Masters of Computer Applications (MCA-P211)
Scheme Choice Based Credit System (CBCS) and Outcome Based Learning (OBL)

Sem	Semester Core Course	Elective: Discipline Specific Elective (DSE)	Ability Enhancement Compulsory Course (AECC)	Skill Enhancement Course (SEC)	Open Electives** (Choose One Paper per sem)
I	• Discrete Structures & Optimization • Advanced Data Structures Using C	• Advanced Computer Architecture	• TechniCA-P211l CommuniCA-P211tion	• Computer Fundamental And Programming In C	• Business Information System Or • Digital Marketing
II	• Advanced Software Engineering • Advanced Operating System	• Analysis And Design Of Algorithms		• Programming In Python	• Database Administration Or • Image Processing
III	• Cloud Computing • E-Commerce	• Big Data Analysis	• Object Oriented Analysis And Design with UML	• Project-I	• Artificial Intelligence Or • Distributed System
IV	• Web Technologies Using PHP • Data Warehouse And Data Mining		• Software Testing and Quality Management	• Project-II	• Cryptography And Network Security Or • Cyber Crime and Computer Forensics

FIRST SEMESTER

S. NO.	SUB_CODE	SUBJECT_TITLE	External Assessment MM:60	Internal Assessment MM:20	Practical MM:20	Total MM:100	L	T	P	Cr	Hrs
1	CA-P211	Discrete Structures & Optimization	60	40		100	4	0	0	4.0	4.0
2	CA-P212	Advanced Data Structures Using C	60	40		100	4	0	0	4.0	4.0
3	CA-P213	Advanced Computer Architecture	60	40		100	4	0	0	4.0	4.0
4	CA-P214	Computer Fundamental And Programming In C	60	40		100	4	0	0	4.0	4.0
5	CA-P215	Technical Communication	60	40		100	4	0	0	4.0	4.0
6	CA-P214-P	Computer Fundamental And Progr. In C Lab			50	50	0	0	2	1.0	2.0
7	CA-P212-P	Advanced Data Structures Using C Lab			50	50	0	0	2	1.0	2.0
8		Open Elective-I	60	40		100	4	0	4	4.0	4.0
		TOTAL	**360**	**240**	**100**	**700**	**24**	**0**	**8**	**26.0**	**28.0**

SECOND SEMESTER

S. NO.	SUB_CODE	SUBJECT_TITLE	External Assessment MM:60	Internal Assessment MM:20	PractiCA-P211l MM:20	Total MM:100	L	T	P	Cr	Hrs
1	CA-P221	Advanced Software Engineering	60	40		100	4	0	0	4	4
2	CA-P222	Advanced Operating System	60	40		100	4	0	0	4	4
3	CA-P223	Programming In Python	60	40		100	4	0	0	4	4
4		Open Elective-II	60	40		100	4	0	0	4	4
5	CA-P224	Analysis And Design Of Algorithms	60	40	0	100	4	0	0	4	4
6		Open Elective –II (Lab)			50	50	0	0	2	1	2
7	CA-P223	Programming In Python Lab			50	50	0	0	4	2	4
8		**TOTAL**	**300**	**200**	**100**	**600**	**20**	**0**	**6**	**23**	**26**

THIRD SEMESTER — MM:60 MM:20 MM:20 MM:100

S. NO.	SUB_CODE	SUBJECT_TITLE	External Assessment	Internal Assessment	Practical	Total	L	T	P	Cr	Hrs
1	CA-P231	Cloud Computing	60	40		100	4	0	0	4	4
2	CA-P232	E-Commerce And E-Governance	60	40		100	4	0	0	4	4
3		Open Elective -III	60	40		100	4	0	0	4	4
4	CA-P233	Big Data Analysis	60	40		100	4	0	0	4	4
5	CA-P234	Object Oriented Analysis And Design with UML	60	40		100	4	0	0	4	4
6	CA-P233-P	Big Data Analysis Lab			50	50	0	0	2	2	2
7	CA-P234-P	Object Oriented Analysis And Design with UML Lab			50	50	0	0	2	1	2
8	CA-PM235	Project-I	200			200	6	0	6	3	6
		TOTAL	**500**	**200**	**100**	**800**	**26**	**0**	**10**	**26**	**30**

FOURTH SEMESTER — MM:60 MM:20 MM:20 MM:100

S. NO.	SUB_CODE	SUBJECT_TITLE	External Assessment	Internal Assessment	PractiCA-P211I	Total	L	T	P	Cr	Hrs
1	CA-P241	Data Warehouse And Data Mining	60	40		100	4	0	0	4	4
2		Open Elective-IV	60	40		100	4	0	0	4	4
3	CA-P242	Web Technologies Using PHP	60	40		100	4	0	0	4	4
4	CA-P243	Software Testing and Quality Management	60	40		100	4	0	0	4	4
5	CA-P242-P	Web Technologies Using PHP Lab			50	50	0	0	4	2	4
6	CA-P243	Project-II	200			200	6	0	6	3	6
7		**TOTAL**	**440**	**160**	**50**	**650**	**22**	**0**	**14**	**21**	**26**

LIST OF ELECTIVE SUBJECTS

S. NO.	SUB_CODE	SUBJECT_TITLE	L	T	P	CR	Hrs
Semester -I		**Open Elective –I**					
1	CA-P216	Digital Marketing	4	0	0	4	4
2	CA-P217	Business Information System	4	0	0	4	4
Semester –II		**Open Elective –II**					
1	CA-P225	Database Administration	4	0	2	5	6
2	CA-P226	Image Processing	4	0	2	5	6
Semester –III		**Open Elective –III**					
1	CA-P236	Artificial Intelligence	4	0	0	4	4
2	CA-P237	Distributed System	4	0	0	4	4
Semester –IV		**Open Elective –IV**					
1	CA-P244	Cryptography And Network Security	4	0	0	4	4
2	CA-P245	Cyber Crime and Computer Forensics	4	0	0	4	4

MCA
SEMESTER-I

CA-P215: TECHNICAL COMMUNICATION

L	T	P	Cr
4	0	0	4

Course Objectives	• Understanding the characteristics of technical writing and the importance of purpose, audience, and genre for written communication in technical fields. • Articulating complex engineering ideas appropriate for targeted audiences. • Planning, drafting, revising, editing, and critiquing technical and professional documents through individual and collaborative writing
Course Outcomes	• Students will be enabled to understand the nature and objective of Technical Communication relevant for the work place as Engineers. • Students will utilize the technical writing for the purposes of Technical Communication and its exposure in various dimensions. • Students would imbibe inputs by presentation skills to enhance confidence in face of diverse audience.

Module-I

Basics of Technical Communication: Functions of Communication-Internal & External Functions, Models-Shannon & Weaver's model of communication, Flow, Networks and importance, Barriers to Communication, Essential of effective communication (7C's and other principles), Non-verbal Communication.

Module-II

Basic Technical Writing: Paragraph writing (descriptive, Imaginative etc.), Precise writing, reading and comprehension, Letters– Format &various types.

Module-III

Advanced Technical Writing: Memos, Reports, E-Mails & Net etiquettes, Circulars, Press Release, Newsletters, Notices. Resume Writing, Technical Proposals, Research Papers, Dissertation and Thesis, Technical Reports, Instruction Manuals and Technical Descriptions, Creating Indexes, List of References and Bibliography.

Module-IV

Verbal Communication: Presentation Techniques, Interviews, Group Discussions, Extempore, Meetings and Conferences.

Text Books:

1. Vandana R Singh, The Written Word, Oxford University Press, New Delhi.

2. K K Ramchandran, et al Business Communication, Macmillan, New Delhi.

3. Swati Samantaray, Business Commnication and Commnicative English, Sultan Chand, New Delhi.

4. S.P. Dhanavel English and Communication Skills for Students of Science and Engineering (with audio CD).

CA-P211: DISCRETE STRUCTURES & OPTIMIZATION

L	T	P	Cr
4	0	0	4

Course Objectives	• Throughout the course, students will be expected to demonstrate their understanding of Discrete Mathematics by being able to do each of the following: • Use mathematically correct terminology and notation. • Construct correct direct and indirect proofs. 1.3 Use division into cases in a proof.
Course Outcomes	• Apply the operations of sets and use Venn diagrams to solve applied problems; solve problems using the principle of inclusion-exclusion. • Apply rules of inference, proof by contradiction, proof by cases, and write proofs using symbolic logic and Boolean Algebra. • Solve counting problems by applying elementary counting techniques using the product and sum rules, permutations, combinations, the pigeon-hole principle

Module-I

Sets, relations, and functions: Introduction, Combination of Sets, ordered pairs, proofs of general identities of sets, relations, operations on relations, properties of relations and functions, Hashing Functions, equivalence relations, compatibility relations, partial order relations. Rings and Boolean algebra: Rings, Subrings, Morphism of rings ideals and quotient rings.

Module-II

Euclidean domains, Integral domains and fields, Boolean Algebra, Direct product morphisms, Boolean sub-algebra, Boolean Rings, Application of Boolean algebra (Logic Implications, Logic Gates, Karnaugh map)

Module-III

Combinatorial Mathematics: Basic counting principles, Permutations and combinations, Inclusion and Exclusion, Principle Recurrence relations, Generating Function, Pigeon Hole Principle, Application

Module-IV

Monoids and Groups: Groups, Semigroups and monoids, Cyclic semigraphs and submonoids, Subgroups and Cosets. Congruence relations on semigroups. Morphisms. Normal subgroups. Dihedral groups.

