2017, McGraw Hill Education.
2. J.S. Milton and J.C. Arnold, Introduction to Probability and Statistics, 4th edition, 2003 Tata McGraw-Hill Publications.

Reference Books:

1. C.L. Liu & Mohapatra, Elements of Discrete Mathematics, 4th Edition, 2017, McGraw Hill Education.
2. T.H. Cormen, C.E. Leiserson, R.L. Rivest and C. Stein, Introduction to Algorithms, 3rd Edition, 2010, Prentice-Hall of India Learning Pvt. Ltd.
3. Thomas Koshy, Discrete Mathematics with Applications, 2012, Elsevier Academic Press.
4. S. C Gupta and V.K Kapoor, Fundamentals of Mathematical Statistics, 11th edition 2010 Sultan Chand & Sons, New Delhi.
5. Sheldon M. Ross, Probability Models for Computer Science, Academic Press, 2002.
6. Kishore S. Trivedi, Probability and Statistics with Reliability, Queuing and Computer Science Applications, John Wiley, 2016.

Mode of Evaluation: Assignments, Internal Mid Examination, External End Examination

MCA I Year I Semester

20MCAP101 PROGRAMMING WITH C++

L	T	P	C
3	0	0	3

Course Prerequisite: None

Course Description:

This course contains the basics of object oriented programming fundamentals through C++.It contains expressions, control flow, functions, arrays, pointers, managing I/O and object oriented programming features.

Course Objectives:

Students will be able to:

1. Understand the basic concepts of object oriented programming.
2. Explain Class, Object, Constructor and Destructor.
3. Demonstrate inheritance, operator overloading and dynamic memory allocation concepts.
4. Describe polymorphism and generic constructs.
5. Explain streams, File I/O and exception handling in C++.

UNIT I **(9)**

Introduction to OOP: Procedure oriented programming, Object oriented programming, Basic concepts of OOP, Benefits and applications of OOP, Differences between OOP and POP.

C++ Basics: Structure of a C++ program, Token, Data types, Declaration of variables, Expressions, Operators, Operator Precedence and Associativity, Type conversions, Control Structures: if, if...else, else if ladder, nested if, switch, for, while, do…while, break, continue, exit, goto, Arrays, Strings, Structure, Union.

UNIT II **(9)**

C++ Functions: Simple functions, 'Call and Return' by reference, Inline functions, Function overloading, Default arguments.

Classes and Objects: Class, Member functions, Access Specifiers, Private member functions, Memory allocation, Static data members and member functions, Arrays of objects, Returning objects, Friend class and friend functions.

Constructors and Destructors: Constructors, Default Constructors, Copy Constructor, Constructor overloading, Destructors.

UNIT III **(9)**

Inheritance: Single inheritance, Multi-level inheritance, Multiple inheritance, Hierarchical inheritance, Hybrid inheritance.

Operator Overloading: Overloading Unary operators, Overloading binary operators.

Pointers in C++: Introduction-Pointer and arrays, Pointer to objects, this pointer, Pointer to derived classes, Pointer to functions, Call by pointer, Memory management – new and delete, Referencing members using pointers.

UNIT IV **(9)**

Virtual Functions and Run Time Polymorphism: Overriding, Static and Dynamic bindings, Virtual functions, Pure virtual functions, Abstract classes.

Template: Generic Functions-Generic Classes - Template Restrictions, The power of Templates-Basic of STL.

UNIT V **(9)**

Streams in C++: Console streams, Console stream classes, Formatted and unformatted console I/O operations, Manipulators; File stream classes - File modes, File pointers and Manipulations, File I/O.

Exception Handling: Principle of Exception handling, Exception handling mechanism, Multiple catch, Nested try, rethrowing the exception.

Course Outcomes:
After completion of the course the student will be able to:

1. Explain the concepts of object-oriented programming and C++ basics.
2. Implement class and object concepts.
3. Apply inheritance and operator overloading concepts.
4. Develop the programs using polymorphism, function and class templates.
5. Implement streams, File I/O and exception handling in C++.

Text Books:

1. E. Balagurusamy, "Object Oriented Programming with C++", Tata McGraw-Hill, 7th Edition, 2018.
2. Schildt Herbert, "The Complete Reference C++", Tata McGraw Hill, 4th Edition, 2009.

Reference Books:

1. Deitel and Deitel, C++ How to program, Pearson Education Asia, 9th Edition, 2014
2. Yeshavant Kanetkar, Let Us C++, Second Edition, BPB Publications,2003.
3. Lafore, Robert, Object Oriented Programming in Turbo C++, Galgotia Publications Pvt. Ltd, 2000.
4. Gaddis Tony, Starting Out with C++, dreamtech Press, 3rd Edition, 2002.
5. Sotter A Nicholas and Kleper J Scott, Professional C++, Wiley Publishing Inc.
6. Walter Savitch, Problem solving with C++, Pearson Education, 6th Edition 2007.

Mode of Evaluation: Assignments, Internal Mid Examination, External End Examination

MCA I Year I Semester

20MCAP102 COMPUTER ORGANIZATION AND ARCHITECTURE

L	T	P	C
2	1	0	3

Course Prerequisite: None

Course Description:

This course introduces internal digital circuits & their operations and basic building block of various computers. Addressing modes and pipelining detailed along with Memory Management. It also covers the concepts of I/O organization and Multiprocessor

Course Objectives

Student will able to

1. Understand the basics of digital circuits
2. Analyze the working mechanism of processing unit.
3. Classify the Pipelining techniques.
4. Explore the concept of Memory Hierarchy.
5. Understand the process of I/O organization and Multiprocessor.

UNIT I: DIGITAL BUILDING BLOCKS Basic structure of a digital computer, Components of computer, Logic gates, combinational circuits, flip flop, Sequential Circuits, adders, multiplexers, encoders, decoders, Registers, Decoder, Multiplexers, Number System Conversion, fixed Point and floating point representation. **(9)**

UNIT II: PROCESSING: Fundamental concepts, Parts of a mother board along with various CPU's, Instruction Set, Instruction formats, Addressing modes, RISC, CISC, Registers, Hardwired control, Micro programmed control, Nano programming. **(9)**

UNIT III: **PIPELINING** Basic concepts: Data hazards, Instruction hazards, Control Hazards Influence on instruction sets, Data path and control considerations, Performance considerations Exception handling, Case Study: Intel Core i7 Pipelines. **(9)**

UNIT IV: MEMORY SYSTEM: Basic concepts, Memory Hierarchy, Characteristics of primary and secondary memories, Semiconductor, Magnetic, Optical memories, Semiconductor Memories (RAM, ROM), Cache memories, RAID Levels, Virtual memory, Secondary storage devices. **(9)**

UNIT V: I/O Organization: Input Output Interface, Connect different Input /Out Put devices, Asynchronous Data Transfer, Modes of Transfer, Priority interrupts, Direct Memory Access.
Multiprocessor: Characteristics of Multiprocessor, Inter Connection Structure, Inter Process Arbitration, Inter Process Communication and synchronization, cache Coherence. **(9)**

Course Outcomes:

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

1. Demonstrate the basic components of Digital Computer.
2. Explain the internal working concept of processing unit along with instruction sets.
3. Identify the different Pipelining flow characteristics.
4. Illustrate various memory organization structures.
5. Analyze the I/O Organization Interface structure along with multiprocessor.

Text Books:

1. Mano, M. Morris. Computer system Architecture. Prentice-Hall of India, 4th Edition, 2003.
2. Stallings, W. Computer Organization and Architecture: designing for performance. Pearson Education India, 2003.

Reference Books:

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

Mode of Evaluation: Assignments, Internal Mid Examination, External End Examination

MCA I Year I Semester

20MCAP103 OPERATING SYSTEMS

L	T	P	C
2	1	0	3

Course Prerequisite: None

Course Description:

The purpose of this course is to provide an overview of computer operating systems. Topics covered include: Operating system structures, processes, process synchronization, deadlocks, CPU scheduling, memory management, file systems, secondary storage management with Unix utilities and shell programming construct.

Course Objectives:

Students will be able to:

1. Explain the fundamental components of the operating system and process concepts
2. Understand the principles of Process Synchronization and Deadlocks.
3. Analyze various memory and storage management schemes.
4. Study Unix operating systems basic utilities
5. Write Unix shell scripting using basic commands

UNIT I INTRODUCTION

Introduction to operating systems -Types of operating systems-Operating System Structures-Operating System Operations- Operating Systems Services-System Calls- Processes: Process Concept- Process Scheduling- CPU Scheduling Algorithms- Operation on processes-co-operating Processes-Inter Process Communications. **(9)**

UNIT II PROCESS SYNCHRONIZATION

Process Synchronization –Critical Section problem – Synchronization Hardware -Semaphores-Classical problems of synchronization -Monitors-Deadlock Characterization-Deadlock handling-Deadlock Prevention-Deadlock avoidance -Deadlock Detection-Deadlock Recovery –Threads-Multithreading Models. **(9)**

UNIT III MEMORY AND STORAGE MANAGEMENT

Memory Management-Swapping-Contiguous Memory allocation-Paging-Segmentation-Virtual Memory-Demand paging-Page Replacement algorithms-Thrashing. Disk Structures-Disk Scheduling-Swap-Space Management, File concepts-Access methods, File Allocation Methods-Free Space management **(9)**

UNIT IV INTRODUCTION TO UNIX

UNIX Features and Environment, UNIX Structure, Accessing UNIX, File handling utilities, Security by file permissions, Process utilities, Disk utilities, Networking commands. Grep command, Vi Editor, SED – scripts, operation, addresses, commands, applications, awk –commands Inter Process Communication**:** semaphores, message queues, shared memory, status commands **(9)**

UNIT V SHELL PROGRAMMING

Introduction, shell responsibilities, pipes and input Redirection, output redirection, command Execution, command line editing, quotes, command substitution, shell variables, Filters, shell meta characters, shell programming-control structures, arithmetic in shell, shell script examples, interrupt processing, functions, debugging shell scripts. **(9)**

Course Outcomes:

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

1. Explain the Operating Systems basics and process concepts.
2. Analyze various process synchronization approaches
3. Classify the various memory management Concepts
4. Execute various Unix commands and utilities
5. Implement shell scripts for various tasks.

Text Books:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 9th Edition, John Wiley and Sons Inc., 2012.
2. Behrouz A. Forouzan, Richard F. Gilberg, "UNIX and Shell Programming ", 9th Edition, Cengage Learning, 2009.

Reference Books:

1. William Stallings, "Operating Systems – Internals and Design Principles", 7th Edition, Prentice Hall, 2011.
2. Andrew S. Tanenbaum, "Modern Operating Systems", Second Edition, Addison Wesley, 2001.
3. M G Venkateshmurthy: UNIX and Shell Programming, Pearson Education, 2005.
4. Maurice J. Bach, "The Design of the Unix Operating System", Indian Edition, PHI Learning Private Limited, 2011.
5. W. Richard. Stevens, Advanced Programming in the UNIX Environment, 3rd edition, Pearson Education, New Delhi, India, 2005.

Mode of Evaluation: Assignments, Internal Mid Examination, External End Examination

MCA I Year I Semester

20MCAP104 OBJECT ORIENTED SOFTWARE ENGINEERING

L	T	P	C
2	1	0	3

Course prerequisite: None

Course Description:

This course covers object oriented practices which are applied during software development. These practices help the students to understand about the development of large size and complex software project. With concepts and knowledge gained from this course, one can easily become part of industrial software production.

Course Objectives

Student will be able to:

1. Understand the object-oriented (OO) approaches in software development.
2. Analyze requirement engineering concepts.
3. Explain software design and principles with UML (Unified Modelling Language) diagrams.
4. Interpret different software quality and metrics.
5. Demonstrate various software testing approaches and maintenance.

UNIT-I: INTRODUCTION TO OBJECT ORIENTED SOFTWARE ENGINEERING AND PROCESS (9)

Introduction to Software Engineering, Software Development life cycle, Software Development Processes and models. What is Object Orientation? – Objects and Classes– Features - Object Oriented Software Life Cycle Models -Object Oriented Methodologies – Oriented Modelling – Terminologies, Agile process

UNIT-II: REQUIREMENT ENGINEERING (9)

Introduction: What is Software Requirement?, Requirement Engineering: Activities and approaches, Software Requirement specification, Software Requirements Elicitation and Analysis - Case Study: Library Management System Requirements Elicitation Techniques –Use Case Approaches. Characteristics of a good Requirement- Software Requirements Specification Document - Requirements Change Management - Object Oriented Analysis - Structured Analysis versus Object Oriented Analysis – Identification of Classes – Identification of Relationships – Identification of State and Behaviour

UNIT-III: SOFTWARE DESIGN AND IMPLEMENTATION (9)

Introduction to Software Design: Objectives and Principles. UML, UML diagrams: Class diagram, Sequence diagram, Use case diagram, state chart diagram, Activity diagram, component diagram, deployment diagram. Module level concepts Coupling and Cohesion, Design notation and specification; Architectural Design, Component Level Design, Interface Design; Structured Design.

UNIT-IV: SOFTWARE QUALITY AND METRICS (9)

What is software quality? Software Implementation - Quality and Metrics, Software Implementation – Tools and Techniques, Software quality models. Metrics for measuring size and structure – Measuring software quality metrics for object oriented environments.

UNIT-V: SOFTWARE TESTING AND MAINTENANCE (9)

Testing: Introduction to software testing, Testing Fundamentals, Test cases and test criteria. Black box testing, White box testing, Code Verification, Code Coverage and Cyclomatic Complexity. Object Oriented Testing - Class testing – State based testing - Mutation testing - Levels of testing - Software testing tools. What is a software maintenance? - Categories –Challenges of software maintenance – Maintenance of Object oriented Software - Software rejuvenation - Estimation of maintenance efforts - Configuration management, Regression testing.

Course Outcomes:

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

1. Explain object-oriented (OO) approaches in software development.
2. Develop SRS documents.
3. Visualize software projects by using various UML diagrams.
4. Analyze various software quality metrics and strategies.
5. Implement various software testing approaches.

Text Books:

1. Yogesh Singh, Ruchika Malhotra, “Object-Oriented Software Engineering”, PHI,2012.
2. Timothy C. Lethbridge and Robert Laganiere, “Object-Oriented Software Engineering”, McGraw-Hill, 2001.

Reference Books:

1. Roger S. Pressman, “Software Engineering: A Practitioner's Approach”, 7th International edition, Mc Graw Hill, 2009.
2. Pankaj Jalote, “An Integrated Approach to Software Engineering”, Narosa publishing House, New Delhi, 1995.
3. G. Booch, Benjamin/Cummings, “Object-Oriented Analysis and Design with Applications”, 3rd Edition, Addison-Wesley, 2007.Roger Pressman, Software Engineering: A Practitioner's Approach”, McGraw-Hill Higher Education, 2010.

Mode of Evaluation: Assignment, Internal Mid Examination, External End Examination

MCA I Year I Semester

20MCAP105 COMPUTER NETWORKS

L	T	P	C
3	0	0	3

Course Prerequisite: None

Course Description:

This course introduces the topologies, models, architecture, various components and protocols of computer networks. It narrates the analog and digital transmission related issues in various networking environments. It explains about network and transport layer protocols and the domain naming, network management protocols in detail. It provides basic information about network security, mechanisms and services provided by various layers.

Course Objectives:

Students will be able to:

1. Explain the basics of networking concepts, functions of various layers in networking architecture and transmission techniques.
2. Identify the datalink layer techniques and various protocols used in networking environment.
3. Compare underlying components used in networking environments and the different versions of Internet Protocol.
4. Illustrate Transport layer services and transmission control protocols.
5. Examine application layer protocols, network vulnerabilities and encryption techniques.

UNIT I: INTRODUCTION (9)

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

UNIT II - DATA LINK LAYER (9)

The Data Link Layer: Design Issues –Error Detection and Correction – Elementary Data Link Protocol – Sliding Window Protocol – HDLC. Medium Access Control Sub Layer: Multiple Access Protocol: CSMA Protocol – Collision Free Protocol, Network Devices (Hub, Repeater, Bridge, Switch, Router, Gateways and Brouter).

UNIT III - NETWORK LAYER (9)

Network layer – Switching concepts – Circuit switching – Packet switching –IP — Datagrams — IP addresses-IPV4, IPV6– ICMP – Routing Protocols – Distance Vector – Link State - Border Gateway Protocol.

UNIT IV – TRANSPORT LAYER (9)

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

UNIT V - APPLICATION LAYER & SECURITY (9)

Applications: DNS- SMTP–FTP- WWW–SNMP

Security: Introduction – Types of Attacks, Security Services, Encryption Techniques - Substitution and Transposition Cipher–Symmetric Key and Asymmetric Key, Firewall and its types.

Course Outcomes:

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

1. Understand the basic networking concepts and layered architecture.
2. Implement various datalink layer protocols and networking hardware.
3. Demonstrate the functionalities of network layer and Routing Protocols.
4. Compare Connection oriented and Connection less protocols.
5. Analyze application layer protocols and various security mechanisms.

Text Books:

1. Andrew S. Tanenbaum, "Computer Networks", 4th Edition, Eastern Economy Edition.
2. Forouzan, "Data Communication and Networking", Fifth Edition, TMH 2012.

Reference Books:

1. William Stallings, "Data and Computer Communications", Tenth Edition, Pearson Education, 2013.
2. Achyut S God bole, AtulHahate, "Data Communications and Networks", Second edition 2011
3. Douglas E. Comer, ―Internetworking with TCP/IP (Volume I) Principles, Protocols and Architecture‖, Sixth Edition, Pearson Education, 2013.
4. James F. Kurose, Keith W. Ross, "Computer Networking: A Top-down Approach, Pearson Education, Limited, sixth edition, 2012.
5. John Cowley, "Communications and Networking : An Introduction", Springer Indian Reprint, 2010.

Mode of Evaluation: Assignments, Internal Mid Examination, External End Examination

MCA I Year I Semester

20ENGP201 SPEAKING THROUGH LISTENING LABORATORY

L	T	P	C
0	0	4	2

Course Prerequisite: None

Course Description:

As the students are being exposed to the global language 'English; it has become a widespread need. This course builds on what was offered in the first semester and facilitates deeper understanding into the mechanics of the English language, especially in regard to two particular skills, i.e. Listening and Speaking. This course is offered in order to help students cultivate and nurture a mind that "thinks in English." Intricate issues of pronunciation, modulation, timbre are dealt with in regard to Speaking and also the sub-skills of Listening, thus the whole course is entirely lab oriented.

Course Objectives:

Students will be able to:

1. Hone in on their listening skills
2. Grasp the differences between native level and mother-tongue influenced pronunciation
3. Develop crucial speaking skills
4. Enhance vocabulary for greater communicative impact
5. Overall development of thinking in the English language

UNIT- I

Listening; Understanding key vocabulary; Listening for main ideas; Listening in detail; Syllable stress; Sentence stress; Presentation.

UNIT -II

Vocabulary for important places (bank, library, restaurant, etc.); Prepositions for places; Stress determiners (this & that); Intonation.

