

From Co-ordinator's Desk:

To meet the challenge of ensuring excellence in Master Program in Computer Applications

(M.C.A.: referred as Master of Computer Applications) education, the issue of quality needs

to be addressed, debated and taken forward in a systematic manner. Accreditation is the principal means of quality assurance in higher education. The major emphasis of accreditation process is to measure the outcomes of the program that is being accredited. In line with this Faculty of engineering Dr.B.R.Ambedkar University, Srikakulam has taken a lead in incorporating philosophy of outcome based education in the process of curriculum development. Faculty of Engineering, University of Dr.B.R.Ambedkar University, Srikakulam, in one of its meeting unanimously resolved that, each Board of Studies shall prepare some course objectives (COs), Learning Objectives (LOs) and course outcomes to be clearly defined for each course, so that all faculty members understand the depth and approach of course to be taught, which will enhance learner's learning process. It was also resolved that, maximum senior faculty from colleges and experts from industry to be involved while revising the curriculum. I am happy to state that, each Board of studies has adhered to the resolutions passed by Faculty of Engineering, and developed curriculum accordingly. In addition to outcome based education, semester based credit and grading system is also introduced to ensure quality of Master of Computer Applications (MCA) education. Semester based Credit and Grading system enables a much required shift in focus from teachercentric to learner centric education since the workload estimated is based on the investment of time in learning and not in teaching. It also focuses on continuous evaluation which will enhance the quality of education. Dr.B.R.Ambedkar University, Srikakulam has taken a lead in implementing the system through Faculty of Engineering has revised a transparent credit assignment policy and adopted seven points scale to grade learner's performance. Choice Based Credit and Grading System is implemented for Master of Computer Applications from the academic year 2019-2020. Subsequently this system will be carried forward for Second Year and Third Year of M.C.A. respectively.

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Preamble:

It is a privilege to present the revised Choice Based Credit and Grading System(CBCGS)syllabus of Master of Computer Applications (M.C.A.) for Sem I and Sem II (effective from year 2019-20) with inclusion of outcome based approach and project based learning. The syllabus is designed keeping in view the requirements of Industry. The basic objective of the syllabus is to equip the students with the necessary knowledge, skills and foundation required for Application development. Since the Master of Computer Application (M.C.A.) programme is inclined more towards Application Development and thus has more emphasis on latest programming languages and tools to develop better and faster applications using integrated approach. For this, the integrated lab concepts like mini-projects are introduced. The syllabus include the combination of various subject in the area of Business Management, Mathematics and Information Technology.

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MASTER OF COMPUTER APPLICATIONS (MCA) R19
Effect from Academic Year 2019- 20 admitted batch
COURSE STRUCTURE AND SYLLABUS

First Year – I semester

Course	Course Code & Name	Internal Marks	External Marks	L	P	C
Core Subject	MCA 1.1.1: Discrete mathematical structures	30	70	4	-	4
Core Subject	MCA 1.1.2: Computer Organization	30	70	4	-	4
Core Subject	MCA 1.1.3: Programming using C	30	70	4	-	4
Core Subject	MCA 1.1.4: Probability, Statistics, and Queuing theory	30	70	4	-	4
Core Subject	MCA 1.1.5: Management Accountancy	30	70	4	-	4
Core Subject	MCA 1.1.6: Computer Organization Lab	50	50	-	3	2
Core Subject	MCA 1.1.7: C Programming Lab	50	50	-	3	2
Subject	MCA 1.1.8 Skill Development – I	100				2
Total				20	06	24

First Year – II semester

Course	Course Code & Name	Internal Marks	External Marks	L	P	C
Core Subject	MCA 1.2.1: Systems Programming	30	70	4	-	4
Core Subject	MCA 1.2.2: Data structures with C++	30	70	4	-	4
Core Subject	MCA 1.2.3: Operations Research	30	70	4	-	4
Core Subject	MCA 1.2.4: Object Oriented Programming with Java	30	70	4	-	4
Core Subject	MCA 1.2.5: Information Systems and Organization Behaviour	30	70	4	-	4
Core Subject	MCA 1.2.6: Object Oriented Programming Lab	50	50	-	3	2
Core Subject	MCA 1.2.7: Data structures Lab	50	50	-	3	2
Subject	MCA 1.1.8 Skill Development – II	100				2
	MOOCs					2
Total				20	06	24

Second Year – I semester

Course	Course Code & Name	Internal Marks	External Marks	L	P	C
Core Subject	MCA 2.1.1: Artificial Intelligence	30	70	4	-	4
Core Subject	MCA 2.1.2: Data Communications and Networking	30	70	4	-	4
Core Subject	MCA 2.1.3: Database Management Systems	30	70	4	-	4
Core Subject	MCA 2.1.4: Design and Analysis of Algorithm	30	70	4	-	4
Core Subject	MCA 2.1.5: Operating Systems	30	70	4	-	4
Core Subject	MCA 2.1.6: Operating Systems Lab	50	50	-	3	2
Core Subject	MCA 2.1.7: Database Management Systems Lab	50	50	-	3	2
Subject	MCA 1.1.8 Skill Development – III	100				2
	MOOCs					2
Total				20	06	24

MOOCs-I :

Each student should learn any one of the following topics by registering for courses through Online instruction from standard e-learning portals like nptel, coursera, etc. and write the examination conducted as per the university norms.

List of topics for MOOCs-I:

Data Visualization using Tableau, Internet of Things, Recommender systems, Mobile Application Development, Social Network Analysis, DevOps.

Second Year – II semester

Course	Course Code & Name	Internal Marks	External Marks	L	P	C
Core Subject	MCA 2.2.1: Cryptography and Network Security	30	70	4	-	4
Core Subject	MCA 2.2.2: Web technologies	30	70	4	-	4
Core Subject	MCA 2.2.3: Object Oriented Software Engineering	30	70	4	-	4
Core Subject	MCA 2.2.4: Data Warehousing and Data Mining	30	70	4	-	4
Elective - I	MCA 2.2.5 A: Distributed Systems	30	70	4	-	4
	MCA 2.2.5 B: Cloud Computing	30	70	4	-	4
Core Subject	MCA 2.2.6: Web technologies Lab	50	50	-	3	2
Core Subject	MCA 2.2.7: Object Oriented S/w Engg. Lab	50	50	-	3	2
Subject	MCA 1.1.8 Skill Development – IV	100				2
	MOOCs					2
Total				20	06	30

Open Electives:

MCA. 2.2.9A. Compiler Design
MCA. 2.2.9B. Computer Graphics
MCA. 2.2.9C. File Structures
MCA. 2.2.9D. Formal Languages & Automata Theory
MCA. 2.2.9E. Microprocessors

Third Year – I semester

Course	Course Code & Name	Internal Marks	External Marks	L	P	C
Core Subject	MCA 3.1.1: Image Processing	30	70	4	-	4
Core Subject	MCA 3.1.2: Data Analytics	30	70	4	-	4
Core Subject	MCA 3.1.3: Cyber Security and Forensics	30	70	4	-	4
Elective - II	MCA 3.1.4 A: Software Project Management	30	70	4	-	4
	MCA 3.1.4 B: Neural Networks and Fuzzy Systems	30	70	4	-	4
	MCA 3.1.4 C: Internet of Things (IoT)	30	70	4	-	4
Elective - III	MCA 3.1.5 A: E Commerce	30	70	4	-	4
	MCA 3.1.5 B: Python Programming	30	70	4	-	4
	MCA 3.1.5 C: Wireless Adhoc Networks	30	70	4	-	4
Core Subject	MCA 3.1.6: Data Analytics through R Lab	50	50	-	3	2
Core Subject	MCA 3.1.7: Mini project using DBMS and OOSE Concepts	50	50	-	3	2
	MOOCs					2
Total				20	06	24

MOOCS-II:

Each student should learn any one of the following topics by registering for courses through Online instruction from standard e-learning portals like Swayam, nptel, coursera, etc. and write the examination conducted as per the university norms.

List of topics for MOOCS-II:

Python programming, Machine Learning, Agile Methods for Software Development, problem solving using Matlab, Programming in Raspberry Pi Platform, Mongo DB for Developers

Open Electives:

MCA 3.1.8A. Embedded Systems
MCA 3.1.8B.

Third Year – II semester

Course	Course Code & Name	Internal Marks	External Marks	L	P	C
Core Subject						
Core Subject						
Core Subject	MCA 3.2.1: (Submission of Dissertation)	-	100	-	-	20

DISCRETE MATHEMATICAL STRUCTURES

Paper Code	Max. Marks	External	MID/Internal	Credits
MCA 1.1.1	100	70	30	4

Course Objectives:

- As successful discrete mathematics course should carefully blend and balance all five themes those are Mathematical Reasoning, Combinatorial Analysis, Discrete structures, Algorithmic Thinking, Applications and Modelling.
- Demonstrate critical thinking, analytical reasoning, and problem solving skills
- Apply appropriate mathematical and statistical concepts and operations to interpret data and to solve problems
- Identify a problem and analyse it in terms of its significant parts and the information needed to solve it
- Formulate and evaluate possible solutions to problems, and select and defend the chosen solutions.
- Construct graphs and charts, interpret them, and draw appropriate conclusions

Unit – I

Introduction: Logic-Propositional Equivalences-Truth tables- Totalologies-Predicates and Quantifiers-Sets-Operations on sets- Sequences and Summations-Growth functions- relations and their properties-n-ary relations and their applications- Representation of relations-Closures of relations-Equivalence relations- Partial Orderings.

Learning

- The student able to learn what makes up a correct mathematical

- outcome
- argument and introduce tools to construct these arguments.
 - Also develop an arsenal of different proof methods that will enable us to prove many different types of results.
 - The student able to develop formulae for certain types of summations such summations appear throughout the study of discrete mathematics, as for instance, when we analyze the number of steps a procedure uses to sort a list of number into increase order.
Algorithms for integer arithmetic, which were the first procedure called algorithms, will also be discussed.
 - Understand several important application of number theory.

Unit -II **Counting Techniques:** Basics of Counting-Pigeonhole Principle-Combinations and Permutations-Generalized Permutations and Combinations-Recurrence relations-Solving Recurrence Relations-Divide and Conquer relations-Generating Functions-Inclusion and Exclusion-Applications of Inclusion-Exclusion.

- Learning outcome
- To understand the basic counting principles, permutation and combinations binomial coefficients, generalized permutation and combinations.
 - The student able to develop a technique, called the principle of inclusion –exclusion, that counts the number of element in a union of sets, and we will show how this principle can be used to solve counting problems.

Unit -III **Graph Theory:** Introduction to Graphs-Terminology-Relations and Directed Graphs- Representations of Graphs-Isomorphism-Connectivity-Euler and Hamiltonian Paths- Shortest Path problems-Planar Graphs-Graph Coloring

- Learning outcome
- To understand the basic concepts of graph theory and present many different graph models.
 - The student able to solve the wide variety of problems that can be studied using graphs, we will introduce many different graph algorithms.
 - The student also studies the complexity of these algorithms.

Unit - IV Introduction to trees- Applications of trees-Traversals-Trees and sorting-Spanning Trees-Minimum Spanning Trees.

- Learning outcome
- To understand the Trees are particularly useful in computer science , where they are employed in a wide range of algorithms.
 - How the Trees are used to construct efficient algorithms for locating items in a list. They can be used in algorithms, such as Huffman coding.
 - Trees can be used to study games such as checkers and chess and can help determine winning strategies for playing these games.

- Trees can be used to model procedures carried out using a sequence of decisions.
- Produces for building trees containing every vertex of graphs, including depth – first search and Depth-first search, can be used to systematically explore the vertexes of graph.

Unit-V **BooleanAlgebraandModelsofComputation: BooleanFunctions-Representing BooleanFunctions-LogicGates-MinimizationsofCircuits-LanguagesandGrammars-FiniteStateMachineswithandwithoutout-LanguageRecognition-TuringMachines.**

- Learning outcome
- To develop the basic properties of Boolean algebra.
 - The operation of a circuit is defined by a Boolean function that specifies the value of an output for each set of inputs.
 - The student describe the methods for finding an expression with the minimum number of sums and products that represents a Boolean function.
 - The producedures that we will develop, Karnaugh maps and the Quine –McCluskey method, are important in the design of efficient circuits.

Text Books Discretemathematicsanditsapplications, Keneth.H.Rosen, TataMcGraw-Hill PublishingCompany, NewDelhi (Chapters: 1, 4.1, 4.2, 4.3, 4.6, 4.7, 5, 6, 7, 8, 9, 10)

Reference Books 1) DiscreteMathematicsforcomputerscientists&Mathematicians, JoeL. Mott, AbrahamKandel&T.P.Baker, PrenticeHallofIndiaLtd, NewDelhi 2) Discretemathematics, RichardJohnsonbaug, PearsonEducation, NewDelhi

Corse Outcomes

- Recognize, identify, and solve problems using set theory, elementary number theory, and discrete probability Recognize, identify, and apply the concepts of functions and relations and graph theory in problem solving Apply proof techniques in logic
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Paper Code & Title	Maximum Marks	External	Internal	Credits
MCA 1.1.2: Computer Organization	100	70	30	4

Course Objective(s):

1. To develop an understanding of basic computer organization.
2. Understanding of the relationship between computer hardware and machine code/assembly code.
3. To gain an understanding of different Memory management and I/O organization techniques.
4. Develop skills in modular design and the implementation of software at the assembly level.

Unit-I

Digital Logic Fundamentals:

Instruction Set Architectures:

Learning objective(s):

1. students demonstrate basic understanding of the functions and relationship between ALU, registers, memory, bus, I/O devices, and the data flow in hardware components
2. in each step of instruction execution, understanding of the relationship between the organization, architecture and assembly language programming.
3. can write pseudo assembly code on different instruction set architectures.

Unit-II

Introduction to Computer Organization:

Register Transfer Languages:

Learning objective(s):

1. demonstrate working programs using different data representations and addressing modes.
2. the ability of using complex development tools and hardware environment to develop programs.

Unit-III

CPU Design:

Micro sequence control unit design:

Learning objective(s):

1. the ability to use assembly directives to manage memory and allocate space for variables needed in a program.
2. can translate high level programming language constructs into conditional and unconditional assembly instructions.
3. draw the control flow of the interrupt and exception components of a computer system.

Unit-IV

Computer Architecture:

Memory Design:

Learning objective(s):

1. familiar with the communication mechanisms (polling, interrupt driven and handshaking) between the processor and an I/O adapter.
2. use subroutines for abstraction and code reuse purposes and demonstrate
3. working program with multiple subroutines, and understanding of parameter passing mechanisms, and stack management.

Unit-V

Input / Output Organization:

Learning objective(s):

1. ability of dealing with the interaction and between assembly language programs
2. the high level language program, analysing the functionality of a program and generating test cases that cover different functions of the program.

Course Outcome(s):

1. Use complex software development tools to assemble programs, test and debug the programs by using breakpoints, single-stepping, and register / memory watches, on a hardware platform or on a simulator, apply assembly directives to allocate memory for global variables, and to set the initial addresses for program and data.
2. use assembly language to implement flow control constructs (sequential, conditional and iterative) and understand how the processor identifies different

sources of interrupts and exceptions, and invokes the corresponding handler to deal with the interrupt and exception.

3. Students are able to write assembly language programs to read and write the registers in an I/O adapter that control the communication with I/O devices and able to apply subroutines to improve program's modularity, readability and reliability.
4. Students are able to use stack to save register contents, to pass parameters to a subroutine and to create a stack frame for local variables and also able to incorporate an assembly language program as a module of a larger software system written in a high level programming language.
5. Students are able to design test cases and apply them to fully test the functionality and correctness of their programs.

Text Book:

Computer Systems Organization & Architecture, John D. Carpinelli, Addison Wesley Longman, Inc ./ Pearson Education.

Reference Book(s):

1. Computer System Architecture, M. Morris Mano, Third Edition, Pearson Education.
2. Computer Architecture and organization: Design Principles and Applications, B. Govindarajalu, TMH Publishing Company Ltd.
3. Fundamentals of Computer organization and Design, Sivarama P. Dandamudi Springer International Edition.

PROGRAMMING USING C

Paper Code	Max. Marks	External	MID/Internal	Credits
MCA 1.1.3	100	70	30	4

Course Objectives:

- The objective of this course is to discuss the basic techniques and algorithms for attacking and solving various types of problems.
- The language used for writing programs is C.
- The emphasis should be on writing algorithms and programs in C.

Unit -1 INTRODUCTION: Definition of Algorithms- Writing algorithms- top down design- Program verification- The efficiency of algorithms- Concept of Recursion- some simple example to illustrate these concepts like finding the GCD of two numbers- Swapping two variables- Summation of n given numbers- generation of Fibonacci sequence- Reversing a given number- base conversion.

Learning Out Comes ➤ Understand how to write the algorithm and how to draw a flow chart.

Unit -2 INTRODUCTION TO C: C character set- Delimiters-The C Keywords-Identifiers- Constants-Variables-Rules for Defining Variables-Data Types-Declaring Variables- Initializing Variables- Type Conversion-Priority of Operators and their Clubbing- Comma and Conditional Operator-Arithmetic Operators-Relational Operators-Logical Operators-Bitwise Operators-Input and Output in C- Formatted and Unformatted Functions-Library Functions.

Learning

- Understand the fundamentals of C programming.

