Scheme & Syllabus

of

Master of Computer Applications (MCA)

(WITH EFFECT FROM 2020 -22)

OUTCOME BASED EDUCATION
WITH
CHOICE BASED EDUCATION

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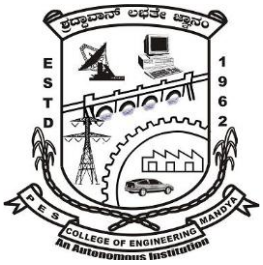
(±ÉÊPÀëtÂPÀªÀµÀð 2020-22)



P.E.S. College of Engineering

Mandya - 571 401, Karnataka

(An Autonomous Institution Affiliated to VTU, Belagavi

Grant -in- Aid Institution (Government of Karnataka), World Bank Funded College (TEQIP)

Accredited by NBA & NAAC and Approved by AICTE, New Delhi.)

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Preface

PES College of Engineering, Mandya, started in the year 1962, has become autonomous in the academic year 2008-09. Since, then it has been doing the academic and examination activities successfully. The college is running 6 Postgraduate programs. It consists of 4 M.Tech programs, which are affiliated to VTU. Other postgraduate programs are MBA and MCA.

India has become a Permanent Member by signing the Washington Accord. The accord was signed by the National Board of Accreditation (NBA) on behalf of India on 13th June 2014. It enables not only the mobility of our degree globally but also establishes equivalence to our degrees with that of the member nations such as Taiwan and Hong Kong, Ireland, Korea, Malaysia, New Zealand, Russia, Singapore, South Africa, Turkey, Australia, Canada and Japan are among 16 signatories to the international agreement besides the US and the UK. Implementation of Outcome Based Education (OBE), has been the core issue for enabling the equivalence and of Indian degrees and their mobility across the countries.

Our Higher Educational Institution has adopted Credit Based system (CBCS) based semester Structure with OBE Scheme and grading system which provides the flexibility in designing curriculum and assigning credits based on the course content and hours of teaching. There lies a shift in thinking, teaching and learning process moving towards students Centric from Teachers Centric Education which enhances the knowledge, skills & moral values of each student.

Choice Based Credit System (CBCS) provides the options for the students to select from the number of prescribed courses. The CBCS provides a 'cafeteria' type approach in which the students can choose electives from a wide range of courses of their choice, learn at their own pace, undergo additional courses and acquire more than the required credits, adopt an interdisciplinary approach for learning which enables integration of concepts, theories, techniques. These are greatly enhances the skill/employability of students.

In order to increase the Industry Institute Interaction, Internship have been added to the existing curriculum of 2020-21. Further, Research Methodology & IPR and two Self Study Courses have been introduced to enhance their Research ability and Self Learning ability respectively. Lab Components are also included in I & II Semester.

Dr. Umesh D R
Deputy Dean (Academic)
Associate Professor,
Dept. of CS & Engg

Dr. Nagarathna
Dean (Academic)
Professor
Dept. of CS & Engg

Department of Master of Computer Applications (MCA)

ABOUT THE DEPARTMENT

The department of MCA started in 1992 in PES College of Engineering Mandya, one among the earliest institutes in Karnataka to start MCA Programme. The intake of the department is 60 students. The department is run by highly qualified teaching staff. The department has three different laboratories to address the programmes of the revised syllabus. The department has received Rs. 25 lakhs funds from AICTE for modernization of labs. The Programme became autonomous in the year 2008 and is affiliated to Visvesvaraya Technological University and approved by AICTE. The department has published several papers in national and international conferences and journal. The department has been actively involved in conducting workshops, Technical Seminars from industry persons to provide a platform for sharing and spreading the latest developments in the field of Computer science and applications. The curriculum for the Master of Computer applications programme is designed to meet the need of IT industry. It includes the core computer science and computer application courses and in addition, the mathematics concepts required for modeling the domain of the software systems and solve them, and management principles. The core courses encompass the core concepts of computer science and the elective courses are designed to deliver the modern technologies and tools. The salient feature of the curriculum is, the laboratory component included as a part of most of the courses and adequate number of courses are having tutorial component. Some of the companies that offered placements to MCA students are Tech Mahindra, TCS, Mindtree, Headstrong, HP, Emphasis etc

VISION AND MISSION

Vision of PESCE

An institution of high repute, imparting quality education to develop innovative and Humane engineers.

Mission of PESCE

Committed to develop students potential through high quality teaching- learning processes and state of the art infrastructure

Vision of the Department

A Department is high repute imparting quality education to develop innovative Computer application engineers and technocrats.

Mission of the Department

Committed to

- Provide state-of-the-art facilities with supportive environment for teaching and learning.
- Prepare the students with curricula of industry expectation.
- Train the students to be competent to solve the real world problems in the field of computer Applications with cutting-edge technology and nurturing the students with ethical values for well being in the society.

ACADEMIC PROGRAM

PROGRAM EDUCATIONAL OBJECTIVES (PEO)

PEO-1. Educate students to be successful computer application professionals in a global environment.

PEO-2. To train the students with good technical and managerial skills so as to grasp, analyze, design and develop novel applications and solutions for real time problems.

PEO-3. To prepare students to adapt to the challenges of an ever changing world.

PEO-4. To encourage the students in professional and ethical attitude, effective communication skills, team work skills, multidisciplinary approach and ability to relate computer applications to broader social context.

PROGRAMME OUTCOMES (PO)

PO-1. Computational knowledge: Apply knowledge of Computing fundamentals, mathematics and domain knowledge in the field of computer applications.

PO-2. Problem Analysis: Ability to understand, identify, analyze, formulate and solve the problems.

PO-3. Design/development of solutions: Design and develop solutions for complex computing problems, and evaluate systems, components, or processes that meet specified needs with appropriate consideration for public, cultural, societal, and economical considerations.

PO-4. Conduct investigations on complex Computing problems: Use research based knowledge and methods to analyze and design of unfamiliar problems to provide valid solutions and conclusions.

PO-5. Explore modern tool: Ability to use techniques and skills necessary for computer applications.

PO-6. Professional Ethics: Work as professionals with ethical values and moral behaviors.

PO-7. Life-long Learning and updation: To engage in independent and life-long technical learning to keep in pace with the changes in technologies.

PO-8. Project management and finance: Demonstrate knowledge and understanding of the computing Problems and solutions of one's own work, as a member or as a member in a team, considering Management and financial factors.

PO-9. Communication proficiency: Ability to communicate effectively

PO-10. Global **Societal and Economical Concern:** Ability to apply the impact of computer applications in global, economic, environmental and societal context.

PO-11.Individual and Team work: Ability to function individually, in team and in multi-disciplinary environment.

PO-12.Innovation and Entrepreneurship: Identify a timely opportunity and using innovation to pursue that opportunity to create value and wealth for the betterment of the individual and society at large.

Credit Pattern

Core Courses **:** I Semester 18 Credits
II Semester 14 Credits
III Semester 12 Credits

Total credits for core courses are 44 credits

Elective Courses **:** II Semester 08 Credits
III Semester 08 Credits

Total credits for Elective courses are 16 credits

Soft Skill Courses **:** **02 credits**

Laboratory Courses **:** I Semester 5 Credits
II Semester 4 Credits
III Semester 3 Credits

Total credits for Laboratory courses are 12 credits

Mini Project **:** **02 Credits** (III Semester)

Seminar **:** **02 Credits (**IV Semester)

Industry Internship **:** **02 Credits** (IV Semester)

Project work **:** **20 Credits** (IV Semester)

A total of 100 credits for 2 years MCA Programme

MASTER OF COMPUTER APPLICATIONS (MCA)
SCHEME OF TEACHING AND EXAMINATION 2020-22

I SEMESTER

Sl. No	Course Code	Course Title	Hrs/Week	Credits	Examination Marks		
			L : T : P : H		CIE	SEE	Total
1	P20MCA11	Basics of Programming Language and Computer Organization	2 : 2 : 0 : 4	3	50	50	100
2	P20MCA12	Object Oriented Programming with Java	4 : 0 : 0 : 4	4	50	50	100
3	P20MCA13	Mathematical Foundation for Computer Applications	4 : 0 : 0 : 4	4	50	50	100
4	P20MCA14	Computer Networks	3 : 2 : 0 : 5	4	50	50	100
5	P20MCA15	Web Technologies	4 : 0 : 0 : 4	3	50	50	100
6	P20MCAL16	Introduction to UNIX	0 : 2 : 2 : 4	2	50	50	100
7	P20MCAL17	Java Programming Lab	0 : 0 : 3 : 3	1.5	50	50	100
8	P20MCAL18	Web Technologies Lab	0 : 0 : 3 : 3	1.5	50	50	100
9	P20MHU19	Effective Communication Development (ECD)*	0 : 2 : 0 : 2	1	50	50	100
10	P20MCAL110	Programming Lab#	0 : 1 : 2 : 3	-	50	50	100
Total			**36**	**24**	**500**	**500**	**1000**

L: Lecture, T: Tutorial, P: Practical, H: Total Hours; CIE: Continuous Internal Evaluation;
SEE: Semester End Examinations
* Taught by Humanities Science and Management Department
# Bridge Course for Non Computer Science Students

II SEMESTER

Sl. No	Course Code	Course Title	Hrs/Week	Credits	Examination Marks		
			L : T : P : H		CIE	SEE	Total
1	P20MCA21	Software Engineering	4 : 0 : 0 : 4	4	50	50	100
2	P20MCA22	Data Structures with Algorithm Analysis	4 : 0 : 0 : 4	4	50	50	100
3	P20MCA23	Operating Systems	3 : 0 : 0 : 3	3	50	50	100
4	P20MCA24	Database Management Systems	3 : 0 : 3 : 6	4.5	50	50	100
5	P20MCA25X	Elective - I	3 : 2 : 0 : 5	4	50	50	100
6	P20MCA26X	Elective - II	4 : 0 : 0 : 4	4	50	50	100
7	P20MCAL27	Data Structures with Algorithm Lab	0 : 0 : 3 : 3	1.5	50	50	100
8	P20MHU28	Technical Skills*	0 : 0 : 2 : 2	1	50	50	100
9	P20MHU29	Professional Communication Development (PCD)*****	0 : 2 : 0 : 2	-	50	-	100
Total			**33**	**26**	**450**	**400**	**900**

L: Lecture, T: Tutorial, P: Practical, H: Total Hours; CIE: Continuous Internal Evaluation;
SEE: Semester End Examinations
***** Taught by Humanities Science and Management Department

ELECTIVES

Sl. No.	Course code	Elective Group - I	Sl. No.	Course code	Elective Group - II
1	P20MCA251	Data Warehousing & Data Mining	1	P20MCA261	Cloud Computing
2	P20MCA252	Model View Control Programming	2	P20MCA262	Artificial Intelligence
3	P20MCA253	System Simulation and Modeling	3	P20MCA263	Research Methodology
4	P20MCA254	Optimization Techniques	4	P20MCA264	Software Testing & Practices
5	P20MCA255	Advance Java Programming	5	P20MCA265	Cyber Security

III SEMESTER

Sl. No	Course Code	Course Title	Hrs/Week	Credits	Examination Marks		
			L : T : P : H		CIE	SEE	Total
1	P20MCA31	Machine Learning using Python	3 : 2 : 0 : 5	4	50	50	100
2	P20MCA32	Internet of Things (IOT)	4 : 0 : 0 : 4	4	50	50	100
3	P20MCA33	Programming using C# and .NET	4 : 0 : 0 : 4	4	50	50	100
4	P20MCA34X	Elective - III	4 : 0 : 0 : 4	4	50	50	100
5	P20MCA35X	Elective - IV	3 : 2 : 0 : 5	4	50	50	100
6	P20MCAL36	IOT Lab	0 : 0 : 3 : 3	1.5	50	50	100
7	P20MCAL37	.NET Lab	0 : 0 : 3 : 3	1.5	50	50	100
8	P20MCA38	Mini Project	0 : 0 : 3 : 3	2	50	50	100
9	P20MHU39	Aptitude and Reasoning Development-BEGINNER (ARDB)*	0 : 2 : 0 : 2	1	50	50	100
Total			**33**	**26**	**450**	**450**	**900**

L: Lecture, T: Tutorial, P: Practical, H: Total Hours; CIE: Continuous Internal Evaluation;
SEE: Semester End Examinations
***** Taught by Humanities Science and Management Department

ELECTIVES

Sl. No.	Course code	Elective Group - III	Sl. No.	Course code	Elective Group - IV
1	P20MCA341	Big Data and Analytics	1	P20MCA351	Mobile Application Development
2	P20MCA342	Block chain Technology	2	P20MCA352	Object-Oriented Modelling and Design Patterns
3	P20MCA343	Management Information System	3	P20MCA353	Deep Learning
4	P20MCA344	Cryptography and Network Security	4	P20MCA354	NOSQL
5	P20MCA345	Business Intelligence - Data Warehousing and Analytics	5	P20MCA355	Digital Image Processing

IV SEMESTER

Sl. No	Course Code	Course Title	Hrs/Week	Credits	Examination Marks		
			L : T : P: H		CIE	SEE	Total
1	P20MCA41	Technical Seminar	------	2	100	------	100
2	P20MCA42	Industry Internship (4 weeks)	------	2	100	------	100
3	P20MCA43	Project Work	------	10	100	------	100
4	P20MCA44	Project Dissertation Evaluation	------	6	-----	100	100
5	P20MCA45	Project Viva - Voce	------	4	-----	100	100
TOTAL			------	**24**	**300**	**200**	**500**

L: Lecture, T: Tutorial, P: Practical, C: Credits ; CIE: Continuous Internal Evaluation;
SEE: Semester End Examinations

SEMESTER-I

Course Code : P20MCA11	Semester : I	L - T - P : 2 : 2 : 0
Course Title : Basics of Programming Language and Computer Organization		
Credits : 3	Contact Period : 52 Hrs, Exam: 3 Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- **Design** an algorithm and flowchart for the given problems
- **Understand** the fundamental concepts of Operation of Computers, Memory Locations and Addresses and constructs of C programming language.
- **Apply** the concept of arrays, strings, structures, pointers in writing C programs.
- **Recognize** the use of different categories of functions in writing C programs.
- **Illustrate** the concepts of file management in C programming language.
- **Compare** structures and unions and different memory management techniques in C programming language

UNIT-I

10 Hours

Algorithms, Flowcharts and their need, Writing algorithms and drawing flowcharts for simple exercises like finding biggest of three numbers, to find roots of given quadratic equation, to find the biggest and smallest of given set of numbers, To generate N Fibonacci numbers and such other simple examples, Character set, C tokens, keywords & identifiers, structure of C program, Constants, variables, data types, declaration of variables, declaration of storage classes, assigning values to variables defining symbolic constants, declaring a variable as constant, declaring a variable as volatile, overflow and underflow of data, Arithmetic operators, relational operators, logical operators, assignment operator, increment and decrement operator, conditional operator, bitwise operators, comma operator, special operators, arithmetic expressions, evaluation of expressions, precedence of arithmetic operators, type conversions in expressions, operator precedence and associatively, mathematical functions.

UNIT-II

10 Hours

The scanf() & printf() functions for input and output operations, reading a character, writing a character, (the getchar() & putchar() functions) , the address operator(&), formatted input and output using format specifiers, Decision making with if statement, simple if statement, the if..else statement, nesting of if..else statements, the else..if ladder, the switch statement, the ?: operator, the goto statement, the break statement, programming examples, The while statement, the do..while statement, the for statement, nested loops, jumps in loops, the continue statement, programming examples, The meaning of an array, one dimensional and two dimensional arrays, declaration and initialization of arrays, reading, writing and manipulation of above types of arrays, multidimensional arrays, dynamic arrays, programming examples.

UNIT-III

10 Hours

Declaring and initialing string variables, reading string from terminal, writing string to screen, arithmetic operations on characters, putting strings together, comparison of two strings, string handling functions, table of strings, programming examples, Need for user defined functions, a multi function program, elements of User defined functions, definition of functions, return values and their types, function calls, function declaration, category of functions, no arguments and no return values, arguments but no return values, arguments with return values, no arguments but returns a value, functions that return multiple

values, nesting of functions, recursion, passing arrays to functions, passing string to functions, programming examples. Defining a structure, declaring structure variables, accessing structure members, structure initialization, copying and comparing structure variables, operations on individual members, array of structures, structures within structures, structures and functions, Unions, size of structures, bit fields, programming examples,

UNIT-IV

10 Hours

Understanding pointers, accessing the address space of a variable, declaring and initialization pointer variables, accessing a variable through its pointer, pointers and arrays, pointer and character strings, pointers and structures, programming examples, Defining and opening a file, closing a file, input/output operations on files, error handling during I/O operations, random access files, command line arguments, programming examples, Dynamic memory allocation, allocating a block of memory: malloc, allocating multiple blocks of memory: calloc, releasing the used space: free, altering the size of a block: realloc, programming examples, Preprocessor- Definition, macro substitution, files inclusion, compiler control directives, programming exercises.

UNIT-V

12 Hours

Computer Types, Functional Units, Basic Operational Concepts, Bus Structures, Software, Performance, Multiprocessors and Multicomputer, Numbers, Arithmetic Operations, and Characters, Memory Locations and Addresses, Memory Locations and Addresses, Memory Operations, Addressing Modes, Basic Input/output Operations, Definition of Interrupt, Stack and Queues, Subroutines, Subroutines Nesting and the Processor stack, Additional Instructions, Logic Instructions, Shift and Rotate Instructions, Multiplication and Division.

Text Books:

1. Programming in ANSI C, Balagurusamy, 6th Edition onwards.
2. The C Programming Language, Brian W Kernighan, Dennis M Ritchie, PHI, 2nd Edition.
3. Computer Organization, Carl Hamcher Zvonko Vranesic Saftwat Zaky, 5TH Edition.

Reference Books:

1. Programming with C, Byron Gottfried & Jithendra Kumar Chhabra, Third Edition
2. Behrouz A. Forouzan and Richard F. Gilberg, Computer Science- A Structured Programming Approach using C.

Course outcomes
On completion of this course, the students should be able to:

CO1: Develop flowchart and algorithms and apply the fundamental concepts and Constructs of C to develop solutions for given programs
CO2: Identify the suitable decision making statements and different looping statements and implement the problems with appropriate input and output functions and arrays
CO3: Analyze different categories of function and develop programs on strings.
CO4: Create programs on structure and pointers.
CO5: Explain Operational Concepts of computers, Memory Locations and Addresses.

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	L	M	L	L	L	L	-	L	L
CO2	S	S	S	S	M	L	L	L	L	M	M	L
CO3	S	S	S	M	M	L	L	L	-	L	L	-
CO4	S	S	S	M	M	L	L	L	-	-	L	L
CO5	S	S	S	M	M	L	L	L	-	-	L	-
S-Strong; M-Medium; L-Low												

Course Code : P20MCA12	Semester : I	L - T - P : 4 : 0 : 0
Course Title : Object Oriented Programming with Java		
Credits : 4	Contact Period : 52 Hrs, Exam: 3 Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- **Understand** Java program syntax construct
- **Summarize** class, member, method and String class and Array concepts give problem statement
- **Outline** appropriate fundamental concepts inheritance, interface, Packages
- **Understand** Exception handling and multithreading programming concepts
- **Analyze** networking and collection frame work

UNIT-I

Java Programming Fundamentals **10 Hours**

The Java Language, The Key Attributes of Object-Oriented Programming, The Java Development Kit, A First Simple Program, The Java Keywords, Identifies in Java.

Introducing Data Types and Operators

Java's Primitive Types, Literals, A Closer Look at Variables, The Scope and Lifetime of Variables, operators, Shorthand Assignments, Type conversion in Assignments, Operator Precedence.

Program Control Statements

Input characters from the Keyword, Use break, Use continue**.**

Introduction to Classes, Objects and Methods

Class Fundamentals, How Objects are Created, Reference Variables and Assignment, Methods, Constructors, Parameterized Constructors, The new operator Revisited, Garbage Collection and Finalizers, The this Keyword.

More Data Types and Operators

Arrays, Multidimensional Arrays, Alternative Array Declaration Syntax, Assigning Array References, Using the Length Member, the For-Each Style for Loop, Strings

UNIT-II

String Handling **10 Hours**

String Fundamentals, The String Constructors, Three String-Related Language Features, The Length() Method, Obtaining the characters within a string, String comparison, using indexOf() and last IndexOf(), Changing the case of characters within a string, String Buffer and String Builder.

A Closer Look at Methods and Classes

Controlling Access to Class Members, Method Overloading, Overloading Constructors, Recursion, Understanding Static, Introducing Nested and Inner Classes, Varargs: Variable-Length Arguments.

UNIT-III

Inheritance **11 Hours**

Inheritance Basics, Member Access and Inheritance, Constructors and Inheritance, Using super to Call Super class constructors, Using super to Access Super class Members, Creating a Multilevel Hierarchy, When are Constructors Executed, Superclass References and Subclass Objects, Method Overriding, Overridden Methods support polymorphism, Why Overridden Methods, Using Abstract Classes, Using final, The Object Class.

Interfaces

Interface Fundamentals, Creating an Interface, Implementing an Interface, Using Interface References, Implementing Multiple Interfaces, Constants in Interfaces, Interfaces can be extended, Nested Interfaces

Packages

Package Fundamentals, Packages and Member Access, Importing Packages, Static Import

UNIT-IV

Exception Handling **10 Hours**

The Exception Hierarchy, Exception Handling Fundamentals, The Consequences of an Uncaught Exception, using multiple catch clauses, Catching subclass Exceptions, try blocks can be nested, throwing an Exception, A Closer look at Throwable, using finally, using throws, Java's Built-in Exceptions.

Multithreaded Programming

Multithreading fundamentals, The Thread Class and Runnable Interface, Creating Thread, Creating Multiple Threads, Determining When a Thread Ends, Thread Priorities, Synchronization, using Synchronization Methods, The Synchronized Statement , Thread Communication using notify(), wait() and notifyAll(), suspending, Resuming and stopping Threads.

UNIT-V

Enumerations, Auto boxing **11 Hours**

Enumerations, Java Enumeration are class types, TheValues() and Valueof() Methods, Constructors, methods, instance variables and enumerations, Autoboxing, Annotations(metadata)

Networking with Java.net

Networking fundamentals, The Networking classes and Interfaces, The Inet Address class, The Socket Class, The URL class, The URL Connection Class, The Http URL Connection Class.

Exploring Collection Framework

Collections Overview, The Collection Interfaces, The collection Classes. The Arrays Class

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Text Books:

1. Java Fundamentals, A comprehensive Introduction by Herbert Schildt, Dale Skrien. Tata McGraw Hill Edition 2013. (Chapters:1,2,3,4,5,6,7,8,9,10,11,12,13,15,22,23,24,25,26)

Reference Books:

1. Java Programming by Hari Mohan Pandey, Pearson Education, 2012.
2. Java 6 Programming, Black Book, KoGenT, Dreamtech Press, 2012.
3. Java 2 Essentials, Cay Hortsmann, second edition, Wiley

Course Outcomes [CO]

On completion of this course, the students should be able to:

CO1:Understand the basic programming constructs of Java. Apply suitable OOP concepts to develop Java programs for a given scenario.

CO2: Illustrate the concepts of Generalization and runtime polymorphism applications

CO3: Exemplify the usage of Packages, Interfaces, Exceptions and Multithreading

CO4: Illustrate exception handling concepts and Multithreading using different problem statements

CO5: Demonstrate Enumerations, Wrappers, Auto boxing, implement the concepts of networking using Java network classes

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	S	-	-	L	-	S	-	-	-	-	-
CO2	S	S	-	M	-	-	-	-	-	-	L	-
CO3	M	S	M	-	-	M	-	M	-	S	-	M
CO4	S	S	M	-	S	-	-	S	-	S	-	-
CO5	-	S	M	M	-	-	-	-	M	-	-	M
S-Strong; M-Medium; L-Low												

Course Code : P20MCA13	Semester : I	L-T-P : 4 : 0 : 0
Course Title : Mathematical Foundation for Computer Applications		
Credits : 4	Contact Period : 52 Hrs, Exam : 3Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- **Analyze** to solve problems using simple techniques of counting theory, and set theory
- **Learn** the fundamentals of logic and **Identify** the Use of quantifiers, the nature of proof like direct or indirect, proof by contradiction, check the validity of a given argument.
- **Learn** the basic concepts of Recurrence relations, Relations and **Identify** the different ways of representing relations in matrix and digraph form with properties.
- **Apply** the concepts of relations and functions to solve given problem.
- **Learn** the concepts graph theory and applications.

UNIT-I

10 Hours

Principles of Counting: The Rules of Sum and Product, Permutation, Combinations, combinations with repetition. Problems .
Sets and Subsets: Set Operations, Membership table method and Venn diagram method and the Laws of Set Theory, Addition principle-Counting and Venn Diagrams, A First Word on Probability.

UNIT-II

12 Hours

Fundamentals of Logic: Basic Connectives and Truth Tables, Logic Equivalence – The Laws of Logic theory, Logical Implication – Rules of Inference.
The Use of Quantifiers: Quantifiers, Definitions, Argument representation using quantifiers, validity. Proofs of Theorems- Direct and Indirect method - contradiction and contrapositive method.

