

THE INSTITUTE : **The Institute of Computer Engineers (India) "ICEI" established in the year 1984, felt the pulsation of various fields to be educated in state-of-the-Art innovation-COMPUTER for successful exposure to challenging career opportunities in the corporate world and educational spheres to meet the challenge to Twenty first century.**

THE RECOGNITION : **A. DOE ON BEHALF OF AICTE**

Based on excellent tract record of the Institute since 1984, The Institute of Computer Engineers (India), Head Office has been granted full accreditation for DOEACC 'O' Level course vide no. Full. 010 ACCR No. 0046 with effect from 21.03.96. and full accreditation for DOEACC "A" LEVEL course vide no. AFULL-002, ACCR NO. A004 with effect from 02.04.97, for "B" - Level course vide no. B PROV-74, ACCR No.-B0087 with effect from 03.12.2001 for 'C' - Level course vide no. CPROV No.-15, ACCR NO : C001with effect from 20.03.97 by the Department of Electronics (DOE) on behalf of AICTE.

B. GOVT. OF WEST BENGAL : DIRECTORATE OF EMPLOYMENT

Directorate of employment, Govt. of West Bengal has Recognised Training courses of University & College computer centres functioning in collaboration with ICEI for employment purpose. Presently 3 Universities and verious College Computer Centres of W.B. are functioning in collaboration with ICEI.

C. GOVT. OF TRIPURA : TRIPURA REGIONAL COMPUTER CENTRE (TRCC)

Govt. of Tripura has recognised ICEI by accepting its collaboration for functioning TRCC, which is a joint project of Directorate of Higher Education, Govt. of Tripura & ICEI.

D. IGNOU (Indira Gandhi National Open University)

Indira Gandhi National Open University has recognised ICEI by allowing them to conduct their different computer courses.

E. B Level qualifiers (with Graduation) can sit for GATE examination for pursuing M.Tech from any recognised University.

General Information

: A. Session

Every year we conduct minimum 4(four) sessions which commence of four intervals, i) January ii) April iii) July iv) October.

B. Library

All the chapters of the Institute are well equipped with library containing good collection of books both reading and lending facilities.

C. Examination

After completion of the course all the students are to appear in the examination conducted & Result by the Institute, in conformity with 'O', 'A', 'B' & 'C' Level syllabus mentioned in the prospectus. The performance of students will be evaluated on the basis of examination results and other parameters set by the Institute.

The Certificate awarded to students by ICE(I) will show actual marks acquired by the students and the grade obtained by the successful candidates such as : Distinction A, B, C based on aggregate marks respectively.

DIS : Above 70% A:60-69% B:45% - 59% C:35% - 44% Fail:Below 35%

Students will be given grades on the basis of their performance in the Examinations. The final examination will be conducted by the DOEACC Society & will issue DOEACC 'O', 'A', & 'B', 'C' level certificates to the candidates.

I.C.E.(I) PLACEMENT

DIVISION

: I.C.E.(1) not only trains the students for different trades and professions, but it also extends help in securing placement (more than 2,00,000 jobs being created every year in the field of computer in different categories). For this purpose there are computerized placement cell recruiting students during/after the completion of their courses & obtaining diplomas.

Our excellent placement record has seen lot of our students secure their future at our organization, our sister organizations & different University / College Computer Centres functioning with our technical collaboration.

During the years 1995-96 ICEI has arranged ON-JOB training for about 1500 of its students at CEL, SARASWATI PRESS LTD., WEBEL COMMUNICATIONS SYSTEMS LTD, ASIATIC OXYGEN etc. with attractive monthly stipend.

N.B.: Successful students of DOEACC from ICEI are all suitably placed

FACULTY

: At ICE(I) the faculty comprises of a team of highly qualified & experienced full-time & part time staff from various related fields. Part time faculty comprises of most reputed lectures / professors from different Universities & Engineering Colleges.

INDUSTRIAL TRAINING : To make the curriculum more job oriented, ICEI is arranging 6 months regular industrial training w.e.f May '97 for different Level students.

Department of Electronics (DOE) Govt. of India RECOGNISED Courses on behalf of All India Council of Technical Education (AICTE) (Ministry of Human Resources Development, Govt. of India)

OBJECTIVE OF THE COURSES

: It has been felt by Govt. of India that private institute imparting computer education have a significant role to play in meeting the demand of computer personnel; shortage of which in all levels, from Programmer Assistant of Systems Manager is acute and the shortfall cannot be met by the Govt. supported Institute only.

With a view to bridge the gap DOE has taken up the scheme of Accreditation, popularly known as DOEACC, by which the effort of private institutes can be turned to an advantage by linking them to a system of examination to qualify their students for a certificate of proficiency, that could lead a quality product.

RECOGNITION

: Under this scheme examination is to be conducted for four level courses, namely O-Level (Diploma Level), A-Level (Advanced Diploma Level), B-Level (B.Tech/MCA Level) and C-Level (M.Tech Level). This unique scheme will take a student of 10+2 standard, if he so desire and bent on it, to what can be termed as M.Tech level, in Computer Science.

