COURSE STRUCTURE

I SEMESTER

S.No	Course code	Course Title	L	T	P	Total	Credits	CIE	SEE	Total
			Contact hours/week					**Scheme of Valuation**		
1	17MC01	Accounting and Financial Management	3	-	-	3	3	40	60	100
2	17MC02	C Programming and Data Structures	2	2	-	4	3	40	60	100
3	17MC03	Digital Logic and Computer System Organization	2	2	-	4	3	40	60	100
4	17MC04	Discrete Structures and Graph Theory	3	-	-	3	3	40	60	100
5	17MC05	English Language for Communication	2	-	-	2	2	40	60	100
6	17MC06	Probability and Statistics	3	-	-	3	3	40	60	100
7	17MC60	C Programming Lab	-	-	4	4	2	40	60	100
8	17MC61	Digital Logic and Computer System Organization Lab	-	-	4	4	2	40	60	100
9	17MC62	IT Lab	-	-	2	2	1	40	60	100
		Total	**15**	**4**	**10**	**29**	**22**	**360**	**540**	**900**

II SEMESTER

S.No	Course code	Course Title	L	T	P	Total	Credits	CIE	SEE	Total
			Contact hours/week					**Scheme of Valuation**		
1	17MC07	Computer Networks	3	-	-	3	3	40	60	100
2	17MC08	Database Management Systems	2	2	-	4	3	40	60	100
3	17MC09	Operating Systems	2	2	-	4	3	40	60	100
4	17MC10	Software Engineering	3	-	-	3	3	40	60	100
5	17MC11	Organization Structure and Personal Management	3	-	-	3	3	40	60	100
6	17MC63	Data Structures Lab	-	-	4	4	2	40	60	100
7	17MC64	Data Base Management Systems Lab	-	-	4	4	2	40	60	100
8	17MC65	English Communication Skills Lab	-	-	4	4	2	40	60	100
9	17MC50	Technical Seminar-I	-	2	-	2	1	100	-	100
		Total	**13**	**6**	**12**	**31**	**22**	**420**	**480**	**900**

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III SEMESTER

S.No	Course code	Course Title	Contact hours/week				Credits	Scheme of Valuation		
			L	T	P	Total		CIE	SEE	Total
1	17MC12	Automata Theory and Compiler Design	3	-	-	3	3	40	60	100
2	17MC13	Design and Analysis of Algorithms	3	-	-	3	3	40	60	100
3	17MC14	OOPs Through Java	2	2	-	4	3	40	60	100
4	17MC15	UNIX Programming	2	2	-	4	3	40	60	100
5	17MC16	Operations Research	3	-	-	3	3	40	60	100
6	17MC66	OOPs Through Java Lab	-	-	4	4	2	40	60	100
7	17MC67	UNIX Programming Lab	-	-	4	4	2	40	60	100
8	17MC68	R Programming Lab	-	-	4	4	2	40	60	100
9	17MC51	Technical Seminar-II	-	2	-	2	1	100	-	100
10	17MC52	Professional Ethics and Human Values	2	-	-	2	0	40	60	100
		Total	15	06	12	33	22	460	540	1000

IV SEMESTER

S.No	Course code	Course Title	Contact hours/week				Credits	Scheme of Valuation		
			L	T	P	Total		CIE	SEE	Total
1	17MC17	Cloud Computing	3	-	-	3	3	40	60	100
2	17MC18	Data Warehousing and Mining	3	-	-	3	3	40	60	100
3	17MC19	Object Oriented Analysis and Design	2	2	-	4	3	40	60	100
4	17MC20	Web Technologies	2	2	-	4	3	40	60	100
	PROGRAM ELECTIVE - I									
5	17MC21	Cryptography and Network Security	3	-	-	3	3	40	60	100
	17MC22	Distributed Operating Systems								
	17MC23	Software Design Methodologies								
	17MC24	Distributed Databases								
6	17MC69	Data Warehousing and Mining Lab	-	-	4	4	2	40	60	100
7	17MC70	Object Oriented Analysis and Design Lab	-	-	4	4	2	40	60	100
8	17MC71	Web Technologies Lab	-	-	4	4	2	40	60	100
9	17MC53	Mini Project	-	-	2	2	1	100	-	100
		Total	13	4	14	31	22	420	480	900

V SEMESTER

S.No	Course code	Course Title	Contact hours/week				Credits	Scheme of Valuation		
			L	T	P	Total		CIE	SEE	Total
1	17MC25	Big Data Analytics	3	-	-	3	3	40	60	100
2	17MC26	Mobile Application Development	2	2	-	4	3	40	60	100
3	17MC27	Python Programming	2	2	-	4	3	40	60	100
4	**PROGRAM ELECTIVE – II**		3	-	-	3	3	40	60	100
	17MC28	Internet of Things								
	17MC29	Open Source Software								
	17MC30	Software Testing Methodologies								
	17MC31	Database Tuning								
5	**PROGRAM ELECTIVE - III**		3	-	-	3	3	40	60	100
	17MC32	E-Commerce								
	17MC33	Unix Administration								
	17MC34	Software Project Management								
	17MC35	Database Administration								
6	17MC72	Big Data Analytics Lab	-	-	4	4	2	40	60	100
7	17MC73	Mobile Application Development Lab	-	-	4	4	2	40	60	100
8	17MC74	Python Programming Lab	-	-	4	4	2	40	60	100
9	17MC54	Internship	-	2	-	2	1	100	-	100
		Total	13	6	12	31	22	420	480	900

VI SEMESTER

S.No	Course code	Course Title	Contact hours/week				Credits	Scheme of Valuation		
			L	T	P	Total		CIE	SEE	Total
1	17MC55	Project work	-	-	24	-	12	40	60	100
2	17MC56	Comprehensive Viva-Voce	-	-	4	-	2	100	-	100
		Total	-	-	28	-	14	140	60	200

		L	T	P	Cr.
MCA (I Sem.)	**17MC01 – ACCOUNTING AND FINANCIAL MANAGEMENT**	3	-	-	3

Course Educational Objectives: In this course student will learn about
➢ The overall view on economic, financial accounting & financial management.
➢ The basic concepts of economics like micro & macro economics.
➢ The concepts of financial management like capital budgeting and its techniques.
➢ Ratio analysis.
➢ Financial management application.

Course Outcomes: At the end of the course, the student will be able to
CO1: The fundamental concepts of Accounting.
CO2: The company's proposal/project.
CO3: How to handle the complicated Financial situations

UNIT-I
Fundamentals of Accounting: Meaning, Nature and Scope of Accounting, Accounting principles:- concepts and conventions, Double entry system of accounting. User of accounting information.
Accounting process: Basic books of accounts-Journals, Ledger & Subsidiary books. Preparation of trial balance, Final Accounts, company final accounts.

UNIT-II
Basics of Financial Management: Meaning and scope of financial management, role of financial manager in modern organization.
Objectives of financial management: Time value of money, **Leverages**: operating, financial leverage and combined leverage. **Cost of capital**: cost of equity, preference shares, bonds-weighted average cost of capital- capital gearing- over capitalization and under capitalization, sources of finance.

UNIT-III
Overview of cost accounting and marginal costing: Meaning, nature, scope and importance of cost accounting, basic cost concepts, cost sheet, absorption costing Vs marginal costing, Cost-Volume- Profit analysis- Break- Even point- significance and limitations of C-V-P analysis, simple problems on marginal costing and C-V-P analysis.

UNIT-IV
Budgetary control and standard costing: Meaning and features of budgetary control – preparation of various types of budgets fixed and flexible budgets (production, sales, cash and master budgets) zero based budgeting.
Standard costing: Meaning and features of standard costing- standard costing Vs budgetary control. **Variance analysis:** material, labor, overhead and sales variances- simple problems.

UNIT-V
Accounting packages and computerized accounting: computerization of accounts- accounting packages- Tally & Wings- documents used for data collection, files management, master files, transaction files- processing of different files and output obtained.

TEXTBOOKS

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1. Dr. S.K. Singh, Dr. G.K. Gupta, Dr. Jitendra Kumar saxena "Financial Accounting", SBPD publication. 2015 edition.
2. T. Paresh Shah, "Basic financial Accounting for Management" Oxford University press, New Delhi, 2008 edition.

REFERENCES
1. T. Vijay Kumar "Accounting for management" TMH 2010.
2. I.M. Pandey " Financial Management" PHI Learning Pvt. Ltd.,
3. S.N. Maheswari, " Cost and Management Accounting" Sultan chand publication.
4. Ambaresh Gupta, "Basic Financial Accounting for Management" Pearson 2005.

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		L	T	P	Cr.
MCA (I Sem.)	**17MC02 – C PROGRAMMING AND DATA STRUCTURES**	2	2	-	3

Course Educational Objectives:

In this course student will learn about
➢ Fundamentals of computer.
➢ The programming fundamentals.
➢ Developing the logical and programming skills in C language.
➢ Various hardware and software components of computer.
➢ Writing small to medium scale programs in C language

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

CO1:   Design algorithmic solutions for given problems.
CO2:   Analyze problems and construct C programs that solve it.
CO3:   Design and Implement Modular Programming and memory management using pointers.
CO4:   Choose the appropriate data structure and algorithm design method for a specified application.
CO5:   Apply and implement learned algorithm design techniques and data structures to solve problems.

UNIT – I
C-Basics:

Algorithm / pseudo code, Flowcharts, Program development steps, Structure of C program, Identifiers, Basic data types , Constants, variables, Operators, expressions, precedence and order of evaluation, type conversion. **Control structures**: If, If-Else and switch statements, Loops-while, do-while and for statements, break, continue & goto, Programming examples.

UNIT – II
Arrays:

Introduction, Single-dimensional Arrays : Declaration of a Single-dimensional Array, Usage of Single-dimensional Array, Memory Representation of Single-dimensional Array , Operations on a Single-dimensional Array, Array of Arrays (Multi-dimensional Arrays) , Advantages and Limitations of Arrays. **Character Arrays:** Introduction, Strings, Character Arrays, Reading and Writing Strings, String Library Functions, Array of strings.

UNIT - III
Functions:

Functions: basics, category of functions, parameter passing techniques, recursive functions, Functions with arrays, storage classes- extern, auto, and register, static, scope rules, Standard library functions, dynamic memory management functions, c program examples. Pointers-concepts, declaring &initialization of pointer variables, pointer arithmetic, pointers and arrays, pointers and character strings, pointers to pointers.

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UNIT - IV

Structures, Unions and Files:

Introduction, Structure definition, Structure declaration, Operations on Structures, Pointers to Structures, Array of Structures, Nested Structures,Unions. **Files** Introduction, Files, Streams, I/O Using Streams :Opening a Stream, Closing Streams, I/O operations on Files, Error Handling during I/O operations, Random Access to Files and Command Line Arguments.

Searching and Sorting Techniques: Linear, Binary Search, Insertion, Selection, Bubble, Quick, Merge sort.

UNIT – V

Introduction to Data Structures:

Data Structures: Introduction to Data Structures, Single linked lists, doubly linked lists, representing stacks and queues in C using arrays and linked lists, infix to post fix conversion, postfix expression evaluation.

TEXT BOOK

Ajay Mittal, "Programming in C: A Practical Approach", First Edition, Person Education, 2010

REFERENCES

1. Reema Thareja "Programming in C", First Edition, Oxford Publications,2011.
2. Fundamentals of Data Structures in C , Horowitz, Sahni, AndersonFreed, 2nd edition , Universities Press,2008.
3. Classic Data Structures, Samanta,2nd ed, PHI, 2009.
4. Pradip Dey, Manas Ghosh "Programming in C", First Edition, Oxford Publications.
5. Brian W. Kernighan, Dennis M. Ritchie" The C Programming Language", 2nd Edition, PHI/Pearson Education, 1988
6. B.A. Forouzan and R.F. Gilberg Computer science, "A structured programming approach using C", Third edition, Thomson

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		L	T	P	Cr.
MCA (I Sem.)	**17MC03 – DIGITAL LOGIC AND COMPUTER SYSTEM ORGANIZATION**	2	2	-	3

Course Educational Objectives:
In this course student will learn about:
➢ To introduce the basic concepts and elements of computer systems.
➢ To give a detailed understanding of fundamentals of computer organization and its relevance to classical and modern problems of computer design
➢ To learn the basic hardware for processing, storing, and moving information, and how they are organized within the internal architecture of a computer.
➢ Understand various combinational and sequential logical circuits.
➢ Describe various data representations and explain how arithmetic and logical operations are performed by computers.

Course Outcomes: At the end of the course, the student will be able to
CO1: Understand the internal functioning of CPU that includes analyzing performance of computer system using performance equations.
CO2: Make use of the binary number system and apply knowledge of mathematics to perform basic arithmetic operations performed by the processor for computation.
CO3: To develop independent learning skills and to learn more about different computer architectures and hardware using modern tools.
CO4: Design hardware and software components by studying hardwired and micro programmed control techniques of designing processor.
CO5: Identify study and optimize various problems based on memory design and performance issues.

UNIT – I
Introduction to Digital Computer:
Number system - Binary, Octal, HEXA and their inter-conversion, 1's and 2's complement, Boolean algebra and Logic Gates, De-Morgan's Theorem, Duality Theorem, K-Maps, Binary Addition, Binary Subtraction, Addition/Subtraction of Numbers in 1's Complement Notation, addition/Subtraction of Numbers in Two's Complement Notation, Fixed and floating point representation of numbers.

UNIT – II
Combinational and Sequential circuits:
Half Adder, Full Adder, Binary Adder and Subtractor, Decoder / Encoder, Multiplexer / De-multiplexer,
Sequential Circuits: Flip Flops - SR, D, JK, Master – Slave and Edge Triggered, Shift Registers. Introduction to Counters: Synchronous and Asynchronous counters.

UNIT - III
Memory System:
Memory Hierarchy, Main Memory-RAM and ROM Chips, RAM & ROM Variants–DRAM, SRAM, ROM, PROM, EPROM, EEPROM, Concepts of Auxiliary Memory, Associative Memory, Cache Memory and Virtual Memory.

UNIT- IV
CPU Organization:

CPU Building Blocks, CPU Registers, Stack Organization and BUS Characteristics, Data Transfer and Manipulation Instructions, Addressing Modes, Instruction Code, Instruction Formats and Types of Computer Instructions, Parallel Processing, Pipelining, Arithmetic Pipelining ,RISC Pipelining, Instruction Pipelining.

Microprogrammed Control - control memory, Address Sequencing, Microprogram Example, and Design of Control Unit.

UNIT – V
Input- Output Organization:

Peripheral Devices, Input-Output Interface, Modes of Transfer, Asynchronous Data Transfer, Priority Interrupts, Direct Memory Access (DMA), and Input-Output Processor (IOP)

TEXT BOOK

MORRIS MANO, "Computer System Architecture", Pearson Education, 3rd edition, 2002

REFERENCES

1. THOMAS C BARTEE, "Digital Computer Fundamentals", TMH, 6th edition.
2. Linda Null and Julia Lobur,"The Essentials of Computer Organization and Architecture", 2nd edition, 2003.
3. William Stallings," Computer Organization and Architecture", 7th edition, Pearson.2006
4. Rajaraman, Radhakrishnan, "Digital Logic and Computer Organization", PHI, 2009.
5. Pal Chaudhuri, "Computer Organization & Design", PHI, 2nd edition, 1999.

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		L	T	P	Cr.
MCA (I Sem.)	**17MC04 – DISCRETE STRUCTURES AND GRAPH THEORY**	3	-	-	3

Course Educational Objectives: In this course student will learn about
➢ Clear thinking and creative problem solving.
➢ To develop logical thinking and its applications to computer science
➢ The construction and understanding of mathematical proofs.
➢ Able to think and solve the problem logically
➢ Common mathematical arguments and proof strategies.
➢ A sense of familiarity and ease in working with mathematical notation and concepts
➢ To develop the habit of thinking mathematically
➢ To introduce the students the theory of graphs
➢ To learn different properties of graphs.

Course Outcomes: At the end of the course, the student will be able to
CO1: Validate statements using propositional logic and convert them to normal form
CO2: Perform operations on various discrete structures such as sets, functions, relations, and sequences.
CO3: Apply basic counting principles, Ability to solve problems on Recursion and generating functions.
CO4: Perform different operations on graphs and trees. And learn different properties of them.
CO5: Apply algorithms and use of graphs and trees as tools to visualize and simplify Problems.

UNIT – I
Mathematical Logic:
Statements and Notations, Connectives, Well formed Formulas, Truth Tables, Equivalence Implications, and Normal Forms. Rules of Inference, Consistency of premises and indirect method of proof.
Predicate Calculus: Predicates, statement functions, Variables and Quantifiers, Predicate formulas, Free and Bound variables, Universe of discourse, Inference theory of predicate calculus.

UNIT – II
Set theory and Relations:
Introduction, Relations and ordering, properties of binary relations, Equivalence, Compatibility relations, Partial Ordering, Hasse Diagram.
Functions:
Composition of functions, Inverse function, Recursive functions, Pigeonhole principle and its applications.

UNIT - III
Elementary Combinatorics:
Basics of Counting, Combinations and Permutations, Binomial Coefficients, Binomial and Multinomial theorems, Principle of inclusion and exclusion.
Generating Functions:
Generating function of sequences, calculating coefficient of generating functions

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Recurrence Relations:

Solving recurrence relations by substitution, by characteristic roots, by generating functions. Solution of non_homogeneous recurrence relations

UNIT - IV
Graph Theory-I:

Basic concepts, Representation of Graph, BFS, DFS, Isomorphism and sub graphs, Multi graphs, Planar graphs, Euler circuits, Hamiltonian graphs, Chromatic Numbers.

UNIT - V
Graph Theory-II:

Single source and All pairs shortest path problems - Dijkstra's and Floyd's algorithms, Transitive closure-Warshall's Algorithm, Spanning Trees, Kruskal's algorithm, Prim's algorithm.

TEXT BOOK

J.L.Molt, A.Kandel, and T.P.Baker, "Discrete Mathematics for Computer Scientists and Mathematicians, PHI,2001.

REFERENCES

1. J.P.Tremblery and R.Manohar, "Discrete Mathematical Structures with Applications to Computer Science", TMH, 2004.
2. C L Liu and D P Mohopatra, "Elements of Discrete Mathematics", TMH, 2008.
3. Schaum's Outlines Lipschutz, and Lipson, "Discrete Mathematics", TMH, 2000.
4. Kolman, Busby and Ross, "Discrete Mathematical Structures", 6th ed; PHI, 2007.