Module-V

Graph Theory: Graph- Directed and undirected, Eulerian chains and cycles, Hamiltonian chains and cycles Trees, Chromatic number Connectivity, Graph coloring, Plane and connected graphs, Isomorphism and Homomorphism. Applications.

Text Books:

 1. Discrete Mathematics (Schaum series), Lipschutz (McGraw Hill).

2. Applied Discrete Structures for Computer Science, Alan Doerr and Kenneth Levarseur (Creative Commons) 2012.

Reference Books:

1. Discrete Mathematics and its Applications, Kenneth H Rosen.(McGraw Hill)

2. Discrete Mathematics and Graph Theory, Sartha, (Cengage Learning)

3. Elements of discrete mathematics. C L Liu (McGraw Hill)

CA-P212: ADVANCED DATA STRUCTURES USING C

L	T	P	Cr
4	0	4	6

Course Objectives	• Introduce the fundamental concept of data structures and to emphasize the importance of data structures in developing and implementing efficient algorithms. • Another objective of the course is to develop effective software engineering practice, emphasizing such principles as decomposition, procedural abstraction, and software reuse.
Course Outcomes	• After completing this course satisfactorily, a student will be able to describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithms. • Describe common applications for arrays, records, linked structures, stacks, queues, trees, and graphs. • Write programs that use arrays, records, linked structures, stacks, queues, trees, and graphs. • Demonstrate different methods for traversing trees.

Module-I

Introduction to Data Structures: Data Structures and its Types, Algorithms, Time Complexity, Recurrence, Probabilistic Analysis, Amortized Analysis, Competitive Analysis.

Module-II

Sorting Algorithms: Quick Sort, Heap Sort, Counting Sort, Bucket Sort, Multi-way Merge Sort. Hashing Techniques: Direct Address Tables, Hash Tables, Hash Functions,

Module-III

Open Addressing, Perfect Hashing. Advanced Data Structures: AVL Trees, Red-Black Trees, Splay Trees, Btrees, Binomial Heaps, Fibonacci heaps, Data Structures for Disjoint Sets.

Module-IV

Graphs & Algorithms: Graphs Representation, Minimum Spanning Tree (MST), Single Source Shortest Paths, All Pairs Shortest Paths, Maximum Flow.

Module-V

String Matching: String, String Length, String Concatenation, String Copy, String-Matching, Brute Force algorithm, Rabin Karp algorithm, KnuthMorris-Pratt (KMP) algorithm, Boyer–Moore algorithm.

Text Books:

1. *Thomas Coremen, "Introduction to Algorithms", Third edition, Prentice Hall of India, 2009.*

Reference Books:

1. *Kleinberg J., Tardos E., "Algorithm Design", 1st Edition, Pearson, 2012.*
2. *Aho Alfred V., Hopperoft John E., UIlman Jeffrey D., "Data Structures and Algorithms", Addison Wesley, 2001.*
3. *Seymour Lipschutz, "Data structure", Indian Adapted Edition, Tata McGraw Hill, 200*

Data Structures Lab

LIST OF EXPERIMENTS

1 Write a program to create an array of 5 elements and display the array items. Access each individual element through indexes.

2 Write a program to reverse the order of the items in the array.

3 Write a program to append a new item to the end of the array.

4 Write a program to remove a specified item using the index from an array.

5 Write a program to get the length of an array.

6 Write a program for binary search.

7 Write a program for sequential or linear search.

8 Write a program to sort a list of elements using the bubble sort algorithm.

9 Write a program to sort a list of elements using the selection sort algorithm.

10 Write a program to sort a list of elements using the insertion sort algorithm.

11 Write a program to sort a list of elements using the quick sort algorithm.

12 Write a program to create a singly linked list, append some items and iterate through the list.

13 Write a program to find the size of a singly linked list.

14 Write a program to search a specific item in a singly linked list and return true if the item is found otherwise return false.

15 Write a program to delete the first item from a singly linked list.

16 Write a program to create circular single linked lists.

17 Write a program to implement stack and its operations using list.

18 Write a program to implement queue and its operations using list.

19 Write a program to create a Balanced Binary Search Tree (BST) using an array (given) elements where array elements are sorted in ascending order.

20 Write a program to find the kth smallest element in a given a binary search tree.

21 Write a program to traverse the binary tree using pre-order, post-order and in order traversals.

22 Write a program to count the number of nodes in binary search tree

23 Write a program to traverse the graph using Depth First Search and Breadth First Search

24 Write a program to create Red Black Tree and perform operations of Insertion and Deletion in it.

25 Write a program to implement AVL Trees as well as various operations of searching, insertion and deletion on AVL Trees.

CA-P213: ADVANCED COMPUTER ARCHITECTURE

L	T	P	Cr
4	0	0	4

Course Objectives	• Discuss the basic concepts and structure of computers. • Understand concepts of register transfer logic and arithmetic operations. • Explain different types of addressing modes and memory organization. • Learn the different types of serial communication techniques. • Summarize the Instruction execution stages.
Course Outcomes	• Understand the theory and architecture of central processing unit. • Analyze some of the design issues in terms of speed, technology, cost, performance. • Design a simple CPU with applying the theory concepts. • Learn the concepts of parallel processing, pipelining and interprocessor communication. • Understand the architecture and functionality of central processing unit.

Module-I

RTL, Bus and memory transfer, Arithmetic micro operations, Logic micro operations, Shift micro operations, Arithmetic Logic Shift unit

Module-II

Instruction codes, Computer registers and instructions, Timing and control, Instruction cycle, MRIs, I/O and Interrupts, Complete computer description, Design of basic computer, Design of Accumulator logic

Control memory, Address sequencing, Computer configuration, Microinstruction format, Symbolic microinstructions, Design of control unit

Module-III

Introduction to CPU, General Register and stack organization, Instruction formats, Addressing modes, Data transfer and manipulation, RISC, CISC

Parallel Computer Models: The state of computing, Multiprocessors and multicomputer, Multivector and SIMD Computers, PRAM and VLSI models

Module-IV

Program and Network Properties: Conditions of Parallelism, Program partitioning and scheduling, Program flow mechanisms, System interconnect architectures

Module-V

Principles of Scalable Performance: Performance metrics and measures, Parallel processing applications, Speedup Performance laws, scalability analysis and approaches.

Processor and Memory Hierarchy: Advanced processor technology, Superscalar and vector processors

Text Books:

1. *M. Morris Mano, "Computer System Architecture", Pearson Education, 2004. Kai Hwang, "Advanced Computer Architecture: Parallelism, Scalability, Programmability", McGraw Hill, 1993.*

Reference Book:

1. *Kai Hwang and Faye A. Briggs, "Computer Architecture and Parallel Processing.McGraw Hill, 1985.*

CA-P214: COMPUTER FUNDAMENTAL AND PROGRAMMING IN C

L	T	P	Cr
4	0	4	6

Course Objectives	• The course is designed to provide complete knowledge of C language. • Students will be able to develop logics which will help them to create programs, applications in C. • Also by learning the basic programming constructs they can easily switch over to any other language in future.
Course Outcomes	• After the completion of this course, the students will be able to develop applications.

Module-I

Introduction to Computers, characteristics and limitations of computer, Block diagram of computer, types of computers, computer generations. Input and output devices: Keyboard and mouse, inputting data in other ways, Types of Software: system software, Application software, commercial, open source, domain and free ware software, Memories: primary, secondary and cache memory, Number system.

Module-II

Problem Solving: Problem - Solving Techniques: Steps for Problem – Solving, Using Computer as a Problem-Solving Tool: Design of Algorithms-Definition, Features of Algorithm, Criteria to be followed by an Algorithm, Top Down Design; Analysis of Algorithm Efficiency: Redundant Computations, Referencing Array Elements, Inefficiency Due to Late Termination, Early Detection of Desired Output Condition, Trading Storage for Efficient Gains

Module-III

Introduction to C: History and salient features of C, structure of C program, writing and compiling C program, Errors – syntax, semantic, linker, logical and runtime. The C preprocessor, #define, #ifdef, Predefined Names Defined by Preprocessor; Macros Vs Functions

Variables and Constants: Character Set; Identifiers and Keywords- Rules for Forming Identifiers, Keywords; Data Types and Storage; Data Type Qualifiers; Variables; Declaring Variables; Initializing Variables; Constants-Integer Constants, Floating Point Constants, Character Constants, String Constants, Symbolic Constants

Module-IV

Operators and Expressions Assignment Statements, Arithmetic Operators, Relational Operators, Logical Operators, Comma and Conditional Operators, Type Cast Operator, Size of Operator, C Shorthand, Priority of Operators

Control statements: Decision Control Statements - The if Statement, The switch Statement; Loop Control Statements- The while Loop, The do-while Statement, The for Loop, The Nested Loop; The Goto Statement; The Break Statement; The Continue Statement

Module-V

Arrays and Strings: Array Declaration-Syntax of Array Declaration, Size Specification; Array Initialization - Initialization of Array Elements in the Declaration, Character Array Initialization; Subscript; Processing the Arrays; Multi-Dimensional Arrays. Declaration and Initialization of Strings, Display of Strings Using Different Formatting Techniques; Array of Strings; Built-in String Functions and Applications.

