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Bachelor of Computer AppliCA-P211tions (BCA-P211)
Scheme Choice Based Credit System (CBCS) and Outcome Based Learning (OBL)
NEP-2020

Sem	Semester Core Course	Elective: Discipline Specific Elective (DSE)	Ability Enhancement Compulsory Course (AECC)	Skill Enhancement Course (SEC)	Open Electives** (Choose One Paper per sem)
I	• Problem Solving and Programming in C • Computer Organization and Architecture	• Foundation Course in Mathematics - I	• CommuniCA-P211tion Skills-I		• Fundamentals of Information Technology Or • Information Technology Trends
II	• Data and File Structure • Database Management System • Digital Electronics	• Environmental Science	• CommuniCA-P211tion Skills-II		• System Analysis and Design Or • Computer Hardware and Troubleshooting
III	• Object Oriented Programming with C++ • Software Engineering		• Business Organization and Management	• Visual Basic Programming	• Multimedia and Animation Or • Linux Server Administration
IV	• Programming in Python • Internet of Things	• Discrete Mathematics	• Organizational Behavior	• PHP	• Operating Systems Or • Cyber Security
V	• Internet Concepts and Web Design • Data Warehousing & Mining		• Management Information System	• Project	• System Administration Or • E-Commerce
VI	• Computer Networks • Programming in Java • Computer Graphics	• Cryptography		• Project	• Information Security Or • Mobile Computing

FIRST SEMESTER

S. NO.	SUB_CODE	SUBJECT_TITLE	External Assessment MM:60	Internal Assessment MM:20	PractiCA-P211l MM:20	Total MM:100	L	T	P	Cr	Hrs
1	CA-U111	Computer Organization and Architecture	60	40		100	4	0	0	4.0	4.0
2		Open Elective-I	60	40		150	4	0	0	4.0	4.0
3	CA-U112	Problem Solving and Programming in C	60	40		100	4	0	0	4.0	4.0
4	MA-011	Foundation Course in Mathematics - I	60	40		100	4	0	0	4.0	4.0
5	HU-004	CommuniCA-P211tion Skills-I	60	40		100	4	0	0	4.0	4.0
6	HU-004	CommuniCA-P211tion Skills-I Lab			50	50	0	0	2	1.0	2.0
7		Open Elective-I			50	50	0	0	2	1.0	2.0
8	CA-U112-P	Problem Solving and Prog. in C Lab			50	50	0	0	4	2.0	4.0
		TOTAL	**300**	**200**	**150**	**650**	**20**	**0**	**8**	**24.0**	**28.0**

SECOND SEMSETER

S. NO.	SUB_CODE	SUBJECT_TITLE	External Assessment MM:60	Internal Assessment MM:20	PractiCA-P211l MM:20	Total MM:100	L	T	P	Cr	Hrs
1	CA-U121	Data and File Structure	60	40		100	4	0	0	4.0	4.0
2	CA-U122	Database Management System	60	40		100	4	0	0	4.0	4.0
3		Open Elective-II	60	40		100	4	0	0	4.0	4.0
4	EC-001	Digital Electronics	60	40		100	4	0	0	4.0	4.0
5	CA-U123	Environmental Science	-	-	-	-	-	--	-	-	-
6	HU-006	CommuniCA-P211tion Skills-II	60	40		100	4	0	0	4.0	4.0
7	CA-U121-P	Data and File Structure Lab			50	50	0	0	4	2.0	4.0
8	CA-U122-P	Database Management System Lab			50	50	0	0	4	2.0	4.0
		TOTAL	**300**	**200**	**100**	**600**	**20**	**0**	**8**	**24.0**	**28.0**

THIRD SEMESTER

S. NO.	SUB_CODE	SUBJECT_TITLE	External Assessment MM:60	Internal Assessment MM:20	PractiCA-P211l MM:20	Total MM:100	L	T	P	Cr	Hrs
1	CA-U131	Object Oriented Programming with C++	60	40		100	4	0	0	4.0	4.0
2	CA-U132	Software Engineering	60	40		100	4	0	0	4.0	4.0
3		Open Elective-III	60	40		100	4	0	0	4.0	4.0
4	CA-U133	Visual Basic Programming	60	40		100	4	0	0	4.0	4.0
5	BM-081	Business Organization and Management	60	40		100	4	0	0	4.0	4.0
6	CA-U131-P	Object Oriented Prog. with C++ Lab			50	50	0	0	4	2.0	4.0
7	CA-U133-P	Visual Basic Programming Lab			50	50	0	0	2	1.0	2.0
8		Open Elective-III			50	50	0	0	2	1	2
		TOTAL	**240**	**160**	**150**	**550**	**20**	**0**	**8**	**24.0**	**28.0**

			External Assessment	Internal Assessment	PractiCA-P211l	Total					
FOURTH SEMESTER			**MM:60**	**MM:20**	**MM:20**	**MM:100**					
S. NO.	**SUB_CODE**	**SUBJECT_TITLE**					**L**	**T**	**P**	**Cr**	**Hrs**
1	CA-U141	Programming in Python	60	40		100	4	0	0	4.0	4.0
2	CA-U142	Internet of Things	60	40		100	4	0	0	4.0	4.0
3	CSE-401	Discrete Mathematics	60	40		100	4	0	0	4.0	4.0
4	HSMCS-401	Organizational Behaviour	60	40		100	4	0	0	4.0	4.0
5		Open Elective-IV	60	40		100	4	0	0	4.0	4.0
6	CA-U141-P	Programming in Python			50	50	0	0	4	2.0	4.0
		TOTAL	**300**	**200**	**50**	**550**	**20**	**0**	**6**	**23.0**	**26.0**

			External Assessment	Internal Assessment	PractiCA-P211l	Total					
FIFTH SEMESTER			**MM:60**	**MM:20**	**MM:20**	**MM:100**					
S. NO.	**SUB_CODE**	**SUBJECT_TITLE**					**L**	**T**	**P**	**Cr**	**Hrs**
1		Open Elective-V	60	40		100	4	0	0	4.0	4.0
2	CA-U151	Internet Concepts and Web Design	60	40		100	4	0	0	4.0	4.0
3	CA-U152	Management Information System	60	40		100	4	0	0	4.0	4.0
4	CA-U153	Data Warehousing & Mining	60	40		100	4	0	0	4.0	4.0
5	CA-U151-P	Internet Concepts and Web Design Lab			50	50	0	0	4	2.0	4.0
6		Open Elective-V			50	50	0	0	2	1.0	2.0
7	CA-UPB154	Project Work	150			150	0	0	6	3.0	6.0
		TOTAL	**390**	**160**	**100**	**650**	**16**	**0**	**12**	**22.0**	**28.0**

			External Assessment	Internal Assessment	PractiCA-P211l	Total					
SIXTH SEMESTER			**MM:60**	**MM:20**	**MM:20**	**MM:100**					
S. NO.	**SUB_CODE**	**SUBJECT_TITLE**					**L**	**T**	**P**	**Cr**	**Hrs**
1	CA-U161	Computer Graphics	60	40		100	4	0	0	4.0	4.0
2	CA-U162	Computer Networks	60	40		100	4	0	0	4.0	4.0
3	CA-U163	Programming in Java	60	40		100	4	0	0	4.0	4.0
3	CA-U164	Cryptography	60	40		100	4	0	0	4.0	4.0
4		Open Elective-VI	60	40		100	4	0	0	4.0	4.0
5	CA-U161	Computer Graphics Lab			50	50	0	0	4	2.0	4.0
6	CA-U163	Programming in Java Lab			50	50	0	0	4	2.0	2.0
7	CA-UPB165	Project Work	200			200	6	0	6	3.0	6.0
		TOTAL	**500**	**200**	**100**	**800**	**26**	**0**	**14**	**27.0**	**32.0**

LIST OF ELECTIVE SUBJECTS

S. NO.	SUB_CODE	SUBJECT_TITLE	L	T	P	CR	Hrs
Semester -I		**Open Elective –I**					
1	CA-U113	Fundamentals of Information Technology	4.0	0.0	2.0	5.0	6.0
2	CA-U114	Information Technology Trends	4.0	0.0	2.0	5.0	6.0
Semester –II		**Open Elective –II**					
3	CA-U124	System Analysis and Design	4	0	0	4.0	4.0
4	CA-U125	Computer Hardware and Troubleshooting	4	0	0	4.0	4.0
Semester –III		**Open Elective –III**					
5	CA-U135	Multimedia and Animation	4.0	0.0	2.0	5.0	6.0
6	CA-U136	Linux Server Administration	4.0	0.0	2.0	5.0	6.0
Semester –IV		**Open Elective –IV**					
7	CA-U143	Operating Systems	4	0	0	4.0	4.0
8	CA-U144	Cyber Security	4	0	0	4.0	4.0
Semester –V		**Open Elective –V**					
9	CA-U155	System Administration	4.0	0.0	2.0	5.0	6.0
10	CA-U156	E-Commerce	4.0	0.0	2.0	5.0	6.0
Semester –VI		**Open Elective –VI**					
11	CA-U166	Information Security	4	0	0	4.0	4.0
12	CA-U167	Mobile Computing	4	0	0	4.0	4.0

Scheme & Syllabus
Of
Computer Applications

Batch 2022 onwards

SRI SAI UNIVERSITY
PALAMPUR (HP)

BCA

SYLLABUS
SEMESTER - I

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CA-U111: COMPUTER ORGANISATION AND ARCHITECTURE

L	T	P	Cr
4	0	0	4

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

Module-I

Basic Computer Organization Principles of Computer design - Software, hardware interaction layers in computer architecture. Central processing unit. Machine language instructions, addressing modes.

Module-II

Control Unit and Arithmetic Unit: ALU, data path design, control path design, hardwired control, micro programmed control, micro programming control Vs hardwired control, RISC Vs CISC, hardware implementation of algorithms for addition, subtraction, multiplication and division.

Module-III

Memory System: Memory, memory hierarchy, main memory, associative memory, cache memory, virtual memory, architectural tools to implement these different memories.

Input Output Organization: Input & output interface, asynchronous data transfer, Modes of transfer, DMA

Secondary Storage Techniques: Secondary Storage Systems; Hard Drives Removable Drives Removable Storage Options- Zip, Jaz & Other Cartridge Drives, Recordable CDs & DVDs, CD-R vs CD-RW, Tape Backup

Module-IV

I/O Technology: Keyboard ; Mouse; Video Cards; Monitors ; Liquid Crystal Displays (LCD) ; Digital Camera ; Sound Cards; Printers ; Modems; Scanners; Power Supply- SMPS (Switched Mode Power Supply)

Text Books:-

1. *Mano, Morris M., Computer System Architecture, Dorling Kindersley*
2. *Hayes, J.P., Computer Architecture and Organization, McGraw Hill*

Reference Books:-

1 *Patterson, David, A., Hennessy, J.L., and Arpacidusseau, A.C., Computer Architecture – A Quantitative Approach, Morgan Kaufmann Publishers,*

2 *Stallings, W., Computer Organization and Architecture: Designing for Performance, PHI*

CA-U112: PROBLEM SOLVING AND PROGRAMMING IN C

L	T	P	Cr
4	0	4	6.0

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

Module-I

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

Module-II

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

Module-III

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

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

Module-IV

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

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

Module-V

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

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

Text Books

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

Reference Books

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

MA-011: FOUNDATION COURSE IN MATHEMATICS-I

L	T	P	Cr
4	0	0	4

Course Objectives	• The objective of this course is to introduce and develop a clear understanding of the fundamental concept of differential calculus such as sequences and series, limit and continuity, differentiation, integration (double and triple), ordinary differential equations along with their applications. • In particular, this course enables students to acquire skill of finding areas and volumes.
Course Outcomes	On completion of this course the student will be able to:- • To check whether the sequences and series convergent or divergent. • To find the maximum and minimum values of the function using differentiation. • To find Gradient, Curl and divergence. • To use Green, Gauss and Stock Theorem. • To solve ordinary, differential equations of 1 st order as well as higher order..