UNIT- III

Using background knowledge; Collocations; Pronouncing clusters of consonants (e.g. –gh, -ing, ph, ck); Mapping ideas; Pronunciation of phrases; Listening for opinion; Vocabulary and collocations for jobs

UNIT- IV

Listening for lecture organization; Text organization features; Phrases with make; Evaluating and proposing ideas; Expressing attitudes

UNIT -V

Identifying opposing viewpoints; Silent letters; Idioms; Fixed expressions; Phrasal verbs

Course Outcomes:
After completion of the course the student will be able to:

1. Listening with intent
2. Pronounce more fluently
3. Develop crucial thinking skills
4. Enhance vocabulary
5. Overall development in the English language

Suggested Reading/Textbook:

1. Sabina Ostrowska; *Unlock 3 series(B1): Listening & Speaking*; Published by: Cambridge University Press.

Reference Books:

1. Gary Buck; *Assessing Listening;* Cambridge University Press, 2010.
2. Adrian Doff, Craig Thaine, Herbert Puchta, et al; *Empower: Upper Intermediate (B2+)*; Published by: Cambridge University Press.
3. Josh Sreedharan; *The Four Skills for Communication;* Cambridge University Press, 2014.
4. William Strunk Jr; *The Elements of Style*; ITHACA, N.Y.; W.P. HUMPHREY, 2006.
5. Joseph Devlin; *How to Speak and Write Correctly*; ITHACA, N.Y.; W.P. HUMPHREY, 2006.
6. Miles Carven; *Listening Extra*; Cambridge University Press, 2008.
7. Jayashree Mohanraj; *Speak Well*; Orient Blackswan, 2013.
8. F. Kipple; Keep Talking; Cambridge University Press, 2013.
9. www.cambridgeenglish.org/in/
10. https://learnenglish.britishcouncil.org/en/english-grammar
11. https://www.rong-chang.com/

Mode of Evaluation: Continuous Cumulative evaluation of the lab experiments, Record, Viva voce and External Lab Examination.

MCA I Year I Semester

20MCAP201 PROGRAMMING WITH C++ LABORATORY

L	T	P	C
0	0	4	2

Course Prerequisite: None.

Course Description:

This course implements programming of C++ basics, control flow, functions, arrays, pointers, managing I/O, and different object oriented programming features using classes and object for real time applications.

Course Objectives:

Students will be able to:

1. Develop the programs using control structures, Array, Pointers and functions.
2. Design the programs using object oriented features.
3. Demonstrate the File I/O operation and exception handling.

LIST OF EXPERIMENTS

1.Control Structures: Branching Statement

a. If Statement

1. Develop a C++ program to find all roots of a quadratic equation ax2+bx+c=0.
2. Develop a C++ program find the largest among three different numbers entered by user.

b. Switch Case Statement

1. Develop a C++ program to implement simple calculator

2.Control Structures: Looping Statement

a. For Loop

1. Develop a C++ program to find the Fibonacci series till the limit entered by the user.
2. Write a C++ program to print the following by reading number of rows to be printed from the user

```
*
* *
* * *
* * * *
* * * * *
```

3. Develop a C++ program to find the sum of digits of a number

b. While loop

1. Develop a C++ program to find reverse of a number.
2. Compute the LCM and GCD of two numbers using a C++ program.

3.Structure and Union

1. Write a C++ program to find average marks of three subjects of N students in a class.
2. Write a C++ Program to find total salary of n employees in a department where da=50% basic pay and hra=10% of basic pay.

4.Pointer Arithmetic

1. Write a C++ program to find the number of vowels present in the given character array using pointer arithmetic.
2. Develop C++ program to find the sum of elements of an array using pointers.

5.Functions, Call by Value, Recursion

1. Write a C++ Program to implement a sphere class with appropriate members and member function to find the surface area and the volume. (Surface = $4 \pi r^2$ and Volume = $4/ 3 \pi r^3$)
2. Write a C++ program to find the value of a number raised to its power that demonstrates a function using call by value.
3. Write a C++ program to implement recursion in finding the factorial.

6. Inline Function and Function Overloading

1. Write a C++ program write a program to find the multiplication values and the cubic values using inline function.
2. Write a C++ program to calculate the volume of cube, cylinder and rectangular box using function overloading.

7. Classes, Objects, Static &Non-Static variable, Constructor and Destructor

1. Write a C++ program to display student's information using Class Declarations, Definition, and Accessing Class Members by objects.
2. Write a C++ program to demonstrate the static and non-static variable usage defining them within a function to count the number of odd numbers in an array.
3. Define a class to represent a Bank account. Include the following members.
   Data members: Name of the depositor; Account number, Type of account, Balance amount in the account, Rate of interest (static data);
   Provide a default constructor; a parameterized constructor and a copy constructor to this class. Also provide
   Member Functions: - 1. To deposit amount. 2. To withdraw amount after checking for minimum balance. 3. To display all the details of an account holder. 4. Display rate of interest (a static function) Illustrate all the constructors as well as all the methods by defining objects and destroy the object using destructor.

8. Use of "this" pointer, dynamic memory allocation

1. Write a C++ program to implement flight class with data member as flight number, source, destination and fare. Write a member function to display the flight information using this pointer.
2. Write C++ Program to store GPA (Grade Point Average) of n number of students and display it using new and delete operator.
3. Write a C++ program to allocate dynamic memory of two variables int and float types. After assigning values to them and printing them, finally deallocate the memories using the delete operator.

9.Inheritance

1. Write a C++ program to accept details of n instructors and display them. Create base Class: Person (id, name) and Derive Two Sub Classes: Teaching (Subject, Name), Nonteaching(dept.) from class Person and derive new class Instructor from two sub classes Teaching and Nonteaching.
2. Write a C++ program to demonstrate multiple inheritance by creating a class cuboid which extends class rectangle, class shape. It calculates area and volume. Use appropriate constructors and member variables.

10.Virtual Function, Unary and Binary Operator

1. Write a C++ program to explain virtual function (polymorphism) by creating a base class c_polygon which has virtual function area (). Two classes c_rectangle and c_traingle derived from c_polygon and they have area () to calculate and return the area of rectangle and triangle respectively
2. Write a C++ program to count the number of persons inside a bank, by increasing count whenever a person enters a bank, using an increment (++) operator overloading function, and decrease the count whenever a person leaves the bank using a decrement (--) operator overloading function inside a class.
3. Develop a C++ program write a program to add two complex numbers using binary operator overloading.

11.Friend function & friend Class.

1. Develop a C++ program to find the area of a rectangle by converting the member of a class square which is a friend class of rectangle. Declare Rectangle as a friend of Square so that Rectangle member functions could have access to the private member of square.
2. Develop a C++ Program to implement friend class for adding two numbers where class sum is declared as friend of other class used to read values.

12.Class Templates

1. Write a C++ program create a template T for a class named pair having two data members of type T which are inputted by a constructor and a member function get-max () return the greatest of two numbers to main.
2. Write a C++ program to search a key element in a given set of elements using class template.

13.Files and Exception Handling

1. Write a C++ program to perform the deletion of white spaces such as horizontal tab, vertical tab, space, line feed, new line and carriage return from a text file and store the contents of the file without the white spaces on another file.
2. Write a C++ program to read the class object of student info such as name, age, sex, height and weight from the keyboard and to store them on a specified file using read () and write () functions. Again the same file is opened for reading and displaying the contents of the file on the screen.
3. Write a C++ program to raise an exception if any attempt is made to refer to an element whose index is beyond the array size.

14.Other Program

1. Consecutive Prime Sum Some prime numbers can be expressed as a sum of other consecutive prime numbers. For example, 5 = 2 + 3, 17 = 2 + 3 + 5 + 7, 41 = 2 + 3 + 5 + 7 + 11 + 13. Your task is to find out how many prime numbers which satisfy this property are present in the range 3 to N subject to a constraint that summation should always start with number 2. Write code to find out the number of prime numbers that satisfy the above-mentioned property in a given range.
2. kth largest factor of N A positive integer d is said to be a factor of another positive integer N if when N is divided by d, the remainder obtained is zero. For example, for number 12, there are 6 factors 1, 2, 3, 4, 6, 12. Every positive integer k has at least two factors, 1 and the number k itself. Given two positive integers N and k, write a program to print the kth largest factor of N.
3. Super ASCII String Checker in the Byteland country a string "S" is said to super ASCII string if and only if count of each character in the string is equal to its ASCII value. In the Byteland country ASCII code of 'a' is 1, 'b' is 2 ...'z' is 26. Your task is to find out whether the given string is a super ASCII string or not.

Mini project:
Student can choose any one of the following:

- Banking Record System
- Bookshop Management System
- Bus Reservation System
- Hotel Management System

- Payroll Management System
- Phonebook Management System
- Railway Reservation System
- Sales Management System
- Student Database Management System
- Student Report Card System
- Supermarket Billing System
- Telephone Directory System

Or

Students can any simple projects based on student's interest.

Course Outcomes:

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

1. Implement basic object oriented programming concepts.
2. Implement advanced features of C++ specifically stream I/O, templates and operator overloading.
3. Develop the real time applications using object oriented programming with C++.

Text Books:

1. E. Balagurusamy, "Object Oriented Programming with C++", Tata McGraw-Hill, 7th Edition, 2018.
2. Schildt Herbert, The Complete Reference C++, Tata McGraw Hill, 4th Edition, 2009**.**

Reference Books:

1. Deitel and Deitel, C++ How to program, Pearson Education Asia, 9th Edition, 2014
2. Yeshavant P. Kanetkar, Let Us C++, BPB Publications.
3. Yeshavant P. Kanetkar, Basic Programming in C++, BPB Publication
4. D. Ravichandran, Programming with C++, Tata McGraw Hill ,2003
5. Bjarne Stroustrup, Programming: Principles and Practice Using C++, Second Edition,2014.
6. Walter Savitch, Problem solving with C++, Pearson Education, 6th Edition 2007.

Mode of Evaluation: Continuous Cumulative evaluation of the lab experiments, Record, Viva voce and External Lab Examination.

Dept. of Computer Applications

MCA I Year I Semester

20MCAP202 PYTHON PROGRAMMING LABORATORY

L	T	P	C
0	0	4	2

Course Prerequisite: None

Course Description:

This course provides the students how to write algorithms for computational problems and how to write programs in python language to perform different tasks such as functions, string handling mechanisms and file handling concepts.

Course Objectives:

Student will be able to

1. Write algorithms and draw flowcharts using raptor tool for different computational problems
2. Design Python programs using looping, decision making, Strings and user defined functions.
3. Develop Python programs using List, Set, Tuple, Dictionary and File concepts.

LIST OF EXPERIEMENTS

Flow-Chart using Raptor Tool

1. Develop flow charts using Raptor Tool
   a. To exchange/swap the values of two variables
   b. To find factorial of a given number
   c. To find the sum of set of numbers
   d. To generate Fibonacci sequence
   e. To reverse the digits of a number

2. Write Python scripts
   (a) To read two numbers and perform an arithmetic operation based on the option chosen by the user.
   (b) To find the grade of a student based on the marks given for all subjects in a semester
   (c) To find the GST of a given item
3. Write a program to generate a multiplication table for a given number
   (b) Write a program using loop that asks the user to enter an even number. If the number entered is not even then display an appropriate message and ask them to enter a number again. Do not stop until an even number is entered. Print a Congratulatory message at end.
4. Write Python scripts for the tasks given in Exercise #1

Programs based on if-else, Loops and Patterns

5. Apoorva super market requires an automated program to print the expenses. Quantity

and price per item are the inputs and discount of 10% is offered if the expense is more than Rs. 5000. Automate the above scenario in python.

6. Write python program to generate the following patterns

```
    1
   2 2
  3 3 3
 4 4 4 4
5 5 5 5 5
6 6 6 6 6 6
7 7 7 7 7 7 7
8 8 8 8 8 8 8 8
9 9 9 9 9 9 9 9 9
```

(a)

```
A
B B
C C C
D D D D
E E E E E
F F F F F F
G G G G G G G
H H H H H H H H
```

(b)

```
*
**
***
****
*****
******
*******
********
*********
```

(c)

Program using Functions

7. Write functions in Python
   (a) To find the distance between two points
   (b) To find the area of a circle
   (c) To find the factorial of a number using recursion
   (d) To find the GCD of two numbers using recursion

Programs based on String Concepts

8. Consider the string str=" Global Warming". Write statements in Python to implement the following
   (a) To display the last four characters.
   (b) To display the substring starting from index 4 and ending at index 8.
   (c) To check whether string has alphanumeric characters or not.
   (d) To trim the last four characters from the string.
   (e) To trim the first four characters from the string.
   (f) To display the starting index for the substring "Wa".
   (g) To change the case of the given string.
   (h) To check if the string is in title case.
   (i) To replace all the occurrences of letter "a" in the string with "*"

Programs based on List, Tuple

9. Write a program to find the sum of two matrices using lists.
10. We can use list to represent polynomial. For Example, $p(x) = -13.39 + 17.5\,x + 3\,x^2$

$+ x^3$ can be stored as [-13.39, 17.5, 3, 1.0] Here "index" is used to represent power of "x" and value at the index used to represent the coefficient of the term. Write a function to evaluate the polynomial for a given "x".

11. Create a list that contains the names of 5 students of your class. (Do not ask for input to do so)
    (i) Print the list
    (ii) Ask the user to input one name and append it to the list
    (iii) Print the list
    (iv) Ask user to input a number. Print the name that has the number as index (Generate error message if the number provided is more than last index value).
    (v) Add "Kamal" and "Sanjana" at the beginning of the list by using "+".
    (vi) Print the list
    (vii) Ask the user to type a name. Check whether that name is in the list. If exist, delete the name, otherwise append it at the end of the list.
    (viii) Create a copy of the list in reverse order
    (ix) Print the original list and the reversed list.
    (x) Remove the last element of the list.

Programs based on Dictionary

12. Write a python program to create telephone directory. Input 10 names and phone numbers to store it in a dictionary and do the following:
    (a) Input any name and print the phone number of that particular name.
    (b) Add a new contact
    (c) Update an existing contact
    (d) Delete a contact
    (e) Sort the directory according to names.

Programs based on Tuple

13. Write a program to input 'n' employees' salary and find minimum & maximum salary among 'n' employees using Tuples.

Programs based on File Handling

14. Write a program to create a file "Story.txt" with the history of MITS
    (a) Write a program to read a file 'Story.txt' and create another file, storing an index of Story.txt telling which line of the file each word appears in. If word appears more than once, then index should show all the line numbers containing the word.
15. Case Studies
    Case Study#1/ Creating Modules
    Case Study#2 Creating Packages

Case Study#3/ Working with NumPy
Case Study#4/ Working with Pandas and Matplotlib

Course Outcomes:

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

1. Draw flow charts for different tasks using raptor tool
2. Write python basic programs using conditional and looping structures
3. Execute programs in python for string handling, functions, create modules and work with packages

Text Books:

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

Reference Books:

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

Mode of Evaluation: Internal Practical Examination, External End Semester Practical Exam

MCA I Year II Semester

20MCAP106 JAVA PROGRAMMING

L	T	P	C
3	0	0	3

Course Prerequisites: 20MCAP101

Course Description:

This course deals with Object Oriented Programming concepts and java programming concepts which starts from data types, control statements. Moreover, this course enables students to learn polymorphism, file handling, exception handling. This course helps the students to understand how to create their own web based application using core java concepts.

Course Objectives

Students will be able to:

1. Explain java identifiers, data types, control statements, arrays and functions
2. Demonstrate OOPS concepts, Polymorphism, Interfaces and packages
3. Explore File Handling concepts in Java Language
4. Identify Exception handling in Java
5. Explain GUI designing methodologies in Java

UNIT-I INTRODUCTORY CONCEPTS (9)

Program, identifiers, Variables, Constants, Primitive data types, Expressions, Control statements, Structured data types, Arrays, Functions.

UNIT-II OBJECT ORIENTED CONCEPTS (9)

Abstraction, Encapsulation, Objects, Classes, methods, Constructors, Inheritance, Polymorphism, Static and Dynamic binding, Overloading, Abstract classes, Interfaces and Packages.

UNIT-III FILE HANDLING (9)

Byte Stream, Character Stream, File I/O Basics, File Operations,Serialization.

UNIT-IV EXCEPTION HANDLING (9)

Throw and Exception, Throw, try and catch Blocks, Multiple Catch blocks, Finally Clause, Throwable Class, Types of Exceptions, java.lang Exceptions, Built-In Exceptions.

UNIT-V GUI DESIGN: (9)

GUI based I/O, Input and Message Dialog boxes, Swing components, Displaying text and images in window.

Course Outcomes:

After completion of the course the student will be able to

1. Execute programs using control statements, arrays and functions.
2. Apply object-oriented concepts – Classes, Objects, Inheritance, Polymorphism– for problem solving.
3. Write Java programs using File Handling techniques on necessity
4. Implement Exception Handling mechanism using Java for problem solving
5. Develop Java applications with graphical user interface (GUI).

Text Books:

1. Herbert Schildt, Java: The Complete Reference, 10th Edition, McGraw-Hill Education, 2018
2. James Gosling, Bill Joy, Guy L. Steele Jr, Gilad Bracha, Alex Buckley, The Java Language Specification, The Java Language Specification, Java SE 8 Edition, Addison-Wesley

Reference Books:

1. Deitel & Deitel, Java-How to Program, 9th edition, Pearson Education, 2012.
2. Richard Johnson, An Introduction to Java Programming and Object-Oriented Application Development, Thomson Learning, 2006.

Mode of Evaluation: Assignments and Internal Mid Examination, External End Examination

MCA I Year II Semester

20MCAP107 DATABASE MANAGEMENT SYSTEMS

L	T	P	C
3	0	0	3

Course Prerequisite: None

Course Description:
This course is designed to investigate how database management system techniques are used to design, develop, implement and maintain database applications in organizations.

Course Objectives:
Students will be able to:

1. Explain data base concepts, applications, data base system structure and ER data modeling.
2. Illustrate the relational model, integrity constraints, DDL, DML, Various types of SQL queries and Relational Algebra.
3. Demonstrate schema refinement and Normal Forms.
4. Explain transactions and its management, concurrency control schemes and recovery.
5. Interpret the concepts of PL/SQL and NO SQL.

UNIT I: INTRODUCTION (9)
Introduction to data bases, Database system Vs File system, Data abstraction, Instances and Schemas, Database users, Database system structure, Entities, Attributes, Entity sets, Relationships and Relationship sets, Database design and ER diagrams, Specialization and Generalization and participation features of ER model.

UNIT II: THE RELATIONAL MODEL, SQL & RELATIONAL ALGEBRA (9)
The Relational model: Introduction, Various types of Integrity constraints.
SQL: Structured Query Language, data types, DDL, DML, TCL, views, NULL Values, Set operations, aggregate functions, character functions, Date functions, String functions, Nested queries, correlated nested queries.
Relation Algebra: Fundamental operations, Additional operations.

UNIT III: NORMALIZATION (9)
Problems Caused by redundancy, Decompositions, Reasoning about FDS , FIRST, SECOND,THIRD Normal forms, BCNF, Lossless-join Decomposition, Dependency preserving, Multi valued Dependencies , Fourth Normal Form and Fifth Normal form.

UNIT IV:TRANSACTION MANAGEMENT AND CONCURRENCY CONTROL (9)
Transaction Management: ACID properties, Transactions and Schedules, Concurrent Execution of transactions, Serializability, Conflict serializability, View serializability, Testing for serializability.
Concurrency Control: Two Phase Locking protocol, Time stamp ordering protocol
Database recovery

UNIT V: PL/SQL & NO SQL (9)
PL/SQL: Functions, procedures, triggers, cursors and exceptional handling, Package in PL/SQL.
No SQL : Key value store Database, Column Store Database, Document Database, Graph Database

Course Outcomes:
After completion of the course the student will be able to

1. Demonstrate the basic concepts and advantages of database systems to an organization.
2. Implement DDL, DML and various types of SQL queries.
3. Design Normal Forms for the given application.
4. Illustrate the concepts of transaction processing, concurrency control and recovery.
5. Execute a relational database system using PL/SQL.

Text Books:

1. Silberschatz, Korth, Data Base System Concepts, 6/e,TMH
2. Raghurama Krishnan, Johannes Gehrke, Data Base Management Systems, TMH
3. Sadalage Pramod J, Fowler Martin, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot persistence , 1st Edition, Addison-Wesley

Reference Books:

1. Elmasri Navathe, Data Base Management System, Pearson publications
2. C J Date, An Introduction to Database Systems, Pearson

Mode of Evaluation: Assignments, Internal Mid Examination, External End Examination

20MCAP108 DATA STRUCTURES AND ALGORITHMS

L	T	P	C
3	0	0	3

Course Prerequisite: 20MCAP101

Course Description:

The purpose of this course is to impart knowledge on various data structures and design and analyze the algorithm concepts.