Functions: Definition of a Function; Declaration of a Function; Function Prototypes; The Return Statement; Types of Variables and Storage Classes- Automatic Variables, External Variables, Static Variables, Register Variables; Types of Function Invoking; Call by Value, Recursion.

Laboratory Work: The laboratory work will be based on contents of course material like expression, control statements, functions arrays, strings.

Text Books
   1. *Kernighan, B.W. and . Ritchie D.M, The C Programming Language (ANSI-C version), PHI*
   2. **Kanetkar,Y.P. Let us C, BPB**

Reference Books
   1. *Schildt, Herbert, The Complete Reference C++, Tata Mcgraw Hill*
   2. *Kaicker, Sudhir, The complete ANSI C, BPB*

Open Elective-I

CA-P217: BUSINESS INFORMATION SYSTEM

L	T	P	Cr
4	0	0	4

Course Objectives	• This course aims to provide students from all business disciplines with a general background of BIS. • An understanding of BIS is important to the work of business professionals because BIS serves as a bridge between management and operation • Mastering both business and technology skills and knowledge builds job opportunities, because they can better contribute to shaping their company's strategy and operation.
Course Outcomes	• Upon successful completion, students will have the knowledge and skills to: • Demonstrate an understanding of the foundations of information systems, and explain the reasons for the current design and use of information systems • Demonstrate an understanding of and interpret the personal, social and business implications of using information systems • Observe and explain the real-world use of information systems, citing practical examples

Module-I

Basic concepts: understanding information and information systems. Hardware, Software, Networks, telecommunications and the Internet.

Module-II

E-business applications, Acquiring and developing BIS, Initiating systems development, BIS project management. Systems analysis, Systems design, System builds, implementation and maintenance.

Module-III

BIS strategy, managing e-business. Managing information security, End-user computing - providing end-user services. Ethical, legal and moral constraints on information systems.

Text Books :

1. *Business Information Systems Technology, development and management for the e-business 2nd Edition Paul Bocij, Dave Chaffey, Andrew Greasley, Simon Hickie.*

CA-P216 : DIGITAL MARKETING

L	T	P	Cr
4	0	0	4

Course Objectives	Each and every ad campaign that is run by a company should be in accordance with your business goals. It's a good idea to translate your business goals into Digital Marketing objectives. For example, if your business goal is brand awareness, make sure your digital marketing efforts are striving to achieve the same.
Course Outcomes	• Analyze the confluence of marketing, operations, and human resources in real-time delivery. • Demonstrate cognitive knowledge of the skills required in conducting online research and research on online markets, as well as in identifying, assessing and selecting digital market opportunities. • Explain emerging trends in digital marketing and critically assess the use of digital marketing tools by applying

Module-I

Digital Marketing - Introduction, Key terms and concepts, understanding marketing strategy, The building blocks of marketing strategy, Crafting a digital marketing strategy, Case study: Nike digital strategy Market Research - Introduction, importance of market research, K market research, Online research methodologies, Justifying the cost of research, Tools of the trade, Advantages and challenges, Case Study: Rocking the Daisies Content Marketing Strategy concepts, Strategic building blocks, Content creation, Content channel distribution, Tools of the trade, Advantages and challenges, Case study : Coca

Module-II

User Experience Design - Introduction, Key terms and con Core principles of UX design, Mobile UX, Step in UX design, Tools of the trade, Case study: Rail Europe Web Development and Design development, Mobile development, Step Writing for Digital - Introduction, Key terms and concepts, Writing for your audience, Types of web copy, HTML for formatting, SEO copywriting, Best practices for online copywriting, Tools of the trade, Case study: Encyclopaedia Britannica Online ,Customer Relationship Management Understanding customers, CRM and data, The benefits of CRM, Social CRM, Steps in implementing a CRM strategy, Tools of the trade, Case study: Fuji Xerox Search Engine Optimisation (SEO) SEO, Search engine friendly website structure, SEO and key phrases, Link popularity, User insights, What not to do, Tools of the trade, Benefits and challenges, Case study: Viewpoints.com

and the Panda update Search Advertising - Introduction, Key terms and concepts, Advertising in search, The elements of a search ad, Targeting options, Bidding and ranking for search ads, Tracking, Planning and setting up a search advertising campaign, Tools of the trade, Advantages and challenges, Case study – 'Sister Act' on Broadway

Module-III

Online Advertising - Introduction, Key terms and concepts, Online advertising objectives, The key differentiator, Types of display adverts, Payment models for display advertising, Getting your ads online, Targeting and optimising, Tracking, Steps in online advertising, The future of online advertising, Advantages and challenges, Case study: Toyota Prius Affiliate Marketing - Introduction, Key terms and concepts, The building blocks of affiliate marketing, Setting up a campaign, Tools of the trade, Advantages and challenges, Case study. Video Marketing - Introduction, Key terms and concepts, Video content strategy, Video production step by step, Video promotion, Tools of the trade, Advantages and study – Woolworths: 'Cook like a MasterChef' for MasterChef South Africa

Module-IV

Social Media Channels - Introduction, Key terms and concepts, Social media channels, Social networking, Content creation, Bookmarking and aggregating, Locat Tracking social media campaigns, Social media marketing: Rules of engagement, Tools of the trade, Advantages and challenges, Case study Social Media Strategy - Introduction, Key terms and concepts, Using soci business challenges, Step-by-step guide to creating a social media strategy, Documents and processes, Dealing with opportunities and threats, Step online brand attack, Social media risks and challenges Command Center

Module-V

Email Marketing - Introduction, Key terms and concepts, Email strategy and planning, Step by-step process, Tools of the trade, Advantages and challenges, Case study Mobile Marketing - Introduction, Key terms and concepts, The role of mobile in personal communication, Mobile messaging channels, Location and mobile, Mobile commerce, Integrating mobile into online marketing, Augmented reality, Mobile analytics, Advantages and challenges, Case study – Carling Black Label's "Be the Coach"

TEXT & REFERENCE BOOKS

1. *eMarketing : The Essential Guide to Marketing in a digital world Stokesand the Minds of Quirk, Availbale online at* <u>*https://www.redandyellow.co.za/content/uploads/woocommerc keting_textbook_download.pdf*</u>

2. *Matt Chiera- "Digital Marketers Sound Off: Tips, Tactics, Tools, and Predictions from 101 Digital Marketing Specialists", Matt Chiera,*

3. *Puneet Bhatia- "Fundamentals of Digital Marketing", Pearson India*

4. *Dan Zarrella- "The Social Media Marketing Book", O'Reilly Media.*

5. *Krista Neher- "Visual Social Media Marketing: Harnessing Images, Instagram, Infographics and Pinterest to Grow Your Business Online", Boot Camp Digital.*

6. *Damian Ryan, Understanding Digital Marketing Strategies for Engaging the Digital Generation*

MCA

SEMESTER-II

CA-P221: ADVANCED SOFTWARE ENGINEERING

L	T	P	Cr
4	0	0	4

Course Objectives	• To provide the idea of decomposing the given problem into Analysis, Design, Implementation, Testing and Maintenance phases. • To provide an idea of using various process models in the software industry according to given circumstances.
Course Outcomes	• Students will be able to decompose the given project in various phases of a lifecycle. • Students will be able to choose appropriate process model depending on the user requirements.

Module-I

Software Engineering Basics – Introduction, Software Engineering Terminologies, Product Life Cycle, Project Life Cycle Models-Spiral model, Waterfall model, Evolutionary prototyping model, Reusable software model.

Module-II

Software Engineering Methodologies- Introduction, Components of Software Engineering, Software Development Models-Capability Maturity Model, Rapid Application Development model, Incremental model, V model, Joint Application Development model.

Module-III

Predictive Versus Adaptive Approaches to SDLC- Introduction, Traditional Predictive Approaches to SDLC, Adaptive Approaches to SDLC, Separation of Design and Construction, Unpredictability of Requirements. Cost estimation technique- LOC, COCOMO model.

Module-IV

Testing Methodologies: White box, black box & grey box testing, Types and categories of testing, Test cases, BLC, QA &QC, Validation and Validity , Manual & Automation testing, Roles and Types of Standards , Testing Tools and Frameworks , CMMI standards and certification.

Module-V

Agile Programming- Introduction, Flavors of Agile Development, Agile Manifesto, Refactoring Techniques, Limitations of The Agile Process.

Reference:

1. Ian Sommeriele, "Software Engineering" , Addison Wesley.

2. C.Easteal and G.Davis, Software Engineering Analysis and Design, Tata McGraw Hill.

3. R.S. Pressman, "Software Engineering: A Practitioner's Approach", 6th Edition, McGraw Hill, 2006

4. Richard Fairley ,Software Engineering Concepts ,Tata McGraw Hill.

5. Pankaj Jalote , An Integrated Approach to Software engineering, Narosa Publication.

6. John Hunt, "Agile Software Construction", Springer, 2006

7. Len Bass, "Software Architecture in Practice", 2nd Edition., Addison Wesley, 2003

CA-P223: PROGRAMMING IN PYTHON

L	T	P	Cr
4	0	4	6

Course Objectives	• To introduce the fundamentals of Python Programming. • To teach about the concept of Functions in Python. • To impart the knowledge of Lists, Tuples, Files and Directories. • To learn about dictionaries in python.
Course Outcomes	• Remembering the concept of operators, data types, looping statements in python programming. • Understanding the concepts of Input / Output operations in file. • Applying the concept of functions and exception handling • Analyzing the structures of list, tuples and maintaining dictionaries.