UNIT-III

10 Hours

Relations and Functions: Properties of the Integers: Mathematical Induction, The Well Ordering Principle-Mathematical Induction (Alternative form), problems**,** Recursive Definitions
Cartesian Products and Relations, Functions – Plain and One-to-One, Onto Functions – Stirling Numbers of the Second Kind, Special Functions, The Pigeon-hole Principle, Function Composition and Inverse Functions**.**

UNIT-IV

10 Hours

Relations Revisited: Properties of Relations, Computer Recognition – Zero-One Matrices and its properties, Directed Graphs and properties. Composition of two relations.
Partial Orders – Partially ordered relations and Hasse Diagrams, Equivalence Relations and Partitions induced by Equivalence relations

UNIT-V

10 Hours

An Introductions to Graph Theory: Definitions and examples Sub graphs, Complements, and Graph Isomorphism, Vertex Degree : Euler Trails and Circuits, Planar Graphs, Hamiltonian Paths and Cycles. Graph coloring and Chromatic Numbers.

Text Book:

1. Ralph P. Grimaldi, "Discrete and Combinatorial Mathematics", 5th Edition, Pearson Education, 2004. (Chapter 1.1 to 1.4 Chapter 3.1 to 3.4, Chapter 2, Chapter 4.1, 4.2, Chapter 5.1 to 5.6, Chapter 7.1 to 7.4, Chapter 11.1 to 11.6.)

Reference Books:

1. Kenneth H. Rosen, "Discrete Mathematics and its Applications", 7th Edition, McGraw Hill Publicatons, 2007.
2. Jayant Ganguly, A Treatise on Discrete Mathematical Structures, Sanguine-Pearson, 2010.
3. Discrete Mathematical Structures –by Dr. D.S. Chandrashekaraih.

Course outcomes

On completion of this course, the students should be able to:

CO1: Explain the principles of counting and set theory.

CO2: Identify the quantifiers and their uses and **Make use of** fundamentals of logic theory.

CO3: Apply the mathematical induction principle and different methods to **solve** the given problem.

CO4: Solve the problems using the concepts of relations and functions and **Identify** the different ways of representing relations.

CO5: Make use of basic concepts of graph theory and solve the given problem.

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	M	-	M	L	M	-	-	L	M	-
CO2	S	S	M	-		L	S	-	-	L	S	M
CO3	S	S	S	M	M	L	S	-	-	L	M	M
CO4	S	S	M	M		L	M	-	-	L	M	-
CO5	S	S	S	S	M	L	S	-	-	L	S	M
S-Strong; M-Medium; L-Low												

Course Code : P20MCA14	Semester : I	L-T-P : 3 : 2 : 0
Course Title : Computer Networks		
Credits : 4	Contact Period : 52 Hrs, Exam: 3Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- **Understand** the fundamental concepts of computer networking.
- **Understand** data transformation and data transmission.
- **Discuss** various inter networking devices and transmission of data in inter-networks using routing algorithms
- **Apply** various error detection and correction techniques in transmission of data.
- **Distinguish** various LANs

UNIT-I

Computer Networks and the Internet **10 Hours**

What Is the Internet? The Network Edge, The Network Core, Delay, Loss, and Throughput in Packet-Switched Networks, Protocol Layers and Their Service Models, Networks Under Attack, History of Computer Networking and the Internet.

UNIT-II

Application Layer **10 Hours**

Principles of Network Applications, The Web and HTTP, File Transfer: FTP, Electronic Mail in the Internet, DNS—The Internet's Directory Service, Peer-to-Peer Applications.

UNIT-III

Transport Layer **10 Hours**

Introduction and Transport-Layer Services, Multiplexing and Demultiplexing, Connectionless Transport: UDP, Principles of Reliable Data Transfer, Connection-Oriented Transport: TCP, Principles of Congestion Control, TCP Congestion Control.

UNIT-IV

The Network Layer **10 Hours**

Introduction, Virtual Circuit and Datagram Networks, What's inside a Router? The Internet Protocol (IP): Forwarding and Addressing in the Internet, Routing Algorithms, Broadcast and Multicast Routing.

UNIT-V

The Link Layer : Links, Access, Networks and LANs **12 Hours**

Introduction and Services, Error-Detection and -Correction Techniques, Multiple Access Protocols, Link-Layer Addressing, Ethernet, Switched Local Area Networks, Link Virtualization: A Network as a Link Layer.

Wireless and Mobile Networks

Introduction, Wireless Links and Network Characteristics, Wi-Fi: 802.11 Wireless LANs.

Text Book:

1. James F. Kurose, Keith W. Ross: Computer Networking: A Top-Down Approach, 5thEdition, Addison-Wesley, 2012.

Reference Books:

1. Behrouz A. Forouzan: Data Communications and Networking, 4thEdition, Tata McGraw-Hill, 2006.
2. William Stallings: Data and Computer Communication, 8thEdition, Pearson Education, 2007.
3. Larry L. Peterson and Bruce S. David: Computer Networks – A Systems Approach, 4thEdition, Elsevier, 2007.

Course outcomes

On completion of this course, the students should be able to

CO1: Describe basic terminologies used for computer networking and data communication model with its components.
CO2: Classify various categories of networks and types of inter-networking devices with their functions
CO3: Explain the roles and functions of each layer of TCP/IP.
CO4: Analyse the routing table for a given subnet using various routing algorithm.
CO5: Identify how error free transmission held between two end nodes.

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	-	-	L	M	S	-	-	-	S	-
CO2	S	S	S	M	M	M	-	-	-	-	M	-
CO3	M	S	M	M	M	-	-	-	-	S	-	-
CO4	S	S	M	-	S	-	-	S	-	S	-	-
CO5	-	S	M	M	-	-	-	-	M	-	-	M
S-Strong; M-Medium; L-Low												

Course Code: P20MCA15	Semester : I	L-T-P: 4 : 0: 0
Course Title : Web Technologies		
Credits: 3	Contact Period : 52 Hrs, Exam : 3Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- **Understand** the fundamental concept of www and **Create** XHTML documents using XHTML tags like images, hyperlink, lists, tables, Forms, Frames.
- **Outline** CSS style sheets and **learn** the fundamentals of javascript.
- **Summarize** static and dynamic XHTML documents using JavaScript.
- **Understand** cookies using PHP and **implement** session tracking using PHP
- **Outline** the concepts of XML and AngularJS to design the web pages.

UNIT-I

Fundamentals of Web and Introduction to XHTML **10 Hours**

Internet, WWW, Web Browsers and Web Servers, URLs, MIME, HTTP, Security, the Web Programmers Toolbox**.**

Basic syntax, Standard structure, Basic text markup, Images, Hypertext Links. Lists, Tables, Forms, Frames.

UNIT-II

Cascading Style Sheets and Basics of JavaScript **10 Hours**

Cascading Style Sheets: Introduction, Levels of style sheets, Style specification formats, Selector forms, Property value forms, Font properties, List properties, Color, Alignment of text, The box model, Background images, The and tags.

Basics of JavaScript and HTML Documents: Overview of JavaScript, Object orientation and JavaScript, Syntactic characteristics, Primitives, operations, and expressions, Screen output and keyboard input, Control statements, Object creation and modification, Arrays, Functions, Constructors, Pattern matching using regular expressions, Errors in scripts, Examples.

UNIT-III

JavaScript Execution Environment and Dynamic JavaScript **10 Hours**

The JavaScript Execution Environment, The Document Object Model, Elements Access in Java Script, Events and Event Handling, Handling Events from Body Elements, Handling Events from Text Box and password Elements, The DOM2 Event Model, The navigator Object, Dom Tree Traversal and Modification.

Introduction, Positioning Elements, Moving Elements, Element Visibility, Changing Colors and Fonts, Dynamic Content, Stacking Elements, Locating the Mouse Cursor, Reacting to a Mouse Click, Slow Movement of Elements, Dragging and Dropping Elements.

UNIT-IV

Introduction to PHP **11 Hours**

Introduction to PHP: Origins and uses of PHP, Overview of PHP. General syntactic characteristics, Primitives, operations and expressions, Output, Control statements, Arrays, Functions, Pattern matching, Form handling, Files, Cookies; Session Tracking.

UNIT-V

XML and Angular JS **11 Hours**

Introduction, Syntax, Document structure, Document Type definitions, Namespaces; XML schemas, Displaying raw XML documents, Displaying XML documents with CSS, XSLT style sheets, XML processors, Web services.

Angular JS: General Features, Core Features, Concepts, Advantages, Disadvantages, MVC Architecture, First application, Directives, Expressions, Controllers, Filters, Tables, HTML DOM, Modules, Forms, Includes, AJAX, Views, Scopes, Services.

Text Books:

1. Robert W. Sebesta: Programming the World Wide Web, 8th Edition, Pearson education, 2015.
2.AngularJS Up & Running- Shyam Seshadri, Brad Green, 1st Edition, 2014, O'Reilly,

Reference Books:

1. Chris Bates: Web Programming Building Internet Applications, 3rd Edition, Wiley India, 2009.
2. Deitel, P.J. Deitel, A. B. Goldberg: Internet & World Wide Web How to program, 3rdEdition, Pearson Education / PHI, 2004.
Reference links: https://www.tutorialspoint.com/angularjs
https://www.tutorialspoint.com/angularjs/angularjs_tutorial.pdf
3. Luke Welling, Laura Thomson, "PHP and MySQL Web Development", 5th Edition, Pearson Education, 2016.

Course outcomes

On completion of this course, the students should be able to:

CO1: Explain the fundamentals of web and **Solve** the problems using XHTML tags .
CO2: Develop presentation web page using CSS tags .
CO3: Implement static and dynamic JavaScript document.
CO4: Illustrate Web Applications using PHP scripts.
CO5: Develop Web applications using XML and AngularJS.

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M	S	-	L	-	S	-	L	-	-	-
CO2	M	M	-	M	-	-	-	-	L	-	L	-
CO3	M	M	M	-	-	M	-	M	L	S	-	M
CO4	S	M	M	-	S	-	-	S	L	S	-	-
CO5	M	M	M	M	-	-	-	-	L	-	-	M
S-Strong; M-Medium; L-Low												

Course Code: P20MCAL16	Semester : I	L-T-P: 0 : 2: 2
Course Title : Introduction to Unix		
Credits: 2	Contact Period : 52 Hrs, Exam : 3Hrs	Weightage: CIE :50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- **Describe** the architecture and features of UNIX operating system.
- **Demonstrate** the fundamental and file handling UNIX command with and examples.
- **Discuss** the UNIX file system concepts, organization and setting permission on files.
- **Use** meta characters, filters and regular expressions to effectively describe desired search pattern.
- **Describe** the shell script with conditional and looping statements.
- **Implement** user interface programs for UNIX operating system

Topics to be discussed in Tutorial

- Introduction to UNIX, UNIX Architecture, Features of UNIX.
- General-Purpose Utilities
- UNIX File System and Ordinary File Handling Commands
- Basic File Attributes
- Shell's Interpretive Cycle, Pattern Matching
- Shell Programming
- Simple Filters and Filters using Regular Expression

Laboratory
- Programs supplementing the concepts covered in tutorials and given in the list.
- Students are expected to execute the program in the list and implement simple user interface programs.

Topics to be covered for Self Study
- The vi Editor

Text Book:
1. UNIX concepts and Applications, Sumitabha Das, 4th Edition, Tata McGraw Hill, 2006.

Reference Books:
1. Your UNIX-The Ultimate Guide, Sumitabha Das, Tata McGraw Hill.
2. "Unix Shell Programming", Yashwant Kanetkar.
3. "Beginning Shell Scripting", Eric Foster-Johnson, John C Welch, Micah Anderson, Wrox publication.
4. "Introduction to UNIX" by M.G.Venkatesh Murthy.

List of Programs

1. a) Write a shell script that accepts two integers as its arguments and compute the value of first number raised to the power of second number
   b) Write a shell script that accepts a pathname and creates all the components in that path name as directories .For example, if the script is named mpc, then the command mpc a/b/c/d should create directories a,a/b,a/b/c,a/b/c/d.

2. Write a shell script that accepts two file name as arguments, checks if the permission for these files are identical and if the permissions are identical, output common permissions otherwise output each file name followed by its permissions.

3. Write a shell script to create a menu that displays the today's date, present working directory, the number of current users, attributes of a particular file and process status of the system based on the user choice

4. a) Write a shell script that accepts valid login-in names as arguments and prints there corresponding home directories, if no arguments are specified, print a suitable error message.
   b) Write a shell script that accept one or more file names as arguments and convert all of them to upper case, provided they exist in current directory.

5. Write a shell script to implement terminal locking (similar to the lock command). It should prompt the user for a password. After accepting the password entered by the user, it must prompt again for the matching password as confirmation and if match occurs, it must lock the keyboard until a matching password is entered again by the user, note that the script must be return to disregard BREAK, control –D. no time limit need be implemented for the lock duration.

6. Write a shell script that displays all the links to a file specified as the first argument to the script. The second argument, which is optional, can be used to specify in which the search is to begin, if this second argument is not present, the search is to begin in current working directory. In either case, the starting directory as well as all its subdirectories at all levels must be searched. The script need not include any error checking.

7. a) Write a shell script that accepts as file-name as argument and display its creation time if file exist and if it does not send output error message.
   b) Write a shell script using expr command to read in a string and display a suitable message if it does not have at least 10 characters.

8. Write a shell script that compute gross-salary for an employee, according to the conditions given below.
   If basic salary is < 15000 then HRA=10% of basic and DA=90% of basic.
   If basic salary is >=15000 then HRA=5% of basic and DA=98% of basic

9. Write a shell script that delete all lines containing a specific word in one or more file supplied as argument to it.

10. a) Write a shell script that gets executed display the message either "Good Morning" or "Good Afternoon" or "Good Evening" depending upon time at which the user logs-in.
    b) Write a shell script to find a file/s that matches a pattern given as command line argument in the home directory, display the contents of the file and copy the file into the directory ~/mydir
11. Write a shell script that accept a list of file names as its arguments, count and report occurrence of each word that is present in the first argument file on other argument files.

12. Write a shell script that accept the file name, starting and ending line number as arguments and display all the lines start with starting line number to ending line number.

NOTE: Students have to develop a simple user interface application using shell scripts.

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

CO1: Identify UNIX utilities to create and manage simple file processing operations.
CO2: Organize file structure with appropriate security.
CO3: Develop shell scripts to perform simple and moderate tasks.
CO4: Apply network activities and using text searching utilities for a given files.
CO5: Use filters and regular expressions to increase the information searching efficiency.

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	M	-	M	-	S	-	-	-	L	-
CO2	S	S	S	M	M	M	S	-	-	-	M	-
CO3	S	S	S	S	S	-	S	-	-	M	M	M
CO4	M	S	S	-	M	-	M	-	-	-	L	-
CO5	S	S	S	S	M	M	S	-	L	M	M	M
S-Strong; M-Medium; L-Low												

Course Code : P20MCAL17	Semester : I	L-T-P : 0 : 0 : 3
Course Title : Java Programming Lab		
Credits : 1.5	Contact Period : 32 Hrs, Exam : 3Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- **Understand** Constructor Overloading and Overriding for a given problem statement
- **Familiarize** Standard String class and Array Class methods
- **Outline** appropriate fundamental concepts interface for real time application
- **Understand** Exception handling and multithreading programming for given problem
- **Outline** the front end GUI tools applet, swing and develop client server programs

List of Programs

1. Write a java program to demonstrate reading data from keyboard and command line arguments.

2. Write a java program to demonstrate constructor overloading and method overloading.

3. Write a java Program to implement Inner class and demonstrate its Access Protections.

4. Write a Java Program to demonstrate the addition of two matrices in Java.

3. Write a program in Java for String handling which performs the following:
   i) Checks the capacity of StringBuffer objects.
   ii) Reverses the contents of a string given on console and converts the resultant string in upper case. Reads a string from console and appends it to the resultant string of ii

4. Write a java program to implement inheritance (Multilevel Inheritance).

5. Write a java program to create an interface and implement it in class.

6. Write a java program to implement Exception Handling (using Nested try catch and finally).

7. Write a java program to create a class (extending thread) and use methods thread class to change name, priority, --- of the current thread and display the same.

10.Write a JAVA program using Synchronized Threads, which demonstrates Producer Consumer concept.

11. Complete the following:
   1. Create a package named shape.
   2. Create some classes in the package representing some common shapes like Square, Triangle, and Circle.
   3. Import and compile these classes in other program.

12. Write a JAVA Program
   Create an enumeration Day of Week with seven values SUNDAY through SATURDAY. Add a method is Workday( ) to the DayofWeek class that returns true if the value on which it is called is MONDAY through FRIDAY.
   For example, the call DayOfWeek.SUNDAY.isWorkDay ( ) returns false.

13. Create an Applet to Scroll a Text Message from right to left across the applet window.

14. Write a Java Swing Applet which accepts a text from a JtextField and display the same text with selected font size and font colour using JLabel.

15. Write a Java Program to implement Client Server(Client requests a file, Server responds to client with contents of that file which is then display on the screen by Client – Socket Programming).

Course outcomes
On completion of this course, the students should be able to:

CO1: Illustrate the concepts of Inheritance, Method Overriding
CO2: Demonstrate the access protection in Java Programming
CO3: Implement Exception handling and Multithreading **for** real time application
CO4: Develop Enumerations, Wrappers, Autoboxing, for given problem Statement
CO5: Implement event handling, Collection framework and Networking for real world scenarios

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	-	-	L	-	S	-	-	-	-	-
CO2	S	S	-	M	-	-	-	-	-	-	L	-
CO3	M	S	M	-	-	M	-	M	-	S	-	M
CO4	S	S	M	-	S	-	-	S	-	S	-	-
CO5	-	S	M	M	-	-	-	-	M	-	-	M
S-Strong; M-Medium; L-Low												

Course Code : P20MCAL18	Semester : I	L-T-P : 0 : 0 : 3
Course Title : Web Technologies Lab		
Credits : 1.5	Contact Period : 32 Hrs, Exam : 3Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- **Understand** the fundamental concept of XHTML programs .
- **Implement** the CSS with XHTML to access user required information from the system.
- **Execute** programs on static and dynamic javascript.
- **Write** and implement programs on PHP.
- **Develop** programs on XML and angular JS to design the web pages.

List of Programs

1) To create a simple XHTML home page which consist of P.E.S.C.E College history to demonstrate the usage of different tags:
    a. Paragraph
    b. Line break
    c. Heading
    d. Hyperlink to web page which consist of
        I. List of departments in college
        II. List of staff names in M.C.A. dept
        III. List of subjects of all semester of M.C.A using nested list
        IV. Frames of all above webpages.
2) To create a simple XHTML page to demonstrate the usage of different tags:
    a. Image insertion
    b. Table-1st sem MCA marks card creation.
3) To create a simple XHTML page to demonstrate the usage of different tags:
    a. Forms which includes text box, check box, radio buttons…
    b. Audio and Video file insertion.
4) To create an XHTML with CSS script code to demonstrate the usage of :
    a. Border properties
    b. Margin and padding which includes all subject code followed by subject name followed by staff name.
5) Develop and demonstrate a XHTML file that includes JavaScript script for the following problems:
    a) Input: A number n obtained using prompt
    Output: The first n Fibonacci numbers
    b) Input: A number n obtained using prompt
    Output: A table of numbers from 1 to n and their squares using alert.
6) Develop and demonstrate, using JavaScript, an XHTML document that collects the customer name (the valid format is: Name(last name, first name, middle initial) and phone number(the valid format is: phone number(ddd-ddd-dddd). Event handler must be included for the form element that collects this information to validate the input. Messages in the alert windows must be produced when errors are detected.
7) Develop and demonstrate different positioning element using JavaScript an XHTML document .
    a. Absolute positioning
    b. Relative positioning.

8) Develop and demonstrate using JavaScript script, a XHTML document that contains three images, stacked on top of each other, with only enough of each showing so that the mouse cursor can be placed over some part of them. When the cursor is placed over the exposed part of any paragraph, it should rise to the top to become completely visible.

9) Write dynamic JavaScript code that contains:
   a. Multi-Validating Registration Form
   b. To create a html page to create online exam paper format with 4 optional answer.

10) Write a PHP program to input previous reading and present reading and prepare an electricity bill

11) Using PHP and MySQL, develop a program to accept book information viz. Accession number, title, authors, edition and publisher from a web page and store the information in a database and to search for a book with the title specified by the user and to display the search results with proper headings.

12) a) Design an XML document to store information about a student in an engineering college affiliated to VTU. The information must include USN, Name, Name of the College, Brach, Year of Joining, and e-mail id. Make up sample data for 3 students. Create a CSS style sheet and use it to display the document.
    b) Create an XSLT style sheet for one student element of the above document and use it to create a display of that element.

13) Write angular js program to perform the following:
    a) arithmetic operations which will produce the result based on the type of operands
    b) Creation of Table.

14) Develop using angular js to create the form which contains Employee Information with submit and reset functionality.

Course Outcomes:

On completion of this course, the students should be able to:

1) **Design** XHTML program using fundamental tags.
2) **Develop** visual effect style sheet using CSS for a given problem.
3) **Implement** JavaScript to validate a form with event handler for a given problem.
4) **Demonstrate** client/server application for a given problem using client as PHP,XML & angular JS and server as MYSQL.
5) **Design** web based applications according to customer needs for a given problem

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M	S	L	-	L	M	-		L	L	L
CO2	S	S	M	L	-	-	M	-	M	-	-	-
CO3	S	S	S	-	M	L	-	-	L	-	-	-
CO4	S	S	S	-	-	-	-	-	-	-	M	M
CO5	M	M	S	-	-	-	-	-	M	-	L	
S-Strong; M-Medium; L-Low												

Course Code : P20MHU19	Semester : I	L-T-P : 0: 2 : 0
Course Title : Effective Communication Development (ECD)		
Credits : 1	Contact Period : 32 Hrs, Exam : 3Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- **Recognize** common mistakes done by an individual in the course of his/her communication.
- **Appraise** knowledge level of English language and enhance better communication.
- **Recognize** the fear of speaking English and to build the morale.
- **Identify** common pronunciation error and rectify them.
- **Enable** the individual to build his/her creative thinking (Thinking in English).
- **Illustrate** the basic rules of sentence structure (Subject verb agreement).
- **Explain** the importance of usage of Tenses and articles .
- **Identify** the present vocabulary of an individual and also to learn ways of building it.
- **Empower** the individual with better writing skills.
- **Ensure** that the individual has elevated life skills.

UNIT – I

6 hours

Subject Verb Agreement: Basic rules of sentence structure, Usage of singular and plural, Usage of appropriate verb, Introduction to phrases, Construction of Simple sentences and Compound Sentences, Introduction to parts of speech

Tenses : Identification of tenses, Past tense, Present tense, Future tense, Indicators of tenses, Introduction to verb tenses, Past perfect, Past progressive, Past perfect progressive, Present perfect progressive, Future perfect, Future progressive.

Articles : Introduction to articles, Exploring the usage of 'a', 'an' and 'the', Golden rules of articles, Differentiating between definite and indefinite articles, Understanding the exceptions of definite and indefinite articles.

UNIT – II

8 hours

Preposition: Introduction to prepositions, Importance of usage of positions, Rectifying common errors in context to using preposition, Right usage of common prepositions like in, on, under, behind, below etc.

Conjunctions: Introduction to conjunctions, Understanding the importance of usage of conjunctions, Usage of different conjunctions in a compound sentence, Understanding the meaning of conjunction like yet, since, until, however, but etc.

UNIT – III

6 hours

Vocabulary builder - Getting off a good start: How to test your present vocabulary, how to start building your vocabulary, how to talk about personality types, how to talk about doctors, how to talk about various practitioners, how to talk about science and scientists, how to talk about liars and liars. Each of these sessions includes origin of words and related words, Etymology, tools to assess and follow up the progress

UNIT – IV

6 hours

Writing Skills 1: Sentence Formation, Punctuation, Avoiding Cliché, Different Types of Writing Formats, Importance of Writing Skills, Formal and Informal Style of Writing

Writing Skills 2 : Format for e-mail writing. Format for Letter Writing. Some common errors. Creative Writing. Blog Writing

UNIT – V

6 hours

SWOT: Identifying the individual's Strengths, Weakness, Opportunities and Threats by using SWOT Matrix, Difference between internal and external factors, Aids on utilizing strengths to maximum effect for both personal and professional growth, Aids to identify the origin of the weakness and take corrective measures, Aids to use one's strengths to identify and maximise both personal and professional opportunities, Identifying the external factors/change in the external environment that can pose threats, Tackling threats appropriately.

Goal Setting: Understanding of the meaning of 'Goals', Understanding the importance of goals, Necessity of goals, 5 myths of goals, Long term and Short term goals, SMART goal setting technique.

Resume Building: Meaning of Resume, Difference between Resume, Curriculum Vitae and Bio-data, Difference between creating a resume and building a resume, Importance of resume, Importance of Academic achievements, Importance of extracurricular achievements, Importance of striking a balance between curricular and co-curricular activities, Value of an all-rounder, Structure of a resume, Importance of building resume from 1st Year Engineering.

Etiquettes: What are Etiquettes, Importance of Professional Etiquettes, Importance of First Impression, Professional presence, Importance of Formal dressing, Decoding the formal dress code, Professional body language, Importance of Microsoft Power point in professional circuits **Watch the Time:** Organizing Yourself, Time Saving Techniques, Understanding Priorities Based Time Roles, Procrastination, Different Methods of Splitting Time, Efficient Time Utilization, Value of Time, Streamlining Daily Routine , Big rock theory, Spent time matrix, Urgency vs Importance, Time bound goal management, 10 time management mistakes, Essential habits for better time management.