Course Objectives:

Students will be able to

1. Demonstrate the algorithms, complexities and Linear Data structures
2. Explain different types of sorting and searching techniques
3. Distinguish between different types of trees
4. Explain graphs and hashing and their operations
5. Analyze different types of Problem Solving Methods.

UNIT-1 INTRODUCTION

Algorithms, Analyzing Algorithms, Designing Algorithms, Basic Algorithms, Growth of Functions: Asymptotic Notation, Standard Notations and Common, Arrays, Stack, Linked Lists, Queues. **(9)**

UNIT-II SEARCHING AND SORTING

Searching Methods-Sequential and Binary Search, Fibonacci Search;
Sorting-Bubble, Selection, Insertion, Heap Sort, Divide and Conquer – Quick and Merge Sort, Comparison of Sorting Techniques. **(9)**

UNIT-III TREES

Non-Linear-Trees-Binary Trees, Binary Search Trees, Minimum Spanning Trees-Prims and Kruskal, AVL Trees, B Trees, B+ Tree, Red–Black Trees, Splay Trees. **(9)**

UNIT-IV GRAPHS AND HASHING

Graphs, Types of Graphs, Graph Traversal Methods, AND/OR graphs.
Introduction to Hashing, Deleting from Hash Table, Efficiency of Rehash Methods, Hash Table Reordering, Resolving collision by Open Addressing. **(9)**

UNIT-V PROBLEM SOLVING METHODS

Greedy Methods- Knapsack problem, Single source shortest paths;
Dynamic Programming Methods- All pairs shortest paths, 0/1 Knapsack Problem, Travelling salesman problem; Backtracking- N-queen problem, Graph coloring; Branch and Bound-15-puzzle problem. **(9)**

Course Outcomes:

After completion of the course the student will be able to

1. Analyze the complexity of algorithm and implement linear data structures
2. Compare various sorting and searching techniques
3. Implement Non-Linear Tree Data structures
4. Apply graph and hashing techniques
5. Implement various types of problem solving approaches.

Text Books:

1. Fundamentals of Data structures, E. Horowitz, S. Sahni and Susan Anderson-Freed, Universities Press.
2. Fundamentals of Computer Algorithms, Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekharan, Galgotia publications.
3. Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser, "Data Structures and Algorithms in Python",John Wiley & Sons.

Reference Books:

1. Roberto Tamassia, Michael T. Goodrich, Data Structure in Python, O'Reilly.
2. Rance D. Necaise "Data Structures and Algorithms Using Python", John Wiley & Sons, Inc.
3. Benjamin Baka , Python Data Structures and Algorithms, Packt Publishing 2016.
4. Donald R. Sheehy, A First Course on Data Structures in Python.

Mode of Evaluation: Assignments, Internal Mid Examination, External End Examination

MCA I Year II Semester

20MCAP109 BLOCKCHAIN TECHNOLOGY

L	T	P	C
3	0	0	3

Course prerequisite: 20MCAP105

Course Description:

Blockchain is an emerging technology for developing decentralized applications and data can be stored in a secured environment. Beyond its role, an underlying technology of cryptocurrencies. The basic principle of this technology is one can create a distributed and replicated ledger of events, transactions and data generation with strong cryptographic guarantees. Documents stored in this environment are tamper proof, immutable and easily verifiable. Blockchain technology is implemented not only in cryptocurrencies also in healthcare, finance, e-governance, real-estate and IoT.

Course Objectives

Students will be able to:

1. Understand the basic security structure of a blockchain technology and why/when it is better than a simple distributed database
2. Analyze the blockchain based system and critically assess its functions, benefits and vulnerabilities.
3. Identify that where blockchain technology may be applied with its potential and its limitations
4. Recognize what constitutes a “smart” contract, and its legal implications in various domains.
5. Identify new challenges that exist in monetizing businesses around blockchain technology and smart contracts

UNIT- I CRYPTOGRAPHY AND HASHING FUNCTION (9)

Overview of cryptography- Basic symmetric-key Encryption-Public key cryptography- Message integrity- Hash Algorithm-SHA-Digital signatures- Identification protocols in Cryptography-SSL/TLS-Zero knowledge protocols- Cryptography in the age of quantum computers.

UNIT-II DISTRIBUTED ENVIRONMENT (9)

Distributed Network - Distributed Database, P2P Network - Two General Problem, Byzantine General problem and Fault Tolerance, Hadoop Distributed File System, Distributed Hash Table, ASIC resistance.

UNIT-III BLOCKCHAIN (9)

Introduction, Advantage over conventional distributed database, Blockchain Network, Mining Mechanism, Distributed Consensus, Wallet – Blocks, Merkle Tree, Transactions and Fee, Anonymity, Reward, Chain Policy, Life of Blockchain application, Soft & Hard Fork, Types of Blockchain.

UNIT-IV CONSENSUS AND CRYPTOCURRENCY (9)

Consensus: Distributed consensus, Proof of Work, Proof of Stake, Proof of Burn, Difficulty Level, Sybil Attack, Energy utilization and alternate.

Cryptocurrency: History, Distributed Ledger, Bitcoin protocols - Mining strategy and rewards, DAO, Smart Contract, GHOST, Vulnerability, Attacks, Namecoin.

UNIT-V ETHEREUM AND BLOCKCHAIN APPLICATIONS (9)

Ethereum: - Ethereum - Construction, Ethereum Virtual Machine (EVM) - Wallets for Ethereum - Solidity - Smart Contracts - some attacks on smart contracts.

Applications: Internet of Things, Medical Record Management System, Domain Name Service and future of Blockchain.

Course Outcomes

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

1. Explain the usage of cryptography and hashing techniques in Blockchain technology.
2. Elucidate the functional model of distributed network environment.
3. Describe the basic building blocks of Blockchain types and transactions.
4. Interpret consensus & cryptocurrencies and describe differences between proof-of-work and proof-of-stake consensus.
5. Explicate ethereum based smart contracts and blockchain based applications.

Text Books

1. Jonathan Katz and Yehuda Lindell "Introduction to Modern Cryptography" (2nd edition)-CRC Press-by Taylor & Francis Group
2. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University Press, 2016.

Reference Books

1. Antonopoulos, Mastering Bitcoin: Unlocking Digital Cryptocurrencies
2. Satoshi Nakamoto, Bitcoin: A Peer-to-Peer Electronic Cash System
3. DR. Gavin Wood, "ETHEREUM: A Secure Decentralized Transaction Ledger,"Yellow paper, 2014.
4. Nicola Atzei, Massimo Bartoletti, and Tiziana Cimoli, A survey of attacks on Ethereum smart contracts
5. Dan Boneh and Victor Shoup, "A graduate course in Applied Cryptography" - Version 0.4, 2017.

Mode of Evaluation: Assignments, Internal Mid Examination, External End Examination

MCA I Year II Semester

20MCAP110 AI TECHNIQUES AND APPLICATIONS

L	T	P	C
3	0	0	3

Course Prerequisites: None

Course Description:

To understand the importance of AI techniques and its wide range of applications. The course is introduced with basics of AI and ML. Then and applications and techniques of AI in various domains

Course Objectives:

Students will be able to:

1. Demonstrate the fundamentals of AI and ML
2. Summarize NLP, Chatbots and Speech Recognition
3. Demonstrate the concepts of Image Processing and Computer Vision
4. Discuss reinforcement learning and its applications
5. Introduced to various real time applications that are implemented using AI

UNIT I: INTRODUCTION TO AI & ML (9)

AI: What is AI, Applications of AI, Advanced search, Constraint satisfaction problems, Knowledge representation and reasoning, Uncertain and probabilistic reasoning.

ML: Introduction, Types of Machine Learning, Perceptron, Neural Networks, Applications of Machine Learning

UNIT II: NLP, CHATBOTS & SPEECH RECOGNITION (9)

Natural Language Processing: Introduction, Natural Language Understanding, Components of NLP, Enterprise Applications, how to Use NLP, Challenges of NLP

Chatbots: Introduction, how to Build a Chatbot, Architecture of Chatbot, Challenges of building a Chatbot, Industry case studies

Speech Recognition: Speech Fundamentals, Speech Analysis, Speech Modeling, Speech Recognition, Speech Synthesis, Text to Speech,Virtual Assistants: What is a Virtual Assistant?

UNIT III: IMAGE PROCESSING & COMPUTER VISION (9)

Image Processing: Introduction, Image Noise Removal of Noise, Removal of Noise from Images, Colour Enhancement, Segmentation, Edge Detection, Optical Character Recognition, Feature Detection & Recognition, Feature Extraction

Computer Vision: Capabilities of Computer Vison for an Enterprise, how to use Computer Vision, Computer Vision on Mobile Devices, Existing Challenges and Implementation
Agriculture [Crop and Soil Monitoring, Predictive Analytics], Retail and Retail Security [Amazon Go]

UNIT IV: REINFORCEMENT LEARNING (9)

Reinforcement Learning: Introduction, Game Playing [Deep Blue in Chess, IBM Watson in Jeopardy, Google's DeepMind in AlphaGo], Agents and Environment, Action-Value Function,
Applications: Robotics, Gaming, Diagnostic systems, Virtual Assistants

UNIT V: SMART APPLICATIONS (9)

Smart Manufacturing, Smart Agriculture, Smart Grids, Smart Transportation and Autonomous Vehicles, Smart Homes, Smart Cities.

Course Outcomes:
After completion of the course the student will be able to:

1. Demonstrate the basic concepts of AI , ML and its applications
2. Discuss briefly about NLP, Chatbots and Speech Recognition
3. Illustrate the concepts of Image Processing and Computer Vision
4. Demonstrate reinforcement learning and its applications
5. Design smart applications for various domains

Textbooks:

1. Tom Markiewicz& Josh Zheng,Getting started with Artificial Intelligence, Published by O'Reilly Media,2017
2. Stuart J. Russell and Peter Norvig,Artificial Intelligence A Modern Approach
3. Joseph Howse, Prateek Joshi, Michael Beyeler - Opencv_ Computer Vision Projects with Python-Packt Publishing (2016)

Reference Books:

1. A classical approach to Artificial Intelligence, Munesh Chandra Trivedi, Khanna Publications
2. Richard Szeliski, Computer Vision: Algorithms and Applications, Springer 2010
3. Artificial Intelligence and Machine Learning, Chandra S.S. & H.S. Anand, PHI Publications
4. Machine Learning, Rajiv Chopra, Khanna Publishing House
5. Build an AI Assistant with Wolfram Alpha and Wikipedia in Python. https://medium.com/@salisuwy/build-an-ai-assistant-with-wolfram-alpha-and-wikipedia-in-python-d9bc8ac838fe

Mode of evaluation: Assignments, Internal Mid Examination, External End Examination

MCA I Year II Semester

20MCAP203 JAVA PROGRAMMING LABORATORY

L	T	P	C
0	0	4	2

Course Prerequisite: 20MCAP201

Course Description:

This course enables the students to write programs based on core java concepts such as control structures, arrays, functions and exception handling for different problems. Moreover, it deals to develop programs using swing components for GUI applications

Course Objectives:

Students will be able to

1. Write Java programs using classes and objects.
2. Build robust applications using object-oriented features
3. Develop Platform Independent GUIs

Laboratory Experiments:

1. Write A Java Program to show the characteristic of a number. {E.g. 24 it has two coefficients 2 in tens position and 4 in unit's position. It is composed of 2 and 3. It is a positive number. Also show whether it is odd or even.
2. Write a menu driven program using switch in Java to perform following:
    a) For input of 1, check whether the number is prime
    b) For input of 3, find the factors of the number
    c) For input of 5, check the number is odd or even.
3. Write a program in Java to generate hexadecimal equivalent of a number without using array
4. Write a Java Program to generate Pascal's Triangle using a square matrix.
5. Write a program in Java to take input of two 3×3 matrices through command line argument and then:
    a) Add them up and display the result
    b) Subtract them and display the result
    c) Multiply them and display product
6. Write a Java Program to count the number of words, characters in a sentence.
7. Write a program in Java to take input of a sentence through command line argument and then count the number of words and vowels.
8. Write a Java Program to handle the Exception using try and multiple catch block; the exceptions that you will handle are, number format error, array bound error and divide by zero.
9. Write a Java Program to create a class called Room with two data member length and width and then implement constructor overloading in it.
10. Write a program in Java to explain the role of the following:
    a) Non-parameterized constructor
    b) Parameterized constructor

c) Copy constructor

Take input and display the output.

11. Develop a Java program to create a class called Fraction with data member numerator and denominator; take input(through command line argument) of two fractions and then add, subtract, multiply and divide, finally display the result in reduced term.
12. Write a program in Java to create a class for Employee having 2 data member code and name. Then create 3 classes Officer, AdminStaff and MStaff. The Officer class has data members designation and pay-scale; the AdminStaff has data members grade and pay-band; the MStaff has data member department and two sub-classes Regular and Casual. The Regular staff has data members level and consolidated-pay and Casual has data member daily-wage. Take all inputs through constructors and write appropriate methods for displaying one data for each type of class.
13. Write A Java Program to draw a format like

```
    *
   ***
  *****
 *******
  *****
   ***
    *
```

14. Develop a Java program to design a class called Account using the inheritance and static that show all function of bank(withdrawal, deposit) and generate account number dynamically.
15. Write a Patient class which inherits from the Person class. Patient can again be of two types, indoor and outdoor. The Patient class requires the following:
    a) a variable to store the patient ID for the patient
    b) a variable to store the department of hospital
    c) a variable to store the ward of hospital
    d) a variable to store the patient 's date of joining the hospital
    e) a variable to store the patient 's address
    f) a variable to store the medical fees that the patient pays
    g) constructor methods, which initialize the variables
    h) a method to calculate the medical fees (for both indoor and outdoor patient)
16. Write a Java Program to take a string count all vowels and then delete the same from the string.
17. Write A Java Program to take a string as password and check whether it contains at least two numbers, 3 alphabets and no space in it. If any contrary throw message.
18. Write a program in Java to create a class called Rational having two data members for numerator and denominator. Take two inputs of rational numbers and perform multiplication and division. Display the result in reduced form.
19. Write a program in Java to print a format like,

```
* * * * * * *
 * * * * *
  * * *
   *
```

20. Write A Java Program to create 4 threads and show exhibit their execution after the call of the “start ( )” method.

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

Course Outcomes:

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

1. Develop Java programs using Classes and Objects.
2. Implement java programs to interface with external data sources.
3. Develop programs using swing components for Graphical User Interface

Text Books:

1. Java Programming for core and advanced learners, Sagayaraj, Dennis, Karthik and Gajalakshmi, University Press.
2. Programming with Java" T.V.Suresh Kumar, B.Eswara Reddy, P.Raghavan Pearson Education

Reference Books:

1. Deitel & Deitel, Java-How to Program, 9th edition, Pearson Education, 2012.
2. Herbert Schildt, Java: The Complete Reference, 10th Edition, McGraw-Hill Education, 2018

Mode of Evaluation: Continuous Cumulative evaluation of the lab experiments, Record, Viva voce and External Lab Examination.

MCA I Year II Semester

20MCAP204 DATABASE MANAGEMENT SYSTEMS LABORATORY

L	T	P	C
0	0	4	2

Course Prerequisite: None

Course Description:

This course provides an executive understanding and approach to the technical subject of database management system.

Course Objectives:
Students will be able to:

1. Explain basic concepts of Database Management System .
2. Sketch ER model and relational model for the given application.
3. Illustrate the concepts of SQL,PL/SQL.

List of Experiments:

1. Implement DDL Commands. (use constraints while creating tables).
2. Implement DML commands by using various examples.
3. Implement Unique, NULL, NOT NULL, Primary key, Foreign key, Check constraints.
4. Implement DCL commands, NVL(),Coalesce() functions.
5. Queries (along with sub Queries) using ANY, ALL, IN, EXISTS, NOT EXISTS, UNION, INTERSET.
6. Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING.
7. Queries using Conversion functions (to_char, to_number and to_date), string functions (Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substr and instr)
8. Queries using date functions (Sysdate, next_day, add_months, last_day, months_between).
9. Implement all types of joins.
10. Calculate Employee Net salary and Gross salary for the following data using

    cursors. If Basic salary <= 8000 then DA is 8.18% of basic,

    HRA is 20% of basic PF is 20.18% of basic PT = 60Rs
    If Basic salary > 8000 and <= 14000
    then DA is 32% of basic,
    HRA is 7% of basic PF = 600Rs

PT = 80Rs
If Basic salary >14000 and <= 16000 then
DA is 30% of basic
HRA is 6% of basic
PF = 600
PT =160

11. Implement functions, procedures and triggers in PL/SQL
12. Implement User defined and System defined exceptions.

Mini Project:

Each student has to implement any one of the following system.

I. Employee management system
II. Student Result information system
III. Bank Management system
IV. Library information system
V. Hotel management system
VI. Railway reservation system

Note: Each system contains minimum of 6 tables. Each table contains minimum 10 rows.

Course Outcomes:
At the end of the course the student will be able to:

1. Execute DDL, DML and DCL commands.
2. Implement PL/SQL procedures, functions, cursors etc.
3. Design Relational model for the given system.

Text Books:

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

Reference Books:

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

Mode of Evaluation: Continuous Cumulative evaluation of the lab experiments, Record, Viva voce and External Lab Examination.

MCA I Year II Semester

20MCAP205 DATA STRUCTURES AND ALGORITHMS LABORATORY

L	T	P	C
0	0	4	2

Course Prerequisite: 20MCAP202

Course Description

This course introduces on the practical part of Data Structures and Algorithms using Python language. This course allows students to implement linear and nonlinear data structures. It gives practical exposure for solving sorting and searching problems. It enables to develop programs using various problem solving methods.

Course Objective

Students will be able to

1. Design Linear and Non-Linear Data structures
2. Compare different types of searching and sorting techniques
3. Demonstrate various problem solving methods

List of Experiments

1. Create a Stack and do the following operations.
   a. Push b. Pop c. Peep
2. Create a queue and do the following operations.
   a. Add b. Delete c. Display
3. Implement the operations on the following data structures:
   a. singly linked list b. circular linked list c. doubly linked list
4. Write a python program to convert from infix to postfix expression.
5. Write a python program to evaluate postfix expression.
6. Implement the following searching techniques using recursive & non-recursive functions.
   a. Linear search b. Binary search c. Fibonacci Search
7. Write a python program to sort elements using the following sorting techniques
   a. Insertion b. Selection c. Bubble.
8. Implement the following Divide and Conquer techniques to sort elements.
   a. Quick sort b. Merge sort.
9. Write a python program on Tree Traversal
   a. Pre order b. In order c. Post order
10. Implement the operations on Binary Search tree.
11. Implement knapsack problem using greedy method.
12. Write python program to find minimum spanning tree using
    a. Prim's method b. Kruskal's method.
13. Implement single source shortest path problem.

14. Implement all pairs shortest path problem.
15. Implement N-queen's problem using backtracking.

Case Study/Mini Project:

Students should undergo a case study/mini project by applying data structures and algorithms

Course Outcomes

After completion of the course the student will be able to

1. Select a suitable data structure for real time applications.
2. Implement Linear and Non-Linear Data structures.
3. Apply various problem solving techniques for complex problems.

Text Books

1. Data Structure and Algorithms in Python by Michael T. Goodrich, and Roberto Tamassia O'reilly and wiley.
2. Data Structures and Algorithm using Python by Brad Miller and David Ranum, Luther College.
3. Problem-Solving with Algorithms and Data Structures Using Python by Bradley N. Mille, Franklin Beedle & Associate Incorporated.