Module-I

Introduction to Python Programming Language: Programming Language, History and Origin of Python Language, Features of Python, Limitations, Major Applications of Python, Getting, Installing Python, Setting up Path and Environment Variables, Running Python, First Python Program, Python Interactive Help Feature

Module-II

Python differences from other languages. Python Data Types & Input/Output: Keywords, Identifiers, Python Statement, Indentation, Documentation, Variables, Multiple Assignment, Understanding Data Type, Data Type Conversion, Python Input and Output Functions, Import command.

Module-III

Operators and Expressions: Operators in Python, Expressions, Precedence, Associativity of Operators, Non Associative Operators. Control Structures: Decision making statements, Python loops, Python control statements. Python Native Data Types: Numbers, Lists, Tuples, Sets, Dictionary, Functions & Methods of Dictionary, Strings (in detail with their methods and operations).

Module-IV

Python Functions: Functions, Advantages of Functions, Built-in Functions, User defined functions, Anonymous functions, Pass by value Vs. Pass by Reference, Recursion, Scope and Lifetime of Variables. Python Modules: Module definition, Need of modules, Creating a module, Importing module, Path Searching of a Module, Module Reloading, Standard Modules, Python Packages.

Module-V

Exception Handling: Exceptions, Built-in exceptions, Exception handling, User defined exceptions in Python. File Management in Python: Operations on files (opening, modes, attributes, encoding, closing), read() & write() methods, tell() & seek() methods, renaming & deleting files in Python, directories in Python.

Text Books:

1. Programming in Python, Pooja Sharma, BPB Publications, 2017.

2. Core Python Programming, R. Nageswara Rao, 2nd Edition, Dreamtech.

Reference Books:

1. Python, The complete Reference, Martin C. Brown, Mc Graw Hill Education.

2. Python in a Nutshell, A. Martelli, A. Ravenscroft, S. Holden, OREILLY.

CA-P224: ANALYSIS AND DESIGN OF ALGORITHMS

L	T	P	Cr
4	0	0	4

Course Objectives	• Analyze the asymptotic performance of algorithms. • Write rigorous correctness proofs for algorithms. • Demonstrate a familiarity with major algorithms and data structures. • Apply important algorithmic design paradigms and methods of analysis. • Synthesize efficient algorithms in common engineering design situations
Course Outcomes	Students who complete the course will have demonstrated the ability to do the following: • Argue the correctness of algorithms using inductive proofs and invariants. • Analyze worst-case running times of algorithms using asymptotic analysis. • Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it.

Module-I

Introduction and Models of Computation: Quick revision of Data Structures-stacks, queues, trees, heaps, sets and graphs. Algorithm Definition, Analysing algorithms, order arithmetic, time and space complexity.

Module-II

Algorithm Design Techniques: Divide and Conquer: general method, binary search, merge sort, quick sort, selection problem. Greedy method: Job Sequencing, Knapsack problem, optimal merge patterns, minimum spanning trees.

Module-III

Dynamic Programming: Use of table instead of recursion, all pair shortest path, 0/1 knapsack, optimal binary search tree, traveling salesperson problem, Search And Traversal: Search techniques: breadth first search, depth first search, code optimization.

Module-V

Backtracking: 8 queens problem, sum of subsets, graph coloring, knap sacking problem. **Integer Programming:** Branch and Bound Algorithm: 0/1 knapsack problem, Traveling salesperson problem.

Module-V

Lower Bound Theory: Comparison trees for sorting and searching, Oracles and adversary arguments, techniques for algebraic problems. Internal And External Sorting And Merging Techniques.

Problem Cases: P, NP, NP- Hard and NP-complete, deterministic and non-deterministic polynomial time algorithm approximation, algorithm for some NP complete problems.

Text Books
1. *Horowitz, Ellis, Sahni, S. and Rajasekaran, S., Fundamentals of Computers Algorithms, University Press*
2. *Cormen, Thomas, H., Leiserson, Charles E., Rivest, Ronald L., Stein, Clifford, Introduction to Algorithms, MIT Press*

Reference Books
1. *Levitin, Anany,V., Introduction to the design and analysis of algorithms, Addison Wesley Aho,*
2. *A.V., Hopcraft, J.E. and Dulman, J., Design and Analysis Algorithms, Dorling Kindersley*

CA-P222: ADVANCED OPERATING SYSTEM

L	T	P	Cr
4	0	2	5

Course Objectives	• Students will gain knowledge of basic operating system concepts. • To have an in-depth understanding of process concepts, deadlock and memory management. • To provide an exposure to scheduling algorithms, devices and information management.
Course Outcomes	• .Remember the basic concepts of operating system. • Understand the concepts like interrupts, deadlock, and memory management and file management. • Analyze the need for scheduling algorithms.

Module-I

Introduction: Definition Of The Operating System, Functions Of An Operating System, Different Types Of Systems - Simple Batch System, Multi- Programmed Batched System, Time Sharing System, Personal Computer Systems, Parallel Systems, Distributed Systems, Real Time Systems.

Module-II

Process Management: Process- Process Concept, Process Scheduling, Operation On Processes, Cooperating Processes, Threads, Inter-Process Communication, CPU Scheduling–scheduling criteria, scheduling algorithms – FCFS, SJF, priority scheduling, round robin scheduling, multilevel queue scheduling, multilevel feedback queue scheduling, multiple processor scheduling, real time scheduling.

Module-III

Process Synchronization: The Critical Section Problem, Synchronization Hardware, Semaphores, Classical Problems of Synchronization, Critical Regions. Deadlocks: Deadlock Characterization, Methods For Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery From Deadlock.

Module-IV

Memory Management: Logical & physical address space, Swapping, Continuous Allocation (single partition, multiple partition), internal , external fragmentation, Paging, Segmentation, Segmentation With Paging, Virtual Memory, Demand Paging, Performance Of Demand Paging, Page Replacement, Page Replacement Algorithms– FIFO, optimal, LRU, LRU approximation algorithms, counting algorithms Thrashing, Demand Segmentation.

Module-V

File System Interface: File Concept, Access Methods–sequential, direct, index, Directory Structure–single-level, two–level, tree-structured, acyclic graph, general graph. Security: problem, authentication–passwords, program threats, system threats- worms, viruses, threat monitoring, encryption.

Text Book:

1. Silberschatz, Galvin "Operating System Concepts", Addison Wesley Publishing Company, 1989.

Reference Books:

1. William Stallings, "Operating Systems", Macmillan Publishing Company.

2. Deitel H.M., "An Introduction To Operating System", Addison Wesley Publishing Company, 1984.

3. Tanenbaum, A.S., "Modern Operating System", Prentice Hall of India Pvt. Ltd. 1995.

Open Elective-I

CA-P225: DATABASE ADMINISTRATION

L	T	P	Cr
4	0	2	5

Course Objectives	• The objective of the course is to present an introduction to database management systems, with an emphasis on how to organize, maintain and retrieve - efficiently, and effectively - information from a DBMS.
Course Outcomes	Upon successful completion of this course, students should be able to: • Describe the fundamental elements of relational database management systems • Explain the basic concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL. • Design ER-models to represent simple database application scenarios

Module-I

Introduction: DBMS architecture and data independence, DBA roles and responsibilities SQL *PLUS Overview: SQL plus Fundamentals, Producing more readable outputs, Accepting values at runtime, Using iSQL *Plus. Database life cycle.

Module-II

Modifying Data: Introduction to DML Statements, Truncating a table, Transaction control language Managing Constraints: Creating constraints, Dropping constraints, enabling and disabling constraints, deferring constraints checks Managing Views: Creating and modifying views, Using views, Inserting, Updating and deleting data through views User Access and Security: Creating and modifying use accounts, creating and using roles, granting and revoking privileges, Managing user groups with profiles.

Module-III

Oracle Overview and Architecture: introduction on Oracle 9i , 10g and 12 C. An overview of logical and physical storage structures, Oracle memory structures, Oracle background processes, processing SQL command. Difference between Oracle & SQL server.

Control and Redo Log Files: Managing the control files, Maintaining and monitoring redo log files Managing tables, indexes and constraints: Storing data (create, alter, analyzing, querying table information), Managing indexes, Managing constraints Managing Users and Security: Profiles, Managing users, managing privileges, managing roles, querying role information. Database links and their types.

<div align="center">

Module-IV

</div>

Introduction to Network Administration: Network design considerations, network responsibilities for the DBA, network configuration, Overview of oracle Net features. Type of DBA and their duties. Need of DBA in an organization.