Module-I

DETERMINANTS: Definition, Minors, Cofactors, Properties of Determinants

MATRICES: Definition, Types of Matrices, Addition, Subtraction, Scalar Multiplication and

Multiplication of Matrices, Adjoint, Inverse, Cramers Rule, Rank of Matrix Dependence of Vectors, Eigen Vectors of a Matrix, Caley-Hamilton Theorem (without proof)

Module-II

LIMITS & CONTINUITY: Limit at a Point, Properties of Limit, Computation of Limits of Various Types of Functions, Continuity at a Point, Continuity Over an Interval, Intermediate Value Theorem, Type of Discontinuities

Module-III

DIFFERENTIATION: Derivative, Derivatives of Sum, Differences, Product & Quotients, Chain Rule, Derivatives of Composite Functions, Logarithmic Differentiation, Rolle's Theorem, Mean Value Theorem, Expansion of Functions (Maclaurin's & Taylor's),Indeterminate Forms, L' Hospitals Rule, Maxima & Minima, Concavity, Asymptote, Singular Points, Curve Tracing, Successive Differentiation & Liebnitz Theorem.

Module-IV

INTEGRATION: Integral as Limit of Sum, Riemann Sum, Fundamental Theorem of Calculus, indefinite Integrals, Methods of Integration Substitution, By Parts, Partial Fractions, Integration of Algebraic and Transcedental Functions, Reduction Formulae for Trigonometric Functions, Gamma and Beta Functions.

VECTOR ALGEBRA: Definition of a vector in 2 and 3 Dimensions; Double and Triple Scalar and Vector Product and their Applications.

Text Books:

1. *Kresyig E., "Advanced Engineering Mathematics", 5th Edition, John Wiley & Sons,*

Reference Books:

1 *B.S. Grewal, "Elementary Engineering Mathematics",.*
2. *H.K. Dass, "Advanced Engineering Mathematics", S. Chand & Company,*
3. *Shanti Narayan, "Integral Calculus", S. Chand & Company,*
4. *Shanti Narayan, "Differential Caluculs", S.Chand & Company,*

HU-004: COMMUNICATION SKILLS – I

L	T	P	Cr
4	0	2	5

Course Objectives	• The objective of this course is to introduce students to the theory, fundamentals and tools of communication. • To help the students become the independent users of English language. • To develop in them vital communication skills which are integral to their personal, social and professional interactions.
Course Outcomes	• The syllabus shall address the issues relating to the Language of communication. • Students will become proficient in professional communication such as interviews, group discussions, office environments, important reading skills as well as writing skills such as report writing, note taking etc.

Module-I

Introduction • Theory of Communication • Types and modes of Communication

Module-II

Language of Communication • Verbal and Non-verbal • (Spoken and Written) • Personal, Social and Business • Barriers and Strategies • Intra-personal, Inter-personal and Group communication

Module-III

Reading and Understanding • Close Reading • Comprehension • Summary Paraphrasing • Analysis and Interpretation • Translation(from Hindi to English and vice-versa) OR Precis writing /Paraphrasing (for International Students) • Literary/Knowledge Texts

Module-IV

(Writing Skills) • Documenting • Report Writing • Making notes • Letter writing

Interactive practice sessions in Language Lab on Oral Communication

• Listening Comprehension • Self Introduction, Group Discussion and Role Play • Common Everyday Situations: Conversations and Dialogues • Communication at Workplace • Interviews • Formal Presentations • Monologue • Effective Communication/ Mis- Communication • Public Speaking

Recommended Readings:

1. Fluency in English - Part II, Oxford University Press, 2006.
2. Business English, Pearson, 2008.
3. Language, Literature and Creativity, Orient Blackswan, 2013.
4. Language through Literature (forthcoming) ed. Dr. Gauri Mishra, Dr Ranjana Kaul, Dr Brati Biswas
5. On Writing Well. William Zinsser. Harper Resource Book. 2001 6. Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006

Open Elective-I

CA-U113: FUNDAMENTAL OF INFORMATION TECHNOLOGY

L	T	P	Cr
4	0	2	5.0

Course Objectives	• This course introduces the concepts of computer basics & programming with particular attention to examples. • Fundamental computational concepts underlying most programming languages • A range of problem solving techniques using computers. • The role of programming within the overall software development process.
Course Outcomes	• On completion of the course students will be able to understanding the concept of input and output devices of computers and how it works and recognize the basic terminology used in computer programming. • Techniques for solving problems. • The main activities of software development and their interactions, and some of the major problems of software development.

Module-I

Computer Organization: What are computers? The evolution of computers, Classification of computers. Block Diagram: Input-output devices, Description of Computer Input Units, Other Input Methods, and Computer Output Units. Computer Memory: Memory Cell, Memory Organization, Read Only Memory, Serial Access Memory, Physical Devices Used to construct Memories, Magnetic Hard disk, floppy Disk Drives, Compact Disk Read Only Memory, Magnetic Tape Drives.

Module-II

Low level and high level languages, assemblers, compilers, interpreters, linkers, algorithms, flow charting, decision tables, pseudo code, software concepts: system & application software packages.

Computer Generation & Classifications: First Generation of Computers, The Second Generation, The third Generation, The fourth Generation, The Fifth Generation, Classification of Computers, Distributed Computer System, Parallel Computers.

Module-III

Operating System concepts, different types of operating systems, structure of operating system, DOS/UNIX/LINUX commands, working with Windows, Windows 9x/NT/XP, Data Processing, File Systems and Database Management Systems, different types of Database Management System.

Module-IV

Basic elements of a communication system, Data transmission modes, Data Transmission speed, Data transmission media, Digital and Analog Transmission, Network topologies, Network Types (LAN, WAN and MAN), OSI & TCP/IP Model, Internet: Network, Client and Servers, Host & Terminals, TCP/IP, World Wide Web, Hypertext, Uniform Resource Locator, Web Browsers, IP Address, Domain Name, Internet Services Providers, Internet Security, Internet Requirements, Web Search Engine, Net Surfing, Internet Services, Intranet

Text Books:-

1 *Alex Leon & Mathews Leon, "Fundamentals of Information Technology", Leon Techworld,*

2 *Vikas Gupta, "Comdex Computer Kit", Wiley Dreamtech, Delhi,*

3. *P. K. Sinha & Priti Sinha , "Computer Fundamentals", BPB Publications,.*

References Books:-

1. *V. Raja Raman, "Introduction to Computers", PHI,*

2. *Alex Leon & Mathews Leon, "Introduction to Computers", Vikas Publishing House,*

3 *Norton Peter, "Introduction to computers", TMH,*

CA-U114: INFORMATION TECHNOLOGY TRENDS

L	T	P	Cr
4	0	2	5.0

Course Objectives	• To make students understand E Governance and E Commerce system. • Make them aware of crime pattern in Cyber World and basic Security Systems. • Make them aware of basics of cellular transmission. • To aware them with distributed system and artificial intelligent system.
Course Outcomes	• Acquaint the students with the application of computers in understanding latest trends in information technology. • Use Government initiative for citizen on E Platforms and E Commerce with security. • Define of basics of cellular transmission systems.

Module-I

Introduction to cyber crime, types of attacks like Spyware, Malware, Spam Mail, Logic bombs, Denial of Service, Types of Cyber Crime : Email Fraud, Phishing, Spoofing, Hacking, Identity Theft.

Module-II

E-Commerce- Introductions, Concepts, Advantages and Disadvantages, Technology in E-Commerce, Benefits and Impact of E-Commerce Electronic Payment Systems: Introduction, Types of Electronic Payment Systems, RTGS, IMPS, NEFT, Payment Gateway, Debit & Credit Card, Internet Banking, Mobile Wallet, UPI, BHIM, PAYTM app, Online Shopping, Online Marketing

Module-III

Introduction to Wireless Communication, Blue Tooth, WiFi, WiMax, LiFi, Mobile Technology, 2G, 3G, 4G, 5G services, , ISP, Mobile Computing, Mobile OS (Symbian/Blackberry/Windows/Android/iPhone), Features and limitations, Types of Mobile apps.

Module-IV

Artificial Intelligence and Expert system-Concepts of AI & Expert Systems, Merits and Demerits of Expert system, Application of Expert system and AI. Cloud Computing– Introduction, Types, Application, Services, Google Play Store, Apple Store, Need of Cloud Computing, Cloud Types, Cloud Services IOT– Introduction, Application & Use, Machine Learning: Introduction and Uses

References:

- *Fundamentals of Information Technology by Alex Leon & Mleon, Vikas Publications.*
- *Information Technology & Computer Applications by V K. Kapoor, Sultan Chand & Sons, New Delhi.*
- *IT Trends &Technologies by Narendra Tiwari Publisher: Narendra Publication*
- *E-Commerce an Indian Perspective (Second Edition) by Pt Joseph, S.J. Prentice-Hall Of India.*
- *Recent Magazines of Computers and Communication. ° System Analysis & Design by V K Jam, Dreamtech Press.*

SEMESTER - II

CA-U121: DATA AND FILE STRUCTURES

L	T	P	Cr
4	0	4	6

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

Module-I

Analysis of Algorithms: Mathematical Background, Process of Analysis, Calculation of Storage Complexity, Calculation of Run Time Complexity. **Arrays:** Arrays and Pointers; Sparse Matrices; Polynomials; Representation of Arrays-Row Major Representation, Column Major Representation; Applications

Module-II

Lists: Abstract Data Type-List; Array Implementation of Lists; Linked Lists-Implementation: Doubly Linked Lists-Implementation; Circularly Linked Lists-Implementation; Applications. **Stacks:** Abstract Data Type-Stack; Implementation of Stack using Arrays and Stack using Linked Lists; Algorithmic Implementation of Multiple Stacks; Applications

Module-III

Queues: Abstract Data Type-Queue; Implementation of Queue - Array and Linked List Implementation; Implementation of Multiple Queues ; Implementation of Circular Queues- Array Implementation, Linked List Implementation of a circular queue; Implementation of DEQUEUE - Array Implementation of a *Dequeue, L* inked List Implementation of *a dequeue*

Module-IV

Trees: Abstract Data Type-Tree; Implementation of Tree; Tree Traversals; Binary Trees; Implementation of Binary Tree; Binary Tree Traversals - Recursive Implementation of Binary Tree Traversals, Non Recursive Implementations of Binary Tree Traversals; Applications **Searching and Sorting:** Linear Search; Binary Search; Internal Sorting - Insertion Sort, Bubble Sort, Quick Sort, 2-way Merge Sort, Heap Sort; Sorting on Several Keys and their applications.

Laboratory Work

Implementation of Stacks, Queues, Linked Lists, Trees, Graphs, Sorting and Searching algorithms.