Reference Books:

1. Data Structures, S. Lipscutz, Schaum's Outlines, TMH.
2. Data Structures and Algorithms ,Alfred Aho,John E. Hop Croft, Ullman, Addision Wesley.
3. Algorithm Design by Jon Kleinberg, Pearson.

Mode of Evaluation: Continuous Cumulative evaluation of the lab experiments, Record, Viva voce and External Lab Examination.

MCA I Year II Semester

20MCAP901 RESEARCH METHODOLOGY

L	T	P	C
2	0	0	2

Course Prerequisites: None

Course Description:

This course provides the fundamental aspects of data collection, analysis, and interpretation of research problem. It also provides the effective way of research paper writing.

Course Objectives:

Students will be able to:

1. Understand the different research methodologies
2. Identify and define research problem
3. Design the use of major experimental methods of Computer Science research, especially surveys, testing, comparisons, case studies, and experiments.
4. Recognize the data collection approaches.
5. Discuss various report writing methods.

UNIT – I RESEARCH METHODOLOGY: AN INTRODUCTION (6)

Meaning of Research, Objectives of Research, Motivation in Research, Types of Research, Research Approaches, Significance of Research, Research Methods versus Methodology, Research and Scientific Method, Importance of Knowing How Research is Done, Research Process, Criteria of Good Research.

UNIT – II DEFINING THE RESEARCH PROBLEM (6)

What is a Research Problem, Selecting the Problem, Necessity of Defining the Problem, Technique Involved in Defining a Problem.

UNIT – III RESEARCH DESIGN (6)

Meaning of Research Design, Need for Research Design, Features of a Good Design, Important Concepts Relating to Research Design, Different Research Designs, Basic Principles of Experimental Designs

UNIT – IV METHODS OF DATA COLLECTION (6)

Collection of Primary Data, Observation Method, Interview Method, Collection of Data through Questionnaires, Collection of Data through Schedules, Difference between Questionnaires and Schedules, Some Other Methods of Data Collection, Collection of Secondary Data

UNIT – V INTERPRETATION AND REPORT WRITING (6)

Meaning of Interpretation, Why Interpretation, Technique of Interpretation: Precaution in Interpretation, 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

1. Understand the different research methodologies
2. Identify the research problem
3. Demonstrate the experimental methods, surveys, testing, comparisons and case studies.
4. Recognize the data collection approaches.
5. Discuss various report writing methods.

Course Outcomes

After completion of the course, students will be able to

1. Analyze different research methodologies
2. Define the research problem
3. Design the research paper using different approaches.
4. Implement various data collection approaches.
5. Write research report and thesis writing

Text Books

1. C.R.Kothari, Research Methodology Methods & Techniques, 2nd Edition, Wishwa Prakashan Publishers
2. Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction".

References

1. Ranjit Kumar, 2ndEdition, "Research Methodology: A Step by Step Guide for beginners"
2. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd, 2007.
3. Mayall , "Industrial Design", McGraw Hill, 1992.
4. Niebel , "Product Design", McGraw Hill, 1974.
5. Asimov , "Introduction to Design", Prentice Hall, 1962

Mode of Evaluation: Assignments, Internal Mid Examination

OPEN ELECTIVES - I

Open Elective - I

20MBAP301 MANAGEMENT AND ORGANIZATIONAL BEHAVIOR

L	T	P	C
3	0	0	3

Course Prerequisite: None

Course Description:
The Course introduces the students the fundamentals of management, its process. The course also facilitates the students in understanding individual, group behavior and organizational culture and climate impacting organizational performance

Course Objectives:

1. To understand the concept, significance, evolution of management and its ethical and social responsibilities
2. To explain the dimensions of the planning-organizing-leading-controlling (P-O-L- C) framework.
3. To describe how individual personality and behavior impacts the typical contemporary work experience
4. To understand group behavior in organizations, including communication, leadership, power and politics, conflict, and negotiations
5. To explain the impact of stress, organizational culture, and climate on organizational performance

UNIT I: FOUNDATIONS OF MANAGEMENT

Concept and Evolution of Management thoughts Different Schools of Thoughts; Classical; Behavioral Science Approach; Systems Approach; Contingency and Modern Theories. Management Levels; Managerial Roles and Skills; Ethics and Social Responsibilities of Business.

UNIT II: MANAGERIAL FUNCTIONS

Process – Problems – Components – Planning – Making It Effective. Decision Making – Process – Techniques.; Organization- as a process and structure, Determinants of Organization Structure; Authority, Responsibility, Delegation, Centralization and De-centralization; Span of Control; Types of Organization Structures; Line & Staff, Functional, Divisional, Matrix and Network; Departmentations, Controlling- Process, types and techniques.

UNIT III: INDIVIDUAL BEHAVIOUR

Concept, Nature and scope; Understanding Human Behavior: Personality:, Traits and types (**Johari Window)**; Perception: Factors and Process, Learning – Theories and applications in organizations, Motivation – Concept, Nature and Process, Theories of Motivation: Need Priority Model, Two Factors, Porter and Lawler model

UNIT IV: GROUP BEHAVIOUR

Formation of groups, Group development, Types of groups, Group norms, Cohesiveness, Group effectiveness, Conflict, and conflict resolution (**Transactional Analysis)**. Leadership- Leadership competencies, traits, Types, Likert's System theory, Managerial Grid, 2 D and 3D theories, Women Leadership in India.

UNIT V: ORGANIZATIONAL BEHAVIOUR

Management of stress; potential sources, consequences and coping strategies, organizational culture, concept, types of culture, organizational climate VS organizations culture, factors contributing towards creating and sustaining culture.

Course Outcomes

After completion of the course, students will be able to

1. Apply theoretical models and concepts to current management practices, problems and issues; and to use critical reflection to gain deeper understanding of issues.
2. Analyze major environmental and social pressures and challenges facing managers today; and reflect the same in the planning, organizing, leading, and controlling of the managerial activities.
3. To analyse and compare different models used to explain individual behaviour related to motivation and rewards
4. Assess and design the elements of group behaviour including group dynamics, communication, leadership, power & politics, and conflict & negotiation.
5. Critically evaluate and create a suitable organizational culture devoid of stress, conflict

Textbook

1. Organizational Behavior, Fred Luthans, McGraw Hill, 2011
2. Management, Stephen P. Robbins, Mary Coulter, Neharika Vohra, Pearson Education,2009

References

1. Human Behaviour at Work, Keith Davis, Tata McGraw Hill,2009 3. Management and Organizational behaviour, Pierce Gordner, Cengage,2009
2. Organizational Behaviour by Aswathappa, 12th revised edition, Himalaya publication
3. Principles of Management, Koonz, Weihrich and Aryasri, Tata McGraw Hill,2004
4. Behaviour in Organizations, Jerald Green Berg & Robert A. Baron, Pearson Education,2008
5. Management and Organizational Behaviour, Subbarao P, Himalaya Publishing House,2008. 7. Organizational Behaviour, Sarma, Jaico Publications,2009
6. Management and Organizational Behaviour, Paul Hersey and Ken Blanchard, PHI,2009
7. Organizational Behavior, Kavita Singh, Pearson 2010

Mode of evaluation: Assignments, Internal Mid Examination, External End Examination

Open Elective - I

20MBAP302 DESIGN THINKING

L	T	P	C
2	1	0	3

Course Prerequisite: None

Course Description

This course deals with various techniques of thinking, enhancement of soft skills & personality development; understanding and applying different concepts in Design Thinking Process of Stanford Model.

Course Objectives

1. To get exposed to the basic concepts Design Thinking of Stanford Model
2. To appreciate the basic concepts of Empathy and the process of sensitization.
3. To develop an understanding of the basic concepts of ideation techniques
4. To familiarize with the basic concepts of prototyping and testing.
5. To acquire and apply the current knowledge from learning about (knowledge) vs. learning to become (skills and mindsets)

UNIT I: INTRODUCTION TO DESIGN THINKING

Open-mindedness; Developing Design Thinking Mindset; Principles of Design Thinking; Primer on Design Thinking; SWOC Analysis for Self-Awareness

UNIT II: EMPATHY & DEFINE

Definition & Components of Empathy; Interrelatedness of Components; Steps in Empathy process; Assessment tools; Roots of Empathy (Case studies);
Decision making process; Research Components; Hypothesis (Interview, team formation & benefits) Defining Problem Statement, Application of "**How might we Statements"**

UNIT III: IDEATION TECHNIQUES

Innovation and Creativity: Ideation Techniques -Role-play; Brainstorming; Pooling Ideas-Idea Clustering; Prioritizing ideas; Analyzing; Synthesizing and integrating the ideas.

Mind-mapping the experiences, Flaring & Focus; Introduction to "Yes but" – "Yes and" Impact of Visuals; Exploring resources, Timeline, Creative Business Legends: CEOs of Alibaba, Facebook, Apple, Microsoft, Space-X etc.

UNIT IV: PROTOTYPING- BUSINESS MODELLING

Innovation & Competitive uniqueness; Evaluation of ideas - Pros Cons; Criteria for idea Ranking; Building artifacts; Real time evaluation; Bringing idea to the life; Use of Visual Clippings; Involve the tester in prototype; initial insight; Market Testing

UNIT V: REFLECTIVE THINKING

Do it Now- Reflect- Do it Better; DT is a team sport; develop a coach-like stance; Altruistic Approach.

Presentation of

1. My Business Idea (Big Picture- Vision- Mission (Connecting Dots)
2. Business Model Presentation
3. Assessment
4. Dissertation/Record

Course Outcomes:

After completion of the course, students will be able to

1. To understand the basic concepts of Design Thinking and develop Self Awareness
2. To empathize, get sensitized and identify the problems.
3. To encourage wild ideas. Defer judgement. Build on ideas of others
4. To enable translation of an innovative idea into a prototype.
5. To understand, implement, and apply the Design Thinking Principles in Personal & Professional Life

Textbook:

1. Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation, Tim Brown, Harper Business, 2009
2. The Design of Business: Why Design Thinking is the Next Competitive Advantage, Roger L. Martin, Harvard Business Review Press; Third Edition, 2009
3. **"Design Thinking-A Practical Approach"** proprietary material-2018, Stanford Tool Kit.

References:

1. Fourth Eye" by Pradeep Khandwala
2. "Action Research" by Eileen Ferrance, "Themes in Education" Northeast and Islands Regional Educational Laboratory Brown University
3. **"Introduction to Life Skills Education"-** NCERT Training Package
4. **"Make space"** - How to Set the Stage for Creative Collaboration" Scott Doorley and Scott Without, d. School Hasso Plattner Institute of Design at Stanford.

Mode of evaluation: Assignments, Internal Mid Examination, External End Examination

Open Elective - I

20MBAP303 MANAGEMENT INFORMATION SYSTEMS

L	T	P	C
3	0	0	3

Course Prerequisite: None

Course Description:

This course introduces the various information and communication technologies. Students will study and practice using modern information technologies. Students will examine how information systems are used to solve problems and make better business decisions and apply these concepts to analyze business cases. Students will able to know information technology security tools and techniques.

Course Objectives:

1. To familiarize the students with the foundation concepts of Information System and fundamentals of strategic advantage.
2. To enable the students to have an understanding about the database approach to improve business and decision-making process.
3. To elucidate and learn about the system development life cycle method and different strategies for business development
4. To enable the students to analyze system vulnerabilities and analyze various methods of communications in decision making process.
5. To provide an insight into the management challenges, controlling techniques and establishing security framework.

UNIT I: INTRODUCTION AND FOUNDATION CONCEPTS

Foundations of information systems (IS) in business System concepts, Components of an IS, IS Resources, fundamental roles of IS applications in business – trends in IS – types of IS – managerial challenges of information technology. Competing with information technology (IT) Fundamentals of strategic advantage – strategic uses of IT – the value chain and strategic IT – using IT for strategic advantages – the basics of doing business on the Internet.

UNIT II DATA BASE AND INFORMATION MANAGEMENT

Data in a Traditional file Environment, The Database Approach to Data Management; Databases improve business performance and decision making, Manage data Resources. The Role of Information System in Business Today, Perspectives on Information Systems, Contemporary Approaches to Information Systems, Organization and Information Systems

UNIT III: MIS DEVELOPMENT PROCESS

System development – System Life cycle method, Structured Development method, Developing Business/IT Strategies Planning for competitive advantage – business models and planning – Business/IT planning – Business application planning – Implementing IT–IS development – the

Systems approach – the Systems Development Cycle – Prototyping – Systems development process – End-user development – implementing new systems – Software development.

UNIT IV: INFORMATION SYSTEMS
Computers in Management – MIS Office automation – Decision Support System – Expert System-Knowledge Work Systems, Artificial Intelligence, Group Decision Support Systems (GDSS).
Control: System Vulnerability and Abuse, Business value of Security and Control, establishing a Framework for Security and Control, Technologies and Tools for Protecting Information Resources.

UNIT V: SYSTEM AUDIT & MANAGEMENT CHALLENGES Security and ethical challenges Ethical responsibility of a business – computer crime – privacy issues – health issues – Security management of IT – tools of security management -Verification and Validation– internet worked security defenses – security measures - The moral dimensions of Information Systems. Enterprise and global management of IT Managing the IS function – failures in IT management – the international dimension in IT management – Cultural, political, and geo-economic challenges Global business/IT strategies and applications – global IT platforms.

Course Outcomes:
After completion of the course, students will be able to
1. Understand the Information system concepts and strategic advantage.
2. Elucidate and learn about database and Information Management
3. Learn about the Systems development cycle and MIS Development Process.
4. Gain insight into system vulnerabilities and various methods of communications in decision making process.
5. Analyze the management challenges and security issues.

Text Book:
1. Management Information Systems, C Laudon and Jane P. Laudon, et al, 9/e, PHI and Pearson
2. Stair, R. M. & Reynolds, G. W. (2001). Principles of Information Systems, 5e, Singapore: Thomson Learning.

References:
1. Management Information Systems, Gordon B. Davis & Margrethe H. Olson, Tata McGraw-Hill, 2006.
2. Management Information Systems Text & Cases, W S Jawadekar, Tata McGraw-Hill , 2009
3. Introduction to Information Systems, Rainer, Turban, Potter, WILEY-India, 2006.
4. Management Information Systems, James A. O brein, Tata McGraw-Hill , 10/e, 2009.
5. Management Information Systems, Dharminder and Sangeetha, 1/e, Excel books, 2006
6. Cases in MIS, Mahapartra, PHI, 2009
7. Management Information Systems, Text & Applications C.S.V. Murthy, Himalaya Publishing House.
8. Management Information Systems, Cengage Learning India Pvt. Ltd, Delhi ,Oz,2008.
9. Management Information Systems, Pearson Education, Noida McLeod, 2008
10. Information Systems Project Management, Pearson Education, Noida- John McManus and Trevor Wood-Harper,2010.

Mode of evaluation: Assignments, Internal Mid Examination, External End Examination

Open Elective - I

20MBAP304 E-COMMERCE AND DIGITAL MARKETS

L	T	P	C
3	0	0	3

Course Prerequisite: None

Course Description:
The course focusses on e-commerce and is divided into five sections to deliver key aspects of E – commerce such as business models, enablers, and supply chain, Social, Political & Ethical Issues of E-Commerce, E-commerce systems and Digital Markets. Each section delves deeply into various intricacies of doing business over the electronic media.

Course Objectives:

1. To Introduce the concept of e-business and the business models used in e-commerce
2. To elucidate about the e-commerce enablers and infrastructure
3. To enable the students to learn about supply chain management used by e-commerce players
4. Analyze the socio, political and ethical issues in e-commerce.
5. To develop an insight into e-markets and e-commerce systems.

UNIT I: E – COMMERCE BUSINESS MODELS

The Revolution Continues, E-commerce Business Models and Concepts, B2C business models, B2B models, B2G, G2C, Business models for emerging Ecommerce area – customer to customer business model, P2P business model, M-commerce models.
IT in business – functional business systems – cross-functional enterprise systems and applications – e-Business models - Enterprise e-Business systems

UNIT II: E – COMMERCE ENABLERS
E- Commerce enablers, internet and its impact on business strategy Pre and Post Covid-19 Pandemic – industry structure, industry value chain, firm value chain. E-commerce Infrastructure: The Internet, Web, and Mobile Platform

UNIT III: SUPPLY CHAIN MANAGEMENT IN E – COMMERCE
B2B E-commerce: Supply Chain Management and Collaborative Commerce. – Introduction to Customer relationship management (CRM) -Building an E-commerce Presence: Web Sites, Mobile Sites, and Apps, E-commerce Marketing Communications -Pre and Post Covid-19 Pandemic

UNIT IV: SOCIAL, POLITICAL, AND ETHICAL ISSUES
Ethical, Social, and Political Issues in E-commerce, Online Retailing and Services, Online Content and Media, Social Networks, Auctions, and Portals.

UNIT V: E-MARKETS
Factions, e-Markets vs Traditional Market, e-Markets Success factors, e-Market Technology Solutions. E-Procurements: The purchasing process, Developments in IT purchasing, e-procurement-

Models, e-procurement- Solutions – E-Commerce systems: E-Commerce systems – Essential e-Commerce processes – electronic payment processes - e-Commerce application trends – Web store requirements – clicks-and-bricks in e-Commerce- Electronic payment systems- impact on the e-business in the pre and post COVID 19 era.

Course Outcomes:

After completion of the course, students will be able to

1. Understand the concepts of e-business and the business models used in e-commerce
2. Learn about the e-commerce enablers and infrastructure
3. Develop an insight into supply chain management
4. Analyse into the socio, political and ethical issues in e-commerce.
5. Develop an understanding of e-markets and e-commerce payment systems

Text Book:

1. Laudon Kenneth C., E-Commerce: Business, Technology, Society, prentice Hall of India, 2019 , 15th Edition
2. Bhanver, J.,& Bhanver, K. (2017). Click!: The Amazing Story of India's E-commerce Boom and Where it's Headed.: Hachette.

Reference Books:

1. Bhaskar, B. (2009). Electronic commerce: Framework, technologies and applications (3rd ed.). New Delhi: Tata McGraw Hill Education.
2. Erisman, P. (2017). Six Billion Shoppers: The Companies Winning the Global ECommerce Boom. Macmillan.
3. Kalakota, R., & Whinston, A. B. (2009). Electronic commerce: A manager's guide. New Delhi: Pearson Education.
4. Vaitheeswaran, K.(2017). Failing to Succeed: The Story of India's First E-Commerce Company. India: Rupa Publications.
5. Kamalesh K Bajaj & Debjani Nag, e-Commerce, the Cutting Edge of BusinessTMH,2008
6. Parg Diwan,E-Commerce,Excel,2008
7. Chaffe, Pearson, e-Commerce and e-Business,2009

Mode of evaluation: Assignments, Internal Mid Examination, External End Examination

Open Elective - I

20MBAP305 ENTREPRENEURSHIP DEVELOPMENT AND PROJECT MANAGEMENT

L	T	P	C
3	0	0	3

Course Prerequisite: None

Course Description:
This course presents the concepts, characteristics and role of the entrepreneur, and the various aspects of entrepreneurship, invention and importance of innovation in entrepreneurship and expansion, role, importance, and challenges of women entrepreneurs in India. This course provides an overview of various aspects of project management and different stages in the project management process.

Course Objectives:

1. To provide theoretical foundations of entrepreneurship development and design thinking
2. To develop the skills required to prepare a Business Plan.
3. To familiarize with project management concepts.
4. To provide insights of project financing and Government's role in promoting entrepreneurship
5. To explain the project implementation methods.