<div align="center">

Module-V

</div>

Backup and Recovery Overview: Database backup, restoration and recovery, Types of failure in oracle environment, defining a backup and recovery strategy, Testing the backup and recovery plan.
Introduction to performance tuning: brief overview of Tuning methodology, General tuning concepts

Text Books
1. *Elmasri, R, Navathe S.B., Fundamentals of Database Systems, Addison Wesley*
2. *Korth, H.F., Silberschatz, S., Sudarshan, A., Database Systems Concepts, McGraw Hill*
3. *Date, C.J., An Introduction to Database Systems, Dorling Kindersley*

Reference Books
1. *Garcia-Molina, Hector, Ullman, J.D. and Widom, J.D.., Database Systems: The Complete Book, Dorling Kindersley*
2. *Desai, Bipin C., An Introduction to Database Concepts, Galgotia Publication*

CA-P226: IMAGE PROCESSING

	L	T	P	Cr
	4	0	2	5.0

Course Objectives	The objective of this course is to make students able to: • Develop a theoretical foundation of Digital Image Processing concepts. • Provide mathematical foundations for digital manipulation of images; image acquisition; preprocessing; segmentation; Fourier domain processing; and compression.
Course Outcomes	This course covers the investigation, creation and manipulation of digital images by computer. The course consists of theoretical material introducing the mathematics of images and imaging. Topics include representation of two-dimensional data, time and frequency domain representations, filtering and enhancement, the Fourier transform, convolution, interpolation.

Module -I

Definition of digital image, pixels, representation of digital image in spatial domain as well as in matrix form.Block diagram of fundamentals steps in digital image processing, application of digital image processing system, Elements of Digital Image, Processing systems,Structure of the Human, Image Formation in the Eye, Brightness Adaptation and Discrimination, Basic Concepts in Sampling and Quantization,Representing Digital Images, Spatial and Gray- Level Resolution, Neighbors of a Pixel, Adjacency, Connectivity, Regions, and Boundaries, Distance Measures between pixels.

Module –II

Image Enhancement and Filter in Spatial Domain: Point operations, Contrast stretching, clipping and thresholding, digital negative, intensity level slicing, log transformation, power log transformation, bit plane slicing, Unnormalized and Normalized Histogram, Histogram Equalization, Use of Histogram Statistics for Image Enhancement, Basics of Spatial Filtering, Linear filters, Spatial Low pass smoothing filters, Averaging, Weighted Averaging, Non-Linear filters, Median filter, Maximum and Minimum filters, High pass sharpening filters, High boost filter, high frequency emphasis filter, Gradient based filters, Robert Cross Gradient Operators, Prewitt filters, Sobel filters, Second Derivative filters, Laplacian filters, Magnification by replication and interpolation

Module –III

Introduction to Morphological Image Processing: Logic Operations involving binary images, Introduction to Morphological Image Processing, Definition of Fit and Hit, Dilation and Erosion, Opening and Closing

Module –IV

Image Segmentation: Definition, Similarity and Discontinuity based techniques, Point Detection, Line Detection, Edge Detection using Gradient and Laplacian Filters, Mexican Hat Filters, Edge Linking and Boundary Detection, Hough Transform, Thresholding: Global, Local and Adaptive Region Based Segmentation: Region Growing Algorithm, Region Split and Merge Algorithm.

Representations, Description and Recognition: Introduction to some descriptors: Chain codes, Signatures, Shape Numbers, Fourier Descriptors, Patterns and pattern classes, Decision-Theoretic Methods, Introduction to Neural Networks and Neural Network based Image Recognition, Overview of Pattern Recognition with block diagram

Text Books:

1. *Digital Image Processing – Rafael C. Gonzalez, Richard E. Woods, 3rd Edition, Pearson, 2008*

2. *Digital Image Processing- S Jayaraman, S Esakkirajan, T Veerakumar- TMH, 2010. REFERENCE BOOKS:*

3. *Digital Image Processing and Analysis-Human and Computer Vision Application with using CVIP Tools – Scotte Umbaugh, 2nd Ed, CRC Press, 2011*

SEMESTER-III

CA-P231: CLOUD COMPUTING

L	T	P	Cr
4	0	0	4

Course Objectives	• Understand the concepts, characteristics, delivery models and benefits of cloud computing • Understand the key security and compliance challenges of cloud computing • Understand the key technical and organizational challenges
Course Outcomes	• Understand the fundamental principles of distributed computing. • Understand how the distributed computing environments known as Grids can be built from lower level services. • Understand the importance of virtualization in distributed computing and how this has enabled the development of Cloud Computing

Module-I

Principles of Parallel and Distributed Computing, Introduction to cloud computing, Cloud computing Architecture, cloud concepts and technologies, cloud services and platforms, Cloud models, cloud as a service, cloud solutions, cloud offerings, introduction to Hadoop and Mapreduce.

Module-II

Cloud Platforms for Industry, Healthcare and education, Cloud Platforms in the Industry, cloud applications. Virtualization, cloud virtualization technology, deep dive: cloud virtualization, migrating in to cloud computing, Virtual Machines Provisioning and Virtual Machine Migration Services, On the Management of Virtual Machines for cloud Infrastructure, Comet cloud, T-Systems,

Module-III

Cloud computing Applications: Industry, Health, Education, Scientific Applications, Business and Consumer Applications, Understanding Scientific Applications for Cloud Environments, Impact of Cloud computing on the role of corporate IT. Enterprise cloud computing Paradigm, Federated cloud computing Architecture, SLA Management in Cloud Computing, Developing the cloud: cloud application Design.

Module-IV

Python Basics, Python for cloud, cloud application development in python, Cloud Application Development in Python. Programming Google App Engine with Python: A first real cloud Application, Managing Data in the cloud, Google app engine Services for Login Authentication, Optimizing UI and Logic, Making the UI Pretty: Templates and CSS, Getting Interactive. Map Reduce Programming Model and Implementations.

Module-V

 Cloud management, Organizational Readiness and change management in the cloud age ,Cloud Security ,Data security in the cloud, Legal Issues in the Cloud , Achieving Production Readiness for the cloud Services

Text Books:

1. *Cloud Computing : Raj Kumar Buyya , James Broberg, andrzej Goscinski, 2013 Wiley*
2. *Mastering Cloud Computing: Raj Kumar buyya, Christian Vecchiola,selvi-2013.*
3. *Cloud Computing: Arshdeep Bahga, Vijay Madisetti, 2014, University Press.*
4. *Cloud computing: Dr Kumar Saurab Wiley India 2011.*

References:

1. *Code in the Cloud: Mark C.Chu-Carroll 2011, SPD.(Second part of IV UNIT)*
2. *Essentials of cloud computing: K Chandrasekharan CRC Press.*
3. *Cloud Computing: John W. Rittinghouse, James Ransome, CRC Press.*
 4. *Virtualization Security: Dave shackleford 2013. SYBEX a wiley Brand.*
5. *Cloud computing and Software Services: Ahson , Ilyas.2011.*
6. *Cloud Computing Bible: Sosinsky 2012. Wiley India .*
7. *Cloud Computing: Dan C. Marinescu-2013, Morgan Kaufmann.*

CA-P233: BIG DATA ANALYSIS

L	T	P	Cr
4	0	0	4

Course Objectives	• Understand the Big Data Platform and its Use cases • Provide an overview of Apache Hadoop • Provide HDFS Concepts and Interfacing with HDFS • Understand Map Reduce Jobs • Provide hands on Hodoop Eco System
Course Outcomes	The students will be able to: • Identify Big Data and its Business Implications. • List the components of Hadoop and Hadoop Eco-System • Access and Process Data on Distributed File System • Manage Job Execution in Hadoop Environment

Module-I

Introduction to Big Data, Big Data characteristics, types of Big Data, Traditional vs. Big Data business approach, Case Study of Big Data Solutions. What is Hadoop? Core Hadoop Components; Hadoop Ecosystem; Physical Architecture; Hadoop limitations.

1. What is NoSQL? NoSQL business drivers; NoSQL case studies;

2. NoSQL data architecture patterns: Key-value stores, Graph stores, Column family (Bigtable) stores, Document stores, Variations of NoSQL architectural patterns;

3. Using NoSQL to manage big data: What is a big data NoSQL solution? Understanding the types of big data problems; Analyzing big data with a shared-nothing architecture; Choosing distribution models: master-slave versus peer-to-peer; Four ways that NoSQL systems handle big data problems

Module-II

MapReduce and the New Software Stack : Distributed File Systems : Physical Organization of Compute Nodes, Large-Scale File-System Organization MapReduce: The Map Tasks, Grouping by Key, The Reduce Tasks, Combiners, Details of MapReduce Execution, Coping With Node Failures. Algorithms Using MapReduce: Matrix-Vector Multiplication by MapReduce , Relational-Algebra Operations, Computing Selections by MapReduce, Computing Projections by MapReduce, Union, Intersection, and

Difference by MapReduce, Computing Natural Join by MapReduce, Grouping and Aggregation by MapReduce, Matrix Multiplication, Matrix Multiplication with One MapReduce Step.

Module-III

Finding Similar Items: Applications of Near-Neighbor Search, Jaccard Similarity of Sets, Similarity of Documents, Collaborative Filtering as a Similar-Sets Problem . Distance Measures: Definition of a Distance Measure , Euclidean Distances, Jaccard Distance, Cosine Distance, Edit Distance, Hamming Distance.

Mining Data Streams: The Stream Data Model: A Data-Stream-Management System, Examples of Stream Sources, Stream Querie, Issues in Stream Processing. Sampling Data in a Stream : Obtaining a Representative Sample , The General Sampling Problem, Varying the Sample Size. Filtering Streams: The Bloom Filter, Analysis. Counting Distinct Elements in a Stream The Count-Distinct Problem, The Flajolet-Martin Algorithm, Combining Estimates, Space Requirements . Counting Ones in a Window: The Cost of Exact Counts, The Datar-Gionis-IndykMotwani Algorithm, Query Answering in the DGIM Algorithm, Decaying Windows.