EXAMINATION

: DOEACC Computer diploma is awarded by an independent body under the Department of Electronics, Govt. in India. The emphasis here is on quality education and career orientation. It is recognized by the Ministry of HRD, AICTE, many public sector undertaking, Bank, State Governments and of course premier national & multinational companies.

Though the main Examination will be conducted by the DOEACC Society, all the students will have to appear in the institutes exam at the end of the course to get the institute's certificate.

COURSE CALENDAR

Examination Level	Level of standard	Output	Entry Level	Duration of Study	Payable at a time	Fees (Rs) payable in instalment of				
						Two	Three	Four	Five	Six
CCC/Office Automation	Appreciation	Computer Literate	Open to all	2 months (F.T.)	2,000	—	—	—	—	—
DOEACC "O"	Foundation	Junior Programmer / FDP Assistant	10+2	1 year	6,500	6,700	6,800	6,900	7,000	7,100
DOEACC "A" (PGDCA Eqiv.)	Advanced Diploma	Programmer / Asst. to Database Manager / Teaching Faculty	Level "O" / Graduation / Polytechnic Diploma	1 year (F.T.) 1½ years (P.T.)	16,000	16,400	16,600	16,800	17,000	17,200
DOEACC "B" (B. Tech/MCA Eqiv.)	MCA (Eqiv)	System Analyst/ Software Engineer / EDP Manager	Graduate / Polytechnic Diploma/ Level 'A'	3 years (F.T.)	45,000	45,800	46,100	46,400	46,700	47,000
DOEACC "C" (M.Tech Eqiv)	Master Degree in Computer Science	Project Manager/ System Specialist/Manager / R & D Scientist/ Consultant	"M.Sc. or B. Tech"/B.E./ (any stream)/ M.C.A. / 'B' Level	2 years	30,000	30,400	30,600	30,800	31,000	31,200

MODE OF PAYMENT

LEVEL	'O'	'A'	'B'	'C'
PAYMENT				
At the time of Admission	50%	30%	20%	25%
REST	in equal instalments at an interval of 2 months		in equal instalments at an interval of 3 months	

• **First instalment ***
payable by Draft & Rest
instalment by post dated
cheques payable at the
time of admission.

* The Draft/Cheque in favour of
**The Institute of Computer
Engineers (India)**
Payable at Kolkata

* FEES ONCE PAID CANNOT BE REFUNDED

COMPUTER COURSE FOR THE COMMON MAN(CCC)

OBJECTIVE OF THE COURSE : This course is designed to aim at imparting an basic level appreciation programme for the common man. After completing the course the incumbent is able to the use the computer for basic purposes of Preparing his personnel / business letters, viewing information on internet (the web), sending mails, preparing his business presentations, playing games etc. This allows a common man or a house-wife to be also part of computer users list. This would also aide the PC penetration programme. This helps the small business communities, house wives to maintain their small accounts using the computers and enjoy in the world of Information Technology. This course is more practical oriented.

Detailed Syllabus :

- 1 **Introduction to Computers :** What is a Computer?, Characteristics of a computers, Basic Applications of Computer.
- 1 **Components of Computer System :** Central Processing Unit (CPU), VDU, Keyboard and Mouse, Other Input / Output Devices, Computer Memory, Concepts of Hardware and Softwar.
- 1 **Classification of Computers, Representation of data / Information and Concepts of data processing :** Definition of Information of Data, Basic data types, Storage of data / Information as files.
- 1 **Introduction to Windows :-** What is an operating system and Basics of Windows, The User Interface: Using Mouse and Moving Icons on the Screen The My Computer Icon, The Recycle Bin, Status Bar, Start and Menus & Menu-selection, Running an Application, Windows Explorer Viewing of Files, Folders and Directories, Creating and Renaming of Files and Folders, Opening and Closing of different Windows.
- 1 **Windows Settings :** Control Panels, Wall paper and Screen Savers, setting the date and sounds, concept of menus using help.
- 1 **Advanced Windows :** Using right button of the mouse, Creating short cuts, Basics of Windows setup, Notepad, Windows accessories.
- 1 **Basic DOS Commands :** Comparison of DOS and Windows, Switching Between DOS and Windows, Basic DOS Commands : File / Directory Manipulations Copying of Files and Disks, Delete/Undelete, Formatting a floppy.
- 1 **Elements of Word Processing :-** Word Processing Basics : An Introduction to Word Processing, Opening Word Processing Package, The Menu Bar, Using the Help, Using the Icons below the menu bar.
- 1 **Opening Documents and Closing documents :** Opening a Document, Save and Save As, Page Set up, Printing of Documents, Display / Hiding of Paragraph marks and inter Word space.
- 1 **Moving Around in a Document :** Scrolling the document, Scrolling by line / Paragraph, Fast Scrolling and Moving Pages.
- 1 **Using a Document/Help Wizard, Text Creation and Manipulation :** Paragraph and Tab Setting, Text selection, cut, copy and paste, font and size selection, bold, italic and underline, Alignment of Texts : Center, Left, Right and Justify.
- 1 **Formatting the Text :** Changing font, size and color, Paragraph indenting, Bullets and Numbering, Use of Tabs and Tab settings, Changing Case.
- 1 **Handling the Text :** Opening and Closing of multiple documents, Cut, Copy and Paste across the documents, Saving of Clip boards.
- 1 **Table manipulation :** Concept of Table : Rows, Columns and Cells, Draw Table, Changing Cell Width and heights, Alignment of Text in cells, Copying of Cells, Delete / insertion of rows and columns, Borders for Table.
- 1 **Printing :** Printing, Print Preview, Print a selected page.
- 1 **Spread Sheet :**
- 1 **Elements of Electronics Spread Sheet :** Application / usage of Electronic Spread Sheets, Opening of Spread sheets, The menu bar, Creation of cells and addressing of cells, Cell inputting.
- 1 **Manipulation of cells :** Enter texts, number and dates, Creation of tables, Cell Heights and Widths, Copying of cells.
- 1 **Providing Formulas :** Using basic functions / formulae in a cell, Sum() function, Average, Percentage, Other basic functions.