Reference Books:

1. "Word Power Made Easy New Revised and Expanded Edit ion", First Edition, Norman Lewis, Goyal Publisher.
2. "Essential English Grammar", Raymond Murphy, Cam bridge University Press, new edition
3. "The 7 habits of Highly Effective People" by Stephen R. Covey

Course outcomes

On completion of this course, the students should be able to:

- **Rectify** Indianism and have better ability to frame grammatically correct sentences.
- **Exhibit** knowledge of correct pronunciation of words.
- **Exhibit** amplified level of confidence to express themselves in English.
- **Reflect** elevated standard of learning through the implementation of creative cognitive techniques.
- **Understand** the correct usage of Tenses and Articles.
- **Increase** the number of words in his/her day to day usage of vocabulary
- **Confidently** attempt writing grammatically correct English paragraphs. L2

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	S	S	S	-	S	M	-	S	L	L	-
CO2	M	S	S	S	-	S	M	-	S	L	L	-
CO3	M	S	S	S	-	S	M	-	S	L	L	-
CO4	M	S	S	S	-	S	M	-	S	L	L	-
CO5	M	S	S	S	-	S	M	-	S	L	L	-
S-Strong; M-Medium; L-Low												

Course Code: P20MCAL110	Semester : I	L-T-P: 0 : 1: 2
Course Title : Programming Lab		
Credits: NA	Contact Period : 52 Hrs, Exam : 3Hrs	Weightage: CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- **Design** basic programming construction in C so that they can easily switch over to any other language in future.
- **Demonstrate** the looping and decision making statements in C language.
- **Analyze** and **interpret** the concept of arrays, structures, pointers and their usage
- **Recognize** the use of various categories of functions.
- **Illustrate** the concepts of file management in C programming language.

Topics to be discussed in Tutorial with respect to C Programming Language

- Decision Making
- Control Structures
- Arrays
- Functions
- Structures
- Pointers
- Files

Laboratory

- Programs supplementing the concepts covered in tutorials are given in the list.
- Students are expected to execute the programs given in the list.

Text Books:

1. Programming in ANSI C, Balagurusamy, 6th Edition onwards.
2. The C Programming Language, Brian W Kernighan, Dennis M Ritchie, PHI, 2nd Edition.

Reference Books:

1. Programming with C, Byron Gottfried & Jithendra Kumar Chhabra, Third Edition
2. Behrouz A. Forouzan and Richard F. Gilberg, Computer Science- A Structured ProgrammingApproach using C.

List of Programs

1. Given the 3 digit register number along with marks of 5 subjects for 100 marks of a student, write a program to display the grade of the student according to the following condition.
   - Minimum passing marks is 35 in all subjects
   - Average Score >= 35 and < 50 no grade "Pass"
   - Average Score of 50 to 60 percent is grade 'D'
   - Average Score > 60 and <= 70 percent is grade 'C'
   - Average Score > 70 and <= 80 percent is grade 'B'
   - Average Score > 80 and <= 90 percent is grade 'A'
   - Average Score >90 grade 'S'

2. A class of N students take an annual examination in M subjects. Write a C program to read the marks obtained by each student in various subjects and to compute and print the total marks obtained by each of them. The program should uses two for loops, one for controlling the number of students and the other for controlling the number of subjects. Since both the number of students and the number of subjects are requested by the program, the program may be used for a class of any size and any number of subjects. The outer loop includes three parts:
   - reading of roll-numbers of students, one after another,
   - inner loop, where the marks are read and totaled for each student, and
   - printing of total marks and declaration of grades.

3. An election is contested by 5 candidates. The candidates are numbered from 1 to 5 and the voting is done by marking the candidate number on the ballot paper . Write a c program to read the ballots and count the votes cast for each candidate using an array variable COUNT**.** In case, a number is read outside the range 1 to 5, the ballot should be considered as a 'Spoilt Ballot' and the program should also count the number of Spoilt Ballot.

4. Write a C program to generate N prime numbers using any of the loop construct.

5. Write a C program to compute and print a multiplication table for numbers 1 to 5 as shown below

	1	2	3	4	5
1	1	2	3	4	5
2	2	4	6	8	10
3	3	6	-	-	-
4	4	8	-	-	-
5	5	10	-	-	25

6. Write a C program using a two-dimensional array to compute and print the following information from the table of data given below

	Item-1	**Item-2**	**Item-3**
Salesgirl #1	310	275	365
Salesgirl #2	210	190	325
Salesgirl #3	405	235	240
Salesgirl #4	260	300	380

   - Total value of sales by each girl.
   - Total value of each item sold.
   - Grand total of sales of all item by all girls.

7. Write a C program to multiply two matrices considering the appropriate size of two matrices.

8. Write a C program to whether the two strings are equal or not **without** using string functions.

9. Write a C program to insert a Substring in a given string using string functions.

10. Write a C program to extract substring from a given string using string functions.

11. Write a C program to find factorial of a number using recursion.

12. Write a C program using structures to maintain information about N student list, Information consist of student name, register no, marks of 3 subjects and to display information of Name, marks of 3 subjects and average marks of given register number.

13. Write a C program to accept and display structure members such as roll no, name, class and attendance using pointers.

14. Write a C program to illustrate the use of pointers in arithmetic operations.

15. Write a C program to read data from the keyboard, write it to a file called INPUT, again read the same data from the INPUT file, and display it on the screen.

Course Outcomes

After completion of this course the student will be able to

CO1: Develop solutions for given problem using fundamental concepts of C programming language.

CO2: Identify the suitable decision making statements and different looping statements to implement solution to the problems

CO3: Understand proper use of functions.

CO4: Apply suitable data structure to implement applications in C .

CO5: Implement different file management concepts.

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	-	M	-	S	-	-	-	L	-
CO2	S	S	S	M	-	-	S	-	-	-	M	-
CO3	S	S	S	M	-	-	M	-	-	L	M	-
CO4	S	S	S	M	-	-	M	-	-	M	L	-
CO5	S	S	M	M	-	-	M	-	L	L	L	-
S-Strong; M-Medium; L-Low												

SEMESTER-II

Course Code : P20MCA21	Semester : II	L-T-P : 4 : 0 : 0
Course Title : Software Engineering		
Credits : 4	Contact Period : 52 Hrs, Exam : 3Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- **Understand** different types of process models used in Software Engineering, the Agile method and Extreme programming of Software Engineering.
- **Explain** different types of software requirements and dependability issues.
- **Apply** system models, Architectural Design, ,System organization and object oriented design using UML.
- **Understand** the concept of Component-based , Distributed Software engineering and Risk management, Managing people, Teamwork
- **Explain** the concept of Project scheduling, Estimation Techniques and Software Testing in Project management.

UNIT-I

Overview, Software Process and Agile Software Development **10 Hours**
Introduction: Professional Software Development Attributes of good software, software engineering diversity, IEEE/ ACM code of software engineering ethics, case studies.
Software Process models: waterfall, incremental development, reuses oriented, Process Activities, The rational Unified process.
Agile Software Development: Agile methods, Plan-driven and agile Development, Extreme Programming, Agile project management, Scaling agile methods.

UNIT-II

Requirement Engineering, Dependability and security **10 Hours**
Requirements Engineering: Functional and non-functional requirements, the software requirements document, Requirements specification, Requirements engineering processes, Requirement elicitation and analysis, Requirements validation, Requirements management.
Dependability and security: Dependability properties, availability and reliability, safety and security.

UNIT-III

System Modeling, Architectural Design, Design and implementation **10 Hours**
System Modeling: Context models, Interaction models, Structural models, Behavioral models, Model-driven Engineering.
Architectural Design: Architectural Design decision, architectural patterns, architectural views.
Design and implementation: object oriented design using UML, design patterns, implementation issues.

UNIT-IV

Component-based, Distributed software engineering and project management **12 Hours**
Component-based software engineering: Components and component model, CBSE process, Component composition.

Distributed Software engineering: Distributed system issues, Client-server computing, Architectural patterns for distributed systems.
Project Management: Risk Management, managing people, Team work.

UNIT-V

Project planning and software testing **10 Hours**

Project Planning: software pricing, plan driven development, Project scheduling, Estimation Techniques, project duration and staffing.
Software Testing: Unit testing, component testing, system testing, user testing.

Text Book:

1. Ian Sommerville: Software Engineering, 9th edition, Person Education Ltd, 2011.
   (Chapters: 1, 2, 3, 4, 5, 6, 7, 8, 11, 17, 18, 22, 23)

Reference Books:

1. Pankaj Jalote, Software Engineering Wiley India Pvt. Ltd. (2010)
2. Roger S Pressman: Software Engineering-A Practitioners approach, 6th edition, McGraw-Hill, 2010.
3. Hans Van Vliet: Software Engineering Principles and Practices, 3rd Edition, Wiley-India, 2010

Course outcomes (CO's):
On completion of this course, the students should be able to

CO1: Identify various types of software process and significance of software process activities.
CO2: Distinguish between different types of software requirements.
CO3: Analyze different system models and architectural models**.**
CO4: Describe concept of Component-based, Distributed Software engineering and team work
CO5: Apply the concept of Project scheduling, Estimation Techniques and Software Testing

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M	S	L	-	L	M	-	M	L	M	L
CO2	M	S	M		-	-	M	-	M	-	M	M
CO3	S	M	S	L	M	L	-	-	M	-	M	-
CO4	M	S	S	-	M	L	-	-	M	-	M	-
CO5	M	M	S	M	-	-	-	-	M	-	L	-
S-Strong; M-Medium; L-Low												

Course Code : P20MCA22	Semester : II	L-T-P : 4 : 0 : 0
Course Title : Data Structures with Algorithm Analysis		
Credits : 4	Contact Period : 52 Hrs, Exam : 3Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- **Determine** the impact of structuring data to achieve efficiency of a solution to a problem.
- **Analyse** and **develop** programs to implement standard data structures such as stacks, queues, lists.
- **Apply** important algorithmic design paradigms and methods of analysis (Brute-Force, Divide-and-conquer, greedy, dynamic etc.)
- **Explain** the importance of designing efficient algorithms by comparing different complexity classes.
- **Possess** the ability to design simple algorithms for solving computing problems

UNIT-I

Introduction to Data Structures **11 Hours**

Definition, Classification of Data Structures.

The Stack and Recursion

Definition and examples: Primitive operations, Example, Representing stacks: Implementing the pop operation, Testing for exceptional conditions, Implementing the push operations, Examples for infix, postfix, and prefix expressions, Basic definition and Examples, Program to evaluate a postfix expression, Converting an expression from infix to postfix, Program to convert an expression from infix to postfix, Applications of Stacks: Expression evaluations, Recursion.

Recursive definition and processes: Factorial function, Fibonacci sequence, Binary search, Tower of Hanoi problem.

UNIT-II

Queues and Linked Lists **11 Hours**

Queue: The queue and its sequential representation: operation of queue, Priority queue, Array implementation of a priority queue.

Linked lists: Inserting and removing nodes from a list, Linked implementations of stacks, get node and free node operations, Linked implementation of queues, Linked list as a data structure, Example of list operations, Header nodes, Array implementation of lists, Limitations of array implementation, allocating and freeing dynamic variables, Linked lists using dynamic variables, Circular lists, operations on circular list

UNIT-III

Introduction and fundamentals of Algorithm Efficiency **10 Hours**

Notion of Algorithm, Fundamentals of Algorithmic Problem Solving, Analysis Framework, Asymptotic Notations and Basic efficiency classes.

Brute Force, Divide and Conquer

Selection Sort and Bubble Sort, String Matching, Merge-sort, Binary tree Traversals and related properties.

UNIT-IV

Decrease-and-Conquer **10 Hours**

Insertion Sort, Depth First search and Breadth First Search, Topological sorting, Algorithms for Generating Combinatorial Objects.

Transform and-Conquer, Space and Time Tradeoffs

Presorting, Balanced Search Trees, sorting by Counting, Input Enhancement in String Matching.

UNIT-V

Dynamic Programming **10 Hours**

Computing a binomial coefficient, Warshall's and Floyd's Algorithms, The Knapsack Problem and Memory Functions

Greedy Technique

Prim's Algorithm, Kruskal's Algorithm, Dijkstra's Algorithm, Huffman Trees.

Text Book:

1. Data Structures Using C and C++ by Yedidyah Langsam and Moshe J. Augenstein and Aaron M Tenanbanum, 2nd Edition,PHI.
2. Anany Levitin: Introduction to the Design and Analysis of Algorithms, 2nd edition, Pearson Education, 2003.

Reference Books:

1. Data Structures and Algorithm Analysis in C, Mark Allen Weiss, 2nd Edition, Pearson Education Aisa,1997.
2. Richard F Giberg and Behrouz A Forouzan: Data Structures – A Pseudo code Approach with C, 2nd Edition, Cengage Learning
3. Robert Kruse, C L Tondo, Bruce Leung and Shashi Mogalla: Data Structures and Program Design in C 2nd Edition, Pearson Education.
4. Coremen T.H., Leiserson C.E., and Rivest R.L.: Introduction to Algorithms, PHI, 1998
5."Analysis and design of Algorithms", Padma Reddy, Sri Nandi Publications, 2009
6. Horowitz E., Sahani S., Rajasekharan S.: Computer Algorithms, Galgotia Publications, 2001.

Course outcomes

On completion of this course, the students should be able to:

CO1: Apply the stack data structures for suitable real time applications.
CO2: Choose and **implement** the appropriate data structures to solve computational problems.
CO3: Understand the correctness of algorithms and efficiency of algorithms.
CO4: Analyze complexity of algorithms for different types of problems.
CO5: Design efficient algorithm using standard algorithmic design techniques.

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	-	M	L	M	-	-	-	L	M
CO2	S	S	S	M	M	L	S	L	-	M	M	-
CO3	S	S	S	S	M	L	M	M	L	L	L	M
CO4	M	M	L	M	L	L	L	L	L	L	M	M
CO5	S	M	M	M	M	M	L	L	L	M	L	L
S-Strong; M-Medium; L-Low												

Course Code : P20MCA23	Semester : II	L - T - P : 3 : 0 : 0
Course Title : Operating Systems		
Credits : 3	Contact Period : 52 Hrs, Exam: 3 Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- **Define** what operating systems are and its concepts.
- **Identify** the services provided by the operating system and learning different operating structure.
- **Understand** process management and coordination with classic synchronization problems.
- **Evaluate** various CPU scheduling algorithm problems and analyze methods for handling deadlocks.
- **Discuss** different memory management techniques such as contiguous, paging, segmentation and virtual memory.
- **Explain** file system and its implementation, mass storage and its scheduling

UNIT-I

10 Hours

What operating systems do, Computer System organization, Computer System architecture, Operating System structure, Operating System operations, Process management, Memory management, Storage management, Protection and security, Distributed system, Special-purpose systems, Computing environments, Open source Operating systems-Linux, Operating System Services, User-Operating System interface, System calls, Types of system calls, System programs, Operating System design and implementation, Operating System structure, Virtual machines, Operating system debugging – Failure Analysis, Performance Tuning, Operating System generation, System boot.

UNIT-II

10 Hours

Process concept, Process scheduling, Inter-process communication. Multi-Threaded Programming: Overview, Multithreading models, Thread Libraries, Threading issues. Process Scheduling: Basic concepts, Scheduling criteria, Scheduling algorithms, Multiple-Processor scheduling.

UNIT-III

12 Hours

Synchronization: The Critical section problem; Peterson's solution; Synchronization hardware, Semaphores, Classical problems of synchronization, Deadlocks: System model, Deadlock characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection and recovery from deadlock.

UNIT-IV

10 Hours

Memory Management Strategies: Background; Swapping; Contiguous memory allocation; Paging; Segmentation. Virtual Memory Management: Background; Demand paging; Page replacement; Allocation of frames; Thrashing.

UNIT-V

10 Hours

File Concept, Access Methods, Directory and Disk Structure, File-System Mounting, File Sharing, Protection, File-System Structure, Directory Implementation, Allocation Methods, Disk Scheduling.

Case Study: The Linux Operating System
Linux history; Design Principles; Kernel modules; Process management; Scheduling; Memory management; File systems, Input and output; Inter-process communication.

Text Book:
1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating System Concepts, 8th edition, Wiley India.

Reference Books:
1. D.M.Dhamdhere, Operating systems - A concept based Approach, 2nd Edition, Tata McGraw- Hill, 2002.
2. William Stallings, "Operating Systems-Internals and Design Principles" Pearson, 6th edition.

Course outcomes
On completion of this course, the students should be able to:

CO1:Define operating system goals, utilities, services and structures.
CO2:Explain process concepts, communication and evaluate various CPU scheduling algorithm Problems
CO3:Understand process synchronization and Identify methods for handling deadlocks
CO4:Analyze and **Explain** different memory management techniques.
CO5:Explain how files are organized, manipulated data on disk is organized scheduled and Linux Operating System.

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	L	S	M	-	-	-	M	-	L	-	-	-
CO2	M	S	S	L	L	-	L	-	M	L	L	-
CO3	S	S	S	L	L	-	L	M	L	-	-	-
CO4	S	S	M	L	L	-	L	-	L	L	L	L
CO5	S	S	M	-	S	-	M	-	-	L	L	M
S-Strong; M-Medium; L-Low												

Course Code : P20MCA24	Semester : II	L - T - P : 3 : 0 : 3
Course Title : Database Management Systems		
Credits : 4.5	Contact Period : 52 Hrs, Exam: 3 Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- **Define** DBMS terms and **illustrate** the components of DBMS.
- **Design** a relational Database schema, ER -Model for real time database applications.
- **Understand** the relational data model concepts.
- **Illustrate** queries using SQL for a DBMS application.
- **Apply** the Normalization concepts to normalize the database and **Describe** the concepts of DBMS transactions, concurrency control and crash recovery.

UNIT-I

Introduction **08 Hours**

Introduction, An example, Characteristics of Database approach, Actors on the screen, Workers behind the scene, Advantages of using DBMS approach, A brief history of database applications, when not to use a DBMS. Data models, schemas and instances, Three-schema architecture and data independence, Database languages and interfaces, The database system environment; Centralized and client-server architectures; Classification of Database Management systems.

UNIT-II

Entity-Relationship Model **10 Hours**

Using High-Level Conceptual Data Models for Database Design; An Example Database Application, Entity Types, Entity Sets, Attributes and Keys, Relationship types, Relationship Sets, Roles and Structural Constraints, Weak Entity Types, Refining the ER Design; ER Diagrams, Naming Conventions and Design Issues; Relationship types of degree higher than two.

UNIT-III

Relational Model and Relational Algebra **10 Hours**

Relational Model Concepts; Relational Model Constraints and Relational Database Schemas; Update Operations, Transactions and dealing with constraint violations; Unary Relational Operations: SELECT and PROJECT; Relational Algebra Operations from Set Theory; Binary Relational Operations : JOIN and DIVISION; Additional Relational Operations; Examples of Queries in Relational Algebra; Relational Database Design Using ER- to-Relational Mapping.

UNIT-IV

SQL **12 Hours**

SQL Data Definition and Data Types; Specifying basic constraints in SQL; Schema change statements in SQL, Basic queries in SQL, More complex SQL Queries. Insert, Delete and Update statements in SQL; Specifying constraints as Assertion and Trigger; Views (Virtual Tables) in SQL; Additional features of SQL; Database programming issues and techniques; Embedded SQL, Dynamic SQL; Database stored procedures and SQL / PSM.

UNIT-V

Database Design and Transaction Management **12 Hours**

Informal Design Guidelines for Relation Schemas; Functional Dependencies; Normal Forms Based on Primary Keys; General Definitions of Second and Third Normal Forms; Boyce-Codd Normal Form.

Transaction : The ACID Properties; Transactions and Schedules; Concurrent Execution of Transactions; Lock- Based Concurrency Control; Performance of locking; Transaction Support in SQL; Introduction to Crash Recovery.

Text Books:

1. Elmasri and Navathe, Fundamentals of Database Systems, 5th Edition, Pearson Education, 2007. (Chapters 1, 2, 3 except 3.8, 5, 6.1 to 6.5, 7.1, 8, 9.1, 9.2 except SQLJ, 9.4, 10)
2. Raghu Ramakrishnan and Johannes Gehrke, Database Management Systems, 3rd Edition, McGraw-Hill, 2003.(Chapters 16)

Reference Book:

1. Silberschatz, Korth and Sudharshan, Database System Concepts, 5th Edition, Mc-GrawHill, 2006.

Laboratory

- Programs given in the list needs to executed in the laboratory.

List of Programs

1. Construct an ER-model and Database schema for the following database for a Banking Enterprise
   BRANCH(branch-name:string, branch-city:string, assets:real)
   ACCOUNT(accno:int, branch-name:string, balance:real)
   DEPOSITOR(customer-name:string, accno:int)
   CUSTOMER(customer-name:string, customer-street:string, customer-city:string)
   LOAN(loan-number:int, branch-name:string, amount:real)
   BORROWER(customer-name:string, loan-number:int)

   a. Create the above tables by properly specifying the primary keys and the foreign keys
   b. Enter at least five tuples for each relation
   c. Find all the customers who have at least two accounts at the *Main* branch.
   d. Find all the customers who have an account at *all* the branches located in a specific city.
   e. Demonstrate how you delete all account tuples at every branch located in a specific city.

2. Construct an ER-model and Database Schema for a Video Library scenario
   CUSTOMER(cust_no: integer,cust_name: string)
   MEMBERSHIP(Mem_no: integer, cust_no: integer)
   CASSETTE(cass_no:integer, cass_name:string, Language: String)
   ISS_REC(iss_no: integer, iss_date: date, mem_no: integer, cass_no: integer)
   a. Create the above tables by properly specifying the primary keys and the foreign keys.
   b. Enter at least five tuples for each relation.
   c. List all the customer names with their membership numbers.
   d. List all the issues for the current date with the customer names and cassette names.
   e. Create a view which lists outs the iss_no, iss_date, cust_name, cass_name

3. Construct an ER-model and Database Schema for a student-Lab scenario.
   STUDENT(stud_no: integer, stud_name: string, class: string)
   CLASS(class: string, descrip: string)
   LAB(mach_no: integer, Lab_no: integer, description: String)

ALLOTMENT(Stud_no: Integer, mach_no: integer, dayof week: string)

a. Create the above tables by properly specifying the primary keys and the foreign keys.
b. Enter at least five tuples for each relation.
c. List all the machine allotments with the student names, lab and machine numbers
d. How many students class wise have allocated machines in the labs
e. Create a view which lists out the stud_no, stud_name, mach_no, lab_no, dayofweek

4. Construct an ER-model and Relation schema for a airline flight information Flights (no: integer, from: string, to: string, distance: integer, Departs: time, arrives:time, price:real)
   Aircraft (aid: integer, aname: string, cruisingrange: integer)
   Certified (eid: integer, aid: integer)
   Employees (eid: integer, ename: string, salary: integer)

Note: That the Employees relation describes pilots and other kinds of employees as well, every pilot is certified for some aircraft, and only pilots are certified to fly.

a. Create the above tables by properly specifying the primary keys and the foreign keys.
b. Enter at least five tuples for each relation.
c. Find the names of aircraft such that all pilots certified to operate them have salaries more than Rs.80, 000.
d. For each pilot who is certified for more than three aircrafts, find the *eid* and the maximum cruisingrange of the aircraft for which she or he is certified.
e. Find the names of pilots whose *salary* is less than the price of the cheapest route from Bengaluru to Frankfurt.

5. Construct an ER-model and Database schema for a Album song Information.
   MUSICIAN(ssn:integer, name:string, address:string, phone:integer)
   PLAYS(id:integer, ssn:integer)
   INSTRUMENT(id:integer, iname:string, m_key:integer)
   PERFORMS(ssn:integer, title:string)
   SONG(title:string, Author,aid:integer)
   ALBUM(aid:integer, title:string , c_date:date, format:string, producer_ssn:integer)
   a. Create the above tables by properly specifying the primary keys and the foreign keys.
   b. Enter at least five tuples for each relation.
   c. List musician name,title of the song which he has played the album in which song has occulted.
   d. List the details of songs which are performed by more than 3 musicians.
   e. List the different instruments played by the musicians and the average number of musicians who play the instrument.

Course Outcomes [CO]
On completion of this course, the students should be able to:

CO1: Demonstrate the basic concepts of DBMS with Data model.
CO2: Construct an ER-diagram for a given problem description.
CO3: Identify appropriate Primary key and foreign key in an ER model, specify structural constraints on each relationship.
CO4: Formulate data retrieval queries in SQL based on assumption and requirements.
CO5: Design and Develop a database application using relation schema with the help of normalization and **Explain** transaction processing, concurrency control and crash recovery.

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M	M	L	-	L	M	-	M	L	M	L
CO2	S	S	S	L	-	L	M	-	M	M	M	M
CO3	S	S	S	-	M	L	M	-	M	M	M	M
CO4	S	S	S	-	M	L	S	-	M	M	S	M
CO5	S	S	S	L	L	L	S	M	L	M	S	S
S-Strong; M-Medium; L-Low												

ELECTIVE GROUP-I

Course Code : P20MCA251	Semester : II	L-T-P : 3 : 2 : 0
Course Title : Data Warehousing & Data Mining		
Credits : 4	Contact Period : 52 Hrs, Exam : 3Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- **Understand** the concepts of Data warehousing Architecture and Implemenation.
- **Describe** the Conceptual, Logical, and Physical design of Data Warehouses OLAP applications and OLAP deployment
- **Understand** Data mining principles and techniques and Introduce DM as a cutting edge business intelligence
- **Discuss** the use association rule mining for handling large data to extract patterns
- **Illustrate** the concept of classification for the retrieval purposes.
- **Describe** Clustering algorithms and Outlier Analysis.