Out Comes**Unit -3**

MORE ABOUT C : if statement- if...else statement-various forms of if-nested if-break statement-continue statement- go to statement- switch statement- nested switch statement- for statement-while statement do while statement- arrays-working with string and standard functions.

Learning

- Choose the loops and decision making statements to solve the problem.
- Implement different Operations on arrays with strings.

Out Comes**Unit - 4**

ADVANCED CONCEPTS OF C : introduction to pointers– pointer declaration– Arithmetic Operations with pointers– pointers and arrays– pointers and two-dimensional arrays– array of pointers– pointers to pointers– pointers and strings– void pointers– function definition and declaration– proto types- types of functions– call by value and reference– functions returning more values– function as an argument– function with operators– function and decision statements– function and loop statements– function with arrays and pointers– recursion– pointer to function– storage classes. ADDITIONALS IN C: preprocessor directives– structures and unions– bit wise operators–files– command line arguments– dynamic memory allocation– graphics in C..

Learning

- Use functions to solve the given problem.

- Out Comes**
- Understand pointers, structures and unions.
 - Implement files Operations in C programming for a given application.

Unit- 5

PROBLEM SOVING: Reversal of an Array- Removal of duplicates in an ordered array- Partitioning of an array- Finding the k th smallest of an element of an array-Finding the longest monotone subsequence of an array-Linear search- Binary search- Hash searching- Bubble sort-merge sort- Quick sort-Insertion sort-selection sort-Text processing- Towers of Hanoi problem using recursion.

- Learning**
- Use functions to solve the given problem.
- Out Comes**
- Understand pointers, structures and unions.
 - Implement files Operations in C programming for a given application.

Text Books

1)Ashok N. Kamthane, Programming with ANSI and Turbo C, Pearson Education, New Delhi.

2)R.G. Dromey, How to Solve it by Computer, Prentice Hall Of India Ltd, New .Delhi

Reference Books:

1) N. G. Venkateshmurthy, Programming techniques through C, Pearson Education, New Delhi.

2) Byron s Gottfried, Programming with C, Schaum's Outline series, Tata McGraw HillPub. Company, New Delhi.

3)Jacqueline A. jones & Keith Harrow, C programming with problem solving, Dreamtech publications, New Delhi.

Course Outcomes:

- Identify situations where computational methods and computers would be useful.
- Given a computational problem, identify and abstract the programming task involved.
- Approach the programming tasks using techniques learned and write pseudo-code.
- Choose the right data representation formats based on the requirements of the problem.
- Use the comparisons and limitations of the various programming constructs and choose the right one for the task in hand.
- Write the program on a computer, edit, compile, debug, correct, recompile and run it.
- Identify tasks in which data structure techniques –sorting and searching learned are applicable and apply them to write programs, and hence use computers effectively to solve the task.

PROBABILITY, STATISTICS & QUEUING THEORY

Paper Code	Max. Marks	External	MID/Internal	Credits
MCA1.1.4	100	70	30	4

Course objectives:

This Course will provide students with

- To understand probability, Baye's theorem and its applications, random variables, their distributions and expectations.
- To Describe Binomial, Poisson distribution, Normal distribution and its properties.
- To understand the concept of Sampling, identify a statistic and its sampling distribution, and calculate standard error point and interval estimations.
- To perform hypothesis test for small and large sample tests.
- To Use queues characteristics of a queuing model, we can calculate different models.

Unit -I Probability: Definitions of probability, Addition theorem, Conditional probability, Multiplication theorem, Bayes theorem of probability and Geometric probability.

Random variables and their properties: Discrete Random variable, Continuous Random variable, Probability Distribution

joint probability distributions their properties, Transformation variables, Mathematical expectations, probability generating functions.

Learning Out Comes *Demonstrate* knowledge and be able to examine and understand the probability and also characterize probability models using probability mass (density) functions and cumulative distribution functions.

Unit -II Probability Distributions / Discrete distributions: Binomial, Poisson Negative binominal distributions and their properties. (Definition mean, variance, moment generating function, Additive properties, fitting of the distribution.) Continuous distributions: Uniform, Normal, exponential distributions and their properties.

Learning Out Comes *Introduce* the techniques of developing discrete and continuous probability distributions and its applications.

Unit -III Multivariate Analysis: Correlation, correlation coefficient, Rank correlation, Regression Analysis, Multiple Regression, Attributes, coefficient of Association, χ^2 – test for goodness of fit, test for independence.
Estimation: Sample, populations, statistic, parameter, Sampling distribution, standard error, unbiasedness, efficiency, Maximum likelihood estimator, notion & interval estimation.

Learning Out Comes *Describe* a random process in terms of its mean and correlation functions, and demonstrate knowledge in special processes like Poisson, renewable processes.

Unit - IV Testing of Hypothesis: Formulation of Null hypothesis, critic al region, level of significance, power of the test.
Small Sample Tests: Testing equality of .means, testing equality of variances, test of correlation coefficient, test for Regression Coefficient.
Large Sample tests: Tests based on normal distribution.

Learning Out Comes *Explain* testing equalities of mean, various and correlation coefficient using hypothesis condition.

Unit-V Queuing theory: Queue description, characteristics of a queuing model, study state solutions of M/M/1: \square Model, M/M/1 ; N Model, M/M/C: Model, M/M/C: N Model Case studies.

Learning Out Comes *Demonstrate* the knowledge and understand the various queuing models and formulate concrete problems using queuing theoretical approaches.

Text Books 1. Probability & Statistics for Engineers and Scientists, Walpole, Myers, Myers, Ye. Pearson Education.
 2. Probability, Statistics and Random Processes T.Veerarajan Tata McGraw – Hill.

Reference Books Probability & Statistics with Reliability, Queuing and Computer Applications, Kishor S. Trivedi, Prentice Hall of India ,1999

Course Outcomes:

Upon completion of the Course, students will be able to

- CO1: *Describe* probability distribution for a range of random variables for discrete and continuous and apply the Baye’s theorem on industrial related problems.
- CO2: *Calculate* the different characteristics of probability distribution under different conditions using Binomial, Poisson and Normal.
- CO3: *Calculate* sample related values, identify a statistic and its sampling distribution, and calculate standard error point and interval estimations.
- CO4: *Construct* the hypothesis, identify appropriate test and apply in a range of statistical test.
- CO5: *Apply* characteristics of a queuing model we get solutions of different models case studies.

MCA 1.1.5 MANAGEMENT ACCOUNTANCY		
Instruction: 4 Periods		Credits:4
Internal: 30 Marks	University Exam: 70 Marks	Total: 100 Marks

COURSE OBJECTIVES:

1. Provides a comprehensive introduction to management accountancy with a foundation in accounting concepts
2. A thorough introduction to accounting principles.
3. To give the basics of several different types of accounts and trading.
4. To give the knowledge about computerized accounting system.

UNIT-I

Principles Of Accounting : Nature And Scope Of Accounting, Double Entry System Of Accounting, Introduction To Basic Books Of Accounts Of Sole Proprietary Concern, Closing Of Books Of Accounts And Preparation Of Trial Balance.

LEARNING OUTCOMES:

1. The students will be able to know the basic concepts of management accounting
2. The students will be able to know the basic books of accounts
3. The students will be able to know the closing of books of accounts

UNIT-II

Final Accounts: Trading, Profit And Loss Accounts And Balance Sheet Of Sole Proprietary Concern With Normal Closing Entries. (with numerical problems)

LEARNING OUTCOMES:

1. The students will be able to know the final accounts, and trading.
2. The students will be able to know the profit and loss accounts and balance sheet preparation

UNIT-III

Ratio Analysis: Meaning, Advantages, Limitations, Types Of Ratio And Their Usefulness.(Theory only) Fund Flow Statement: Meaning Of The Term Fund, Flow Of Fund, Working Capital Cycle, Preparation and Inter-preparation Of Statement.

LEARNING OUTCOMES:

1. The students will be able to know the meaning of ratio analysis, advantages and disadvantages and various types of ratio analysis
2. The students will be able to know the meaning of funds flow statement, flow of funds, working capital cycle, preparation and inter-preparation of statement

UNIT-IV

Costing: Nature, Importance And Basic Principles. Budget And Budgetary Control: Nature And Scope, Importance Method Of Finalization And Master Budget, Functional Budgets. Marginal Costing : Nature, Scope, Importance, Construction Of Break Even Chart, Limitations And Uses Of Break Even Chart, Practical Applications Of Marginal Costing. (with numerical problems)

LEARNING OUTCOMES:

1. The students will be able to know the importance, nature and scope of costing, nature, scope and importance of budget, master budget and functional budgets
2. The students will be able to know the importance, nature and scope of marginal costing, construction, limitations and uses of break-even chart
3. The students will be able to know the Practical Applications Of Marginal Costing

UNIT-V

Introduction To Computerized Accounting System: Coding Logic And Codes Required, Master Files, Transaction Files, Introduction To Documents Used For Data Collection, Processing Of Different Files And Outputs Obtained.

LEARNING OUTCOMES:

1. The students will be able to know the Computerized Accounting System
2. The students will be able to know the Master Files, Transaction Files, Documents Used For Data Collection, Processing Of Different Files And Outputs Obtained

Text Books:

Introduction to Accountancy. T.S.Grewal

Management Accountancy, S .P.Jain

Reference Book:

Introduction To Accounting, G.Agarwal.

COURSE OUTCOMES:

1. The students will understand the basics of management accounting and graphics hardware.
2. The students can demonstrate various types of accounts their advantages and disadvantages.
3. The students can create the computerized accounts and obtain the results.

Computer Organization and Architecture Lab

Paper Code	Max. Marks	External Marks 50				Internal Marks 50		Credits
		Record	Viva-Voce	Program Execution	Communication/ Personality	Observation	Mid I+II	
MCA 1.1.6	100	10	20	10	10	20	30	4

Course Objective(s):

1. A student should grasp the basic concepts of computer architecture and organization and understand the key skills of constructing cost-effective computer systems.
2. A student should learn how to quantitatively evaluate different designs and organizations, and provide quantitative arguments in evaluating different designs.

3. A student should be able to articulate design issues in the development of processor or other components that satisfy design requirements and objectives.
4. In addition, a student should experience use of design tools to model various alternatives in computer design.
5. A student should understand the basics of technical writing, and is able to construct a detailed tutorial paper on a selected topic related to computer engineering.

First Cycle : Digital Logic Design Experiments:

1. TTL Characteristics and TTL IC Gates
2. Multiplexers & Decoders
3. Flip-Flops
4. Counters
5. Shift Registers
6. Binary Adders & Subtractors
7. A L U

Second Cycle: 8070 Assembly Language Programming:

1. 8070 Assembly Language Programming according to theory course microprocessors-I using the following trainers : Keyboard Monitor of 8070 μ P Trainer. Graded Problems are to be used according to the syllabus of COMPUTER ORGANIZATION
2. PENTIUM CLASS PC ARCHITECTURE FAMILIARIZATION HARDWARE & SOFTWARE PARTS DEMONSTRATION

Learning objective(s):

1. To understand the structure, function and characteristics of computer systems.
2. To understand the design of the various functional units and components of computers.
3. To identify the elements of modern instructions sets and their impact on processor design.
4. To explain the function of each element of a memory hierarchy
5. To identify and compare different methods for computer I/O.

Course Outcome(s):

1. Demonstrate computer architecture concepts related to design of modern processors, memories and I/Os.
2. Analyze the performance of commercially available computers.
3. To develop logic for assembly language programming

BOOKS RECOMMENDED

1. William Stallings, "Computer Organization and Architecture", Prentice Hall of India, Sixth Edition.
2. A. Tannenbaum, "Structured Computer Organization", Pearson Education, 2002.
3. Patterson & Hennessy, "Computer Organization and Design", Morgan Kaufmann, 2007
4. Ramesh S. Gaonkar, "Microprocessor, Architecture, Programming, and Applications with the 8085", Penram International Publication, 5/e

C PROGRAMMING LAB

Paper Code	Max. Marks	External 50				Internal 50		Credits
		Record	Viva-Voce	Experiment Implementation	Communication/ Personality	Observation	Mid I+II	
MCA 1.1.7	100	10	20	10	10	20	30	4

Course objectives:

- The course aims to provide exposure to problem-solving through programming.
- It aims to train the student to the basic concepts of the C-programming language.
- This course involves a lab component which is designed to give the student hands-on experience with the concepts.

BASIC TECHNIQUES: Swapping of the contents of two variables- Finding the sum of digits of a given number- Reversing a given number.
DECISION MAKING: Finding the largest and the smallest of a given array- solving a quadratic equation- selecting an operation based on a menu.

LOOPING TECHNIQUES& ARRAYS: Finding the sum to n terms of a sine series - Matrix Multiplication- Transpose-Polynomial addition- Polynomial Multiplication- Sorting algorithms- Searching algorithms.

CHARACTERS AND STRING HANDLING Finding the length of string-reversal of string- concatenation of two strings -checking whether it is a palindrome or not- converting upper case alphabets to lowercase and vice versa in a string.

:

POINTERS,	Finding the sum of all elements of an array using pointers-
STRUCTURES AND	Swapping the contents of two variables using pointers- Finding
UNIONS:	the first and second rank holders and printing their names and roll numbers, in a class of 60 students using structures- Defining a complex number as structure and writing a program to illustrate the operations on complex numbers-Some examples of Unions.
FILES & OTHER	Copying and concatenation of files- Bit wise operations -
TOPICS	Command line parameters- C preprocessor directives- Macros.

Reference books:

1. M. G. Venkateshmurthy, Programmin techniques through C, Pearson Education, New Delhi.
2. Ashok N. Kamthane, Programming with ANSI and Turbo C, Pearson Education, New Delhi.
3. Byron s Gottfried, Programming with C, Schaum's Outline series, Tata McGraw Hill. Publishing Company, New Delhi.

Course Out comes:

- Implement fundamental concepts of C language –Decision making and looping techniques.
- Using Array concepts implement Matrix Multification –Transpose ; Polynomial addition- Polynomial Multiplication
- Implement different programs by using pointers, structures and unions concepts
- Implement different searching and sorting techniques.

SYSTEMS PROGRAMMING

Paper Code	Max. Marks	External	MID/Internal	Credits
MCA 1.2.1	100	70	30	4

Course Objectives:

- Learn the system programming process.
- Learn the how to compiler and Assemblers are working.
- Learn the role of macros and Loaders in system programming.
- Understand the role of Operating System.

Unit-1 Introduction to grammars, languages, finite state machines. Introduction to Systems Programming, Introduction to Assembly Language Programming- Introduction to Instruction Formats, Data formats- Role of Base Register, Index Register.

Learning ➤ Understand the concept of Assembly Language programming

Outcomes ➤ Understand the concept of Role of Base Register, Index Register.

Unit-2 Introduction to Assembler, databases used in assembler design, Design of Assembler- Single Pass & Double Pass. Introduction to Macros, various types of Macros, Design of Macro Processor- Single Pass & Double Pass.

Learning ➤ Know the concepts of Design of Assembler- Single Pass & Double Pass

Outcomes

➤ Know the concepts of Design of Macro Processor- Single Pass & Double Pass.

Unit-3 Introduction to Loaders, functions of a loader, types of Loaders, databases used in Loaders, Design of Loaders- Absolute & DLL.

Learning ➤ Know the concepts loaders and Types of Loaders

Outcomes

➤ Know the concepts of design of loaders.

Unit-4 Introduction to compilers: a brief discussion on various phases of compilers. Applications of FSM and grammars in compiler design

Learning ➤ Understand the phase of compilers.

Outcomes

➤ Understand the Applications of FSM



Unit-5 Introduction to Software Tools, Text editors, Interpreters, Program Generators, Debug Monitors.

Learning ➤ Know the concepts of Software Tools.

Outcomes ➤ Know the concepts Text editors and Interpreters

Text Book Systems Programming, Donovan, Tata Mc Graw Hill

Reference:

1. System Programming, Dhamdhare (IInd Revised Edition), Tata Mc Graw Hill
2. System Software, Leland. L. Beck, Pearson Education.

Course Outcomes:

- Understand the Assemblers role in System programming.
- How compilers and Assemblers are working in System programming.
- Understand the Role of Marcos and Loaders in System programming.

DATA STRUCTURES WITH C++

Paper Code	Max. Marks	External	MID/Internal	Credits
MCA 1.2.2	100	70	30	4

Course Objectives:

- Assess how the choice of data structures and algorithm design methods impacts the performance of programs.
- To introduce the concepts of Abstract data Type, data structure, performance measurement,time and space complexities of algorithms.
- Choose the appropriate data structure and algorithm design method for a specified application.
- Solve problems using data structures such as linear lists, stacks, queues, hash tables, binary trees, heaps, binary search trees, and graphs and writing programs for these solutions.
- To discuss the implementation linear data structures such as stacks, queues and lists and their applications.
- To discuss the implementation of different nonlinear data structures such as trees and graphs.
- To introduce various search data structures such as hashing, binary search trees, red black trees, splay trees and b-trees.
- To introduce various internal sorting techniques and analyze their time complexities.