Module-IV

Link Analysis: PageRank Definition, Structure of the web, dead ends, Using Page rank in a search engine, Efficient computation of Page Rank: PageRank Iteration Using Map Reduce, Use of Combiners to Consolidate the Result Vector. Topic sensitive Page Rank, link Spam, Hubs and Authorities

Frequent item sets Handling Larger Datasets in Main Memory Algorithm of Park, Chen, and Yu, The Multistage Algorithm, The Multihash Algorithm. The SON Algorithm and Map Reduce Counting Frequent Items in a Stream Sampling Methods for Streams, Frequent Item sets in Decaying Windows

Module-V

Clustering: CURE Algorithm, Stream-Computing, A Stream-Clustering Algorithm, Initializing & Merging Buckets, Answering Queries

Recommendation system: A Model for Recommendation Systems, Content-Based Recommendations, Collaborative Filtering

Mining Social-Network Graphs: Social Networks as Graphs, Clustering of Social-Network Graphs, Direct Discovery of Communities, SimRank, Counting triangles using Map-Reduce

Text Books:

1. *Anand Rajaraman and Jeff Ullman "Mining of Massive Datasets", Cambridge University Press,*

2. *Alex Holmes "Hadoop in Practice", Manning Press, Dreamtech Press.*

3. *Dan McCreary and Ann Kelly "Making Sense of NoSQL" – A guide for managers and the rest of us, Manning Press.*

References:

1. *Bill Franks , "Taming The Big Data Tidal Wave: Finding Opportunities In Huge Data Streams With Advanced Analytics", Wiley*

2. *Chuck Lam, "Hadoop in Action", Dreamtech Press*

3. *Judith Hurwitz, Alan Nugent, Dr. Fern Halper, Marcia Kaufman, "Big Data for Dummies", Wiley India*

4. *Michael Minelli, Michele Chambers, Ambiga Dhiraj, "Big Data Big Analytics: Emerging Business Intelligence And Analytic Trends For Today's Businesses", Wiley India*

5. *Phil Simon, "Too Big To Ignore: The Business Case For Big Data", Wiley India*

6. *Paul Zikopoulos, Chris Eaton, "Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data', McGraw Hill Education.*

7. *Boris Lublinsky, Kevin T. Smith, Alexey Yakubovich, "Professional Hadoop Solutions", Wiley India.*

Term work:

Assign a case study for group of 2/3 students and each group to perform the following experiments on their case-study; Each group should perform the exercises on a large dataset created by them.

Term work: (15 marks for programming exercises + 10 marks for mini-project)

Suggested Practical List: Students will perform at least 8 programming exercises and implement one mini-project. The students can work in groups of 2/3.

1. Study of Hadoop ecosystem

2. 2 programming exercises on Hadoop

3. 2 programming exercises in No SQL

4. Implementing simple algorithms in Map- Reduce (3) - Matrix multiplication, Aggregates, joins, sorting, searching etc.

5. Implementing any one Frequent Itemset algorithm using Map-Reduce

6. Implementing any one Clustering algorithm using Map-Reduce

7. Implementing any one data streaming algorithm using Map-Reduce

8. Mini Project: One real life large data application to be implemented (Use standard Datasets available on the web)

a) Twitter data analysis

b) Fraud Detection

CA-P234: OBJECT ORIENTED ANALYSIS AND DESIGN

L	T	P	Cr
4	0	2	5.0

Course Objectives	• Specify, analyze and design the use case driven requirements for a particular system. • Model the event driven state of object and transform them into implementation specific layouts. • Identify, Analyze the subsystems, various components and collaborate them interchangeably.
Course Outcomes	• The importance of modeling in the software development life cycle • The UML notation and symbols • The object-oriented approach to analyzing and designing systems and software solutions • How to Employ the UML notation to create effective and efficient system design

Module-I

Object orientation and Development, OO Benefits, Abstraction, OO Modeling, The Three Models: Class Modeling (Objects and Classes, Relationships, Generalization and Inheritance, Association, Aggregation, Constraints, Packages), State Modeling (Events, States, Transitions and Conditions, State and Behavior, Concurrency) and Interaction Modeling (Use case models, Sequence and Activity)

Module-II

System and Process, SDLC, Creation of SRS document: Requirement Specification, Documentation and SDLC Models. Domain and Application Analysis (Class, State and Interaction Models), System Design (Subsystems, Global Resources, Conditions, Priorities) Using design patterns (Abstraction-Occurrence, General Hierarchy, Player-Role, Singleton, Observer, Delegation, Adapter and Proxy Patterns), Class Design (Use cases, algorithms, refactoring, design optimization, inheritance adjustment)

Module-III

UML Diagram: Use case diagram, Class diagram, Object diagrams, Aggregation activities on real objects(Aggregation, Generalization relations, Association and multiplicity), Activity diagram(Activity and state diagram), Interaction Diagram(Sequence diagram, Collaboration diagram, Component diagram.)

Module-IV

UML Diagram: Use case diagram, Class diagram, Object diagrams, Aggregation activities on real objects(Aggregation, Generalization relations, Association and multiplicity), Activity diagram(Activity and state diagram), Interaction Diagram(Sequence diagram, Collaboration diagram, Component diagram.)

Text Books
   • *Frederick Eddy, James Rumbaugh, Michael Blaha, Willliam Premerlani, William Lorensen: Object-Oriented Modeling and Design, Pearson Education.*
   • *James Rumbaugh, Michael R. Blaha: Object-Oriented Modeling and Design with UML, Pearson Education.*

Reference Books
Timothy C. Lethbridge, Robert Laganiere: Object Oriented Software Engineering, Practical Software Development using UML and Java, Tata McGraw-Hill edition.

CA-P232: E-COMMERCE AND E-GOVERNANCE

L	T	P	Cr
4	0	0	4

Course Objectives	• This course provides an introduction to information systems for business and management. • It is designed to familiarize students with organizational and managerial foundations of systems, the technical foundation for understanding information systems
Course Outcomes	After Completion of the subject student should able to • Understand the basic concepts and technologies used in the field of management information systems • Have the knowledge of the different types of management information systems • Understand the processes of developing and implementing information systems • Be aware of the ethical, social, and security issues of information systems

Module-I

Introduction to e-commerce: History of e-commerce, e-business models B2B, B2C, C2C, C2B, legal; environment of e-commerce, ethical issues, electronic data interchange, value chain and supply chain, advantages and disadvantages of e-commerce.

Module-II

Electronic Payment Systems: Credit cards, debit cards, smart cards, e-credit accounts, e-money, Marketing on the web, marketing strategies, advertising on the web, customer service and support, introduction to m-commerce, case study: e-commerce in passenger air transport.

Module-III

E-Government, theoretical background of e-governance, issues in e-governance applications, evolution of e-governance, its scope and content, benefits and reasons for the introduction of e-governance, e-governance models- broadcasting, critical flow, comparative analysis, mobilization and lobbying, interactive services / G2C2G.

Module-IV

E-readiness, e-government readiness, E- Framework, step & issues, application of data warehousing and data mining in e-government, Case studies: NICNET-role of nationwide networking in egovernance, e-seva.

Module-V

E-Government systems security: Challenges and approach to e-government security, security concern in e-commerce, security for server computers, communication channel security, security for client computers.

References:-

- *Gary P. Schneider, "E-commerce", Cengage Learning India.*

- *C.S.R. Prabhu, "E-governence: concept and case study", PHI Learning Private Limited.*

- *V. Rajaraman, "Essentials of E-Commerce Technology", PHI Learning Private Limited.*

- *David Whiteley, "E-commerce study , technology and applications", TMH.*

- *J. Satyanarayan, "E-government: The science of the possible", PHI Learning Private Limited.*

- *P.T. Joseph, "E-Commerce An Indian Perspective", PHI Learning Private Limited.*

- *Hanson and Kalyanam, "E-Commerce and Web Marketing", Cengage Learning India.*

Open Elective-III

CA-P236: ARTIFICIAL INTELLIGENCE

L	T	P	Cr
4	0	0	4

Course Objectives	• Gain a historical perspective of AI and its foundations. • Become familiar with basic principles of AI toward problem solving, inference, perception, knowledge representation, and learning. • Investigate applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models. • Experience AI development tools such as an 'AI language', expert system shell, and/or data mining tool.
Course Outcomes	• Demonstrate fundamental understanding of the history of artificial intelligence (AI) and its foundations. • Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning. • Demonstrate awareness and a fundamental understanding of various applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models.

Module-I

Introduction- What is intelligence? Foundations of artificial intelligence (AI). History of AI; Problem Solving- Formulating problems, problem types, states and operators, state space, search strategies.

Informed Search Strategies- Best first search, A* algorithm, heuristic functions, Iterative deepening A*(IDA), small memory A*(SMA); Game playing - Perfect decision game, imperfect decision game, evaluation function, alpha-beta pruning

Module-II

Reasoning-Representation, Inference, Propositional Logic, predicate logic (first order logic), logical reasoning, forward chaining, backward chaining; AI languages and tools - Lisp, Prolog, CLIPS. Planning- Basic representation of plans, partial order planning, planning in the blocks world, hierarchical planning, conditional planning, representation of resource constraints, measures, temporal constraints

Module-III

Uncertainty - Basic probability, Bayes rule, Belief networks, Default reasoning, Fuzzy sets and fuzzy logic; Decision making- Utility theory, utility functions, and Decision theoretic expert systems.