UNIT-I

Data Warehousing and OLAP **12 Hours**

Introduction, Operational Data Stores (ODS), Extraction Transformation Loading (ETL), Data Warehouses, Data Warehouse Design, and Guidelines for Data Warehouse Implementation, Data Warehouse Metadata.

OLAP : Introduction, Characteristics of OLAP systems, Multidimensional view and Data Cube, Data Cube Implementations, Data Cube Operations, Guidelines for OLAP Implementation, and Overview on OLAP Software.

UNIT-II

Data Mining **08 Hours**

Introduction, Challenges, Data Mining Tasks, Types of Data, Data Preprocessing, Measures of Similarity and Dissimilarity, Data Mining Applications.

UNIT-III

Association Analysis: Basic Concepts and Algorithms **12 Hours**

Frequent Item set Generation, Rule Generation, Compact Representation of Frequent Item sets, Alternative methods for Generating Frequent Item sets, FP-Growth Algorithm, Evaluation of Association Patterns.

UNIT-IV

Classification **08 Hours**

Basics, General Approach to Solve Classification Problem, Decision Tree Induction, Rule Based Classifier, Nearest-Neighbor Classifiers, and Bayesian Classifiers.

UNIT-V

Clustering Techniques and Outlier Analysis **12 Hours**

Overview, Features of Cluster Analysis, Types of Data and Computing Distance, Types of Cluster Analysis Methods, Partitional Methods, Hierarchical Methods, Density Based Methods, Quality and Validity of Cluster Analysis Methods.

Outlier Analysis: Outlier Detection Methods, Statistical Approaches, Clustering based Approaches, Classification based Approaches.

Text Books:

1. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, Introduction to Data Mining, Pearson 2005.
2. G. K. Gupta, Introduction to Data Mining with Case Studies, 2nd Edition, PHI, New Delhi, 2012.

Reference Books:

1. Jiawei Han and Micheline Kamber, Data Mining - Concepts and Techniques, 3rd Edition, Morgan Kaufmann Publisher.
2. Michael, J.Berry, Gordon Linoff: "Data Mining Techniques: Marketing, Sales, Customer support", John wiley & sons, 2012.

Note: At the end of the course students should come out with case study, It carries a weightage of 20% of CIE.

Course Outcomes:

On completion of this course, the students should be able to:

CO1: Explain the basic concepts of Data Warehousing and OLAP Implementation.
CO2: Explain the basic concepts, techniques and applications of data mining.
CO3: Illustrate the association rules to extract appropriate pattern in massive data.
CO4: Design and deploy appropriate classification techniques
CO5: Illustrate the clustering techniques and outlier analysis in detail for better organization and retrieval of data

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M	M	-	-	L	M	-	M	-	M	-
CO2	M	M	S	M	-	L	M	-	M	-	M	-
CO3	M	M	S	-	-	L	M	-	M	-	M	-
CO4	S	M	M	-	-	L	M	-	M	-	M	-
CO5	M	M	S	-	-	L	M	-	M	-	M	-
S-Strong; M-Medium; L-Low												

Course Code : P20MCA252	Semester : II	L-T-P : 3 : 2 : 0
Course Title : Model View Control Programming		
Credits : 4	Contact Period : 52 Hrs, Exam : 3Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to

- **Understand** and Discuss different Model View Controller design pattern techniques in various application areas
- **Summarise** knowledge of frameworks in the development of Web application
- **Analyze** the performance of Web frameworks
- **Understand** MVC based applications using MEAN

UNIT-I

10 Hours

Introduction to MEAN (MongoDB, ExpressJS, AngularJS, NodeJS) Three-tier web application development, Introduction to JavaScript and MEAN,Introduction to Node.js, JavaScript event-driven programming Node.js - event-driven programming, JavaScript closures Node modules, Common JS modules, Node.js core modules, Node.js third-party modules,Node.js file modules Introduction to AngularJS-Key concepts of AngularJS, the core module of AngularJS, The angular global object, AngularJS modules Two-way data binding

UNIT-II

12 Hours

Building Express Web Application - Introduction to Express, Installing Express, Creating your first Express application, The application, request and response objects- The application object, The request object, The response object, External middleware, Implementing the MVC pattern-Application folder structure, Horizontal folder structure, Vertical folder structure, File-naming, conventions, Implementing the horizontal folder structure, Configuring an Express application-Environment configuration files Rendering views, Configuring the view system Rendering EJS views-Configuring the view system 71, Rendering EJS views.

UNIT-III

10 Hours

Creating a MEAN CRUD Module Implementing the AngularJS MVC module-Creating the AngularJS module service, Setting up the AngularJS module controller, Implementing the AngularJS module views, The create() method of the AngularJS controller, The find( ) and find One() methods of the AngularJS controller, The update() method of the AngularJS controller, The delete() method of the AngularJS controller Implementing the AngularJS module views- The create-article view, The view-article view, The editarticle view, The list-articles view

UNIT-IV

8 Hours

Introduction to MongoDB - Introduction to NoSQL, Introducing MongoDB, MongoDB sharding, MongoDB CRUD operations-Creating a new document, Creating a document using insert(), Creating a document using update(), Creating a document using save().

UNIT-V

12 Hours

Introduction to Mongoose-Introducing Mongoose ,Connecting to MongoDB, Understanding Mongoose schemas, Creating the user schema and model, Registering the User model, Creating new users using save(), Finding multiple user documents using find(), Reading a single user document using find One(), Updating an existing user document Deleting an existing user document, Extending your Mongoose schema- Defining default values, Using schema modifiers, Predefined modifiers, Custom setter modifiers, Custom getter modifiers.

Text Books:

1. Amos Q. Haviv,"MEAN Web Development", PACKT Publication, 2014, ISBN 978-1-78398-328-5.
2. Simon Holmes, "Getting MEAN with Mongo, Express, Angular, and Node", MEAP Edition November 2015, ISBN 9781617292033.

Reference Book:

1. Angular JS for .NET Developers by Sheppard/Miller/Liptak SAMS 2016

Note: At the end of the course students should come out with case study, It carries a weightage of 20% of CIE.

Course outcomes

On completion of this course, the students should be able to:

CO1: Explain MEAN
CO2: Build express web application
CO3: Develop the angularJS MVC modules services
CO4: Explain about MongoDB
CO5: Apply the knowledge of Mongoose to implement document modeling.

Mapping with Program Outcome

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	M	M	L	M	-	L	-	L	L
CO2	S	S	S	M	M	-	M	M	-	L	-	L
CO3	S	S	S	S	M	L	M	L	-	L	L	L
CO4	S	S	S	S	S	-	M	-	L	-	L	L
CO5	S	S	S	S	M	L	M	-	-	L	L	L
S-Strong; M-Medium; L-Low												

Course Code : P20MCA253	Semester : II	L-T-P : 3 : 2 : 0
Course Title : System Simulation and Modelling		
Credits : 4	Contact Period : 52 Hrs, Exam : 3Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to

- **Understand** whether the simulation is a useful tool for analysis of behavior of the system.
- **Ability** to understand different types of systems.
- **Determine** the capabilities and limitations of a system that undergoes simulation study.
- **Discuss** generators for random number generation for simulation study of a system.
- **Analyze** the system behaviour based on Input and Output modelling.
- **Describe** the verification and validation of the system.

UNIT-I

Introduction **10 Hours**

When simulation is the appropriate tool and when it is not appropriate; Advantages and disadvantages of Simulation; Areas of application; Systems and system environment; Components of a system; Discrete and continuous systems; Model of a system; Types of Models; Discrete-Event System Simulation; Steps in a Simulation Study.

UNIT-II

Random-Number Generation **12 Hours**

Properties of random numbers; Generation of pseudo-random numbers; Techniques for generating random numbers; Tests for Random Numbers.

Random-Variate Generation

Inverse transform technique; Acceptance-Rejection technique.

UNIT-III

Queuing Models **10 Hours**

Characteristics of queuing systems; Queuing notation Simulation Examples: Queuing, Inventory System

UNIT-IV

General Principles **10 Hours**

Concepts in Discrete-Event Simulation: The Event-Scheduling / Time-Advance Algorithm, World Views, Manual simulation Using Event Scheduling;

Input Modeling

Data Collection; Identifying the distribution with data; Parameter estimation; Goodness of Fit Tests; Chi-Square test, K-S Test.

UNIT-V

Verification and Validation **10 Hours**

Model building, verification and validation; Verification of simulation models; Calibration and validation of models.

Output analysis

Types of simulations with respect to output analysis; Stochastic nature of output data; Measures of performance and their estimation; Output analysis for terminating simulations.

Text Book:

1. Jerry Banks, John S. Carson II, Barry L. Nelson, David M. Nicol: Discrete-Event System Simulation, 4th Edition.

Reference Books:

1. Lawrence M. Leemis, Stephen K. Park: Discrete – Event Simulation: A First Course, Pearson / Prentice-Hall, 2006.
2. Averill M. Law: Simulation Modeling and Analysis,4th Edition, Tata McGraw-Hill, 2007.
3. Simulation 5ed Ross Elsevier
4. Theory of modeling and simulation, Zeiglar, Elsevier

Note : At the end of the course students should come out with case study, It carries a Weightage of 20% of CIE.

Course outcomes

On completion of this course, the students should be able to:

CO1: **Define** the basic concepts in simulation and modelling with respect to real time system.
CO2: **Identify** various simulation models for a given system. And understand the manual Simulation using simulation algorithm.
CO3: Illustrate various random number generators.
CO4: Analyze the input and output modelling for a given system.
CO5: **Illustrate** verification and validation of a given simulation model.

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M	-	-	L	-	-	-	-	-	-	-
CO2	S	S	S	S	M	-	-	-	-	-	-	-
CO3	S	-	S	M	M	-	-	-	-	-	-	-
CO4	M	-	-	M	M	-	M	S	-	-	M	-
CO5	M	-	-	M	M	-	-	-	-	-	M	-
S-Strong; M-Medium; L-Low												

Course Code : P20MCA254	Semester : II	L-T-P : 3 : 2 : 0
Course Title : Optimization Techniques		
Credits : 4	Contact Period : 52 Hrs, Exam : 3Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- **Understand** the origin nature and applications of OR study.
- **Identify** the general model of a LPP and learn to **Formulate** a mathematical model of a LPP for the given data. **Learn** to solve the given LPP by different techniques.
- **Understand** the role of duality in sensitivity analysis
- **Analyze** different methods to minimize the total transportation and assignment cost in the given problem.
- **Learn** the concepts of game theory and Metahueristics

UNIT-I

10 Hours

Introduction and Overview of the OR Modeling Approach : The origin of OR, the nature of OR, the impact of OR, defining the problem and gathering data, Formulating a mathematical model, deriving solutions from the model, testing the model, preparing to apply the model, implementation.
Introduction to Linear Programming: Formulation of linear programming problem (LPP), examples, Graphical solution, the LP Model, Special cases of Graphical method, assumptions of Linear Programming (LP), additional example.

UNIT-II

10 Hours

Solving LPP - the Simplex Method:The essence of the simplex method, setting up the simplex method, algebra of the simplex method, the simplex method in tabular form, special cases in the simplex method, tie breaking in the simplex method.
Adopting to other model forms (Two Phase method, Big-M method), Post optimality analysis.

UNIT-III

10 Hours

Duality Theory and Sensitivity Analysis: The essence of duality theory, economic interpretation of duality, primal dual relationship, Properties.
Adapting to other primal forms, the role of duality in sensitive analysis- all types of changes, the dual simplex method. (Problems)

UNIT-IV

12 Hours

Transportation Problems**:** The transportation problem, General model Initial basic feasible solution by North West corner rule , Vogel's approximation method , Least cost method. Optimal solution by Stepping stone method, u-v method . Unbalanced Transportation problems and Non degeneracy in a Transportation problems.
Assignment problem: General model a special algorithm for the assignment problem Unbalanced Assignment problems, Hungarian method, Maximization problems.

UNIT-V

10 Hours

Game Theory: The formulation of two persons, zero sum games, solving simple games- a prototype example, Games with Mixed Strategies, Using Dominance property, graphical solution procedure.
Metaheuristics: The nature of Metaheuristics, Tabu Search, Simulated Annealing, Generating Algorithms.

Text Books:

1. Frederick S.Hillier& Gerald J.Lieberman, Introduction to Operations Research: Concepts and cases, 9th Edition, Tata McGraw Hill, 2013.
   (Chapters 1.1 to 1.3, 2.1 to 2.6, 3.2 to 3.4, 4.1 to 4.7, 6.1 to 6.6 , 7.1,8.1 to 8.4, 13.1 to 13.4, 14.1 to 14.4)
2. Hamdy A Taha, Operations Research - An Introduction, 8th Edition, Pearson Education, 2007.

Reference Books:

1. Operations Theory and Applications, J.K. Sharma, 5th edition, MacMillan, 2009.
2. Wayne L. Winston, Operations Research Applications and Algorithms, 4th Edition, Cingage Learning, 2003.
3. Richard Bronson and Govindasami Naadimuthu, Theory and Problems of Operations Research, Schaum's Outline, Tata McGraw Hill, 2nd Edition, 1997.

Note : At the end of the course students should come out with case study, It carries a Weightage of 20% of CIE.

Course outcomes
On completion of this course, the students should be able to:

CO1: Learn quantitative methods and techniques for model formulation and applications that are used in solving business decision problems.
CO2: Analyze and **Solve** linear programming problems using graphical method and simplex method in different forms **Identify** different methods of solving a LPP.
CO3: Identify the role of duality and sensitivity analysis in OR study.
CO4: Apply different methods to solve transportation and assignment problems for minimum cost.
CO5: Analyze the competitive situations by game theory approach.

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	M	-	-	-	M	-	-	L	M	-
CO2	S	S	M	-	-	-	S	M	-	L	M	-
CO3	S	S	S	M	-	-	S	-	-	L	M	-
CO4	S	S	S	M	-	-	S	M	-	M	M	M
CO5	S	S	S	L	-	-	S	M	-	L	M	M
S-Strong; M-Medium; L-Low												

Course Code : P20MCA255	Semester : II	L-T-P : 3 : 2 : 0
Course Title : Advanced Java Programming		
Credits : 4	Contact Period : 52 Hrs, Exam : 3Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- **Understand** the concept of Servlet and its services.
- **Understand** the concept of Servlet and its services
- **Familiarize** how to create packages and interfaces.
- **Outline** Database connection with any front end.
- **Outline** to use various beans in different applications

UNIT-I

Servlet **10 Hours**

Servlet Structure, Servlet packaging, HTML Building utilities, Lifecycle, Single Thread Model Interface, Handling Client request: Form Data, HTTP Request Headers.
Generating Server Response: HTTP Status Codes, HTTP Response Headers, Handling Cookies, Session Tracking.

UNIT-II

Introduction to JSP **10 Hours**

Overview of JSP: JSP Technology, Need of JSP, Benefits of JSP, Advantages of JSP, Basic Syntax, Invoking Java code with JSP Scripting Elements, Creating Template Text, Invoking Java Code form JSP, Limiting Java Code in JSP, Using JSP Expressions, Comparing Servlets And JSP, Writing Scriptlets. For Example: Using Scriplets to make parts of JSP Conditional, Using declarations, Declaration Examples

UNIT-III

12 Hours

Controlling the structure, Structure of generated Servlets and Java Beans, Controlling the structure of generated Servlets: The JSP Page directive, Import Attribute, Session Attribute, isElignore attribute, Buffer and Autoflush Attribute, Info Attribute, errorPage, and iserrorPage Attributes, isThreadSafe Attribute, extends Attribute, language Attribute, Including Files and Applets in JSP Pages using Java Beans components in JSP documents.
JAR File, Manifest file, Working with Java Beans. Introspection, Customisers, Bean Properties: Simple properties, Design pattern events, Creating bound properties, Bean Methods, Beaninfo class, Persistence.

UNIT-IV

Annotations and JDBC **10 Hours**

Annotations: Built-in Annotations with examples, Custom Annotation. Talking to Database, Immediate Solutions, Essentials JDBC program, using prepared statement object, and Interactive SQL tool. JDBC in Action Result sets, Batch updates, Mapping, Basic JDBC datatypes, Advanced JDBC data types, immediate solutions

UNIT-V

EJB and Server Side Components Models **10 Hours**

Introduction to EJB: The Problem domain, Breakup responsibilities, Code Smart not hard, the enterprise java bean specification, Components Types.
Server Side Component Types: session Beans, MessageDriven Beans, Entity Beans, The Java

Persistence Model. Container services: Dependency Injection, Concurrency, Instance pooling n caching, Transactions, security, Timers, Naming and object stores, Interoperability, Life Cycle Callbacks, Interceptors, platform integration. Developing your first EJB, Models: The Stateless Session Bean, The Stateful Session Bean, the Singleton Session Bean, Message- Driven Beans. EJB and Persistence. Persistence Entity Manager Mapping persistence objects, Entity Relationships

TextBooks:

1.Marty Hall,Larry Brown Core Servlets and Java server pages. Vol 1: Core Technologies. 2nd Edition. (Chapter 3,4,5,6,7,8,9,10,11,12,13,14)
2.Java 6 Programming Black Book, Dreamtech press 2012(Chapter 17,18,19,20,21,22,27,28,29,30)
3.Andrew LeeRubinger, Bill Burke. Development Enterprise Java Components. Enterprise JavaBeans 3.1. O'reilly (Chapters 1,2,3,4,5,6,7,8,9,10,11)

Reference Books:

1.Michel Siklora, EJB 3 Developer Guide, A Practical Guide For Developers And Architects to the Enterprise Java Beans Standard,Shroff Publishers and Distributers Private Limited July2008.
2. Herbert Schildt The Java Complete Reference, 8th Edition, Comprehensive coverage of the Java Language, Tata Mc Graw Hill Edition.

Note : At the end of the course students should come out with case study, It carries a weightage of 20% of CIE.

Course outcomes
On completion of this course, the students should be able to

CO1: Choose the Servlet technology for server side web application
CO2: Identify the JSP technology for server side web application
CO3: Create packages and interfaces.
CO4: Describe Develop application using JDBC
CO5: Develop Enterprise Java Bean Applications

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	-	-	L	-	S	-	M	-	-	-
CO2	S	S	-	M	-	-	-	-	M	-	L	-
CO3	M	S	M	-	-	M	-	M	M	S	-	M
CO4	S	S	M	-	S	-	-	S	M	S	-	-
CO5	-	S	M	M	-	-	-	-	M	-	-	M
S-Strong; M-Medium; L-Low												

ELECTIVE GROUP - II

Course Code : P20MCA261	Semester : II	L-T-P : 4 : 0 : 0
Course Title : Cloud Computing		
Credits : 4	Contact Period : 52 Hrs, Exam : 3Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to

- **Understand** the basic concepts of cloud computing
- **Identify** the challenges of cloud Computing
- **Classify** various service models of cloud
- **Understand** virtualization in various levels of cloud computing
- **Identify** the resource management policies, its mechanism, various storage systems and security issues

UNIT-I

Introduction **10 Hours**

Network centric computing and network centric content, Peer-to-peer systems, Cloud Computing: an old idea, whose time has come, Cloud Computing delivery models & Services, Ethical issues, Cloud vulnerabilities, Challenges,

Cloud Infrastructure

Amazon, Google, Azure & online services, open source private clouds. Storage diversity and vendor lock-in, intercloud, Energy use & ecological impact of data centers, service level and compliance level agreement, Responsibility sharing, user experience, Software licensing.

UNIT-II

Cloud Computing **10 Hours**

Applications & Paradigms, Challenges, existing and new application opportunities, Architectural styles of cloud applications, Workflows coordination of multiple activities, Coordination based on a state machine model -the Zoo Keeper, The Map Reduce programming model, Apache Hadoop, High performance computing on a cloud.

UNIT-III

Cloud Resource Virtualization **10 Hours**

Virtualization, Layering and virtualization, Virtual machine monitors, Virtual machines Performance and security isolation, Full virtualization and par virtualization, Hardware support for virtualization A performance comparison of virtual machines, Virtual machine security, The darker side of virtualization, Software fault isolation.

UNIT-IV

Cloud Resource Management and Scheduling **10 Hours**

Policies and mechanisms for resource management, Applications of control theory to task scheduling on a cloud, Stability of a two level resource allocation architecture, Feedback control based on dynamic thresholds, Coordination of specialized autonomic performance managers, A utility-based model for cloud-based web services, Resource bundling, combinatorial auctions for cloud resources, Scheduling algorithms for computing clouds, fair queuing, Start time fair queuing.

UNIT-V

Networking Support **12 Hours**

Storage Area Networks, Content Delivery Networks.

Storage systems

Storage models, file systems, databases, DFS, General parallel File system, GFS, Apache Hadoop, Locks & Chubby, TPS & NOSQL databases, Bigdata, Mega store.

Cloud security

Risks, Security, privacy and privacy impacts assessments, Trust.

Text Book:

1. Cloud Computing: Theory and Practice, Dan Marinescu, 1st edition, MK Publishers, 2013.

Reference Books:

1.Distributed and Cloud Computing, From Parallel Processing to the Internet of Things, Kai Hwang, Jack Dongarra, Geoffrey Fox. MK Publishers, 2012.

2.Cloud Computing: A Practical Approach, Anthony T. Velte, Toby J. Velte, Robert Elsenpeter, McGrawFill, 2010.

3. Cloud Computing-A Hands-on Approach, ArshdeepBahga, Vijay Madisetti, Universities Press, 2014.

Course outcomes

On completion of this course, the students should be able to:

CO1: Define basic concepts and terminologies of cloud computing

CO2: Identify the appropriate cloud services for a given application.

CO3: Assess the comparative advantages and disadvantages of Virtualization technology.

CO4: Describe resource management policies and its implementation in cloud

CO5: Discuss various storage systems and security issues with case studies

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	-	-	L	M	S	-	-	-	S	-
CO2	S	S	S	M	M	M	-	-	-	-	M	-
CO3	M	S	M	M	M	-	-	-	-	S	-	-
CO4	S	S	M	-	S	-	-	S	-	S	-	-
CO5	-	S	M	M	-	-	-	-	M	-	-	M
S-Strong; M-Medium; L-Low												

Course Code : P20MCA262	Semester : II	L-T-P : 4 : 0 : 0
Course Title : Artificial Intelligence		
Credits : 4	Contact Period : 52 Hrs, Exam : 3Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to

- **Understand** the fundamental concepts of computer networking.
- **Understand** data transformation and data transmission.
- **Discuss** various inter networking devices and transmission of data in inter-networks using routing algorithms
- **Apply** various error detection and correction techniques in transmission of data.
- **Distinguish** various LANs

UNIT-I

Intelligent Agents And Searching Methods **12 Hours**

Artificial Intelligence: Introduction : What is AI; Foundations of Artificial Intelligence; History of Artificial Intelligence; The state of Art;

Intelligent Agents: Agent and Environments; Good Behavior; The Nature of Environments; The Structure of Agents;

Problem-solving: Problem-solving agent; searching for solution; Uniformed search strategies;

Informed Search and Exploration: Informed search strategies; Heuristic functions; Online Search agents and unknown environment;

Constraint Satisfaction problems: Constraint satisfaction problems; Backtracking search for CSPs;

Adversarial search: Games; optimal decisions in Games; Alpha-Beta pruning;

UNIT-II

Logic **10 Hours**

Logical Agents: Knowledge-based agents**;** The wumpus world; Logic; propositional logic; Reasoning patterns propositional logic; Effective propositional interference; Agent based on propositional logic;

First-Order Logic: Representation revisited; Syntax and semantics of first order logic; Knowledge engineering in first order logic;

Interference in First-Order Logic: Propositional verses first-order interference; Unification and lifting.

UNIT-III

Knowledge Representation And Planning **10 Hours**

Knowledge Representation: Ontological engineering; Categories and object; Action, situations and events; Mental events and mental objects; The internet shopping world; Reasoning system for categories; Reasoning with default information; Truth maintenance system;

Planning: The planning problems; Planning with state-space search; Planning graphs; Planning with propositional logic

UNIT-IV

Uncertainty **10 Hours**

Uncertainty: Acting under uncertainty; Interference using full joint distributions; Independence; Bayes's rile and its use;

Probabilistic Reasoning: Representing knowledge in an uncertain domain; The semantic of Bayesian networks; Efficient representation of conditional distribution; Exact interference in Bayesian network

UNIT-V

Learning **10 Hours**

Learning: Forms of learning**;** Inductive learning; Learning decision tree; Ensemble learning; Computational learning theory

Text Book:

1. Elaine Rich,Kevin Knight, Shivashanka B Nair:Artificial Intelligence, Tata CGraw Hill 3rd edition. 2013.
2. Stuart Russel, Peter Norvig: Artificial Intelligence A Modern Approach, Pearson 3rd edition 2013.

References Books:

1. Elaine Rich, Kevin Knight, Shivashankar.B.Nair, "Artificial Intelligence", Tata Mc Graw Hill Publishing Company Limited. Third Edition, 2009.
2. Nils J. Nilsson, "Artificial Intelligence: A new Synthesis", Harcourt Asia Pvt. Ltd., 2000.
3. George F. Luger, "Artificial Intelligence-Structures and Strategies for Complex Problem Solving", Pearson Education / PHI, 2002.