Unit -I	<p>C++ Class Overview- Class Definition, Objects, Class Members, Access Control, Class Scope, Constructors and destructors, parameter passing methods, Inline functions, static class members, this pointer, friend functions, dynamic memory allocation and deallocation (new and delete), exception handling.</p> <p>Function Over Loading, Operator Overloading, Generic Programming-Function and class templates, Inheritance basics, base and derived classes, inheritance types, base class access control, runtime polymorphism using virtual functions, abstract classes, streams I/O.</p>
Learning Outcome	<ul style="list-style-type: none"> ➤ In this the student able to learn to migrate from structured oriented programming to object oriented programming ➤ To learn about object oriented concepts, fundamentals of C++ programming. ➤ The student able to learn How to write programming using C++ concepts.
Unit -II	<p>IntroductiontoDataStructures:AbstractDataTypes,Reviewofstrings, multi-dimensionalarrays,structuresandpointersconceptsin C++.</p> <p>The Stack:SpecificationofADTandprimitiveoperators,Representing Stacks in C++, Applications of Stacks: Infix, Postfix and prefix expression handling.</p> <p>Recursion:RecursionDefinitionandProcesses,Recursionin C++,Writing RecursivePrograms,SimulatingRecursion,EfficiencyofRecursion.</p>
Learning Outcome	<ul style="list-style-type: none"> ➤ To understand the data structures and its categories. ➤ The student able to learn implementation of stacks, applications of stacks. ➤ Understand the use of recursion and its implementation .
Unit -III	<p>QueuesandLists:ThequeuesanditsSequentialRepresentation,Linkedlists, Listsin C++,CircularLinkedlists,Doublylinkedlists.</p>
Learning Outcome	<ul style="list-style-type: none"> ➤ The student able to understand about queues, it's applications and the types of queues. ➤ To learn about lists, it's applications, and types of lists and it's applications.
Unit -IV	<p>Trees:BinaryTrees,BinaryTreeRepresentations,TreesandTheir Applications,Searching:BasicSearchTechnologies,TreeSearching, GraphsandTheirApplications:Graphs,GraphTraversalandSpanning Forests,Prim'salgorithm.</p>
Learning Outcome	<ul style="list-style-type: none"> ➤ To understand about the trees it's representations and it's applications. ➤ The student able to learn different searching techniques in trees. ➤ To understand about graphs, it's applications. ➤ And also learn how to construct minimum spanning tree and it's complexities.
Unit -V	<p>Sorting:GeneralBackground,ExchangeSorts,SelectionandTreeSorting, InsertionSorts,MergeandRadixSorts.</p>

Learning Outcome

- To understand the different sorting techniques, it's teal time examples.
- To understand different types of searching techniques, it's applications and complexities of searching and sorting techniques.

Text Books

1. Object oriented programming with C++ by E. Balaguru Swamy, Tata McGraw-Hill
2. Data structures and Algorithm Analysis in C++, Mark Allen Weiss, Pearson Education. Ltd.,

Reference Books

1. Data structures, Algorithms and Applications in C++, S.Sahni, University Press (India) Pvt.Ltd, 2nd edition, Universities Press Orient Longman Pvt. Ltd.
2. Data structures and Algorithms in C++, Michael T.Goodrich, R.Tamassia and .Mount, Wiley student edition, John Wiley and Sons.

Course Outcomes:

- To get the knowledge about implementation techniques in object oriented programming.
- Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithm.
- Demonstrate different methods for traversing trees.
- Compare alternative implementations of data structures with respect to performance.
- Discuss the computational efficiency of the principal algorithms for sorting, searching, and hashing.

OPERATIONS RESEARCH

Paper Code	Max. Marks	External	MID/Internal	Credits
MCA 1.2.3	100	70	30	4

Course objectives:

This subject will provide students with

- Ability to understand the concepts and importance of Operations Research.
- Knowledge of formulating mathematical models in day to day business operations.
- Skills in improving management by applying Operations Research theories in real life.
- Operations Research models in decision makings.
- Describe the games by using different game strategies.

Unit -I Overview of operations Research: OR models – OR

Techniques Linear Programming: Introduction – Graphical solution; Graphical sensitivity analysis – The standard form of linear programming problems – Basic feasible solutions - unrestricted variables – simplex algorithm – artificial variables – Big M and two phase method – Degeneracy - alternative optima – unbounded solutions – infeasible solutions.

Learning Out Comes Understand the mathematical/ selection methods that are needed to solve optimization problems by using graphs.

Unit -II Dual problems: Relation between primal and dual problems – Dual simplex method

Learning Out Comes Solve linear programming problems from primal to dual by using dual formations or guidelines.

Unit -III Transportation model: starting solutions. North West corner Rule - lowest cost method –Vogels approximation method – Transportation algorithms – Assignment problem – Hungarian Method. Network Models: Definitions – CPM and PERT – Their Algorithms Integer Programming: Branch and Bound Algorithms cutting plan algorithm.

Learning Out Comes Formulate and solve problems as transportation models and networks.

- Develop linear programming models for transportation problems, shortest path model and minimal spanning tree model.
- Use CPM and PERT techniques, to plan, schedule and control project activities.

Unit - IV Dynamic Programming: Recursive nature of dynamic programming - Forward and Backward Recursion.

Learning Out Comes Solve multi level decision problems using dynamic programming method.

- Using fundamentals of dynamic programming and solve forward and backward recursion problems.

Unit-V Deterministic Inventory Models: Static EOQ Models – Dynamic EOQ models. Game theory: Two person Zero Sum Games – Mixed strategy games and their Algorithms.

Learning Out Comes	Propose the best strategy using decision making methods under game theory ➤ Formulate pure and mixed strategy Solve the zero- sum two-person games by algorithms
Text Books	1. Operations Research – An Introduction, Handy A Taha – Pearson Education. [Chapter 1,2,3,4,5 and 6.1, 6.2, 6.7, 9,10, 11, 14] 2. Operations Research Panneer Selvan Prentice Hall ofIndia.
Reference Books	Rader, D. J. 2010, Deterministic Operations Research: Models and Methods in Linear Optimization, J. Wiley & Sons

Course Outcomes:

Upon completion of the Course, students will be able to

- CO1: *Recognize* the importance of Operations Research.
- CO2: *Understands* Operations Research theories and models and their applications to a variety of scenarios.
- CO3: *Use* the knowledge of operations research to solve problems like linear programming problem, transportation problem and assignment problem.
- CO4: *Understand* different application areas of operations research like maximum flow problem, shortest path problem, game theory and queuing theory.
- CO5: *Succeed* in stating whether a problem can be solved using operations research and solving problems using techniques of operations research.

M CA 1.2.4 OBJECT ORIENTED PROGRAMMING WITH JAVA		
Instruction: 4 Periods		Credits:4
Internal: 30 Marks	University Exam: 70 Marks	Total: 100 Marks

SYLLABUS

COURSE OBJECTIVES:

1. To understand Object Oriented Programming concepts, class hierarchy, characteristics of Java, inheritance and polymorphism and become familiar with the relationship between classes and objects in a Java program.
2. Learn programming based on JAVA 7 and above.
3. To write efficient and effective applications in Java, Java's event handling model, graphical user interface (GUI), swing component set, understand the relationship between the AWT and Swing.

4. Have a better understanding of Java's event model and design, build simple Graphical User Interfaces (GUI)s, Java Database Connectivity with JDBC™.

UNIT-I

Object oriented thinking :- Need for oop paradigm, A way of viewing world – Agents, responsibility, messages, methods, classes and instances, class hierarchies (Inheritance), method binding, overriding and exceptions, summary of oop concepts, coping with complexity, abstraction mechanisms. Java Basics History of Java, Java buzzwords, datatypes, variables, scope and life time of variables, arrays, operators, expressions, control statements, type conversion and costing, simple java program, classes and objects – concepts of classes, objects, constructors, methods, access control, this keyword, garbage collection, overloading methods and constructors, parameter passing, recursion, string handling.

LEARNING OUTCOMES:

1. The students will be able to know the basic concepts of Object-Oriented Programming (OOP), benefits and applications of OOP approach
2. The students will be able to know the history and features of JAVA and why JAVA is suitable for Internet Programming and how JAVA can be incorporated into World Wide Web with the help of web browsers
3. The students will be able to know the basic elements of JAVA language and creating and executing the JAVA application programs
4. The students will be able to know the basic data types and operators available in JAVA ,selection statements, loop statements, recursion, use of break and continue statements, classes, objects and methods, arrays and string handling

UNIT-II

Inheritance – Hierarchical abstractions, Base class object, subclass, subtype, substitutability, forms of inheritance- specialization, specification, construction, extension, limitation, combination, benefits of inheritance, costs of inheritance. Member access rules, super uses, using final with inheritance, polymorphism- method overriding, abstract classes. Packages and Interfaces : Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages, differences between classes and interfaces, defining an interface, Implementing interface, applying interfaces, variables in interface and extending interfaces. Exploring packages – Java.io, java.util.

LEARNING OUTCOMES:

1. The students will be able to know the extending of classes, polymorphism, method overriding, abstract classes and implementation of packages and interfaces
2. The students will be able to know the CLASSPATH, types of packages and importing packages and difference between classes and interfaces

UNIT-III

Exception handling and multithreading - Concepts of exception handling, benefits of exception handling, Termination or resumptive models, exception hierarchy, usage of try, catch, throw, throws and finally, built in exceptions, creating own exception sub

classes. Differences between multithreading and multitasking, thread life cycle, creating threads, synchronizing threads, daemon threads, thread groups.

LEARNING OUTCOMES:

1. The students will be able to know the exception handling concepts, benefits of exception handling exception hierarchy, usage of try, catch, throw, throws and finally, built in exceptions, creating own exceptions.
2. The students will be able to know the multithreading and differences between multithreading and multitasking, thread life cycle, creating threads, synchronizing threads, daemon threads and thread groups.

UNIT-IV

Event Handling : Events, Event sources, Event classes, Event Listeners, Delegation event model, handling mouse and keyboard events, Adapter classes, inner classes. The AWT class hierarchy, user interface components- labels, button, canvas, scrollbars, text components, check box, check box groups, choices, lists panels – scrollpane, dialogs, menubar, graphics, layout manager – layout manager types – boarder, grid, flow, card and grib bag.

LEARNING OUTCOMES:

1. The students will be able to know the event handling concepts and delegation event model and adapter classes
2. The students will be able to know the AWT class hierarchy and user interface components

UNIT-V

Applets – Concepts of Applets, differences between applets and applications, life cycle of an applet, types of applets, creating applets, passing parameters to applets. Swing – Introduction, limitations of AWT, MVC architecture, components, containers, exploring swing- JApplet, JFrame and JComponent, Icons and Labels, text fields, buttons – The JButton class, Check boxes, Radio buttons, Combo boxes, Tabbed Panes, Scroll Panes, Trees, and Tables. Networking – Basics of network programming, addresses, ports, sockets, simple client server program, multiple clients, Java .net package Packages – java.util,

LEARNING OUTCOMES:

1. The students will be able to know the internet programming, concepts of Applets, differences between applets and application programs, life cycle of an applet.
2. The students will be able to know the networking and basics of network programming, addresses, ports, sockets, simple client server programming

TEXT BOOKS :

1. Java; the complete reference, 7th editon, Herbert schildt, TMH.

2. Understanding OOP with Java, updated edition, T. Budd, pearson education.

REFERENCES :

1. An Introduction to programming and OO design using Java, J.Nino and F.A. Hosch, John wiley & sons.

2. An Introduction to OOP, second edition, T. Budd, pearson education.

3. Introduction to Java programming 6th edition, Y. Daniel Liang, pearson education.

4. An introduction to Java programming and object oriented application development, R.A. Johnson- Thomson.

5. Core Java 2, Vol 1, Fundamentals, Cay.S.Horstmann and Gary Cornell, seventh Edition, Pearson Education.

6. Core Java 2, Vol 2, Advanced Features, Cay.S.Horstmann and Gary Cornell, Seventh Edition, Pearson Education

COURSE OUTCOMES:

1. The course aims to make the students learn programming in Java. Java language elements and characteristics, including data types, operators, and control structures are discussed in order to make the students develop Java applications.

2. The course also intended for students who would like to learn how to develop internet based applications, graphical user interface (GUI), and graphics in both AWT and SWING.

3. Advanced Java topics discussed helps students writing programs for Java database connectivity with JDBC; Manipulating databases with JDBC; Programming for Internet.

INFORMATION SYSTEM ORGANISATIONAL BEHAVIOUR

Paper Code	Max. Marks	External	MID/Internal	Credits
MCA 1.2.5	100	70	30	4

Course Objectives:

- The student will learn about how the management will manage the organisations and also handle the behaviour of the employee to run the organisation efficiently .
- To provide students with the fundamentals and essentials of management functions.
- To provide students a clear idea what are the various sectors a management has to manage and also various problems in an organisation and handle them.
- To enable students exploring some important management functions which helps to run an organisation and also handle the employe work and improve his skills.

Unit -I **OrganizationalStructureandDesign–
ManagerialCommunicationanditsbarriers– Controlling–
DelegationofAuthorityandInterDepartmentalCo-ordination.**

Learning Out Comes

- While learning this we create a basic idea about the structure of the organisation.
- This unit make student learn how the work flows in a organisation and also the importance of the co ordination of employees.

Unit -II **OrganizationalClimateandCulture–
ManagementofOrganizationalConflicts– TheoriesofMotivation.**

Learning Out Comes

- The students understand how your organization can prepare a best climatic conditions to work.
- The student understand various types of conflicts which occur in a organisation and how to handle them.

Unit -III **GroupDynamics–CharacteristicsofaLeader–LeadershipStyles–Analysisof
InterpersonalRelations.**

Learning Out Comes

- Student learn how to be a leader and their importance.
- Student learns how to have best relations in a organisation.

Unit - IV **MISPerspective–Informationneedsanditsobjectives–
ManagementInformationand
ControlSystems.**

Learning Out Comes

- In this the student understand about the goals of the management
- Student create a awareness about how to control a organisation.

Unit-V **InformationforDecisionMaking–
ConceptualFoundationsofInformationSystems–
InformationResourceManagement.**

- Learning Outcomes
- Understand the factors influences to take a decision.
 - Create student an idea about various resources in organisation and also how to manage them.

Suggested Books for Readings:

1. Elements of organizational Behavior, Robbins, 7th Edition, Pearson Education
2. Information Systems, Alter, Pearson Education
3. Organization and Management - R.D. Agarwal
4. Organization theory and Behaviour - L.M. Prasad
5. Practice and Management - Peter F. Drucker
6. Management Information Systems - Kanter Jerma
7. Computer and Information Management - S.C. Bhatnagar and K.V. Rama Dev

Course Outcomes:

- Understanding the key dimensions of organisation.
- Assessment of the issues present in a organisation implications for our own organisations
- Assessing the employer problems and their solutions along with behaviour to employer's for active participation.

M CA 1.2.6 OBJECT ORIENTED PROGRAMMING LAB		
Instruction: 4 Periods		Credits:4
Internal: 30 Marks	University Exam: 70 Marks	Total: 100 Marks

SYLLABUS

COURSE OBJECTIVES:

1. To make the students learn an object oriented way of solving problems.
2. To make the students to write programs in Java to solve the problems
3. To make the students to write programs in Java so that the programs can run anywhere, on any machine by using internet

PROGRAMS LIST

Week1 :

- a) Write a Java program that prints all real solutions to the quadratic equation $ax^2 + bx + c = 0$. Read in a, b, c and use the quadratic formula. If the discriminant $b^2 - 4ac$ is negative, display a message stating that there are no real solutions.
- b) The Fibonacci sequence is defined by the following rule: The first two values in the sequence are 1 and 1. Every subsequent value is the sum of the two values preceding it. Write a Java program that uses both recursive and non recursive functions to print the nth value in the Fibonacci sequence.

Week 2 :

- a) Write a Java program that prompts the user for an integer and then prints out all prime numbers up to that integer.
- b) Write a Java program to multiply two given matrices.
- c) Write a Java Program that reads a line of integers, and then displays each integer, and the sum of all the integers (Use StringTokenizer class of java.util)

Week 3 :

- a) Write a Java program that checks whether a given string is a palindrome or not. Ex: MADAM is a palindrome.
- b) Write a Java program for sorting a given list of names in ascending order. c) Write a Java program to make frequency count of words in a given text.

Week 4 :

- a) Write a Java program that reads a file name from the user, then displays information about whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file in bytes.
- b) Write a Java program that reads a file and displays the file on the screen, with a line number before each line.
- c) Write a Java program that displays the number of characters, lines and words in a text file.

Week 5 :

- a) Write a Java program that: i) Implements stack ADT. ii) Converts infix expression into Postfix form iii) Evaluates the postfix expression

Week 6 :

- a) Develop an applet that displays a simple message.
- b) Develop an applet that receives an integer in one text field, and computes its factorial Value and returns it in another text field, when the button named “Compute” is clicked.

Week 7 :

Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -, *, % operations. Add a text field to display the result.

Week 8 :

- a) Write a Java program for handling mouse events.

Week 9 :

- a) Write a Java program that creates three threads. First thread displays “Good Morning” every one second, the second thread displays “Hello” every two seconds and the third thread displays “Welcome” every three seconds.
- b) Write a Java program that correctly implements producer consumer problem using the concept of inter thread communication.