Module-IV

Inductive learning - decision trees, rule based learning, current-best-hypothesis search, least-commitment search , neural networks, reinforcement learning, genetic algorithms; Other learning methods - neural networks, reinforcement learning, genetic algorithms.

Communication - Communication among agents, natural language processing, formal grammar, parsing, grammar

Text Books:

1. Stuart Russell and Peter Norvig. Artificial Intelligence – A Modern Approach, Pearson Education Press, 2001.
2. Kevin Knight, Elaine Rich, B. Nair, Artificial Intelligence, McGraw Hill, 2008.

Reference Books:

1. George F. Luger, Artificial Intelligence, Pearson Education, 2001
2. Nils J. Nilsson, Artificial Intelligence: A New Synthesis, Morgan Kauffman, 2002

CA-P237: DISTRIBUTED SYSTEMS

L	T	P	Cr
4	0	0	4

Course Objectives	• To provide hardware and software issues in modern distributed systems. • To get knowledge in distributed architecture, naming, synchronization, consistency and replication, fault tolerance, security, and distributed file systems. • To analyze the current popular distributed systems such as peer-to-peer (P2P) systems will also be analyzed.
Course Outcomes	• To provide hardware and software issues in modern distributed systems. • To get knowledge in distributed architecture, naming, synchronization, consistency and replication, fault tolerance, security, and distributed file systems. • To analyze the current popular distributed systems such as peer-to-peer (P2P) systems will also be analyzed. • To know about Shared Memory Techniques.

Module-I

Course Contents: Characterization of Distributed Systems: Introduction, system models –Architectural and Fundamental models. Inter process communication: API for internet protocol, Marshalling. Client server communication, group communication case study: Unix.

Module-II

Distributed objects and remote invocation: communication between Distributed objects, RPC, events and notification case study: Java RMI. Operating System Support: Operating System layer. Protection, processes and threads, operating system architecture.

Module-II

Distributed File System: File service architecture, network file system, Sun network file system,
Andrew file system Case Study: Unix Name services: Name services and domain name system, directory and discovery services Case Study: Global Name service

Module-III

Transaction and concurrency control: transactions, nested transactions, Locks, optimistic concurrency control, time stamp ordering, Comparison of methods for concurrency control. Distributed transaction: Flat and nested distributed transactions. Atomic Commit protocol, Distributed dead locks.

Module-IV

Distributed Multimedia systems; characteristics of multimedia, multimedia data. Quality of service management, resource management, stream adaptation. Case study; Tiger video file server.

Module-V

Distributed shared memory: design and implementation issues, sequential consistency and Ivy and Release Consistency an Munin Case Study of distributed systems: CORBA

Text Books :

1. G. Coulouis, et al. Distributed Systems: Concepts and design, Pearson Education Asia,2004
2. A.S. Tanenbaum, Modern operating Systems, Prentience Hall

CA-PM235: Project

SEMESTER-IV

CA-P242: WEB TECHNOLOGIES USING PHP

L	T	P	Cr
4	0	4	6

Course Objectives	• On completion of this course, a student will be familiar with client server architecture and able to develop a web application using java technologies. • Students will gain the skills and project-based experience needed for entry into web application and development careers.
Course Outcomes	• Students are able to develop a dynamic webpage by the use of java script and DHTML. • Students will be able to write a well formed / valid XML document. • Students will be able to connect a java program to a DBMS and perform insert, update and delete operations on DBMS table. • Students will be able to write a server side java application called Servlet to catch form data sent from client, process it and store it on database

Module-I

Introduction to XML, XML Basics, XML Syntax and Editors, Elements, Attributes, Document Type Definitions (DTD), XML Schemas (XSD), XML Namespaces, XML Document Object Model, XSLT, Use of XSLT with XML Intro to, and XPath, XQuery XML Database.

Developing websites (Submit items for listing, Get Categories, View Items, Placing orders, Integrate remote data on website), Integrating with payment gateways.

Module-II

Introduction to PHP : Evaluation of Php, Basic Syntax ,Defining variable and constant ,Php Data type ,Operator and Expression Handling Html Form With Php :Capturing Form Data ,Dealing with Multi-value filed ,Generating File uploaded form ,Redirecting a form after submission Decisions and loop: Making Decisions ,Doing Repetitive task with looping ,Mixing Decisions and looping with Html, Introduction CSS, Types of CSS (In-Line, Internal & External)

Module-III

Functions: What is a function , function String: Creating and accessing String ,Searching & Replacing String ,Formatting String ,String Related Library function.

Module-IV

Database Connectivity with MySql: Introduction to RDBMS ,Connection with MySql Database ,Performing basic database operation(DML) (Insert, Delete, Update, Select),Setting query parameter ,Executing query ,Join (Cross joins, Inner joins, Outer Joins, Self joins.)

Module-V

Introduction to Web 2.0, Content Management System CMS (Types, Usages, Benefits),
Frameworks in Web development (CakePHP, Zend), Understanding MVC Architecture and
its Importance

Text Books:

1. Professional XML, Wrox Publications
2. Professional Web APIs with PHP: eBay, Google, PayPal, Amazon, FedEx, Plus
3. Web Feeds by Paul Reinheimer, John Wiley & Sons

CA-P243: SOFTWARE TESTING AND QUALITY MANAGEMENT

L	T	P	Cr
4	0	0	4

Course Objectives	• To study fundamental concepts in software testing • To discuss various software testing issues and solutions in software unit test, integration and system testing. • To expose the advanced software testing topics, such as object-oriented software testing methods.
Course Outcomes	At the end of this course student will: • List a range of different software testing techniques and strategies and be able to apply specific (automated) unit testing method to the projects. • Demonstrate various issues for object oriented testing.

Module-I

Software Testing Fundamentals: Testing-Related Terminology, Key Issues: Test selection criteria/Test adequacy criteria, Testing effectiveness/Objectives for testing, Testing for defect identification, Theoretical and practical limitations of testing, the problem of infeasible paths, Testability, Relationship of Testing with other activities, Testing Levels: Unit Testing, Integration Testing, System Testing, Acceptance Testing.

Module-II

Testing Techniques: Based on the software engineer's intuition and experience, Ad hoc testing, Exploratory testing, Specification-based techniques, Equivalence partitioning, Boundary-value analysis, Decision Table Testing, Testing with Formal Specifications, Finite State Machine based, Code Based, Data Flow Based, Mutation Testing, Techniques based on nature of the application: Object-oriented testing, Component-based testing, Web-based testing, GUI testing, Testing of concurrent programs, Protocol conformance testing, Testing of real-time systems, Testing of safety-critical Systems, Selecting and combining techniques

Module-III

Software Quality: Software Engineering Culture and Ethics, Value and Cost of Quality, Models and Quality Characteristics: Software Engineering Process Quality, Software Product Quality, Quality Improvement, Software Quality Management Processes: Quality assurance process, Verification process, Validation process, Review process, Audit process, Practical Considerations: *Software Quality Requirements,* Dependability, Integrity levels of software, *Defect Characterization,.*

Module-IV

Software Quality: Management Techniques, Software Quality Measurement, ISO 9000:2000 Quality management systems -- Fundamentals and vocabulary, ISO 9001:2000 Quality management systems –Requirements, ISO 9004:2000 Quality management systems --Guidelines for performance improvements, Quality Management Processes: Quality Planning, Quality Assurance, Quality Control.
Quality Planning: Inputs, Tools and Techniques, Outputs

Module-V

Quality Assurance: Inputs, Quality Management Plan, Results of Quality Control Measurements, Operational Definitions, Quality Planning tools and techniques, Quality Audits, Quality Improvements

Quality Control: Inputs, Tools and Techniques: Inspection, Control Charts, Pareto Diagrams, Statistical Sampling, Flowcharting, Trend Analysis, Outputs: Quality Improvements, Acceptance Decisions, Rework, Completed Checklist, Process Adjustments.

Text Books
   1. *Beizer, Boris B. ,Software Testing Techniques, Wiley Dreamtech Publication*
   2. *Tian,Jeff, Software Quality Engineering: Testing, Quality Assurance, and Quantifiable Improvement, Wiley-IEEE Computer Society Press*

Reference Books
   1. *A Guide to the Software Engineering Body of Knowledge (SWEBOK), IEEE Computer Society, (2004).   (http://www.nt.fh-koeln.de/fachgebiete/inf/nissen/softeng/swebok.pdf)*
   2. *A Guide to the Project Management Body of Knowledge (PMBOK), Project Management Institute, PA, USA (2004).*

CA-P241: DATA WAREHOUSE AND DATA MINING

L	T	P	Cr
4	0	0	4

Course Objectives	• Be familiar with mathematical foundations of data mining tools. • Understand and implement classical models and algorithms in data warehouses and data mining • Characterize the kinds of patterns that can be discovered by association rule mining, classification and clustering.
Course Outcomes	• Appreciate the strengths and limitations of various data mining and data warehousing models. • Explain the analyzing techniques of various data Analyze • Describe different methodologies used in data mining and data ware housing.

Module-I

Introduction to Data Warehousing: The need for data ware housing, Operational Data Stores Informational Data Stores, Data Ware house definition & Characteristics, Data Warehouse Architecture.