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		L	T	P	Cr.
MCA (I Sem.)	**17MC05– ENGLISH LANGUAGE FOR COMMUNICATION**	2	-	-	2

Course Educational Objectives : In this course, the students will learn
- English with emphasis on LSRW skills.
- The standard vocabulary along with the meaning and usage of the words.
- The concepts of effective writing with special focus on drafting reports, e-mails, letters, resume etc.
- The concepts of process, channels, and barriers of effective communication (verbal and non-verbal)
- The concepts of process and requisites of good Listening and Reading skills.
- The concepts of soft skills such as team work, professional etiquettes, leadership strategies and interpersonal skills.

Course Outcomes : At the end of the course, the student will be able to
CO1: Read, write and aptly understand what ever is written and spoken in English.
CO2: Speak fluently with acceptable pronunciation and write with appropriate words, spellings, grammar and syntax.
CO3: Manage the situation and negotiate business with good English communication.
C04: Think and analyze the situations and make good presentations of their work and decisions.
CO5: Prepare oneself to face interviews and also to participate in group discussions

UNIT – I
Communicative Grammar
Types of sentences, Question Tags, Tense forms, Direct & Indirect speech, Active and Passive voice, Subject – Verb Agreement, Spotting the errors.
Vocabulary
Using Words as Different Parts of Speech, Formation of Words, Words often confused Idioms and phrases, One-Word Substitutes.

UNIT - II
Communication
Process - Methods and Channels of Communication - Non - Verbal Communication – Body Language - Barriers to Effective Communication.

UNIT - III
Listening-process & requisites of good listening - Types of listening- Barriers of listening – Listening comprehension; Reading skills- process & requisites – Reading strategies – Reading comprehension

UNIT - IV
Features of Effective Writing -7 Cs - Paragraph writing - Letter writing - e-mail drafting, Résumé Writing - Report writing - Synopsis/Abstracting.

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UNIT - V

Soft Skills-Significance and Components - Interpersonal Skills - Professional Etiquette – Empathy - Leadership development strategies - Team work- concept and exercises - Cross cultural communication.

REFERENCES

1. Murphy, "English Grammar", Cambridge University Press, New Delhi, 2009.
2. Rizvi Ashraf M, "Effective Technical Communication", Tata McGraw Hill, New Delhi, 2008.
3. Ramesh & Ramesh, " Ace of Soft skills", Pearson Education, New Delhi, 2009.
4. Raman and Sharma, "Technical communication", Oxford University Press.
5. K. Alex, "Soft skills: know yourself & know the world", S.Chand.

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	L	T	P	Cr.
MCA (I Sem.) 17MC06 – PROBABILITY AND STATISTICS	3	-	-	3

Course Educational Objectives: The main objectives of this course are
- To revise elementary concepts and techniques encountered in probability.
- To introduce new techniques for carrying out probability calculations and identifying probability distributions.
- To motivate the use of statistical inference in practical data analysis
- To study elementary concepts and techniques in statistical methodology.
- To develop the skills for applying the probability and statistical techniques in computer science.

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

CO1: Predict various probabilistic situations based on various laws of probability like additive, multiplicative laws.

CO2: Distinguish among the criteria of selection and application of Binomial, Poisson, Normal and Gamma distributions.

CO3: Estimate the point and interval estimators of mean, variance and proportion for the given Sample data.

CO4: Apply various sample tests like Z-test, t-test, F-test and $\chi2$ -test for decision making regarding the population based on sample data.

CO5: Estimate the level of correlation, the linear relationship for the given bivariate data and the best fit curve of the given data by the method of least squares.

UNIT – I
PROBABILITY

Probability Theory: Sample space, Events & Probability, axioms of Probability. addtion law of probability ,conditional probability, Multiplication theorem and Baye's theorem.

UNIT – II
PROBAILITY DISTRIBUTIONS

Random variables and distributions : Discrete and continuous Random variables, Mathematical Expectation. Discrete and continuous probability distributions- Binomial, Poisson, Normal Distributions and its applications.

UNIT – III
SAMPLING DISTRIBUTION AND ESTIMATION

Sampling distribution: Populations and samples - Sampling distributions of mean (known and unknown) proportions, sums and differences. Estimation – point estimation, interval estimation, Bayesian estimation.

UNIT – IV
TESTS OF HYPOTHESIS

Testing of hypothesis: Null and alternative hypothesis, one-tail and two-tail tests, tests of Hypothesis concerning means, Tests of Hypothesis concerning proportions, F-test for variances , chi-squre test for goodness of fit and independence of attributes.

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UNIT – V
CORRELATION AND CURVE FITTING

Correlation and Regression: Simple bivariate correlation coefficient, rank correltion and Linear regression, regression lines.

Non Linear regression: Least square fit , fitting of straight line, polynomial and Exponential curve.

TEXT BOOK

S.C.Gupta & V.K.Kapoor "Fundamentals of Mathematical statistics" Sultan chand and sons, New Delhi. 11th edition,2002.

REFERENCES

1. Jay L.Devore "Probability and Statistics for engineering and the sciences." Cengage Learning india, 8th edition,2012.
2. Murray R.Spiegel "Probability and Statistics" Schaum;s outline series, ,Mc Graw Hill, 4th edition.
3. T.K.V. Iyengar "Probability & Statistics for MCA ". S. Chand & company, New Delhi, 2009 edition.
4. Miller and Freund's "Probability and Statistics for Engineers" Prentice Hall of India,NewDelhi, 8th edition,2011.

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		L	T	P	Cr.
MCA (I Sem.)	**17MC60- C PROGRAMMING LAB**	-	-	4	2

Course Educational Objectives: In this course student will learn about
➢ The programming fundamentals.
➢ Basic concepts of the C-programming language.
➢ The logical and programming skills in C language.

Course Outcomes: At the end of the course, the student will be able to
CO1: Assemble and dismantle a PC.
CO2: Develop logical solution for a given problem.
CO3: Implement solutions for various problems using C language.
CO4: Develop programs for simple applications of real life using structures and files.
CO5: Implement Modular Programming and memory management using pointers.

LIST OF EXPERIMENTS

Cycle-1:

1) Write programs in C Language:
   a. To Exercise preliminary data types
   b. To illustrate the usage of various Operators
   c. To illustrate the order of evaluation of expressions

Cycle-2:
Write programs in C Language
   a) To check whether the given year is leap year (or) not
   b) To convert given two digit number into words using switch statement
   c) To illustrate the usage of 'goto' statement
   d) To find smallest& biggest number from the given set of 4 numbers using 'if' statement.
   e) To calculate the student grade in the examination – assume suitable constraints.
   f) To prepare electricity bill for the consumed units – assume suitable constraints.
   g) To find roots of Quadratic Equation.

Cycle-3:
Write programs in C Language
   a) To display first N natural numbers
   b) To find whether the given number is Armstrong (or) not
   c) To find reverse of the given number and to check whether it is palindrome (or) not.
   d) To find whether given number is strong number (or) not.
   e) To check whether a given number is Prime (or) not
   f) To display prime numbers with in the given range(Nesting of Loops).
   g) To display the following formats (Nesting of Loops)