UNIT I: FOUNDATIONS OF ENTREPRENEURSHIP
Definition, Scope and Importance – Characteristics of entrepreneur - The Cultural and social Environment — Functions of Entrepreneur, Types of Entrepreneurship, Role of entrepreneurship in economic development, Theories of Entrepreneurship, Innovation and Entrepreneurship; managing for innovation – "Design Thinking", Entrepreneurship as a career, Women Entrepreneurs: Challenges to Woman Entrepreneurs, Achievements of woman Entrepreneurs, role Models of Woman Entrepreneurs. Case studies of Entrepreneurs – successful, failed, turnaround ventures to be discussed in the class.

UNIT II: ENTREPRENEURIAL BUSINESS PLANNING
Business Planning Process - The business plan as an entrepreneurial tool; Elements of Business Plan, Objectives, Market Analysis, Development of product / idea, Marketing, Finance, Organization & Management, Ownership, Critical risk contingencies of the proposal, Scheduling and milestones. Promotion of a Venture, Stages of Promotion of a Venture.

UNIT III: PROJECT MANAGEMENT
Project Management: Meaning of project - concepts - categories - project lifecycle, phases - characteristics of a project – project manager - role and responsibilities of project manager. Technical, Financial, Marketing Personnel and Management feasibility Reports.

UNIT IV: ROLE OF GOVERNMENT IN PROMOTING ENTREPRENEURSHIP
Start Up India, Make in India, Incubation centers, MSMEs & MSME culture in India, Self-reliant India, Mudra NIESBUD, NEDB, SISI, SIDBI,KVIC, DIC, SFC, SIDC,TCO AND IIDC, Venture Capital Funding, and Angel Capitalist.
Various finance schemes available for the MSMEs by the Central and State government.

UNIT V: PROJECT IMPLEMENTATION

Implementation of projects: Graphic Representation of Project Activities, Introduction to Network Analysis, Management & control of projects, Project scheduling, MIS in project, problems of project implementation, project audit

Course Outcomes:

After completion of the course, students will be able to

1. Understand the concepts of entrepreneurship development and design thinking.
2. assess the ways of preparing business plan
3. Analyze the project management concepts and having idea on financial institutions in entrepreneurship development
4. Discover about project financing and Government's role in promoting entrepreneurship
5. Evaluate the project implementation methods

Text Book:

1. Vasanth Desai, Dynamics of Entrepreneurship Development – Himalaya Publishing House, 2009.
2. David H. Holt, Entrepreneurship: New Venture Creation – PHI, 2009
3. H. Nandan, Fundamentals of Entrepreneurship, PHI, First/e, New Delhi, 2009.

Reference Books:

1. Dr. S.S. Khanka, Entrepreneurial Development, - S. Chand & Co. Ltd., Ram Nagar, New Delhi. 110055.
2. Raj Shankar, Entrepreneurship Theory and practice, - Vijay Nicole and Tata McGraw Hill, December 2011
3. Sahay, M.S.Chhikara, New Vistas of Entrepreneurship: Challenges & Opportunities, Excel Books, 2007.
4. Siropolis, Entrepreneurship and Small Business Management
5. Gurmeet Naroola, The Entrepreneurial Connection, GurmeetNaroola; Special edition (May 30, 2001)
6. Vijay Sathe, Corporate Entrepreneurship, February 2007

Mode of evaluation: Assignments, Internal Mid Examination, External End Examination

MCA II Year I Semester

Dept. of Computer Applications

MCA II Year I Semester

20MCAP111 FULL STACK WEB DEVELOPMENT

L	T	P	C
3	0	0	3

Pre-requisite Computer Networks Basics

Course Description:

This course introduces web designing and development methodologies using the front end development languages such as HTML, CSS, Javascript and Angular JS. Also, this course gives the idea of web development process using NODE JS.

Course Objectives:

Student will be able to:

1. Get familiar with web design using HTML and CSS
2. Understand the concepts on Bootstrap framework and JavaScript
3. Identify the working methodologies on Angular JS concepts
4. Get familiarity with Node JS techniques
5. Gain the knowledge about database connectivity for web application development

UNIT I HTML & CSS (9)

HTML Basics HTML Elements --HTML Attributes - HTML Formatting - HTML Links and Images HTML Lists, HTML tables – Frames and Framesets - Blocks, Classes - HTML Layout and Forms. CSS: Introduction CSS3 -□CSS3Colours - Backgrounds, Borders, Padding, Height/Width - CSS3 Gradients, Shadows - CSS3 Text, Fonts - CSS3 2D &3D Transforms - CSS Links – CSS Lists & Tables - CSS Box Model, Outline, Display, Max-width, Position - CSS Float, Inline-block – CSS Align – CSS Pseudo-class, Pseudo-element - CSS Navigation, Dropdowns, Tooltips, Images – CSS Selectors - CSS Forms, Buttons - CSS3 Multiple Columns - CSS3 User Interface: Box Sizing, Filters – Menu creation -Responsive CSS

UNIT II BOOTSTRAP AND JAVASCRIPT (9)

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

UNIT III ANGULAR JS (9)

Introduction – Features of Angular JS – Angular Expressions – Directives – Controllers – Modules – Forms – Dependency Injection and Services – Angular JS Animations

UNIT IV NODE JS (9)

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

UNIT V DATABASE CONNECTIVITY WITH NODE JS (9)

Overview of Database Queries – Connecting String – Configuring Node JS – Working with select Command – Updating Records – Deleting Records –MERN STACK - Project Development Using Node JS

Course Outcomes:

After completion of the course, students will be able to

1. Write HTML and CSS scripts to design web pages.
2. Implement JavaScript methodologies while designing web pages
3. Design web pages using Angular JS techniques
4. Implement Node JS concepts in web development
5. Develop web sites using Node JS with database connectivity.

Text Book(s)

1. HTML & CSS: The Complete Reference, Fifth Edition, Thomas Powell, McGrawHill
2. Complete Bootstrap: Responsive Web Development with Bootstrap 4, Matt Lambert,Bass Johnson, David Cochran, Ian Whitley, PACKT publishing
3. Javascript for Dummies, Emily Vander Veer, Wiley Publishing, 4th Edition
4. Learning Angular JS, Ken Williamson, O.Reilly, 2015
5. Beginning Node JS, Basarath Ali Syed, Apress, 2014

Reference Books

1. Complete Bootstrap: Responsive Web Development with Bootstrap 4, Matt Lambert,Bass Johnson, David Cochran, Ian Whitley, PACKT publishing
2. Mastering Javascript, VedAntani, PACKT publishing, 2016
3. Node JS Web Development, David Herron, PACKT publishing, 2016

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

MCA II Year I Semester

20MCAP112 DATA SCIENCE

L	T	P	C
3	0	0	3

Pre-requisite **Basic Mathematics**

Course Description:

This course will introduce students to this rapidly growing field Data Science and equip them with some of its basic principles. Students will learn concepts and techniques they need to deal with various facets of data science practice, including data collection and integration, Exploratory Data Analysis, Predictive modeling, descriptive modeling and Forecasting concepts.

Course Objectives:

Students will be able to:

1. Understand Exploratory Data Analysis.
2. Illustrate Unsupervised Learning concepts
3. Explain Supervised Learning concepts.
4. Explain Forecasting methods.
5. Apply Text Mining methods.

UNIT I INTRODUCTION (9)

Why Data Science, Exploring business objectives, Work flow from data to deployment, Measures of Central Tendency, Measures of Variability, Data Visualization plots and graphs, skewness, Kurtosis, Probability, Random Variable, Confidence Intervals, Hypothesis Testing, Z and t Statistic ,Data transformation.

UNIT II UNSUPERVISED LEARNING (9)

Association Rules-Support, Confidence and Lift measures, Apriori Algorithm, Generation of Association rules, Principal Component Analysis, Clustering-K-means, Hierarchical Clustering methods

UNIT III SUPERVISED LEARNING (9)

Regression - Simple Linear Regression, Multiple Linear Regression, Validation methods for Multiple Linear Regression, Multi collinearity, Deletion Diagnostics

Classification- Logistic Regression, Decision Tree, Overfitting, Underfitting, Complexity of Model, Classifier accuracy measures, Ensemble methods -Bagging, Boosting, Stacking, Random Forest, **KNN** Classifier.

UNIT IV FORECASTING METHODS (9)

Forecasting – Forecasting Analytics, Time Plot, Lag plot, ACF plot, Aspect Ratio, Time Series Components (Trend, Seasonal, Irregular), Model based methods- Naïve, Simple Average, Moving Average, Weighted Moving Average. Data driven methods -Simple Exponential Smoothing, Holt's method, Winter's method. AR(p) model, MA(q) model, ARMA(p,q) model, Box Jenkins ARIMA model building.

UNIT V NEURAL NETWORKS AND TEXT MINING (9)

Neural Networks – Perceptron, Multi Layer Perceptron using Back Propagation method.

Text Mining - Applications, Complexity of Unstructured Text, Text Mining methods- Bag of words, Vector Source Model, Emotion Mining.

Course Outcomes:

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

1. Examine Exploratory Data Analysis for given data set.
2. Implement Unsupervised Learning algorithms for the given data set.
3. Apply Supervised Learning algorithms for the given data set.
4. Design Forecasting methods.
5. Illustrate MLP using Back Propagation method and Text Mining methods.

Text Book(s)

1. Aurelien Geron, Hands on Machine Learning with Scikit -Learn , Keras and Tensor Flow Concepts, Tools and Techniques to build intelligent Systems,2nd Edition by O'Reilly Media Publishers,2019.
2. Laura Igual Santi Seguí, Introduction to Data Science, A Python approach to concepts and Applications, Springer-2017.

Reference Books

1. Cathy O'Neil and Rachel Schutt ,Doing Data Science, Straight Talk From The Frontline, O'Reilly. 2014
2. Joel Grus, Data Science from Scratch: First Principles with Python, O'Reilly Media
3. Amir Aczel, Jayavel Souder Pandian, P. Saravanan, Complete Business Statistics, Mc Graw Hill publishers,2012.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Applications

MCA II Year I Semester

20MCAP113 CLOUD COMPUTING

L	T	P	C
3	0	0	3

Pre-requisite **Computer Networks**

Course Description:

Cloud computing is one of the emerging fields of computer science. Various IT vendors are working based on the cloud computing paradigm to offer computational resources, development platforms and application hosting services at service-level agreements (SLA)-backed performance and uptime promises for their services.

Course Objectives:

Students will be able to

1. Classify different computing paradigms
2. Explain the available services and deployment models used in cloud computing architecture
3. Describe the virtualization, migration model and related operations
4. Build the capacity planning to meet SLA and legal issues
5. Asses the risks and cloud security issues

UNIT I EVOLUTION OF CLOUD COMPUTING (9)

Computing paradigms -Distributed Computing, Grid Computing, Cluster Computing, Utility Computing; Overview of Cloud Computing -Introduction to Cloud Computing, properties, characteristics and disadvantages.

UNIT II CLOUD COMPUTING ARCHITECTURE (9)

Architecture- Cloud Computing Stack, Microsoft Azure Platform, Amazon EC2 Platform, Architecture for Elasticity, Best Practices in Architecture; Service Models –SaaS, PaaS, IaaS, general overview of everything as a service; Deployment Models - Public, Private, Hybrid and Community.

UNIT III VIRTUALIZATION (9)

Virtual Machines, Role of Virtualization, Types of Virtualization, VM primitive Operations, Virtualization Middleware, Virtualization of Clusters and Data centers, Virtual machines provisioning, VM Migration services, Management of Virtual machines for Cloud Infrastructures, OS-OpenStack and its components.

UNIT IV SERVICE MANAGEMENT IN CLOUD COMPUTING (9)

Scheduling Techniques for Advance Reservation of Capacity, Service Level Agreement (SLA), Capacity Management to Meet SLA Commitments, Cloud Economics, Data Management, MapReduce- Model, Fault Tolerance, Efficiency, Applications.

UNIT V CHANGE MANAGEMENT AND CLOUD SECURITY (9)

Organizational Readiness, Change management in the Cloud age, Infrastructure Security, data security and Storage, Identity and Access Management, Access Control and Trust, reputation and Risk, Introduction to Cloud Simulator.

Course Outcomes:

After completion of the course, students will be able to

1. Identify current computing paradigm of the real-time applications
2. Manage and schedule the virtually created computational resources in cloud environment
3. Assess the legal issues and security risks related cloud resources
4. Use cloud computing platforms for their start-ups at low cost
5. Explore the impact of cloud computing on legal and societal issues

Text Book(s)

1. Cloud Computing: Principles and Paradigms by Rajkumar Buyya.
2. Cloud Application Architectures: Building Applications and Infrastructure in the Cloud. George Reese, O'RedI SPD, 2011.
3. Cloud Computing, Soumya Kanti Gosh, 2017 (NPTEL E-Book).

Reference Books

1. Enterprise Cloud Computing Gautam Shroif, Cambridge University Press. 2010.
2. Cloud Computing: Implementation, Management and Security, John W. Rittinouse, James F Ransome. CRC Press, 2012.
3. Cloud Application Architectures: Building Applications and Infrastructure in the Cloud. George Reese, O'RedI SPD 2011.
4. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance,Tim Mather, SubraKtriaraswamy, ShahedLatif, O'Redç SPD, 2011.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Applications

MCA II YEAR I SEM

20MCAP206 FULL STACK WEB DEVELOPMENT LABORATORY

L	T	P	C
0	0	4	2

Pre-requisite Basic knowledge on Java, DBMS

Course Description:

Full Stack Web Development course will make students to become master in front-end technology. It provides basic information and experiments to grow to be a Full-Stack web developer. With fast growing technologies, the students can update their knowledge on technologies. This will help the students to learn the complete set of process like designing, development and deployment.

Course Objectives:

Students will be able to:

1. Acquire knowledge on web designing using front end tools
2. Develop coding using scripting languages
3. Develop applications using AJAX

List of Programs

1. Write a HTML Program to create a Website for your department using all HTML tags.
2. Write a Java Script program to perform Arithmetic Operations
3. Write a Java Script Program
   i. To Sort an Array of Strings
   ii. To print the array values using for loop
4. Develop a Javascript program to print the Even numbers less than the given number using do-while loop
5. Write a Javascript program to
   i. Check whether the person is eligible for vote or not using if statement
   ii. Print the Message “Good Morning”, “Good Afternoon” and “Good Evening” based on system timings. (Use If Else)
6. Write Javascript programs to perform all relational operations and show “True” or “False”
7. Write a Javascript program
   i. To count the number of vowels using functions
   ii. To perform the arithmetic operations using functions
8. Develop a web page using HTML, CSS and Javascript to display a Calculator. If the button is clicked for Normal Calculator it should display normal calculator. If the button is clicked for Scientific Calculator it should display the scientific calculator

9. Develop a Javascript program to create a validation form
10. Write a Javascript program to demonstrate the Javascript DOM Events
11. Create a form that collects the first name, last name, email, user id, password and confirm password from the user. All the inputs are mandatory and email address entered should be in correct format. Also, the values entered in the password and confirm password textboxes should be the same. After validating using JavaScript, display proper error messages in red color just next to the textbox where there is an error.
12. Write a Java Script Program to compute the average and grade of the student
13. Design an XML document to store information about a student in an engineering college affiliated to VTU. The information must include USN, Name, and Name of the College, Branch, Year of Joining, and email id. Make up sample data for 3 students. Create a CSS style sheet and use it to display the document

Course Outcomes:

After completion of the course, students will be able to

1. Implement webpages using HTML and CSS
2. Execute different types of Javascript programs
3. Apply the concepts of XML for web programming

Text Book(s)

1. Java Script for ProgrammersPaul J. Deitel, Deitel & Associates, Inc.Harvey M. Deitel, Deitel& Associates, Inc.
2. XSLT: Working with XML and HTMLKhun Yee Fung, Addison Wesley, 2000

Reference Books

1. Web Coding Bible, An Accelerated Course, Chong Lip Phang, 2015

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

Dept. of Computer Applications

MCA II Year I Semester

20MCAP207 DATA SCIENCE LABORATORY

L	T	P	C
0	0	4	2

Pre-requisite Basic Mathematics, Python Programming

Course Description:

This course will introduce the students to learn concepts and techniques to deal with various facets of Data Science practice including data collection and integration, Exploratory Data Analysis, Predictive modeling, Descriptive modeling and Forecasting concepts

Course Objectives:

Students will be able to:

1. Understand Exploratory Data Analysis concepts.
2. Understand Supervised and Unsupervised Learning concepts.
3. Explain Time Series Forecasting methods and MLP.

List of Programs:

1. Implement visualization techniques for a given data set using
   (a) Bar Graph (b) Histogram (c) Scatter plot (d) Box plot
2. Generate Association Rules for a given data set using Apriori algorithm.
3. Implement K-means Clustering algorithm and find the value of K using Elbow method
4. Implement Agglomerative Hierarchical Clustering algorithm
5. Implement Simple Linear Regression for a given data set
6. Implement Multiple Linear Regression for a given data set.
7. Implement Logistic Regression method for the given data set.
8. Implement Decision tree algorithm
9. Implement Random Forest method for given data set
10. Implement the following Time Series Forecasting methods
    (a) Naïve method (b) Simple average (c) Moving average (d) Single Exponential Smoothing
11. Implement KNN classifier
12. Implement Multilayer Perceptron using Back Propagation method

Mini Project : Implement Mini Project consists of various classifiers and specify which is the best for given data set.

Dept. of Computer Applications

Course Outcomes:

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

1. Analyze Exploratory Data Analysis for given data set.
2. Implement Unsupervised and Supervised Learning algorithms for the given data set.
3. Design Time Series Forecasting methods and MLP.

Text Book(s)

1. Wes Mc Kinney, *Python for Data Analysis*, O'Reilly,2012.
2. Jake Vanderplas, *Python Data Science Hand Book*, O'Reilly,2016

Reference Book

1. Andreas C. Muller, Sarah Guido, *Introduction to Machine Learning with Python: A Guide for Data Scientists,*O'Reilly,2016

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

Dept. of Computer Applications

MCA II YEAR I SEM

20MCAP208 ANDROID APPLICATION DEVELOPMENT LABORATORY

L	T	P	C
0	0	4	2

Pre-requisite CoreJava, XML

Course Description:

This course gives the practical experience to the students to develop android applications. It provides the methodology of creating user interface for different applications using different components in android and testing the interface properly. This course also gives idea on creating applications using Sensor Classes to work with different android sensors.

Course Objectives:

Student will be able to

1. Understand the installation of Android SDK
2. Get idea on the User Interface Design and their testing methodologies
3. Know the components of Android Building Blocks and how to use them for different application developments

List of Programs:

1. Develop an android application to display a simple text in the emulator
2. Develop an android application to display the internal keyboard in the emulator
3. i. Write an android program to display a message in the toast

   Write an android program to input a text through a text and the same must bedisplayed in the toast when a button is clicked on the screen
4. i. Develop an application to perform 5 arithmetic operations: Addition, Subtraction, Multiplication, Division and Modulo operation with necessary user interface creation

   ii. Develop an android application to process a student mark list by creating proper UI using the necessary controls
5. Write an android application to create a calculator
6. Create an android UI that consists of Different Departments of a company namely Production, Finance, Marketing and HR. If the user clicks on any department it should show details of that department. Use indents.
7. Design an android application to display a list of items on the android screen. If theuser clicks any one of the list items a dialogue box should show that the user has clicked that particular item (Use array adopters)

8. Develop an android application to show some categories such as education, entertainment, health, provisions etc., If the user clicks on any one of the items it should show the sub categories of the category and if is again clicked it should the details of those items. (Use indents and lists

9. i. Design an android application to create a service that shows the service is running in the background in the form of a toast

   ii. Develop an android application to create an alarm using the concept of service.