Text Books:-

1. *Weiss, Mark, A., Data Structures and Algorithm Analysis in C, Dorling Kindersley*
2. *Kruse, R.L., Data Structures and Program design in C, Dorling Kindersley*

Reference Books:-

1. *Aho, Alfred V., Ullman, Jeffrey D., and Hopcroft, John E., Data Structures and Algorithms, Addison Wesley*
2. *Tenenbaum, A. M., Data Structures Using C, Dorling Kindersley*
3. *Seymour Lipschutz, Schaum's Outline Series of Theory and problems of data structures, TMH*

CA-U122: DATABASE MANAGEMENT SYSTEMS

L	T	P	Cr
4	0	4	6

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

Module-I

The Basic Concepts: Need for a Database Management System - The file based system, Limitations of file based system, The Database Approach; The Logical DBMS Architecture - Three level architecture of DBMS or logical DBMS architecture, Mappings between levels and data independence, The need for three level architecture; Physical DBMS Architecture- DML Precompiler, DDL Compiler, File Manager, Database Manager, Query Processor, Database Administrator, Data files indices and Data Dictionary, Commercial Database Architecture, Data Models.

Module-II

Relational And ER Models: The Relational Model- Domains, Attributes, Tuple and Relation, Super keys Candidate keys and Primary keys for the Relations; Relational Constraints- domain, Key and integrity, Dealing with Constraint Violations; Relational Algebra- Basic Set Operation, Cartesian Product, Relational Operations; Entity Relationship (ER) Model- Entities, Attributes, Relationships; E-R Diagram; Conversion of E-R Diagram to Relational Database.

Module-III

Database Integrity and Normalization: Relational Database Integrity- The Keys, Referential Integrity, Entity Integrity; Redundancy and Associated Problems; Single-Valued Dependencies; Single-Valued Normalisation- The First Normal Form, The Second Normal Form, The Third Normal Form, Boyce Codd Normal Form.

Module-IV

Structured Query Language and Transaction Management: What is SQL?; Data Definition Language; Data Manipulation Language; Data Control; Database Objects: Views, Sequences, Recovery- Kinds of failures, Failure controlling methods, Database errors; Recovery Techniques; Security & Integrity- Relationship between Security and Integrity, Difference between Operating System and Database Security; Authorization.

Module-V

EXERCISES: Using SQL Server

1. Getting Familiar with Access Objects: Tables, Queries, Forms, Reports, and Modules.
2. Creating Database: Creating database using wizards, documenting the database, creating own databases.
3. Creating Tables: Working with tables in design view, setting field properties, naming fields, setting data types, setting primary key, multiple field primary keys, creating indexes, using table wizard.
4. Creating Queries: Working with query design grid, adding tables, adding fields, sorting records, setting field criteria, planning for null values, using simple query wizard – summarizing your records.
5. Creating forms: Working in design view, components of a form in design view, sections of a form, assigning form properties, modifying form properties to create a dialog box, using form templates, creating forms with a wizard, auto forms.
6. Creating Reports: Using Report Wizards, Working with auto report, creating a report template, inserting a chart into a report with the chart wizard, printing report.
7. Creating Labels and Mail-Merge Documents: Using the Label wizard, using custom labels, printing multiple labels, merging access data with word documents.

Text Books

1. *Elmasri, R, Navathe S.B., Fundamentals of Database Systems, Addison Wesley*

2. *Korth, H.F., Silberschatz, S., Sudarshan, A., Database Systems Concepts, McGraw Hill*
3. *Date, C.J., An Introduction to Database Systems, Dorling Kindersley*

Reference Books

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

EC001: DIGITAL ELECTRONICS

L	T	P	Cr
4	0	0	4

Course Objectives	• To acquire the basic knowledge of digital logic levels and application of knowledge to understand digital electronics circuits. • To impart how to design Digital Circuits.
Course Outcomes	At the end of this course, students will demonstrate the ability to • Understand working of logic families and logic gates. • Design and implement Combinational and Sequential logic circuits. • Understand the process of Analog to Digital conversion and Digital to Analog conversion. • Be able to use PLDs to implement the given logical problem.

Module-I

Boolean Algebra -Basics Laws of Boolean Algebra, Logic Gates, Simplifications of Boolean equations using K-maps, Code Conversion, (Binary, Octal, Hexadecimal), Overview of Gray codes and Excess – 3 codes.

Module-II

Arithmetic Circuits - Adder, Subtractor, Parallel binary adder/subtractor, binary multiplier and divider.

Combinational Circuits - Multiplexers, De-Multiplexers, decoders, encoders, Design of code converters.

Flip-flops - S-R, D, J-K, T, Clocked Flip-flop, Race around condition, Master slave Flip-Flop,

Realization of one flip-flop using other flip-flop.

Module-III

Shift Registers - Serial-in-serial-out, serial-in-parallel-out, parallel-in-serial-out and parallel-in-parallel-out, Bi-directional shift register.

Memory Devices - RAM, ROM, PAL & PLA

Text Books:-

1. *Moris Mano, "Digital Logic and Computer Design", PHI*
2. *R. P. Jain, "Modern Digital Electronics", TMH.*

References Books:-

1 *.R.L.Tokheim, "Digital Electronics, Principles and Applications", TMH*
2. *W.Gothman, "Digital electronics", PHI.*
3. *S. Salivahanan & S. Arivyhgan. "Digital circuits and design", Vikas Publication,*
4. *Malvino Leach, "Digital Principles and Application", TMH,*

CA-U123: ENVIRONMENTAL SCIENCE

L	T	P	Cr
-	0	0	-

Course Objectives	• To acquire the basic knowledge of environmental science and application of knowledge to understand the basic concept of science.
Course Outcomes	Upon successful completion of the course, students should be able to: • Measure environmental variables and interpret results • Evaluate local, regional and global environmental topics related to resource use and management • Propose solutions to environmental problems related to resource use and management.

Module-I

Introduction: Definition and scope and importance of multidisciplinary nature of environment. Need for public awareness.

Module-II

Natural Resources: Natural Resources and associated problems, use and over exploitation, case studies of forest resources and water resources.

Module-III

Ecosystems: Concept of Ecosystem, Structure, interrelationship, producers, consumers and decomposers, ecological pyramids-biodiversity and importance. Hot spots of biodiversity

Module-IV

Environmental Pollution: Definition, Causes, effects and control measures of air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, nuclear hazards. Solid waste Management: Causes, effects and control measure of urban and industrial wastes. Role of an individual in prevention of pollution. Pollution case studies. Disaster Management: Floods, earthquake, cyclone and landslides.

Module-V

Social Issues and the Environment from Unsustainable to Sustainable development, urban problems related to energy, Water conservation, rain water harvesting, watershed management. Resettlement and rehabilitation of people; its problems and concerns Case studies. Environmental ethics: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies. Wasteland reclamation. Consumerism and waste products. Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and control of pollution) Act. Wildlife Protection Act, Forest Conservation Act, Issues involved in enforcement of environmental legislation Public awareness

Human Population and the Environment, Population growth, variation among nations. Population explosion – Family Welfare Programme. Environment and human health, Human Rights, Value Education, HIV/AIDS. Women and child Welfare. Role of Information Technology in Environment and human health. Case studies

Suggested Readings/ Books:

1. Agarwal, K. C. 2001 Environment Biology, Nidi Publ. Ltd. Bikaner.
2. Jadhav, H & Bhosale, V.M. 1995. Environment Protection and Laws. Himalaya Pub House, Delhi 284p.
3. Rao M. N. & Datta A.K. 1987. Waste Water Treatment. Oxford & IBH Publ. Co. Pvt. Ltd. 345 p.
4. Principle of Environment Science by Cunninghan, W.P.
5. Essentials of Environment Science by Joseph.
6. Environment Pollution Control Engineering by Rao, C.S.
7. Perspectives in Environmental Studies by Kaushik, A.
8. Elements of Environment Science & Engineering by Meenakshi.
9. Elements of Environment Engineering by Duggal.

HU006: COMMUNICATION SKILL-II

L	T	P	Cr
4	0	0	4

Objectives:-

To develop the project writing and presentation skills in students and build confidence and leadership qualities.

Module-I

Project and report writing, and proposals – how to write an effective report, basics of project writing, paragraph writing, paper reading and voice modulation, basics of project presentation.

Module-II

How to make a presentation, the various presentation tools, along with guidelines of effective presentation, boredom factors in presentation and how to overcome them, interactive presentation & presentation as part of a job interview, art of effective listening.

Module-III

Resume writing skills, guidelines for a good resume, how to face an interview board, proper body posture, importance of gestures and steps to succeed in interviews. Practice mock interview in classrooms with presentations on self. Self-introduction – highlighting positive and negative traits and dealing with people with face to face.

Module-IV

Leadership – quality of a leader, leadership quiz with case study, knowing your skills and abilities. Introduction to group discussion techniques with debate and extempore, increase your professionalism. Writing of Cases for discussion. Audio Video recording and dialogue sessions on current topics, economy, education system, environment, politics.

Text Books:-

1. *Essentials of Business Communication by Rajendra Paul,Sultan Chand & Sons*
2. *Reuben, Ray; Communication today – understanding creating skills, HPH, 2001.*

Reference Books:-

1. *E. H. McGraw, S. J.; Basic Managerial Skills for All. Fourth Edition, PHI*
2. *Stephen R. Covey; The seven habits of highly effective people.*
3. *Rogets Thesaur*

Open Elective-II

CA-U124: SYSTEM ANALYSIS AND DESIGN

L	T	P	Cr
4	0	0	4

Course Objectives	• To determine specific needs of system. • Discuss approaches and tasks of system. • Evaluate tools and techniques. • Use appropriate methods and techniques to design software.
Course Outcomes	• The overall goal of *System Analysis* is to study procedural components and modules. • The goal of *System Design*is to design whole software, which fulfils all the requirements of customer**.** • This leads to improve organizational systems, by applying software, which helps employees to perform business, tasks more effectively.

Module-I

Introduction to System Development: Categories of Information Systems, Structured Analysis Method, System Prototype Method, Succeeding as System Analyst., Systems Development Life Cycle. Concept and Models requirements determination. Logical design. Physical design, communication, interviewing, presentation skills; group dynamics; group-based approaches.

Requirement Analysis: Basic Requirements, fact-Finding Techniques, Various Tools: Data Flow Diagrams, Data Dictionaries, Decision Tables, Decision Trees; Feasibility Study, feasibility considerations, steps in feasibility analysis, Cost and benefit analysis, Procedure for cost and benefit determination.

Module-II

Design: System design considerations, Process and stages of system Design: Logical and Physical, selection of best alternate design strategy, Design of Input: Capturing data for Input, Input, validation, Design of Output: Output objectives, Types of Output, Presentation format of Output, user interface design.

System Engineering and Quality Assurance: Program Structure Chart, Purpose, Data Passing, Quality Software Design: Top Down Structure, Coupling, Cohesion, Span of Control, Module Size, and Shared Modules.

Module-III

Testing: Managing Testing practices, Testing Strategies, Levels of Testing

System Implementation: Training, Conversion Methods,

Module-IV

Design and Implementation of OO Platforms: Object oriented analysis and design through object modeling technique, object modeling, dynamic modeling and functional modeling, object oriented design and object oriented programming systems for implementation, Unified Modeling Language.