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```
i)              1                    ii)   5   4   3   2
                1       2                       4   3   2
        1
        1       2           3              3   2   1
1           2       3   4                  2   1
1       2       3       4   5          1
```

Cycle -4:
Write programs in C Language
a) To Find the sum and average of given numbers using Arrays.

b) To display elements of array in reverse order

c) To search whether the given element is in the array (or) not using linear search & binary search. d) Addition, subtraction and multiplication of Matrices

e) Transpose of given matrix

f) To illustrate the use of any 5 string handling functions.

g) To accept line of text and find the number of characters, number of vowels and number of blank

spaces in it.

h) To find whether the given string is palindrome (or) not.

Cycle -5:
Write programs in C Language
a) To find factorial of a given number using functions.

b) To swap two numbers using functions.

c) To find GCD of two numbers using recursion

d) To solve Towers of Honai problem.

e) To illustrate the use of external & static storage classes.

Cycle-6:
Write programs in C Language
a) Illustrating pointer declaration, initialization and Pointer arithmetic.

b) To illustrate *call by reference*.

c) To find sum of the elements of the array using functions.

d) To illustrate the usage of command line arguments.

e) To illustrate the usage of dynamic memory management functions.

Cycle-7:
Write programs in C Language
a) To process the student records. Assume suitable fields for student structures
   (Different kinds of initialization of structure variables are to be exercised)

b) To read records of 10 employees and find their average salary
   (Exercise array of structures & Nested structures concepts).

c) To handle a structure variable using pointers and implement
   self - referential structure

d) To exercise i) unions ii) bit fields iii) enum

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<u>**Cycle -8 :**</u>

Write programs in C Language

a) Accessing content from files and writing content in to it.
   (Exercise different file operation modes)
b) Accessing structured data using files.
c) Copy the contents of one file into another
   (Exercise different file operation modes)
d) Exercise random access files operations

TEXT BOOK

Ajay Mittal, "Programming in C: A Practical Approach" , First Edition , Person Education, 2010

REFERENCES

1. Reema Thareja "Programming in C", First Edition, Oxford Publications, 2011.
2. Fundamentals of Data Structures in C, Horowitz, Sahni, AndersonFreed, 2nd ed, Universities Press, 2008.

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			L	T	P	Cr.
MCA (I Sem.)	**17MC61 – DIGITAL LOGIC AND COMPUTER SYSTEM ORGANIZATION LAB**		-	-	4	2

Course Educational Objectives: In this course student will learn about:
➢ Fundamental designing concepts of different types of Logic Gates and Minimization techniques.
➢ Design, analyze and implement various sequential and combinational circuits.
➢ Practical knowledge of DeMorgan's Law and Boolean Algebra Rules and Theorems.
➢ Simplifying circuits using Karnaugh maps.

Course Outcomes: At the end of the course, the student will be able to
CO1: Apply knowledge of number systems, Boolean algebra, multiplexers and counters to conduct experiments of digital electronics laboratory.
CO2: Identify various ways of implementing arithmetic circuits.
CO3: Identify various ways of implementing sequential and combinational circuits.
CO4: Design, Implementation and Realizations of various logic gates.
CO5: Design and Construct various types of Counters.

LIST OF EXPERIMENTS

EXERCISE 1
Using Logic Gates: - AND, OR, NOT, NOR, XOR, NAND, XNOR, Buffer

EXERCISE 2
Boolean algebra: Theorems and logical Gates, verification of truth tables for some given expressions

EXERCISE 3
Realization of Boolean expressions; Using (i) AND – OR-NOT Gates (ii) NAND Gates (iii) NOR Gates

EXERCISE 4
Latches Flip – Flops: RS, JK, T, D, Master –Slave FF, Edge – Triggered Flip – Flops

EXERCISE 5
Registers: All types of Shift Register s and Adder, Subtractor, Divider, Negator, Comparator

EXERCISE 6
Counters: Binary Counter, Synchronous Binary Counter, Synchronous Up/Down counter

EXERCISE 7
Asynchronous Binary Counter, Ripple Counter, Decade Counter, Up/Down Counter

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EXERCISE 8
Modulo Counter: Modulo - 5, Modulo – 10

EXERCISE 9
Adders / Sub tractors: Half Adder, Full Adder, 1's and 2's complement addition

EXERCISE 10
Multiplexers/ Data Selector: 2- input and 8- input, Demultiplexers, Logic Function Generator

EXERCISE 11
Decoders and Encoders

EXERCISE 12
BCD adders and Comparators

EXERCISE 13
Code Converters : Decimal –to-Binary, Binary – to – Decimal, Decimal – to- Hexa Decimal, BCD- to –Decimal, Binary – to- gray, gray- to –Binary

EXERCISE 14
RAM, ROM, PROM, EPROM – Testing Memory Chips

REFERENCES
1. Rajaraman, Radhakrishnan, "Digital Logic and Computer Organization", PHI, 2006.
2. Floyd & Jain, "Digital Fundamentals", Pearson, 2000.

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		L	T	P	Cr.
MCA (I Sem.)	**17MC62- IT LAB**	-	-	2	1

Course Objectives: In this course student will learn about
Microsoft Office Tools which includes
➤ Microsoft Word
➤ Microsoft Power Point
➤ Microsoft Excel
➤ Microsoft Access

Course Outcomes : At the end of the course, the student will be able to
CO1: Creation of letters, Tables, Pictures and Mail Merge in MS-Word
CO2: Implement various formulas in MS-Excel
CO3: Generate graphs for the given data using MS-Excel
CO4: Design Power Point presentations
CO5: Creating Database, Forms and Generate Reports using MS-Access

LIST OF EXPERIMENTS

EXERCISE-1: Microsoft Word
Basic Editing, Formatting, Copying and Moving Text and Objects, Editing Features, Paragraph Formatting, Tables, Lists, Page Formatting, Inserting Graphics, Pictures, and Table of Contents, Perform Mail Merge.

EXERCISE-2: Microsoft Power Point
Designing a presentation: Organizing the content
The visual communication: using graphics and images
The visual communication: using shapes, charts and diagrams
Multimedia: using audio and video, Animations
Organizing and publishing a presentation

EXERCISE-3: Microsoft Excel
Excel Fundamentals, Worksheet Basics, Editing a Worksheet, Creating Formulas and Functions, Copying and Pasting of formulas, creating and Working with Charts, Conditional Formatting and Cell Styles, Tables, Filtering and Sorting data, Preparing Files for Distribution

EXERCISE-4: Microsoft Access
Access Fundamentals, Database Basics, Creating and Working with a Database, Finding, Filtering, and Formatting Data, Creating & querying using forms, Creating and Printing reports.

REFERENCES
1. Beginning Microsoft Office 2010 by Guy Hart-Davis Publication Apress
2. Learning Microsoft® Office 2013 Deluxe Edition Pearson.

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	L	T	P	Cr.
MCA (II Sem.) 17MC07 – COMPUTER NETWORKS	3	-	-	3

Course Educational Objectives:
- ➢ To build an understanding for the Layered network architectures OSI, TCP/IP and ATM.
- ➢ To enrich the knowledge in Data link layer fundamental such as error detection, correction, flow control techniques and multiple access control techniques.
- ➢ To enrich the knowledge in internetworking principles and how the Internet protocols, routing algorithms operate.
- ➢ To extend the knowledge of Transport layer services, connections, and protocols such as TCP and UDP.
- ➢ To assist in implementation of Application layer protocols.

Course Outcomes: At the end of the course, the student will be able to :
CO1: Enumerate the layers of the OSI model, TCP/IP and ATM.
CO2: Analyze MAC layer protocols and multiple access control techniques.
CO3: Implement routing and congestion control algorithms.
CO4: Analyze TCP and UDP protocols.
CO5: Design applications using Application layer protocols.

UNIT - I
Introduction to Computer Networks:
Uses of Computer Networks, Network Hardware: LAN, MAN, WAN, Bridges, Repeaters, Gateways, Network Software: Protocol hierarchies, Design issues, Types of services, Reference models: OSI, TCP/IP, ATM
Physical Layer:
Guided Transmission Media

UNIT - II
Data Link Layer:
Design issues of Data Link Layer, Error Correction and Detection, Elementary Data Link Protocols: Unrestricted Simplex Protocol, Stop and Wait, Simplex Protocol for noisy channel, Sliding Window Protocol, Go back N, Selective Repeat, and HDLC
Medium Access Control sub layer (MAC):
Multiple Access Protocols, Ethernet-802.3, Wireless LAN, Bluetooth

UNIT - III
Network Layer:
Design Issues of Network Layer, Routing Algorithms: Optimality, Shortest path, Flooding, Distance Vector Routing, Hierarchical Routing, and Routing for Mobile Hosts.
Congestion Control Techniques:
Leaky Bucket, Token Bucket. Congestion Prevention Techniques: Traffic Shaping, Choke Packet, Load Shedding, Jitter Control.

UNIT - IV
Transport Layer:
Services of Transport Layer, Elements of Transport Protocols: UDP and TCP, Service Model, Protocol segment Header, Connection Establishment, Connection Release, TCP Connection Management.
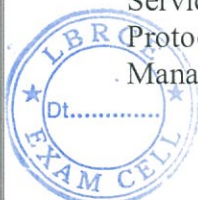
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UNIT - V
Application Layer:

DNS: Domain Name System, Electronic Mail (SMTP): Architecture, User Agent, Message Format, Message Transfer, Delivery, FTP, The World Wide Web (HTTP).

TEXT BOOK

Andrew S. Tanenbaum "Computer Networks" Fourth Edition, Pearson Education-2006.

REFERENCES

1. Behrouz A.Frouzon "Data Communications and Networks" Tata McGraw Hill Publication, 200
2. William Stallings "Data and Computer Communication "Sixth Edition, Pearson Education Asia, 2008.
3. Larry L.Peterson and Bruce S.Davie "Computer Networks" A system approach Third Edition, Kaufmann Publisher, 2011.
4. Michel A. Gallo, William M.Hancock "Computer Communication and Networking Technologies", Thomson Publication, 2001.
5. William Ashay, "Understanding Data Communications and Networks", 3nd Edition, Vikas Publishing House, 2008.

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L	T	P	Cr.
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MCA (II Sem.)   **17MC08 – DATADBASE MANAGEMENT SYSTEMS**

Course Educational Objectives:
In this course student will learn about
➢ Various Data Models, Schemas, Instances, Three Schema Architecture and DBMS Components.
➢ Data modelling using the entity-relationship and practice developing database designs.
➢ Solving problems by constructing database queries using the Structured Query Language (SQL) and PL/SQL.
➢ Applying normalization techniques to normalize the database.
➢ The need of database processing and learn techniques for controlling the consequences of concurrent data access.
➢ Indexing Techniques for physical implementation of databases.

Course Outcomes: At the end of the course, the student will be able to :
CO1: Design and implement a database schema for a given problem-domain.
CO2: Populate and query a database using SQL commands and PL/SQL constructs.
CO3: Normalize a database.
CO4: Understand the transaction management protocols and crash recovery algorithms.
CO5: Implement the Indexing Techniques.

UNIT – I
Introduction to Database Management Systems:
Database system Applications, Database system Vs File system, Data abstraction, Instances and Schemas, Database users, Database system structure, Database design and ER diagrams, ER Design - Entities, Attributes, Entity sets, Relationships and Relationship sets, Additional features of ER model.

UNIT - II
Introduction to Relational model:
Integrity constraints over the relations, Enforcing integrity constraints, Database Languages, DDL, DML, TCL, basic form of SQL query, Querying relational data, Logical database design, views, Destroying and altering tables/views. Nested queries correlated nested queries, Null values, Relation Algebra- selection, projection, renaming, join, examples.

UNIT – III
Normalization:
Schema refinement – Problems Caused by redundancy – Decompositions – Problem related to decomposition – reasoning about FDS – FIRST, SECOND, THIRD Normal forms – BCNF – Lossless-join Decomposition , Dependency- preserving Decomposition – Schema refinement in Data base Design – Multi valued Dependencies – Fourth Normal Form and Fifth Normal form.

UNIT - IV
Transaction Management and Concurrency Control :
ACID properties, Transactions and Schedules, Concurrent Execution of transactions, Serializability and Recoverability
Introduction to Lock Management:
Lock Conversions, Dealing with Dead Locks, Concurrency without Locking. Performance Locking, Transaction Support in SQL, Crash Recovery-Aries Recovery Algorithm.

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UNIT - V

File organizations:
Comparison of File Organizations, Index data Structures, Tree based Indexing-Indexed Sequential Access Methods (ISAM), B+ Trees: Dynamic Index Structure.

Hash Based Indexing:
Static Hashing – Linear Hashing, Extendable hashing.

TEXT BOOK

Raghurama Krishnan and Johannes Gehrke, "Data Base Management Systems", TMH 3rd Edition, 2003.

REFERENCES

1. Silberschatz, Korth, "Data Base System Concepts", 5/e, TMH,2006.
2. Elmasri Navathe, "Data Base Management System", 5/e, , Pearson,2005.
3. C.J.Date, "Introduction to Data Base Systems", 8/e, , Pearson,2008.
4. Majumdr, Bhattacharyya," Data Base Management Systems", TMH ,96.
5. Peter ROB,Coronel,Cengage, "Data Base System Concepts".

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	L	T	P	Cr.
MCA (II Sem.) **17MC09 – OPERATING SYSTEMS**	2	2	-	3

Course Educational Objectives:
In this course student will learn about:
➢ To understand the services the operating system provides to the user.
➢ To study process scheduling schemes and synchronization.
➢ To study techniques for efficient memory utilization and deadlock handling.
➢ To study about file system interface and implementation and Disk scheduling.
➢ To study the structure, purpose, and functionalities of modern computers.

Course Outcomes: At the end of the course, the student will be able to :
CO1: Gain in depth knowledge about the structures of the operating system, different types of operating system and functions performed by modern operating system.
CO2: Identify and apply knowledge of various software and hardware synchronization tools for solving critical section problem in concurrent processes.
CO3: Understand and apply process management and memory management concepts to solve various hardware and software problems.
CO4: Identify various system protection and security mechanisms in order to design efficient software system by using various access control techniques.
CO5: Understand the concepts of deadlock in operating systems and employ the deadlock avoidance techniques in multiprogramming system.

UNIT-I
Introduction to Operating System:
Definition of Operating System, Functions of Operating System, Multi-user, Multiprocessing, Multiprogramming, Time Sharing, Real Time Systems, Virtual Computer, Operating System Structure, System Components, Services, System Calls, System Programs, System Design and Implementation.

UNIT – II
Process Management:
Process concept, Context Switching, Process Control Block, Process Scheduling, Operations on Processes, Co-operating Processes, Inter Process Communication,
CPU Scheduling:
Scheduling Concepts, Criteria, Scheduling Algorithms, Multiprocessor Scheduling, Real time scheduling.

UNIT – III
Process Synchronization:
Critical Section, Synchronization Hardware, Semaphores, Problems of Synchronization, Critical Regions, Monitors.
Deadlocks:
Characterization, Handling Deadlocks, Deadlock Prevention, Avoidance, Detection, Deadlock Recovery

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UNIT – IV
Memory Management:

Storage Hierarchy, Storage Management Strategies: Contiguous, Non Contiguous Storage Allocation, Single User-Fixed Partition, Variable Partition, Paging, Segmentation, Swapping-Virtual Memory concept, Demand paging and its performance, Need for Page Replacement, Page Replacement Algorithms, Thrashing.

UNIT – V
File System Interface and Implementation:

Access Methods, Directory Structure, Protection, File system structure, Allocation Methods, Free space Management, Directory Management, Directory Implementation, Efficiency and Performance, RAID Levels

Device management:

Physical characteristics Disk Scheduling: FCFS, SST, and C- SCAN.

TEXT BOOK

Silberschatz, Galvin ,Gagne, "Operating System Principles", 7th Edition, Wiley,2006.

REFERENCES

1. Tenenbaum A.S., Modern Operating Systems, 2nd edition, Pearson Education, 2001
2. William Stallings, "Operating Systems", Sixth edition, PHI,2009.
3. Milan Milankovic, "Operating Systems, Concepts and Design", McGraw-Hill.
4. Harvey M Deital, "Operating Systems", Addison Wesley ,1999.
5. Stuart .E. Madnick & John. J. Donovon , "Operating System"

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	L	T	P	Cr.
MCA (II Sem.) **17MC10– SOFTWARE ENGINEERING**	3	-	-	3

Course Educational Objectives:
In this course student will learn about:
➢ How to analyze and Model User's Requirements.
➢ Selecting an appropriate Process Model and apply it to All Stages of Software Development Life Cycle.
➢ Selecting and Appling Appropriate Design Methodology.
➢ Assuring Software Quality, Select and Apply Appropriate Testing Strategies.
➢ Selecting and Applying Appropriate Metrics to Estimate Software Size, Effort, and Cost.

Course Outcomes: At the end of the course, the student will be able to :
CO1: Identify, formulate, analyze, and solve problems, as well as identify the computing requirements appropriate to their solutions.
CO2: Design, implement, and evaluate software-based systems, components, or programs of varying complexity that meet desired needs, satisfy realistic constraints, and demonstrate accepted design and development principles.
CO3: Apply knowledge of computing, mathematics, science, and engineering appropriate to the discipline, particularly in the modeling and design of software systems and in the analysis of tradeoffs inherent in design decisions.
CO4: Compute metrics and conduct testing activities during software development.
CO5: Conduct Risk management and Quality management activities during software development.

UNIT – I
Introduction to Software Engineering:
The evolving role of software, Changing Nature of Software, Software myths
A Generic view of process:
Software engineering- A layered technology, a process framework, The Capability Maturity Model Integration (CMMI)
Process models:
The waterfall model, Incremental process models, Evolutionary process models, The Unified process
Software Requirements:
Functional and non-functional requirements, User requirements, System requirements, Interface specification, the software requirements document

UNIT – II
Requirements engineering process:
Feasibility studies, Requirements elicitation and analysis, Requirements validation, Requirements management
Design Engineering:
Design process and Design quality, Design concepts, the design model
Creating an architectural design:
Software architecture, Data design, Architectural styles and patterns, Architectural Design

UNIT – III
Object-Oriented Design:
Objects and object classes, An Object-Oriented design process, Design evolution.
Performing User interface design:
Golden rules, User interface analysis and design, Interface analysis, interface design steps, Design evaluation.

UNIT - IV
Testing Strategies:
A strategic approach to software testing, test strategies for conventional software, Black-Box and White-Box testing, Validation testing, System testing, the art of Debugging
Product metrics:
Software Quality, Metrics for Analysis Model, Metrics for Design Model, Metrics for source code, Metrics for testing, Metrics for maintenance.
Metrics for Process and Products:
Software Measurement, Metrics for software quality.

UNIT - V
Risk management:
Reactive vs. Proactive Risk strategies, software risks, Risk identification, Risk projection, Risk refinement, RMMM, RMMM Plan.
Quality Management:
Quality concepts, Software quality assurance, Software Reviews, Formal technical reviews, Statistical Software quality Assurance, Software reliability, The ISO 9000 quality standards.

TEXT BOOK
Roger S. Pressman, "Software Engineering, A practitioner's Approach", 6th edition. McGraw-Hill International Edition, 2005.

REFERENCES
1. Somerville, "Software Engineering", 7th edition, Pearson education,2009.
2. K.K. Agarwal & Yogesh Singh," Software Engineering", New Age International Publishers,2008.
3. James F. Peters, Witold Pedrycz," Software Engineering an Engineering approach", John Wiley,2007.
4. Waman S Jawadekar, "Software Engineering principles and practice-, MGH.

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		L	T	P	Cr.
MCA (II Sem.)	**17MC11 – ORGANIZATION STRUCTURE AND PERSONNEL MANAGEMENT**	3	-	-	3

Course Educational Objectives:

In this course student will learn about
➢ Principles of management, Human Resource Management, communication and Strategic Management.
➢ The HR practices in the organization.
➢ The basic tips for better communication.
➢ The company's strength, weakness, opportunities and threats through SWOT analysis.
➢ The recruitment methods, selection process, training methods and induction about the job.

Course Outcomes: At the end of the course, the student will be able to :
CO1: Tackle the business situations effectively.
CO2: Gain the practical implication of theories and principles of management.
CO3: Understand about the organization structure and hierarchy of the organization.
CO4: Handle the organization problems with excellence.

UNIT – I
Introduction to Management:
Concepts, Nature and definitions of Management-Management and administration, principles of management.
Functions of management:
Planning, organizing, directing and controlling-importance of management-introduction to motivation.

UNIT – II