Week 10 :

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

Week 11 :

Write a Java program that implements a simple client/server application. The client sends data to a server. The server receives the data, uses it to produce a result, and then sends the result back to the client. The client displays the result on the console. For ex: The data sent from the client is the radius of a circle, and the result produced by the server is the area of the circle. (Use java.net)

Week 12 :

a) Write a java program that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green. When a radio button is selected, the light is turned on, and only one light can be on at a time No light is on when the program starts.

b) Write a Java program that allows the user to draw lines, rectangles and ovals.

Week 13 :

a) Write a java program to create an abstract class named Shape that contains an empty method named numberOfSides (). Provide three classes named Trapezoid, Triangle and Hexagon such that each one of the classes extends the class Shape. Each one of the classes contains only the method numberOfSides() that shows the number of sides in the given geometrical figures.

b) Suppose that a table named Table.txt is stored in a text file. The first line in the file is the header, and the remaining lines correspond to rows in the table. The elements are separated by commas. Write a java program to display the table using Jtable component.

TEXT BOOKS :

1. Java How to Program, Sixth Edition, H.M.Dietel and P.J.Dietel, Pearson Education/PHI
2. Introduction to Java programming, Sixth edition, Y.Daniel Liang, Pearson Education
3. Big Java, 2nd edition, Cay Horstmann, Wiley Student Edition, Wiley India Private Limited.

COURSE OUTCOMES:

1. Student will be able to use OOPs concepts.
2. Ability to apply Inheritance concepts to several problems.
3. Ability to use Exception Handling concepts.
4. Ability to implement Multi Threading concepts
5. Ability to implement Internet Programming

DATASTRUCTURESLAB

Paper Code	Max. Marks	External 50				Internal 50		Credits
		Record	Viva-Voce	Experiment Implementation	Communication/ Personality	Observation	Mid I+II	

MCA 1.2.7	100	10	20	10	10	20	30	4
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Course Objectives:

- To implement stacks and queues using arrays and linked lists.
- To develop programs for searching and sorting algorithms.
- To write programs using concepts of various trees.
- To implement programs using graphs.

LIST OF EXPERIMENTS.

- 1 ADT Stack implementation and use it for evaluation of post-fix expression.
- 2 Conversion of prefix expression into post-fix form using recursion.
- 3 Implementation of circular queue (using array) with menu options like insert, delete, display and exit.
- 4 Implementation of a priority queue (using pointers) and use it to organize student records prioritised by marks.
- 5 Implementation of ADT doubly linked circular list to hold strings and use it for organizing a sequence of cities constituting a tour program.
- 6 Implementation of a binary search tree with menu options: Construct a tree, insert a node, delete a node, traverse and display preorder, inorder and post order sequence of its nodes.
- 7 Implementation of di-graphs using adjacency matrix and find the transitive closure using Warshall's algorithm.
- 8 Implementation of a weighted graph and find minimal cost spanning tree using PRIM's Algorithm.
- 9 Generate 50 random integers in a given range and sort them using quicksort. Apply both binary search and Interpolation search to locate a given integer and compare these search algorithms based on the number of comparisons/probes required for a successful as well as unsuccessful search..
- 10 HeapSort
- 11 MergeSort.
- 12 Implementation of a small Real World Application illustrating DS usage

Course Outcomes:

- Student will be able to write programs to implement stacks and queues.
- Ability to implement various searching and sorting techniques.

- Ability to implement programs using trees and graphs.
- Student will able to write real world application using data structures

Paper Code & Title	Maximum Marks	External	Internal	Credits
MCA 2.1.1 : Artificial Intelligence	100	70	30	4

Course objective(s):

1. Create appreciation and understanding of both the achievements of AI and the theory underlying those achievements.
2. Introduce the concepts of a rational intelligent agent and the different types of agents that can be designed to solve problem.
3. Review the different stages of development of AI field from human like behaviour to rational agent.
4. Improve basic proficiency in representing difficult real life problems in a state space search so as to solve them using AI technique like searching and game playing.
5. Create an understanding of the basic issues of knowledge representation and heuristic search, and other topics minimal, resolution etc. that play an important role in AI.
6. Introduce advance topics of AI such as planning, Bayes network, natural language processing, and cognitive component.

Unit-I

Problems and Search: What is Artificial Intelligence?, The AI Problems, The Underlying Assumption, What is an AI Technique, The Level of the Model, Criteria for Success, Some General References, One Final Word. Problems, Problem Spaces, and Search: Defining the problem state Space Search, Production systems, Problem Characteristics, production system characteristics, issues in the design of search programs, additional problems.

Learning Objective(s): Games, theorem proving, natural language processing, vision, expert systems, AI techniques-search knowledge, State space search; Production systems, search space control: depth-first, breadth-first search, heuristic searches: Hill climbing, best-first search, branch and bound, Problem Reduction.

Unit-II

Heuristic Search Techniques: Generate-and- Test, Hill Climbing, Best- First Search, Problem Reduction, Constraint Satisfaction, Means-Ends Analysis. Knowledge Representation: Knowledge Representation Issues, Representations and Mappings, Approaches to knowledge Representation, Issues in Knowledge Representation, The Frame Problem.

Learning Objective(s):Constraint Satisfaction End, Means-End Analysis, Understand the fundamentals of knowledge representation inference and theorem proving.

Unit-III

Using Predicate Logic: Representing Instance and Isa Relationships, Computable Functions and Predicates, Resolution, Natural Deduction. Representing Knowledge Using Rules: Procedural Versus Declarative knowledge, Logic Programming, Forward versus Back ward Reasoning, Matching, control Knowledge.

Learning Objective(s):Forward reasoning: Conflict resolution, backward reasoning: use of no backtrack, resolution, dependency directed backtracking, understand the fundamentals of knowledge representation inference and theorem proving, working knowledge of reasoning in the presence of incomplete and/or uncertain information.

Unit-IV

Symbolic reasoning under uncertainty: introduction to nonmonotonic reasoning, logics for nonmonotonic reasoning, implementation issues, augmenting a problem solver, DFS, BFS, statistical reasoning: probability, Baye's theorem, certainty factors and rule based theorems, Bayesian networks, Dempster safer theory, Fuzzy logic, Weak slot and filler structure: semantic nets, frames.

Learning Objective(s):Semantic Nets, slots, default frames, conceptual dependency, and scripts. Non-Monotonic Reasoning, Probabilistic reasoning, and use of certainty factors, apply knowledge representation, reasoning, and machine learning techniques to real-world problems.

Unit-V

Strong slot and filler structure: conceptual dependency, scripts, Knowledge Representation
Summary: Semantic Spectrum of Representation, Logic and Slot-and-Filler Structures, Other
Representational Techniques, Summary of the Role of Knowledge.

Learning Objective(s): Concept of learning, learning automation, genetic algorithm,
learning by inductions, neural nets, Ability to carry out independent research and
communicate it effectively.

Course outcome(s):

1. Demonstrate the knowledge of the building blocks of AI as presented in terms of intelligent agents.
2. Analyze and formalize the problem as a state space, graph, design heuristic and select amongst different search or game based technique to solve them.
3. Develop intelligent algorithms for constraint satisfaction problem and also design intelligent systems game playing.
4. Attain the capability to represent various real life problem domains using logic based techniques and use this to perform inference or planning.
5. Formulate and solve problems with uncertain information using Bayesian approaches.
6. Apply concept natural language processing to problems leading to understand of cognitive computing.

MCA 2.1.2 DATA COMMUNICATIONS AND NETWORKING		
Instruction: 4 Periods		Credits:4
Internal: 30 Marks	University Exam: 70 Marks	Total: 100 Marks

SYLLABUS

COURSE OBJECTIVES:

1. Data Communications and Networking forms the fourth semester comprehensive course to be taught to the MCA- IV semester students
2. The aim of the course is to impart knowledge in concepts of Data Communications and Networking, parts of the LANs, WANs, Internet and their applications

UNIT - 1

Introduction: Data communications, Networks, The Internet, Protocol & Standards Network Models: Layered tasks, Internet model, OSI model

LEARNING OUTCOMES:

1. The students will be able to know the general ideas related to both Data Communications and Networking
2. The students will be able to know Data Communication and its components and the types of data exchanged
3. The students will be able to know the Networks, their criteria, structures, types of N/Ws and Internet
4. The students will be able to know the switching shows how small N/Ws can be combined to create larger ones
5. The students will be able to know the standards and standards organizations, protocol layering, five layers of TCP/IP protocol suite and the OSI model

UNIT - II

Physical layer: Signals: Analog and digital signals, data rate limits, Transmission impairment, Signal measurements like throughput, propagation speed and time, wave length Digital Transmission: Line coding, block coding, sampling, transmission mode Analog Transmission: Modulation digital data, telephone modem, Modulation analog signals Multiplexing: FDM, WDM, TDM Transmission Media: Guided media, unguided media Circuit Switching & Telephone Network: Circuit switching, telephone network

LEARNING OUTCOMES:

1. The students will be able to know the functions of the physical layer ie how data and signals can either digital or analog and the attributes of analog and digital signals and data transmission performance
2. The students will be able to know the digital-to-digital and analog-to-digital, digital-to-analog and analog-to-analog conversion techniques and transmission modes
3. The students will be able to know the multiplexing and spectrum spreading, transmission media types, switching types and switch structure

UNIT - III

Data Link Layer: Error detection and Correction: Type of errors, detection and correction of errors Data Link Control & Protocol: Flow & error control, Stop-And-Wait ARQ, GoBack-N ARQ, Select Repeat ARQ, HDLC Point-To-Point Access: Point-to-point protocol, PPP stack Local Area Network: Traditional Ethernet, fast and gigabit Ethernets Connecting LANs, Backbone Networks and Virtual LANs: Connecting devices, Backbone networks, Virtual LANs

LEARNING OUTCOMES:

1. The students will be able to know the data-link layer concepts ie links, nodes, link-layer addressing, types of errors, error detection and correction

2. The students will be able to know the upper sub layer of the data-link layer ie the data-link control (DLC) and services provided by DLC
3. The students will be able to know the wired LAN concepts and Ethernet technology, connecting devices, backbone N/Ws and virtual LANs

UNIT-IV

Network Layer: Internetworks, Addressing, Routing Network Layer Protocols: ARP, IP, ICMP, IPV6 Unicast routing, Unicast routing protocols, Multi routing, Multicast routing protocols

LEARNING OUTCOMES:

1. The students will be able to know the N/W layer concepts and services provided by n/w layer
2. The students will be able to know the packetizing of data , packet switching, IPv4 addressing, forwarding of N/W layer packets and N/W layer performance
3. The students will be able to know the IPv4 protocol, ICMPv4 protocol and the mobile IP
4. The students will be able to know the unicast routing and its protocols, multicast routing and its protocols, IPv6 protocol and ICMPv6 protocol

UNIT-V

Transport Layer: Process-To-Process delivery, user data gram, Transmission control protocol
Application Layer: Client-Server Model: Client-Server model, Socket interface A brief introduction to DNS, SMTP, FTP

LEARNING OUTCOMES:

1. The students will be able to know the transport layer concepts and services provided by transport layer and transport layer protocols
2. The students will be able to know the user datagram protocol (UDP), transmission control protocol (TCP) and stream control transmission protocol (SCTP) and their services
3. The students will be able to know the application layer concepts and services provided by application layer and application layer protocols
4. The students will be able to know the client-server programming, socket programming in C and JAVA
5. The students will be able to know the TCP/IP, FTP, SMTP and POP and the general client-server program TELNET

Text Book:

Data Communications and Networking, Behrouz A. Forouzan, 3rd Edition, Tata McgrawHill Publishing Co

Reference Book:

Understanding Data Communications and Networks, William A Shay, 2nd Edition, Vikas Publishing House

COURSE OUTCOMES:

- 1 The goal of this course is to teach principles of Data Communications and Networking
- 2 This course is designed to help the students understand the basics of Data Communications and Networking in general and the protocols used in the networks such as LANs, WANs and the Internet in particular
- 3 The principles are explained by using the protocol layering of the Internet and the TCP/IP protocol suite
- 4 Explain how the data is transmitted from one layer to another layer and explain how the bits are moving at the physical layer before learning how some programs exchange messages at the application layer

DATABASE MANAGEMENT SYSTEMS

Paper Code	Max. Marks	External	MID/Internal	Credits
MCA 2.1.3	100	70	30	4

Course Objectives:

- Learn and practice data modeling using the entity-relationship and developing database designs.
- Understand the use of Structured Query Language (SQL) and learn SQL syntax.
- Apply normalization techniques to normalize the database
- Understand the needs of database processing and learn techniques for controlling the consequences of concurrent data access

Unit-1. Database Systems Concepts And Architecture: Introduction, data models, schemas and instance; three-schema architecture and data independence; database language and interface, the database system environment; centralized and client/server architecture of DBMSs; classification of DBMSs. Data Modeling Using The E-R Model: High-level conceptual data models for database design; Entity types, entity sets, attributes and keys; relationship types, relationship sets, roles and structural constraint; weak entity types, ER diagrams, naming conventions and design issues; Notation for UML class diagrams.

- Learning Outcomes**
- Know the concepts of three-schema architecture
 - Know the concepts of E-R Model and ER diagrams.
 - Know the concepts UML class diagrams.

Unit-2 Enhanced ER And UML Modeling: Subclasses, super classes and inheritance; specialization and generalization; constraints and characteristics of specialization and generalization, modeling of union types using categories; representing specialization/ generalization and inheritance in UML class diagrams; relationship types of degree higher than two; data abstraction, knowledge representation and ontology concepts The Relational Data Model And Relational Database Constraints: Relational model concepts, relational model constraints and relational database schemas; updating operations and dealing with constraints violations.

- Learning Outcomes**
- Know the concepts of Enhanced ER and UML Modeling
 - Know the concepts of characteristics of specialization and generalization

Unit-3 The Relational Algebra and Relational Calculus Unary relational operations: SELECT and PROJECT; relational algebra operations from set theory; binary relational operations: JOIN and DIVISION; additional relational operations; the tuple relational calculus; the domain relational calculus Relational Database Design By ER and EER-To-Relational Mapping: Relational database design using ER-to-Relational mapping; mapping EER model constructs to relations.

- Learning Outcomes**
- Know the concepts of Relational Algebra and Relational Calculus.
 - Know the concepts of ER and EER-To-Relational Mapping.

Unit-4 Functional Dependencies And Normalization For Relational Databases: Informal design guidelines for relational schemas; functional dependencies; normal forms based on primary keys; general definitions of 2nd and 3rd normal forms; Boyce- Codd normal forms Transaction Processing Concepts: Introduction to transaction processing; transaction and system concepts; desirable properties of transaction; characteristics schedule based on recoverability; characteristics schedule based on serializability.

- Learning Outcomes**
- Know the concepts of Functional Dependencies.
 - Know the concepts Normalization for Relational Databases.
 - Know the concepts of transaction processing

Unit-5 Concurrency Control Techniques: Two phase locking techniques for concurrency control; concurrency control based on timestamp ordering; multi-version concurrency control techniques; validation (optimistic) concurrency control techniques; granularity of data items and multigranularity locking. Database Recovery Techniques: Recovery concepts; recovery techniques based on deferred updates; recovery techniques based on immediate update; shadow paging; the ARIES recovery algorithm.

- Learning Outcomes**
- Know the concepts of Concurrency Control Techniques.
 - Know the concepts of Database Recovery Techniques.

Text Book Fundamentals of Database Systems Ramez Elmasri and Shamkant B. Navathe, 4th edition, Pearson education.

Reference: Database Concepts, Abraham Silberschatz, Henry F Korth, S.Sudarshan, McGraw-Hill

Course Outcomes:

- The learner will be able:
- To describe data models and schemas in DBMS
- To understand the features of database management systems and Relational database.
- To use SQL-the standard language of relational databases.
- To understand the functional dependencies and design of the database.
- To understand the concept of Transaction and Query processing.

DESIGN AND ANALYSIS OF ALGORITHMS

Paper Code	Max. Marks	External	MID/Internal	Credits
MCA 2.1.4	100	70	30	4

Course Objectives

- Analyze the asymptotic performance of algorithms.
- Write correctness proofs for algorithms.
- Demonstrate a familiarity with major algorithms and data structures.

- Apply important algorithmic design paradigms and methods of analysis.
- Synthesize efficient algorithms in common engineering design situations.

Unit-1. Introduction:- Notion of Algorithm– Algorithmic Problem solving (1.1, 1.2). Analysis of Algorithm Efficiency:- Analysis framework– Asymptotic notations– Analysis of Non-recursive and recursive algorithms (2.1,2.4)

Learning Outcomes ➤ Understand the fundamental concepts of Design and analysis of Algorithms.

Unit-2 . Divide and Conquer:- Merge sort– Quick Sort– Binary search– Large integer Multiplication and Strassen's Matrix multiplication-closest pair and convex Hull problems (4.1 to 4.3,4.5 to 4.6) Decrease and conquer:- DFS and BFS, Topological sorting, Decrease– by–a– Constant- factor Algorithms, variable– size– Decrease Algorithms- (5.2,5.3, 5.5, 5.6) Transform and conquer:- Horner's Rule and Binary Exponentiation– Problem Reduction– (6.5, 6.6)

Learning ➤ Know the concepts of sorting and searching

Outcomes ➤ Know the concepts divide and conquer techniques

Unit-3. Space and Time Trade offs: - Input Enhancement in String Matching (7.2) Dynamic Programming:- Warshall's and Floyd's Algorithm– Optional Binary Search Trees– knapsack Problem (8.2 to 8.4)

Learning Outcomes ➤ Know the concepts of binary search trees and Dynamic programming algorithms.