Case Study of Some Common Systems: Inventory Control, Laboratory Management Systems, Hotel Reception System, Hospital Management System etc

The course should be based on lectures, case analysis and laboratory work. Cases should be used to illustrate each major topic in the course.

Text Books:-

1. *Senn, James A., Analysis and Design of Information Systems, Tata McGraw Hill.*
2. *Rumbaugh, James, Jacobson, Ivar, and Booch, Grady, Unified Modeling Language Reference Manual, Addison-Wesley Object Technology Series*

CA-U125: COMPUTER HARDWARE AND TROUBLESHOOTING

L	T	P	Cr
4	0	0	4

Course Objectives	• To develop skills in installation and configuration of Operating systems, • Identify faults, troubleshoot, repair and do preventive maintenance of computer system and its peripherals. ° • To understand the various hardware device and configuration. • Develop ability to repair and maintain computer system
Course Outcomes	• Understand hardware components in computer system. • Install, configure Operating Systems and device drivers. • Install, configure and maintain various components in computer system and peripheral devices. • Diagnose faults, repair and maintain computer system and its peripherals

Module-I

Inside the PC: Core Components, Identify different type and generation of computer, Identify devices required for using laptops, Identify components which makes the system and specify its importance. Identify various types of ports and its connecting devices.
Motherboard: definition, Components/connections in motherboard, functional block diagram Central Processing Unit (CPU): CPU Speeds, Word Size, Data Path, Internal Cache memory, Slots and sockets, CISC vs RISC processor

Module-II

Expansion Buses (Definition, Bus Architecture (PC/PC-XT, PC-AT/ISA, EISA, MCA, VESA Local (VL) Bus, PCI, Combination of Bus Systems, AGP – Accelerated Graphics Port, Universal Serial Bus (USB), A Bus Standard System Controller: Definition, Basic Input Output System: Services, Bios Interaction, CMOS-RAM

Module-III

System Memory : definition, memory sizes, speeds and shapes (DIP, ZIP, SIPP, SIMM, DIMM, RIMM), Memory modules (Dynamic RAM, SDRAM, DDR SDRAM, SLDRAM, DRDRAM, Fast Page Mode (FPM) DRAM, Extended Data Out(EDO) DRAM)

Module-IV

Hard Disk Drive and Controller, DVD Drives, Disk Basics, Hard Disk Interfaces: EIDE, DVD Drives : Types, Recording, Construction, Interfacing, DVD Drive Performance Criteria : Data Transfer Rate, Access time, Cache/buffer, Blu-ray disk specification.
Input Devices and Printers, Keyboard : Keyboard operation, Keyboard Types, Types of Key switches (Membrane, mechanical, rubber dome, capacitive) Keyboard interfaces, Mouse : Types, Operation, Interfaces, Scanner : Scanner Types, Image quality measurement, Types of Printers, Printer Interfaces, Ink-jet Printer : Parts, working principle, LaserJet Printer : Parts, working principle.

References:

1. *Computer Installation and Servicing, D Balasubramanian, Tata McGraw Hill Education Private Limited*
2. *The complete PC Upgrade & Maintenance Guide, Mark Minasi, BPB Publications*
3. *IBM PC and clones, GovindRajalu, Tata McGraw Hill Education Private Limited*

SEMESTER – III

CA-U131: OBJECT ORIENTED PROGRAMMING USING C++

L	T	P	Cr
4	0	4	6

Course Objectives	• To learn the fundamental programming concepts and methodologies which are essential to building good C/C++ program. • To practice the fundamental programming methodologies in the C/C++ programming language via laboratory experiences. Microsoft Visual Studio is the programming environment that will used.
Course Outcomes	• Describe and compare machine language and a high level language. • Discuss the advantages of a high-level language. • Distinguish between source code, object code and executable code.

Module-I

Evolution of Programming methodologies, Introduction to OOP and its basic features, Basic components of a C++, Program and program structure, Compiling and Executing C++ Program. Selection control statements in C++.

Module-II

Data types, Expression and control statements Iteration statements in C++, Introduction to Arrays, Multidimensional Arrays, Strings and String related Library Functions. Functions, Passing Data to Functions, Scope and Visibility of variables in Functions, Structures in C++.

Module-III

Creating classes and Abstraction: Classes objects, data members, member functions, this Pointer, Friends, Friend Functions, Friend Classes, Friend Scope, and Static Functions. Constructors and Destructors, Static variables and Functions in class. Operator Overloading in C++, Overloading Unary Operators, Overloading binary operators. Inheritance in C++, Types of Inheritance, Pointers, Objects and Pointers, Multiple Inheritance. Virtual Functions, Polymorphism, Abstract classes. Files and streams in C++: Character and String input and output to files, Command Line Arguments and Printer Output.

Module-IV

Standard input and output operations: C++ iostream hierarchy, Standard Input/output Stream Library, Organization Elements of the iostream Library, Programming using Streams, Basic Stream Concepts.
File input and output: Reading a File, Managing I/O Streams, Opening a File – Different Methods, Checking for Failure with File Commands, Checking the I/O Status Flags, Useful Functions.

Module-V

Exception handling: Throwing an exception, catching an exception: The try block, Exception handlers, Termination vs. Resumption, Exception specification, rethrowing an exception, uncaught exceptions, Standard exceptions, Programming with exceptions.

Text Books:-

- *Balaguruswamy, E., Objected Oriented Programming with C++, Tata McGraw Hill*
- *Cornell, Gary, and Horstmann, Cay, S., Core Java 2 Vol I- Fundamentals Prentice Hall*
- *Cornell, Gary, and Horstmann, Cay, S., Core Java 2 Vol II- Advanced features , Prentice Hall*

Reference Books :-

- *Deitel, H.M. and Deitel,P.J., C++ How to Program, PHI*
- *D. Ravichandran, Programming with C++, TMH*

CA-U132: SOFTWARE ENGINEERING

L	T	P	Cr
4	0	0	4

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

Module-I

Introduction: Software Crisis, Software Processes & Characteristics, Software life cycle models, Waterfall, Prototype, Evolutionary and Spiral Models.

Software Requirements analysis & specifications: Requirement engineering, requirement elicitation techniques like FAST, QFD, requirements analysis using DFD, Data dictionaries & ER Diagrams, Requirements documentation, Nature of SRS, Characteristics & organization of SRS.

Module-II

Software Project Management Concepts: The Management spectrum, The People The Problem, The Process, The Project

Software Project Planning: Size Estimation like lines of Code & Function Count, Cost, Estimation Models, COCOMO, Risk Management.

Module-III

Software Design: Cohesion & Coupling, Classification of Cohesiveness & Coupling, Function Oriented Design, Object Oriented Design

Software Metrics: Software measurements: What & Why, Token Count, And Halstead Software

Science Measures, Design Metrics, Data Structure Metrics,

Module-IV

Software Testing: Testing Process, Design of Test Cases, Types of Testing, Functional Testing, Structural Testing, Test Activities, Unit Testing, Integration Testing and System Testing. Debugging Activities

Software Maintenance: Management of Maintenance, Maintenance Process, Reverse Engineering, Software Re-engineering, Configuration Management, Documentation.

Text Books:-

1. *K. K. Aggarwal & Yogesh Singh, "Software Engineering", 2nd Ed., New Age International,*
2. *R. S. Pressman, "Software Engineering – A practitioner's approach", McGraw Hill Int. Ed.,*

Reference Books :-

1 *Stephen R. Schach, "Classical & Object Oriented Software Engineering", IRWIN,*
2. *James Peter, W. Pedrycz, "Software Engineering: An Engineering Approach", John Wiley & Sons.*
3 *I. Sommerville, "Software Engineering", Addison Wesley.*

BM081: BUSINESS ORGANIZATION & MANAGEMENT

L	T	P	Cr
4	0	0	4

Course Objectives	• To help the students gain understanding of the functions and responsibilities of managers. • To provide them tools and techniques to be used in the performance of the managerial job. • To enable them to analyze and understand the environment of the organization. • To help the students to develop cognizance of the importance of management principles.
Course Outcomes	• Understand the concepts related to Business. • Demonstrate the roles, skills and functions of management. • Analyze effective application of PPM knowledge to diagnose and solve organizational problems and develop optimal managerial decisions. Understand the complexities associated with management of human resources in the organizations and integrate the learning in handling these complexities.

Module-I

Introduction: Business –Meaning and Contents, Business as a system, Business and Legal and Economic Environment, Forms of Business Organization (meaning, merits & demerits).

Module-II

Management Thought: Management Principles, Henry Fayol's principles of management, Taylor's Scientific Management, Management Process, Basic Functions (in short), Meaning, Nature and Process, Role of Manager, Organizational Behavior- Need of Understanding human behavior in organizations, Challenges and opportunities for OB, Contributing disciplines to the field of OB, Conceptual, Models of OB.

Module-III

Managing Personnel- HRM- Meaning and Functions, Manpower Planning, Job Analysis and Design, Training, Career Planning & Development, Motivation, Compensation Management.

Module-IV

Managing Finance- Concept of Fixed and Working Capital, Main Sources of Finance, Accounting: Meaning, Users, Budgeting-Meaning, Type of Budgets.

Module-V

Managing Production- Basic Concepts, Objectives, Elements of Productions, Planning and Control.

Managing Sales and Marketing- Basic Concepts of marketing, Sales Promotions (including Salesmanship)

Text Books:-

1. *Kotler, "Philip, Marketing Management", PHI*
2. *Maheshwari S.N., "Financial Management – Principles and Practice", S. Chand & Sons.*

Reference Books:-

1. *Chadha N.K., "Human Resource Management- Issues, Case Studies & Experimental Exercises"*
2. *John W. Newstrom and Keith Davis, "Organisational Behaviour–Human Behaviour at work",.*
3. *Koontz and Weihrich, "Management - A global perspective", McGraw Hill International Ed.,*
4 *Maheshwari S.N and Maheshwari S.K, "An introduction to Accountancy", Vikas publishing house*
5. *Panneerselvam, Production and Operations Managment, PHI*
6. *Robbins, Stephen P., "Organisational Behaviour", PHI*
7. *Singh B.P. & Chabbra T.N., Business Organisation and Management Functions, Dhanpat Rai*

CA-U133: VISUAL BASIC PROGRAMMING

L	T	P	Cr
4	0	2	5.0

Course Objectives	• The main aim of the course is to cover visual basic and oracle programming skills required for modern software development. • To study the advantages of Controls available with visual basic. • To gain a basic understanding of database access and management using data controls.
Course Outcomes	• Demonstrate fundamental skills in utilizing the tools of a visual environment such as command, menus and toolbars. • Implement SDI and MDI applications using forms, dialogs, and other types of GUI components.

Module-I

Introduction to Visual Basic: Variables, Data Types, If-then, If-then-else, if then-elseifelse, expression, print statement, arrays, variable declaration, built-in & User defined types, Subroutine and functions, Boolean Operators, Arithmetic Operator, For- .next, do loop, while-wend, Procedure/ Public, Private and Static & Dim Statement.

Module-II

Structure of VB program, Forms & built in controls, Properties and events, Code Module, Scale Modes, Printer Object (Printing text, setting Fonts, graphics), Common dialog Boxes, picture controls, image-controls, send keys, MS-Common Controls, Error Handling, Classes, Control Arrays, MDI, SDI.

Module-III

File Handling – Text and Binary Files, Files System Orbit Object.