Classical Theories of Organization & Behavior Theories of Organization:
Functional approach-division of labor, levels of authority, span of control, authority & responsibility, Efficiency of management. Concept of organization structure-formal and informal organization, difficulties due to informal organization-group behavior-Committee-motivation and theories of motivation.

UNIT - III
Human Resource Management:
Objectives, functions of HRM, duties and responsibilities of HR department in the organization-changing, concepts of personal management

UNIT - IV
HR Planning, Training and Development:
Preparation of man power inventory and forecasting, job description, recruitment, job specification and selection, Interviewing techniques, transfers, promotion and its policies. Objectives of training-identifying training needs-training methods-on the job training-off the job training.

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UNIT - V
Communication, Strategic Management:
Importance of communication, communication process-methods of -two way communication, barriers of communication, Organizational barriers-essentials of effective Communication system. Introduction-study of Strategic Management-environmental scanning-internal environment and external environment SWOT analysis-challenges in LPG.

TEXT BOOK
Recenzo, Robins, "Personnel and Human Resource Management", PHI, India.

REFERENCES
1. Gay Dessler, "Human Resource Management", PHI, India, 2005.
2. Agarwal," Organization and Management", TMH.
3. Venkat Ratnam, "Personnel management and Human Resources", TMH, 2009.
4. L.M.Prasad, "Human Resource Management", S.Chand Publications.
5. Aswathappa, "Human Resource & Personnel Management", TMH, 2006.

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L	T	P	Cr.
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MCA (II Sem.)　　　　**17MC63 – DATA STRUCTURES LAB**

Course Educational Objectives:
In this course student will learn about
➢　The specification, representation, and implementation of Data Types and Data Structures.
➢　The Analysis of various Algorithms for mainly Time and Space Complexity.
➢　Applications of Data Structures.
➢　How to get a base for advanced computer science study

Course Outcomes: At the end of the course, the student will be able to :
CO1: Demonstrate familiarity with major algorithms and data structures.
CO2: Calculate and analyze performance of algorithms.
CO3: Choose the appropriate data structure and algorithm design method for a specified application.
CO4: Identify which algorithm or data structure to use in different scenarios.
CO5: Implement indexing and hashing techniques used in several other fields of computer science.

LIST OF EXPERIMENTS

Implement the following programs using C language.
1. Implement Linear and Binary Search mechanisms.

2. Sort the given list of numbers using a) Selection Sort b) Bubble Sort c) Insertion Sort d) Merge sort e) Quick sort

3. Implement PUSH and POP operations on Stacks using Arrays. Handle the OVERFLOW and UNDERFLOW problems also.

4. Implement Insertion and Deletion operations on Queues using Arrays. Handle the OVERFLOW and UNDERFLOW problems also.

5. Perform various operations on Circular Queue using Arrays

6. Perform various operations on DEQueue using Arrays

7. To convert infix notation to postfix notation

8. Create a single linked list and implement the following operations:
a) Insert a node at specific position
b) Delete a node from a specific position
c) Counting the nodes
d) Reversing the linked list

9. Implement PUSH and POP operations on Stacks using Linked List. Handle the OVERFLOW and UNDERFLOW problems also.

10. Implement Insertion and Deletion operations on Queues Linked List. Handle the OVERFLOW and UNDERFLOW problems also.

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11. Create a Double linked list and implement the following operations:
    a) Insert a node at specific position
    b) Delete a node from a specific position
    c) Counting the nodes
    d) Reversing the linked lis

12. To implement Heap Sort
13. Write program to perform various operations on BST.
14. Implement BFS and DFS traversal techniques on a given graph.

REFERENCES

1. Fundamentals of Data Structures in C, Horowitz, Sahni, AndersonFreed, 2nd ed, Universities Press, 2008.
2. Classic Data Structures, Samanta, 2nd ed, PHI, 2009.

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			L	T	P	Cr.
MCA (II Sem.)	**17MC64 – DATABASE MANAGEMENT SYSTEMS LAB**		-	-	4	2

Course Educational Objectives:

In this course student will learn about
- Different issues involved in the design and implementation of a database system.
- SQL for database management.
- The significance of integrity constraints, referential integrity constraints.
- The concepts and techniques relating to query processing by SQL engines.
- Programming PL/SQL including stored procedures, stored functions, cursors, packages.

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

CO1: Illustrate ER mapping to relational model.

CO2: Apply common SQL statements including DDL, DML and DCL statements to perform different operations.

CO3: Design different views of tables for different users and to apply embedded and nested queries.

CO4: Create procedures, functions, cursors, triggers on databases using PL/SQL.

CO5: Design and implement a database for a given problem according to well known design principles that balance data retrieval performance with data consistency.

DATABASE MANAGEMENT SYSTEMS LAB (Using Oracle, SQL & PLSQL)

LIST OF EXPERIMENTS

1. Creating tables for various relations(in SQL).
2. Construct a bank database with ER diagrams and tables with all IC's.
3. Create sailors, reserves and boats tables and implement all algebraic operations.
4. Create a database for university with all IC's.
5. Aggregate functions.
6. String functions.
7. Nested queries.
8. Views.
9. Writing Triggers on bank database.
10. Writing triggers on university database.
11. Writing functions.
12. Writing procedures.

REFERENCES

1. Understanding SQL, Martin Gruber, John Wiley & Sons.
2. SQL- PL/SQL, Ivan bayross, BPB.
3. Oracle – The Complete Reference, Byrla, TMH /oracle press.

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				L	T	P	Cr.
MCA (II Sem.)	**17MC65- ENGLISH COMMUNICATION SKILLS LAB**			-	-	4	2

Course Educational Objectives:
In this course, the students learn to
➢ Gather information and organize ideas relevantly and coherently, Write project/research reports/technical reports.
➢ Make oral presentations, power point presentations and participate in team presentations.
➢ Critical reading and Analytical writing.
➢ Learn Interview skills.

Course Outcomes: At the end of the course, the student will be able to
CO1 : Make power point presentations and oral presentations.
CO2 : Face competitive exams (like GRE, TOEFL, IELTS etc).
CO3 : Exhibiting their critical reading and analytical writing skills.
CO4 : Enhanced negotiation skills at work places / professional lives.

Syllabus: Presentation Skills Lab (PSL) has two parts:
➢ **Computer Assisted Language Learning (CALL) Lab** for 60 students with 60 systems, LAN facility and English language software for self- study by learners.
➢ **Interactive Communication Skills (ICS) Lab.** with movable chairs and audio-visual aids with a P.A System, a T. V., a digital stereo –audio & video system and camcorder etc.

Exercise - I
CALL Lab:
Understand: Features of JAM
ICS Lab:
Practice: Ice-Breaking Activity and JAM Session – Introducing Oneself – Extempore - Public Speeches.

Exercise - II
CALL Lab:
Understand: Features of Good Conversation – Strategies for Effective Communication.
ICS Lab: Group Discussion

Exercise - III
CALL Lab:
Understand: Data collection – Organizing data - Making Poster – Making slides.
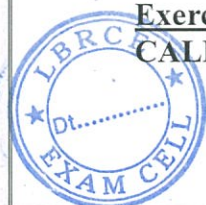**ICS Lab:**
Practice: Poster Presentation – Power Point Presentations.

Exercise - IV
CALL Lab:
Understand: Types of Résumé – Formats of various letters and e-mails.
ICS Lab:
Practice: Writing Résumé & Letters e-mails.

Exercise - V
CALL Lab:

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Understand: Reading comprehension – Listening Comprehension – scanning, skimming, reading between lines and critical reading.

ICS Lab:

Practice: Reading comprehension - Listening Comprehension – scanning, skimming, reading between lines and critical reading.

Exercise - VI

CALL Lab:

Understand: Interview Skills

ICS Lab:

Practice: Mock Interviews

Minimum Requirement:

System Requirement (Hardware component):

Computer network with LAN with minimum 60 multimedia systems with the following specifications:

i.   Intel (R) Core (TM) i3-41`50 (CPU) Processor
   1.   Speed – 3.50 GHZ
   2.   RAM – 4 GB Minimum
   3.   Hard Disk – 400 GB
ii.   Headphones of High quality

Suggested Software:

   1.   Globarena's software
   2.   Young India's Clarity software

Lab Manual:

   1. Board of Editors, "ELCS Lab Manual – A Workbook of CCALL and ICS Lab Activities", Orient
         Black Swan Pvt. Ltd., Hyderabad, 2016.

Books Recommended:

   1.   Stephen Bailey, "Academic Writing- A Practical guide for students", Rontledge Falmer, London & New York, 2004.
   2.   A Ramakrishna Rao, Dr.G Natanam & Prof SA Sankaranarayanan, "English Language Communication : A Reader cum Lab Manual, Anuradha Publications, Chennai
   3.   DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice, New Age International (P) Ltd., Publishers, New Delhi.
   4.   Books on TOEFL/GRE/GMAT/CAT by Barron's/cup
   5.   IELTS series with CDs by Cambridge University Press.

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		L	T	P	Cr.
MCA (III Sem.)	**17MC12– AUTOMATA THEORY AND COMPILER DESIGN**	3	-	-	3

Course Educational Objectives:
In this course student will learn about:
➢ Deterministic finite automaton and non deterministic finite automaton.
➢ Regular languages and Regular grammars.
➢ Context free grammars and push down Automata.
➢ Turing machines,
➢ Compilation process.
➢ Top down parsing and Bottom up parsing.

Course Outcomes: At the end of the course, the student will be able to
CO1: Construct finite automata for regular languages and push down automata for context free languages
CO2: Design regular and context free grammars.
CO3: Design Turing machines.
CO4: Execute top down parsing on context free grammars using LL(1),recursive descent and predictive parsers.
CO5: Conduct bottom up parsing on context free grammars using LR parsers.

Unit-I
Fundamentals, Introduction to Finite Automata:
Finite automaton model, acceptance of strings, and languages, deterministic finite automaton and non deterministic finite automaton, transition diagrams, NFA with E-transitions-Significance, acceptance of Languages, Conversions and Equivalence: Equivalence between NFA with and without E-transitions, NFA to DFA conversion, minimization of FSM, equivalence between two FSM's Finite Automata with output-Moore and Melay machines

Unit-II
Regular Languages:
Regular expressions, Identity rules, Constructing Finite Automata for a given regular expressions, Conversion of finite Automata to regular expressions-.Ardens Lemma method, State elimination method, Pumping lemma of regular sets

Unit-III
Grammar Formalism:
Regular grammars – right linear and left linear grammars, Context free grammar, derivation trees, Ambiguity in context free grammars. Chomsky normal form, Greiback normal form, Pumping Lemma for Context free Languages, push down automata, definition, model, acceptance of CFL, Acceptance by final state and acceptance by empty state and its equivalence, Turing Machine, Definition, Model, design of Turing machines,

UNIT-IV
Overview of Compilation:
Phases of Compilation – Lexical Analysis, Phases of translation, interpretation,
Top down parsing:
Top down parsing – Backtracking, LL (1), recursive descent parsing, Predictive parsing,

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UNIT-V
Bottom up parsing:
Shift Reduce parsing, LR and LALR parsing, Error recovery in parsing, handling ambiguous grammar,

Semantic analysis:
Syntax directed translation, S-attributed and L-attributed grammars, intermediate code – abstract syntax tree, polish notation and three address codes

TEXT BOOK
1. Hopcroft H.E. and Ullman J.D, Introduction to Automata Theory Languages and Compilation, Pearson Education.
2. Aho, Ullman, Ravisethi, Compilers Principles, techniques and Tools, Pearson Education.

REFERENCES
1. John C Martin, Introduction to languages and the Theory of Computation, TMH
2. Lewis H.P. & Papadimition, "Elements of theory of Computation", C.H. Pearson / PHI
3. Andrew W.Appel. Modern Compiler construction in C, Cambridge University Press.

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		L	T	P	Cr.
MCA (III Sem.)	17MC13 – DESIGN AND ANALYSIS OF ALGORITHMS	3	-	-	3

Course Educational Objectives:

In this course student will learn about
- The importance of studying the complexity of a given algorithm.
- Various algorithmic design techniques.
- Data structures and/or algorithmic design techniques in solving new problems including recursion, divide-and-conquer, greedy algorithms, and dynamic programming.
- Fundamental computing algorithms: sorting, searching, and graph algorithms.
- The basic computability concepts and the complexity classes P, NP, and NP-Complete.
- Some techniques for solving hard problems.

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

CO1: Apply and analyze the complexity of certain divide and conquer, greedy, and dynamic programming algorithms.

CO2: Differentiate the lower and upper bounds of various problems and their importance in deciding the optimality of an algorithm.

CO3: Differentiate between various algorithms for sorting (e.g., insertion, merge, quick-sort, and heap sort), searching (e.g., linear and binary search), and selection (e.g., min, max) and when to use them.

CO4: Implement the techniques used for designing fundamental graph theory algorithms (e.g., breath-first and depth-first algorithms) and apply them to solve other related problems (e.g., single source shortest path as in Dijkstra's and Bellman-Ford algorithm, multiple source shortest path as in Floyd's Algorithm, minimum spanning trees as in Prim's and Kruskal's algorithms)

CO5: Apply backtracking and branch and bound techniques to deal with some hard problems.

UNIT - I
Introduction:
Algorithm, Pseudo code for expressing algorithms, Performance Analysis: Space complexity, Time complexity, Asymptotic Notation: Big Oh notation, Omega notation, Theta notation,
Divide and Conquer:
General method, Applications, Binary search, Quick sort, Merge sort, Stassen's matrix multiplication

UNIT - II
Greedy Method:
General method, Applications: Job sequencing with deadlines, knapsack problem, Minimum cost spanning trees, Single source shortest path problem, Optimal storage on tapes.
Basic Search and traversal Techniques:
AND/OR graphs, Bi-connected components, Depth-first search, Breadth - first Search.

UNIT - III
Dynamic Programming:
General method, Applications: Matrix chain multiplication, Optimal binary search trees, 0/1 knapsack problem, All pairs shortest path problem, Travelling sales man problem, Reliability Design.

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UNIT - IV
Backtracking:
General method, Applications: n-queens problem, sum of subsets problem, graph colouring, Hamiltonian cycles.

UNIT - V
Branch and Bound:
General method, Applications - Travelling sales person problem,0/1 knapsack problem- LC Branch and Bound solution, FIFO Branch and Bound solution.NP-Hard and NP-Complete problems: Basic concepts, Non deterministic algorithms, NP - Hard and NP Complete classes, Cook's theorem.

TEXT BOOK
Ellis Horowitz, Satraj Sahni and Rajasekharam, "Fundamentals of Computer Algorithms", Galgotia publications pvt. Ltd.

REFERENCES
1. M.T.Goodrich and R.Tomassia, "Algorithm Design: Foundations, Analysis and Internet examples", John wiley and sons.
2. *C.*E.Leiserson & T.H.Cormen, "Introduction to Algorithms", second edition.
3. Aho, Ullman and Hopcroft Design and Analysis of algorithms, Pearson Education.

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	L	T	P	Cr.
MCA (III Sem.) **17MC14 – OOPS THROUGH JAVA**	2	2	-	3

Course Educational Objectives:

In this course student will learn about:

➢ The concepts and features of object oriented programming
➢ Key aspects of java Standard API library such as util, io, applets, swings, GUI basedcontrols.
➢ Java's exception handling mechanism, multithreading, packages and interfaces.
➢ Internet programming using applets and swings

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

CO1: Apply object oriented programming features and concepts for solving given problem
CO2: Use java standard API library to write complex programs
CO3: Implement object oriented programming concepts using java
CO4: Develop interactive programs using AWT components.
CO5: Design interactive programs using swing components.

UNIT – I
Features of OOPS:

OOPS concepts, Introduction to Java, History of Java, Features of Java,Java Virtual Machine, Garbage collection , Why Java is important for Internet?, Programming concepts of basic Java, Identifiers and Keywords, Data types in Java, Java coding conventions, Expressions in Java, Control structures, Decision making statements ,Arrays.
String handling: String, StringBuffer.

UNIT – II
Objects and Classes:

Object fundamentals, Pass by value, Pass by reference, Overloading, Overriding, Constructors, Finalization, Subclasses(Inheritance), this, super, final with inheritance, Dynamic method dispatch, Scope rules, Static data, Static methods, Static blocks, class modifiers , Command line arguments, Abstract Classes, Interfaces, Inner classes, Packages, Package access, User define packages.

UNIT – III
Exception Handling:

Types of Exceptions, try, catch, finally, throw and throw keywords, Handling User defined Exceptions.

Multithreading:

Processes and threads, Thread states, Thread life cycle, Creating threads, Thread priorities, Synchronizing threads, Inter thread communication, Thread groups, Daemon threads.

Applets:

Types of Applets, Applet life cycle, Graphics, Parameter Passing

UNIT – IV
AWT:

Abstract Window Toolkit, Components and Graphics, Containers, Frames and Panels, Layout Managers, Border Layout, Flow Layout, Grid Layout, Card Layout, Event delegation model, Event sources and Event handlers, Event categories, Event Listeners, Adapters classes, Anonymous classes.

UNIT – V
Swings:
Introduction, Handling Swing Controls like Icons, Buttons, Textboxes, Combo Boxes, Tabbed Panes, Scroll Panes, JTree, JTable, Differences between AWT Controls & Swing Controls, developing home page using Applets & Swings.

Util Package:D
Java.util package: Vector, Array List, Hash map, Hash table, StringTokenizer class, and Date class.

I/O Package:
Java.io package: Files and Streams, Stream classes, Reader-Writer classes, Utilities.

TEXT BOOK
Herbert Schildt," The Complete Reference Java J2SE", 7th Edition, TMH, New Delhi,2009.

REFERENCES
1. Cay Horstmann, John Wiley and Sons, "Big Java 2nd Edition", John Wiley and Sons, Pearson Edu, 2006.
2. H.M.Dietel and P.J.Dietel," Java How to Program" , Sixth Edition,   Pearson Education/PHI,2007.
3. Cay.S.Horstmann and Gary Cornell, "Core Java 2, Vol 1, Fundamentals, Seventh Edition, Pearson Education, 2011.
4. R.Krishna Murthy-"Java and Internet Programming"
5. Somasundaram, Jaico, "Java.
6. Y.Daniel Liang, "Introduction to Java programming", Pearson, 2012.

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	L	T	P	Cr.
MCA (III Sem.) **17MC15– UNIX PROGRAMMING**	2	2	-	3

Course Educational Objectives:
In this course student will learn about
➢   Various utilities and filters in UNIX operating system.
➢   Programming in networking environment.
➢   Operating system functionalities including process management, file management, networking etc.
➢   Shell programming
➢   Inter Process Communication.
➢   Network Programming through sockets.

Course Outcomes: At the end of the course, the student will be able to
CO1: Describe the architecture and features of UNIX Operating System and distinguish it from other Operating System and Learn various command utilities in UNIX.
CO2: Demonstrate UNIX commands and system calls for file handling and process control
CO3: Analyze a given problem and Apply requisite facets of SHELL programming in order to devise a SHELL script to solve the problem
CO4: Implement inter process communication applications using pipes, FIFO's, messages queues, semaphores and shared memory.
CO5: Design and Develop client/server applications using socket system calls and remote procedure call.

UNIT – I
Introduction: History, features, Architecture of UNIX, Unix File System, vi editor
Utilities and commands: File handling utilities, Security by file permissions, Process utilities, Disk utilities, Networking commands, text processing utilities and backup utilities, detailed commands to be covered are cat, tail, head, sort, nl, uniq, grep, egrep, fgrep, cut, paste, join, tee, comm, cmp, diff, tr, tar, cpio, cp, mv, ln, rm,unlink, mkdir, rmdir, du, df, mount, umount, find, umask, ulimit, ps, who, w, finger, arp, ftp, telnet, rlogin.
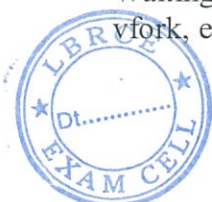
UNIT - II
Working with the Bourne shell: Introduction to shell programming, different shells, shell responsibilities, Pipes and input redirection, Output redirection, here documents, Shell meta characters, Shell variables, Shell commands, Environment, Control structures, Shell script examples.
UNIX Files: Unix file system structure ,Inodes, File attributes, File types, performing file operations using system calls (open, creat, read, write, close, lseek, stat, fstat, umask, dup, dup2), file operations using Standard I/O (fopen, fclose, fflush, fseek, fgetc, getc, getchar, fputc, putc, putchar,fgets, gets)

UNIT-III
I/O: Formatted I/O, Files and record locking, Directory Management, Directory API, symbolic and hard links detailed commands to be covered are chmod, chown, unlink, link, symlink, mkdir, rmdir, chdir, getcwd, opendir, readdir, closedir, rewinddir, seekdir, telldir.