Unit- 4. Greedy Technique: - Prim's and Kruskal's Algorithms, Dijkstra's Algorithm, Huffman Trees (9.1 to 9.4)

Learning ➤ Know the concepts of Greedy Technique.

Outcomes

Unit-5. Limitations of Algorithm Power:- Lower Bound Arguments– Decision Trees– P, NP and NP Complete problems (10.1 to 10.3) Coping with limitations of Algorithmic Power:- Backtracking, Branch and Bound, Approximation Algorithms for NP– hard problems (11.1 to 11.3)

Learning ➤ Know the concepts of , NP and NP-Complete problems.

Outcomes

Text Book: Introduction to the design and analysis of Algorithms, Anany Levitin : PearsonEducation, 2003.

Reference Books:

1. Fundamentals of Computer Algorithms, Horowitz and Sahni, Galgothia publications.
2. Introduction to Algorithms, Cormen, Leiserson and Rivest : Prentice Hall of India.

Course outcomes:

- Explain fundamental concepts of asymptotic notations of an algorithm divide and conquer techniques
- Know various design and analysis techniques such as greedy algorithms, dynamic programming.
- Understand the techniques used for designing of different graph algorithms.
- Apply backtracking, branch and bound techniques for real time problems.
- Know the concepts of P, NP and NP-Complete problems.

OPERATING SYSTEMS

Paper Code	Max. Marks	External	MID/Internal	Credits
MCA 2.1.5	100	70	30	4

Course objective:

- To introduce students with basic concepts of Operating System, its functions and services.
- To familiarize the students with various views and management policies adopted by O.S. as pertaining with processes , Deadlock , memory , File and I/O operations.

- To brief the students about functionality of various OS like Unix , Linux and Windows XP as pertaining to resource management.
- To provide the knowledge of basic concepts towards process synchronization and related issues.

Unit-I Introduction, Computer System structures, Operating systems structures

- Learning outcomes
- Understand what is an operating system and the role it plays
 - Understanding of the structure of operating systems, applications, and the relationship between them.
 - Some knowledge of the services provided by operating systems.
 - Exposure to some details of major OS concepts.

Unit-II **Process Management**
Processes, Threads, CPU scheduling, Process synchronization, Deadlocks

- Learning outcomes
- The student able to learn what is process and how it is working
 - The student able to learn how the process are scheduling, different scheduling algorithms its throughput, waiting and response times.
 - The student able to understand the deadlock, deadlock detection, avoidance techniques, recovery techniques.

Unit-III **Storage Management**
Memory management, Virtual memory, filesystem

- Learning outcomes
- To understanding about storage management. Implementation of paging, segmentation, and segmentation with paging.
 - The student able to learn the concept of virtualization, implementation of virtualization, page replacement algorithms and its implementation.
 - To understand file operations, file access methods and directory structures.
 - To understand about file allocation methods.

Unit-IV I/O systems, Mass-storage structure

- Learning outcomes
- The student able to learn the I/O system and bus structure, the use of interrupt.
 - Also familiar with disc scheduling and disc management.

Unit-V Protection and Security

- Learning outcomes
- To understand about goal of protection, domain of protection and understand access matrix and it's use, implementation of access matrix.
 - To understand the security problems, encryption password protection.
 - The student able to learn about System Threads, worms, Viruses.

Course outcomes:

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

- Appreciate the role of operating system as System software.
- Compare the various algorithms and comment about performance of various algorithms used for management of memory, CPU scheduling, File handling and I/O operations.
- Apply various concept related with Deadlock to solve problems related with Resources allocation, after checking system in Safe state or not.
- To appreciate role of Process synchronization towards increasing throughput of system.
- Describe the various Data Structures and algorithms used by Different Oss like Windows XP , Linux and Unix pertaining with Process , File , I/O management.
- To control the behavior of OS by writing Shell scripts.

OPERATING SYSTEMS LAB

Paper Code	Max. Marks	External 50				Internal 50		Credits
		Record	Viva-Voce	Experiment Implementation	Communication/ Personality	Observation	Mid I+II	
MCA 2.1.6	100	10	20	10	10	20	30	4

Course Objectives

- To familiarize students with the architecture of Unix OS.
- To provide necessary skills for developing and debugging programs in UNIX environment.

1. Study of laboratory environment:
Hardware specifications, software specifications
2. Simple Unix-C programs:
Programs using system calls, library function calls to display and write strings on standard output device and files.
3. Programs using fork system calls.
2. Programs for error reporting using `errno`, `perror()` function.
3. Programs using pipes.
4. Shell programming.
5. Programs to simulate process scheduling like FCFS, Shortest Job First and Round Robin.
6. Programs to simulate page replacement algorithms like FIFO, Optimal and LRU.
7. Programs to simulate free space management.

8. Programstosimulatevirtualmemory.
10. Programstosimulatedeadlockdetection.

The Learning Outcomes of this lab is:

After completion of the course the student would be able to

- Appreciate the advantages of Unix OS.
- Develop and debug, C programs created on UNIX platforms.
- Use and if necessary install standard libraries.

Database Management Systems LAB

Paper Code	Max. Marks	External 50				Internal 50		Credits
		Record	Viva-Voce	Experiment Implementation	Communication/ Personality	Observation	Mid I+II	
MCA 2.1.7	100	10	20	10	10	20	30	4

Course Objectives:

- To give a good formal foundation on the relational model of data and usage of Relational Algebra.
- To introduce the concepts of basic Structured Query Language (SQL) as a data definition language, data manipulation language, and data control language
- To enable the design of an efficient database using normalization concepts.
- To enable students to be create indexes for databases for efficient retrieval.

Course Description:

This course explores database programming using both native and embedded ANSI-standard Structured Query Language (SQL). Topics include enterprise database management systems, database middleware, data definition language, data manipulation language, data control language, database queries reporting, query optimization, and database views. Student assignments include database creation, query design and programming, and database manipulation via embedded SQL calls from a programming language.

Course Goal: Successful graduates of this course should be able to:

- Understand the fundamentals of a relational database
- Understand the fundamentals of client-server and multi-tiered applications
- Understand the use of Structured Query Language (SQL) as a data definition language, data manipulation language, and data control language
- Understand and write SQL /PL_SQL queries to create, report, and update data in a relational database
- Understand the purpose of and be able to create views, scripts, triggers, and transactions
- Understand and be able to implement the fundamentals of security and permissions in SQL Server
- Design entity relationship models for a business problem and develop a normalized database structure
- Using Oracle or DB2 under Windows platform and My SQL under Linux/Unix platform

Reference Books:

1. Introduction to Relational Databases and SQL Programming, Christopher Allen, Simon Chatwin, Catherine A. Vreary Tata McGraw-Hill
2. Oracle SQL and PL/SQL Hand book, John Adolph Palinski, Pearson Education
3. Oracle 9i PL/SQL Programming, Scott Urman, Tata McGraw-Hill
4. MySQL: The Complete Reference, Vikram Vaswani, Tata McGraw-Hill
5. MySQL Bible, Steve Suehring, Wiley.

Course out comes:

- Understand DBMS concepts, data models and Architecture.
- Use SQL for database management.
- Understand ER concepts and ER mapping to relational model
- Apply the concepts of relational algebra and calculus.
- Apply normalization process to construct the data base.
- Understand Concurrency and recovery strategies of DBMS

Paper Code & Title	Maximum Marks	External	Internal	Credits
MCA 2.2.1: Cryptography and Network Security	100	70	30	4

Course Objectives:

1. To develop an understanding of cryptography.
2. To develop an understanding of cryptography algorithms and message digest.
3. To gain an understanding of the authentication.
4. To develop skills in modular design and the implementation of standards.
5. To develop skills in electronic mail and leftovers.

Unit – I

INTRODUCTION: Terminology— notation-primer on networking- types of attacks- Layer and cryptography-Authorization-Key Escrow-Viruses, worms and Trojan Horses- Multi Level mode of security-legal issues.

Learning Objective(s): Students demonstrate basic understanding and we have tried our best to make the descriptions of the actual cryptographic algorithms nonthreatening yet through, it is intended to be readable by any one and Identify work station and network security threats, classify the threats and develop a security model to prevent, detect and recover from the attacks.

Unit – II

Secrete key cryptography, Public key cryptography, Hash algorithm, DES, IDEA, AES, Modes of operations, Message digest: MD2, MD4, MD5, and SHA1. RSA, Deffie Hellamn, DSS, ECC.

Learning Objective(s): Students demonstrate the ability of using security handshake pitfalls deals with the details of authentication handshakes and describe variations of authentication handshakes and their relative security and performance strengths, Encrypt and decrypt messages using block ciphers, sign and verify messages using well known signature generation and verification algorithms.

Unit – III

AUTHENTICATION: Password based authentication, address based authentication, Cryptographic authentication Protocols, Passwords as cryptographic keys, trusted Intermediaries, certificate revocation, Multiple trusted Intermediaries, Session Key establishment, Delegation.

Learning Objective(s): Analyse existing authentication and key agreement protocols, identify the weaknesses of these protocols.

Unit – IV

STANDARDS: Kerberos V4-Kerberos V5-Public Key Infrastructure-Real Time communication Security-IPsec: AH and ESP-IPsec: IKE – SSL/TLS

Learning Objective(s): Various organizations have been involved in the development or promotion of these standards. The most important of these organizations are: NIST (National Institute of standards and Technology), ISOC(Internet Society), ITU (The international telecommunication Union), ISO(International Organization for standardization). Develop SSL or Firewall based solutions against security threats, employ access control techniques to the existing computer platforms such as Unix and Windows NT.

Unit – IV

ELECTRONIC MAIL: E- Mail Security-PEM & S/MIME and PGP

Learning Objective(s): Web issues talk about the protocols involved in web surfing: URLs, HTTP, HTML, cookies, etc. and the security issues, download and install an e-mail and file security software, PGP, and efficiently use the code to encrypt and sign messages.

Program outcome(s):

1. Students understand the major components of generic properties of secret key, message digest, public key algorithms, how each is used and provide conceptual understanding of network security issues, challenges and mechanisms.
2. Proving your identity across a network. Authentication of people deals with the special circumstances when the device proving its identity and develop basic skills of secure network architecture and explain the theory behind the security of different cryptographic algorithms.
3. Standards cover management practices and the overall architecture of security mechanisms and services and describe common network vulnerabilities and attacks, defense mechanisms against network attacks, and cryptographic protection mechanisms.

- Electronic Mail Security describes the various types of security features one might want and how they might be provided and explore the requirements of real-time communication security and issues related to the security of web services.

Text Book: Network Security Private Communication in a public world, Charlie Kaufman, Radia Perlman & Mike Speciner, Pearson Education / Prentice Hall of India Private Ltd., New Delhi. (Chapters: 1 to 6, 9, 13 to 22).

Reference Book: Network Security Essentials Applications and Standards, William Stallings, Pearson Education, New Delhi.

Paper Code & Title	Maximum Marks	External	Internal	Credits
MCA 2.2.2: Web Technologies	100	70	30	4

Course Objective(s):

- Students are able to develop a dynamic webpage by the use of java script and DHTML.
- able to write a well formed / valid XML document and to connect a java program to a DBMS and perform insert, update and delete operations on DBMS table.
- able to write a server side java application called Servlet to catch form data sent from client, process it and store it on database.
- Students will be able to write a server side java application called JSP to catch form data sent from client and store it on database.

Unit-1

Introduction to HTML , Core Elements , Links and Addressing, Images , Text , Colors and Background, Lists, Tables and Layouts , Frames, Forms , Cascading Style Sheets

Learning Outcome(s):

Unit-2

Introduction to Java Scripts, Elements of Objects in Java Script, Dynamic HTML with Java Script. Document type definition, XML Syntax, XML Schemas, Document Object model, Presenting XML, Using XML Processors

Learning Outcome(s):

Unit-3

JDBC OBJECTS- JDBC Driver Types, JDBC Packages, Database Connection, Statement Objects, Result Set. JDBC and Embedded SQL - Tables, Inserting Data into Tables , Selecting Data from

a Table, Meta Data ,Updating Table , Deleting data from Table , Joining Table , Calculating Data, Grouping and Ordering Data , Sub quires ,View.

Learning Outcome(s):

Unit-4

Introduction to Servlet, Servlet Life Cycles, Servlet Basics, Tomcat Web Server, Configuring Apache Tomcat, Handling Client Request and Response, Handling Cookies, Session Tracking Introduction to JSP, Benefits of JSP, Basic Syntax, Invoking Java code with JSP Scripting Elements, JSP Page Directive, Including Files in JSP Pages

Learning Outcome(s):

Unit-5

Introduction to Java Beans, Using JAVA Bean Components in JSP Documents, MVC Architecture.

Learning Outcome(s):

Text Books:

1. Web Programming, building internet applications, 2nd Ed., Chris Bates, Wiley Dreamtech
2. The complete Reference HTML and DHTML, Thomas A. Powey
3. The complete Reference J2ME, James Keogh
4. Core Servlets and Java Server Pages, Marty Hall Larry Brown, Second Edition

Reference Books:

1. Internet , World Wide Web , How to program, Dietel , Nieto, PHI/PEA
2. Web Tehnologies, Godbole, Kahate, 2nd Ed., TMH

Course Outcome(s):

1. Design and implement dynamic websites with good aesthetic sense of designing and latest techniques.
2. Have a good grounding of web application terminologies, internet tools, E-Commerce and other web services.
3. Introduce in the area of online game programming.

MCA 2.2.3 OBJECT ORIENTED SOFTWARE ENGINEERING		
Instruction: 4 Periods		Credits:4
Internal: 30 Marks	University Exam: 70 Marks	Total: 100 Marks

SYLLABUS

COURSE OBJECTIVES:

1. Object-Oriented Software Engineering forms the fifth semester comprehensive course to be taught to the MCA-V semester students
2. The aim of the course is to impart knowledge in the concepts of Object-Oriented Software Engineering
3. To provide the knowledge for several different types of Object-Oriented techniques applied to Software Engineering
4. To focus on a limited set of techniques and explain their applications

UNIT-1

Software Engineering: Software related problems, software engineering, concepts, development activities Modeling: Concepts, Modeling with UML

LEARNING OUTCOMES:

1. The students will be able to know Software Engineering, and related problems
2. The students will be able to know software engineering concepts, Modelling Concepts, and UML

UNIT-II

Project Organization & Communication: Project Organization & communication concepts and their activities Requirements: Requirements elicitation & its activities and managing requirements elicitation

LEARNING OUTCOMES:

1. The students will be able to know the Project Organization and Communication concepts
2. The students will be able to know the Requirements elicitation and its activities

UNIT-III

Analysis: Analysis overview, concepts, activities and managing analysis System Design: Design overview, concepts, and activities, addressing design goals and managing system design

LEARNING OUTCOMES:

1. The students will be able to know the Analysis concepts and activities
2. The students will be able to know the System Design concepts and activities
3. The students will be able to know the design goals

UNIT-IV

Object Design: Object reuse, its activities & managing reuse, Interface specification concepts & its activities and Managing object design Testing; Testing concepts, activities and managing testing

LEARNING OUTCOMES:

1. The students will be able to know the Object reuse and its activities
2. The students will be able to know the Interface specification concepts and its activities
3. The students will be able to know the Testing concepts and activities

UNIT-V

Software Configuration Management: Configuration Management overview, concepts, activities and managing configuration management

LEARNING OUTCOMES:

1. The students will be able to know the Software Configuration Management overview, concepts
2. The students will be able to know the Software Configuration Management activities

Text Book:

Object-Oriented Software Engineering: Using UML, Patterns and Java, Bernd Bruegge and Allen H. Dutoit, 2nd Edition, Pearson Education Asia

Reference Book:

1. Object-Oriented Software Engineering: Practical software development using UML and Java Timothy C. Lethbridge and Robert Laganier , McGraw-Hill Higher education
2. An Introduction to Object Oriented Systems Analysis and Design with UML and the Unified Process, Stephen R Schach, Tata McGraw-Hill

COURSE OUTCOMES:

1. This course is designed to help the students understand the basics of Object-Oriented Software Engineering concepts
2. To explain Software Engineering must be linked with practical experience
3. To explain Software Engineering must be based on problem solving process with limited resources
4. To know that Software Engineering is an interdisciplinary field

Paper Code & Title	Maximum Marks	External	Internal	Credits
MCA 2.2.4: Data Ware Housing and Data Mining	100	70	30	4

Course Objectives

- Identify the scope and necessity of Data Mining & Warehousing for the society.
- Describe the designing of Data warehousing so that it can be able to solve the root problems.
- To understand various tools of Data Mining and their techniques to solve the real time problems.
- To develop ability to design various algorithms based on data mining tools.
- To develop further interest in research and design of new Data Mining techniques.

Unit-1

Introduction to Data Mining: Motivation and importance, what is Data Mining, Relational Databases, Data Warehouses, Transactional Databases, Advanced Database Systems and Advanced Database Applications, Data Mining Functionalities, Interestingness of a pattern Classification of Data Mining Systems, Major issues in Data Mining.