Course Outcome (CO):

At the end of this course, the students will be able to

CO1: Analyze the modern view of AI as the study of agents that receive precepts from the environment and perform actions.
CO2: Demonstrate awareness of informed search and exploration methods.
CO3:Demonstrate about AI techniques for knowledge representation, planning and uncertainty management.
CO4: Create knowledgebase for decision making and learning methods.
CO5: Illustrate the use of AI to solve English Communication problems.

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	-	-	-	M	-	M	-	-	-	-	-
CO2	S	S	S	M	M	-	S	-	-	-	M	-
CO3	M	-	-	-	-	-	-	-	-	-	S	-
CO4	M	S	M	-	S	-	M	-	-	-	M	-
CO5	S	M	M	M	M	-	-	M	-	-	M	-
S-Strong; M-Medium; L-Low												

Course Code : P20MCA263	Semester : II	L-T-P : 4 : 0 : 0
Course Title : Research Methodology		
Credits : 4	Contact Period : 52 Hrs, Exam : 3Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- **Explain** Objective, Types and defining a research problem
- **Discuss** searching, review of literature and Writing about the literature reviewed
- **Demonstrate** Research surveys and Research design
- **Illustrate** of Data Collection and Data Preparations
- **Outline** Statistics concept and Report Writing

UNIT-I

Research Methodology **10Hours**

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

Defining the Research Problem

Research Problem, Selecting the Problem, Necessity of Defining the Problem, Technique Involved in Defining a Problem, an Illustration.

UNIT-II

Reviewing the literature **10Hours**

Place of the literature review in research, Bringing clarity and focus to your research problem, Improving research methodology, Broadening knowledge base in research area, Enabling contextual findings, How to review the literature, searching the existing literature, reviewing the selected literature, Developing a theoretical framework, Developing a conceptual framework, Writing about the literature reviewed.

UNIT-III

Design of Sample Surveys **10Hours**

Introduction, Sample Design, Sampling and Non-sampling Errors, Sample Survey versus Census Survey, Types of Sampling Designs

Research Design

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, Important Experimental Designs.

UNIT-IV

Data Collection **11Hours**

Experimental and Surveys, Collection of Primary Data, Collection of Secondary Data, Selection of Appropriate Method for Data Collection, Case Study Method.

Data Preparation

Data preparation process, Questionnaire checking, Editing, Coding, Classification, Tabulation, Graphical Representation, Data Cleaning, Data Adjusting, Some Problems in Preparation Process, Missing Values and Outliers, Types of Analysis, Statistics in Research

UNIT-V

Descriptive Statistics **11Hours**

Measures of Central Tendency, mean, Median, Mode, Other Averages, Measures of Dispersion, Range, Mean Deviation, Standard Deviation, Measures of Relationship Covariance

Interpretation and Report Writing: Meaning of Interpretation, Technique of Interpretation, Precaution in Interpretation, Significance of Report Writing, Different Steps in Writing Report, Layout. Types of Reports, Oral Presentation, Mechanics of Writing a Research Report, Precautions for Writing Research Reports.

Text Book:

1. Research Methodology: Methods and Techniques, C.R. Kothari, Gaurav Garg New Age International 4th Edition, 2018.

Reference Books:

1. Research Methods: the concise knowledge base Trochim, Atomic Dog Publishing, 2005.
2. Conducting Research Literature Reviews: From the Internet to Paper Fink A Sage Publications, 2009.

Course outcomes

On completion of this course, the students should be able to:

CO1: **Identify** the types, methods of the given research problem
CO2: **Explain** searching and writing reviewed literature
CO3: **Illustrate** Research surveys and Research design
CO4: **Demonstrate** Data Collection and Data Preparations with examples.
CO5: **Understands** the Statistics concept and Report Writing

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	L	M	M	L	M	-	M	M	M	M	L	-
CO2	M	S	S	S	M	-	M	L	-	M	L	-
CO3	M	S	S	S	M	-	M	L	-	M	L	-
CO4	M	S	S	S	L	-	S	L	L	-	L	-
CO5	M	S	S	S	L	-	L	L	L	L	L	-
S-Strong; M-Medium; L-Low												

Course Code : P20MCA264	Semester : II	L-T-P : 4 : 0 : 0
Course Title : Software Testing & Practices		
Credits : 4	Contact Period : 52 Hrs, Exam : 3Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- **Demonstrate** the basic definitions, test case, defect management, execution history, fault taxonomies and levels of testing.
- **Discuss** the scenario and select the proper testing technique like Boundary Value Testing, Equivalence Class Testing and Decision Table-Based testing
- **Compare** Traditional view, Alternative life - cycle models
- **Illustrate** the approaches for Test Execution: from test case specifications to test cases, Scaffolding, Generic versus specific scaffolding
- **Outline** the test strategies to test design specifications document.

UNIT-I

Basics of Software Testing **10 Hours**

Humans, Errors and Testing, Software Quality; Requirements, Behavior and Correctness, Correctness Vs Reliability; Testing and Debugging; Test Metrics; Software and Hardware Testing; Testing and verification; Defect Management; Execution History; Test Generation Strategies; Static Testing; Test Generation from Predicates.

UNIT-II

A Perspective on Testing, Examples, Boundary Value, Equivalence Class, Decision Table-Based Testing **11 Hours**

Basic definitions, Test cases, Insights from a Venn diagram, Identifying test cases, Error and fault taxonomies, Levels of testing.

Examples: Generalized pseudo code, The triangle problem, The Next Date function, The commission problem, The SATM (Simple Automatic Teller Machine) problem, The currency converter, Saturn windshield wiper.

Boundary value analysis, Robustness testing, Worst-case testing, Special value testing, Examples, Random testing.

Equivalence classes, Equivalence test cases for the triangle problem, Next Date function, and the commission problem, Guidelines and observations. Decision tables, Test cases for the triangle problem. A case study

UNIT-III

Path Testing, Data Flow Testing, Levels of Testing, Integration Testing **10 Hours**

DD paths, Test coverage metrics, Basis path testing, guidelines and observations.

Definition-Use testing, Slice-based testing, Guidelines and observations.

Traditional view of testing levels, Alternative life-cycle models, The SATM system, Separating integration and system testing. A case study

UNIT-IV

Basic principles, Fault-Based Testing **11 Hours**

Sensitivity, redundancy, restriction, partition, visibility, Feedback.

Assumptions in fault-based testing, Mutation analysis, Fault-based adequacy criteria, Variations on mutation analysis.
From test case specifications to test cases, Scaffolding, Generic versus specific scaffolding, Test oracles, Self-checks as oracles, Capture and replay.

UNIT-V

Test Case Selection and Adequacy, Planning and Monitoring the Process, Documenting Analysis and Test **10 Hours**

Test Specification and cases, Adequacy Criteria, Comparing Criteria.
Quality and process, Test and analysis strategies and plans, Risk planning, Monitoring the process, Improving the process, the quality team.
Organizing documents, Test strategy document, Analysis and test plan, Test design specifications documents, Test and analysis reports.

Text Books:

1. Aditya P Mathur**,** Foundations of Software Testing, Pearson, 2008
2.Paul C. Jorgensen, Software Testing, A Craftsman's Approach, 3rd Edition, Auerbach Publications, 2008.
3. Mauro Pezze, Michal Young, Software Testing and Analysis – Process, Principles and Techniques, Wiley India, 2008.

Reference Book:

1.Srinivasan Desikan, Gopalaswamy Ramesh, Software testing Principles and Practices, 2ndEdition, Pearson, 2007.

Course outcomes
On completion of this course, the students should be able to:

CO1: **Explain** Test cases, Error and fault taxonomies, Levels of testing.
CO2: **Classify** different types of testing.
CO3: **Illustrate** traditional view**,** Alternative life - cycle models
CO4: **Choose** approaches for Test Execution: from test case specifications to test cases, Scaffolding, Generic versus specific scaffolding.
CO5: **Identify** and plan strategies to test design specifications document.

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	M	M	-	L	L	M	M	M	-
CO2	M	S	S	S	M	-	M	L	-	M	M	L
CO3	M	S	S	S	M	-	M	L	-	M	M	-
CO4	M	S	S	S	L	L	L	L	L	-	L	-
CO5	M	S	S	S	L	-	L	L	L	L	L	
S-Strong; M-Medium; L-Low												

Course Code : P20MCA265	Semester : II	L-T-P : 4 : 0 : 0
Course Title : Cyber Security		
Credits : 4	Contact Period : 52 Hrs, Exam : 3Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- **Demonstrate** the cybercrime and how criminals plan the attacks**.**
- **Discuss** tools and methods used in Cybercrime
- **Explain** Security Challenges and Attacks on Mobile/Cell Phones
- **Illustrate** complete information about Computer Forensics
- **Outline** Social, Political Ethical and Psychological Dimensions on Cybercrime

UNIT-I

Introduction to Cybercrime **10 Hours**

Introduction, Cybercrime: Definition and Origins of the word, Cybercrime and Information Security, Who are Cybercriminals? Classifications of Cybercrimes.

Cyberoffenses: How Criminals Plan the Attacks

Categories of Cybercrime. How Criminals Plan Attacks? Social Engineering, Cyber stalking, Cybercafe and Cybercrimes, Botnets, Attack Vector, The Indian ITA 2000.

UNIT-II

Tools and Methods used in Cybercrime **10 Hours**

Introduction, Proxy Server and Anonymizers, Phishing, Password Cracking, Keyloggers and Spyware, Virus and Worms, Trojan Horses and backdoors, Steganography, DOS and DDOS attack, SQL Injection, Buffer Overflow, Attacks on Wireless Networks.

UNIT-III

Cybercrime: Mobile and Wireless Devices **11 Hours**

Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing, Security Challenges posed by Mobile Devices, Attacks on Mobile/Cell Phones.

Phishing and Identity Theft

Introduction, Phishing – Methods of Phishing, Phishing Techniques, Phishing Toolkits and Spy Phishing. Identity Theft – PII, Types of Identity Theft, Techniques of ID Theft

UNIT-IV

Understanding Computer Forensics **11 Hours**

Introduction, historical background of Cyber forensics, Need for Computer Forensics, Cyber forensics and Digital Evidence, Digital Forensics Life Cycle. Forensics and Social Networking Sites: The Security / Privacy Threats, Special Toolkit and Techniques.

Forensics of Hand-Held devices

Understanding Cell Phone Working Characteristics, Hand-held devices and digital Forensics. Toolkits of Hand-Held Device Forensics. An illustration on Real life Use of Forensics

UNIT-V

Cybercrime and Cyberterrorism: Social, Political Ethical and Psychological Dimensions 10 Hours

Introduction, Intellectual Property in the Cyberspace, The ethical dimension of Cybercrimes, The Psychology, Mindset and shoes of Hackers and Cybercriminals, Sociology of Cybercriminals, Information Warefare: perception or An Eminent Reality.

Text Book:

1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, by Nina Godbole and Sunit Belapure, Wiley.

Reference Books:

1. Marjie T. Britz - Computer Forensics and Cyber Crime: An Introduction - Pearson
2. Chwan-Hwa (John) Wu,J. David Irwin - Introduction to Computer Networks and Cyber security – CRC Press.
3. Bill Nelson, Amelia Phillips, Christopher Steuart - Guide to Computer Forensics and Investigations - Cengage Learning.

Course outcomes

On completion of this course, the students should be able to:

CO1: **Explain** cybercrime and how criminals plan the attacks**.**
CO2: **Discuss** tools and methods used in Cybercrime
CO3: **Illustrate** Security Challenges and Attacks on Mobile/Cell Phones
CO4: **Summarize** complete information about Computer Forensics
CO5: **Explain** Social, Political Ethical and Psychological Dimensions on Cybercrime

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	S	S	S	L	M	S	L	-
CO2	S	S	S	S	S	S	S	M	-	M	M	L
CO3	S	S	S	S	S	S	S	-	-	M	M	-
CO4	S	S	S	S	S	S	S	-	-	S	L	L
CO5	M	S	S	S	M	M	S	-	M	S	M	-
S-Strong; M-Medium; L-Low												

Course Code : P20MCAL27	Semester : II	L-T-P : 0 : 0 : 3
Course Title : Data structures with algorithms Lab		
Credits : 1.5	Contact Period : 32 Hrs, Exam : 3Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- **Demonstrate** the basic concepts of algorithms and data structures.
- **Apply** important algorithmic design paradigms and methods of analysis.
- **Implement** efficient algorithms in common engineering design situations.
- **Understand** specific algorithms for a number of important computational problems like sorting, searching, and graphs etc.
- **Illustrate** the concept of greedy techniques.

List of Programs

1. Write a C Program to construct a stack of integers and to perform the following operations on it:
   a. Push
   b. Pop
   c. Display
   The program should print appropriate messages for stack overflow, stack underflow, and stack empty.

2. Write a C Program to convert and print a given valid parenthesized infix arithmetic expression to postfix expression. The expression consists of single character operands and the binary operators + (plus), - (minus), * (multiply) and / (divide).

3. Write a C Program to evaluate a valid suffix/postfix expression using stack. Assume that the suffix/postfix expression is read as a single line consisting of non-negative single digit operands and binary arithmetic operators. The arithmetic operators are + (add), - (subtract), * (multiply) and / (divide).

4. Write C program using recursive function
   a. To find the nth factorial
   b. To print the nth Fibonacci number
   c. To solve Towers of Hanoi problem.

5. Write C Program to simulate the working of a queue of integers using arrays. Provide the following operations:
   a. Insert
   b. Delete
   c. Display

6. Implement a C Program to simulate the working of a circular queue of integers using an array. Provide the following operations:
   a. Insert
   b. Delete
   c. Display

7. Implement a menu driven program in c for the following operation on Singly Linked List (SLL) of student Data with the fields: USN, Name, Branch, Sem
   a. Create a SLL of N students Data.
   b. Display the status of SLL and count the number of nodes
   c. perform insertion at the beginning/end of SLL.
   d. perform Deletion at the beginning /end of SLL.
   e. Exit

8. Implement Recursive Binary search and Linear search and determine the time required to search an element. Repeat the experiment for different values of n, the number of elements in the list to be searched.

9. a. Sort a given set of elements using Selection sort method and determine the time required to sort the elements.
   b.Implement Pattern-Matching using Brute Force technique.

10. a. Print all the nodes reachable from a given starting node in a digraph using BFS method.
    b.Check whether a given graph is connected or not using DFS method.

11. a. Implement Horspool algorithm for String Matching.
    b. Compute the transitive closure of a given directed graph using Warshall's algorithm.

12. Implement Floyd's algorithm for the All-Pairs- Shortest-Paths Problem.

13. Find Minimum Cost Spanning Tree of a given undirected graph using Prim's algorithm.

14. Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm.

15. From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm.

Course outcomes

On completion of this course, the students should be able to:

CO1: Explain the characteristics of algorithms, time and space complexity.
CO2: Implement string matching and parallel algorithms.
CO3: Analyze and understand searching and sorting algorithms.
CO4: Design dynamic programming algorithms problems.
CO5: Analyze greedy problems to find shortest path in a given graph.

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M	M	M	-	L	M	-	-	M	-	L
CO2	S	M	M	M	-	-	M	-	-	M	-	L
CO3	S	M	M	M	-	L	L	-	-	M	-	L
CO4	S	M	M	M	-	L	-	-	-	M	-	L
CO5	S	M	M	M	-	L	-	-	-	M	-	L
S-Strong; M-Medium; L-Low												

Course Code : P20MHU28	Semester : II	L - T - P : 0 : 0 : 2
Course Title : Technical Skills		
Credits : 1	Contact Period : 26 Hrs, Exam: 3 Hrs	Weightage : CIE : 50% SEE : 50%

COURSE OUTCOME:

To enable students to:

- Strengthen their understanding of **how Computer works**, **C**, and **Data Structures**
- Write effective codes on **C** Programming and to debug.

OVERALL SYLLABUS BREAKUP:

Sl. No.	Module name	Classroom (Hours)	Lab (Hours)	Total duration (Hours)
1.	**Working of Computer**	05	0	5
2.	**C Programming**	0	16	16
3.	**Introduction to Data Structures**	02	03	05
Total Hours		**07**	**19**	**26**

COURSE PLAN:

C Programming

Sl. No.	Topics covered	Learning outcome	Type of learning	Duration
1.	**Working of Computer:** • Booting. Loading of O.S., Dual Booting • How a computer executes a Prg. • What happens inside the computer when programs run? • Difference between running and executing states of a process in the Operating System. • The Fetch and Execute Cycle: Machine Language. • Discussion of Basic Electronics, Logic design, Computer organization, Computer architecture, Compilers, System Programing, Linux Internals.	• Understand the basics of computer working and operation of peripherals. • The purpose of **Operating System,** Basic Electronics, Logic design, Computer organization, Computer architecture, Linux Internals.	Class - 5	5
2.	**C Programming Language:** • **Difficult level** of Snippets for o Understanding basic syntax o If - else statement o Switch case o Struct o For loop o While and do - while loop o Array o Strings o Pointers o Function o String o File handling o Preprocessing	• Understand the concepts of snippets in a programming term for a small region of re-usable source code, machinecode, or text. In C it could be part of the program - A Function, typedef or a part of the algorithm or code. • Understand the concepts of programs as sequences or machine instructions.	Lab - 16	16

3.	**Introduction to Data Structures:** Data Structures Basics: Structure and Problem Solving, Data structures, Data structure Operations, Algorithm: complexity, Time- space tradeoff. o Linked List o Stack and Queue o Searching and Sorting Techniques	• Understand common data structures and the algorithms that build and manipulate them including various sorting and searching algorithms. Data structures include arrays, linked lists, stacks, queues, Features, properties, applications, enumerators, and performance issues.	Class –2 Lab - 3	05

LEARNING OUTCOMES
• After undergoing training in this course, the students will be in a position to – • Deep understanding of Computer components and working of its components. • write complete program based on the requirements and to debug. • Frame effective programs using C programming and Data Structures.

ASSESSMENTS
•All of the modules will have two types of assessments - • Multiple-choice assessment for programming logic, concepts and debugging • Coding

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	L	M	L	L	L	L	-	L	L
CO2	S	S	S	S	M	L	L	L	L	M	M	L
CO3	S	S	S	M	M	L	L	L	-	L	L	-
CO4	S	S	S	M	M	L	L	L	-	-	L	L
CO5	S	S	S	M	M	L	L	L	-	-	L	-
S-Strong; M-Medium; L-Low												

Course Code:: P20MHU29	Semester : II	L – T – P : 0 : 2 : 0
Course Title: Professional Communication Development (PCD)		
Credit: NA	Contact Period : 32 Hrs, Exam: 3Hrs	Weightage :CIE:100% - [P/NP]

Course Learning Objectives (CLOs)
The objectives of this course are to:

- Recognize common mistakes done by an individual in the course of his/her communication
- Appraise knowledge level of English language and enhance better communication
- Recognize the fear of speaking English and to build the morale
- Identify common pronunciation error and rectify them
- Enable the individual to build his/her creative thinking (thinking in English)
- Understand the correct usage of Preposition and conjunctions
- Effective Email writing skill
- Enable the individual to write Blogs
- Introduce the most scientific ways of mastering vocabulary.
- Explain the concept of root words and the related words

UNIT–I

6 hours

Sentences: Introduction to simple and compound sentences, Techniques to build simple and compound sentences, Rules for constructing a complex sentence, Introduction to punctuation, Introduction to active and passive voice

UNIT–II

8 hours

Vocabulary builder - Gaining increased momentum How to talk about actions– Verbs that accurately describe human activities, excursions intoexpressive terms good and evil, doing saying, wishing and pleasing. how to talk about various speech habits– words that explore in depth all the degrees and kinds of talk and silence, **how toinsult your enemies–** terms for describing a disciplinarian, toady, dabbler, provocative woman,flag-waver, possessor of a one track mind, free thinker, sufferer from imaginary ailments, various manias and phobias, **how to flatter your friends**– terms for describing friendliness, energy, honesty, mental keenness, bravery, charm, sophistication ,etc.

Vocabulary builder - Finishing with a feeling of complete success.

How to talk about common phenomena and occurrences– Words for poverty and wealth, directand indirect emotions, not calling spade a spade, banter and other light talk, animal like contentment, homesickness and different kind of secrecy. Excursions into terms expressive of goodness, of hackneyed phraseology, of human similarity to various animals, of kinds of sound, etc. How to react to the new words you meet in your reading.

How to talk about what goes on - Verbs that show exhaustion, criticism, self-sacrifice,repetition, mental stagnation, hinting, soothing, sympathizing, indecision, etc. How you can increase your vocabulary by picking your friends brains.

How to talk about a variety of personal characteristics: Adjectves that describe insincerehumility, dissatisfaction, snobbery, courtesy to women, financialembarrassment, sadness, etc. How increasing your vocabulary has begun to change the intellectual climate of life.

UNIT–III

8 hours

Sharpen your axe!!

Vedic mathematics:

Viniculum and de- viniculum, subtractions using viniculum .Nikhilum multiplication: For numbers close to base values, multiplication of any two digit numbers or three digits number usingcriss cross method. Finding the square, square root, cubes , cube root of two digit and three digit numbers quickly. Approximation in multiplication and division. Checking the answer using digital sum method.

SSC- Get hands on multiplication tables, increasing the speed in basic arithmetic operations. Classification of numbers.

Percentage calculations and ratio comparison:

Percentage calculations: Percentage rule for calculating, percentage values through additions, percentage – fraction table, approximation in calculating percentages. Application based problems

Ratio comparison: calculations method for ratio compressions: 1. the cross multiplication method, 2. percentage value compression method 3. numerator and denominator percentage change method. Method for calculating the value of percentage change in the ratio. Application based problems.

SSC- Thorough with fractions and decimal values. Applications of tabulated fractions. Product of means and extremes.

UNIT–IV

4 hours

Analytical Reasoning 1: series

Number series: Standard patterns of number series, pure series: perfect square, square cube,prime, combination of this series. Difference series, ratio series, mixed series, geometric series, two-tier arithmetic series, three-tier arithmetic series, change in the order for difference series, change in the order for ratio series, sample company questions.

Letter series: Alphabet and Alphanumeric series, finding the missing term based on logiclearnt in number series module, continuous pattern series, correspondence series. sample company questions.

Picture series: image analysis, addition deletion rotation or modification of lines or shapes. Understanding the symmetry of the image. Mirror image analysis. Sample company questions.

SSC- Basic knowledge of letter positions, Different number series for example–even, odd, prime, omposite etc.

UNIT–V

6 hours

Number system:

Introduction, **Integers:** Remainder zero concept, Odd and Even Integers, Negative and positive integers, power number a^x, properties of a perfect square number. **Prime number:** General method to identify the prime number, properties of prime numbers. Euler's number. **Factorial number:** Wilson'stheorem, important results on factorial. **Divisor:** number ofdivisors, sum of divisors, number expressed as the product of two factors.

Divisibility rules: divisibility of a whole number by a whole number, divisibility of an expression by an expression. **Modulus concept:** divisibility rules in modulus, rules of operations in modulus. **Finding one remainder:** One divisor, remainder of (a^n–b^n), remainder for more than one divisor.

UNIT digit: Concept of power cycle, finding last two digits**.** Number of trailing zeroes.

SSC-Basic arithmetic operations, knowledge about quotient and remainders, multiples and factors.

Reference Books:

1. "Word Power Made Easy New Revised and Expanded Edition", First Edition, Norman Lewis, Goyal Publisher.

2. "Essential English Grammar" by Raymond Murphy, p ublished by Cambridge University Press.

Course outcomes
On completion of this course, the students should be able to

- Amplified level of confidence to express themselves in English. L2
- Elevated standard of learning through the implementation of creative cognitive techniques. L2
- Understand the correct usage of Prepositions and Conjunctions. L4
- Write Emails, Letters and Creative passages. L4
- Apply the knowledge of vocabulary in his speaking and writing. L2

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	S	S	S	-	S	M	-	S	L	L	-
CO2	M	S	S	S	-	S	M	-	S	L	L	-
CO3	M	S	S	S	-	S	M	-	S	L	L	-
CO4	M	S	S	S	-	S	M	-	S	L	L	-
CO5	M	S	S	S	-	S	M	-	S	L	L	-
S-Strong; M-Medium; L-Low												

SEMESTER-III

Course Code : P20MCA31	Semester : III	L-T-P : 3 : 2 : 0
Course Title : Machine Learning using Python		
Credits : 4	Contact Period : 52 Hrs, Exam : 3Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- **Discuss** the basic concepts of python programming language
- **Demonstrate** the use of dataframes in python
- **Analyse** the process of model building and evaluation
- **Comprehend** various classification problems
- **Discuss** the libraries required to implement the techniques of Machine Learning.

UNIT – I

11 Hours

Introduction To Machine Learning
Introduction to Analytics and Machine Learning, Why Machine Learning?, Framework for Developing Machine Learning Models, Why Python?, Python Stack for Data Science, Getting Started with Anaconda Platform, Introduction to Python

UNIT – II

10 Hours

Descriptive Analytics
Working with DataFrames in Python, Handling Missing Values, Exploration of Data using Visualization

UNIT – III

10 Hours

Linear Regression
Simple Linear Regression, Steps in Building a Regression Model, Building Simple Linear, Regression Model, Model Diagnostics, Multiple Linear Regression.

UNIT – IV

11 Hours

Classification Problems
Classification Overview, Binary Logistic Regression, Credit Classification, Gain Chart and Lift Chart, Classification Tree (Decision Tree Learning).