UNIX Process: Process concept, kernel support for Process, process attributes, process creation, Waiting for a process, process termination, Zombie process, orphan process, process API -fork, vfork, exit, wait, waitpid, system

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UNIT – IV

IPC : Interposes Communication : introduction to IPC, Pipes, FIFOS
Semaphores: UNIX kernel support for Semaphores, Unix System V API for Semaphores.
Message Queues: UNIX kernel support for Message Queues, UNIX system-V API for Messages Queues, Client/Server example.
Shared Memory: UNIX kernel support for shared memory, UNIX system-V APIs for shared memory, Semaphore and Shared memory examples.

UNIT – V

Sockets: introduction to Sockets, Socket addressing, Socket system calls for connection oriented protocol and connectionless protocol, Client/Server example.
Sun RPC:
Client/Server example

TEXT BOOK

W.R.Stevens , "Unix Network Programming", Pearson/PHI,2010.

REFERENCES

1. Sumitabha Das, "Unix Concepts and Applications", 3rd Edition, TMH, 2010.
2. Graham Glass, King Ables," Unix for programmers and users", 3rd Edition, Pearson Education, 2009.
3. T.Chan, "Unix system programming using C++", PHI
4. Stephen A.Rago, "Unix System-V Network Programming", Pearson Education.
5. Kernighan and Pike, "Unix programming environment" , PHI. / Pearson Education, 1984.

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		L	T	P	Cr.
MCA (III Sem.)	17MC16 – OPERATIONS RESEARCH	3	-	-	3

Course Educational Objectives:

In this course student will learn about

➢ The reasoning and techniques used in formulating and solving deterministic problems in operations research.

➢ The connections between operations research and other math-related courses.

➢ The concepts of operations research by way of modeling real-world problems as Linear Programming (LP).

➢ Formulation of the mathematical, economical and statistical models for decision and control problems, to deal with the situations arising out of risk and uncertainty.

➢ Application of scientific techniques to analyze the firm's ongoing activities like production scheduling, assignment etc.

➢ Different techniques of analyzing the time involved in completing a project and the related costs are presented after defining the prerequisites of networks under project management.

➢ The concept of queuing system under various disciplines.

➢ The connections between LPs and Dynamic programming.

➢ Bellmen's principle of optimality to get an optimum solution of any multi stage decision problem.

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

CO1:   Recognize, classify and use various models for solving a problem under consideration.

CO2:   Identify the situations in which linear programming technique can be applied.

CO3:   Handle the problem of degenerate and unbalanced transportation problems. Examine multiple optimal solutions and prohibited routes in the transportation problem.

CO4:   Appreciate the aims of study sequencing techniques and how to extend Johnson's rule to more complicated problems.

CO5:   Construct the network diagrams. Determine critical path and floats associated with non-critical activities and events along with total project completion time.

UNIT - I

Development:

Characteristics and Phases scientific method, Types of models, General methods for solving OR problems, Operations Research models, Significance of operations research.

Linear Programming:

Introduction to Linear Programming, Two phase Simplex method, Big-M method, Duality, Interpretation, Applications.

UNIT - II

Transportation Problem:

Introduction, Optimal solution, Un-balanced transportation problem, Degeneracy, Assignment problem: formulation optimal solution, variations. 1. a non-square (mxn) matrix, Restrictions.

Sequencing Model:

Classification of self-problems, processing of n jobs through two machines, three machines, processing of two jobs through m machines.

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UNIT - III
Network optimization Models:

Shortest path problem, Minimum spanning tree problem, Maximum flow problem, Minimum cost flow problem, The project management with PERT/CPM, Scheduling a problem with PERT/CPM, Dealing with uncertain activity durations, Considering time cost trades Offs, Scheduling and Controlling, Projects costs, Evaluation of PERT/CPM.

UNIT - IV
Waiting Lines:

Introduction, Single channel, Poisson arrivals, Exponential service times, Unrestricted queue, with infinite population models, Single channel, Exponential Service times with infinite population and restricted queue, Multi-channel, Exponential service times with infinite population and unrestricted queue.

UNIT - V
Dynamic Programming:

Introduction, Bellman's principal of optimality, Solution of problems with finite number of stages.

TEXT BOOK
S.D.SHARMA: Operations Research, Kedarnath Ramnath, Meerut, 2001.

REFERENCES
1. P.K.GUPTA & D.S.HIRA: Operations Research, S. Chand, 2002.
2. Taha, Operations Research, Macmillan, 1998.

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		L	T	P	Cr.
MCA (III Sem.)	17MC66 – OOPS THROUGH JAVA LAB.	-	-	4	2

Course Educational Objectives:

In this course student will learn about
- ➢ The OOP s concepts.
- ➢ Object oriented Programming
- ➢ Window based applications using AWT and swing components
- ➢ Multi-threading concepts

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

CO1: Use fundamentals of programming such as variables, conditional and iterative execution, methods, etc.

CO2: Implement fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.

CO3: Implement error handling techniques using exception handling

CO4: Develop Applications using AWT components.

CO5: Develop Applications using SWING Components

LIST OF EXPERIMENTS

1) Write a Java program to find the roots of a quadratic equation?
2) Write a Java program to generate Fibonacci numbers up to given range?
3) Write a Java program to check whether given number is Palindrome or not?
4) Write a Java program to check whether given number is Armstrong or not?
5) Write a Java program to find factorial of the given number using recursions?
6) Write a Java program to search an element by using linear search and binary search?
7) Write a Java program to sort the elements of an Array?
8) Write a Java program to perform Matrix Multiplication?
9) Write a Java program for constructor overloading.
10) Write a Java program using inheritance?
11) Write a Java program to implement Method over Loading and Method over riding?
12) Write a Java program by using this and super key word.
13) Write a Java program by using final variables and final methods.
14) Write a Java program to implement dynamic method dispatch.
15) Write a Java program using abstract class?
16) Write a Java program to implement Multiple Inheritance (Interface)?
17) Write a Java program on demonstration of packages and sub packages?
18) Write a Java program illustrating various string handling functions
19) a) Write a Java program to check whether given string is palindrome (or) not. ?
     b) Write a Java program to sort the set of strings in sorting order?
20) Write a Java program by using length () and capacity () Methods of String Buffer?
21) Write a Java program to find the sum of the numbers by using command line arguments?
22) (a) Write a Java program by using Exception handling Mechanism including Finally block?
     (b) Write a Java program to Handle User Defined Exceptions?
23) Write a Java program to create Multithreads?
24) Write a Java program to implement Inter thread communication?
25) (a) Write a sample Applet program to Display Message?
     (b) Write an Applet program using Graphics?
     (c). Write an Applet program to pass parameters to Applet.

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26)   Write a Java program to create user login by using AWT components?
27)   Write a Java program to implement border layout.
28)   (a) Write an applet program to handle Mouse Events?
      (b) Write an applet program to handle Key Events using adapter Class?
29)   Write a Java Program by using the following Swing Components
      a)   JTabbedPanes
      b)   JTree
30)   Write a Java Program by using Menu Component
31)   Write a Java program by using String Tokenizer class.
32)   Write a Java Program by using
      a)ArrayList
      b)Vector

TEXT BOOK
Herbert Schildt," The Complete Reference Java J2SE", 7th Edition, TMH, New Delhi,2009.

REFERENCES
1.   Cay Horstmann, John Wiley and Sons, "Big Java 2nd Edition", John Wiley and Sons, Pearson Edu, 2006.
2.   H.M.Dietel and P.J.Dietel," Java How to Program", Sixth Edition, Pearson Education/PHI,2007.
3.   Cay.S.Horstmann and Gary Cornell, "Core Java 2, Vol 1, Fundamentals, Seventh Edition, Pearson Education, 2011.
4.   R.Krishna Murthy-"Java and Internet Programming"
5.   Somasundaram, Jaico, "Java.
6.   Y.Daniel Liang, "Introduction to Java programming", Pearson, 2012.

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	L	T	P	Cr.
MCA (III Sem.) **17MC67 – UNIX PROGRAMMING LAB**	-	-	4	2

Course Educational Objectives:
In this course student will learn about
➢ Various utilities and filters in UNIX operating system.
➢ Programming in networking environment.
➢ Various operating system functionalities including process management, file management, networking etc.
➢ Shell programming
➢ Inter Process Communication.
➢ Network Programming through sockets.

Course Outcomes: At the end of the course, the student will be able to
CO1: Utilize various utilities in UNIX operating system.
CO2: Implement various OS functionalities using system calls.
CO3: Implement Inter Process Communication.
CO4: Implement network programming using sockets.
CO5: Implement Remote Procedure Call.

LIST OF EXPERIMENTS

1. Practice Vi Editor

2. Practice the Text Processing Commands like cat, sort, grep, cut, comm., diff, cmp etc

3. Practice the Network Commands like cp, rm, ln, find, ps, who, finger, ls etc

4. Write a shell script to perform arithmetic operations of two numbers (+, -, *, /, %)

5. Write a Shell script to generate a multiplication table

6. Write a shell script to find factorial of any number entered through the keyboard

7. Write a Shell script that copies multiple files to a directory

8. Write a Shell script that counts the number of lines and words present in a given file

9. Write a Shell script that displays the list of all files in the given directory

10. Write a shell program to print sum of digits of a number

11. Write a Shell script to generate Fibonacci series

12. Write a Shell script to Print prime numbers in a given range

13. Write a Shell script to reverse the given number

14. Write a Shell script to find given no is palindrome or not

15. Write a Shell script to find factors of a given number

16. Write a Shell script to generate Fibonacci series

17. Write a C program that counts the number of blanks in a text file.
    (a) Using standard I/O
    (b) Using system calls.

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18.   Implement in C the following UNIX commands using system calls.
      a) cat   b) ls   c) mv

19.   Write a C program that illustrates uses of the mkdir, opendir, readdir, closedir, and rmdir APIs

20.   Write a C programs that illustrates Two-way communication with bidirectional pipes

21.   Write a C program that illustrates the creation of child process using fork system call. In which parent process adds odd numbers and the child adds even numbers.

22.   Write a C program that displays the real time of a day every 60 seconds

23.   Write a C program that illustrates file-locking using Semaphores

24.   Write a C program that implements a Producer-Consumer system with two processes.(Using semaphores)

25.   Write a C program that illustrates Inter Process Communication(IPC) using shared memory system calls.

26.   Write a C program that illustrates the following.
      a) Creating a Message Queue.
      b) Writing to a Message Queue.
      c) Reading from a Message Queue.

27.   Write a C program to develop simple Client /Server application using Sockets (system calls).

REFERENCE
N.B.Venkateswarulu Advanced UNIX Programming, BS Publications.

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	L	T	P	Cr.
MCA (III Sem.) 17MC68 – R PROGRAMMING LAB.	-	-	4	2

Course Educational Objectives:
In this course student will learn about
- Read Structured Data into R from various sources.
- Understand the different data types in R.
- Understand the different data structures in R.
- Understand how to use dates in R.
- Use R for mathematical operations.
- Use of vectorized calculations.
- Write user-defined R functions.

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

CO1: Master the use of the R interactive environment.
CO2: Expand R by installing R packages.
CO3: Write Loop constructs in R.
CO4: Use R for descriptive statistics.
CO5: Use R for inferential statistics

LIST OF EXPERIMENTS

1. Write a program to illustrate basic Arithmetic in R.
2. Write a program to illustrate Variable assignment in R.
3. Write a program to illustrate data types in R.
4. Write a program to illustrate creating and naming a vector in R.
5. Write a program to illustrate creates a matrix and naming matrix in R.
6. Write a program to illustrate Add column and add a Row in Matrix in R.
7. Write a program to illustrate Selection of elements in Matrixes in R.
8. Write a program to illustrate Performing Arithmetic of Matrices.
9. Write a program to illustrate Factors in R.
10. Case study of why you need use a Factor in R.
11. Write a program to illustrate Ordered Factors in R.
12. Write a program to illustrate Data Frame Selection of elements in a Data frame.
13. Write a program to illustrate sorting a Data frame.
14. Write a program to illustrate List? Why would you need a List?
15. Write a program to illustrate adding more elements into a List.
16. Write a program to illustrate if-else-else if in R.
17. Write a Program to illustrate While and For loops in R.
18. Write a program to illustrate Compare and Matrices and Compare vectors.
19. Write a program to illustrate Logical & and Logical | operators in R.
20. Write a program to illustrate Function inside function in R.
21. Write a program to illustrate to create graphs and usage of plot() function in R
22. Write a program to illustrate Customizing and Saving to Graphs in R.
23. Write a program to illustrate some built in Mathematical Functions.

TEXT BOOKS:
1. The Art of R Programming, Norman Matloff, Cengage Learning
2. R for Everyone, Lander, Pearson

REFERENCES:
1. R Cookbook, PaulTeetor, Oreilly.
2. R in Action,Rob Kabacoff, Manning.
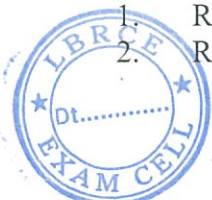
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		L	T	P	Cr.
MCA (III Sem.)	**17MC52 – PROFESSIONAL ETHICS AND HUMAN VALUE**	2	-	-	-

COURSE EDUCATIONAL OBJECTIVES:
➢ To create an awareness on engineering ethics and human values.
➢ To incorporate the attitude of handling dilemmas and decision making process.
➢ To give an impetus on achieving higher positions in profession, with ethical and human values as a base and support for the growth.
➢ To explicate the professional and societal responsibilities of the engineers.
➢ To make the student realize the sensitiveness associated with experimentation process

COURSE OUTCOMES: At the end of the course, the student will be able to
CO1: Appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.

CO2: Develop a holistic perspective towards life, profession and happiness, based on the correct understanding of the Human reality and the rest of the Existence.

CO3: To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually satisfying human behavior and mutually enriching interaction with Nature.

CO4: Understand the significance of value inputs and apply them in their life and profession. Understand the value of harmonious relationship based on trust and respect in their life and profession.

CO5: Distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.

UNIT –I
ETHICS
Senses of 'Engineering Ethics' -Variety of moral issues - Types of inquiry -Moral dilemmas Moral autonomy -Kohlberg's theory Gilligan's theory -Consensus and controversy – Models of Professional Roles -Theories about right action- Self interest - Customs and religion -Uses of Ethical theories.

UNIT – II
HUMAN VALUES
Morals, Values and Ethics – Integrity – Work Ethic – Service Learning - Civic Virtue –Respect for Others–Living Peacefully – Caring – Sharing - Honesty – Courage– Valuing Time - Cooperation – Commitment – Empathy – Self Confidence – Character – Spirituality

UNIT – III
ENGINEERING AS SOCIAL EXPERIMENTATION
Engineering as experimentation- Engineering Projects VS. Standard Experiments - Engineers as responsible experimenters – Codes of ethics - Industrial Standards - A balanced outlook on law- The challenger case study.

UNIT – IV
SAFETYAND RESPONSIBILITIES
Safety and risk- Assessment of safety and risk- Risk benefit analysis and reducing risk- Three Mile Island and Chernobyl case study - Collegiality and loyalty -Respect for authority- Collective bargaining – Confidentiality- Conflicts of interest- Occupational crime

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UNIT – V
INTELLECTUAL PROPERTY RIGHTS (IPR)
Introduction, types of IPR, Importance of IPR. **TRADEMARKS**: Purpose and functions of trademarks, acquisition of trademark rights, trademark registration process. **COPYRIGHT:** fundamentals of copyright, registration, ownership issues, notice of copyright. **Laws:** patents, trade secret laws, IP audits.

TEXT BOOKS
1. R.S.Nagarajan, a Textbook on "Professional Ethics and Human Values", New Age Publishers – 2006.
2. Mike Martin and Roland Schinzinger, "Ethics in engineering", McGraw Hill, New York 1996.
3. "An Introduction to Intellectual Property Rights", Dr.J.P.Mishra, Central law House, 3rd edition, 2012.

REFERENCES
1. Govindarajan M, Natarajan S, Senthil Kumar V. S, " Engineering Ethics", Prentice Hall of India, New Delhi, 2004.
2. Charles D. Fleddermann, "Engineering Ethics", Pearson Education/ Prentice Hall, New Jersey,2004 (Indian Reprint now available)
3. Charles E Harris, Michael S. Protchard and Michael J Rabins, "Engineering Ethics – Concepts and Cases", Wadsworth Thompson Leatning, United States, 2000 (Indian Reprint now available).
4. John R Boatright, "Ethics and the conduct of business", Pearson Education, New Delhi,2003.
5. Edmund G Seebauer and Robert L Barry, "Fundamentals of ethics for scientists and engineers", Oxford University Press, Oxford, 2001.
6. "Fundamentals of ethics for scientists and engineers" Edmund G Cseebauer and Robert L Barey,Oxford University Press, 2001.
7. "Text book on Intellectual Property rights", N K Acahrya, Asian Law House,7th edition, 2014.

	L	T	P	Cr.
MCA (IV Sem.) 17MC17 – CLOUD COMPUTING	3	-	-	3

Course Educational Objectives

In this course, the students will learn about

- ➢ Fundamentals of Cloud Computing.
- ➢ The Concepts of Virtualization and the Cloud delivery and Deployment Models.
- ➢ Cloud computing software security objectives, design principles and development practices.
- ➢ The Cloud computing risks, challenges and threats to infrastructure, data and access control.
- ➢ The Cloud computing security architectural issues, Identity management and Autonomic security.

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

CO1: Articulate the main concepts, key technologies, strengths, limitations of cloud computing and the possible applications for state-of-the-art cloud computing.

CO2: Identify the architecture and infrastructure of cloud computing, including cloud delivery and deployment models.

CO3: Analyze the core issues of cloud computing such as security, privacy, and interoperability.

CO4: Identify problems, analyze, and evaluate various cloud computing solutions.

CO5: Analyze appropriate cloud computing solutions and recommendations according to the applications used.

UNIT - I

Cloud Computing fundamentals: Essential characteristics, Architectural Influences, Technological Influences, and Operational Influences.

UNIT - II

Cloud Computing Architecture: Cloud Delivery models, The SPI Framework, Cloud Software as a Service (SaaS) , Cloud Platform as a Service(PaaS), Cloud Infrastructure as a Service(IaaS), Cloud deployment models, Public Clouds, Community Clouds, Hybrid Clouds, Alternative Deployment models, Expected benefits.

UNIT - III

Cloud Computing Software Security fundamentals: Cloud Information Security Objectives, Confidentiality, Integrity, Availability, Cloud Security Services, Relevant Cloud Security Design Principles, Secure Cloud Software Requirements, Secure Development practices, Approaches to Cloud Software Requirement Engineering, Cloud Security Policy Implementation.

UNIT - IV

Cloud Computing Risk Issues: The CIA Traid**,** Privacy and Compliance Risks, Threats to Infrastructure, Data and Access Control, Cloud Access Control Issues ,Cloud Service Provider Risks.

Cloud Computing Security challenges: Security Policy Implementation, Policy Types, Computer Security Incident Response Team (CSIRT).

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UNIT – V
Cloud Computing Security Architecture: Architectural Considerations, General Issues, Trusted Cloud Computing, Secure Execution environments and Communications, Micro architectures, Identity Management and Access Control, Autonomic Security.

TEXT BOOK
Ronald L. Krutz, Russell Dean Vines, *"Cloud Security A comprehensive Guide to secure Cloud Computing"* Wiley.

REFERENCES
1. John Witinghouse james F.Ransome, *"Cloud Computing Implementation, Management and Security"* , CRC Press.
2. Borko Furht. Armando Escalante, "Handbook of Cloud Computing", Springer.
3. Charles Badcock, "Cloud Revolution" , TMH.

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		L	T	P	Cr.
MCA (IV Sem.)	**17MC18 – DATA WAREHOUSING AND MINING**	3	-	-	3

Course Educational Objectives