Learning Outcomes

- Understand the basic concepts of data warehouse and data mining

Unit-2

Data Warehouse and OLAP Technology for Data Mining What is a Data Warehouse? Multi-Dimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, Development of Data Cube Technology, Data Warehousing to Data Mining.

Learning Outcomes

- Understand the OLAP Technology for Data Mining.
- Understand the Data Warehouse Architecture.
- Understand the Data Cube Technology.

Unit-3

Data Preprocessing Why Pre-process the Data? Data Cleaning, Data Integration and Transformation Data Reduction, Discretization and Concept Hierarchy Generation Data Mining Primitives, Languages and system Architectures Data Mining Primitives: What defines a Data Mining Task? A Data Mining query language Designing Graphical Use Interfaces Based on a Data Mining Query language Architectures of Data Mining Systems.

Learning Outcomes

- Know the concepts of data pre processin techniques Data cleaning.
- Know the concepts Data and Transformation, Reduction, Data integration
- Know the concepts of Data Mining Query language.

Unit-4

Concept Description: Characterization and comparison what is Concept Description? Data Generalization and summarization-based Characterization, Analytical Characterization: Analysis of Attribute Relevance, Mining Class Comparisons: Discriminating between different Classes, Mining Descriptive Statistical Measures in large Databases Mining Association rule in large Databases Association Rule Mining, Mining Single-Dimensional Boolean Association Rules from Transactional Databases, Mining Multilevel Association Rules from Transaction Databases, Mining Multidimensional Association Rules from Relational Databases and Data Warehouses, From Association Mining to Correlation Analysis, Constraint-Based Association Mining

Learning Outcomes

Analyze transaction databases for association rules.

Unit-5

Classification and prediction Concepts and Issues regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Classification by Back propagation, Classification Based on Concepts from Association Rule Mining, Other Classification Methods like k-Nearest Neighbor Classifiers, Case-Based Reasoning, Generic Algorithms, Rough Set Approach, Fuzzy Set Approaches, Prediction, Classifier Accuracy Cluster Analysis What is Cluster Analysis? Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods

Learning Outcomes

- Understand various clustering techniques for categorizing data.
- Understand various classification techniques for categorizing data.

Text Book

Data Mining Concepts and Techniques, Jiawei Han and Micheline Kamber, Morgan Kaufman Publications.

Reference Books: 1. Introduction to Data Mining , Adriaan , Addison Wesley Publication
2. Data Mining Techniques, A.K.Pujari ,University Press

Course outcomes:

- Understand the concepts of data warehouse and data mining.
- Use data pre processing techniques to build data warehouse.
- Analyze transaction databases for association rules.
- Use classification methods and prediction techniques on transaction databases.
- Understand various clustering techniques for categorizing data.

- Understand methods for outlier analysis.

DISTRIBUTED SYSTEMS

Elective-I

Paper Code	Max. Marks	External	MID/Internal	Credits
MCA 2.2.5A	100	70	30	4

Course Objectives:

- It provides an introduction to the fundamentals of distributed computer systems, assuming the availability of facilities for data transmission.
- The structure of distributed systems using multiple levels of software is emphasized.
- Use of distributed file systems, distributed databases, security and protection, distributed services such as the world-wide web, and examples of research and commercial distributed systems

Unit -I **Characterization of Distributed Systems:-** Introduction, Examples of distributed systems, Resource sharing and the Web, Challenges.
System models:- Introduction, Architectural models, Fundamental models.
Networking and Internetworking :- Introduction, Types of network, Network principles, Internet protocols, Network case studies: Ethernet, wireless LAN and ATM.

Learning Out Comes ➤ The student able to understand several examples of modern distributed applications, including web search, multiplayer online games and financial trading systems
 ➤ To understand the principles on which computer networks are based include protocol layering, packet switching, routing and data streaming. Internetworking techniques enable heterogeneous networks to be integrated

Unit -II **Interprocess communication:-** Introduction, The API for the Internet protocols, External data representation and marshalling, Client-server communication, Group communication, Case study: Interprocess communication in UNIX.
Distributed Objects and Remote Invocation: Introduction, Communication between distributed objects, Remote procedure call, Events and notifications, Java RMI case study.

Learning Out ➤ The student able learn characteristics of protocols for communication

Comes between processes in a distributed system

- The student will be examining the most primitive service, request-reply communication, which represents relatively minor enhancements to the underlying interprocess communication primitives.

Unit -III

DistributedFileSystems:-Introduction,Fileservicearchitecture,Sun Networkfilesystem,TheAndrewFileSystem,Recentadvances.
NameServices:-Introduction,NameservicesandtheDomainNameSystem, Directoryanddiscoveryservices,CasestudyoftheGlobalNameService, CasestudyoftheX.700DirectoryService.
TimeandGlobalStates:-Introduction,Clocks,eventsandprocesstates, Synchronizingphysicalclocks,Logicaltimeandlogicalclocks,Globalstates, Distributeddebugging.

Learning Out Comes

- To understand simple architecture for file systems and describe two basic distributed file service implementations with contrasting designs that have been in widespread use for over two decades: 1) the Sun Network File System, NFS; 2) the Andrew File System, AFS
- To learn about the name service as a distinct service that is used by client processes to obtain attributes such as the addresses of resources or objects when given their names.

Unit - IV

CoordinationandAgreement:-Introduction,Distributedmutualexclusion, Elections,Multicastcommunication,Consensusandrelatedproblems.
TransactionsandConcurrencyControl:-Introduction,Transactions, Nestedtransactions,Locks,Optimisticconcurrencycontrol,Timestamp ordering,Comparisonofmethodsforconcurrencycontrol.

Learning Out Comes

- Understand about algorithms related to the issue of how processes coordinate their actions and agree on shared values in distributed systems, despite failures.
- To understand the related problems of group communication, consensus, Byzantine agreement and interactive consistency.
- The student able to understand the application of transactions and concurrency control to shared objects managed by servers.

Unit-V

DistributedTransactions:-Introduction,Flatandnesteddistributed transactions,Atomiccommitprotocols,Concurrencycontrolindistributed transactions,Distributeddeadlocks,Transactionrecovery.
Replication:-Introduction,systemmodelandgroupcommunication,fault-tolerantservices,Highlyavailableservices,Transactionswithreplicateddata.

Learning Out Comes

- To understand the two-phase commit protocol, which is the most commonly used atomic commit protocol.
- Understand the section on concurrency control in distributed

transactions discusses how locking, timestamp ordering and optimistic concurrency control may be extended for use with distributed transactions.

- The use of locking schemes can lead to distributed deadlocks.
- Understand approaches to achieving fault tolerance.
- To learn the correctness criteria of linearizability and sequential consistency, then explores two approaches: passive (primary-backup) replication, in which clients communicate with a distinguished replica; and active replication, in which clients communicate by multicast with all replicas.

Text Books Distributed Systems – Concepts and Design, George Coulouris, Jean Dollimore, Tim Kindberg, Pearson Education.

Reference Book Distributed Systems – Principles & Paradigms, Andrew S. Tenenbaum, Marten Van Steen, Pearson Education.

Course Outcomes:

- The student will learn a range of fundamental and applied techniques in distributed systems.
- Apply knowledge of distributed systems techniques and methodologies.
- Explain the design and development of distributed systems and distributed systems applications.
- Use the application of fundamental Computer Science methods and algorithms in the development of distributed systems and distributed systems applications.
- Discuss the design and testing of a large software system, and to be able to communicate that design to others.

CLOUD COMPUTING

Elective-I

Paper Code	Max. Marks	External	MID/Internal	Credits
MCA 2.2.5B	100	70	30	4

Course Objectives:

- The student will learn about the cloud environment, building software systems and components that scale to millions of users in modern internet, cloud concepts capabilities across the various cloud service models including IaaS, PaaS, SaaS, and developing cloud based software applications on top of cloud platforms.
- To provide students with the fundamentals and essentials of Cloud Computing.

- for, when you don't want to use it, and some security issues.
- And also highlight some popular cloud vendors and discuss what they offer.

Unit - IV

Software as a Service - Overview, Driving Forces, Company Offerings, Industries Software plus Services - Overview, Mobile Device Integration, Providers, Microsoft Online. Developing Applications - Google, Microsoft, Intuit QuickBase, Cast Iron Cloud, Bungee Connect, Development, Troubleshooting, Application Management.

Learning Out Comes

- In this the student under the hood of SaaS and examine the pros and cons of it. And specific vendors are offering SaaS, and then how SaaS exists in different industries.
- The student able to learn the ups and downs of Software plus Services, and we'll spend some extra time looking at Microsoft's solution, which employs an in-depth use of Software plus Services.
- The student able to learn the different cloud offerings out there. Varying levels of intricacy and functionality are available. For instance, you can write an app and host it on the Google App Engine in a few while other clouds are more complex, but offer more features. Some clouds cater to specific needs, like Intuit's QuickBase, which allows you to develop financial-based cloud apps.

Unit-V

Local Clouds and Thin Clients - Virtualization in Your Organization, Server Solutions, Thin Clients, Case Study: McNeilus Steel. Migrating to the Cloud - Cloud Services for Individuals, Cloud Services Aimed at the Mid-Market, Enterprise-Class Cloud Offerings, Migration, Best Practices and the Future of Cloud Computing - Analyze Your Service, Best Practices, How Cloud Computing Might Evolve.

Learning Out Comes

- Understand the virtualization and its benefits.
- To get knowledge about leading technologies driving virtualization and talk about a company that decided to move from the conventional hub-and-spoke configuration to a virtualized environment.
- And also understand the migration tools and strategies for people at different levels—starting with individuals and small groups, then moving to mid-sized organizations, and then finally to considerations for enterprise-sized groups.

Text Books

Cloud Computing-A Practical Approach, Anthony T. Velte, Toby J.

Velte, Robert Elsenpeter. McGrawHill.

Course Outcomes:

- Understanding the key dimensions of the challenge of Cloud Computing
- Assessment of the economics , financial, and technological implications for selecting cloud computing for own organization
- Assessing the financial, technological, and organizational capacity of employer’s for actively initiating and installing cloud-based applications.
- Assessment of own organizations’ needs for capacity building and training in cloud computing-related IT areas

Web Technologies Lab

Paper Code	Max. Marks	External Marks 50				Internal Marks 50		Credits
		Record	Viva-Voce	Program Execution	Communication/ Personality	Observation	Mid I+II	
MCA 2.2.6	100	10	20	10	10	20	30	4

1. Design of the Web pages using various features of HTML and DHTML
2. Client server programming using Servlets, ASP and JSP on the server side and java script on the client side
3. Web enabling of databases
4. Multimedia effects on web pages design using Flash.
5. Case Study: Design & Development of Websites with Database Connectivity and Multimedia Effects

Reference Books:

1. Internet and Web Technologies by Raj Kamal, Tata McGraw-Hill
2. Programming the World Wide Web by Robert W. Sebesta, Pearson Education

MCA 2.2.7 OBJECT ORIENTED SOFTWARE ENGINEERING LAB		
Instruction: 4 Periods		Credits:4
Internal: 30 Marks	University Exam: 70 Marks	Total: 100 Marks

SYLLABUS

COURSE OBJECTIVES:

1. The purpose of the Software Engineering Lab course is to familiarize the students with modern software engineering methods and tools, Rational Products.
2. The course is realized as a project-like assignment that can, in principle, be done by a team of three/four students working full time.
3. Typically the assignments have been completed during the semester requiring approximately 80-120 hours from each project team.
4. The goal of the Software Engineering Project is to have a walk through from the requirements, design to implementing and testing.

The project deliverables:

Preparation of Documentation including

1. A problem statement
2. A requirements document
 - I. A Requirements Analysis Document.
 - II. A System Requirements Specification.
 - III. A Software Requirements Specification.
3. A design document
 - I. A Software Design Description and a System Design Document.
4. A test specification.
5. Manuals/guides for
 - I. Users and associated help frames
 - II. Programmers
 - III. Administrators (installation instructions)
6. A project plan and schedule setting out milestones, resource usage and estimated costs.
7. A quality plan setting out quality assurance procedures
8. An implementation

References:

1. Project-based software engineering: An Object-oriented approach, Evelyn Stiller, Cathie LeBlanc, Pearson Education
2. Visual Modelling with Rational Rose 2002 and UML, Terry Quatrini, Pearson Education
3. UML2 Toolkit, Hans-Erik Eriksson, etc; Wiley

COURSE OUTCOMES:

1. This course is designed to help the students understand that an emphasis is put on proper documentation

2. To know that extensive hardware expertise is not necessary, so that proportionate attention can be given to the design methodology.
3. To know that Despite its apparent simplicity, the problem allows plenty of alternative solutions and should be a motivating and educating exercise.
4. To know that Demonstration of a properly functioning system and sufficient documentation is proof of a completed assignment

IMAGE PROCESSING

Paper Code	Max. Marks	External	MID/Internal	Credits
MCA 3.1.1	100	70	30	4

Course Objectives:

- The student will learn about what is image and how to process a image
- The student learn what are the various parameters which enhances a image.

Unit -I **Fundamentals of ImageProcessing:ImageAcquisition,ImageModel,Sampling, Quantization,Relationshipbetweenpixels,distancemeasures,connectivity,Image Geometry,Photographicfilm.Histogram:Definition,decisionofcontrastbasingon histogram,operationsbasingonhistogramslikeimagestretching,imagesliding,Image classification.DefinitionandAlgorithmofHistogramequalization**

Learnin
g Out
Comes ➤ While learning this it creates a basic idea how to acquire a digital image and perform various operations on a image .

 ➤ This unit make student learn how to create a histogram and various histogram operations.

Unit -II **ImageTransforms:AdetaildiscussiononFourierTransform,DFT,FFT,properties**
A brief discussion on WALSH Transform,WFT,HADAMARDTransform,DCT.

Learnin
g Out
Comes ➤ The students understand what are various transforms and their properties.

 ➤ Student also understand the usage of transforms in image enhancement.

Unit -III **Image Enhancement:**(by SPATIAL Domain Methods)
 a.Arithmetic and logical operations, pixel or point operations, size operations,
 b.Smoothing filters-Mean, Median, Mode filters-Comparative study
 c..Edge enhancement filters-Directorial filters, Sobel, Laplacian, Robert, KIRSCH
 Homogeneity & DIFF Filters, prewitt filter, Contrast Based edge enhancement
 techniques.-Comparative study
 d.Low Pass filters, High Pass filters, sharpening filters.-Comparative Study
 e.Comparative study of all filters
 f.Color image processing.

Learning Outcomes
 Comes

- Student learn about spatial domain and to process a image using filters in spatial domain.
- Student also learns what are the various types of filter we have and their differences.

Unit - IV **.Image enhancement:**(By FREQUENCY Domain Methods)-esign of Low pass, High pass, EDGE Enhancement, smoothening filters in Frequency Domain. Butterworth filter, Homomorphic filters in Frequency Domain Advantages of filters in frequency domain, comparative study of filters in frequency domain and spatial domain.
Image compression: Definition: A brief discussion on-Run length encoding, contour coding, Huffman code, compression due to change in domain, compression due to quantization Compression at the time of image transmission. Brief discussion on:- Image Compression standards.

Learning Outcomes
 Comes

- In this the student understand about how to enhance a image
- Student also creates a awareness about various compression techniques and also the importance of image compression.

Unit-V **Unit-5. Image Segmentation:** Definition, characteristics of segmentation. Detection of Discontinuities, Thresholding Pixel based segmentation method. Region based segmentation methods- segmentation by pixel aggregation, segmentation by sub region aggregation, histogram based segmentation, split and merge technique. Use of motion in segmentation (spatial domain technique only)
Morphology: -Dilation, Erosion, Opening, closing, Hit-and-Misstransform, Boundary extraction, Region filling, connected components, thinning, Thickening, skeletons, Pruning Extension to Gray Scale Images Application of Morphology in I.P

- Learning Outcomes
- Understand the what is segmentation and various types of segmentation.
 - Create student an idea about the importance of morphology to a image and applications of morphology.

TextBook:

DigitallImageProcessing,RafaelC.GonzalezandRichardE.Woods

AddisionWesley

Referencebooks:

1. FundamentalsofElectronicImageProcessingbyArthyr–R–Weeks,Jr.
(PHI)
2. Imageprocessing,Analysis,andMachinevisionbyMilanSonkavaclan
HalavacRogerBoyle,VikasPublishing
- 3.OrganizationtheoryandBehaviour –L.M.Prasad
- 4.PracticeandManagement- PeterF.Drucker
- 5.ManagementInformationSystems–KanterJerma
- 6.ComputerandInformationManagement –S.C.Bhatnagarand
K.V.RamaDevi

Course Outcomes:

- Understanding the key dimensions in a digital image.
- Assessment of the components present in a image processing.
- Assessing the importane of image operations and their usage.