10. Develop an android application to demonstrate the database connectivity with the SQLite database to post and retrieve data through the User Interface(Example: Student mark list processing, Email Registration and Login, Products and sales)
11. Create an android application to demonstrate the working methodology of Broadcast Receivers.
12. Demonstrate the usage of Sensors in android by developing proper application

Course Outcomes:

After completion of the course, students will be able to

1. Do the installation of Android SDK and write simple programs
2. Write programs for different applications by creating different user interfaces and testingthem
3. Work on Sensor programs and network connectivity applications.

Text Book(s)

1. Android Programming-The Big Nerd Ranch Guide, Bill Philips, ChristStewart, Kristin Mariscano, Big Nerd Ranch publishers, 3rd Edition
2. Android Programming for Beginners, John Horton, PACKT publishers

Reference Books

1. Android Application Development All in One for Dummies
2. Android application Development-Black Book

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

Dept. of Computer Applications

MCA II Year I Semester

20MCAP401 CRYPTOGRAPHY AND NETWORK SECURITY

L	T	P	C
3	0	0	3

Pre-requisite **Computer Networks**

Course Description:

Network Security introduces techniques for protecting information and network components against attacks. It highlights the core cryptographic mechanisms and their implementation procedure to provide security for the data. Investigates various networking security standards and methods for enforcing and enhancing those standards. It also covers the electronic mailing system and supporting protocols.

Course Objectives:

Students will be able to

1. Gain knowledge about symmetric key encryption techniques
2. Study of asymmetric key cryptographic algorithms and encryption methods for security.
3. Understand the message authentication codes and hashing algorithms.
4. Understand the method of public, private key distribution and applications related to authentication.
5. Know about IP security and Transport layer security with supporting protocols

UNIT I SYMMETRIC CIPHERS (9)

Introduction to security attacks, services and mechanisms, Classical Encryption Techniques – Substitution Ciphers and Transposition Ciphers, Stream and Block Ciphers. Modern Block Ciphers: Block cipher principles, Shannon's theory of confusion and diffusion, fiestal structure, modular arithmetic, DES, AES.

UNIT II ASYMMETRIC CIPHERS (9)

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

UNIT III MESSAGE AUTHENTICATION (9)

Message Authentication Codes: Authentication requirements, authentication functions, message authentication code, hash functions, security of hash functions, Secure hash algorithm (SHA). Digital Signatures: Digital signature standards (DSS).

UNIT IV KEY DISTRIBUTION & AUTHENTICATION APPLICATIONS (9)

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

UNIT V NETWORK & TRANSPORT LAYER SECURITY (9)

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

Course Outcomes:

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

1. Acquire knowledge about block ciphering and symmetric ciphering techniques.
2. Implement RSA algorithm
3. Execute Secure Hashing and Digital Signature Algorithms.
4. Implement authentication applications Kerberos and MIME.
5. Apply Knowledge on IPsecurity, Transport layer security Protocols and system security

Text Book(s)

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

Reference Books

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

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Applications

MCA II Year I Semester

20MCAP402 DATA WAREHOUSING AND DATA MINING

L	T	P	C
3	0	0	3

Pre-requisite Databases

Course Description:
This course introduces the overview of Data warehouse and Data mining. It describes various Data Mining techniques. It also includes mining the complex objects such as spatial mining, text mining and web mining.

Course Objectives:
Students will be able to:

1. Know the fundamentals of Data mining and Data pre-processing techniques.
2. Understand the data warehouse and discover the frequent Item sets for the given data set.
3. Predict the knowledge from data sets using Classification techniques.
4. Understand the various clustering methods.
5. Learn the mining concepts for complex data objects.

UNIT I INTRODUCTION (9)

Fundamentals of data mining, Data Mining Functionalities, Classification of Data Mining systems, Data Mining Task Primitives

Data Pre-processing: Need for Pre-processing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction

UNIT II DATA WAREHOUSE TECHNOLOY AND ASSOCIATION RULES (9)

Data Warehouse, Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation

Mining Frequent Patterns, Associations and Correlations: Basic Concepts, Efficient and Scalable Frequent Item set Mining Methods, mining various kinds of Association Rules

UNIT III CLASSIFICATION AND PREDICTION (9)

Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Rule-Based Classification, Classification by Back propagation, Prediction, Evaluating the accuracy of a Classifier or a Predictor.

UNIT IV CLUSTER ANALYSIS (9)

Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid-Based Methods

UNIT V MINING COMPLEX DATA (9)

Spatial Data Mining, Multimedia Data Mining, Text Mining, Mining the World Wide Web, Mining Time Series data.

Course Outcomes:

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

1. Explore the knowledge about fundamentals of Data Mining and implement the methods of data pre-processing.
2. Generate the frequent item sets for the given data set using association rule mining.
3. Extract the knowledge by classification techniques.
4. Perform cluster analysis for the given data set.
5. Apply the data mining to advanced database applications.

Text Book(s)

1. Data Mining – Concepts and Techniques - Jiawei Han &MichelineKamber, Morgan Kaufmann Publishers, Third edition,2014
2. Data Mining Introductory and advanced topics –Margaret H Dunham, Pearson education

Reference Books

1. Data Mining Techniques – Arun K Pujari,2nd edition, Universities Press.
2. Introduction to Data Mining – Pang-Ning Tan, Michael Steinbach and Vipin Kumar, Pearson education.
3. Data Mining,V.Pudi and P.Radha Krishna, Oxford University Press

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Applications

MCA II Year I Semester

20MCAP403 IOT TECHNOLOGY AND APPLICATIONS

L	T	P	C
3	0	0	3

Pre-requisite **Computer Network, Artificial Intelligence**

Course Description:
Internet of Things is transforming our physical world into a complex and dynamic system of connected devices on an unprecedented scale. This course introduces the IoT technologies, protocols, and designing IoT systems with hardware basis. It provides basic information about Data Analytics and its Supporting Services. It imparts the Applications on industry, healthcare and smart cities.

Course Objectives:
Student will be able to:

1. Understand Smart Objects and IoT Architectures.
2. Identify the various IOT-related protocols
3. Create a simple IoT Systems using Arduino and Raspberry Pi.
4. Analyse the data analytics and cloud systems in the context of IoT
5. Classify the IoT infrastructure for popular applications.

UNIT I FUNDAMENTALS OF IoT (9)

Evolution of Internet of Things – Enabling Technologies – IoT Architectures: oneM2M, IoT World Forum (IoTWF) and Alternative IoT models – Simplified IoT Architecture- Core IoT Functional Stack– Smart Objects – Sensors, Actuators, Sensor Networks and Connecting Smart Objects

UNIT II IoT PROTOCOLS (9)

IoT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11ah and LoRaWAN – Network Layer: IP versions, The Key Advantages and Adoption of the Internet Protocol, Constrained Nodes and Networks – Optimizing IP for IoT: 6LoWPAN to 6Lo, Header Compression, Fragmentation , Mesh Addressing, Routing over Low Power and Lossy Networks – **Application Transport Methods**: SCADA – IoT Application Layer Protocols: CoAP and MQTT.

UNIT III BUILDING IoT WITH RASPBERRY PI AND ARDUINO (9)

Design Methodology – Embedded computing logic - Building IOT with RASPBERRY PI- IoT Systems– Logical Design using Python – IoT Physical Devices & Endpoints - IoT Device - Building blocks -Raspberry Pi -Board - Linux on Raspberry Pi - Raspberry Pi Interfaces - Programming Raspberry Pi with Python- IoT Design and Prototyping Using Arduino Boards.

UNIT IV DATA ANALYTICS AND SUPPORTING SERVICES (9)

Data Analytics for IoT: Structured Vs Unstructured Data, Data in Motion Vs Data in Rest – Role of Machine Learning – No SQL Databases – Hadoop Ecosystem – Apache Kafka, Apache Spark, lambda – Edge Streaming Analytics and Network.

UNIT V APPLICATIONS AND CASE STUDIES (9)

Applications: Smart and Connected Cities-Underlying Technologies for Smart Cities, Driverless Vehicles, Crowd sensing , Smart Buildings Smart Campuses, Smart Grid- Health Care-Agriculture: Crop Water Stress Index, Data Acquisition, IoT Irrigation System, Crop Disease and Pest Management

Case Study: Cisco IoT system, Smart City Streetlights Control and Monitoring

Course Outcomes:

After completion of the course, students will be able to

1. Explain the term "internet of things" in different contexts.
2. Analyze various protocols for IoT.
3. Design an IoT system using Raspberry PI/Arduino
4. Apply data analytics and use cloud offerings related to IoT.
5. Analyze applications of IoT in real time scenario.

Text Book(s)

1. IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, Cisco Press, 2017.
2. Hassan, Qusay F., ed. Internet of things A to Z: Technologies and Applications. John Wiley & Sons, 2018.

Reference Books

1. Arshdeep Bahga, Vijay Madisetti, "Internet of Things – A hands-on approach", Universities Press, 2015.
2. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), "Architecting the Internet of Things", Springer, 2011.
3. Olivier Hersent, David Boswarthick, Omar Elloumi , ―The Internet of Things – Key applications and Protocols, Wiley, 2012
4. Jan Ho¨ ller, Vlasios Tsiatsis , Catherine Mulligan, Stamatis , Karnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things – Introduction to a New Age of Intelligence", Elsevier, 2014.
5. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), ―Architecting the Internet of Things, Springer, 2011.
6. Michael Margolis, Arduino Cookbook, Recipes to Begin, Expand, and Enhance Your Projects, 2nd Edition, O'Reilly Media, 2011.
7. Kamal, Raj. Internet of Things- Architecture and Design Principles. McGraw-Hill Education, 2017.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Applications

MCA II Year I Semester

20MCAP404 AGILE SOFTWARE DEVELOPMENT PROCESS

L	T	P	C
3	0	0	3

Pre-requisite Software Engineering

Course Description:

Object oriented analysis, UML, Agile software development and Frameworks of Agile development. DevOps is fundamental for developers and application oriented personalities. Improved workflows and faster deployment will be helpful for developers in their project implementation.

Course Objectives:

Students will be able to:

1. Explain the object oriented techniques used in the real world software industries.
2. Acquire knowledge about the classes, objects and UML diagrams.
3. Compare agile with traditional software development and Contrast different agile methodologies.
4. Analyze the DevOps relationship to Agile, Lean and ITSM.
5. Improve workflows and speed up deployment.

UNIT I INTRODUCTION TO OBJECT ORIENTED ANALYSIS (9)

Introduction: SDLC & its variations, Approaches to system development, SSAD, OOAD, Unified Process and its characteristics, Unified Process life cycle, Basics of Object Orientation- OO development and its themes; Modelling and usefulness of OO development

UNIT II OBJECT ORIENTED MODELING AND UML (9)

Object Oriented Modeling-Capturing, modeling, documenting system requirements, and Object oriented basic components; Dynamic Modeling- Use-case Modeling and Various UML diagrams.

UML: Introduction to UML, UML Building Blocks. Conceptual model of UML, Architecture, Classes, Relationships, Common Mechanisms, Class-Object-Sequence-Activity-Use Case Diagrams.

UNIT III INTRODUCTION TO AGILE AND ITS SIGNIFICANCE (9)

Software Development Process. Iterative and Evolutionary Methods. Agile software development Vs other traditional methods. Agile Manifesto: Principles, and Benefits of agile development, User Stories, Generating User Stories. Agile Story: Evolutionary delivery, Scrum Demo, Planning game, Sprint back log, adaptive planning. Agile Motivation Problems with the Waterfall - Research Evidence; Agile roles.

UNIT IV AGILE FRAMEWORK (9)

Method Overview, Life cycle phases and Work product roles and practices- Scrum, Extreme Programming., Unified process, EVO

UNIT V INTRODUCTION OF DEVOPS (9)

Continuous Delivery, and the three ways The Principles of Flow Feedback Continual Learning and Experimentation. Selecting which value stream to start with Understanding the Work in our value stream Making it visible Expanding - Design Organization and architecture Outcomes by Integrating Operations.

Course Outcomes:

After completion of the course, students will be able to

1. Analyze the object oriented techniques.
2. UML diagrams for real-world project components.
3. Identify the significance of agile development over the traditional approaches.
4. To examine the different frameworks of agile software development approaches.
5. To analyze DevOps and its relationship with agile development.

Text Book(s)

1. Object Oriented Analysis and Design with Applications by Grady Booch Robert, Third Edition.
2. Agile Software Development Best Practices for Large Software Development Projects by Thomas Stober, and Uwe Hansmann.
3. Shore, James. The Art of Agile Development: Pragmatic guide to agile software development. "O' Reilly Media, Inc.", 2007.
4. The DevOps Handbook by Gene Kim, Jez Humble, Patrick Debois and John Willis.

Reference Books

1. Object - Oriented Modeling and Design with UML 2nd Edition.
2. Agile Software Development, Principles, Patterns, and Practices by Robert C. Martin
3. Effective DevOps, by Jennifer Davis, Ryn Daniels.
4. DevOps for Web Development by MiteshSoni.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Applications

MCA II Year I Semester

20MCAP405 WEB PROGRAMMING

L	T	P	C
3	0	0	3

Pre-requisite Basic HTML, Computer Networks

Course Description:
This course enables students to have strong fundamentals in web programming using PHP, This course helps students to understand various concepts of web page designing, and to establish connection between the front end PHP forms with the backend database. This course helps the students to develop dynamic websites for different applications

Course Objectives:
Students will be able to:

1. Understand HTML Tags – Both basics and Advanced, PHP basics, Operators, Control structures and arrays
2. Learn String manipulation, Function concepts and Regular Expressions
3. Know Object oriented concepts and their implementation PHP.
4. Learn Database concepts, and analyze different types of Queries in MySQL
5. Know advanced PHP concepts, to develop application using PHP

UNIT I INTRODUCTION TO HTML TAGS, PHP BASICS AND ARRAYS (9)

Basic Tags in HTML, Advanced HTML Tags, CSS Concepts, Linking CSS and HTML. PHP Introduction: Evolution of PHP, Static Vs Dynamic Web pages, PHP servers for different Operating Systems, PHP Data types, Variables in PHP, User defined variable declaration, Scope of variables, Operators and their precedence in PHP, Conditional and Looping/Iterative constructs in PHP. Arrays: Types, Array Operators, Array Manipulation, Useful Library functions in Arrays

UNIT II STRINGS, REGULAR EXPRESSIONS & FUNCTIONS (9)

Strings: Creating a string and accessing, Formatting Strings, Searching and Replacing String, String Functions. Regular Expressions: Basics, Types, Pattern matching, Replacing text, Splitting strings using Regular Expressions. Functions: Built in functions, User defined functions, Returning values from function, Call by Value and Call by Reference, Recursion)

UNIT III OBJECT ORIENTED CONCEPTS AND EXCEPTION HANDLING (9)

Basic concepts in OOPs, Object Oriented PHP, Creation of Classes and Operations in PHP using OOPs, Implementing different types of Inheritance using PHP, Advanced object oriented functionality. Exception Handling: Exceptions Vs Errors, Implementing Try, Catch and Throw in PHP

UNIT IV DATABASE AND MYSQL (9)

RDBMS concepts, Database Architecture and Web Database Architecture, MySQL: Creating tables, Usage of Primary keys and Foreign Keys, Inserting data into tables, Data manipulation with MySQL databases using join queries and sub queries

UNIT V ADVANCED PHP (9)

PHP Forms and validation checking, PHP Sessions: Starting PHP Session, Session variables, Modifying Session variables, Destroying Session. PHP Cookies, Connecting PHP with MySQL, Authentication using PHP and MySQL. Secure data Transaction using PHP and MySQL. Developing applications in PHP by connecting with MySQL

Course Outcomes:

After completion of the course, students will be able to

1. Work with basic and advanced tags in HTML & CSS and basic programs in PHP using arrays and embedding PHP tags with HTML tags.
2. Write programs in PHP using Functions, strings and regular expressions.
3. Apply object oriented approach in PHP programming
4. Develop different MySQL Queries for data manipulation and mechanism of RDBMS to connect with PHP.
5. Develop a complete end-to-end web application using PHP

Text Book(s)

1. The Complete Reference – PHP, Steven Holzner, McGrawHill, 2007
2. Programming PHP - Creating dynamic web pages, RasmusLerdorf,KevinTatroe and Peter B. MacIntyre, O'Reilly, 2006

Reference Books

1. The Joy of PHP, Alan Forbes, Copyright Material, 2017
2. Programming PHP MySQL- Let’s Explore, HirdeshBharadwaj, Educreation Publishing, 2 nd Edition

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Applications

MCA II Year I Semester

20MCAP406 IMAGE PROCESSING

L	T	P	C
3	0	0	3

Pre-requisite **Basics of Computer Graphics**

Course Description:

This course is designed to provide basic understanding on image processing. The course material further used for developing any digital image processing applications. Course covers image enhancement methods, image restoration techniques, multi-resolution analysis, image segmentation models, feature extraction methods, supervised, unsupervised algorithms and applications.

Course Objectives:

Student will be able to:

1. Understand the basic concepts of digital image processing.
2. Understand the image enhancement techniques.
3. Expose the various image processing techniques and their applications.
4. Expose the use of current technologies in image processing systems.
5. Apply real world applications of image processing.

UNIT I FUNDAMENTALS OF IMAGE PROCESSING (9)

Introduction – Applications of image processing – Steps in image processing applications – Digital imaging system – Sampling and quantization – Pixel connectivity – Distance measures – Color fundamentals and models – File formats – Image operations

UNIT II IMAGE ENHANCEMENT (9)

Image Transforms: Discrete Fourier Transform – Fast Fourier Transform – Discrete Cosine Transform – Image Enhancement in Spatial and Frequency Domain – Grey Level Transformations – Histogram Processing –Spatial Filtering – Smoothing And Sharpening –Frequency Domain: Filtering in Frequency Domain.

UNIT III IMAGE RESTORATION AND MULTI-RESOLUTION ANALYSIS (9)

Multi Resolution Analysis: Image Pyramids – Multi Resolution Expansion – Wavelet Transforms – Image Restoration – Image Degradation Model – Noise Modelling – Blur – Order Statistic Filters – Image Restoration Algorithms.

UNIT IV IMAGE SEGMENTATION AND FEATURE EXTRACTION (9)

Image Segmentation – Detection of Discontinuities –Edge Operators –Edge Linking and Boundary Detection – Thresholding – Region based Segmentation – Image Features and

Extraction – Image Features – Types of Features – Feature Extraction – SIFT, SURF and Texture – Feature Reduction Algorithms

UNIT V **IMAGE PROCESSING APPLICATIONS** **9 hours**

Image Classifiers – Supervised Learning – Support Vector Machines, Image Clustering – Unsupervised Learning – Hierarchical and Partition based Clustering Algorithms – EM Algorithm

Course Outcomes:

After completion of the course, students will be able to

1. Understand basic image processing operations.
2. Apply new techniques in the areas of image enhancement and restoration.
3. Understand the image segmentation algorithms.
4. Extract features from images by using classifiers and clustering algorithms.
5. Design image processing application that uses different concepts of image processing.

Text Book(s)

1. Rafael Gonzalez, Richard E. Woods, "Digital Image Processing", Fourth Edition, Pearson Education, 2018.
2. Milan Sonka, Vaclav Hlavac, Roger Boyle, "Image Processing Analysis and Machine Vision", Fourth Edition, Cengage India, 2017.

Reference Books

1. S. Sridhar, "Digital Image Processing", Second Edition, Oxford University Press, 2016.
2. Anil K. Jain, "Fundamentals of Digital Image Processing", PHI, 2011.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Applications

MCA II Year I Semester

20MCAP407 BIOMETRIC SECURITY

L	T	P	C
3	0	0	3

Pre-requisite **Computer Networks**

Course Description:

Biometrics has emerged as a specialized field in criminal forensics, public safety surveillance, user authentication and identification. Expansion of biometric modalities are ranged from fingerprint, face and other traits to multimodal biometric traits.