In this course, the students will learn about

➢ Data Mining Primitives, Languages, and System Architectures .
➢ Mining Association Rules in Large Databases (compressed).
➢ Classification and Prediction .
➢ Cluster Analysis.
➢ Mining Complex Types of Data.
➢ Data Mining Applications and Trends in Data Mining.

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

CO1: Implement knowledge discovery and data mining.
CO2: Recognize the key areas and issues in data mining.
CO3: Apply the techniques of clustering, classification, association finding, feature selection and visualization to real world data.
CO4: Determine whether a real world problem has a data mining solution.
CO5: Apply evaluation metrics to select data mining techniques.

UNIT - I
Introduction
Fundamentals of Data Mining, Data Mining functionalities, Classification of Data Mining Systems, Data mining applications, Data Warehouse and OLAP Technology, Multidimensional data Model, Data warehouse architecture.

UNIT – II
Data preprocessing: Data cleaning, Data Integration and Tranformation, Data Reduction, Discretization and concept Hierarchy generation, Data Mining primitives, Data Generalization and Summerization, Basic Characterization, attribute relevants analysis, Mining descriptive statistical measures, Data Mining query Languages.

UNIT – III
Association Rule Mining & Market Basket Analysis, Efficient and scalable Frequent Item Set Mining methods. (Apriory and FP growth), Mining various kinds of Association rule

UNIT – IV
Classification and Prediction, Classification by Decision tree induction, Bayesian classification, Prediction: Linear regression, Non-Linear regression.

UNIT – V
Cluster analysis: Types of Data in Cluster analysis, Categorization of clustering methods, Partitioning methods, Outlier analysis, Text Mining, Web Mining.

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TEXT BOOK

Data Mining, Concepts and Techniques, Jiawei Han, Micheline Kamber, Harcourt India,2006, Elsevier.

REFERENCES

1.   Data Mining, Introductory & advanced Topics, Margaret H Dunham, Pearson, 2006.
2.   Data Mining Techniques, Arun K Pujari, University Press, 2007.
3.   Data warehousing Fundamentals, Paulraj Ponnaiah, Wiley, 2006.
4.   The Data Warehouse Life Cycle Tool kit, Ralph Kimball, Wiley.

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		L	T	P	Cr.
MCA (IV Sem.)	**17MC19 – OBJECT ORIENTED ANALYSIS AND DESIGN**	2	2	-	3

Course Educational Objectives

In this course, the students will learn to

➢ Concept and techniques necessary to effectively use system requirements to drive the development of a robust design model.
➢ Applying UML to fundamental OOAD concepts.
➢ Forward engineering
➢ Reverse engineering

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

CO1: Capture and communicate analysis and design decisions.
CO2: Use object oriented technologies.
CO3: Perform reverse and forward engineering.
CO4: Implement any object oriented design with object oriented programming languages like C++, JAVA etc.
CO5: Manage the complexity of artifacts.

UNIT – I

Introduction to UML: Object, Object Orientation, Development, Modeling, Object Modeling, Importance of Modeling, Principles of Modeling, Conceptual model, Model Driven Architecture with UML, Software Development Life Cycle of UML, UML Architecture

UNIT – II

Basic Structural Modeling: Classes, Relationships, Diagrams.
Advanced structural Modeling: Advanced Classes, Advanced relations, Interfaces, Types and Roles

UNIT – III

Class & Object diagrams: Terms, Concepts, Common Modeling techniques for Class & Object diagrams.
Basic Behavioral Modeling –I: Interactions, Interaction diagrams.

UNIT – IV

Basic Behavioral Modeling –II: UseCases, UseCase Diagrams, Activity Diagrams.
Advanced Behavioral Modeling: Events and Signals, State machines, State chart diagrams.

UNIT - V

Architectural Modeling: Component, Development, Component Diagrams, and Deployment Diagrams.

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TEXT BOOK
Grady Booch, James Rambaugh, Ivar Jacobson: The Unified Modeling Language User Guide, Pearson edition.

REFERENCES
1. Craig Larman," Applying UML and Patterns- An Introduction to Object oriented Analysis and Design and Iterative Development", 3rd Edition Pearson Edition, 2004.
2. HansEriksson, Magnus,Penker, BrainLyons, DavidFado:UML2Toolkit, WILEY-Dreamtech India Pvt.Ltd,2007.
3. Meilir Page-Jones:Fundamentals of Object Oriented Design in UML-Pearson Education,2008.
4. Atul Kahate: Object Oriented and Design,The McGraw-Hill Company.
5. Grady Booch, James Rambaugh, Ivar Jacobson: The Unified Modeling Language Reference Manual, Addison Wesley, 1999.
6. Object Oriented Analysis and Design Bennett, Simon McGraw Hill.

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	L	T	P	Cr.
MCA (IV Sem.)　　　17MC20 – WEB TECHNOLOGIES	2	2	-	3

Course Educational Objectives:

In this course, the students will learn to
- Developing the HTML document involving a variety of element types, including hyperlinks, images, lists, tables, and forms.
- Developing the web sites which are secure and dynamic in nature and writing scripts which get executed on server as Well.
- To design and to develop simple database driven web applications using a server-side scripting language.
- The web page site planning, management and maintenance.
- Develop a reasonably sophisticated web application that appropriately employs the MVC architecture

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

CO1: Develop web Application Using HTML and XML.
CO2: Build dynamic web pages using JavaScript (client side programming).
CO3: Develop server side applications using servlets and JSP.
CO4: Install and run web servers, Deploy a web based application onto the web server.
CO5: Design and construct various data base tables using JDBC and produce various results based on given query.

UNIT - I
HTML:

Introduction, Common tags, HTML Tables and formatting internal linking, Complex HTML forms and Frames.

Introduction to Scripting Languages, Basics of Java script, Control structures, Java script functions, Arrays and Objects.

UNIT - II
DHTML:

Introduction, Cascading Style Sheets (CSS), Event model

XML:

Introduction, Document Type Definition, Types of DTD, DTD and CSS, XML Schema, Parsers: DOM and SAX.

Introduction to AJAX

UNIT - III
JDBC:

Database Programming using JDBC, Javax.sql.* package, JDBC Drivers, JDBC applications using select, insert, delete, update, Types of Statements (Statement, Prepared Statement and Callable Statement); ResultSet, ResultSetMetaData, Inserting and updating records,

BDK:

Introduction to Java Beans, Advantages of Java Beans, Introspection, Bound properties, Bean Info Interface, Constrained properties, Persistence, Customizers, Java Beans API.

Introduction to EJB.

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UNIT - IV
Servlets:
Introduction, Servlet Basics, Life cycle of Servlet, Servlet API Overview, Writing and running Simple Servlet. ServletConfig & ServletContext, Writing Servlet to handle Get and Post Methods, Reading user request , Servlet chaining, Concept of cookies, Reading and writing cookies, Need of Session Management, Types of Session management-Using HttpSession Object, Servlet using JDBC.

TOMCAT:
How to configure TOMCAT, Directory structure for a web Application

UNIT - V
JSP:
Servlet drawbacks, Anatomy of a JSP Page, JSP Processing, JSP Application Design with MVC. Introduction to JSP and JSP Basics, Implicit Objects, JSP Tags, Life cycle of JSP, JSP and Java Beans, JSP: sessions and cookies, Error Handling with JSP, JDBC with JSP.
Introduction to Struts

TEXT BOOK
Harvey M. Deitel and Paul J. Deitel, "Internet & World Wide Web How to Program", 4/e, Pearson Education.

REFERENCES
1.   A. A. Puntambekar, 1/e 2010, Web Technologies, Technical Publications, Pune.
2.   JAVA Complete Reference, 5th Edition, Tata McGraw-Hill, New   Delhi.
3.   K. Moss, 1999, Java Servlets, Second edition, Tata McGraw Hill, New Delhi.
4.   D. R.Callaway, 1999, Inside Servlets, Addison Wesley, Boston
5.   TomValesky, Enterprise JavaBeans, Addison Wesley. 7. Cay S Horseman & Gary Cornell, Core Java Vol II Advanced Features, Addison Wesley.

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		L	T	P	Cr.
MCA (IV Sem.)	**17MC21 – CRYPTOGRAPHY AND NETWORK SECURITY**	3	-	-	3

Course Educational Objectives

In this course, the students will learn to
- ➢ The introduce the objectives of information security
- ➢ The symmetric block ciphers (DES, AES, other contemporary symmetric ciphers)
- ➢ The public-key cryptosystem (RSA and others) -theoretic assumption for its security.
- ➢ The Authentication and Hash Functions.
- ➢ The Network Security: email, web security and IP Security.
- ➢ Intrusions and intrusion detection.
- ➢ The System Security: Password Management, viruses, Firewalls, Trusted systems.

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

CO1: Identify security threats and develop a security model to prevent, detect and recover from attacks.

CO2: Perform Encryption and decryption of messages using block ciphers.

CO3: Implement various cryptographic techniques that provide information and network security.

CO4: Evaluate the security of communication systems, networks and protocols based on security metrics.

CO5: Design the ethical issues related to misuse of computer security.

UNIT - I
INTRODUCTION:

Security Trends, OSI Security Architecture, Security Attacks, Security Services, Security Mechanism, A model for Network Security

Symmetric Cipher:

Classical Encryption Techniques, Block Ciphers, Data Encryption Standard, Advanced Encryption Standard, Triple DES, Placement of Encryption Function, Traffic confidentiality, Key Distribution, Random Number Generation.

UNIT - II
PUBLIC-KEY CRYPTOGRAPHY

Number Theory,Principles of public-key Cryptosystems, RSA, Key Management, Diffie-Hellman Key Exchange, Elliptic Curve Arithmetic and cryptography.

UNIT - III
AUTHENTICATION AND HASH FUNCTIONS

Authentication Requirements and Functions, Message Authentication Codes, Hash Functions, Security of Hash Function and MACs, Secure Hash Algorithm, HMAC, CMAC, Digital Signatures, Authentication Protocols, Digital Signature Standard.

UNIT - IV
NETWORK SECURITY

Authentication Applications: Kerberos, X.509 Authentication Service, Public-Key Infrastructure, Electronic Mail Security: PGP, S/MIME, IP Security, Web Security

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UNIT - V
SYSTEM SECURITY

Intruders, Intrusion Detection, Password Management, Viruses and Related Threads, Virus Counter Measure, Firewall Design principles, Trusted Systems.

TEXT BOOK

"Cryptography and Network Security Principles and practices" by William Stallings 4th Edition, Prentice Hall.

REFERENCES

1. "Fundamentals of Network Security" by Eric Maiwald Dreamtech press
2. "Principles of Information Security", by Whitman, Thomson
3. "Network Security: the complete reference", by Robert Bragg, Mark Rhodes,TMH
4. "Introduction to Cryptography" by Buchmann, Springer.

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MCA (IV Sem.) **17MC22 – DISTRIBUTED OPERATING SYSTEMS**	3	-	-	3

Course Educational Objectives

In this course, the students will learn about
➢ The types of problems which arise and methods used in the design and analysis of systems of interconnected computers.
➢ Distributed systems and their characteristics, and the developments in distributed systems.
➢ Distributed algorithms for locking, synchronization and concurrency, scheduling, and replication.
➢ Investigating problems of timing and event ordering, naming of objects, and distribution of objects
➢ Inter-process communication in a distributed environment.
➢ How to fault-tolerance can be enhanced with concurrency control mechanisms and replication of services.
➢ Distributed file systems.

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

CO1: Characterise different implementation paradigms for distributed systems.
CO2: Perform simple proofs of system properties, given a formalised description of a system.
CO3: Select an appropriate distributed algorithm to satisfy given design requirements for a distributed system.
CO4: Select an appropriate implementation paradigm to satisfy given design requirements for a distributed system.
CO5: Develop an implementation of a distributed system from a formal or informal description of its function and purpose.

UNIT - I
Introduction

Definition of a DOS, Goals, H/w and S/w Concepts, Client-Server Model
Processes Threads: Introduction to Threads, Threads in Distributed Systems, Clients: User Interfaces, Client-Side Software for Distribution Transparency; Servers: General Design Issues, Object Servers; Code Migration: Approaches to Code Migration, Migration and Local Resources, Migration in Heterogeneous Systems; Software Agents: Software Agents in Distributed Systems, Agent Technology.

UNIT - II
Naming Systems:

Naming Entities: Names, Identifiers, and Addresses, Name Resolution, The Implementation of a Name Space, Example: DNS, X.500 **Locating Mobile Entities:** Naming versus Locating Entities, Simple Solutions, Home-Based Approaches, Hierarchical Approaches Clock synchronization, logical clocks, global state, election algorithms, mutual exclusion.

UNIT - III
Consistency and Replication:

Introduction, Data-Centric Consistency Models, Client-Centric Consistency Models, Distribution Protocols, Consistency Protocols.
Fault Tolerance:

Introduction to Fault Tolerance, Process Resilience, Reliable Client-Server Communication, Reliable Group Communication, Distributed Commit.

UNIT - IV
Distributed File System

Sun Network File System, Coda File System, Plan~9, XFS and SFS, Scalable Security. Distributed Shared memory: Introduction, Bus based multi processors, Ring based multiprocessors, Switched multiprocessors - NUMA comparison of shared memory systems.

UNIT - V
Distributed Object Based System

CORBA, Distributed Com, Globe and Comparison of CORBA, DCOM.
Distributed Document-Based System and Coordinate Based System
The World Wide Web, Lotus Notes, Comparison of WWW and Lotus Notes.

TEXT BOOK

Distributed Systems, Principles and paradigms, 2/e Tanenbaum, Maarten Vansteen, Pearson education, 2009.

REFERENCES

1. Andrew S.Tanenbaum: Distributed Operating System, Prentice Hall International Inc. 1995, McGrawHill., 2007.
2. Distributed Operating Systems & Algorithm Analysis, Chow, Johnson,PEA.
3. Distributed Systems Concepts and Design 4/e, George coulouris, Dollimore, Kindberg, PEA
4. Distributed Operating Systems, Pradeep K.Sinha, PHI, 2001.

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	L	T	P	Cr.
MCA (IV Sem.) **17MC23 – SOFTWARE DESIGN METHODOLOGIES**	3	-	-	3

Course Educational Objectives

In this course, the students will learn about
➢ Software Design methodology
➢ Software Architectural styles
➢ The basic characteristics of Software Design processes;
➢ The elements of Software Designs;
➢ The factors that affect Software Design processes and outcomes.

Course Outcomes : At the end of the course, the student will be able to
CO1: Implement best quality principles while designing a software
CO2: Evaluate various Architectural Styles
CO3: Create new Architectural styles for specific purposes
CO4: Perform the Software Design analytically.
CO5: Implement SAAM,ATAM and HASARD methods for software design.

UNIT – I

Basic concepts of Design:
Introduction, Characteristics of Design activities, Essential elements of Designs.

Design Quality:
Software Quality models: Hierarchical models, Relational models,
The effect of Design on software quality, Efficiency, Correctness and Reliability, Portability, Maintainability, Reusability, Interoperability, Quality attributes of software Design, Witt, Baker and Merritt's Design objectives, Parnas and Weiss's requirements of good Designs, Quality of development process

Design Principles:
Basic rules of software Design: Causes of difficulties, Vehicles to overcome difficulties, Basic rules of software Design
Design processes: The context of Design in Software development process, Generic Design process, Descriptive models, Structure of software Design methods

UNIT - II

Software Architecture:
The notion of Architecture: Architecture in the discipline of buildings, Architecture in the discipline of computer hardware, General notion of architecture. The notion of software architecture, Prescriptive models, Descriptive models, Multiple view models, Roles of architecture in software Design. Software architectural style, Introductory examples, the notion of software architectural style.

Description of Software Architectures:
The Visual Notation: Active and Passive elements, Data and control Relationships, Decomposition/Composition of Architectural elements

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UNIT - III
Typical Architectural Styles:
Data flow: General data flow styles, The pipe- and filter sub-style, The batch sequential processing ,sub-style Independent components: the general independent components style, the event-based implicit invocation systems sub-style.
Call and return:
The general call and return style, the layered systems sub-style, Data Abstraction: the abstract data type and object-oriented sub-style
 Data-centered style, Virtual machine Architecture
Using Styles in Design:
Choices of styles, Combinations of styles: Hierarchical heterogeneous styles, Simultaneously heterogeneous styles, Locationally heterogeneous styles

UNIT – IV
Architectural Design space:
Theory of Design spaces: Structure of Design spaces, Solving Design synthesis and analysis problems; Design space of architectural elements: Behavior features, Static features, Design space of architectural styles, Characteristic features of architectural styles, Classification of styles
Scenario-Based Analysis and Evaluation:
The concept of scenario, Scenarios for evaluating modifiability, Scenarios for evaluating Performance, Scenarios for evaluating reusability.

UNIT – V
Analysis and Evaluation of Modifiability: SAAM Method:
The input and output, the process (Activities in SAAM Analysis)
Quality Trade- Off Analysis: ATAM Method
ATAM analysis process, ATAM analysis activities
Model-Based Analysis: HASARD Method
 Representation of quality models, construction of quality models.

TEXT BOOK
Software Design Methodology: From Principles to Architectural Styles, Hong zhu,Elsevier,2006.

REFERENCES
1. Shaw, M.,Garlan, Software Architecture: Perspectives on an Emerging discipline, PEA, 2010.
2. Bass, L., Clements P,Kazman, Software Architecture in Practice, PEA,2003
3. Clements, Kazman, Klien, Evaluating Software Architectures: Methods and Case Studies, PEA, 2002
4. Bernard Witt, Baker, Merritt, Von Nostrand Reinhold, Software Architecture and Design, NY, 1994.

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	L	T	P	Cr.
MCA (IV Sem.) **17MC24 – DISTRIBUTED DATABASES**	3	-	-	3

Course Educational Objectives
In this course, the students will learn about
➢ To provide an understanding of architecture and design tradeoffs of all aspects of distributed database management systems.
➢ To apply heuristics to design high performing distributed database schemas.
➢ To learn how to create optimized distributed query execution plans as well as understand the underpinnings of transaction management and fault tolerance.
➢ To characterize algorithms that are optimally solved by Map Reduce, to design and query large-scale databases, and to understand tradeoffs among distributed database, cloud databases, and data warehouses.

Course Outcomes: At the end of the course, the student will be able to
CO1: Implement basic database concepts, including the structure and operation of the relational data model.
CO2: Design simple and moderately advanced database queries using Structured Query Language (SQL).
CO3: Implement database transaction and related database facilities, including concurrency control, journaling, backup and recovery, and data object locking and protocols.
CO4: Learn and discuss selected advanced database topics, such as distributed database systems and the data warehouse.
CO5: Use the concepts of object models.

UNIT-I
INTRODUCTION DISTRIBUTED DATA PROCESSING - Distributed database system (DDBMSS) - Promises of DDBMSs - Complicating factors and Problem areas in DDBMSs - Overview Of Relational DBMS Relational Database concepts – Normalization - Integrity rules - Relational Data Languages - Relational DBMS

UNIT-II
DISTRIBUTED DBMS ARCHITECTURE DBMS STANDARDIZATION - Architectural models for Distributed DBMS - Distributed DBMS Architecture Distributed Database Design - Alternative design Strategies - Distribution design issues, Fragmentation – Allocation - Semantic Data Control - View Management - Data security - Semantic Integrity Control

UNIT-III
OVERVIEW OF QUERY PROCESSING QUERY PROCESSING PROBLEM - Objectives of Query Processing - Complexity of Relational Algebra operations - characterization of Query processors - Layers of Query Processing Introduction to Transaction Management - Definition of Transaction - Properties of transaction - types of transaction

UNIT-IV
DISTRIBUTED CONCURRENCY CONTROL SERIALIZABILITY THEORY - Taxonomy of concurrency control mechanisms - locking bases concurrency control algorithms - Parallel Database Systems - Database servers - Parallel architecture - Parallel DBMS techniques - Parallel execution problems - Parallel execution for hierarchical architecture.

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UNIT-V
DISTRIBUTED OBJECT DATABASE MANAGEMENT SYSTEMS Fundamental Object concepts and Object models - Object distribution design - Architectural issues - Object management - Distributed object storage - Object query processing - Transaction management - Database Interoperability - Database Integration - Query processing

TEXTBOOK
M.Tamer Ozsu, —Principles of Distributed Database Systems 2nd, Patrick Valduriez, 2011.

REFERENCES
StefanoCeri, Giuseppe Pelagatti, —Distributed Databases principles and systems, ,Tata mcGraw Hill, 2010