MCA 3.1.2 DATA ANALYTICS		
Instruction: 4 Periods		Credits:4
Internal: 30 Marks	University Exam: 70 Marks	Total: 100 Marks

SYLLABUS

COURSE OBJECTIVES:

On completing this course student will be able to

1. Understand big data and Apache Hadoop Eco system
2. Understand distributed , parallel, cloud computing and SQL concepts
3. Apply Hadoop concepts
4. Understand concepts of map and reduce and functional programming

UNIT-I

Introduction to Big Data: Big Data-definition, Characteristics of Big Data (Volume, Variety, Velocity, Veracity, Validity), Importance of Big Data , Patterns for Big Data Development, Data in the Warehouse and Data in Hadoop,

Introduction to Hadoop: Hadoop- definition, Understanding distributed systems and Hadoop, Comparing SQL databases and Hadoop, Understanding MapReduce, Counting words with Hadoop—running your first program, History of Hadoop, Starting Hadoop - The building blocks of Hadoop, NameNode, DataNode, Secondary NameNode, JobTracker and Task Tracker

LEARNING OUTCOMES:

1. The students will be able to know that what is big data, characteristics and importance of big data, patterns for big data development
2. The students can understand what is hadoop, comparison between SQL databases and hadoop
3. The students can be able to know the history and building blocks of hadoop, running the hadoop programs

UNIT-II

MapReduce -A Weather Dataset, Analyzing the Data with Unix Tools, Analyzing the Data with Hadoop, Scaling Out, Hadoop Streaming, Hadoop Pipes, Developing a MapReduce Application - The Configuration API, Configuring the Development Environment, Running Locally on Test Data, Running on a Cluster, Tuning a Job, MapReduce Workflows

LEARNING OUTCOMES:

1. The students can be able to know the analysis of data with unix tools and hadoop
2. The students can understand the development of a map reduce application
3. The students will be able to know that what is configuration API, and how the development environment is configured

UNIT-III

HDFS: Components of Hadoop -Working with files in HDFS, Anatomy of a MapReduce program, Reading and writing the Hadoop Distributed File system -The Design of HDFS, HDFS Concepts, The Command-Line Interface, Hadoop Filesystem, The Java Interface, Data Flow, Parallel Copying with distcp, Hadoop Archives

LEARNING OUTCOMES:

1. The students can understand the components of hadoop, and anatomy of a map reduce program

2. The students will be able to know the design of HDFS and working with files in HDFS
3. The students can be able to know the command-line interface and java interface

UNIT-IV

MapReduce Programming: Writing basic Map Reduce programs - Getting the patent data set, constructing the basic template of a Map Reduce program, Counting things, Adapting for Hadoop's API changes, Streaming in Hadoop, Improving performance with combiners.

MapReduce Advanced Programming: Advanced MapReduce - Chaining MapReduce jobs, joining data from different sources, creating a Bloom filter, Passing job-specific parameters to your tasks, probing for task-specific information, Partitioning into multiple output files, Inputting from and outputting to a database, keeping all output in sorted order

LEARNING OUTCOMES:

1. The students can be able to know the writing of basic map reduce programs and adapting of hadoop's API changes
2. The students can understand the advanced map reduce programming concepts such as chaining mapreduce jobs, joining data from different sources
3. The students can also understand the advanced map reduce programming concepts such as partitioning into multiple output files, inputting from and outputting to a database, and keeping all output in sorted order

UNIT-V

Graph Representation in MapReduce: Modeling data and solving problems with graphs, Shortest Path Algorithm, Friends-of-Friends Algorithm, PageRank Algorithm, Bloom Filter, Parallelized Bloom filter creation in MapReduce, Map-Reduce semi-join with Bloom filters

LEARNING OUTCOMES:

1. The students can understand the modeling of data and solving problems with graphs, Shortest Path Algorithm, Friends-of-Friends Algorithm, and PageRank Algorithm
2. The students can be able to know the Bloom Filter and creation of Parallelized Bloom filter
3. The students will be able to know the Map-Reduce semi-join with Bloom filters

Textbooks:

1. Dirk deRoos, Chris Eaton, George Lapis, Paul Zikopoulos, Tom Deutsch "Understanding Big Data Analytics for Enterprise Class Hadoop and Streaming Data", 1st Edition, TMH, 2012.

2. Hadoop: The Definitive Guide by Tom White, 3rd Edition, O'reilly

Reference Books:

1. Hadoop in Action by Chuck Lam, MANNING Publ.
2. Hadoop in Practice by Alex Holmes, MANNING Publishers
3. Mining of massive datasets, Anand Rajaraman, Jeffrey D Ullman, Wiley Publications.

COURSE OUTCOMES:

1. Gain conceptual understanding of analytics concepts, algorithms and statistical tests
2. Students will be able to look at the core projects used for both batch and real time data processing such as Hadoop
3. Students will be able to look at wider range of problems and data science based solutions

Paper Code & Title	Maximum Marks	External	Internal	Credits
MCA 3.1.3: Cyber Security and forensics	100	70	30	4

Course Objective(s):

1. understand underlying principles and many of the techniques associated with the digital forensic practices and cyber crime.
2. explore practical knowledge about ethical hacking methodology.
3. learn the importance of evidence handling and storage for various devices.
4. develop an excellent understanding of current cyber security issues and analyzed the ways that exploits in securities.
5. investigate attack, IDS technical exploits and router attacks and “Trap and Trace” computer networks.
6. apply digital forensic knowledge to use computer forensic tools and investigation report writing.

Unit-I

Definition and origins of the word, Cybercrime and information security, Who are cyber criminals, Classification of cybercrime: the legal perspective, An Indian perspective, cybercrime and the Indian ITA 2000, A global perspective on cybercrime, cybercrime Era: survival mantra for netizens.

Learning Objective(s): improved internet and disambiguation, and ultimately the creation of systems that can identify likely suspects, appropriated accounts, and other types of anomalies.

Unit-II

Cyber offenses: How criminals plan them, how criminals attack, social engineering, cyber café and cybercrime, the fuel for cybercrime, attack vector, cloud computing.

Learning Objective(s):Next-generation forensic tools need to integrate interactive visualization with automated analysis techniques, which will present data in new ways and allow investigators to interactively guide the investigation.

Unit-III

Cybercrime mobile and wireless devices: Proliferation of mobile and wireless devices, trends in mobility, credit card frauds in mobile and wireless communication Era, security challenges posed by mobile devices, registry settings for mobile devices, authentication service security, attacks on mobile / cell phones, security implications for organization, organization measures for handling mobile, organizational security policies and measures in mobile computing Era, Laptops.

Learning Objective(s): Forensic tools need to support collaboration as a first class function. additionally, new collaboration modes need to be discovered and implemented.

Unit-IV

Tools and methods used in cybercrime: proxy server and anonymizers, phishing, p/w cracking, key loggers and spywares, virus and worms, Trojan Horses, and backdoors, steganography, Dos, DDoS attacks, SQL injection, buffer overflow, attacks on wireless networks, phishing and identity theft.

Learning Objective(s):Programs should be able to detect and resent outliers and other data elements that seem out-of-place. These systems will be able to construct detailed baselines that are more than simply a list of registry entries and hash codes for resident files.

Unit-V

Cybercrime and cyber security: The Indian context, the Indian IT Act, challenges to Indian Law and cybercrime scenario in India, consequences of not addressing the weakness in information technology Act, Digital signatures and the Indian IT Act, Information security planning and Governance, Information security policy standards, practices, the information security blueprint, security education, training and awareness program, continuing strategies.

Learning Objective(s):Increasing diversity and size of forensic collections is to create more powerful abstractions that allow for the easier manipulation of data and the composition of forensic processing elements.

Course outcome(s):

1. Define the concept of ethical hacking and its associated applications in information communication technology(ICT) world.
2. Underline the need of digital forensic and role of digital evidences.
3. The methodology of incident response and various security issues in ICT world and identify digital forensic tools for data collection.
4. Recognize the importance of digital forensic duplication and various tools for analysis to achieve adequate perspectives of digital forensic investigation in various applications / devices like windows / Unix system.
5. Apply the knowledge of IDS to secure network and performing router and network analysis.
6. List the method to generate legal evidence and supporting investigation reports and will also be able to use various digital forensic tools.

Text Book(s):

1. Cyber security: Understanding cybercrimes, computer forensics and legal perspectives. Nina Godbole, Sunit Belapure, Wiley.
2. Principles of Information security, Micheal E.Whitman and Herbert J.Mattord, Cengage Learning.

References: Information security, Mark Rhodes, Ousley, MGH.

SOFTWARE PROJECT MANAGEMENT

Elective-II

Paper Code	Max. Marks	External	MID/Internal	Credits
MCA 3.1.4A	100	70	30	4

Course Objectives:

- Understand the fundamental principles of Software Project management and will also have a good knowledge of responsibilities of project manager and how to handle.
- To familiar with the different methods and techniques used for project management.
- Student will have good knowledge of the issues and challenges faced while doing the Software project Management and will also be able to understand why majority of the software projects fails and how that failure probability can be reduced effectively.
- The student Will be able to do the Project Scheduling, tracking, Risk analysis, Quality management and Project Cost estimation using different techniques

Unit -I	<p>Conventional Software Management: The waterfall model, conventional softwareManagement performance.</p> <p>Evolution of Software Economics: Software Economics, pragmatic software cost estimation. Improving Software Economics: Reducing Software product size, improving softwareprocesses, improving team effectiveness, improving automation, Achieving required quality, peer inspections.</p> <p>The old way and the new: The principles of conventional software Engineering, principles ofmodern software management, transitioning to an iterative process.</p>
Learning Out Comes	<ul style="list-style-type: none"> ➤ The student able to understand the performance for conventional software management principles. ➤ The student able understands the software cost estimation difficulties. ➤ To understand the modern software technologies and maintenance environments
Unit -II	<p>Life cycle phases: Engineering and production stages, inception, Elaboration, construction,transition phases.</p> <p>Artifacts of the process: The artifact sets, Management artifacts, Engineering artifacts,programmatic artifacts.</p>
Learning Out Comes	<ul style="list-style-type: none"> ➤ To understand about the engineering stages of the life cycle evolves the plans, the requirements and architecture and resolving the development risk. ➤ Able to understand the artefacts process sets. ➤ Able to understand the requirements, design, implementation

	and development artifacts are captures in rigorous notations that support automated analysis.
Unit -III	<p>Model based software architectures: A Management perspective and technical perspective.</p> <p>Work Flows of the process: Software process workflows, Iteration workflows.</p> <p>Checkpoints of the process: Major mile stones, Minor Milestones, Periodic status assessments. Iterative Process Planning: Work breakdown structures, planning guidelines, cost and scheduleestimating, Iteration planning process, Pragmatic planning.</p>
Learning Out Comes	<ul style="list-style-type: none"> ➤ The student able to understand an architecture of the software system design and goal of the engineering stages. ➤ Understand the use of checkpoint. ➤ To understand project plan, work broken structure of the project plan. ➤ Able to estimate the cost and schedule budject of the projects.
Unit - IV	<p>Project Organizations and Responsibilities: Line-of-Business Organizations, ProjectOrganizations, evolution of Organizations.</p> <p>Process Automation: Automation Building blocks, The Project Environment.</p> <p>Project Control and Process instrumentation: The seven core Metrics, Managementindicators, quality indicators, life cycle expectations, pragmatic Software Metrics, Metrics automation.</p>
Learning Out Comes	<ul style="list-style-type: none"> ➤ Able to understand the structure of the architecture from the architecture of the team. ➤ Able to understand responsibilities clearly across project team. ➤ Learn about process automation and change management in a particular are critical to an interactive process. ➤ To evolving artifacts the use of matrice.
Unit-V	<p>Tailoring the Process: Process discriminates.</p> <p>Future Software Project Management: Modern Project Profiles, Next generation Softwareeconomics, modern process transitions.</p>
Learning Out Comes	<ul style="list-style-type: none"> ➤ To understand the positive and negative trends early in the life cycle. ➤ To understand the next generation software economics, further technology, advantages, cost estimation models.
Text Books	1. Software Project Management, Walker Royce, PEA, 2005.

REFERENCE BOOKS	<ol style="list-style-type: none"> 1. Software Project Management, Bob Hughes,3/e, Mike Cotterell, TMH 2. Software Project Management, Joel Henry, PEA 3. Software Project Management in practice, Pankaj Jalote, PEA, 2005, 4. Effective Software Project Management, Robert K.Wysocki, Wiley,2006 5. Project Management in IT, Kathy Schwalbe, Cengage 6. Quality Software Project Management, Futrell,Donald F. Shafer, Donald I. Shafer, PEA
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Course Outcomes:

- Student able to evaluate and selection of projects against strategic, technical and economic criteria and use a variety of cost benefit evaluation techniques for choosing among competing project proposals.
- Approach project planning in an organized step by step manner and select an appropriate process model produce an activity plan for a project.
- Identify project risks, monitor and track project deadlines and produce a work plan and resource schedule.
- Plan the evaluation of a proposal or a product and manage people in software environments.
- Understand the importance of teamwork and quality management in software project management.
- Apply these project management tools and techniques in a diversity of fields such as new product and process development, construction, information technology.

**Neural Networks and Fuzzy Systems
Elective-II**

Paper Code & Title	Maximum Marks	External	Internal	Credits
MCA 3.1.4B: Neural Networks and Fuzzy Systems (Elective-II)	100	70	30	4

Unit-1

Neural Networks and Fuzzy Systems Neural and Fuzzy Machine Intelligence, Fuzziness as Multivalence, The Dynamical Systems Approach to Machine Intelligence, Intelligent Behavior as Adaptive Model Free Estimation.

Unit-2

Neural Dynamics I: Activations and Signals Neurons as Functions, Signal Monotonicity, Biological Activations and Signals, Neuron Fields, Neuronal Dynamical Systems, Common Signal Functions, Pulse-Coded Signal Functions. . Neuronal Dynamics II: Activation Models Neuronal Dynamical Systems, Additive Neuronal Dynamics, Additive Neuronal Feedback,

Additive Bivalent Models, BAM Connection Matrices, Additive Dynamic and the Noise Saturation Dilemma, General Neuronal Activations: Cohen-Grossberg and Multiplicative Models.

Unit-3

Synaptic Dynamics I: Unsupervised Learning Learning as Encoding, Change, and Quantization, Four Unsupervised Learning Laws, Probability Spaces and Random Processes, Stochastic Unsupervised Learning and Stochastic Equilibrium, Signal Hebbian Learning, Competitive Learning, Differential Hebbian Learning, Differential Competitive Learning.

Unit-4

Synaptic Dynamics II: Supervised Learning Supervised Function Estimation, Supervised Learning as Operant Conditioning, Supervised Learning as Stochastic Pattern Learning with known Class Memberships, Supervised Learning as stochastic Approximation, The Back propagation Algorithm.

Unit-5

Fuzziness Versus Probability Fuzzy Sets and Systems, Fuzziness in a Probabilistic World, Randomness vs. Ambiguity: Whether vs. How much, The Universe as a Fuzzy Set, The Geometry of Fuzzy Set, The Geometry of Fuzzy Sets: Sets as Points. The Fuzzy Entropy Theorem, The Subsethood theorem. The Entropy-Subsethood Theorem. Fuzzy Associative Memories Fuzzy Systems as Between-Cube Mappings, Fuzzy and Neural Function Estimators, Fuzzy Hebb FAMs, Adaptive FAMs: Product-Space Clustering in FAM Cells.

Text Book: Neural Networks & Fuzzy Systems, Bark Kosko, PHI

Reference Books:

1. Neural network Design, Hagan, Demuth and Beale, Vikas Publishing House
2. Fundamentals of Artificial Neural Networks, Mohamad H Hassoum. PHI
3. Fuzzy Set Theory & its Application, H.J. Zimmerman Allied Published Ltd

INTERNET OF THINGS

Elective-II

Paper Code	Max. Marks	External	MID/Internal	Credits
MCA 3.1.4C	100	70	30	4

Course Objectives:

- To assess the vision and introduction of IoT.
- Student will be explored to the interconnections and interactions of physical world and the cyber space.
- To Understand IoT business perspective
- To Implement Data and Knowledge Management and use of Devices in IoT Technology.
- They are also able to design and develop IOT dives.

Unit -I	The Internet of Things: An Overview of Internet of things, Internet of Things Technology, behind Io Ts Sources of the Io Ts, M2M Communication, Examples OF Io Ts, Design Principles For Connected Devices Internet Connectivity Principles, Internet connectivity, Application Layer Protocols: HTTP, HTTPS, FTP, Telnet.
Learning Out Comes	<ul style="list-style-type: none"> ➤ The student able to understand the importance of the IOT. ➤ Will learn different internet connections in devices and different protocols.
Unit -II	Business Models for Business Processes in the Internet of Things ,IoT/M2M systems LAYERS AND designs standardizations ,Modified OSI Stack for the IoT/M2M Systems ,ETSI M2M domains and High-level capabilities ,Communication Technologies, Data Enrichment and Consolidation and Device Management Gateway Ease of designing and affordability
Learning Out Comes	<ul style="list-style-type: none"> ➤ To understand the business of the IOT . ➤ Able to understand the different communication technologies. ➤ To learn connection between systems using Gateway.
Unit -III	Design Principles for the Web Connectivity for connected-Devices, Web Communication protocols for Connected Devices, Message Communication protocols for Connected Devices, Web Connectivity for connected-Devices.
Learning Out Comes	<ul style="list-style-type: none"> ➤ Understand the design principles for the web connectivity for connected devices. ➤ Able to learn communication between different devices.
Unit - IV	Data Acquiring, Organizing and Analytics in IoT/M2M, Applications/Services/Business Processes, IOT/M2M Data Acquiring and Storage, Business Models for Business Processes

	in the Internet Of Things, Organizing Data, Transactions, Business Processes, Integration and Enterprise Systems.
Learning Out Comes	<ul style="list-style-type: none"> ➤ The student able to understand business process, storage and business models of the IOT. ➤ Able to understand organizing data, transactions and interactions with in the systems.
Unit-V	Data Collection, Storage and Computing Using a Cloud Platform for IoT/M2M Applications/Services, Data Collection, Storage and Computing Using cloud platform Everything as a service and Cloud Service Models, IOT cloud-based services using the Xively (Pachube/COSM), Nimbits and other platforms Sensor, Participatory Sensing, Actuator, Radio Frequency Identification, and Wireless, Sensor Network Technology, Sensors Technology, Sensing the World.
Learning Out Comes	<ul style="list-style-type: none"> ➤ Able to understand the storage in cloud and its services. ➤ The student able to understand services provided by the cloud for IOT. ➤ Able to understand different types of networks used in IOT.
Text Books	<ol style="list-style-type: none"> 1. Internet of Things: Architecture, Design Principles And Applications, Rajkamal, McGraw Hill Higher Education 2. Internet of Things, A. Bahgya and V. Madiseti, Univesity Press, 2015
REFERENCE BOOKS	<ol style="list-style-type: none"> 1. Designing the Internet of Things, Adrian McEwen and Hakim Cassimally, Wiley 2. Getting Started with the Internet of Things CunoPfister , Oreilly.