UNIT – V

10 Hours

Advanced Machine Learning
Scikit-Learn Library for Machine Learning, Advanced Machine Learning Algorithms.
Clustering
Overview, How Does Clustering Work?, K-Means Clustering, Creating Product Segments Using Clustering, Hierarchical Clustering.

Text Book:
1. Machine Learning using Python, Manaranjan Pradhan, U Dinesh Kumar, Wiley India Pvt. Ltd., 2019 (Chapters: 1, 2, 4, 5, 6.3, 6.5, 7)

Reference Books:

1. Practical Programming: An introduction to Computer Science Using Python, second edition, Paul Gries, Jennifer Campbell, Jason Montojo, The Pragmatic Bookshelf, 2013.
2. Learning with Python: How to Think Like a Computer Scientist Paperback – Allen Downey , Jeffrey Elkner, 2015.
3. Jake Vander plas, "Python Data Science Handbook: Essential tools for working with data", O'Reilly Publishers, I Edition.
4. Hands-On Machine Learning with Scikit-Learn and TensorFlow Concepts, Tools, and Techniques to Build Intelligent Systems, Aurelien Geron, O'Reilly Publisher , I edition, 2017

Course Outcomes

After completion of this course the student will be able to

CO1: Understand the basic concepts of the python programming

CO2: Identify the appropriate dataframes, panads and its operations

CO3: Apply knowledge on building, diagnose and validate the linear regression models

CO4: Distinguish between different classification techniques

CO5: Analyse how dataset divided in unsupervised learning techniques

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	-	-	-	M	-	M	-	-	-	-	-
CO2	S	S	S	M	M	-	S	-	-	-	M	-
CO3	M	-	-	-	-	-	-	-	-	-	S	-
CO4	M	S	M	-	S	-	M	-	-	-	M	-
CO5	S	M	M	M	M	-	-	M	-	-	M	-
S-Strong; M-Medium; L-Low												

Course Code : P20MCA32	Semester : III	L-T-P : 4 : 0 : 0
Course Title : Internet of Things (IoT)		
Credits : 4	Contact Period : 52 Hrs, Exam : 3Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- **Familiarize** IOT concepts and its domain
- **Analyze** the concepts M2M and IOT system management
- **Understand** the concepts IOT platforms and design methodology
- **Outline** Raspberry Pi Interfaces
- **Understand** various applications of IOT

UNIT-I

Introduction & Concepts **10 Hours**

Introduction of IoT; Physical Design of IoT; Logical Designof IoT; IoT Enabling Technologies; IoT Levels & Deployment Templates.

Domain Specific IoTs- Introduction, Home Automation; Cities; Environment; Energy; Retail; Logistics; Agriculture; Industry; Health & Lifestyle

UNIT-II

IoT and M2M **11 Hours**

Introduction; M2M; Difference between IoT and M2M; SDN and NFV for IoT; IoT System management with NETCONF-YANG- Need for IoT Systems management; SNMP; Network Operator Requirements; NETCONF; YANG; IoT Systems management with NETCONFYANF; NETOPEER

UNIT-III

IoT Platforms Design Methodology **11 Hours**

Introduction; IoT Design Methodology; Case Study on IoT System for Weather Monitoring; Motivating for using Python.

IoT Systems- Logical Design using Python- Introduction; Installing Python; Python Data Types & Data structures; Control Flow; Functions; Modules; Packages; File Handling; Date/Time Operations; Classes.

UNIT-IV

10 Hours

What is an IoT Device; Exemplary Device: Raspberry Pi; About the Board; Linux on Raspberry Pi;Raspberry Pi Interfaces ; Programming Raspberry Pi with Python;

UNIT-V

10 Hours

Case Studies Illustrating IoT: Introduction ;Home Automation; Cities; Environment Case Studies Illustrating IoT(Continued..): Environment; Agriculture; Productivity Applications

Text Book

1. Internet of Things - A Hands on Approach**,** Arshdeep Bahga and Vijay Madisetti Universities Press, 2015.

Reference Books

1. Olivier Hersent, David Boswarthick, Omar Elloumi, The Internet of Things: Key Applications and Protocols, 2nd Edition, Wiley ISBN: 978-1-119-99435-0, 370 pages, January 2012.

2. Vijay Madisetti, Arshdeep Bahga,Internet of Things: A Hands-On Approach Vijay Madisetti, 1st Edition ISBN-10: 0996025529, 2014

Note: At the end of the course students should come out with various Case study Report which covers the concept of IOT that is discussed in Tutorial class. It carries a weightage of 15 marks of CIE.

Course outcomes
On completion of this course, the students should be able to:

CO1: Recognize the basic concepts of IoT and the vision of IoT from a global context.
CO2: Explain the application areas of IOT.
CO3: Acquire knowledge on M2M Technology and IoT system management.
CO4: Develop design methodologies and develop IoT system using python.
CO5: Use Raspberry Pi interface to develop IoT physical devices. Implement and deploy IoT application.

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	-	-	L	-	S	-	-	-	-	-
CO2	S	S	-	M	-	-	-	-	-	-	L	-
CO3	M	S	M	-	-	M	-	M	-	S	-	M
CO4	S	S	M	-	S	-	-	S	-	S	-	-
CO5	-	S	M	M	-	-	-	-	M	-	-	M
S-Strong; M-Medium; L-Low												

Course Code : P20MCA33	Semester : III	L - T - P : 4 : 0 : 0
Course Title : Programming using C# and .NET		
Credits : 4	Contact Period : 52 Hrs, Exam: 3 Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to

- **Familiarize** .NET Framework components and OOPs concepts in c#
- **Analyze** the concepts of Delegates, Events
- **Understand** the concepts of ADO.NET
- **Outline** Windows applications using C# .NET
- **Understand** web applications using ASP.NET

UNIT-I

Getting started with .NET Framework 4.5 **04 Hours**

Benefits of .NET Framework, Architecture of .NET Framework 4.5, Components of .NET Framework 4.5: CLR, CTS, Metadata and Assemblies, .NET Framework Class Library, BCL, Windows Forms, ASP .NET and AJAX, ADO .NET, Windows workflow Foundation, Windows Presentation Foundation, Windows Communication Foundation, Widows Card Space and LINQ.

Introducing C# **06 Hours**

Need of C#, C# Pre-processor Directives, Creating a Simple C# Console Application, Identifiers and Keywords. Data Types, Variables and Constants: Value Types, Reference Types, Type Conversions, Boxing and unboxing, Variables and Constants. Expression and Operators: Operator Precedence, Using the ?? (Null Coalescing) Operator, Using the :: (Scope Resolution) Operator and Using the is and as Operators. Control Flow statements: Selection Statements, Iteration Statements and Jump Statements.

UNIT-II

Namespaces, Classes, Objects and Structures **09 Hours**

Namespaces, The System namespace, Classes and Objects: Creating a Class, Creating an Object, Using this Keyword, Creating an Array of Objects, Using the Nested Classes, Defining Partial Classes and Method, Using methods as class members, Passing an object as an argument to a method, Returning a Value from a Method and Describing Access Modifiers. Constructors and destructors: using parameterized constructor in a class, calling a destructor of a class. Static Classes and Static Class Members. Properties: Read-only Property, Static Property, Accessibility of accessors and Anonymous types. Indexers, Structs: Syntax of a struct and Access Modifiers for structs.

UNIT-III

Object- Oriented Programming **05 Hours**

Encapsulation: Encapsulation using accessors and mutators, Encapsulation using Properties. Inheritance: Inheritance and Const ructors , Sealed Classes and Sealed Methods , Extension methods. Polymorphism: Compile time Polymorphism/ Overloading, Runtime Polymorphism/ Overriding. Abstraction: Abstract classes, Abstract methods. Interfaces: Syntax of Interfaces, Implementation of Interfaces and Inheritance.

Delegates and Events and Exception Handling **05 Hours**

Delegates: Creating and using Delegates, Muticasting with Delegates. Events: Event Sources, Event Handlers, Events and Delegates, Multiple Event Handlers. Exception Handling: The try/catch/finally statement, throw statement, Checked and Unchecked Statements.

UNIT-IV

Graphical User Interface with Windows Forms **10 Hours**

Introduction, Windows Forms, Event Handling: A Simple Event- Driven GUI, Visual Studio Generated GUI Code, Delegates and Event- Handling Mechanism, Another Way to Create Event Handlers, Locating Event Information. Control Properties and Layout, Labels, TextBoxes and Buttons, GroupBoxes and Panels, CheckBoxes and RadioButtons, ToolTips, Mouse-Event Handling, Keyboard-Event Handling. Menus, MonthhCalendar Control, Date TimePicker Control, LinkLabel Control, ListBox Control, CheckedListBox Control, ComboBox Control, TreeView Control, ListView Control, TabControl Control and Multiple Document Interface (MDI) Windows.

UNIT-V

Data Access with ADO.NET **07 Hours**

Understanding ADO.NET: Architecture of ADO.NET, typed Vs. Untyped dataset, Data reader: ADO.NET Entity Framework. Creating Connection Strings: Syntax for Connection Strings. Creating a Connection to a Database: SQL Server Database, OLEDB Database, ODBC Data Source. Creating a Command Object. Working with DataAdapters: Creating DataSet from DataAdapter, Paging with DataAdapters, Updating with DataAdapters, Adding Multiple Tables to a DataSet, Creating Data View. Using DataReader to Work with Databases.

Web App Development with ASP.NET **06 Hours**

Introduction, Web Basics, Multitier Application Architecture, Your First Web Application: Building WebTime Application, Examining WebTime.aspx's Code-Behind File, Standard Web Controls: Designing a Form, Validation Controls, Session Tracking: Cookies, Session Tracking with http Session State, optaions.aspx Selecting a Programming Language & Recommenations.aspx: Displaying Recommendations based on Session Values.

Case study: Database-Driven ASP.NET Guestbook, Building a Web Form that Displays
Data from a Database, Modifying the Code-Behind File for the Guestbook Application

Text Books:

1. .NET 4.5 Programming (6-in-1), Black Book, Kogent Learning Solutions Inc., Dreamtech Press. (Chapters: 1,3, 4, 5, 6, 7, 12)
2. Paul Deitel and Harvey Deitel: C# 2010 for Programmers, 4th Edition, Pearson Education. (Chapters: 14,15,19)

References Books:

1. Andrew Trolsen: Pro C# 5.0 and the .NET 4.5 Framework, 6th Edition, Wiely-Appress.
2. Bart De Smet: C# 4.0 Unleashed, Pearson Education- SAMS Series.
3. Hebert Shildt: Programming in C# 4.0, Tata McGraw Hill.

Course outcomes
On completion of this course, the students should be able to:

CO1: Describe the components of .NET technologies
CO2: Apply the object-oriented concepts of C# for applications development
CO3: Select relevant exception handling types to handle errors in applications
CO4: Implement windows forms and process events in response to user interaction with GUI controls
CO5: Create database driven ASP.NET web application and web services
Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	-	-	L	-	S	-	-	-	-	-
CO2	S	S	-	M	-	-	-	-	-	-	L	-
CO3	M	S	M	-	-	M	-	M	-	S	-	M
CO4	S	S	M	-	S	-	-	S	-	S	-	-
CO5	-	S	M	M	-	-	-	-	M	-	-	M
S-Strong; M-Medium; L-Low												

ELECTIVE GROUP - III

Course Code : P20MCA341	Semester : III	L-T-P : 4 : 0 : 0
Course Title : Big Data and Analytics		
Credits : 4	Contact Period : 52 Hrs, Exam : 3Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)

The objectives of this course are to:

- **Explore** the significance of Big Data analytics and Analyze Technologies for Handling Big Data and Hadoop Ecosystem.
- **Understand** the applications using Map Reduce Concepts.
- **Outline** the management of NoSQL data.
- **Summarise** different types of analytics.
- **Understand** the various data visualization techniques.

UNIT-I

Getting an Overview of Big Data and Hadoop Ecosystem **11 Hours**

Big Data, History of Data Management – Evolution of Big Data, Structuring Big Data, Types of Data, Elements of Big Data, Volume, Velocity, Variety ,Veracity ,Big Data Analytics ,Advantages of Big Data Analytics ,Careers in Big Data ,Skills Required, Future of Big Data. Business Intelligence, Preventing Fraud Using Big Data Analytics.

Hadoop Ecosystem, Hadoop Distributed File System, HDFS Architecture, Features of HDFS, MapReduce, Features of MapReduce, Hadoop YARN.

UNIT-II

Understanding MapReduce Fundamentals and HBase **11Hour**

The MapReduce Framework, Exploring the Features of MapReduce, Working of MapReduce, Exploring Map and Reduce Functions, Techniques to Optimize MapReduce Jobs, Hardware/Network Topology, Synchronization, File System, Uses of MapReduce, Role of HBase in Big Data Processing, Characteristics of HBase, Installation of HBase.

UNIT-III

NoSQL Data Management **10 Hours**

Introduction to NoSQL, Characteristics of NoSQL, Evolution of Databases, Aggregate Data Models, Key Value Data Model, Document Databases, Relationships, Graph Databases, SchemaLess Databases, Materialized Views, Distribution Models, Sharding, MapReduce Partitioning and Combining, Composing MapReduce Calculations,CAP Theorem

UNIT-IV

Understanding Analytics and Big Data **10 Hours**

Comparing Reporting and Analysis, Reporting, Analysis, The Analytic Process, Types of Analytics, Basic Analytics, Advanced Analytics, Operationalized Analytics, Monetized Analytics, Characteristics of Big Data Analysis, Points to Consider during Analysis, Frame

the Problem Correctly, Statistical Significance or Business Importance? , Making Inferences versus Computing Statistics, Developing an Analytic Team, Convergence of IT and Analytics, Understanding Text Analytics, Skills required for an Analyst.

UNIT-V

Data Visualization **10 Hours**

Introducing Data Visualization, Techniques Used for Visual Data Representation, Types of Data Visualization, Applications of Data Visualization, Visualizing Big Data, Deriving Business Solutions, Turning Data into Information, Tools Used in Data Visualization, Proprietary Data Visualization Tools, Open-Source Data Visualization Tools, Analytical Techniques Used in Big Data Visualization, Tableau Products. Relevant Case Studies related to Automation and other Industries : Product Design and Development, Use of Big Data in Preventing Fraudulent Activities, Preventing Fraud Using Big Data Analytics, Use of Big Data in Detecting Fraudulent Activities in Insurance Sector, Fraud Detection Methods, Use of Big Data in Retail Industry, Use of RFID Data in Retail.

Text book:

1. Big Data: Black Book, DT Editorial Services, Wiley India Pvt Ltd, 2015 Edition.

Reference Books:

1. Big Data and Analytics – Seema Acharya and Subhashini C – Wiley India.
2. Arvind Sathi, ―Big Data Analytics: Disruptive Technologies for Changing the Game, 1st Edition, BM Corporation, 2012
3. Big Data Analytics with R and Hadoop, Vignesh Prajapati, Packt Publishing 2013.
4. Michael Minelli, Michehe Chambers, ―Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today‘s Business, 1st Edition, AmbigaDhiraj, Wiely CIO Series, 2013.

Course outcomes

On completion of this course, the students should be able to:

CO1: Describe the significance and importance of Big Data and Analytics
CO2: Analyze the HADOOP and Map Reduce technologies associated with Big Data analytics
CO3: Understand the impact of big data for business decisions and strategy.
CO4: Formulate and use appropriate models of data analysis to solve hidden solutions to business-Related challenges.
CO5: Interpret data findings effectively to any audience visually and in written formats.

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	-	-	L	-	S	-	-	-	-	-
CO2	S	S	-	M	-	-	-	-	-	-	L	-
CO3	M	S	M	-	-	M	-	M	-	S	-	M
CO4	S	S	M	-	S	-	-	S	-	S	-	-
CO5	-	S	M	M	-	-	-	-	M	-	-	M
S-Strong; M-Medium; L-Low												

Course Code : P20MCA342	Semester : III	L - T - P : 4 : 0 : 0
Course Title : Block Chain Technology		
Credits : 4	Contact Period : 52 Hrs, Exam: 3 Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- To understand the basic concepts of distributed computing on which Blockchain technology
- To Illustrate concept of Decentralization and its relationship with blockchain technology.
- To understand that how various security services in Cryptography
- Outline the technical concepts related to Bitcoin cryptocurrency
- Explain the underlying principles, features, and components of Ethereum blockchain

UNIT-I

Blockchain **10 Hours**

Distributed systems, CAP theorem, Byzantine Generals problems, Consensus. The history of blockchain, Introduction to blockchain, various technical definitions of blockchains, Generic elements of a blockchain, Features of a blockchain, Applications of blockchain technology, Tiers of blockchain technology, Consensus in blockchain, CAP theorem and blockchain,

UNIT-II

Decentralization **10 Hours**

Decentralization using blockchain, Methods of decentralization, Blockchain and full ecosystem decentralization, Smart contract, Decentralized organizations, Decentralized autonomous organizations, Decentralized autonomous corporations, Decentralized autonomous societies, Platforms for decentralization

UNIT-III

Cryptographic primitives **10 Hours**

Symmetric cryptography, Asymmetric cryptography, Public and private keys, Hash functions: Compression of arbitrary messages into fixed length digest. Easy to compute, Pre-image resistance, Second pre-image resistance, Collision resistance, Message Digest(MD), Secure Hash Algoriths (SHAs),Merkle trees, Patricia trees, Distributed hash tables(DHTs), Digital signatures, Elliptic Curve Digital signature algorithm(ECDSA)

UNIT-IV

Bitcoin **10 Hours**

Bitcoin definition, Transactions, The transaction life cycle, The transaction structure Types of transaction, The structure of a block, The structure of a block header, The genesis block, The bitcoin network, Wallets, Smart Contacts-History, Definition, Ricardian contracts, Smart contract templates, Oracles, Smart Oracles, Deploying smart contracts on a blockchain, The DAO.

UNIT-V

Ethereum **12 Hours**

Introduction, Ethereum clients and releases, The Ethereum stack, Ethereum blockchain, Currency(ETH and ETC), Forks, Gas, The consensus mechanism, The world state, Transactions, Contract creation transaction, Message call transaction, Elements of the Ethereum blockchain, Ethereum virtual machine(EVM), Accounts, Block, Ether, Messages, Mining

Text Book:

1. Imran Bashir "Mastering BlockChain", Packt.

Reference Books:

1. Mastering Bitcoin: Programming the Open Blockchain Paperback-2017 by Andreas M O'rielly Bitcoin Press, 2016.
2. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. and cryptocurrency technologies: a comprehensive introduction. Princeton

Course outcomes

On completion of this course, the students should be able to:

CO1: Summarize the blockchain terminologies with its applications.
CO2: Explain the process of Decentralize in various methods.
CO3: Illustrate the Public and private keys, Digital signature that are provided in Cryptography.
CO4: Describe the methodologies used in Bitcoin.
CO5: Describe the Ethereum Virtual machine, wallets, Nodes, Smart contract.

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M	M	L	L	M	M	L	M	M	M	L
CO2	M	M	S	M	L	M	M	L	M	M	M	L
CO3	S	M	S	M	L	M	M	M	M	M	M	L
CO4	S	M	M	L	L	M	M	L	M	M	M	L
CO5	M	M	S	M	L	M	M	S	M	M	M	L
S-Strong; M-Medium; L-Low												

Course Code : P20MCA343	Semester : III	L-T-P : 4 : 0 : 0
Course Title : Management Information System		
Credits : 4	Contact Period : 52 Hrs, Exam : 3Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- **Demonstrate** the Role of information system in the Today's Global Business
- **Discuss** business intelligence of software industry & IT infrastructure
- **Illustrate the** digital marketing and managing knowledge in Industry
- **Analyse** the decision making concepts for building and managing information systems in an organization
- **Outline** the project management principles for managing the system

UNIT-I

Information Systems in Global Business Today **10 Hours**

The Role of Information Systems in Global Business Today, Perspective on Information Systems, Contemporary Approaches to Information Systems Global E-Business and collaboration: Business Process and Information Systems, Types of Business Information Systems, The Information Systems Function in Business. Information Systems. What is an Organization? How Information Systems Impact Organizations and Business Firms.

UNIT-II

Information Technology Infrastructure **10 Hours**

IT Infrastructure, Infrastructure Components, Contemporary Hardware Platform Trends, Contemporary Software Platform Trends.

Foundation of Business Intelligence: Databases and Information Management

Organizing Data in a Traditional File Environment, the Database Approach to Data Management, Using Database to Improve Business Performance and Decision Making.

UNIT-III

Key system Applications for the Digital Age **11 Hours**

Enterprise Systems, Supply Chain Management Systems, Customer Relationship Management Systems, Enterprise Applications: New Opportunities and Challenges

E-Commerce: Digital Markets, Digital Goods

Electronic Commerce and the Internet, M-Commerce, Electronic Commerce, Electronic Commerce payment systems.

UNIT-IV

Managing Knowledge **11 Hours**

The Knowledge Management Landscape, Enterprises-Wide Knowledge Management Systems, Knowledge Work Systems **Enhancing Decision Making** Decision Making and Information Systems, Systems for Decision support, Executive support systems (ESS) and the Balanced Scorecard.

UNIT-V

Building and Managing Systems **10 Hours**

Systems as Planned Organizational Change, Overview of Systems Development, Alternative Systems-Building Approaches, Application Development for the digital firm. **Managing Projects** The Importance of Project Management, Selecting Projects, Establishing the Business Value of Information Systems, Managing Project Risk.

Text Book:

1. Kenneth C.Laudon, Jane P.Laudon: Management Information Systems Managing the Digital Firm, 12thEdition, Pearson Education, 2015.

Reference Books:

1. Kenneth C.Laudon, Jane P.Laudon: Management Information Systems Managing the Digital Firm, 1st Edition, Pearson Education, 2010.
2. Laudon & Laudon: Essentials of Management Information Systems, 8thEdition, Pearson Education, 2009.
3. McLeod & Schell: Management Information Systems, 10th Edition, Pearson Education, 2007.

Course outcomes
On completion of this course, the students should be able to:

CO1: **Explain** the importance and role of information in present global business
CO2: **Outlines** the information in business intelligence and IT infrastructure
CO3: **Understands** digital marketing and how to manage knowledge
CO4: **Analyses** the role of information in decision support systems in an organization
CO5: **Understands** the principles for project management and system management

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	L	S	S	S	S	S	S	M	S	M	M	-
CO2	M	S	S	S	S	S	S	L	S	M	M	L
CO3	M	S	S	S	S	S	S	L	S	M	M	-
CO4	M	S	S	S	S	S	S	L	S	S	L	-
CO5	M	S	S	S	S	S	S	L	S	S	L	-
S-Strong; M-Medium; L-Low												

Course Code : P20MCA344	Semester : III	L-T-P : 4 : 0 : 0
Course Title : Cryptography and Network Security		
Credits : 4	Contact Period : 52 Hrs, Exam : 3Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to

- **Understand** various security attacks and security services
- **Analyze** data encryption standard and its policies
- **Identify** various authentication functions and its applications
- **Determine** security architecture and management of Internet Protocol
- **Comprehend** relevant protocol like SSL, TLS etc.,

UNIT-I

Introduction **10 Hours**

OSI Security Architecture, Security Attacks, Security Services, Security Mechanism, Model for Network Security.

Classical Encryption Technique

Symmetric Cipher Model, Substitution Techniques, Transposition Techniques.

UNIT-II

Block Ciphers, Data Encryption Standard and Advanced Encryption Standard **12 Hours**

Block Cipher Principles, The Data Encryption Standard, Block Cipher Design Principles and Modes of operation, Evaluation Criteria for AES, AES Cipher-Encryption and Decryption, Data Structure, Encryption Round.

Public Key Cryptography and Key Management

Principles of Public Key Cryptosystem, RSA algorithm, Key management, Diffie Hellman Key exchange

UNIT-III

Message Authentication and Hash Function **10 Hours**

Authentication Requirement, Authentication Functions, Message Authentication Code, Hash Functions, Digital Signatures, Digital Signature Standard

Authentication Applications

Kerberos, X.509 Authentication Service.

UNIT-IV

Electronic Mail Security **10 Hours**

Pretty Good Privacy (PGP), S/MIME.

IP Security

IP Security Overview; IP Security Architecture; Authentication Header; Encapsulating Security Payload; Combining Security Associations; Key Management.

UNIT-V

Web Security **10 Hours**

Web security Considerations; Secure Socket layer (SSL) and Transport layer Security (TLS); Secure Electronic Transaction (SET).

System Security

Intruders, Intrusion Detection, Firewall Design Principles- Characteristics, Types of Firewall and Firewall Configuration.

Text Book:

1. William Stallings, "Cryptography and Network Security – Principles and Practices", 4th Edition, Pearson Education, 2009.
   (Chapters: 1, 2.1-2.3, 3.1, 3.2, 3.5, 5.1,5.2, 6.2, 9.1,9.2, 10.1,10.2, 11.1- 11.4, 13.1, 13.3, 14.1, 4.2, 15.1, 15.2, 16.1-16.6, 17.1-17.3, 18.1, 18.2, 20.1; Exclude the topic not mentioned in the syllabus)

Reference Books:

1. Behrouz A. Forouzan and Debdeep Mukhopadhyay: "Cryptography and Network Security", 2nd Edition, Tata McGraw-Hill, 2010.
2. Atul Kahate, "Cryptography and Network Security" 2nd Edition TMH.