Course Objectives:

Students will be able to

1. Understand the fundamentals of biometric security
2. Acquire knowledge on standard algorithms and protocols used to provide confidentiality, integrity and authenticity.
3. Understand the various key distribution and management strategies.
4. Understand how to deploy encryption techniques to secure data using biometric
5. Design security applications in the field of Information technology

UNIT I ATTACKS IN BIOMETRIC (9)

Adversary attacks-attacks at the user Interface-Attacks on the biometric processing, Attacks on template database –system security analysis – spoofing and mimicry attacks

UNIT II BIOMETRIC AUTHENTICATION PROTOCOLS (9)

Introduction-biometric based secure cryptographic protocols – biometrics based cryptographic key Regeneration and sharing – Biometrics based session key generation and sharing protocol – performance evaluation strategies.

UNIT III BIOMETRIC CRYPTOGRAPHY (9)

Protection of biometric data –biometric data shuffling scheme- experimental results –security analysis - cryptographic key Reservation - cryptographic key with Biometrics-Revocability in key generation system-Adaptations of Generalized key Regeneration scheme –IRIS Biometrics –Face Biometrics –Extension of Key Regeneration scheme.

UNIT IV BIOMETRIC DATA PROTECTION (9)

Biometric data – Concept of personal data – Data protection and privacy – Security criteria for Biometric system – Adoption of security – Revocation procedures – Security and organizational aspects of biometric system.

UNIT V BIOMETRIC MULTI MODAL AND APPLICATIONS (9)

Integration – Multiple traits – Multiple snapshots – Score fusion methods – Applications – Board Security – Identification cards – Biometrics on smart cards – Overview of local and global structure –Mechanism for on card comparison – Off card and On card alignment – Smart textile sensors – Bio signals – Biometrics and intelligence services.

Course Outcomes:

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

1. Implement basic security algorithms required by the biometric system.
2. Analyze the vulnerabilities in biometric system and hence be able to design a security Solution.
3. Analyze the possible security attacks in complex real time systems and their effective Countermeasures
4. Identify the security issues in the network and resolve it.
5. Formulate research problems in the biometric security field

Text Book(s)

1. David Check Ling Ngo,Andrew Beng Jin Teoh,Jiankun Hu "Biometric Security" Cambridge Scholars, 2015
2. Els. J.Kindt, Privacy and data protection issues of Biometric Applications- , springer,2013.

Reference Books

1. Anil K. Jain, Arun Ross, and Karthik Nandakumar, “Introduction to Biometrics”, Springer, 2011
2. Eliza Yinzi Du, ―Biometrics from fiction to practice‖, Panstandford Publishers 2012.

   James wayman, ―Introduction to Biometrics‖, Springer 2011
3. Liangwang,Xin Geng "Behavioral Biometrics for Human Identifications Intelligent Applications" Medical Information Science Reference, IGI Global 2010
4. Patrizio campisi "Security and Privacy in Biometrics" Springer 2013

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Applications

MCA II Year I Semester

20MCAP408 MACHINE LEARNING

L	T	P	C
3	0	0	3

Pre-requisite Algorithm Design & Programming, Probability & Statistics

Course Description:

This course provides a concise introduction to the fundamental concepts in machine learning and popular machine learning algorithms. This will cover the standard and most popular supervised learning algorithms including linear regression, logistic regression, decision trees, k-nearest neighbour, an introduction to Bayesian learning and the naïve Bayes algorithm, support vector machines and neural networks.

Course Objectives:

Students will be able to:

1. Know about overview of machine learning.
2. Learn about Regression and Classification methods.
3. Gain knowledge on Graphical models and Hidden Markov models.
4. Understand Clustering methods for real world problems
5. Learn neural networks for various inputs and expected outputs

UNIT I INTRODUCTION **(9)**

Well posed learning problems, Designing a Learning system, Perspectives and issues in Machine Learning, Types of Machine Learning, Bayes theorem and Concept learning, Maximum likelihood and least squared Error hypotheses

UNIT II REGRESSION & CLASSIFICATION **(9)**

Simple Linear Regression, Multiple Linear Regression, Classification Methods- Logistic regression, Nearest neighbor Classifier- Decision trees- Support Vector Machine.

UNIT III GRAPHICAL MODELS **(9)**

Graphical models- Bayesian networks- Conditional independence Markov random fields- Inference in graphical models- Belief propagation- Markov models- Hidden Markov models

UNIT IV CLUSTERING **(9)**

Clustering Methods-Partitioned based Clustering – K means, K medoids; Hierarchical Clustering – Agglomerative, Divisive, Distance measures; Density based Clustering, Gaussian model

UNIT V ARTIFICIAL NEURAL NETWORKS (9)

Neural network representation, Perceptron, Multi Layer Perceptron with Back propagation, An Illustrative example: Face Recognition, Advance topics in Artificial Neural Networks

Course Outcomes:

After completion of the course the students will be able to:

1. Select real-world applications that needs machine learning based solutions.
2. Implement supervised Machine Learning algorithm
3. Apply Graphical models for Machine Learning
4. Implement the appropriate Clustering methods for real world problems
5. Implement MLP.

Text Book(s)

1. Aurelien Geron, *Hands on Machine Learning with Scikit -Learn , Keras and Tensor Flow Concepts, Tools and Techniques to build intelligent Systems*,2nd Edition by O'Reilly Media Publishers, 2019.
2. Tom Michel , "Machine Learning", Mc.Graw Hill, Indian Edition, 1997.

Reference Books

1. Mohri, Rostamizadeh and Talwalkar, "Foundations of Machine Learning", MIT Press, 2012
2. Laura Igual Santi Seguí, *Introduction to Data Science, A Python approach to concepts and Applications,* Springer-2017.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Applications

MCA II Year I Semester

20MCAP409 WIRELESS SENSOR NETWORKS

L	T	P	C
3	0	0	3

Pre-requisite **Computer Network basics**

Course Description:

This course covers the fundamentals of wireless sensor design and technology, the communication protocols used, compatible operating System and the application requirements of Wireless Sensor Networks

Course Objectives:

Student will be able to:

1. Introduce the characteristics and basic concepts in wireless sensor networks.
2. Identify the trends and latest development of the technologies in the area.
3. Illustrate architecture and protocols in wireless sensor networks.
4. Understand Transport control and middleware technology in WSN
5. Recognize the suitable OS for WSN.

UNIT I INTRODUCTION AND WSN STANDARDS (9)

Introduction, Overview and Applications of Wireless Sensor Networks Introduction, Basic overview of the Technology, Applications of Wireless Sensor Networks: WSN Standards, IEEE 802.15.4, Zigbee. Network Architectures and Protocol Stack – Network architectures for WSN, classification of WSN, protocol stack for WSN.

UNIT II WIRELESS SENSOR TECHNOLOGY (9)

Basic Wireless Sensor Technology and Systems: Introduction, Sensor Node Technology, Sensor Taxonomy, WN Operating Environment, WN Trends, Wireless Transmission Technology and Systems: Introduction, Radio Technology Primer, Available Wireless Technologies

UNIT III ROUTING PROTOCOLS FOR WSN (9)

MAC and Routing Protocols for Wireless Sensor Networks: Introduction, Background, Fundamentals of MAC Protocols, MAC Protocols for WSNs, Sensor-MAC case Study, IEEE 802.15.4 LR-WPANs Standard Case Study. Routing Protocols for Wireless Sensor Networks: Introduction, Background, Data Dissemination and Gathering, Routing Challenges and Design Issues in WSNs, Routing Strategies in WSNs

UNIT IV TRANSPORT CONTROL AND MIDDLEWARE FOR WSN (9)

Traditional Transport Control Protocols, Transport Protocol Design Issues, Examples of Existing Transport Control Protocols, Performance of Transport Control Protocols. Middleware for Wireless Sensor Networks: Introduction, WSN Middleware Principles, Middleware Architecture, Existing Middleware.

UNIT V NETWORK MANAGEMENT AND OPERATING SYSTEM FOR WSN (9)

Introduction, Network Management Requirements, Traditional Network Management Models, Network Management Design Issues. Operating Systems for Wireless Sensor Networks: Introduction, Operating System Design Issues, Examples of Operating Systems.

Course Outcomes:

After completion of the course, students will be able to

1. Architect sensor networks for various applications and WSN Standard
2. Determine suitable medium access protocols, localization techniques.
3. Identify suitable routing protocols for WSN.
4. Illustrate various Transport Control Protocols for WSN.
5. interpret the suitable Operating Systems for WSN.

Text Book(s)

1. Kazem Sohraby, Daniel Minoli, Taieb Znati, “wireless sensor networks: technology, protocols and applications:, wiley , second edition (indian) , 2014.
2. Mahmood, Zaigham, ed. *Security, Privacy and Trust in the IoT Environment*. Springer, 2019.

Reference Books

1. Ian F. Akyildiz, Mehmet Can Vuran "Wireless Sensor Networks", Wiley 2010
2. Feng Zhao & Leonidas J. Guibas, “Wireless Sensor Networks- An Information Processing Approach", Elsevier, 2007
3. Jun Zheng, Abbas Jamalipour, “Wireless Sensor Networks: A Networking Perspective”, Wiley, 2009.
4. Ibrahiem M. M. El Emary, S. Ramakrishnan, “Wireless Sensor Networks: From Theory to Applications”, CRC Press Taylor & Francis Group, 2013

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Applications

MCA II Year I Semester

20MCAP410 SOFTWARE QUALITY ASSURANCE AND TESTING

L	T	P	C
3	0	0	3

Pre-requisite **None**

Course Description:

This course covers software quality assurance and testing practices which are applied in in real-time. These learning practices help the students to understand about how software quality assurance steps takes place and how to check software testing with various standard techniques. With concepts and knowledge gained from this course, one can easily become part of industrial software production.

Course Objectives:

Student will be able to:

1. Understand the basics of testing, test planning &design and test team organization
2. Study the various types of test in the life cycle of the software product.
3. Build design concepts for system testing and execution
4. Learn the software quality assurance, metrics, defect prevention techniques
5. Learn the techniques for quality assurance and applying for applications

UNIT I SOFTWARE TESTING - CONCEPTS, ISSUES, AND TECHNIQUES (9)

Quality Revolution, Verification and Validation, Failure, Error, Fault, and Defect, Objectives of Testing, Testing Activities, Test Case Selection White-Box and Black ,test Planning and design, Test Tools and Automation, . Power of Test. Test Team Organization and Management-Test Groups, Software Quality Assurance Group ,System Test Team Hierarchy, Team Building.

UNIT II SYSTEM TESTING (9)

System Testing - System Integration Techniques-Incremental, Top Down Bottom Up Sandwich and Big Bang, Software and Hardware Integration, Hardware Design Verification Tests, Hardware and Software Compatibility Matrix Test Plan for System Integration. Built- in Testing. functional testing - Testing a Function in Context. Boundary Value Analysis, Decision Tables. acceptance testing - Selection of Acceptance Criteria, Acceptance Test Plan, Test Execution Test.

UNIT III SYSTEM TEST CATEGORIES (9)

System test categories Taxonomy of System Tests, Interface Tests Functionality Tests. GUI Tests, Security Tests Feature Tests, Robustness Tests, Boundary Value Tests Power Cycling Tests Interoperability Tests, Scalability Tests, Stress Tests, Load and Stability Tests, Reliability Tests, Regression Tests, Regulatory Tests.

UNIT IV SOFTWARE QUALITY (9)

Software quality - People's Quality Expectations, Frameworks and ISO-9126, McCall's Quality Factors and Criteria – Relationship. Quality Metrics. Quality Characteristics ISO 9000:2000 Software Quality Standard. Maturity models- Test Process Improvement ,Testing Maturity Model.

UNIT V SOFTWARE QUALITY ASSURANCE (9)

Quality Assurance - Root Cause Analysis, modeling, technologies, standards and methodologies for defect prevention. Fault Tolerance and Failure Containment - Safety Assurance and Damage Control, Hazard analysis using fault-trees and event-trees. Comparing Quality Assurance Techniques and Activities. QA Monitoring and Measurement, Risk Identification for Quantifiable Quality Improvement. Case Study: FSM-Based Testing of Web-Based Applications.

Course Outcomes:

After completion of the course, students will be able to

1. Perform functional and nonfunctional tests in the life cycle of the software product.
2. Understand system testing and test execution process.
3. Identify defect prevention techniques and software quality assurance metrics.
4. Analyze quality and reliability metrics to ensure the performance of the software
5. Apply techniques of quality assurance for typical applications.

Text Book(s)

1. Software Testing And Quality Assurance-Theory and Practice, Kshirasagar Nak Priyadarshi Tripathy, John Wiley & Sons Inc,2008

Reference Books

1. Software Quality Engineering: Testing, Quality Assurance, and Quantifiable Improvement, Jeff Tian, John Wiley & Sons, Inc., Hoboken, New Jersey. 2005.
2. Software Quality Assurance - From Theory to Implementation, Daniel Galin, Pearson Education Ltd UK, 2004
3. Software Quality Assurance, Milind Limaye, TMH ,New Delhi, 2011

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Applications

MCA II Year I Semester

20MCAP411 COMPUTER GRAPHICS AND MULTIMEDIA

L	T	P	C
3	0	0	3

Pre-requisite **Basic concepts of Algorithms**

Course Description:
This course introduces the different types of graphical devices, various types of transformations, Line and Circle drawing algorithms, color models that are used in display devices and Multimedia graphical concepts

Course Objectives:
Student will be able to:

1. Understand the two dimensional graphics and their transformations.
2. Know about graphics hardware devices and software used.
3. Appreciate illumination and color models.
4. Understand the three dimensional graphics and their transformations.
5. Be familiar with understand clipping techniques.

UNIT I INTRODUCTION (9)

Survey of computer graphics, Overview of graphics systems – Video display devices, Raster scan systems, Random scan systems, Graphics monitors and Workstations, Input devices, Hard copy Devices, Graphics Software; Output primitives – Point Plotting Techniques, Qualities of good line drawing algorithms, The Digital Differential Analyzer (DDA), Bresenham's Algorithm, Generation of Circles

UNIT II TWO DIMENSIONAL GRAPHICS (9)

Two dimensional geometric transformations – Matrix representations and homogeneous coordinates, composite transformations; Two dimensional viewing – viewing pipeline, viewing coordinate reference frame; widow-to-viewport coordinate transformation, Two dimensional viewing functions; clipping operations – point, line, and polygon clipping algorithms.

UNIT III THREE DIMENSIONAL GRAPHICS (9)

Three dimensional concepts; Three dimensional object representations – Polygon surfaces- Polygon tables- Plane equations – Polygon meshes; Curved Lines and surfaces, Quadratic surfaces; Blobby objects; Spline representations – Bezier curves and surfaces -B-Spline curves and surfaces. TRANSFORMATION AND VIEWING: Three dimensional geometric and modeling transformations – Translation, Rotation, Scaling, composite transformations; Three dimensional viewing – viewing pipeline, viewing coordinates, Projections, Clipping; Visible surface detection methods.

UNIT IV ILLUMINATION AND COLOUR MODELS (9)

Light sources – basic illumination models – halftone patterns and dithering techniques; Properties of light – Standard primaries and chromaticity diagram; Intuitive colour concepts – RGB colour model – YIQ colour model – CMY colour model – HSV colour model – HLS colour model; Colour selection

UNIT V ANIMATIONS GRAPHICS (9)

Design of Animation sequences – animation function – raster animation – key frame systems – motion specification –morphing – tweening. COMPUTER GRAPHICS REALISM: Tiling the plane – Recursively defined curves – Koch curves – C curves – Dragons – space filling curves – fractals – Grammar based models – fractals – turtle graphics – ray tracing

Course Outcomes:

After completion of the course, students will be able to

1. Illustrate the concepts of Graphical devices and basics of drawing algorithms
2. Apply the concepts of 2D and 3D transformations
3. Apply different types of equations related to computer graphics
4. Illustrate different types of Color Models
5. Analyze concepts of Multimedia

Text Book(s)

1. John F. Hughes, Andries Van Dam, Morgan Mc Guire ,David F. Sklar , James D. Foley, Steven K. Feiner and Kurt Akeley ,"Computer Graphics: Principles and Practice", , 3rd Edition, Addison- Wesley Professional,2013..
2. Donald Hearn and Pauline Baker M, "Computer Graphics", Prentice Hall, New Delhi, 2007

Reference Books

1. Donald Hearn and M. Pauline Baker, Warren Carithers,"Computer Graphics With Open GL", 4th Edition, Pearson Education, 2010.
2. Peter Shirley, Michael Ashikhmin, Michael Gleicher, Stephen R Marschner, Erik Reinhard, KelvinSung, and AK Peters, Fundamental of Computer Graphics, CRC Press, 2010.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Applications

MCA II Year I Semester

20MCAP412 VIDEO ANALYTICS

L	T	P	C
3	0	0	3

Pre-requisite None

Course Description:
This course covers video analytics details and practices which are applied in in real-time. These learning practices help the students to understand, what skills they required and how to apply them in video analytics. With these concepts and knowledge gained from this course, one can easily become part of IT and other relevant domains.

Course Objectives:
Student will be able to:

1. Understand the fundamental concepts of big data and analytics
2. Explain various techniques for mining data streams
3. Acquire the knowledge of extracting information from surveillance videos.
4. Analyse Event Modelling for different applications.
5. Demonstrate and understand the models used for recognition of objects in videos.

UNIT I INTRODUCTION TO BIG DATA & DATA ANALYSIS (9)

Introduction to Big Data Platform – Challenges of Conventional systems – Web data- Evolution of Analytic scalability- analytic processes and tools- Analysis Vs Reporting- Modern data analytic tools- Data Analysis: Regression Modeling- Bayesian Modeling- Rule induction.

UNIT II MINING DATA STREAMS (9)

Introduction to Stream concepts- Stream data model and architecture – Stream Computing- Sampling data in a Stream- Filtering Streams- Counting distinct elements in a Stream- Estimating moments- Counting oneness in a window- Decaying window- Real time Analytics platform(RTAP) applications- case studies.

UNIT III VIDEO ANALYTICS (9)

Introduction- Video Basics - Fundamentals for Video Surveillance- Scene Artifacts- **Object Detection and Tracking**: Adaptive Background Modelling and Subtraction- Pedestrian Detection and TrackingVehicle Detection and Tracking- Articulated Human Motion Tracking in Low-Dimensional Latent Spaces.

UNIT IV BEHAVIOURAL ANALYSIS & ACTIVITY RECOGNITION (9)

Event Modelling- Behavioural Analysis- Human Activity Recognition-Complex Activity Recognition- Activity modelling using 3D shape, Video summarization, shape based activity models- Suspicious Activity Detection.

UNIT V HUMAN FACE RECOGNITION & GAIT ANALYSIS (9)

Introduction: Overview of Recognition algorithms – Human Recognition using Face: Face Recognition from still images, Face Recognition from video, Evaluation of Face Recognition Technologies- Human Recognition using gait: HMM Framework for Gait Recognition, View Invariant Gait Recognition, Role of Shape and Dynamics in Gait Recognition.

Course Outcomes:

After completion of the course, students will be able to

1. Understand with big data platform and its analysis techniques.
2. Explain efficient algorithms for mining the data from large volumes.
3. Analyse with surveillance videos for analytics.
4. Demonstrate optimization algorithms for better analysis and recognition of objects in a scene.
5. Understand how to model a framework for Human Activity Recognition

Text Book(s)

1. Anand Rajaraman and Jeffrey David Ullman, Mining of Massive Datasets, Cambridge University Press, 2012.
2. Anand Rajaraman and Jeffrey David Ullman, Mining of Massive Datasets, Cambridge University Press, 2012.
3. Rama Chellappa, Amit K.Roy-Chowdhury, Kevin Zhou.S, “Recognition of Humans and their Activities using Video”, Morgan&Claypool Publishers, 2005.