Course Outcomes:

- Able to understand the applications area of IOT
- Able to realize the revaluation of internet in mobile device cloud and sensor networks.
- Able to understand building block of internet of things and characteristics.
- The student able to understand services of the cloud in the IOT.
- Student able to understand and implement different types of networks in IOT.

E-COMMERCE (ELECTIVE-III)

Paper Code	Max. Marks	External	MID/Internal	Credits
MCA 3.1.5A	100	70	30	4

Course Objectives:

Students will be able to develop the skills in the field of Electronic Commerce and to keep students at the forefront of the Global Digital Economy via facilitating innovation, creating values in the Electronic market place with the Cooperation of leading Edge to become familiar with state of the art Electronic Model, Payment organizations. The Objectives of this course are three fold:

- To understand the basic principal of E-Government,
- Securities, Supply Chain Mechanisms.
- To Evaluate and observe various online businesses

Unit-1

1. Introduction: Electronic Commerce-Frame Work, Anatomy of E-Commerce Applications, E-Commerce Consumer Applications, E-Commerce Organization Applications. Consumer Oriented Electronic Commerce - Mercantile Process Models.

Learning

- Discuss Electronic Commerce process and Frame work.

Outcomes

- Application of E-commerce

Unit-2

- 2 Electronic Payment Systems – Types of Electronic Payment Systems, Digital Token-Based, Smart Cards, Credit Cards, Risks in Electronic Payment Systems, Designing Electronic Payment Systems

Learning

- Discuss electronic payment issues

Outcomes

- Contrast the different e-payment options.
- Identify on-line payment services.

Unit-3

4. Intra Organizational Commerce, Macro Forces And Internal Commerce, Work Flow Automation and Coordination, Customization And Internal Commerce, Supply Chain Management.

5. Business Cases for Documents
6. Library, Digital Document Types, Corporate Data Ware-Houses.

Learning

Outcomes

- Compare Electronic Data Interchange techniques and Internet techniques used in E-Commerce.
- Define Supply Chain Management.
- Examine why businesses are moving to database driven Supply Chain Management Systems.
- Discuss types of digital Documents

Unit-4

7. Advertising And Marketing: Information Based Marketing, Advertising On Internet, Online Marketing Process, Market Research. Consumer Search and Resource Discovery, Information Search and Retrieval, Commerce Catalogues, Information Filtering.

Learning

Outcomes

- Define Business-to-Business marketing
- Examine strategies used by businesses use to improve purchasing, logistics, and other support activities
- Discuss Electronic Data Interchange

Unit-5

8. Multimedia-Key Multimedia Concepts, Digital Video and Electronic Commerce, Desktop Video Processing, Desktop Video Conferencing.

Learning

Outcomes

- Discuss Multimedia key Concepts
- Discuss Digital Video and Electronic Commerce

Text Book

1. Frontiers of Electronic Commerce, Kalakata and Whinston, Pearson.

Reference:

1. E-Commerce fundamentals and Applications, Hendry Chan, Raymond Lee, Tharam Dillon, Ellizabeth Chang, John Wiley.
2. E-Commerce, S.Jaiswal, Galgotia.

3. E-Commerce, Efrain Turbon, Jae Lee, David King, H.Michael Chang.
4. E-Commerce - Business, Technology and Society, Kenneth C.Taudon, Carol Guyerico Traver.

Course Outcomes:

- Recognize the impact of Information and Communication technologies, especially of the Internet in business operations
- Recognize the fundamental principles of e-Business and e-Commerce
- Distinguish the role of Management in the context of e-Business and e-Commerce
- Explain the added value, risks and barriers in the adoption of e-Business & e-Commerce.
- Examine applications of e-Commerce in relation to the applied strategic.
- Develop and publish web pages using HTML5, CSS3 and JavaScript.
- Use tools and services of the internet in the development of a virtual e-commerce site

PYTHON PROGRAMMING (ELECTIVE -III)

Paper Code	Max. Marks	External	MID/Internal	Credits
MCA 3.1.5B	100	70	30	4

Course Objectives:

- Acquire programming skills in core Python.
- To acquire Object Oriented Skills in Python
- To develop the skill of designing Graphical user Interfaces in Python
- To develop the ability to write database applications in Python

Unit -I

Introduction: History of Python, Need of Python Programming, Applications Basics of Python Programming Using the REPL(Shell), Running Python Scripts, Variables, Assignment, Keywords, Input-Output, Indentation.

**Learning
Out Comes**

- Discuss the History of Python Programming
- To understand why Python is a useful scripting language for developers
- To learn how to design and program Python applications.

Unit -II

Types, Operators and Expressions: Types - Integers, Strings, Booleans; Operators- Arithmetic Operators, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, Expressions and order of evaluations Control Flow- if, if-else if- else, for, while, break, continue.

**Learning
Out Comes**

- Discuss the various types Operators
- To learn how to write loops and decision statements in Python

Unit -III

Data Structures Lists - Operations, Slicing, Methods; Tuples Sets, Dictionaries, Sequences, Comprehensions.

**Learning
Out Comes**

- To learn how to use indexing and slicing to access data in Python programs.
- To learn how to use lists, tuples, and dictionaries in Python programs.

Unit - IV

Functions - Defining Functions, Calling Functions, Passing Arguments, Keyword Arguments, Default Arguments, Variable-length arguments, Anonymous Functions, Fruitful Functions(Function Returning Values), Scope of the Variables in a Function - Global and Local Variables.

Modules: Creating modules, import statement, from. Import statement, name spacing, via PIP, Using Python Packages

Python packages, Introduction to PIP, Installing Packages

**Learning
Out Comes**

- To learn how to write functions and pass arguments in Python.
- To learn how to build and package Python modules for reusability
- To learn how to read and write files in Python

Unit-V

Object Oriented Programming OOP in Python: Classes, 'self variable', Methods, ConstructorMethod, Inheritance, Overriding Methods, Data hiding,

Error and Exceptions: Difference between an error and Exception, Handling Exception, tryexcept block, Raising Exceptions, User Defined Exceptions

Brief Tour of the Standard Library - Operating System Interface - String Pattern Matching, Mathematics, Internet Access, Dates and Times, Data Compression, Multithreading, GUI Programming, Turtle Graphics

Testing: Why testing is required ?, Basic concepts of testing, Unit testing in Python, WritingTest cases, Running Tests

**Learning
Out Comes**

- To learn how to design object-oriented programs with Python classes.
- To learn how to use class inheritance in Python for reusability.
- To learn how to use exception handling in Python applications for error handling
- To learn why testing is required

Text Books

1. Python Programming: A Modern Approach, Vamsi Kurama, Pearson
2. Learning Python, Mark Lutz, Orielly

Reference**Books:**

1. Think Python, Allen Downey, Green Tea Press
2. Core Python Programming, W.Chun, Pearson.
3. Introduction to Python, Kenneth A. Lambert, Cengage

Course Outcomes:

- Explain basic principles of Python programming language
- Implement object oriented concepts,
- Implement database and GUI applications

WIRELESS ADHOC NETWORKS (ELECTIVE - III)

Paper Code	Max. Marks	External	MID/Internal	Credits
MCA 3.1.5C	100	70	30	4

Course Objectives

- The goal is to introduce students to the mathematical models and network protocol designs in wireless multihop networks
- A systematic exposition of network protocols and their cross-layer Interactions
- A broad perspective on the active research areas in wireless multi-hop networks
- To analyze the various design issues and challenges in the layered architecture of Ad hoc wireless networks

Unit-1

1. Introduction: Introduction to Wireless Networks, Various Generations of Wireless Networks, Virtual Private Networks- Wireless Data Services, Common Channel Signaling, Various Networks for Connecting to the

Internet, Blue tooth Technology, Wifi-WiMax- Radio Propagation mechanism , Pathloss Modeling and Signal Coverage

Learning

➤ To learn what is wireless network.

Outcomes

➤ To learn the various wireless data services.

Unit-2

2. WIRELESS LOCAL AREA NETWORKS: Introduction-WLAN topologies- IEEE 802.11 Standards , MAC Protocols, Comparison of 802.11 a,b,g and n Standards, HIPER LAN , ZigBee 802.15.4, Wireless Local Loop

3. Wireless Adhoc Networks: Basics of Wireless Networks, Infrastructure Versus Infrastructureless Networks – Properties of Wireless, Ad hoc Networks, Types of Ad Hoc Networks, Challenges in Ad Hoc Networks – Applications of Wireless Ad Hoc Networks

Learning

➤ To learn the Basic concepts of Wireless Networks,

Outcomes

➤ To learn Types & challenges of Ad Hoc Networks,

➤ To learn the Applications of Wireless Ad Hoc Networks.

Unit-3

4. Routing Protocols for Ad Hoc Networks: Introduction-Proactive Routing Protocols- Reactive Routing protocols-Hybrid Routing Protocols-QoS Metrics-Energy impact issues in Routing.

5. Mobile Ad Hoc Networks (MANETs): Overview, Properties of A MANET, Spectrum of MANET Applications, Routing and Various Routing Algorithms.

Learning

➤ To learn the Routing Protocols for Ad Hoc Networks

Outcomes

➤ To learn the Routing & Various Routing Algorithms

➤ To learn the Mobile Ad Hoc Networks (MANETs) Applications

Unit- 4.

6. Other Wireless Technologies: Introduction, IEEE 802.15.4 and Zigbee, General Architecture, Physical Layer, MAC layer, Zigbee, WiMAX and IEEE 802.16, Layers and Architecture, Physical Layer, OFDM Physical layer.

Learning

➤ To learn the other Wireless Technologies IEEE 802.15.4 and Zigbee

Outcomes

➤ To learn the Physical Layer, OFDM Physical layer.

Unit-5.

- 7. Security in Ad Hoc Networks: Introduction- Security Attacks, Intrusion Detection System, Intrusion Prevention system, Intrusion Response system, Wired Equivalent Privacy(WEP) -A Security Protocol for Wireless Local Area Networks (WLANs), Security in MANETs.

Learning

- To learn the Ad Hoc Networks Security.

Outcomes

- To learn the MANETs Security.

Text Book: 1.Principles of Wireless Networks , Kaveth Pahlavan, K. Prasanth Krishnamurthy, Pearson Publications, Asia, 2002
2. Mobile Cellular Communications, G.Sasibhusan Rao, “”, Pearson Publications.

Reference Books:

- 1. Guide to Wireless Ad Hoc Networks: Series: Computer Communications and Networks, Misra, Sudip; Woungang, Isaac; Misra, Subhas Chandra, 2009, Springer

Course outcomes:

Students are able to

- Compare the differences between cellular and ad hoc networks and the analyse the challenges at various layers and applications
- Summarize the protocols used at the MAC layer and scheduling mechanisms
- Compare and analyze types of routing protocols used for unicast and multicast routing
- Examine the network security solution and routing mechanism
- Evaluate the energy management schemes and Quality of service solution in ad hoc networks

Data Analytics through R Lab

Paper Code	Max. Marks	External Marks 50				Internal Marks 50		Credits
		Record	Viva-Voce	Program Execution	Communication/ Personality	Observation	Mid I+II	
MCA 3.1.6	100	10	20	10	10	20	30	4

Course Objective(s):

1. To provide an overview of a new language R used for data science.
2. To introduce students to the R programming environment and related ecosystem and thus provide them with a demand skill-set, in both the research and business environments
3. To introduce the extended R ecosystem of libraries and packages
4. To demonstrate usage of a standard Programming Language.
5. To familiarize students with how various statistics like mean median etc. can be collected for data exploration in R
6. To enable students to use R to conduct analytics on large real life datasets.

Module-I on Data Mining

1. Introduction to the WEKA machine learning toolkit or R programming Create an ARFF (Attribute-Relation File Format) file and read it in WEKA. Explore the purpose of each button under the preprocess panel after loading the ARFF file. Also, try to interpret using a different ARFF file, weather.arff, provided with WEKA.
2. Performing data preprocessing in Weka – Part 1 Study Unsupervised Attribute Filters such as ReplaceMissingValues to replace missing values in the given dataset, Add to add the new attribute Average, Discretize to discretize the attributes into bins. Explore Normalize and Standardize options on a dataset with numerical attributes.
3. Perform data preprocessing in WEKA – Part 2 Study the Unsupervised Instance Filters such as Remove Range filter to remove the last two instances,
4. Classification using the WEKA toolkit – Part 1 Explore classification process using ID3 algorithm on categorical dataset (weather). Explore classification process using naïve Bayes algorithm on categorical dataset ('vote'). Explore classification process using Random Forest algorithm on datasets containing large number of attributes.
5. Classification using the WEKA toolkit – Part 2 Explore classification process using J48 algorithm on mixed type of dataset after discretizing numeric attributes. Generate classification rules from a small dataset. Perform cross-validation strategy with various fold levels. Compare the accuracy of the results.
6. Performing clustering in WEKA a. Apply hierarchical clustering algorithm on numeric dataset and estimate cluster quality. b. Apply DBSCAN algorithm on numeric dataset and estimate cluster quality. c. Apply COBWEB clustering algorithm on categorical dataset and estimate cluster quality.
7. Association rule analysis in WEKA with different support and confidence thresholds Apply Association Rule Mining on supermarket dataset using Apriori Algorithm. Apply Association Rule Mining on supermarket dataset using FP-Growth Algorithm. 57

Module-II on Bigdata Analytics:

1. (i) Perform setting up and Installing Hadoop in its three operating modes: • Standalone, • Pseudo distributed, • Fully distributed. (ii) Use web based tools to monitor your Hadoop setup.
2. Implement the following file management tasks in Hadoop: • Adding files and directories • Retrieving files • Deleting files Hint: A typical Hadoop workflow creates data files (such as log files) elsewhere and copies them into HDFS using one of the above command line utilities.
3. Run a basic Word Count Map Reduce program to understand Map Reduce Paradigm.
4. Write a Map Reduce program that mines weather data. Weather sensors collecting data every hour at many locations across the globe gather a large volume of log data, which is a good candidate for analysis with MapReduce, since it is semi structured and record-oriented.
5. Implement Matrix Multiplication with Hadoop Map Reduce
6. Write a Map Reduce program to implement Join operations on RDBMS.
7. Write a Map Reduce program to determine statistical measures a) Variance b) Max c) Min d) Range of a large data collection.

Course Outcome(s):

1. Install and use R for simple programming tasks.
2. Extend the functionality of R by using add-on packages
3. Extract data from files and other sources and perform various data manipulation tasks on them.
4. Code statistical functions in R.
5. Use R Graphics and Tables to visualize results of various statistical operations on data
6. Apply the knowledge of R gained to data Analytics for real life applications.

Mini Project Using DBMS and OOSE Concepts

Paper Code	Max. Marks	External Marks 50				Internal Marks 50		Credits
		Record	Viva - Voce	Program Execution	Communication / Personality	Observation	Internal reviews	
MC A 3.1.7	100	10	20	10	10	20	30	4

Course Objective(s):

1. To offer students a glimpse into real world problems and challenges that need IT based solutions.
2. To enable students to create very precise specifications of the IT solution to be

designed.

3. To introduce students to the vast array of literature available of the various research challenges in the field of IT
4. To create awareness among the students of the characteristics of several domain areas where IT can be effectively used.
5. To enable students to use all concepts of IT in creating a solution for a problem
6. To improve the team building, communication, and management skills of the students.

Scope of the Mini Project:

1. Object Oriented Concepts: Requirement Engineering, Design Such as architecture, User Interface Design, Testing, Preparations User Manuals etc.
2. Design of DBMS Schema Including Normalization, Forms design, Report Generation, Linking to Web Data Bases Etc. Preferably on Live Projects
3. Periodical Presentations and Discussions Among the Groups and their Outputs

Course Outcome(s):

1. Discover potential research areas in the field of IT
2. Conduct a survey of several available literature in the preferred field of study
3. Compare and contrast the several existing solutions for research challenge
4. Demonstrate an ability to work in teams and manage the conduct of the research study.
5. Formulate and propose a plan for creating a solution for the research plan identified
6. To report and present the findings of the study conducted in the preferred domain