Data Warehouse Components: Overall architecture, Data Warehouse database, Sourcing, acquisition, cleanup and transformation tools, Metadata, Access tools, Data Marts, Data Warehouse Administration and management, Information delivery System.

Module-II

Building a Data Warehouse: Considerations - business, design, technical & implementation, integrated solutions, Benefits of Data Warehousing. Mapping Data Warehouse to a Multiprocessor Architecture: Relational database technology, Database architectures for parallel processing, Parallel RDBMS features, Parallel DBMS Vendors.

DBMS Schemas for Decision Support: Data layout for best access, Multidimensional data models, Star schema.Data Extraction, Cleanup & Transformation Tools: Tool requirements, Vendor approaches, Access to legacy data, Transformation Engines.

Module-III

Metadata - definition, interchange initiative, repository, trends. Reporting and Query Tools and Applications: Tools – Categories.
OLAP: Need, Multidimensional data model, guidelines, Multidimensional Vs multi-relational
OLAP, Categorization of OLAP tools.

Module-IV

Introduction to Data mining, Measuring Data Mining effectiveness, Discovery Vs prediction, Overfitting, Comparing the Technologies. Decision trees, where to use them, General idea, how do they work, Strengths and Weaknesses. Techniques and Algorithms: Neural networks - uses, making predictions, different kinds, Kohonen feature map, their working.

Module-V

Nearest Neighbour & Clustering – uses, predictions and differences, their working. Genetic Algorithms – uses, cost minimization, cooperative strategies, their working, Rule Induction – uses, evaluation of rules, rules Vs decision trees, their working, Using the right technique, Data mining & business process

Text Book:

1. Alex Berson Data Warehousing, Data Mining, and Olap, Tata Mcgraw Hill

2. George M Marakas, Modern Data Warehousing, Mining & Visualization Core Concepts, Pearson Education

Other Specific Book:

1. M.Kamber, Data Mining: Concepts and Techniques

2. (Berry,Michael) Data Mining Techniques

CA-P243: Project

Open Elective-IV

CA-P245: CYBER CRIME &COMPUTER FORENSICS

L	T	P	Cr
4	0	0	4

Course Objectives	• Exhibit knowledge to secure corrupted systems, protect personal data, and secure computer networks in an Organization. • Practice with an expertise in academics to design and implement security solutions. • Understand key terms and concepts in Cryptography, Governance and Compliance. • Develop cyber security strategies and policies • Understand principles of web security and to guarantee a secure network by monitoring and analyzing the nature of attacks through cyber/computer forensics software/tools.
Course Outcomes	• Analyze and evaluate the cyber security needs of an organization. • Determine and analyze software vulnerabilities and security solutions to reduce the risk of exploitation. • Measure the performance and troubleshoot cyber security systems • Implement cyber security solutions and use of cyber security, information assurance, and cyber/computer forensics software/tools.

Module-I

Computer and Cyber Forensic Basics- Introduction to Computers, Computer History, Software, Hardware, Classification, Computer Input-Output Devices, Windows, DOS Prompt Commands, Basic Computer Terminology, Internet, Networking, Computer Storage, Cell Phone / Mobile Forensics, Computer Ethics and Application Programs

Module-II

Cyber Forensic Basics- Introduction to Cyber Forensics, Storage Fundamentals, File System Concepts, Data Recovery, Operating System Software and Basic Terminology.

Module-III

Cyber Forensics Investigation- Introduction to Cyber Forensic Investigation, Investigation Tools, Discovery, Digital Evidence Collection, Evidence Preservation, E-Mail Investigation, E-Mail

Cyber Crimes and Cyber Laws- Introduction to IT laws & Cyber Crimes – Internet, Hacking, Cracking, Viruses, Virus Attacks, Pornography, Software Piracy, Intellectual property, Legal System of Information Technology, Social Engineering, Mail Bombs, Bug Exploits, and Cyber Security.

Module-IV

Tracking, IP Tracking, E-Mail Recovery, Encryption and Decryption methods, Search and Seizure of Computers, Recovering deleted evidences, Password Cracking

Cyber Security- Introduction to Cyber Security, Implementing Hardware Based Security, Software Based Firewalls, Security Standards, Assessing Threat Levels, Forming an Incident Response Team, Reporting Cybercrime, Operating System Attacks, Application Attacks, Reverse Engineering & Cracking Techniques and Financial Frauds.

Textbooks

1. Cyber Crime Investigations, Anthony Reyes

2. Computer and Intrusion Forensics: George Mohay, Alison Anderson, Byron Collie, Olivier de Vel, Rodney McKemmish, Publication: Artech House 2.

Other Specific Books

1. Insider Attack and Cyber Security, Beyond the hacker , Springer publication.

2. Digital Crime and Forensic science and cyberspace, Panagiotis Kanellis

CA-P244: CRYPTOGRAPHY AND NETWORK SECURITY

L	T	P	Cr
4	0	0	4

Course Objectives	• To understand basics of Cryptography and Network Security. • To be able to secure a message over insecure channel by various means. • To learn about how to maintain the Confidentiality, Integrity and Availability of a data. • To understand various protocols for network security to protect against the threats in the networks.
Course Outcomes	• Classify the symmetric encryption techniques. • Illustrate various Public key cryptographic techniques. • Evaluate the authentication and hash algorithms. • Discuss authentication applications. • Summarize the intrusion detection and its solutions to overcome the attacks. • Basic concepts of system level security.

Module-I

Security in Computing Environment: Need for Security; Security Attack – Threats, Vulnerabilities, and Controls, Types of Threats (Attacks); Security Services – Confidentiality, Integrity, Availability; Information Security; Methods of Protection. Basics of Cryptography: Terminologies used in Cryptography; Substitution Techniques – The Caesar Cipher, One-Time Pads, The Vernam Cipher, Book Cipher; Transposition Techniques – Encipherment/Decipherment Complexity, Diagrams, Trigrams, and Other Patterns.

Module-II

Encryption and Decryption: Characteristics of Good Encryption Technique; Properties of Trustworthy Encryption Systems; Types of Encryption Systems – Based on Key, Based on Block; Confusion and Diffusion; Cryptanalysis. Symmetric Key Encryption: Data Encryption Standard (DES) Algorithm – Overview of the DES Algorithm; Double and Triple DES – Double DES, Triple DES; Security of the DES; Advanced Encryption Standard (AES) Algorithm – Overview of Rijndael, Strength of the Algorithm; DES and AES Comparison.

Module-III

Public Key Encryption: Characteristics of Public Key System; RSA Technique – Encryption-Method; Key Exchange; Diffie-Hellman Scheme; Cryptographic Hash Functions; Digital Signature – Properties of Digital Signature, Public Key Protocol; Certificates; Certificate Authorities. Protection of Computing Resources: Secure Programs – Fixing Faults, Unexpected Behavior, Types of Flaws; Non-malicious Program Errors – Buffer Overflows, Incomplete Mediation; Viruses and Other Malicious Code – Kinds of Malicious

Code, Virus Attack, Appended Virus; Targeted Malicious Code – Trapdoors, Causes of Trapdoors; Methods of Control – Developmental Controls, Operating System Controls on use of Programs, Administrative Controls.

Module-VI

Security Features in Operating System: Objects to be Protected; Protection Methods of Operating Systems; Memory Protection; File Protection – All-None Protection, Group Protection, Single Permissions; User Authentication – Use of Passwords, Additional Authentication Information, Attacks on Passwords, Exhaustive Attack, and Password Selection Criteria. Designing Trusted Operating Systems: Types of Security Policies – Military Security Policy, Commercial Security Policy, Chinese Wall Security Policy; Models of Security; Design of OS – Design Elements, Security Features of Ordinary Operating Systems, Security Features of Trusted Operating Systems.

Module-V

Network Security: Network Concepts; Threats in Networks – Who Attacks Networks? Threats in Transit: Eavesdropping and Wiretapping, Protocol Flaws, Impersonation; Network Security Controls – Architecture, Encryption, Virtual Private Networks, Public Key Infrastructure (PKI) and Certificates. IP Security: Overview of IP Security (IPSec); IP Security Architecture; Modes of Operation; Security Associations (SA) – Security Parameter Index (SPI), SA Management, Security Policy; Authentication Header (AH); Encapsulating Security Payload (ESP); Internet Key Exchange.

Web Security: Web Security Requirements; Secure Socket Layer (SSL) – SSL Architecture, SSL Protocol; Transport Layer Security (TLS); Secure Electronic Transaction (SET) – Features, Components, Dual Signature, Purchase Request. Electronic Mail Security: Threats to E-Mail; Requirements and Solutions – Confidentiality, Integrity; Encryption for Secure E-Mail; Secure E-Mail System – PGP (Pretty Good Privacy), S/MIME (Secure Multipurpose Internet Mail Extensions).

Firewalls: Firewalls – Types – Packet Filtering Gateway, Stateful Inspection Firewall, Application Proxy, Guard, Personal Firewalls; Comparison of Firewall Types; Firewall Configurations. Planning and Enforcing Security Policies: Planning Security Policies; Risk Analysis; Security Policies for an Organization; External Security.

Text Books:

1. William Stallings, Cryptography and Network Security, 4th Edition, Pearson Education/PHI. 2006

Reference Books:

Charlie Kaufman, Radia Perlman, Mike Speciner, Network Security: Private Communication in Public World, 2nd   Edition,2011, Pearson Education