Course outcomes

On completion of this course, the students should be able to:

CO1: Define security services for a given network model
CO2: Describe various data encryption schemes and apply on a network model
CO3: Discuss various authentication functions and its applications
CO4: Describe a security management of a given IP network model
CO5: Identify characteristics of firewall, and configure a firewall

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	-	-	-	M	-	M	-	-	-	-	-
CO2	S	S	S	M	M	-	S	-	-	-	M	-
CO3	M	-	-	-	-	-	-	-	-	-	S	-
CO4	M	S	M	-	S	-	M	-	-	-	M	-
CO5	S	M	M	M	M	-	-	M	-	-	M	-
S-Strong; M-Medium; L-Low												

Course Code : P20MCA345	Semester : III	L-T-P : 4 : 0 : 0
Course Title : Business Intelligence - Data Warehousing and Analytics		
Credits : 4	Contact Period : 52 Hrs, Exam : 3Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- **Discuss** the definition of BI, BI terminologies and framework
- **Understand** basics of data integration [ETL] in context of data warehousing and multidimensional data modelling
- **Analyze** the multidimensional data modelling
- **Identify** the metrics, KPIs and make recommendation to achieve the business goal in a given business scenario
- **Generate** enterprise reports and design enterprise dashboard

UNIT-I

Introduction to Business Intelligence **10 Hours**

Introduction to digital data and its types – structured, semi-structured and unstructured, Introduction to OLTP and OLAP (MOLAP, ROLAP, HOLAP), BI Definitions & Concepts, BI Framework, Data Warehousing concepts and its role in BI, BI Infrastructure Components – BI Process, BI Technology, BI Roles & Responsibilities, Business Applications of BI, BI best practices.

UNIT-II

Basics of Data Integration (Extraction Transformation Loading) **10 Hours**

Concepts of data integration, needs and advantages of using data integration, introduction to common data integration approaches, Meta data - types and sources, Introduction to data quality, data profiling concepts and applications, introduction to ETL using Pentaho data Integration (formerly Kettle)

UNIT-III

Introduction to Multi-Dimensional Data Modeling **12 Hours**

Introduction to data and dimension modeling, multidimensional data model, ER Modeling vs. multi dimensional modeling, concepts of dimensions, facts, cubes, attribute, hierarchies, star and snowflake schema, Step-by-step lab guide to analyze data using MS Excel

UNIT-IV

Measures, metrics, KPIs, and Performance management **10 Hours**

Understanding measures and performance, Measurement system terminology, Navigating a business enterprise, role of metrics, and metrics supply chain, ―Fact-Based Decision Making‖ and KPIs, KPI Usage in companies, business metrics and KPIs, Connecting the dots: Measures to business decisions and beyond.

UNIT-V

Basics of enterprise reporting **10 Hours**

A typical enterprise, Reporting perspectives common to all levels enterprise, Report standardization and presentation practices, Enterprise reporting characteristics in OLAP world, Malcolm Baldrige - quality performance framework, balanced scorecard, enterprise dashboard, balanced scorecard vs. enterprise

dashboard, enterprise reporting using MS Access / MS Excel, best practices in the design of enterprise dashboards.

Text Book:

1. R N Prasad and Seema Acharya, "Fundamentals of Business Analytics", 2nd edition, Publisher: WileyIndia, 2016.

Reference Books:

1. David Loshin - Business Intelligence: The Savvy Manager's Guide, Publisher: Morgan Kaufmann
2. Larissa T Moss and Shaku Atre – Business Intelligence Roadmap : The Complete Project Lifecycle for Decision Support Applications, Addison Wesley Information Technology Series
3. Brian Larson - Delivering Business Intelligence with Microsoft SQL Server 2005, Mc Graw Hill.

Course outcomes (CO's)

On completion of this course, the students should be able to:

CO1: Demonstrate process associated with BI framework and apply best practices in BI/Data warehousing

CO2: Demonstrate technology and processes associated with Business Intelligence framework for data integration.

CO3: Construct data models and prototypes needed to achieve business objectives.

CO4: Demonstrates how effectively a company is achieving key business objectives using KPIs at multiple levels

CO5: Design an enterprise dashboard that depicts the key performance indicators which helps in decision making.

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	S	L	L	-	-	M	M	-	-	L	L
CO2	M	-	S	L	-	S	-	-	-	-	-	-
CO3	M	M	M	S	-	-	S	-	-	-	-	M
CO4	S	S	S	S	M	-	-	M	-	M	-	M
CO5	S	S	S	S	M	-	-	M	-	-	-	M
S-Strong; M-Medium; L-Low												

ELECTIVE GROUP-IV

Course Code : P20MCA351	Semester : III	L-T-P : 3 : 2 : 0
Course Title : Mobile Application Development		
Credits : 4	Contact Period : 52 Hrs, Exam : 3Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- **Understand** mobile architecture and OS.
- **Illustrate** effective user interfaces that leverage evolving mobile device capabilities
- **Design** mobile apps for Android devices.
- **Learn** about Android Databases such as SQLite
- **Explain** the sensors, maps and location based services

UNIT-I

Hello, Android **10 Hours**

A Little Background, What Android Isn't, Android: An Open Platform for Mobile Development, Native Android Applications, Android SDK Features, Access to hardware, including camera, GPS and Sensors, Introducing the Open Handset Alliance, What Does Android Run On?, Why Develop for Mobile?, Why Develop for Android?, Introducing the Development Framework

UNIT-II

Getting Started **10 Hours**

Developing for Android, Android Development Tools, Understanding Hello World.

Creating Applications and Activities

What Makes an Android Application?, Introducing the Application Manifest File, Externalizing Resources, Using Resources, The Android Application Lifecycle, Understanding an Application's Priority and Its Process' States, Introducing the Android Application Class, A Closer Look at Android Activities.

UNIT-III

Building User Interfaces **10 Hours**

Fundamental Android UI Design, Android User Interface Fundamentals, Introducing Layouts, Introducing Fragments: The Fragment lifecycle The Android Widget Toolbox.

Intents And Broadcast Receivers: Introducing Intents, Using Intents to Launch Activities, using Intents to Broadcast Events, Broadcasting Events with Intents.

UNIT-IV

Databases Content Providers **10 Hours**

Introducing Android Databases, Introducing SQLite, Content Values and Cursors, Working with SQLite Databases, Creating Content Providers: registering content providers, storing Files in a content Provider. **Hardware Sensors:** Using Sensors and the Sensor Manager, Monitoring a Device's Movement and Orientation, Introducing the Environmental Sensors.

UNIT-V

Maps, Geocoding, And Location-Based Services **12 Hours**

Using Location-Based Services, Using the Emulator with Location-Based Services, Selecting a Location Provider, Finding Your Current Location, Best Practice for Location Updates, Using Proximity Alerts, Using the Geocoder, Creating Map-Based Activities.

Audio, Video, And Using The Camera: Playing Audio and Video, Manipulating Raw Audio, Creating a Sound Pool, Using Audio Effects, Using the Camera for Taking Pictures, Recording Video, Using Media Effects.

Note: In tutorial, some of the Programs based on the above concepts are developed and executed, to get practical knowledge on Mobile Application development.

Text Book:

1. Reto Meier: Professional Android 4 Application Development. Wiley India Edition, 2012, Reprint: 2017. Chapters: 1, 2, 3,4,5,8,12,13,15.

Reference Book:

1. Jerome (J.F.) DiMarzio: Android A Programmer's Guide, Tata McGraw-Hill, 2010.
2. B.M. Harwani: Android Programming, Pearson, 2013.

Note: At the end of the course students should come out with case study, It carries a weightage of 20% of CIE.

Course outcomes

On completion of this course, the students should be able to:

CO1: Identify the Fundamentals of Mobile Application Development.
CO2: Create simple android applications.
CO3: Design and develop the user interface that leverage evolving mobile device capabilities.
CO4: Construct of mobile application using android SQlite and content providers and categorize the mobile sensors.
CO5: Understand the mobile applications based on maps, location based, audio, video and camera.

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	L	L	L	M	-	L	-	-	-
CO2	S	S	S	L	-	-	-	M	-	L	-	L
CO3	S	S	S	S	M	L	M	L	L	L	L	L
CO4	S	S	S	S	S	-	M	L	-	-	L	L
CO5	S	S	S	S	M	-	L	-	-	L	-	L
S-Strong; M-Medium; L-Low												

Course Code : P20MCA352	Semester : III	L-T-P : 3 : 2 : 0
Course Title : Object-Oriented Modelling and Design Patterns		
Credits : 4	Contact Period : 52 Hrs, Exam: 3Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objective (CLO)
The objectives of this course are to:

- **Demonstrate** the basic of object oriented concepts
- **Identify** various relationship like association, aggregation, composition and generalization
- **Construct** various UML models including use case diagrams, sequence diagrams, class diagrams, state diagrams and activity diagrams based on Rumbaugh approach
- **Discuss** properties and functions of system design and class design for the ATM as a case study
- **Illustrate** properties, function and standard categories of patterns along with case studies

UNIT-I

Introduction, Modeling Concepts, Class Modeling and Advanced Class Modeling **10 Hours**
What is Object Orientation? What is OO development? OO themes; Evidence for usefulness of OO development; OO modeling history.
Modeling as Design Technique: Modeling; abstraction; the three models.
Object and class concepts; Link and associations concepts; Generalization and inheritance; A sample class model; Navigation of class models; Practical tips.
Advanced object and class concepts; Association ends; N-array associations; Aggregation; Abstract classes; Multiple inheritance; Metadata; Reification; Constraints; Derived data; Packages; Practical tips.

UNIT-II

State Modeling and Advanced State Modeling **10 Hours**
State Modeling: Events, States, Transitions and Conditions; State diagrams; State diagram behavior; Practical tips.
Advanced State Modeling: Nested state diagrams; Nested states; Signal generalization; Concurrency; A sample state model; Relation of class and state models; Practical tips.

UNIT-III

10 Hours
Interaction Modeling, Advanced Interaction Modeling, Process Overview, System Conception and Domain and Application analysis
Interaction Modeling: Use case models; Sequence models; Activity models. Use case relationships Procedural sequence models; Special constructs for activity models. Process Overview: Development stages; Development life cycle. System Conception: Devising a system concept; elaborating a concept; preparing a problem statement. Overview of analysis; Domain class model; Domain state model; Domain interaction model Iterating the analysis. Application Analysis. Application interaction model; Application class model; Application state model; adding operations.

UNIT-IV

12 Hours
System Design and Class Design
Overview of system design; Estimating performance; Making a reuse plan; Breaking a system into sub-systems; Identifying concurrency; Allocation of sub-systems; Management of data storage; Handling

global resources; Choosing a software control strategy; Handling boundary conditions; Setting the trade-off priorities; Common architectural styles; Architecture of the ATM system as the example.
Class Design: Overview of class design; Bridging the gap; Realizing use cases; Designing algorithms; Recursing downwards, Refactoring; Design optimization; Reification of behavior; Adjustment of inheritance; Organizing a class design; ATM example.

UNIT-V

Patterns and Design Patterns **10 Hours**

What is a pattern and what makes a pattern? Pattern categories; Relationships between patterns; Pattern description. Introduction, structural decomposition, Organization of work, Model View Controller; Communication Patterns: Forwarder-Receiver; Client-Dispatcher-Server; Publisher-Subscriber; Management Patterns: Command processor; Whole Part, Master Slave, View Handler;

Text Books:

1. Michael Blaha, James Rumbaugh: Object-Oriented Modeling and Design with UML, 2nd Edition, Pearson Education / PHI, 2005. (Chapters 1 to 15)
2. Frank Buschmann, Regine Meunier, Hans Rohnert, Peter Sommerlad, Michael Stal: Pattern-Oriented Software Architecture, A System of Patterns, Volume 1, John Wiley and Sons, 2006. (Chapters 1, 3)

Reference Book:

1. Rumbaugh, Blaha, Premerhani, Eddy, Lorensen; Object Oriented Modeling and Design, PHI Latest Edition.

Note : At the end of the course students should come out with case study, It carries a weightage of 20% of CIE.

Course outcomes
On completion of this course, the students should be able to:

CO1: Explain the fundamentals of object oriented concepts
CO2: Illustrate the importance of object oriented modelling and object oriented system is developed based on unified modelling language (UML)
CO3: Design class diagram, state diagram and interaction diagram for the real time problems
CO4: Apply the properties and functions of system design and class design
CO5: Select standard suitable patterns for the particular problems

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	M	L	L	L	L	M	M	-
CO2	S	S	S	S	M	L	L	L	L	M	M	-
CO3	S	S	S	S	M	L	L	L	M	M	M	-
CO4	S	S	S	S	L	L	L	L	M	M	M	-
CO5	S	S	S	S	S	M	M	L	L	M	M	-
S-Strong; M-Medium; L-Low												

Course Code : P20MCA353	Semester : III	L-T-P : 3 : 2 : 0
Course Title : Deep Learning		
Credits : 4	Contact Period : 52 Hrs, Exam: 3Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- **Recall** the concepts of machine learning.
- **Understand** fundamental principles of deep networks.
- **Demonstrate** various deep learning networks.
- **Analyze** various layers in deep networks.
- **Examine** training, debugging, evaluating a Deep network architecture.

UNIT-I

Review of Machine learning and Foundations of Neural Networks and Deep Learning **10 Hours**
The math behind Machine learning-Linear algebra and Statistics, evaluating models, Neural Networks, Training Neural Networks, Activation Functions, Loss Functions, Hyperparameters.

UNIT-II

Fundamentals of Deep Networks **10 Hours**
Defining Deep Learning, Common architectural principles of Deep Networks-Parameters, Layers, Activation functions, Loss functions, Hyperparameters, Building blocks of Deep Networks-RBMs, and Autoencoders.

UNIT-III

Major architectures of Deep Networks **12 Hours**
Convolutional Neural Networks-Biological inspiration, Intuition, CNN architecture overview, Input Layers, Convolutional layers, Pooling layers, Fully Connected layers, Recurrent Neural Networks-Modelling the time dimension, 3D Volumetric input, General RNN architecture, LSTM networks, Domain specific Applications, When do I need deep learning?

UNIT-IV

Tuning Deep Networks **10 Hours**
Basic concepts, Matching Input data and Network architectures, Relating Model Goal and Output layer, Working with layer count, Parameter count, and memory, Weight initialization strategies, Using activation functions, Understanding learning rates, Controlling epochs and Mini-batch size, How to use regularization, using network statistics from the tuning.

UNIT-V

Tuning Specific Deep Network Architectures **10 Hours**
CNN-Common Convolutional Architectural patterns, Configuring Convolutional layers, Configuring Pooling layers, Transfer learning, Recurrent Neural Networks (RNN)-Network Input data and input layers, Output Layers, Training the network, Debugging common issues with LSTMs, Padding and Masking, Evaluation and Scoring with masking.

Text Book:

1. Josh Patterson and Adam Gibson, Deep Learning, A practitioner's approach, First edition, Shroff Publishers and Distributors Pvt. Ltd., 2017

Reference Books:

1. DouweOsinga, Deep learning Cookbook, Shroff Publishers and Distributors Pvt. Ltd., 2018.
2. Ian Goodfellow and YoshuaBengio and Aaron Courville, Deep Learning, MIT Press, Jan 2017

Note: At the end of the course students should come out with various Case study Report which covers the concept of Deep Learning Networks that is discussed in Tutorial class. It carries a weightage of 20% marks of CIE.

Course Outcome (CO):
At the end of this course, the students will be able to:

CO 1: **Outline** the machine learning techniques along with knowledge base.
CO2: Understand the applications deep neural networks.
CO3: Apply various deep networks.
CO4: Illustrate the various deep learning models.
CO5: Demonstrate a specific deep network architecture.

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	-	-	-	M	-	M	-	-	-	-	-
CO2	S	S	S	M	M	-	S	-	-	-	M	-
CO3	M	-	-	-	-	-	-	-	-	-	S	-
CO4	M	S	M	-	S	-	M	-	-	-	M	-
CO5	S	M	M	M	M	-	-	M	-	-	M	-
S-Strong; M-Medium; L-Low												

Course Code : P20MCA354	Semester : III	L - T - P : 3 : 2 : 0
Course Title : NOSQL		
Credits : 4	Contact Period : 52 Hrs, Exam: 3 Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- **Understand** fundamentals concepts of NOSQL, Storing data in NOSQL and Accessing data in NOSQl.
- **Outline** the CRUD operations.
- **Understand** how Hive provides a SQL for Hadoop Map Reduce tasks.
- **Choose** the right database to facilitate ease of application development.
- **Apply** the actions to perform with the PHP driver and few functions to execute in the MongoDB shell.

UNIT-I

Introduction to NOSQL **10 Hours**

Definition of NOSQL, History of NOSQL and Different NOSQL products, Exploring MongoDB Java/Ruby/Python, Interfacing and Interacting with NOSQL

UNIT-II

NOSQL Basics **10 Hours**

NOSQL Storage Architecture, CRUD operations with MongoDB, Querying, Modifying and Managing NOSQL Data stores, Indexing and ordering datasets (MongoDB/CouchDB/Cassandra)

UNIT-III

Advanced NOSQL **10 Hours**

NOSQL in CLOUD, Parallel Processing with Map Reduce, BigData with Hive

UNIT-IV

Working with NOSQL **12 Hours**

Surveying Database Internals, Migrating from RDBMS to NOSQL, Web Frameworks and NOSQL, using MySQL as a NOSQL

UNIT-V

Developing Web Application with NOSQL and NOSQL Administration **10 Hours**

PHP and MongoDB, Python and MongoDB, Creating Blog Application with PHP,NOSQL Database Administration

Text Book:

1. Professional NOSQL,Shashank Tiwari,WROX Press.

2. The Definitive Guide to Mongo DB, The NOSQL Database for cloud and Desktop Computing Eelco Plugge, Peter Membreyand Tim Hawkins APress.

Reference Books:

1. MongoDB Basics,Peter Membrey ,David Hows , Eelco Plugge, 1st Edition, 2014, Apress.
2. Web Development with MongoDB and NodeJS , Mithun Satheesh ,Bruno Joseph D'mello, Jason Krol,2nd Edition, Kindle Edition.

Note: At the end of the course students should come out with case study, It carries a weightage of 20% of CIE.

Course outcomes
On completion of this course, the students should be able to:

CO1: Explain the concepts of unstructured data
CO2: Analyse and Manage the Data using CRUD operations
CO3: Develop the applications using NoSQL
CO4: Apply the concept of Map Reduce in the real world application development
CO5: Develop web application using PHP and MangoDB in the NOSQL framework

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M	M	M	M	L	M	-	M	L	M	L
CO2	S	S	S	M	M	L	M	-	M	M	M	M
CO3	S	S	S	M	M	L	M	-	M	M	M	M
CO4	M	M	S	M	M	L	M	M	M	M	M	M
CO5	M	M	M	M	M	L	M	M	M	M	M	M
S-Strong; M-Medium; L-Low												

Course Code : P20MCA355	Semester : III	L-T-P : 3 : 2 : 0
Course Title : Digital Image Processing		
Credits : 4	Contact Period : 52 Hrs, Exam : 3Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- **Understand** the block schematic of a digital image processing system
- **Outline** the areas of applications of image processing.
- **Outline** the knowledge of image enhancement and basic FFT and their applications for image processing.
- **Understand** the image segmentation, noise models and image restoration.
- **Summarize** filters for colour image processing, exposure to image compression concepts and algorithms

UNIT-I

Digital Image Fundamentals **10 Hours**

Digital Image Restoration, fundamental Steps in Image Processing, Image processing Application, Overview of Digital Imaging Processing, Physical Aspects of Image Acquisition, Biological Aspects of Image Acquisition, Sampling and Quantization.

UNIT-II

Image Enhancement **11 Hours**

Image Enhancement in Spatial domain, Histogram-Based Techniques, Image Smoothing Spatial Filter, Image Sharpening Spatial Filters.

Image Enhancement in Frequency Domain: Image smoothing frequency domain filtering, Image sharpening frequency domain filtering.

UNIT-III

Image Restoration **11 Hours**

Image Degradation Model, Noise modeling, Image Restoration in Presence of Noise, Periodic Noise and Band Pass and Band Reject Filtering, Image Restoration Techniques.

UNIT-IV

Image Segmentation **10 Hours**

Detection of discontinuities, Edge Detection, Principle of Region Growing.

Morphological Image Processing: Morphological Operators (Dilation and Erosion), opening and closing, Basic Morphological algorithms.

UNIT-V

Colour Image Processing **10 Hours**

Introduction, colour models, pseudo colour image processing, Full colour processing, colour transformations.

Image Compression: Image Compression Models, Compression Algorithm and its types.

Text Books:

1. "Digital Image Processing", Rafael C. Gonzalez and Richard E.Woods Pearson Education, 2009, 3rd Edition.
2. "Digital Image Processing" S.Sridhar Oxford University Press, 2016, 2nd edition. ISBN 10: 0199459355 ISBN 13: 9780199459353.

Reference Books:

1. "Fundamentals of Digital Image Processing", Anil K. Jain, Pearson Edition, 2001. ISBN: 9788120309296, 8120309294
2. "Digital Image Processing" S. Jayaraman and others. ISBN: 9780070144798, 0070144796

Note : At the end of the course students should come out with case study, It carries a weightage of 20% of CIE.

Course outcomes
On completion of this course, the students should be able to

CO1: Describe different image processing stages for given problem statement
CO2: Discuss spatial/frequency domain using various methods
CO3: Implement image enhancement & segmentation technique for a given image
CO4: Illustrate image restoration algorithms
CO5: Identify and **apply** Image Compression Models for given application

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	-	-	L	-	S	-	M	-	-	-
CO2	S	S	-	M	-	-	-	-	M	-	L	-
CO3	M	S	M	-	-	M	-	M	M	S	-	M
CO4	S	S	M	-	S	-	-	S	M	S	-	-
CO5	-	S	M	M	-	-	-	-	M	-	-	M
S-Strong; M-Medium; L-Low												

Course Code : P20MCAL36	Semester : III	L - T - P : 0 : 0 : 3
Course Title : IOT Lab		
Credits : 1.5	Contact Period : 32 Hrs, Exam: 3 Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- **Demonstrate the** IoT architecture and design for a given problem
- Apply IOT architecture for a given problem Analyse the application protocol
- Transport layer methods for the given business case.
- Design and develop an application for the given problem
- Develop python program for the given problem and verify the output

1. Run some python programs on Pi like: Read your name and print Hello message with name Read two numbers and print their sum, difference, product and division. Word and character count of a given string Area of a given shape (rectangle, triangle and circle) reading shape and appropriate values from standard input Print a name 'n' times, where name and n are read from standard input, using for and while loops. Handle Divided by Zero Exception. Print current time for 10 times with an interval of 10 seconds. Read a file line by line and print the word count of each line.
2. Get input from two switches and switch on corresponding LEDs
3. Flash an LED at a given on time and off time cycle, where the two times are taken from a file.
4. Switch on a relay at a given time using cron, where the relay's contact terminals are connected to a load.
5. Access an image through a Pi web cam
6. Control a light source using web page.
7. Implement an intruder system that sends an alert to the given email.
8. Get the status of a bulb at a remote place (on the LAN) through web
9. Get an alarm from a remote area (through LAN) if smoke is detected.

The student should have hands on experience in using various sensors like temperature, humidity, smoke, light, etc. and should be able to use control web camera, network, and relays connected to the Pi.

Course outcomes
On completion of this course, the students should be able to:

CO1: Demonstrate the IoT architecture and design for a given problem
CO2: Apply IOT architecture for a given problem
CO3: Analyse the application protocol, transport layer methods for the given business case.
CO4: .Design and develop an application for the given problem
CO5: Develop python program for the given problem and verify the output

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	-	-	L	-	S	-	-	-	-	-
CO2	S	S	-	M	-	-	-	-	-	-	L	-
CO3	M	S	M	-	-	M	-	M	-	S	-	M
CO4	S	S	M	-	S	-	-	S	-	S	-	-
CO5	-	S	M	M	-	-	-	-	M	-	-	M
S-Strong; M-Medium; L-Low												

Course Code : P20MCAL37	Semester : III	L - T - P : 0 : 0 : 3
Course Title : .NET Lab		
Credits : 1.5	Contact Period : 32 Hrs, Exam: 3 Hrs	Weightage : CIE : 50% SEE : 50%

Course Learning Objectives (CLOs)
The objectives of this course are to:

- **Understand** the Visual Studio IDE to create and debug Console applications, Windows Forms Application and ASP.NET Web applications.
- **Familiarize** C# code to demonstrate the concepts Command Line Arguments, Operator Overloading, Object Oriented Techniques,
- **Outline** the C# concepts of Interfaces, Delegates and Exception handling
- **Understand** windows applications using C#.NET
- **Outline** data driven web applications using ADO.NET and ASP.NET

PART A

1. Write a Program in C# to demonstrate Command line arguments processing.
2. Write a Program in C# to demonstrate boxing and Unboxing.
3. Write a program to demonstrate the static members.
4. Find the sum of all the elements present in a jagged array of 3 inner arrays.
5. Using Try, Catch and Finally blocks write a program in C# to demonstrate error Handling.
6. Demonstrate use of virtual and override key words in C# with a simple program.
7. Write a program to demonstrate delegates.
8. Write a program to demonstrate abstract class and abstract methods in C#.
9. Write a program to illustrate the use of different properties in C#.
10. Write a Program in C# to build a class which implements an interface.