Database Interface: Review of ANSI SQL, ODBC, Pass through ODBC, DAO, MS-Jet Engine, DB-Engine, Workspaces, Databases, recordsets, Data bound controls, ActiveX controls, ADO, Active X Data controls, RDO

Data view Window, Data Environment Designer, Crystal Report and Data Report Utility Using Visual Basic (VB) for Transaction Management, Concurrency Control, Interfacing with RDBMS, Backend Stored procedure Usage.

Module-IV

Help Writing: Building a help, System, Building & Topics File, Labeling the topics, Creating a help project, primary & secondary help window, linking to internet, Adding Multimedia, Using HTML help workshop, content sensitive help, help file. Overview of COM/DCOM using Windows API Functions, MAPI interface, Microsoft Transaction Server, Visual source safe, VB Script.

Text Books:-

1. *E. Petroutsos, "Mastering Visual Basic 6.0", BPB Publications,*
2. *Perry, Greg, "Teach Yourself Visual Basic 6 in 21 Days", Techmedia,*

References Books:-

1. *E. Petroutsos, "Mastering Database Programming with Visual Basic 6", BPB Publications*
2. *Norton Peter, "Peter Norton's Guide to Visual Basic 6", Techmedia,*

Open Elective-III

CA-U135: MULTIMEDIA AND ANIMATION

L	T	P	Cr
4	0	2	5.0

Course Objectives	• To provide students with a basic understanding of multimedia systems and its components. • This course focuses on topics in multimedia information representation and multimedia standards in the components of multimedia – text, audio, image, video and animation. • To provide information about the standards tools and techniques used in development of multimedia components for productions
Course Outcomes	• Develop understanding of technical aspect of multimedia systems. • Understand and explain the storage mechanism and applicability of various file formats for audio, video and text media. • Develop various multimedia systems applicable in real time. • Create a multimedia component using various tools and techniques

Module-I

Introduction to multimedia, needs and areas of use, development platforms for multimedia identifying multimedia elements text, images, sound, animation and video, making simple multimedia with PowerPoint. Concepts of plain & formatted text, RTF& HTML texts, using common text preparation tools, conversion to and from of various text formats, using standard software, object linking and embedding concept.

Module-II

Sound - sound and its attributes, sound and its effects in multimedia, frequency, sound depth, channels and its effects on quality and storage, size estimation of space of a sound file, sound card standard – FM synthesis cards, waves table cards, MIDI and MP3 Files and Devices, 3D Sounds, recording and editing sound using sound editors like audacity, sound forge etc. Importance of images graphics in multimedia, vector and raster graphics, regular graphics vs. interlaced graphics, image capturing methods - scanner, digital camera etc.

Module-III

Animation and its basic – principals of animation and its use in multimedia, computer system configuration and peripherals requirements, software for animation, effects of resolution, pixel depth, image size, on quality and storage, types of animation and applications.

Module-IV

Video- Basic of Video, Analog and Digital Video Type of Video, Digitization of Analog Video, Video Editing and Movie Making Tools, Converting Formats of Videos. Authoring tools for multimedia – introduction to various types of multimedia authoring tools, CD/DVD based and web based tools, features and limitations, creating multimedia package using all components.

References:

1. *Ramesh Bangia-Introduction to Multimedia- Laxmi Publications Pvt. Ltd.*
2. *Tay Vaughan-Multimedia: Making It Work,TataMc-Graw Hill.*
3. *Bhatnager G. Elsevie-,Introduction to Multimedia Systems,*
4. *Satish Jain O Level Introduction to Multimedia (M4.2-R4), BPB Publications.*

CA-U136: LINUX SERVER ADMINISTRATION

L	T	P	Cr
4	0	2	5.0

Course Objectives	• Understand fundamental concepts of Linux server administration, • Will be able to put those concepts to use in real-world situations. • Understand how to install and customize Linux • Manage users, permissions, folders, and native applications; • Creating and maintaining print, e-mail, FTP, and web servers.
Course Outcomes	• Write shell program for simple problem • Use of basic commands of Linux. • Analyze the need for security measures for Linux sever. ° Managing user account in Linux. • Install and configure Email Sever, DNS, FTP etc.

Module-I

Introduction · History of Unix · Directory structure of Unix & Linux · History of Linux · Comparison of various operating systems · Advantages of Linux, Flavors of Linux, Installation notes, Linux Loader, Linux kernel

Module-II

File System and Devices · File System concept ext3, ext2. · File systems: - mount, fsconf and other related commands · Adduser, alias, cat, cd, chmod, chown, chroot, cp, cpio, dc, df, dir, du, fdformat, find, finger, grep, gunzip, gv, gvim, gzip, halt, hostname, ifconfig, kill, logout, lpc, lpd, lp, rm, ls, man, mcopy, mformat, mkdir, more, mount, mt, mv, passwd, ping, ps, pwd, quota, quotaoff, rm, rmdir, route, set, shut down, sort, stat, strings, su, tar, tree, umount, unzip, vdir, vi, view, wc, who, whoami, zip.

Module-III

Working with permissions · Assigning file permission · Directory Permission · Using text editors · Working with vi & emacs · System services and run levels · Controlling services at boot with administration tools (chkconfig & using GUI based services)

Module-IV

System Administration · Performing system maintenance · Communication commands: - write, wall, talk, mesg, motd, · Pre-login Message · Managing software with RPM :- Installing, Uninstalling, Upgrading · Managing users and managing Groups and managing passwords.

Module-V

Backup strategies · Choosing Backup Strategies and Operations · Choosing Backup hardware and media. · Using backup software and commands. **Network configuration for Linux** · Network configuration tools · Dynamic host configuration protocol. · Network files system. · Introduction to samba · Introduction to DNS & Apache web server

Text Books:

1. *Bill Ball, David Pitts, "Red Hat Linux 7 Unleashed", Techmedia SAMS Publication*
2. *Evi Nemeth, Garth Snyder, Scott Seebass, Trent R. Hein, "UNIX System Administration*
3. *Handbook" Person Education Asia (LPE) (IIIrd Edition)*
4. *Red hat Linux & fedora unlashed Authors Bill Ball & Hoyt Dust.*

SEMESTER –IV

CA-U142: INTERNET OF THINGS

L	T	P	Cr
4	0	0	4

Course Objectives	• Students will be explored to the interconnection and integration of the physical world and the cyber space. • They are also able to design & develop IOT Devices.
Course Outcomes	• Able to understand the application areas of IOT · • Able to realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks. • Able to understand building blocks of Internet of Things and characteristics.

Module-1

Introduction to IoT: Sensing, Actuation, Networking basics, Communication Protocols, Sensor Networks, Machine-to-Machine Communications, IoT Definition, Characteristics. IoT Functional Blocks, Physical design of IoT, Logical design of IoT, Communication models & APIs.

Module-1I

M2M to IoT-The Vision-Introduction, From M2M to IoT, M2M towards IoT-the global context, A use case example, Differing Characteristics. Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT.

Module-1II

M2M vs IoT An Architectural Overview–Building architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations. Reference Architecture and Reference Model of IoT.

Module-1V

IoT Reference Architecture- Getting Familiar with IoT Architecture, Various architectural views of IoT such as Functional, Information, Operational and Deployment. Constraints affecting design in IoT world- Introduction, Technical design Constraints.

Domain specific applications of IoT: Home automation, Industry applications, Surveillance applications, Other IoT application.

Module-V

Developing IoT solutions: Introduction to Python, Introduction to different IoT tools, Introduction to Arduino and Raspberry Pi Implementation of IoT with Arduino and Raspberry, Cloud Computing, Fog Computing, Connected Vehicles, Data Aggregation for the IoT in Smart Cities, Privacy and Security Issues in IoT.

References:

1. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014.

CA-U141: PROGRAMMING IN PYTHON

L	T	P	Cr
4	0	4	6

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

Module-1

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

Module-II

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

Module-III

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

Module-IV

Python Functions: Functions, Advantages of Functions, Built-in Functions, User defined functions, Anonymous functions, Pass by value Vs. Pass by Reference, Recursion, Scope and Lifetime of Variables.

Python Modules: Module definition, Need of modules, Creating a module, Importing module, Path Searching of a Module, Module Reloading, Standard Modules, Python Packages.

Module-V

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

Text Books:

1. *Programming in Python, Pooja Sharma, BPB Publications, 2017.*
2. *Core Python Programming, R. Nageswara Rao, 2nd Edition, Dreamtech.*

Reference Books:

1. *Python, The complete Reference, Martin C. Brown, Mc Graw Hill Education.*
2. *Python in a Nutshell, A. Martelli, A. Ravenscroft, S. Holden, OREILLY.*

HSMCS401: ORGANISATIONAL BEHAVIOUR

L	T	P	Cr
4	0	0	4

Course Objectives	• To learn the basic concepts of Organizational Behaviour and its applications in contemporary organizations. • To understand how individual, groups and structure have impacts on the organizational effectiveness and efficiency. • To appreciate the theories and models of organizations in the workplace. • To creatively and innovatively engage in solving organizational challenges. • To learn and appreciate different cultures and diversity in the workplace.
Course Outcomes	• To understand the conceptual framework of the discipline of OB and its practical applications in the organizational set up. • To deeply understand the role of individual, groups and structure in achieving organizational goals effectively and efficiently. • To critically evaluate and analyze various theories and models that contributes in the overall understanding of the discipline. • To develop creative and innovative ideas that could positively shape the organizations. • To accept and embrace in working with different people from different cultural and diverse background in the workplace.

Module-I

Accounting System: Scope of Accounting; Accounting as an Information System; Role and Activities of an Accountant; Accounting Personnel; Nature of Accounting Function; Organization Chart for Accounting and Finance.

Accounting Concepts and Standards: Accounting Framework; Concepts; Standards; Accounting Principles (GAAP); Attempts towards Standardization ; Accounting Standards in India

Module-II

Basic Accounting Process: Preparation of Journal, Ledger and Trial Balance: Accounting Equation; Classification of Accounts; Definitions of Journal and Ledger- Journalizing Process, Ledger Posting, Balancing an Account; Trial Balance-Objectives, Total and Balance Method of Preparing the Trial Balance, Limitations of Trial Balance; Accounting Cycle

Module-III

Preparation and Analysis of Final Accounts: Trading Account; Profit And Loss Account; Difference between Trading and Profit & Loss Account; Balance Sheet; Constructing a Balance Sheet; Classification of Balance Sheet's Items; Adjustment Entries- Closing Stock, Depreciation, Bad Debts, Provision for Bad and Doubtful Debts, Salaries and Wages, Outstanding Expenses, Prepaid Expenses, Accrued Income, Income Received in Advance.

Module-IV

Funds Flow and Cash Flow Statements: Statements of changes in Financial Positions; Fund Flow Statement; Analyzing Changes in Working Capital; Sources of Funds; Uses (Applications) of Funds; Cash Flow Statement; Sources and Uses of Cash

Ratio Analysis: Long-term Solvency Ratios, Short-term Solvency Ratios, Activity or Turnover Ratios, Profitability Ratios, Market Test Ratios

Introduction to Financial Management: Evolution and Significance of Financial Management; Principles of Financial Management, Agency Relationship

Module-V

Time Value of Money and Investment Decisions: Determining The Future Value, Annuity

Working Capital Management: Characteristics of Current Assets; Operating Cycle Concepts, Factors Influences Working Capital Environment, Estimating working capital Requirement. ***Cash and Treasury Management***- Treasury Risk Management, Functions of Treasury Department; Cash Management- Motives for Holding Cash, Cash Planning, Determining the Optimum Cash Balance; Methods of Cash Flow Budgeting; Investing Surplus Cash; Cash Collection and Disbursements.