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	L	T	P	Cr.
MCA (IV Sem.) 17MC69 – DATA WAREHOUSING AND MINING LAB	-	-	4	2

Course Educational Objectives:

In this course, the students will learn about
- Mining Association Rules in Large Databases (compressed)
- Classification and Prediction
- Cluster Analysis
- Mining Complex Types of Data
- Data Mining Applications and Trends in Data Mining

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

CO1: Apply the techniques of clustering, classification, association finding, feature selection and visualization to real world data

CO2: Determine whether a real world problem has a data mining solution

CO3: Apply evaluation metrics to select data mining techniques

LIST OF EXPERIMENTS

1. Creation and Usage of ARFF files.
2. Develop Weka application to preprocess the Data.
3. Develop Weka application for attribute selection using Filters.
4. Develop Weka application to perform association Mining and categorical   Data.
5. Develop Weka applications for various classification algorithms.
6. Develop Weka applications for various clustering algorithms.
7. Develop Weka application to access the data from database
8. Develop Weka application to visualize the Data in Graphs
9. Develop a Clementine stream to access the data from various sources.
10. Develop a Clementine stream for various record options.
11. Develop a Clementine stream for various field options.
12. Develop a Clementine stream to visualize user input Data on Graphs.
13. Develop a Clementine stream to perform Clustering using various algorithms.
14. Develop a Clementine stream to perform Classification using various   algorithms.
15. Develop a Clementine stream to find associations among data using various algorithms.

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		L	T	P	Cr.
MCA (IV Sem.)	**17MC70 – OBJECT ORIENTED ANALYSIS AND DESIGN LAB.**	-	-	4	2

Course Educational Objectives:

In this course, the students will learn to
➤ Concept and techniques necessary to effectively use system requirements to drive the development of a robust design model.
➤ Applying UML to fundamental OOAD concepts.
➤ Forward engineering
➤ Reverse engineering

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

CO1: Capture and communicate analysis and design decisions.
CO2: Use object oriented technologies.
CO3: Perform reverse and forward engineering.
CO4: Implement any object oriented design with object oriented programming languages like C++, JAVA etc.
CO5: Manage the complexity of artifacts.

LIST OF EXPERIMENTS

1. Library Information System.
2. University Model
3. ATM Transactions
4. Cell Phone Networking System
5. Hospital Management System

TEXT BOOK

1. Grady Booch, James Rambaugh, Ivar Jacobson: The Unified Modeling Language User Guide, Pearson Edition

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		L	T	P	Cr.
MCA (IV Sem.)	**17MC71 –WEB TECHNOLOGES LAB**	-	-	4	2

Course Educational Objectives: In this course, the students will learn to
➢ Developing the HTML document involving a variety of element types, including hyperlinks, images, lists, tables, and forms.
➢ Developing the web sites which are secure and dynamic in nature and writing scripts which get executed on server as Well.
➢ To design and to develop simple database driven web applications using a server-side scripting language.
➢ The web page site planning, management and maintenance.
➢ Develop a reasonably sophisticated web application that appropriately employs the MVC architecture

Course Outcomes: At the end of the course, the student will be able to
CO1: Develop web Application Using HTML and XML.
CO2: Build dynamic web pages using JavaScript (client side programming).
CO3: Develop server side applications using servlets and JSP.
CO4: Install and run web servers, Deploy a web based application onto the web server.
CO5: Design and construct various data base tables using JDBC and produce various results based on given query.

LIST OF EXPERIMENTS

1. Write a HTML program to create a Table.

2. Write a HTML program to create Lists.

3. Design a web page using Frames

4. Design a form that can be used to fill student information.

5. Design a web page that use CSS.

6. Write a Java script program to find the reverse of a given number.

7. Write a Java script program to find that a given number is prime or not.

8.   Write a Java script program to find that a given number is Armstrong or not.

9. Write a Java script program to find the factorial of a number using recursion.

10. Write a Java script program by using Java script Objects.

11. Write a HTML program that handles the events.

12. Write an XML program using DTDs

13. Develop a web page to implement online book stores using XML which includes

    a. Title of the book

    b. Author name

    c. Publisher name

    d. Edition

    e. Price

14. Write a Java program to retrieve data from data base using Type-4 driver

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15.   Write Java program by using Prepared Statements and Callable Statements.

16.   Write a Java program using forward only and bi-directional Resultsets

17.   Write an example program using BDK.

18.   Write a simple Servlet program using Generic and HTTP Servlets.

19.   Write a Servlet program that handles the user request by using doGet () and doPost () methods.

20.   Write a Servlet program using Config and Context parameters.

21.   Write a Servlet program to implement Session Tracking.

22.   Write a Servlet program that uses JDBC.

23.   Write a simple JSP program to display Date.

24.   Write a JSP program by using Implicit objects.

25.   Write a JSP program to handle Exceptions.

26.   Write a JSP program using JDBC.

27.   Write a JSP program using Include, Forward requests.

28.   Write a JSP program using useBean.

29.   Write a web application program using struts frame work

30.   Develop an application using EJB.

TEXT BOOK
Harvey M. Deitel and Paul J. Deitel, **"Internet & World Wide Web How to Program"**, 4/e, Pearson Education.

REFERENCES

1.   A. A. Puntambekar, 1/e 2010, Web Technologies, Technical Publications, Pune.
2.   JAVA Complete Reference, 5th Edition, Tata McGraw-Hill, New Delhi.
3.   K. Moss, 1999, Java Servlets, Second edition, Tata McGraw Hill, New Delhi.
4.   D. R.Callaway, 1999, Inside Servlets, Addison Wesley, Boston
5.   TomValesky, Enterprise JavaBeans, Addison Wesley. 7. Cay S Horseman & Gary Cornell, Core Java Vol II Advanced Features, Addison Wesley.

	L	T	P	Cr.
MCA (V Sem.) **17MC25 – BIGDATA ANALYTICS**	3	-	-	3

Course Educational Objectives

In this course, the students will learn about:
- Concepts of BigData, Hadoop and HDFS.
- Processing the large data using MapReduce Framework.
- Limitations between MapReduce and YARN.
- Analyzing the data by using PIG functions and operators.
- Creation of databases and tables by using Hive.

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

CO1: At the end of the course, the student will be able to Use HDFS technology, to store various types of data and store large volume of data.

CO2: Use MapReduce Framework, to process large volume of data.

CO3: Evaluate the MapReduce and YARN.

CO4: Analyze the data using PIG Concepts.

CO5: Create databases and tables using Hive concepts.

UNIT-I
OVERVIEW OF BIG DATA & HADOOP

Define Big Data, Evolution of Big Data, Types of Data, Elements of Big Data, BigData Analytics, Advantages of Big Data Analytics, Hadoop Ecosystem, HDFS Design, HDFS Concepts, The Command-Line Interface, HDFS File Systems, HDFS Commands, Data Flow, Features of HDFS, Parallel Copying with distcp.

UNIT-II
MAPREDUCE-I

Framework of MapReduce, Features of MapReduce, Anatomy of a MapReduce job run(MR1), Failures, Shuffle and Sort, Task Execution, MapReduce Types and Formats, MapReduce Program:Driver code, Mapper code, Reducer code, Record Reader, Combiner, Partitioner.

UNIT-III
MAPREDUCE-II

Counters, Sorting, Joins, Compression, Serialization, File-Based Data Structures, Side-Data Distribution.
YARN

Anatomy of a YARN application run, MR1 vs YARN, YARN architecture, Scheduling in YARN, YARN Configurations, YARN Containers, YARN Compatibility.

UNIT-IV
PIG

Introduction to Pig, Benefits of pig, Running Pig, Running Pig Programs, Grunt Shell, Pig Latin, Pig Functions, User-Defined Functions, Data Processing Operators.

UNIT-V
HIVE

Introduction to Hive, Architecture of Hive, Hive Shell, Hive Services, Metastore, Hive vs Traditional Databases, HiveQL, Data Types, Functions, Operators, Hive Tables, Querying Data, User-Defined Functions.

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TEXT BOOKS
1. BIG DATA Black Book by DT Editorial Services,1st Edition, Dreamtech press
2. Hadoop: The Definitive Guide by Tom White, 4rd Edition, O'reilly

REFERENCES
1. Hadoop in Action by Chuck Lam, MANNING Publ.
2. Hadoop for Dummies by Dirk deRoos, Paul C.Zikopoulos, Roman B.Melnyk,Bruce Brown, Rafael Coss

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	L	T	P	Cr.
MCA (V Sem.) **17MC26 – MOBILE APPLICATION DEVELOPMENT**	2	2	-	3

Course Educational Objectives:
- ➤ To enrich the knowledge in Android application architecture, including the roles of the task stack, activities, and services.
- ➤ To Design and develop useful Android applications with compelling user interfaces by using, extending, and creating your own layouts and Views and using Menus.
- ➤ To explore Android APIs for Media, Camera, Location, Sensors, and Connectivity in your own Android applications.
- ➤ To extend the knowledge in testing the mobile Apps.
- ➤ To enrich the knowledge in Business strategy aspects of Android Application, including techniques for distributing app on Google Play and techniques for building revenue.

Course Outcomes: At the end of the course, the student will be able to
CO1: Describe the components and structure of a mobile development framework (Google's Android Studio).

CO2: Develop mobile application using UI Design: Widgets, Layouts, UI Events and Event Listeners.

CO3: Develop Android user interfaces using Media, Camera, Location, Sensors, and Database connectivity.

CO4: Test android applications using Testing tools.

CO5: Deploy applications to the Android marketplace for distribution.

Unit 1
Getting started with Mobility
Mobility landscape, Mobile platforms, Mobile apps development, Overview of Android platform, setting up the mobile app development environment along with an emulator, a case study on Mobile app development

Unit II
Building blocks of mobile apps
App user interface designing – mobile UI resources (Layout,UI elements,Draw-able, Menu), Activity- states and life cycle, interaction amongst activities.
Native data handling – on-device file I/O, shared preferences, mobile databases such as SQLite, and enterprise data access (via Internet/Intranet)

Unit III
Sprucing up mobile apps
App functionality beyond user interface - Threads, sync task, Services – states and lifecycle, Notifications, Broadcast receivers.
Graphics and animation – custom views, multimedia – audio/video playback and record, location awareness.

Unit IV
Testing mobile apps
Debugging mobile apps, White box testing, Black box testing, and test automation of mobile apps, JUnit for Android, MonkeyTalk.

Unit V
Taking apps to Market

Native hardware access (sensors such as accelerometer and gyroscope)
Versioning, signing and packaging mobile apps, distributing apps on mobile market place

TEXT BOOK

Anubhav Pradhan, Anil V Deshpande, 'Mobile Applications Development' Edition 1

REFERENCES

1. Barry Burd 'Android Applications Development all in one for Dummies", edition 1.
2. "Teach Yourself Android Application Development in 24 hours" Edition 1, SAMS.

		L	T	P	Cr.
MCA (V Sem.)	**17MC27– PYTHON PROGRAMMING**	2	2	-	3

Course Educational Objectives:

In this course, the students will learn about:
- Using lists, tuples and dictionaries in python program.
- Structure and components of a python program.
- Building functions and packages in python.
- Designing object oriented programs with python classes.

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

CO1: Design programs in Python.
CO2: Use various python packages in real time applications.
CO3: Run Python scripts.
CO4: Test and debug python scripts.
CO5: Handle exceptions 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.

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-elseif-else, for, while, break, continue, pass.

UNIT – III

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

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,
Python packages, Introduction to PIP, Installing Packages via PIP, Using Python Packages.

UNIT – V

Object Oriented Programming OOP in Python: Classes, 'self variable', Methods, Constructor Method, Inheritance, Overriding Methods, Datahiding.
Error and Exceptions: Difference between an error and Exception, Handling Exception, try except 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.

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

REFERENCES
1.   Think Python, Allen Downey, Green Tea Press.
2.   Core Python Programming, W.Chun, Pearson.

L	T	P	Cr.
3	-	-	3

MCA (V Sem.)   **17MC28 – INTERNET OF THINGS**

Course objectives: In this course, the students will learn about
➢ The vision and introduction of IoT.
➢ IoT Market perspective.
➢ The Implementation of Data and Knowledge Management and use of Devices in IoT Technology.
➢ The State of the Art - IoT Architecture.
➢ The classification of Real World IoT Design Constraints, Industrial Automation in IoT.

Course Outcomes: At the end of the course, the student will be able to
CO1: Interpret the vision of IoT from a global context.
CO2: Determine the Market perspective of IoT.
CO3: Compare and Contrast the use of Devices, Gateways and Data Management in IoT.
CO4: Implement state of the art architecture in IoT.
CO5: Illustrate the application of IoT in Industrial Automation and identify Real World Design
       Constraints.

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.

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.

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.

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.

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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.

TEXTBOOKS

1. Internet of Things: Architecture, Design Principles And Applications, Rajkamal, McGraw Hill Higher Education.
2. Internet of Things, A.Bahgya and V.Madisetti, Univesity Press, 2015.

REFERNCES

1. Designing the Internet of Things, Adrian McEwen and Hakim Cassimally, Wiley
2. Getting Started with the Internet of Things CunoPfister, Oreilly.

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		L	T	P	Cr.
MCA (V Sem.)	**17MC29 – OPEN SOURCE SOFTWARE**	3	-	-	3

Course Educational Objectives:

In this course student will learn about:

➢ An overview of the historical and modern context and operation of free and open source software (FOSS) communities and associated software projects.

➢ How to participate in a FOSS project in order to contribute to and improve aspects of the software that they feel are wrong.

➢ Learn some important FOSS tools and techniques for contributing to projects and how to set up their own FOSS projects.

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

CO1: Install and run open-source operating systems

CO2: Gather information about Free and Open Source Software projects from software releases and from sites on the internet.

CO3: Build and modify one or more Free and Open Source Software packages.

CO4: Use a version control system and interface with version control systems used by development communities.

CO5: Interact with Free and Open Source Software development projects.

UNIT – I

Open Source Software: Definitions & History- Definitions of terms, A Brief History of Software

Where Open Source Is Successful –Analytical Framework, Open Source in widespread successful use, Examples of Open Source Systems

Open Source: The Good, the Bad, and the Ugly-What is Good about Open source, Open Source is Not enough by itself, How Choosing Open Source Is More difficult for You, What Others Say about Open Source.

UNIT – II

Five Open Source Opportunities – Introduction, Directory Services, Email, Groupware and Collaboration, Complex Web Publishing, Manage User Desktops, Other Possibilities

Operating Systems – Contents of the Operating systems, Linux Distribution Vendors, Enterprise Distribution Vendors, Community-Supported Distribution Vendors, International Alternatives

UNIT – III

Open Source Server Applications – Infrastructure Services, Web Services, Database Servers, Mail Servers, System Management

Open Source Desktop Applications – Introduction, Graphical Desktops, Web Browsers, The Office Suite, Mail and Calendar Clients, Personal Software

UNIT - IV

How Open Source Software is Developed – Methodology, Languages Used to Develop Open source Products, Cross-Platform Code

Application Architecture –Types of Systems, Tiered Design, Managing Performance and Scalability, Interoperability, Development Platform Choices

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UNIT - V

Managing System Implementations – Implementation Roles, Open Source Impact on Team Issues, Implementation Process, Implementations Principles, Key Documents, Migration, Interacting with Open Source Community, Support.

The Cost of Open Source Systems- Total Cost of Ownership, Types of Costs, Scenarios

Licensing – Types of Licenses, Licenses in Use, Mixing Open and Closed Code, Dual Licensing, Other Intellectual Property Issues

TEXTBOOK

Paul Kavanagh, "Open Source Software Implementation and Management", Elsevier Digital Press.

REFERENCES

1. Joseph Feller and Brian Fitzgerald," Understanding Open Source Software Development", Addison Wesley Professional 2002.
2. Karl Fogel, "Producing Open Source Software", O'reilly-2006.

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		L	T	P	Cr.
MCA (V Sem.)	17MC30 – SOFTWARE TESTING METHODOLOGIES	3	-	-	3

Course Educational Objectives: In this course, the students will learn to
➢ Test process and continuous quality improvement
➢ Test generation from requirements
➢ Types and levels of testing.
➢ Special kinds of tests.
➢ Quality plan and Test plan preparation.
➢ Collection of Test metrics.
➢ Preparation Test Reports.
➢ Identify uses of various testing tools.

Course Outcomes: At the end of the course, the student will be able to
CO1: Understand and apply various levels of testing.
CO2: Perform special kinds of Tests
CO3: Develop Quality plan or Test plan.
CO4: Gather and analyze various test metrics.
CO5: Demonstrate the uses of testing tools.

UNIT - I
Basics of Software Testing:
Humans, Errors and Testing, Software Quality, Requirements, Behavior and Correctness, Correctness versus Reliability, Testing and Debugging, Test Metrics, Software and Hardware testing, Testing and Verification, Defect Management, Execution History, Test-Generation stratagies,Static Testing, Control flow Graph, Dominators and Post Dominators, Program dependence Graph.

UNIT - II
Testing Techniques:
Levels of Testing, Acceptance Testing. Special Tests: Complexity Testing, GUI Testing, Security Testing, Performance, Volume and Stress Testing, Recovery Testing, Requirement Testing, Regression Testing, Smoke Testing, Sanity Testing, Adhoc Testing, State Graph, Object-Oriented Applications Testing, COTS Testing.
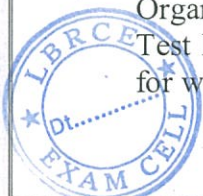
UNIT - III
Test Planning:
Test policy, Test strategy, Test plan, Quality plan and Test plan, Quality plan template, Test plan template, Guidelines for developing the Test plan, Test Standards, Building Test data and Test cases, Test scenario, Test cases, Template for Test cases, Test scripts, Test Log Document, Effective Test cases, Test file, Building Test data, Generation of Test data, Roles and Responsibilities in Testing life cycle, Test progress monitoring.

UNIT - IV
Test Metrics and Test Reports:
Test Metrics and Test Reports, Categories of the Product/Project Test Metrics, Estimated, Budgeted, Approved and Actual, Resources Consumed in Testing, Effectiveness of Testing, Defect Density, and Defect Leakage Ratio, Residual Defect Density, Test team efficiency, Test case efficiency, Rework ,MTBF/MTTR, Implementing Measurement Reporting System in an Organization, Test Reports, Project Test Status Report,
Test Reports: Integration Test Report, System Test Report, Acceptance Test Report, Guidelines for writing and using Report, final Test Reporting, Test Status Report.

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UNIT - V
Test process Improvement:
The need for Test process Improvement, Test process Maturity, Test process Improvement Model, Test process Improvement Model stages, Graphical representation of Improvements.
Testing Tools:
Introduction, Features of Test Tool, Guidelines for selecting a Tool, Tools and Skills of Tester, Static Testing Tools, Dynamic Testing Tools, Advantages of using Tools, When to use Automated Test Tools.

TEXT BOOK
M G Limaye, "Software Testing, Principles, Techniques, and Tools", (TMH),2011.

REFERENCES
1. Aditya P. Mathur Foundations of Software Testing. –, 2011.
2. Baris Beizer, "Software Testing techniques", Dreamtech, second edition.
3. Dr.K.V.K.K.Prasad, "Software Testing Tools ", Dreamtech, 2007.
4. Edward Kit, "Software Testing in the Real World", Pearson, 2006.
5. Perry, "Effective Methods of Software Testing", John Wiley, 3rd edition, 2007.

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	L	T	P	Cr.
MCA (V Sem.) **17MC31 – DATABASE TUNING**	3	-	-	3

Course Educational Objectives: In this course, the students will learn about
- ➤ Database internals and their impact on performance.
- ➤ The recurring principles underlying database tuning.
- ➤ Principled approach to database tuning problems. This includes both discussion of case studies and hands-on experiments.

Course Outcomes: At the end of the course, the student will be able to
CO1: Understand the parameters that impact the performance of a database system.