PART – B

1. Consider the Database STUDENT consisting of following tables: tbl_Course (CourseID: int, CourseName: string) tbl_Student (USN: string, StudName: string, Address: string, CourseID: int, YrOfAdmsn: int)
   Develop suitable windows application using C#.NET having following options:
   1. Entering new course details.
   2. Entering new student details.
   3. Display the details of students (in a Grid) who belong to a particular course.
   4. Display the details the students who have taken admission in a particular year.

2. Consider the Database BLOODBANK consisting of following tables: tbl_BloodGroup (BloodID: int, BloodGroup: string) tbl_Donor (DonorID: int, DonorName: stirng, Address:string, ContactNo: int, DOB: date, Gender: string, Weight: int, BloodID: int)
   Develop suitable windows application using C#.NET having following options:
   1. Entering Blood group details.
   2. Entering new donor details.

3. Display the details of donors (in a Grid) having particular blood group.
4. Display the details of donors (in a Grid) based on gender.
5. Display the details of donors (in a Grid) based on age (above 18), weight (above 45KG) and Gender(user's choice).

3. Consider the Database STUDENT consisting of following tables: tbl_Course (CourseID:int, CourseName: string) tbl_Book (BookID :int, BookTitle: string, Author: string,CourseID: int) tbl_Student (USN: string, StudName: string, CourseID: int) tbl_BookIssue(USN: string, BookID: int, IssueDate: Date)

   Develop suitable windows application using C#.NET having following options:
   1. New Course Entry.
   2. New Book Entry
   3. New Student Entry
   4. Issue of books to a student.
   5. Generate report (display in a grid) showing all the books belonging to particular course.
   6. Generate report (display in a grid) showing all the books issued on a particular date.
   7. Generate report (display in a grid) showing all the books issued to a particular student.

4. Develop a Web Application using C#.NET and ASP.NET for an educational institution.
   The master page should consist of Institution Name, Logo and Address. Also, it should provide hyperlinks to Departments, Facilities Available and Feedback. Each department page and facilities page should be designed as static pages. The hyperlinks should navigate to these static pages in the form of Content Pages associated with Master Page designed. The Feedback page should have fields to enter Name, Email and Message with Submit and Cancel Buttons. Database should be created to store these three data.

5. Develop a Web Application using C#.NET and ASP.NET for a Bank. The BANK Database should consist of following tables: tbl_Bank (BankID: int, BankName: string) tbl_Branch (BranchID: int, BankID: int, BranchName: string) tbl_Account (AccountNo: int, BankID: int, BranchID: int, CustomerName: string, Address: string, ContactNo: int, Balance: real) (Note: AccountNo and BankID together is a composite primary key).
   The master page of this web application should contain hyperlinks to New Bank Entry, New Branch Entry (of selected Bank), New Customer Entry (based on branch and bank) and Report Generation.
   The hyperlinks should navigate to respective content pages. These content pages provide the fields for respective data entry. The reports should be generated (display in grid) as below:
   1. Display all records of particular bank.
   2. Display all records of a branch of particular bank.
   3. The balance should be displayed for the entered account number (Bank and Branch are input through ComboBox controls and Account number is input through TextBox).

Note: Students are required to execute one program from Part A and one from Part B.

Course outcomes
On completion of this course, the students should be able to:

CO1: Design and develop small C# applications using basic concepts and Object Oriented techniques.
CO2: Identify Exception handling classes for implementing C# applications.

CO3: Select the problem to Develop user interactive windows applications
CO4: Design and develop web application to Implement, debug and deploy using ASP.NET Web applications
CO5: Design and develop frontend and backend connectivity using ODBC

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	-	-	M	-	S	-	M	-	-	-
CO2	S	S	-	M	-	-	-	-	M	-	L	-
CO3	M	S	M	-	-	M	-	M	M	S	-	M
CO4	S	S	M	-	S	-	-	S	M	S	-	-
CO5	-	S	M	M	-	-	-	-	M	-	-	M
S-Strong; M-Medium; L-Low												

Course Code : P20MCA38	Semester : III	L - T - P : 0 : 0 : 3
Course Title : Mini Project		
Credits : 2	Contact Period : 52 Hrs, Exam: 3 Hrs	Weightage : CIE : 50% SEE : 50%

Mini Project Guidelines:

- A team of **TWO** students must develop the mini project. However, during the examination, each student must demonstrate the project individually.
- The team may implement a mini project of their choice based on latest trends.
- The team must submit a **Brief Project Report** (**25 to 30 Pages**) that must include the following:
  - Introduction
  - Requirements
  - Software Development Process Model Adopted
  - Analysis and Design Models
  - Implementation
  - Testing
  - References
- **SEE:** The Report will be valued for 10 marks, Demonstration for 30 marks and Viva-Voce for 10 marks.

Course Code : P20MHU39	Semester : III	L - T - P : 0 : 2 : 0
Course Title : Aptitude and Reasoning Development - BEGINNER (ARDB)		
Credits : 1	Contact Period : 32 Hrs, Exam: 3 Hrs	Weightage : CIE : 50% SEE : 50%

Prerequisites: Basics of mathematics.

Course Learning Objectives (CLOs)
This course aims to

- Solve the mathematical calculations easily and quickly using the methods of vedic mathematics.
- Illustrate different examples to learn about percentages effectively.
- Compare the different types of series.
- Explain the logic behind solving problems under series such as A.P.,G.P.,H.P.
- Explain divisibility rules, properties of different types of numbers.
- Explain methods to find the number of factors and sum of factors.
- Analyze the concept of power cycle, and find last digit and last two digits.
- Solve problems involving simple equations and inequalities.
- Explain Componendo, Dividendo, Invertendo, Alternendo and other terms related to ratio and proportion.
- Explain the concepts behind the logical reasoning modules such as arrangement, blood relations and directions

Relevance of the course:
3rd Semester is considered as the right time to build a base to a student's analytical and logical ability. This course connects the basics of maths learnt in school into the present problem solving techniques. It creates an awareness towards the importance and significance of an individual's logical abilities.

UNIT - I

6 hours

Time, Speed and Distance:
Concept of motion and mathematical representation of motion, The rule of proportionality, Conversion between kmph to m/s, Concept of average speed and its application in different scenarios, Relative speed– Importance, application and observation in day to day life, same direction and opposite direction, An application of allegation in Time speed and distance, Trains– Different scenarios. Boats and streams– resultant speed, upstream and downstream concept. Circular motion– Two or three bodies meeting at the starting point or anywhere in the track. Races– Concept of head start, solving problems under different constraints. Application of solving problems under Clocks.
SSC: Basic relation between the 3 different quantities. Conversions between different UNITs of measurement. Speed and velocity.

UNIT - II

4 hours

Simple equations, Ratio Proportions and Variations:
Simple equations: Linear equations-Linear equations in one variable, linear equation in two variables, Different methods of solving linear equations in two variables– Method of elimination, Method of substitution, Method of cross multiplication. Format of equations that can be converted to linear equations, Linear equations of three variables, Inequalities and its properties. Advanced problems on Simple equations. Age problems.

Ratio Proportions and Variations: Understanding the meaning and difference betweenratio, proportion and variation. Properties of ratio, Comparison of more than two quantities, Proportion, Properties of proportion - Componendo, Dividendo, Invertendo, Alternendo. Continued proportion, Mean proportion. Variation - Direct variation, Indirect variation, Joint variation, Short cut methods to solve problems on variation. **SSC-**Knowledge about factors, types of factors. Splitting the middle term rule, formula rule.

UNIT - III

8 hours

Time and Work:

Relationship between time and work. Importance of efficiency, Conventional method of solving problems, L.C.M method, Negative work, The specific case of building a wall, Group work, Constant product rule, When work is not constant, Pipes and cistern– Similarity of logic.

SSC: LCM methods, basic arithmetic. Fractions and efficiency.

Geometry and Mensuration:

Theory, straight lines, triangles– theorems, area, lines inside triangle and geometric centre, Special property of an equilateral triangle, Application of Pythagoras theorem, Congruency and similarity of triangles, Basic proportionality theorem, Polygons, Quadrilaterals,

Trapezium, Parallelogram, Rectangle, Rhombus, Square, Division of polygons, Circumscribed and Inscribed polygons, Concyclic points concept, Cyclic quadrilateral, Circle– Radius, Area and perimeter, Arc, Chord, Sector, Segment, Tangent, Secant, Area of common region Solid figures– Introduction, Classification of a solid, Net of a solid, Cuboid, Cube, Right cylinder, Pyramid– right pyramid, triangular pyramid, Cone– frustum of a cone, Sphere, Combination of solid.

Co-ordinate geometry:

Cartesian coordinate geometry– rectangular coordinate axis, distance formula, Section formula, Area of a triangle, Centre of gravity or Centroid of a triangle, In-centre of a triangle, Circumcentre of a triangle, Orthocentre of a triangle, Collinearity of three points, Slope of a line, Different forms of equations of a straight line, Perpendicularity and parallelism, Length of perpendicular.

Self-study Component-Basics of geometry, formula, dimensions, shapes. Different types of lines.
Example – parallel, intersecting etc..

UNIT - IV

4 hours

Building the fundamentals of logical reasoning:

Arrangement:

Approach to tackle questions, Different types of arrangement– Linear arrangement, Circular arrangement. Selection, Double line map. Possible ways of arrangement– Words or numbers, left side only, right side only, left right alternate, increasing or decreasing order, interchange vs push, Strategy for solutions– some tips for quick answers, general strategy.

Directions:

Basics. Pythagorean theorem, Pythagorean triplets, Solving problems for practice.

Blood relations:

Some typical relations that we come across, family tree, Structuring the given problem step by step. Suggested methods– Backtracking, drawing family tree. Problems on blood relations and professions.

SSC-Basic knowledge of directions, Pythagoras theorem. Logical reasoning skills, Relations, Family tree.

UNIT - V

10 hours

Cubes, Clocks & Calendars:

Cubes: Number of faces, vertices and edges. Colored cubes. Number of colored faces and the formulae to find-out the same. Problems on cubes.

Clocks & Calendars: Minute spaces. Hour hand and minute hand. Angle between the hands. Relative speed. Faulty clocks. Time gained or lost by the clock. Odd days. Leap year. Ordinary year. Counting of odd days. Problems on clocks and calendars.

Self-study Component- Knowledge about shapes and dimensions, Area and volume. Leap year, number of days. Important dates.

Set theory and Venn diagram: Set builder form, Tabular form, Venn diagram, Types ofsets, Operation of sets using venn diagram, Important properties, Algebraic laws of sets, Maxima and minima in set operation, Venn diagram for four sets.

Syllogism: Meaning of syllogisms, Format of problems and standard qualifiers, Concept ofdistribution, Standard question pattern, Application of venn diagram to solve problems. **Logical Venn diagrams:** Analysis of the given problem and solve it. **Self-study Component-** Basics about sets, operations using venn diagram. Basic applications.

Reference Books:

1. The Trachtenberg speed system of basic mathematics, published by Rupa publications.
2. CAT Mathematics by AbhijithGuha. Published by PHI learning private limited.
3. Quantitative aptitude by Dr. R. S Agarwal, published by S.Chand private limited.
4. Verbal reasoning by Dr. R. S Agarwal, published by S. Chand private limited.
5. Quantitative aptitude for CAT by Arun Sharma, published by McGraw Hill publication.
6. Analytical reasoning by M.K Pandey BSC PUBLISHING.CO.PVT.LTD

Course Outcomes
After completing this course, the student is able to:

- Solve mathematical calculations in less duration compared to the conventional method.
- Give examples for AP, GP and HP and differentiate between them.
- Apply divisibility rules, power cycle method and evaluate the significance of the number system module.
- Point out the errors in the problems concerning inequalities and solve simple equations and problems based on ratio, proportion and variation.
- Solve the problems based on blood relations, directions and arrangement.

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	S	S	M	-	S	M	-	S	L	L	M
CO2	M	S	S	M	-	S	M	-	S	L	L	M
CO3	M	S	S	M	-	S	M	-	S	L	L	M
CO4	M	S	S	M	-	S	M	-	S	L	L	M
CO5	M	S	S	M	-	S	M	-	S	L	L	M
S-Strong; M-Medium; L-Low												

Evaluation Scheme for I, II & III Semesters.

Evaluation Scheme						
Scheme	**Weightage**	**Marks**	**Event Break UP**			
CIE	50%	50	**CIE I**	**CIE II**	**Assignment**	**Average of CIE I & CIE II + Assignment**
			40	40	10	50
SEE	50%	50*	**Questions to Set : 5**		**Questions to Answer : 5**	

Note: * The SEE will be conducted for 100 Marks.

Scheme of SEE Question Paper(100 Marks)		
Duration : 3hrs	**Marks :100**	**Weightage : 50%**

- The question paper should cover the entire contents of the syllabus.
- Total questions to be set are FIVE, which have internal choice for any THREE units and remaining TWO units' questions are compulsory.
- The students should answer 5 full questions
- Each unit carries equal marks of 20.

SEMESTER-IV

Sl. No	Course Code	Course Title	Hrs/Week	Credits	Examination		
					Marks		
			L : T : P: H		CIE	SEE	Total
1	P20MCA41	Technical Seminar	------	2	100	------	100
2	P20MCA42	Industry Internship (4 weeks)	------	2	100	------	100
3	P20MCA43	Project Work	------	10	100	------	100
4	P20MCA44	Project Dissertation Evaluation	------	6	-----	100	100
5	P20MCA45	Project Viva - Voce	------	4	-----	100	100
TOTAL			------	**24**	**300**	**200**	**500**
L: Lecture, T: Tutorial, P: Practical, C: Credits ; CIE: Continuous Internal Evaluation; SEE: Semester End Examinations							

Technical Seminar (P20MCA41)

Guidelines for Technical Seminar:

- The Student has to choose minimum 8 weeks NPTEL online course recommended by the Department.
- The student can undergo NPTEL course registration during III / IV Semester and the credit will be considered in IV Semester.
- The CIE marks awarded for Technical Seminar, shall be based on the evaluation of final NPTEL score (i.e. with NPTEL Certification Only), Seminar Report, Presentation skill with Question and Answer session in the ratio 40:20:40 respectively.

Industry Internship (P20MCA42)
Guidelines for Industry Internship:

- The students shall undergo internship in the industry for a period of 4 weeks during the vacation immediately after the 3rd semester examination.
- The internship shall be carried out in industry / R&D labs or institutions.
- The same should be presented by the student along with the report at the end of 4th week and will be evaluated by the internal panel for 100 marks.
- The student should present the progress about the internship to the panel of members constituted by the Head of the Department (HOD) and the presentation will be evaluated for 50 marks.
- The student shall prepare a report and submit the same to the guide allotted by the institute. The report is evaluated for 50 marks.
- The report format for the internship shall be as equivalent as the Project Report as prescribed by the Department.

Project Work

Guidelines for Project:

- This is an individual project for duration of minimum of 4 months.
- The candidate should carry out the project in any industry or R&D institution or educational institution under a guide/co-guide.
- The candidate has to present the work carried out before the examiners during the final examination.
- The work out carried out should be free from plagiarism.
- The literature study may be clearly written which may be summary of existing project and highlight of what are the functionalities that are proposed to this project.
- Student shall indicate the different research papers, documents refereed as a part of the literature study.
- Students are encouraged and appreciated to do paper publication in an indexed Journal / journal with impact factor / conference in leading avenues like IEEE, Springer etc. during their project work as an added advantage.
- The student shall present the progress about the internship to the panel of members constituted by the Head of the Department (HOD).

Paper publication:

20% Weightage is given in CIE as well as in SEE, for students who have published the research paper in indexed Journal / journal with impact factor / conference in leading avenues like IEEE, Springer etc.

Rubrics / Scheme of Evaluation:

Course code	Title	Internal (CIE)					External (SEE)			Total Marks
		NPTEL Score	Report	Presentation	Dissertation evaluation	Paper Publication	Paper Publication	Dissertation evaluation	Viva-Voce	
P20MCA41	Technical Seminar	40	20	40	--	--	--	--	--	100
P20MCA42	Industry Internship	--	50	50	--	--	--	--	--	100
P20MCA43	Project Work	100					--	--	--	100
P20MCA44	Project Dissertation Evaluation	--					--	100	--	100
P20MCA45	Project Viva Voce	--					20	--	80	100

Rubrics: Department can have its own rubrics as per the scheme mentioned above for the evaluation of internship, technical seminar and project work.

Technical Seminar (P20MCA41)

Rubrics for Technical Seminar Presentation Assessment

Particulars	Excellent (8)	Good (6)	Satisfactory (4)	Poor (2)	Final Score
Knowledge of the topic at analyse level	Demonstrates in depth knowledge; answered all questions with elaboration	Adequate knowledge on most of the topics. Answered all questions but failed to elaborate	Superficial knowledge of topic; only able to answer basic questions	Does not have any knowledge; Unable to answer questions	
Organization of the presentation	Presented in logical sequence; introduction and background give proper context key points and conclusions are clear and well presented	Most information presented in logical sequence; clear introduction; adequate background; some irrelevant information	Problems with sequencing, lacks clear transitions; incomplete or overly detailed introduction, emphasis given to less important information	Little or no organization, difficult o follow; missing or ineffective introduction; confusing background; key points unclear	
Level of Understanding	Sufficient for understanding and presented very effectively	Sufficient for understanding and presented well	Sufficient for understanding but not clearly presented	Too brief or insufficient for understanding or too detailed	
Presentation Skills	Clear articulation, steady delivery rate, good posture and eye contact, confident and appropriately dressed	Clear articulation but not very polished. Able to recover from minor mistakes. Appropriately dressed	Refers to slides to make points, occasional eye contact, incorrect pronunciations, and Voice fluctuation.	Inaudible or too loud, no eye contact, delivery rate is too slow or too fast, not in formal attire	
Visuals	Visually pleasing and easy to read; good use of white space, colour, backgrounds; images and Graphics support.	Adequate layout, but with some fonts, colours, backgrounds difficult to read	Difficult to read, cluttered appearance; images improperly sized; some distracting graphics or animations	Confusing layout, text extremely difficult to read; many graphics, sounds, animations distract from the presentation	
				Total Score	

Rubrics for Seminar Report Assessment

	Excellent (4)	Good (3)	Satisfactory (2)	Poor(1)	Final Score
Objective, relevance, impact and conclusion	The purpose and objective, relevance and impact of the topic is made clear, and the report addresses them in a focused and logical manner.	The purpose and objective, relevance and impact of the topic is made clear, and the report addresses them.	Purpose and objectives are stated ambiguously	The report does not clearly address any of them.	
Grammar & Spelling	Very few spelling errors, correct punctuation, grammatically correct, complete sentences.	Occasional lapses in spelling, punctuation, grammar, but not enough to seriously distract the reader.	Less technical details, sentences are not framed properly and with a few spelling mistakes	Numerous spelling errors, non-existent or incorrect punctuation, and/or severe errors in grammar thatinterfere with understanding.	
References	Sources are Acknowledged with full reference details.	Sources are acknowledged with bare reference details.	Sources are acknowledged with partial reference details.	Sources are not acknowledged.	
Report Format	All required elements of the report are present and completed efficiency.	All required elements of the report are present and completed to a satisfactory standard.	All required elements are provided but in a haphazard way	Key elements of the report are not provided. Overall presentation of the document is not to a professional standard.	
Plagiarism Check	Uniqueness 90% and above	Uniqueness 80% to 89%	Uniqueness between 75% to 79%	Uniqueness less than 75%	
				Total Score	

Course outcomes:
At the end of the Seminar Course, students will be able to

CO1: Analyse relevant topic in computing sciences and make valid conclusions on industry/society/environment using fundamental/ research based knowledge.
CO2: Demonstrate self-learning by making effective presentation and report writing.
CO3: Understand ethics, cyber regulations / responsibilities and demonstrate the same by using relevant / modern tool.

Mapping with Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	-	-	-	-	-	-	-	M	-	-
CO2	-	-	-	-	-	-	S	-	S	-	-	-
CO3	-	-	-	-	S	S	-	-	-	-	-	-
S-Strong; M-Medium; L-Low												

NPTEL Score (out of 40 marks) =

Rubrics for Seminar Presentation Assessment (out of 40 marks) =

Rubrics for Seminar Report Assessment (out of 20 marks) =

Total Marks (Out of 100 marks) =

Signature of Seminar Guide / Coordinator

Name:

Signature of HOD

Industry Internship (P20MCA42)

Rubrics for Internship Presentation Assessment

	Excellent (10)	Good (8)	Satisfactory (5)	Poor (2)	Final Score
Knowledge on Industry experience /Research work	Demonstrates in depth knowledge about Industry / Research processes; answered all questions with elaboration	Knowledge to a limited extent on major processes. Able to answer most of the questions though not elaborate	Superficial knowledge of topic; only able to answer basic questions	Does not have any knowledge; Unable to answer questions	
Organization of the presentation	Presented in logical sequence; Introduction and background given in proper context; Key points and conclusions are clear and well presented most citationed and references	Organized in a presentable manner though lacks details of some of the topics. Or very less references and citations.	Problems with sequencing, lacks clear transitions; incomplete or overly detailed introduction , emphasis given to less important information	Little or no organization, difficult to follow; missing or ineffective introduction; confusing background; key points unclear	
Usage of Modern tools and technologies	Effectively utilized appropriate tools and technologies for implementation.	Developed applications, though not very effectively. Fair enough.	Sufficient for understanding but not clearly elaborated about usage of tools and technologies	Too brief or insufficient for understanding or too detailed	
Presentation Skills	Clear articulation about tools/technology, steady delivery rate, good posture and eye contact, confident and appropriately dressed	Good Articulation about tools/technology and not very polished. Not able to realize minor mistakes. Presentable attire	Refers to slides to make points, occasional eye contact, incorrect pronunciations, and Voice fluctuation.	No clarity in sentence, Inaudible or too loud,no eye contact, delivery rate is too slow or too fast, not in formal attire	
Visuals	Visually pleasing and easy to read; good use of white space, colour, backgrounds; images and Graphics support.	Good visuals but can be improved largely.	Difficult to read, cluttered appearance; images improperly sized; some distracting graphics or animations	Confusing layout, text extremely difficult to read; many graphics, sounds, animations distract from the presentation	
				Total Score	

Rubrics for Internship Report Assessment

	Excellent (10)	Good (8)	Satisfactory (5)	Poor (2)	Final Score
Purpose and Objective of Internship	The purpose and objective of the Internship report is made clear, and the report addresses the objective(s) in a focused and logical manner.	Documented well but with slight ambiguity in analyzing the problems	Purpose and objectives are stated ambiguously	The report does not clearly address the objective(s) of Internship.	
Documenting the essence of Tools/Technology used, Grammar & Spelling	Complete information is provided about tools/technology, Very few spelling errors, correct punctuation, grammatically correct, complete sentences.	Average technical details on tools / technology usage, Grammatical mistakes not corrected.	Less technical details, sentences are not framed properly and with a few spelling mistakes	No details about tools/technology, Numerous spelling errors, non-existent or incorrect punctuation, and/or severe errors in grammar that interfere with understanding.	
References	Multiple references, Citations appropriately placed, Formatted correctly	References limited or a few missed citations, format mostly correct.	References sparse, poor formatted	No appropriate references.	
Report Format	All required elements of the report are present and completed efficiently.	All required elements are present but some of them are not given completely	All required elements are provided but in a haphazard way	Key elements of the report are not provided. Overall presentation of the document is not to a professional standard.	
Plagiarism Check	Uniqueness 90% and above	Uniqueness 80% to 89%	Uniqueness between 75% to 79%	Uniqueness less than 75%	
				Total Score	

Course Outcomes
At the end of the Industry Internship Course, students will be able to

CO1.Analyse the real-time industry/research work environment with emphasis on organizational structure/job process/different departments and functions / tools /technology.

CO2.Develop applications using modern tools and technologies.

CO3.Demonstrate self-learning capabilities with an effective report and detailed presentation.

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S		S	-	-	-	-	M	-	-
CO2	-	-	S	S	S	-	-	-	-	-	M	-
CO3	-	-	-	-	-	S	S	-	S	-	-	-

Rubrics for Seminar Presentation Assessment (out of 50 marks) =

Rubrics for Seminar Report Assessment (out of 50 marks) =

Total Marks (Out of 100 marks) =

Signature of Seminar Guides

Name:

Signature of HOD

P.E.S COLLEGE OF ENGINEERING, MANDYA - 571 401

(An Autonomous Institution Affiliated to VTU, Belagavi)

Internship Report on

<INTERNSHIP TOPIC>

Submitted in partial fulfillment of the requirements of the 4th Semester in

MASTER OF COMPUTER APPLICATIONS

BY

<<STUDENT NAME>>

<<USN>>

Under the Guidance of

<<Internal Guide Name>>

<<Designation>>

<< External Guide Name >>

<<Designation>>

DEPARTMENT OF MASTER OF COMPUTER APPLICATIONS

P.E.S College of Engineering, Mandya - 571 401

<<Academic Year>>

P.E.S COLLEGE OF ENGINEERING, MANDYA – 571 401

(An Autonomous Institution Affiliated to VTU, Belagavi)

MASTER OF COMPUTER APPLICATIONS

INTERNSHIP CERTIFICATE

This is to certify that <<**Student Name**>> bearing <<**USN**>> has satisfactorily completed the Industry Internship (P20MCA42) entitled <<**Topic**>> in the academic year <<2021-22>> as prescribed by VTU for completion of IV Semester Master of Computer Applications**.**

Signature of the internal Guide

Signature of the external Guide

Signature of the HOD