***Receivables Management*:** Terms of Payment, Credit Policy Variables, Credit Evaluation, Monitoring Receivables, Factoring., ***Inventory Management*-** Reasons for Holding Inventory, Objectives of Inventory Management, Techniques of Inventory Control, Modern Techniques , Traditional Techniques.

Text Books:-

1. *J.C.Katyal," Principles A Book-Keeping".*
2. *Jain and Narang," Principles of Accounting".*
3 *I.M.Pandey," Financial Management, Vikas Publications.*

Reference Books:-

1. *P.H.Barrett," Computerized Accounting", BPB.*

CSE 401: DISCRETE MATHEMATICS

L	T	P	Cr
4	0	0	4

Course Objectives	The objective of this course is to prepare the students to develop Mathematical foundations to understand and create mathematically arguments require in learning mathematically and computer sciencecourses. Also in the course basic concepts of graph theory such as- trees, graphs, vertex colouring, edge colouring etc. are introduced.
Course Outcomes	At the end of the course, the students will be able to:- • Construct mathematical arguments using logical • connectives and quantifiers. • Understand how lattice and Boolean algebra are used as • tools and mathematical models in the study of networks. • Learn how to work with some of the discrete structures • like set, relations, functions etc. • Understand the importance of the concept coloring. • Learn how to use truth tables.

Module-I

Sets, Relation and Function: Operations and Laws of Sets, Cartesian Products, Binary Relation, Partial Ordering Relation, Equivalence Relation, Image of a Set, Sum and Product of Functions, Bijective functions, Inverse and Composite Function, Size of a Set, Finite and infinite Sets, Countable and uncountable Sets, Cantor's diagonal argument and The Power Set theorem, Schroeder-Bernstein theorem. Principles of Mathematical Induction: The Well-Ordering Principle, Recursive definition, The Division algorithm: Prime Numbers, The Greatest Common Divisor: Euclidean Algorithm, The Fundamental Theorem of Arithmetic

Module-II

Basic counting techniques-inclusion and exclusion, pigeon-hole principle, permutation and combination.

Module-III

Propositional Logic: Syntax, Semantics, Validity and Satisfiability, Basic Connectives and Truth Tables, Logical Equivalence: The Laws of Logic, Logical Implication, Rules of Inference, The use of Quantifiers. Proof Techniques: Some Terminology, Proof Methods and Strategies, Forward Proof, Proof by Contradiction, Proof by Contraposition, Proof of Necessity and Sufficiency.

Module-IV

Algebraic Structures and Morphism: Algebraic Structures with one Binary Operation, Semi Groups, Monoids, Groups, Congruence Relation and Quotient Structures, Free and Cyclic Monoids and Groups, Permutation Groups, Substructures, Normal Subgroups, Algebraic Structures with two Binary Operation, Rings, Integral Domain and Fields. Boolean Algebra and Boolean Ring, Identities of Boolean Algebra, Duality, Representation of Boolean Function, Disjunctive and Conjunctive Normal Form

Module-V

Graphs and Trees: Graphs and their properties, Degree, Connectivity, Path, Cycle, Sub Graph, Isomorphism, Eulerian and Hamiltonian Walks, Graph Colouring, Colouring maps and Planar Graphs, Colouring Vertices, Colouring Edges, List Colouring, Perfect Graph, definition properties and Example, rooted trees, trees and sorting, weighted trees and prefix codes, Bi-connected component and Articulation Points, Shortest distances.

Text books:

1. Kenneth H. Rosen, Discrete Mathematics and its Applications, Tata McGraw – Hill
2. Susanna S. Epp, Discrete Mathematics with Applications,4th edition, Wadsworth Publishing Co. Inc.
3. C L Liu and D P Mohapatra, Elements of Discrete Mathematics A Computer Oriented Approach, 3rd Edition by, Tata McGraw – Hill.

Reference books:

1. J.P. Tremblay and R. Manohar, Discrete Mathematical Structure and It's Application to Computer Science", TMG Edition, TataMcgraw-Hill

2. Norman L. Biggs, Discrete Mathematics, 2nd Edition, Oxford University Press. Schaum's Outlines Series, Seymour Lipschutz, Marc Lipson,

3. Discrete Mathematics, Tata McGraw - Hill

Open Elective-IV

CA-U143: OPERATING SYSTEMS

L	T	P	Cr
4	0	0	4

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

Module-I

Introduction: Concept of Operating Systems, Generations of Operating systems, Types of Operating Systems, OS Services, System Calls, Structure of an OS - Layered, Monolithic, Microkernel Operating Systems, Concept of Virtual Machine. Case study on UNIX and WINDOWS Operating System.

Module-II

Processes: Definition, Process Relationship, Different states of a Process, Process State transitions, Process Control Block (PCB), Context switching Thread: Definition, Various states, Benefits of threads, Types of threads, Concept of multithreads, Process Scheduling: Foundation and Scheduling objectives, Types of Schedulers, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time; Scheduling algorithms: Pre-emptive and Non pre-emptive, FCFS, SJF, RR; Multiprocessor scheduling: Real Time scheduling: RM and EDF.

Module-III

Inter-process Communication: Critical Section, Race Conditions, Mutual Exclusion, Hardware Solution, Strict Alternation, Peterson's Solution, The Producer\ Consumer Problem, Semaphores, Event Counters, Monitors, Message Passing, Classical IPC Problems: Reader's & Writer Problem, Dinning Philosopher Problem etc.

Deadlocks: Definition, Necessary and sufficient conditions for Deadlock, Deadlock Prevention, and Deadlock Avoidance: Banker's algorithm, Deadlock detection and Recovery.

Module-1V

Memory Management: Basic concept, Logical and Physical address map, Memory allocation: Contiguous Memory allocation – Fixed and variable partition– Internal and External fragmentation and Compaction; Paging: Principle of operation – Page allocation – Hardware support for paging, Protection and sharing, Disadvantages of paging. Virtual Memory: Basics of Virtual Memory – Hardware and control structures – Locality of reference, Page fault , Working Set , Dirty page/Dirty bit – Demand paging, Page Replacement algorithms: Optimal, First in First Out (FIFO), Second Chance (SC), Not recently used (NRU) and Least Recently used (LRU).

Module-V

I/O Hardware: I/O devices, Device controllers, Direct memory access Principles of I/O Software: Goals of Interrupt handlers, Device drivers, Device independent I/O software, Secondary-Storage Structure: Disk structure, Disk scheduling algorithms File Management: Concept of File, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods (contiguous, linked, indexed), Free-space management (bit vector, linked list, grouping), directory implementation (linear list, hash table), efficiency and performance.
Disk Management: Disk structure, Disk scheduling - FCFS, SSTF, SCAN, C-SCAN, Disk reliability, Disk formatting, Boot-block, Bad blocks

Text Books:-

1. *Comer D. E. ,"Inter Networking with TCP/IP: Principles, Protocol And Architecture", PHI Janet Valade, " Spring into Linux" PE.*
2. *Michael Bech, Harold Bohma…"Linux Kernel Programming", PE Johnson M. Hart"Windows System Programming"PE*

Reference Books:-

1. *Nameth Hein , et. All" Linux Administration Hand book"PE*

CA-U144: CYBER SECURITY

L	T	P	Cr
4	0	0	4

Course Objectives	• Understand the fundament concepts of Cyber and Information Security • Gain the knowledge of different types and working of malware and security hazards incident of real-world. • Understand cryptography techniques and apply them for secure data communication and authentications • Understand the working and implementation of Firewall. • Understand the concept of cyberspace and cyber-crime and digital signature
Course Outcomes	• Explain various security concepts and apply them in daily cyber use. • Configure firewall and other security setting in computer • Perform the malware and spam email identification, analysis, virus scanning and cleaning and other services using security tools • Explain and practice the Cyber Law, Ethics, and Intellectual Property Rights, Patent and Trademark and Design Law.

Module-I

Information security: overview, information security importance, information security components. Threats to information system- external and internal thread, security threat and vulnerability- overview, malware, type of malware: virus, worms, trojans, rootkits, robots, adware's, spywares, ransom wares, zombies etc., desktop security

Module-II

Application security- database security, e- mail security, internet security, principles of security- confidentiality, integrity, availability, introduction to cryptography- symmetric key cryptography, asymmetric key cryptography, message authentication, applications of cryptography. Security technology- firewall, type of firewall, firewall benefits, VPN, antivirus software

Module-III

Cybercrime-concept of cybercrime, type of cybercrime, phishing, cyber-crime prevention, case study, security threats to e-commerce- electronic payment system, Digital Signature– digital signature process.

Module-IV

ISO- international organization for standardization, world intellectual property organization, cyber law- cyber law in India, IT act 2000, intellectual property rights- definition, intellectual property, categories of intellectual property, rights protected under intellectual property, copyright, patent and trademark

References:

1. *Allan Friedman and P. W. Singer, Cyber Security and Cyber war: What Everyone Needs to Know by Published Oxford University*
2. *Don Franke, Cyber Security Basics: Protect Your Organization by Applying the Fundamentals by Publisher CreateSpace Independent Publishing Platform, 2016*
3. *Mayank Bhushan, Fundamental of Cyber Security*

SEMESTER - V

CA-U151: INTERNET CONCEPTS AND WEB DESIGN

L	T	P	Cr
4	0	4	6

Course Objectives	• Students will be explored to the interconnection and integration of the physical world and the cyber space. • They are also able to design & develop IOT Devices.
Course Outcomes	• Able to understand the application areas of IOT · Able to realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks. • Able to understand building blocks of Internet of Things and characteristics.

Module-I

Introduction: Define Network with their types , Classification of Networks; Networking Models ; Packet Switching; Accessing the Internet; Internet Protocols- Internet Protocol (IP),Dynamic IP & Static IP, Transmission Control Protocol (TCP), Internet Address- Structure of Internet Servers Address, Address Space; How does the Internet work; Intranet & Extranet; Internet Infrastructure; protocols and Services on Internet - Domain Name System, SMTP and Electronic Mail, Http and World Wide Web, Usenet and Newsgroups, FTP, Telnet, Internet Tools, Search Engines, Web Browser

Module-II

Introduction to HTML: What is HTML; Basic Tags of HTML- HTML Tag, TITLE Tag, BODY Tag; Formatting of Text – Headers, Formatting Tags, PRE Tag, FONT Tag, Special Characters; Working with Images; META Tag;

Module-III

CSS: Introduction of CSS, Types of CSS (Inline, internal, External).

Advanced HTML: Links- Anchor tag; Lists- Unordered Lists, Ordered Lists, Definition Lists; Tables - TABLE, TR and TD Tags, Cell Spacing and Cell Padding, Colspan and Rowspan; Frames – Frameset, FRAME Tag, NOFRAMES Tag; Forms- FORM and INPUT Tag, Text Box, Radio Button, Checkbox, SELECT Tag and Pull Down Lists, Hidden, Submit and Reset; Some Special Tags – COLGROUP, THREAD, TBODY, TFOOT, IFRAME, LABEL, Attribute for <SELECT>, TEXTAREA.