Reference Books

1. Michael Berthold, David J.Hand, Intelligent Data Analysis, Springer, 2007.
2. Yunqian Ma, Gang Qian, “Intelligent Video Surveillance: Systems and Technology”, CRC Press (Taylor and Francis Group), 2009.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Applications

MCA II Year I Semester

20MCAP413 CYBER SECURITY

L	T	P	C
3	0	0	3

Pre-requisite **Computer Networks**

Course Description:

This course provides secure communication and ensuring confidentiality and integrity of information in the field of information technology. It deals with the techniques and mathematics used to provide information security. It also provides importance of Cyber Law and its objectives, Policies.

Course Objectives:

Students will be able to

1. Understand the nature of threats and cyber security management goals technology
2. Understand the landscape of hacking and perimeter defense mechanisms
3. Develop strategies for cyber security and protecting critical infrastructure
4. Understand policies to mitigate cyber risks and digital signature
5. Understand the IT Act , scheme, amendments, IPR and emerging cyber law and desired cyber ecosystem capabilities.

UNIT I INTRODUCTION TO CYBER SECURITY (9)

Introduction- Cyberspace, Cyber Crime, Nature of Threat, Cyber security, Cyber security Policy, Mission and Vision of Cyber security Program. Cyber security management system- goals, technology categories – perimeter defense and encryption. Cyber security management framework.

UNIT II CYBER SECURITY MANAGEMENT SYSTEM (9)

Introduction to Hacker Means, Social Engineering, Scanners, password Cracking, IP Spoofing Trojan Horses. Case study: an example of how a bank/plant was hacked. The Cyber Security Management System: Policy - Password Management, Anti-Virus, Incident Handling, Backup and Recovery, Proprietary Information. Technology - Perimeter Defense, Types of Network Security Devices - Firewalls, Intrusion Detection Systems, Content Filtering, Virtual Private Networks, Encryption.

UNIT III STRATEGIES FOR CYBER SECURITY (9)

Creating a Secure Cyber, Types of Attacks, Comparison of Attacks, Creating an Assurance Framework, Encouraging Open Standards, Strengthening the Regulatory framework, Creating Mechanisms for IT Security, Securing E-Governance Services, Protecting Critical Information Infrastructure.

UNIT IV POLICIES TO MITIGATE CYBER RISK (9)

Promotion of R&D in Cyber security, Reducing Supply Chain Risks, Mitigate Risks through Human Resource Development, Creating Cyber security Awareness, Information sharing Implementing a Cyber security Framework. SIGNATURES -Digital Signature, Electronic Signature, Digital Signature to Electronic.

UNIT V CYBER LAW (9)

Information Technology Act: Salient Features, Scheme, Application of the I.T. Act, Amendments I.T. Act , Offences,Compounding of Offences. INTELLECTUAL PROPERTY RIGHTS: Types of Intellectual Property Rights, Intellectual Property Rights in India, Intellectual Property in Cyber Space. Emerging Trends of Cyber Law. Desired Cyber Ecosystem Capabilities.

Course Outcomes:

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

1. Implement basic security algorithms required by the biometric system.
2. Analyze the vulnerabilities in biometric system and hence be able to design a security Solution.
3. Analyze the possible security attacks in complex real time systems and their effective Countermeasures
4. Identify the security issues in the network and resolve it.
5. Formulate research problems in the biometric security field

Text Book(s)

1. David Check Ling Ngo, Andrew Beng Jin Teoh, Jiankun Hu "Biometric Security" Cambridge Scholars, 2015
2. Els. J.Kindt, Privacy and data protection issues of Biometric Applications- , springer,2013.

Reference Books

1. Anil K. Jain, Arun Ross, and Karthik Nandakumar, “Introduction to Biometrics”, Springer, 2011
2. Eliza Yinzi Du, ―Biometrics from fiction to practice‖, Panstandford Publishers 2012.

   James wayman, ―Introduction to Biometrics‖, Springer 2011
3. Liangwang,Xin Geng "Behavioral Biometrics for Human Identifications Intelligent Applications" Medical Information Science Reference, IGI Global 2010
4. Patrizio campisi "Security and Privacy in Biometrics" Springer 2013

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Applications

MCA II Year I Semester

20MCAP414 DEEP LEARNING

L	T	P	C
3	0	0	3

Pre-requisite Algorithms, Machine Learning

Course Description:

This course covers the theoretical foundations, algorithms and methodologies of various Deep Neural Network models.

Course Objectives:

Students will be able to

1. Understand basics of Machine Learning
2. Design Deep Learning architectures.
3. Understand Convolution Neural networks.
4. Understand Recurrent Neural networks.
5. Design and develop an application using specific deep learning models

UNIT I MACHINE LEARNING BASICS (9)

Learning algorithms, Building machine learning algorithm, Neural Networks Multilayer Perceptron, Back-propagation algorithm and its variants Stochastic gradient decent, Curse of Dimensionality

UNIT II DEEP LEARNING ARCHITECTURES (9)

Machine Learning and Deep Learning, Representation Learning, Width and Depth of Neural Networks, Activation Functions: RELU, LRELU, ERELU, Unsupervised Training of Neural Networks, Restricted Boltzmann Machines, Auto Encoders, Deep Learning Applications

UNIT III CONVOLUTIONAL NEURAL NETWORKS (9)

Architectural Overview,Motivation, Layers, Filters, Parameter sharing, Regularization, Popular CNN Architectures: ResNet, AlexNet – Applications

UNIT IV SEQUENCE MODELLING –RECURRENT AND RECURSIVE NETS (9)

Recurrent Neural Networks, Bidirectional RNNs, Encoder-decoder sequence to sequence architectures - BPTT for training RNN, Long Short Term Memory Networks

UNIT V AUTO ENCODERS & DEEP GENERATIVE MODELS (9)

Under complete Auto encoder, Regularized Auto encoder, stochastic Encoders and Decoders, Contractive Encoders

Deep Belief networks, Boltzmann Machines, Deep Boltzmann Machine

Course Outcomes:

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

1. Implement the basics of Machine Learning.
2. Recognize the characteristics of deep learning models that are useful to solve real-world problems.
3. Implement CNN for real life applications
4. Apply RNN to solve problems.
5. Implement different deep learning algorithms

Text Book(s)

1. Ian Goodfellow, YoshuaBengio and Aaron Courville, “Deep Learning”, MIT Press, 2017.
2. Josh Patterson, Adam Gibson "Deep Learning: A Practitioner's Approach", O'Reilly Media, 2017
3 Umberto Michelucci “Applied Deep Learning. A Case-based Approach to Understanding Deep Neural Networks” Apress, 2018

Reference Books

1. Kevin P. Murphy "Machine Learning: A Probabilistic Perspective", The MIT Press, 2012
2. EthemAlpaydin,"Introduction to Machine Learning”, MIT Press, Prentice Hall of India, Third Edition 2014

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Applications

MCA II Year I Semester

20MCAP415 PRIVACY AND SECURITY IN IOT

L	T	P	C
3	0	0	3

Pre-requisite **Computer Network basics**

Course Description:
This course gives an overview of IoT system in security aspects. The course mainly focusses on current security risks IoT domain faces and countermeasure available for the known issues.

Course Objectives:
Students will be able to:

1. Understand IoT general models and security challenges.
2. Distinguish IoT security and vulnerability threats.
3. Recognize different IoT protocols and their security measures.
4. Understand how to secure an IoT environment
5. Identify different types of attacks.

UNIT I SECURITY OVERVIEW (9)

IoT Reference Model- Introduction -Functional View, IoT Security Challenges-Hardware Security Risks - Hardcoded/Default Passwords -Resource Constrained Computations -Legacy Assets Connections - Devices Physical Security, Software Security Risks -Software Vulnerabilities -Data Interception - Identification of Endpoints -Tamper Detection, Lack of Industrial Standards

UNIT II IOT- SECURITY &VULNERABILITY ISSUES (9)

IoT Security Requirements -Data Confidentiality -Data Encryption -Data Authentication -Secured Access Control –IoT-Vulnerabilities – Secret-Key, Authentication/Authorization for Smart Devices - Constrained System Resources -Device Heterogeneity -Fixed Firmware.IoT Attacks -Side-channel Attacks -Reconnaissance -Spoofing -Sniffing -Neighbour -Discovery -Rogue Devices-Man-in-Middle

UNIT III SECURED PROTOCOLS FOR IOT (9)

Infrastructure-IPv6 -LowPAN , Identification-Electronic Product Code -uCode, Transport-Bluetooth - LPWAN, Data -MQTT -CoAP, Multi-layer Frameworks-Alljoyn, - IoTivity

UNIT IV SECURING INTERNET OF THINGS ENVIRONMENT (9)

IoT Hardware -Test Device Range-Latency and Capacity -Manufacturability Test -Secure from Physical Attacks, IoT Software -Trusted IoT Application Platforms, -Secure Firmware Updating - Network Enforced Policy -Secure Analytics, Visibility and Control

UNIT V IOT ATTACKS -CASE STUDY (9)

MIRAI Botnet Attack -Iran's Nuclear Facility Stuxnet Attack -Tesla Crypto jacking Attack -The TRENDnet Webcam Attack -The Jeep SUV Attack -The Owlet Wi-Fi Baby Heart Monitor Vulnerabilities -St.Jude_Hackable Cardiac Devices

Course Outcomes:

After completion of the course, students will be able to

1. Understand IoT general models and security challenges.
2. Recognize IoT security and vulnerability threats.
3. Analyze the different IoT protocols and their security measures.
4. Interpret how to secure an IoT environment
5. Interpret different types of attacks.

Text Book(s)

1. B. Rusell and D. Van Duren, “Practical Internet of Things Security,” Packt Publishing, 2016.
2. Mahmood, Zaigham, ed. *Security, Privacy and Trust in the IoT Environment*. Springer, 2019.

Reference Books

1. Gilchrist, Alasdair. *IoT security issues*. De| G Press, 2017.
2. Security and Privacy in the Internet of Things: Challenges and Solutions. (2020). Germany: IOS Press.
3. Dave, Mayank. Security and Privacy Issues in Sensor Networks and IoT. United States, IGI Global, 2019.
4. Xu, Li Da, and Li, Shancang. Securing the Internet of Things. United States, Elsevier Science, 2017.
5. Liyanage, Madhusanka, et al. IoT Security: Advances in Authentication. United Kingdom, Wiley, 2019.

Online Resources

1. https://www.postscapes.com/internet-of-things-protocols/
2. https://www.cse.wustl.edu/~jain/cse570-15/ftp/iot_prot/index.html
3. https://www.cisco.com/c/en/us/about/security-center/secure-iot-proposed-framework.html
4. https://www.iotforall.com/5-worst-iot-hacking-vulnerabilities/

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Applications

MCA II Year I Semester

20MCAP416 SOFTWARE PROJECT MANAGEMENT

L	T	P	C
3	0	0	3

Pre-requisite Software Engineering

Course Description:

This course describes the key aspects of Software Project. It introduces the strategies required for managing projects from their genesis to completion. The course brings about Software Project Planning, Cost Estimation, scheduling and management tools

Course Objectives:

Students will be able to

1. Define the scope of Software Project Management
2. Evaluate the risk involved in a project and select appropriate strategies for minimizing potential costs.
3. Produce an activity plan for a project
4. Monitor the progress of projects
5. Identify factors that influence people's behaviour in a project environment

UNIT I INTRODUCTION TO SOFTWARE PROJECT MANAGEMENT (9)

Introduction, what is Project? What is a Project? Software projects versus other types of project, Activities Covered by Software Project Management, some ways of categorizing software projects, the project as a system, what is Management? Problems with software projects, Management Control, Stakeholders, Information and control in organization, overview of project planning

UNIT II PROJECT EVALUATION AND ESTIMATION (9)

Cost Benefit Evaluation Techniques, Risk Evaluation, Software effort estimation: where are estimates done, Problems with over and under estimates, the basis for software estimating, Software effort estimation techniques

UNIT III ACTIVITY PLANNING (9)

Objectives of Activity Planning, when to Plan, Project Schedules, Sequencing and Scheduling Activities, Network Planning Models, Forward Pass – Backward Pass, identifying critical path, Activity Float, Shortening Project Duration, Activity on Arrow Networks

Risk Management, Nature of Risk, Categories of Risk, A framework for dealing with Risk, Risk Identification, Risk analysis and prioritization, risk planning and risk monitoring

UNIT IV MONITORING AND CONTROL (9)

Creating the Framework, Collecting the Data, Review, Project Termination Review, Visualizing Progress, Cost Monitoring, Earned Value Analysis, Prioritizing Monitoring, Getting Project Back to Target, Change Control

UNIT V MANAGING PEOPLE AND ORGANIZING TEAMS (9)

Introduction, Understanding Behaviour, Organizational Behaviour: A Background, Selecting the Right Person for the Job, Instruction in the Best Methods, Motivation, Becoming a Team, Decision Making, Leadership

Course Outcomes:

After completion of the course, students will be able to

1. Understand the practices and methods for successful software project management
2. Identify techniques for requirements, policies and decision making for effective resource management
3. Apply the evaluation techniques for estimating cost, benefits, schedule and risk
4. Devise a framework for software project management plan for activities, risk, monitoring and control
5. Devise a framework to manage people

Text Book(s)

1. Bob Hughes, Mike Cotterell, Rajib Mall, "Software Project Management", Fifth Edition, Tata McGraw Hill, 2011.

Reference Books

1. JackMarchewka," Information Technology-Project Management", Wiley Student Version, 4th Edition, 2013.
2. James P Lewis,"Project Planning, Scheduling & Control", McGraw Hill, 5th Edition, 2011.
3. PankajJalote," Software Project Management in Practise", Pearson Education, 2002

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

MCA II Year I Semester

20MCAP417 XML AND WEB SERVICES

L	T	P	C
3	0	0	3

Pre-requisite Web designing concepts, HTML concepts

Course Description:
This course provides XML technology family, architecture of web services, the building blocks of Web services, the role of XML in E-business and content management.

Course Objectives:
Student will be able to:

1. Understand the overview of XML family and related technologies
2. Learn the concepts of Web Services Architecture
3. Understand the ideas on Web services building blocks
4. Identify the implementation of XML in E-Business
5. Understand the concepts of content management in XML

UNIT I XML TECHNOLOGY FAMILY (9)

XML – benefits – Advantages of XML over HTML – EDL –Databases – XML based standards – DTD –XML Schemas – X- Files – XML processing – DOM –SAX presentation technologies – XSL – XFORMS – XHTML – voice XML – Transformation – XSLT – XLINK – XPATH –XQ

UNIT II ARCHITECTING WEB SERVICES (9)

Business motivations for web services – B2B – B2C- Technical motivations – limitations of CORBA and DCOM – Service – oriented Architecture (SOA) – Architecting web services – Implementation view – web services technology stack – logical view – composition of web services – deployment view – from application server to peer to peer – process view – life in the runtime

UNIT III WEB SERVICES BUILDING BLOCK (9)

Transport protocols for web services – messaging with web services – protocols – SOAP – describing web services – WSDL – Anatomy of WSDL – manipulating WSDL – web service policy – Discovering web services – UDDI – Anatomy of UDDI- Web service inspection – Ad-Hoc Discovery – Securing web services.

UNIT IV IMPLEMENTING XML IN E-BUSINESS (9)

B2B - B2C Applications – Different types of B2B interaction – Components of ebusiness XML systems – ebXML – Rosetta Net Applied XML in vertical industry – Web services for mobile devices

UNIT V XML AND CONTENT MANAGEMENT (9)

Semantic Web – Role of Meta data in web content – Resource Description Framework – RDF schema – Architecture of semantic web – content management workflow – XLANG –WSFL.

Course Outcomes:

After completion of the course, students will be able to

1. Illustrate the ideas on XML concepts
2. Explain the architecture of web services.
3. Analyze web designing building blocks
4. Explain the implementation ideas XML in E-Business
5. Illustrate the XML content management system

Text Book(s)

1. Ron schmelzer et al, "XML and Web Services", Pearson Education, 2002.
2. Sandeep Chatterjee and James Webber, "Developing Enterprise Web Services: An Architect's Guide", Prentice Hall, 2004

Reference Books

1. Henry Bequet and Meeraj Kunnumpurath, "Beginning Java Web Services", Apress, 2004
2. Russ Basiura and Mike Batongbacal, "Professional ASP.NET Web Services", Apress, 2003.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Applications

MCA II Year I Semester

20MCAP418 COMPUTER VISION

L	T	P	C
3	0	0	3

Pre-requisite None

Course Description:
This course covers image processing techniques for computer vision in real-time. These learning practices help the students to understand about how computer vision techniques works with various standard techniques. With concepts and knowledge gained from this course, one can easily become part of software and other relevant industries.

Course Objectives:
Student will be able to:

1. Understand image processing techniques for computer vision
2. Explain shape and region analysis
3. Identify Hough Transform and its applications to detect lines, circles, ellipses
4. Understand three-dimensional image analysis techniques and motion analysis
5. Analyze some applications of computer vision algorithms

UNIT I IMAGE PROCESSING FOUNDATIONS (9)

Review of image processing techniques – classical filtering operations – thresholding techniques – edge detection techniques – corner and interest point detection – mathematical morphology – texture

UNIT II SHAPES AND REGIONS (9)

Binary shape analysis – connectedness – object labeling and counting – size filtering – distance functions – skeletons and thinning – deformable shape analysis – boundary tracking procedures – active contours – shape models and shape recognition – centroidal profiles – handling occlusion – boundary length measures – boundary descriptors – chain codes – Fourier descriptors – region descriptors – moments

UNIT III HOUGH TRANSFORM (9)

Line detection – Hough Transform (HT) for line detection – foot-of-normal method – line localization – line fitting – RANSAC for straight line detection – HT based circular object detection – accurate center location – speed problem – ellipse detection – Case study: Human Iris location – hole detection – generalized Hough Transform (GHT) – spatial matched filtering – GHT for ellipse detection – object location – GHT for feature collation

UNIT IV 3D VISION AND MOTION (9)

Methods for 3D vision – projection schemes – shape from shading – photometric stereo – shape from texture – shape from focus – active range finding – surface representations – point-based representation – volumetric representations – 3D object recognition – 3D reconstruction – introduction to motion – triangulation – bundle adjustment – translational alignment – parametric motion – spline based motion – optical flow – layered motion

UNIT V APPLICATIONS (9)

Introduction: Overview of Recognition algorithms – Human Recognition using Face: Face Recognition from still images, Face Recognition from video, Evaluation of Face Recognition Technologies- Human Recognition using gait: HMM Framework for Gait Recognition, View Invariant Gait Recognition, Role of Shape and Dynamics in Gait Recognition.

Course Outcomes:

After completion of the course, students will be able to

1. Describe fundamental image processing techniques required for computer vision
2. Perform shape analysis, implement boundary tracking techniques, and apply chain codes and other region descriptors
3. Apply Hough Transform for line, circle, and ellipse detections
4. Understand 3D vision techniques and implement motion related techniques
5. Analyze applications using computer vision techniques

Text Book(s)

1. Simon J. D. Prince, “Computer Vision: Models, Learning, and Inference”, Cambridge University Press, 2012.
2. E. R. Davies, “Computer & Machine Vision”, Fourth Edition, Academic Press, 2012.
3. D. L. Baggio et al., “Mastering OpenCV with Practical Computer Vision Projects”, Packt Publishing, 2012.

Reference Books

1. Jan Erik Solem, “Programming Computer Vision with Python: Tools and algorithms for analyzing images”, O'Reilly Media, 2012.
2. Mark Nixon and Alberto S. Aquado, “Feature Extraction & Image Processing for Computer Vision”, Third Edition, Academic Press, 2012.
3. R. Szeliski, “Computer Vision: Algorithms and Applications”, Springer 2011.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.