CO2: Monitor performance relevant parameters.
CO3: Interpret performance parameters correctly and pinpoint bottlenecks.
CO4: Propose effective solutions to performance problems.
CO5: Address tuning issues related to common underlying components of all database systems.

UNIT – I
Basic Principles : The Power of Principles, Five Basic Principles, Basic Principles and Knowledge, Tuning The Guts , Locking and Concurrency Control, Logging and the Recovery Subsystem, Operating System Considerations, Hardware Tuning.

UNIT – II
Index Tuning, Types of Queries, Key Types, Data Structures, Sparse Versus Dense Indexes, To Cluster or Not to Cluster, Joins, Foreign key Constraints, and Indexes, Avoid Indexes on small Tables.

UNIT – III
Tuning Relational Systems, Table Schema and Normalization, Clustering Two tables, Aggregate Maintenance, Record Layout, Query Tuning, Triggers. Communicating with the outside Client-server Mechanisms, Objects, application Tools, and Performance, Tuning the application Interface, Bulk Loading Data, Accessing Multiple Databases.

UNIT - IV
Troubleshooting: Introduction, How to gather Information: The Tools, Queries from Hell, Are DBMS Subsystems Working Satisfactorily, Is the DBMS Getting All It Needs.

UNIT - V
Transaction Chopping: Assumptions, Correct Chopping, Finding the Finest Chopping, Optimal Chopping Algorithm, Application to Typical Database Systems, Related Work.
Time Series, Especially for Finance: Setting up a Time Series Database, FAME,S-Plus, SAS, KDB, Oracle-8i Time Series, features you want for Time Series, Time Series Data Mining.
Understanding access Plans: Data Access Operators, Query structure Operators, Auxiliary Operators.
Configuration Parameters: Oracle, SQL Server, DB2 UDB.

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TEXT BOOK

Dennis Shasha and Philippe Bonnet "Database Tuning, Principles, Experiments and Troubleshooting Techniques", Morgan Kaufmann, Elsevier.

REFERENCES

1. Thomas Connoly and Carlolyn Begg,"Database Systems, A Practical Approach to Design, Implementation and Management", Third Edition, Pearson Education.
2. M.Tamer Ozsu, Patrick Valduriez and S.Sridhar "Principles of Distributed Database Systems", Pearson Education.

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		L	T	P	Cr.
MCA (V Sem.)	**17MC32 – E-COMMERCE**	3	-	-	3

Course Educational Objectives: In this course, the students will learn about
➢ Importance of information systems for business and management:
➢ Evaluate the role of the major types of information systems in a business environment and their relationship to each other;
➢ Assess the impact of the Internet and Internet technology on business-electronic commerce and electronic business;
➢ Identify the major management challenges to building and using information systems and learn how to find appropriate solutions to those challenges.
➢ Define an infrastructure and describe its components
➢ Learn the core activities in the systems development process;
➢ Cultivate skills and experience in the development and implementation of information systems projects.

Course Outcomes: At the end of the course, the student will be able to
CO1: Understand the basic concepts and technologies used in the field of management information systems.
CO2: Develop and implement information systems.
CO3: Be aware of the ethical, social, and security issues of information systems.
CO4: Develop an understanding of how various information systems work together to accomplish the information objectives of an organization.
CO5: Use the application software skills such as analyzing spreadsheets, creating database, and web browsing, that they have learned in other courses to apply to real-world business problems.

UNIT – I

Electronic Commerce-Frame work, anatomy of E-Commerce applications, E-Commerce Consumer applications, E-Commerce organization applications.
Consumer Oriented Electronic commerce - Mercantile Process models.

UNIT – II

Electronic payment systems - Digital Token-Based, Smart Cards, Credit Cards, Risks in Electronic Payment systems. Inter Organizational Commerce - EDI, EDI Implementation, Value added networks.

UNIT – III

Intra Organizational Commerce - work Flow, Automation Customization and internal Commerce, Supply chain Management.

UNIT – IV

Corporate Digital Library - Document Library, digital Document types, corporate Data Warehouses.
Advertising and Marketing - Information based marketing, Advertising on Internet, on-line marketing
Process, market research.

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UNIT – V

Consumer Search and Resource Discovery - Information search and Retrieval, Commerce Catalogues,
Information Filtering.
Multimedia - key multimedia concepts, Digital Video and electronic Commerce, Desktop video Processing's, Desktop video conferencing.

TEXT BOOK

Frontiers of electronic commerce – Kalakata, Whinston, Pearson.

REFERENCES

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. Electronic Commerce – Gary P.Schneider – Thomson.
5. E-Commerce – Business, Technology, Society, Kenneth C.Taudon, Carol Guyerico.

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L	T	P	Cr.
3	-	-	3

MCA (V Sem.)   **17MC33– UNIX ADMINISTRATION**

Course Educational Objectives: In this course, the students will learn about
➢ Various key aspects of Unix administration
➢ Process controlling
➢ Users creation
➢ Adding new disks
➢ System logs

Course Outcomes: At the end of the course, the student will be able to
CO1: Create new users
CO2: Administrate various users with various permissions.
CO3: Backup a system
CO4: Implement system logs

UNIT - I
Booting and shutting Down: Bootstrapping, Booting Pcs, Booting in Single User mode, Startup Scripts Rebooting and Shutting down.

UNIT - II
Controlling Processes: Components of a process, Life cycle of a process, Signals, Process states.
The File System: Path names, Mounting and unmounting files, Organization of the file tree, File types, File attributes.

UNIT - III
Adding New Users: The /etc/passwd file, Adding users, Removing users, Disabling logins, Configuration of hardwired terminals, Special characters and Terminal driver, How to unwedge a terminal.

UNIT - IV
Adding a Disk: Disk Interfaces, An overview of the disk installation procedure, Periodic Processes.
Backups: Motherhood and apple pie, Backup devices and media, Restoring from dumps, using other archiving programs.

UNIT - V
Syslog and Log Files: Logging Polices, Finding Log Files, Files not to manage, Syslog.
Drivers and the Kernel: Kernel Types, Configuring a Solaris Kernel, Linux Kernel, Adding Device Drivers, Device Files, Naming Conventions for devices.

TEXT BOOK
E. Nemeth, G. Snyder, S. Seebass and T.R.Hein, "UNIX System Administration Handbook", Pearson Education, 3rd ED.

REFERENCES
1. Goodheart B. Cox J, "The Magic Garden Explained", Prentice Hall of India.
2. Leffler S.J., Mckusick M.K., Karels M.J. and Quarterman J.S.,"The Design and Implementation of the4.3 BSD Unix Operating System", Addison Wesley.
3. Behrouz A.Forouzan , Richard Gilberg, " Unix & Shell programming ", Thomson Asia, 2003.

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	L	T	P	Cr.
MCA (V Sem.) **17MC34 – SOFTWARE PROJECT MANAGEMENT**	3	-	-	3

Course Educational Objectives: In this course, the students will learn about:

➢ Define and highlight importance of software project management.
➢ Software project management concepts, techniques and issues related to implementation.
➢ Describe the software project management activities
➢ Train software project managers and other individuals involved in software project planning and tracking.
➢ Implementation of the software project management process

Course Outcomes: At the end of the course, the student will be able to
CO1: Develop a project management plan (PMP).
CO2: Select appropriate architecture style and patterns depending on the application.
CO3: Track project execution through collecting artifacts and metrics according to procedures described in PMP.
CO4: Revise PMP.
CO5: Use real time software tools for software project management.

UNIT - I
Conventional Software Management: Waterfall model, Conventional Software Management performance.
Evolution of Software Economics: Software economics, Pragmatic software cost estimation.
Improving Software Economics: Reducing Software product size, Improving software processes, Improving team effectiveness, Improving automation, Achieving required quality, peer inspections
The Old way and the new: The principles of conventional software Engineering, Principles of modern software management, transitioning to an iterative process.

UNIT - II
Life cycle phases: Engineering and Production stages, Inception, Elaboration, Construction, Transition phases.
Artifacts of the process: The Artifact sets, Management artifacts, Engineering artifacts, Programmatic artifacts.

UNIT - III
Model based software architectures: A Management perspective and technical perspective.
Work Flows of the process: Software process workflows, Iteration workflows
Checkpoints of the process: Major mile stones, Minor Milestones, Periodic status assessments.

UNIT - IV
Iterative Process Planning: Work breakdown structures, Planning guidelines, Cost and Schedule estimating, Iteration planning process, Pragmatic planning
Project Organization and Responsibilities: Line-of-Business Organizations, Project Organizations, evolution of Organizations.
Process Automation: Automation Building blocks, The Project Environment.

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UNIT - V

Project Control and Process instrumentation: The seven core Metrics, Management indicators, Quality indicators, Life cycle exceptions, Pragmatic Software Metrics, Metrics automation

Tailoring the Process: Process discriminants.

Future Software Project Management: Modern Project Profile, Next generation Software economics, Modern process transitions.

TEXT BOOK

Walker Royce, "Software Project Management", Pearson Education, 2012.

REFERENCES

1. Walker Royce, Bob Hughes and Mike Cotterell, "Software Project Management", Tata McGraw-Hill Edition.
2. Joel Henry, "Software Project Management", Pearson Education.
3. Pankaj Jalote, "Software Project Management in practice", Pearson Education 2005.

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	L	T	P	Cr.
MCA (V Sem.) **17MC35 – DATABASE ADMINISTRATION**	3	-	-	3

Course Educational Objectives: In this course, the students will learn about
➢ The basics of Database Administration.
➢ How to maintain a database quickly & accurately.
➢ Design and manage the Database Server to solve the issues related to the Database Server.
➢ Analyze the DBMS requirements for specific scenarios.
➢ Latest emerging trends in Database design and implementation of object-relational databases

Course Outcomes: At the end of the course, the student will be able to
CO1: Analyze and model requirements and constraints for the purposes of Install, configure, optimize and tune the performance of a DBMS;
CO2: Design and implement plans for security, back-up and recovery measures;
CO3: Manage the Database storage structures;
CO4: Create and administer user accounts;
CO5: Monitor, troubleshoot, and maintain a database.

UNIT – I

Introduction: Database Architecture, DBMS Architecture and Data independance,DBA roles and responsibilities, Logical Database layouts, Physical Database layouts,Hardware Configurations and considerations, Overview of physical and logical storage structures.

UNIT – II

Schema Management,User Management and Database Security, Database creation, Connectivity and User Management, Creating and modifying user accounts, Creating and using Roles, Granting and revoking previliges, Managing user groups with profiles, Managing user and Security, Profiles, Managing previliges.

UNIT – III

Transaction Management, Managing multiple Databases, Managing Rollback statements, Database security and auditing, Introduction to Network administration, Network responsibilities for DBA, Network configuration, Managing large Databases, managing Distributed Databases, Configuring, Client-Server and Network computing. Oracle background processors, Overview of Oracle Net Futures.

UNIT – IV

Backup and recovery : Overview, Database backup restoration and recovery. Types of failures in oracle environment.
Defining backup and recovery strategies : Optimal backup and recovery procedures, Testing the backup and recovery plan.

UNIT – V

Introduction to performance tuning: Improving Database performance, Brief overview of Tuning methodology, An approach to oracle performance, Tuning, Optimizing, Oracle query processing, Query optimization and Oracle cost based Optimizer, The role of DBA to improve SQL processing.

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TEXT BOOK
Kevin Loney , "Oracle DBA Handook", Oracle press

REFERENCES
1. Sam R Alapati,"Expert Oracle database administration", Apress.
2. Jennick,Carol,Mccullough Dieter,and Gerrit, Jan Linker , "Oracle DBA Bible"
3. Loney Kevin, "Oracle Database The complete reference", McGrahill
4. Bob Brayela,Biju Thomas, "Oracle DBA fundamentals" BPV publications.

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	L	T	P	Cr.
MCA (V Sem.) **17MC72 – BIGDATA ANALYTICS LAB**	-	-	4	2

Course Educational Objectives: In this course, the students will learn about:
➢ Hadoop Frameworks, in different operating modes.
➢ HDFS commands, copy the data into local system to HDFS and HDFS to local system.
➢ Writing MapReduce programs, processing large volume of the data.
➢ Writing pig scripts and analyzing the data.
➢ Installations of Hive, to maintain warehouses of the data.

Course Outcomes: At the end of the course, the student will be able to
CO1: Install Hadoop Framework in three operating modes.
CO2: Copy the data into Local system to HDFS and HDFS to Local System by using HDFS Commands.
CO3: Implement the map function and reduce function in the MapReduce programs.
CO4: Design pig scripts and executing in different modes, using functions and operations to analyze the data.
CO5: Create Hive tables, querying the data and warehousing the data.

LIST OF EXPERIMENTS

Exercise 1:
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.

Exercise 2:
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.

Exercise 3:
3) Run a basic Word Count Map Reduce program to understand Map Reduce Paradigm.

Exercise 4:
4) Write a MapReduce 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 good candidate for analysis with MapReduce, since it is semi-structured and record-oriented.
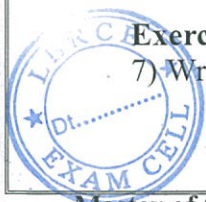
Exercise 5:
5) Implement Matrix Multiplication with Hadoop Map Reduce.

Exercise 6:
6) Write a program to group of repeated characters in a string by using Mapreduce.

Exercise 7:
7) Write a program to count characters in a text data by using Mapreduce.

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Exercise 8:

8) Write a program to find how many flights between origin and destination by using Mapreduce.

Exercise 9:

9) Install and Run Pig then write Pig Latin scripts to sort, group, join, project, and filter your data.

Exercise 10:

10) Install and Run Hive then use Hive to create, alter, and drop databases, tables, views, Functions and indexes

TEXT BOOKS

1.   BIG DATA Black Book by DT Editorial Services,1st Edition, Dreamtech press
2.   Hadoop: The Definitive Guide by Tom White, 4rd Edition, O'reilly

REFERENCES

1.   Hadoop in Action by Chuck Lam, MANNING Publ.
2.   Hadoop for Dummies by Dirk deRoos, Paul C.Zikopoulos, Roman B.Melnyk,Bruce Brown, Rafael Coss

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		L	T	P	Cr.
MCA (V Sem.)	**17MC73 –MOBILE APPLICATION DEVELOPMENT LAB**	-	-	4	2

Course Educational Objectives: In this course, the students will learn about
- ➢ Mobile Applications development using Android
- ➢ App User interface designing
- ➢ Testing the mobile Apps.
- ➢ Distribute and market mobile Apps

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

CO1: Appreciate the Mobility landscape

CO2: Familiarize with Mobile apps development aspects

CO3: Design and develop mobile apps, using Android as development platform, with key focus on user experience design, native data handling and background tasks and notifications.

CO4: Appreciation of nuances such as native hardware play, location awareness, graphics, and multimedia.

CO5: Perform testing, signing, packaging and distribution of mobile apps

LIST OF EXPERIMENTS

Students should implement (and learn to use the tools to accomplish this task) the following during Practical hours: (illustrative only)

1. Understand the app idea and design user interface/wireframes of mobile app
2. Set up the mobile app development environment
3. Develop and debug mobile app components – User interface, services, notifications, broadcast receivers, data components
4. Using emulator to deploy and run mobile apps
5. Testing mobile app - unit testing, black box testing and test automation

Infrastructure Requirements

HARDWARE / SOFTWARE REQUIREMENTS
Machine:
Pentium P4, 2.8 GHz or higher
2 GB (or higher) RAM, 40 GB (or higher) HD
Windows XP with SP2 (or higher)

REFERENCES
1. Anubhav Pradhan, Anil V Deshpande, 'Mobile Applications Development' Edition 1
2. Barry Burd 'Android Applications Development all in one for Dummies", edition 1
3. "Teach Your self Android Application Development in 24 hours" Edition 1, SAMS.

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		L	T	P	Cr.
MCA (V Sem.)	**17MC74 – PYTHON PROGRAMMING LAB**	-	-	4	2

Course Educational Objectives: In this course, the students will learn about:
➢ Using lists, tuples and dictionaries in python program.
➢ Structure and components of a python program.
➢ Building functions and packages in python.
➢ Designing object oriented programs with python classes.

Course Outcomes: At the end of the course, the student will be able to
CO1: Installations of Python programming software.
CO2: Design programs in Python.
CO3: Build functions and packages in python.
CO4: Run Python scripts.
CO5: Handle exceptions in Python.

LIST OF EXPERIMENTS

Exercise 1: Basics
a) Running instructions in Interactive interpreter and a Python Script
b) Write a program to purposefully raise Indentation Error and correct it

Exercise- 2: Operations
a) Write a program to compute distance between two points taking input from the user (Pythagorean Theorem)
b) Write a program add.py that takes 2 numbers as command line arguments and prints its sum.

Exercise – 3: Control Flow
a) Write a Program for checking whether the given number is a even number or not.
b) Using a for loop, write a program that prints out the decimal equivalents of 1/2, 1/3, 1/4, . . . , 1/10
c) Write a program using a for loop that loops over a sequence. What is sequence ?
d) Write a program using a while loop that asks the user for a number, and prints a countdown from that number to zero.

Exercise- 4: Control Flow – Continued
a) Find the sum of all the primes below two million.
Each new term in the Fibonacci sequence is generated by adding the previous two terms. By starting with 1 and 2, the first 10 terms will be:
1, 2, 3, 5, 8, 13, 21, 34, 55, 89...
b) By considering the terms in the Fibonacci sequence whose values do not exceed four million, find the sum of the even-valued terms.

Exercise – 5: DS
a) Write a program to count the numbers of characters in the string and store them in a dictionary data structure
b) Write a program to use split and join methods in the string and trace a birthday with a dictionary data structure.

Exercise – 6: DS - Continued
a) Write a program combine lists that combines these lists into a dictionary.
b) Write a program to count frequency of characters in a given file. Can you use character frequency to tell whether the given file is a Python program file, C program file or a text file?

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Exercise – 7: Files
a) Write a program to print each line of a file in reverse order.
b) Write a program to compute the number of characters, words and lines in a file.

Exercise – 8: Functions
a) Write function balls collide that takes two balls as parameters and computes if they are colliding. Your function should return a Boolean representing whether or not the balls are colliding.
Hint: Represent a ball on a plan e as a tuple of (x, y, r), r being the radius
If (distance between two balls centers) <= (sum of their radii) then (they are colliding) b) Find mean, median, mode for the given set of numbers in a list.

Exercise -9: Functions – Continued
a) Write a function nearly equal to test whether two strings are nearly equal. Tw o strings a and b are nearly equal when a can be generated by a single mutation on b.
b) Write a function dups to find all duplicates in the list.
c) Write a function unique to fin d all the unique elements of a list.

Exercise -10: - Functions - Problem Solving
a) Write a function cumulative product to compute cumulative product of a list of numbers.
b) Write a function reverse to re verse a list. Without using the reverse function.
c) Write function to compute gcd, LCM of two numbers. Each function shouldn't exceed one line.

Exercise-11: Multi-D Lists
a) Write a program that defines a matrix and prints
b) Write a program to perform addition of two square matrices
c) Write a program to perform multiplication of two square matrices

Exercise -12: Modules
a) Install packages requests, flask and explore them using (pip)
b) Write a script that imports requests and fetch content from the page. Eg. (Wiki)
c) Write a simple script that serves a simple HTTP Response and a simple HT ML Page

Exercise -13: OOP
a) Class variables and instance variable and illustration of the self variable
i)   Robot
ii) ATM Machine

Exercise – 14: GUI, Graphics
1.   Write a GUI for an Expression Calculator using tk
2.   Write a program to implement the following figures using turtle

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

REFERENCES
Think Python, Allen Downey, Green Tea Press