Module-IV

Introduction to JavaScript: JavaScript Variables and Data Types- Declaring Variables, Data Types; Statements and Operators; Control Structures- Conditional Statements, Loop Statements; Object-Based Programming – Functions, Executing Deferred Scripts, Objects; Message box in Javascript- Dialog Boxes, Alert Boxes, Confirm Boxes, Prompt Boxes; Javascript with HTML – Events, Event Handlers; Forms- Forms Array.

Text Books:-

1. *Raj Kamal, Internet and Web Technology, TMH*
2. *P. Naughton and H.Schieldt, The Complete Reference Java 2, TMH*

Reference Books:-

1. *Margaret Leaven Young, The Complete reference Internet Millennium Edition, TMH*

CA-U152: MANAGEMENT INFORMATION SYSTEM

L	T	P	Cr
4	0	0	4

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

Module-I

Introduction: Definition, Purpose, Objectives and Role of MIS in Business Organization with particular reference to Management Levels. MIS Growth and Development, Location of MIS in the Organization – concept and design. Transaction Processing System, Decision Support System, Executive Information system, Expert System, and the recent developments in the field of MIS. **System**

Module-II

Development: Concept of System, Types of Systems – Open, Closed, Deterministic, Probabilistic, etc. Relevance of choice of System in MIS, Integration of Organization Systems and Information Systems, System Development Life Cycle. System Analysis, Design and Implementation, MIS Applications in Business.

Module-III

Information Concepts: Data and Information – meaning and importance, Relevance of Information in Decision Making, Sources and Types of Information, Cost Benefit Analysis – Quantitative and Qualitative Aspects, Assessing Information needs of the Organization.

Module-IV

Information Technology: Recent Developments in the Field of Information Technology: Multimedia Approach to Information Processing. Decision of Appropriate Information Technology for proper MIS. Choice of appropriate IT Systems – Database, Data warehousing & Data mining Concepts, Centralized and Distributed Processing.

Text Book:-

1. *Parker, Charles Case, Thomas, "Management Information System: Strategy & Action", TMH,*
2. *Javadekar, W.S.; Management Information System, TMH*

Reference books:-

1. *Arora,Ashok and Akshaya Bhatia, Information Systems for Managers, Excel Books,*
2. *Basandra,Suresh K , Management Information Systems.Wheeler Publishing,.*

CA-U153: DATA WAREHOUSE AND DATA MINING

L	T	P	Cr
4	0	0	4

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

Module-I

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

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

Module-II

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

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

Module-III

Metadata - definition, interchange initiative, repository, trends. Reporting and Query Tools and Applications: Tools – Categories.

OLAP: Need, Multidimensional data model, guidelines, Multidimensional Vs multi-relational
OLAP, Categorization of OLAP tools.

Module-IV

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

Module-V

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

Text Books:

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

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

Reference Books:

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

2. (Berry,Michael) Data Mining Techniques

CA-UPB154: Project

Open Elective-V

CA-U155: SYSTEM ADMINISTRATION

L	T	P	Cr
4	0	2	5

Course Objectives	• To learn how to install and configure a Unix operating system. • To learn how to install and update applications on a Unix operating system, including configuration of some important user services such as email and printing. • To learn how to manage users and groups, as well as best practices for supporting the users (customers) of an organization's computing infrastructure.
Course Outcomes	• After the completion of the course, the students will gain knowledge about System Administration or Windows Administration. • The success of learning outcomes is measured by surveying students on a random sample of the Learning Objectives in the course specification.

Module-I

Introduction: What is system administration? History of system administration. System administration roles. Basics of window NT/2000/2003 and UNIX/ Linux.

History of linux and Unix. Difference between window and Linux.

Basics info & account management: File & directory layout. File system (NTFS, FAT, and UFS). File permission. ACL installation of operating system. Basics of DOS/window/Linux command and tools. Command line VS GUI. Startup (booting and shutdown). Task manager, more account management.

Module-II

System process: Scheduling jobs, job monitoring (event and viewer/ps), start & stop job. AT command VS scheduling task GUI tool. More Task manager. Disk administration, file system/partition.

Disk Defragmentation: RAID, basic client /server file sharing, file directories and memory management. Permission ,networking.

TCP/IP, DNS, DHCP, Domain/NIS. File sharing NFS, Active directory, setting up a file server(client /server network), Ethernet address , hostname.

Module-III

Performance monitoring & optimization: Control panel and admin tools items. Computer management GUI tools, window update, security and backup, patches and update, update VS upgrade, password ,backup methods.

Lab Work:

Installation of window and printer

How to make bootable Pen drive /CD

RAM, Diode, South Gate/North Gate

Text Book:

1. *Windows 2003 Server Study Guide – Microsoft Certified Professional (BPB Publications)*

CA081: E-COMMERCE

L	T	P	Cr
4	0	2	5

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

Module-I

Introduction to E-Commerce: The Scope of Electronic Commerce, Definition of Electronic Commerce, Electronic Commerce and the Trade Cycle Electronic Markets, Electronic Data Interchange, Internet Commerce, E-Commerce in Perspective.

Module-II

Business Strategy in an Electronic Age: Supply Chains, Porter's Value Chain Model, Inter Organizational Value Chains, Competitive Strategy, Porter's Model, First Mover Advantage, Sustainable Competitive Advantage, Competitive Advantage using E-Commerce, Business Strategy, Introduction to Business Strategy, Strategic Implications of IT, Technology, Business Environment, Business Capability, Existing Business Strategy, Strategy Formulation & Implementation Planning, E-Commerce Implementation, E-Commerce Evaluation.

Module-III

Business-to-Business Electronic Commerce: Characteristics of B2B EC, Models of B2B EC, Procurement Management Using the Buyer's Internal Marketplace, Supplier-Oriented Marketplace, Intermediary-Oriented Marketplace, Just-in-Time Delivery, Other B2B Models, Auctions and Services from Traditional to Internet-Based EDI, Integration with Back-end Information Systems, The Role of Software Agents for B2B EC, Electronic Marketing in B2B, Solutions of B2B EC, Managerial Issues, Electronic Data Interchange (EDI), EDI: The Nuts and Bolts, EDI & Business.

Intranet and Extranet: Automotive Network Exchange, The Largest Extranet, Architecture of the Internet, Intranet, and Extranet, Intranet Software, Applications of Intranets, Intranet Application Case Studies, Considerations in Intranet Deployment, The Extranets.

Module-IV

Electronic Payment Systems: Is SET a Failure, Electronic Payments & Protocols, Security Schemes in Electronic Payment Systems, Electronic Credit Card System on the Internet, Electronic Fund Transfer and Debit Cards on the Internet, Stored-Valued Cards and E-Cash, Electronic Check Systems, Prospect of Electronic Payment Systems, Managerial Issues.

Infrastructure for EC: It takes more than Technology, A Network of Networks, Internet Protocols, Web-Based client/ Server, Internet Security, Selling on the Web, chatting on the Web, Multimedia delivery, Analyzing Web Visits, Managerial issues

Module-V

Economics, Global & Other Issues in EC: Competition in Marketspace, Some Issues in Digital Economy and Success Factors, Impacts on Industry Structure, Intermediaries, and Others, virtual Communities, Global Electronic Commerce, Electronic Commerce in Small companies, Research in EC, The Future of EC

Text Books

1. Devid Johnson and Perk William, , "Electronic Commerce", Pearson Education
2. Ahley wanualer and Sofie, "E-Commerce", Tata McGraw Hill

Reference Books

1. David Whiteley, "E-Commerce", Tata McGraw Hill
2. Eframi Turban, Jae Lee, David King, K. Michale Chung, "Electronic Commerce", Pearson Education

SEMESTER – VI

CA-U161: COMPUTER GRAPHICS

L	T	P	Cr
4	0	4	6

Course Objectives	• The course introduces the basic concepts of computer graphics. • It provides the necessary theoretical background and demonstrates the application of computer science to graphics. • The course further allows students to develop programming skills in computer graphics through programming assignments.
Course Outcomes	• Understand the basics of computer graphics, different graphics systems and applications of computer graphics. • Discuss various algorithms for scan conversion and filling of basic objects and their comparative analysis. • Use of geometric transformations on graphics objects and their application in composite form.

Module 1

Introduction to Computer Graphics: Overview of Graphics Systems, Display Devices, Hard copy Devices. Interactive Input Devices, Display Processors, The Graphical Kernel System, Output Primitives, Line drawing algorithms, Circle Generation algorithms, Character Generation. **Raster Scan Graphics -** Line Drawing Algorithms, Circle Generation, General Function Rasterization, Scan Conversion-Generation of the display, Image Compression, Polygon Filling, Fundamentals of Antialiasing.

Module 2

Two-Dimensional Geometric Transformation & Viewing: Basic Transformation, Translation, Rotation, Scaling, Other Transformation Reflection, Shear, Transformation functions, Window to viewport co-ordinate transformation, Clipping Operations, Point Clipping, Line Clipping, Polygon Clipping.

Three- Dimensional Concepts & Object Representations

Three Dimensional Display Methods, Parallel Projection, Perspective Projection, Translation, Rotation, Scaling, Composite Transformation, Three dimensional Transformation function, Polygon Surfaces, Curved Lines and surfaces, Bezier Curves and surfaces, B-Spline Curves and surfaces.

Module 3

Graphics hardware: Display technology, random scan, raster scan display processing, input devices for interaction.

Visible Lines and Visible Surfaces

Visual Realism, Hidden line and hidden surface removal: depth buffer algorithm, geometric computations, scan line coherence algorithms, area coherence algorithms, priority algorithm, shading and color models, Modeling methods.

Module 4

Rendering: A simple illumination model, Transparency, Refraction effects in transparent materials, Simple Transparency Models, Z-Buffer Transparency, Shadows, Texture.

Text and Reference Books

1. *D.F. Rogers, "Procedural Elements for Computer Graphics", McGraw Hill.*
2. *Hearn and Baker, "Computer Graphics", PHI.*
3. *S. Harrington, "Computer Graphics - A programming approach", McGraw Hill. 4. D.F. Rogers, "Mathematical Elements for Computer Graphics", McGraw Hill.*

CA-U162: COMPUTER NETWORKS

L	T	P	Cr
4	0	0	4

Course Objectives	• To develop an understanding of computer networking basics. • To develop an understanding of different components of computer networks, various protocols, modern technologies and their applications.
Course Outcomes	• Understand computer network basics, network architecture, TCP/IP and OSI reference models. • Identify and understand various techniques and modes of transmission. • Describe routing and congestion in network layer with routing algorithms and classify IPV4 addressing scheme.

Module-I

Basic Concepts: Components of data communication, distributed processing, standards and organizations. Line configuration, topology, transmission mode, and categories of networks. OSI and TCP/IP Models: Layers and their functions, comparison of models. Digital Transmission: Interfaces and Modems: DTE-DCE Interface, modems, cable modems.

Module-II

Transmission Media: Guided and unguided, Attenuation, distortion, noise, throughput, propagation speed and time, wavelength, Shannon Capacity, comparison of media.

Module-II

Telephony: Multiplexing, error detection and correction: Many to one, one to many, WDM, TDM, FDM, circuit switching, packet switching and message switching. **Data Link control protocols:** Line discipline, flow control, error control, synchronous and asynchronous protocols, character and bit oriented protocols, Link access procedures.

Module-III

Point to point protocols: Transmission states, PPP layers, LCP, Authentication, NCP. **ISDN:** Services, historical outline, subscriber's access, ISDN, Layers, and broadband ISDN.

Module-IV

Devices: Repeaters, bridges, gateways, routers, The Network Layer, Design Issues, Routing Algorithms, Congestion Control Algorithms, Quality of Service, Internetworking, Network- Layer in the Internet. Transport and upper layers in OSI Model: Transport layer functions, connection management, Functions of session layers, Presentation layer, and Application layer.

Text Books:-

1. *A. S. Tanenbaum, "Computer Networks"; Pearson Education Asia,*
2. *Behrouz A. Forouzan, "Data Communication and Networking", TMH*

References Books:-

1. *D. E. Comer, "Internetworking with TCP/IP", Pearson Education Asia,*
2. *William Stallings, "Data and computer communications", Pearson education Asia*

CA-U163: PROGRAMMING IN JAVA

L	T	P	Cr
4	0	4	6

Course Objectives	• To understand the basic concepts and fundamentals of platform independent object oriented language. • To demonstrate skills in writing programs using exception handling techniques and multithreading. • To understand streams and efficient user interface design techniques.
Course Outcomes	After successful completion of the course, the students are able to • Use the syntax and semantics of java programming language and basic concepts of OOP. • Develop reusable programs using the concepts of inheritance, polymorphism, interfaces and packages. • Apply the concepts of Multithreading and Exception handling to develop efficient and error free codes.

Module-I

Fundamentals of object–oriented programming: -
Introduction; Object-Oriented Paradigm; Basic Concepts of Object-Oriented Programming Benefits of OOP; Applications of OOP. **Java evolution: -** Java History; Java Features; How Java Differs from C and C++; Java and Internet, Java and World Wide Web, Web Browsers; Hardware and Software Requirements; Java Support Systems, Java Environment

Module-II

Overview of java language: - Introduction; Simple Java Program; Comments in java; An application with Two Classes; Java Program Structure; Java Tokens; Java Statements; Implementing a Java Program; Java Virtual Machine; Command Line Arguments; Programming Style. **Constants, variables and data types: -** Introduction; Constants; Variables; Data Types; Variables, Constants, Standard Default Values. **Operators and expressions: -** Introduction to Operators, Expressions; Operator Precedence; Mathematical Functions.

Module-III

Decision making, branching and looping: - Decision making and Branching Statements, Looping Statements, Labeled loops, Jumping Statements. **Classes, objects and methods: -** Introduction; Defining a Class; Adding Variables; Adding Variables; Adding Methods; Creating Objects; Accessing Class Members; Constructors; Methods Overloading; Static Members; Nesting of Methods.

Module-IV

Inheritance: Extending a Class; Overriding Methods; Final Variables and Methods; Final Classes; Finalizer Methods; Abstract Methods and Classes; Visibility Control. **Arrays, strings and vectors: -** Arrays; Zagged Arrays; Strings; String functions: Vectors; Wrapper Classes. **Interfaces:-** Introduction; Defining Interfaces; Extending Interfaces; Implementing Interfaces; Accessing Interface Variables, Implementing Multiple Inheritance using Interfaces.

Module-V

Packages: Introduction; System Packages; Using System Packages; Naming Conventions; Creating Packages; Accessing a Package; Using a Package; Adding a Class to a Package; Hiding Classes. **Managing errors and exceptions: -** Introduction; Types of Errors; Exceptions; Exception Handling using Try, Catch and finally block: Throwing Our Own Exceptions; Using Exceptions for Debugging.

Reference Books:

1. Programming with JAVA - E Balgurusamy

2. The Complete Reference – JAVA Herbert Schildt

CA-U164: CRYPTOGRAPHY

L	T	P	Cr
4	0	0	4

Course Objectives	• To know about various encryption techniques. • To understand the concept of Public key cryptography. • To study about message authentication and hash functions • To impart knowledge on Network security
Course Outcomes	After successful completion of the course, the learners would be able to • Classify the symmetric encryption techniques • Illustrate various Public key cryptographic techniques • Evaluate the authentication and hash algorithms. • Discuss authentication applications • Summarize the intrusion detection and its solutions to overcome the attacks. • Basic concepts of system level security.

DETAILED CONTENT

Module 1: INTRODUCTION

Security trends - Legal, Ethical and Professional Aspects of Security, Need for Security at Multiple levels, Security Policies - Model of network security – Security attacks, services and mechanisms – OSI security architecture – Classical encryption techniques: substitution techniques, transposition techniques, steganography- Foundations of modern cryptography: perfect security – information theory – product cryptosystem – cryptanalysis.

Module 2: SYMMETRIC KEY CRYPTOGRAPHY

MATHEMATICS OF SYMMETRIC KEY CRYPTOGRAPHY: Algebraic structures - Modular arithmetic-Euclid's algorithm- Congruence and matrices - Groups, Rings, Fields- Finite fields- SYMMETRIC KEY CIPHERS: SDES – Block cipher Principles of DES – Strength of DES – Differential and linear cryptanalysis - Block cipher design principles – Block cipher mode of operation – Evaluation criteria for AES – Advanced Encryption Standard - RC4 – Key distribution.

Module 3: PUBLIC KEY CRYPTOGRAPHY

MATHEMATICS OF ASYMMETRIC KEY CRYPTOGRAPHY: Primes – Primality Testing – Factorization – Euler's totient function, Fermat's and Euler's Theorem - Chinese Remainder Theorem – Exponentiation and logarithm - ASYMMETRIC KEY CIPHERS: RSA cryptosystem – Key distribution – Key management – Diffie Hellman key exchange - ElGamal cryptosystem – Elliptic curve arithmetic-Elliptic curve cryptography.

Module 4: MESSAGE AUTHENTICATION AND INTEGRITY

Authentication requirement – Authentication function – MAC – Hash function – Security of hash function and MAC – SHA –Digital signature and authentication protocols – DSS- Entity Authentication: Biometrics, Passwords, Challenge Response protocols- Authentication applications - Kerberos, X.509

TEXT BOOK:

1. *William Stallings, Cryptography and Network Security: Principles and Practice, PHI 3rd Edition, 2006.*

REFERENCES:

1. *C K Shyamala, N Harini and Dr. T R Padmanabhan: Cryptography and Network Security, Wiley India Pvt.Ltd*
2. *BehrouzA.Foruzan, Cryptography and Network Security, Tata McGraw Hill 2007.*
3. *Charlie Kaufman, Radia Perlman, and Mike Speciner, Network Security: PRIVATE Communication in a PUBLIC World, Prentice Hall, ISBN 0-13-046019-2.*

CA-UPB165:PROJECT

Open Elective-VI

CA-U166: INFORMATION SECURITY

L	T	P	Cr
4	0	0	4

Course Objectives	The course is designed in a way that a candidate can identify, analyze and remediate computer security breaches by learning and implementing the real-world scenarios in Cyber Investigations Laboratory, Network Security Laboratory and in Security and Penetration Testing Laboratory. • Exhibit knowledge to secure corrupted systems, protect personal data, and secure computer networks in an Organization. • Practice with an expertise in academics to design and implement security solutions.
Course Outcomes	After studying this course, you should be able to: • Appreciate the value of information to the modern organization • Understand the via triad of confidentiality, integrity and availability • Appreciate the difficulties that arise when valuable information needs to be shared • Identify the five leading-edge resources that have up-to-date information on information security.

Module-I

Information Security Concepts : Information Security Overview: Background and Current Scenario, Principles of Security-Information Classification, Policy Framework, Role based Security in an organization, Components of Information Systems, Balancing Information Security and Access, Approaches to information Security Implementation, Security Systems Development Life Cycle.

Module-II

Security Threats and Vulnerabilities: Overview of Threats and Vulnerabilities-Intruders, Malicious Software, Viruses and related Threats, Desktop Security ,Email security: PGP and S/MIME, Web Security: Web authentication, SSL and SET, Database Security . Firewalls- Overview, Design principles and Types.

Module-III

Security Management and Laws: Introduction to Security Management, Access Control and Intrusion Detection, Overview of Identification and Authorization, Intrusion Detection Systems and Intrusion Prevention Systems, Security Procedures and Guidelines, Business Ethics and Best Practices, Security Assurance, Security Laws, IPR , International Security Standards, Security Audit, SSE-CMM / COBIT etc.

Module-IV

Cryptography: Concepts and Techniques, Symmetric and Asymmetric Key Cryptography, Steganography , Symmetric Key Ciphers- DES, AES (Structure and Analysis). Asymmetric Key Ciphers- Principles of Public Key cryptosystems, RSA Algorithm and its Analysis. Digital Signatures.

Suggested Books:

1. *Introduction to Information Security and Cyber Laws Paperback - by Surya Prakash Tripathi (Author), Ritendra Goel (Author), Praveen Kumar Shukla (Author)*
2. *Principles of Information Security. Paperback - by Whitman (Author)*
3. *Cryptography and Information Security Paperback – by Pachghare V. K. (Author)*

CA-U167: MOBILE COMPUTING

L	T	P	Cr
4	0	0	4

Course Objectives	Students taking this course will develop an understanding of the ways that mobile technologies can be used for teaching and learning. They will also consider the impact of mobile computing on the field of education.
Course Outcomes	• To understand concepts of Mobile Communication. (Understand) • To analyse next generation Mobile Communication System. (Analyze) • To understand network and transport layers of Mobile Communication. (Understand) • Analyze various protocols of all layers for mobile and ad hoc wireless communication networks. (Analyze) • To understand IP and TCP layers of Mobile Communication. (Understand)

Module-I

INTRODUCTION: Introduction to Mobile Computing — Applications of Mobile Computing- Generations of Mobile Communication Technologies- Multiplexing — Spread spectrum -MAC Protocols — SDMA- TDMA- FDMA- CDMA

Module-II

MOBILE TELECOMMUNICATION SYSTEM**:** Introduction to Cellular Systems — GSM — Services & Architecture — Protocols — Connection Establishment — Frequency Allocation — Routing — Mobility Management — Security — GPRS- UMTS — Architecture — Handover — Security

Module-III

MOBILE NETWORK LAYER

Mobile IP — DHCP — AdHoc– Proactive protocol-DSDV, Reactive Routing Protocols — DSR, AODV , Hybrid routing – ZRP, Multicast Routing- ODMRP, Vehicular Ad Hoc networks (VANET) –MANET Vs VANET — Security.

Module-IV

MOBILE TRANSPORT AND APPLICATION LAYER

Mobile TCP– WAP — Architecture — WDP — WTLS — WTP –WSP — WAE — WTA Architecture — WML

MOBILE PLATFORMS AND APPLICATIONS

Mobile Device Operating Systems — Special Constraints & Requirements — Commercial Mobile Operating Systems — Software Development Kit: iOS, Android, BlackBerry, Windows Phone — MCommerce — Structure — Pros & Cons — Mobile Payment System — Security Issues

References:

1. *Mobile ComputingTechnology,Applications and service creation ,Asoke K Telukder, Roopa R Yavagal by TMH.*
2. *Mobile Computing,Raj Kamal by Oxford*
3. *Wireless Communications & Networks, Second Edition,William Stallings by Pearson*
4. *Mobile Computing Theory and Practice-Kumkum Garg-Pearson*
5. *TCP/IP Protocol Suite by Behrouz A Forouzan, Third Edition,TMH*