- 1 *Spread Sheets for Small accountings* : Maintaining invoices / budgets, Totaling of various transactions, Maintaining daily / monthly sales reports.
- 1 *Computer Communication and Internet* :- Basics of Computer networks : LAN, WAN.
- 1 *Internet* : Concept of Internet, Applications of Internet.
- 1 *Services on Inter Net* : WWW and Websites, Electronics mails, Communication on Internet.
- 1 **WWW and Web Browsers** :- Web Browsing software : Internet Explorer, Netscape Communicator.
- 1 *Surfing the Internet* : Giving the URL address, search, Moving around in a website, Printing or saving portions of web pages, Down Loading.
- 1 *Chatting on Internet*
- 1 **Emails** :- *Basics of electronic mail* : What is an electronic mail, Email addressing, Mailbox : Inbox and Outbox.
- 1 *Using Emails* : Viewing an email, Sending an email, Saving mails, Sending same mail to various users.
- 1 *Documents handling* : Sending soft copy as attachment, Enclosures to email, Sending a portion of document as email.
- 1 **Making Small Presentations** :- Basics : Difference between Presentation and document, Using power point, Opening a power point presentation, Using Wizard for creating a presentation.
- 1 *Creation of Presentation* : Title, Text Creation, Fonts and sizes, Bullets and Indenting, Moving to Next Slides.
- 1 *Preparation of Slides* : Selection of type of slide, Importing text from word documents, Moving to next slide, The slide manager.
- 1 *Providing aesthetics* : Slide Designs, Background and Text colors, Making your own slide format, Footnotes and Slide numbering.
- 1 *Slide Manipulation and Slide Show* :

DOEACC "O" LEVEL COMPUTER COURSE

OBJECTIVE OF THE COURSE :

The Government of India has estimated a sharp growth in requirement of computer trained personnel in India. But Govt. has been suffering from the shortage of computer personnel at all levels & the shortfall cannot be met by the Govt. supported Institutions. With a view of fulfilling the need, Govt. has offered ACCREDITATION to some reputed private and public sector institutions to conduct the "O-Level Course". After completion of the course participants will be confident enough to take up full time Computer career in any responsible position as "Computer Programmer Assistant". ICE(I) H.O. has been granted FULL ACCREDITATION by the DOE Govt. of India for the "O-Level Course" Vide no. FULL NO. 010.

BLOCK SYLLABUS - "O" LEVEL COURSE

<i>Module</i>	<i>Contents</i>	<i>Marks Distribution</i>
MOD 1	IT TOOLS AND APPLICATIONS	100
MOD 2	BUSINESS SYSTEMS	100
MOD 3	INTERNET AND WEB DESIGN	100
MOD 4	" C " LANGUAGE / VISUAL BASIC	100
	PRACTICAL	100
	PROJECT	

MOD 1 : IT TOOLS AND APPLICATIONS

Detailed Syllabus

1. Computer Appreciation 4 Hrs.

Characteristics of Computers, Input, Output, storage units, CPU, computer system, Binary number system, Binary to Decimal Conversion, Decimal to Binary Conversion Binary Coded Decimal (BCD) Code, ASCII Code

2. Computer Organization 13 Hrs.

2.1 Central Processing Unit 1 Hrs.

Control Unit, Arithmetic Unit, Instruction Set, Register, Processor Speed.

2.2 Memory 3 Hrs.

Main memory : Storage Evaluation Criteria, Memory Organization, capacity, RAM, Read Only Memories. Secondary Storage Devices :- Magnetic Disks, Floppy and Hard Disks, Optical Disks CD-Rom, Mass Storage Devices.

2.3 Input Devices 2 Hrs.

Keyboard, Mouse, trackball, joystick, Scanner, OMR, BAR-code reader, MICR Digitizer, Card Reader, Voice Recognition, web cam, video cameras.

2.4 Output Devices 2 Hrs.

Monitors, Printers - Dot matrix, inkjet, laser, Plotters, Computer Output Micro-Film (COM), Multimedia Projector, speech synthesizer, dumb, smart and intelligent terminal.

2.5 Multimedia : 2 Hrs.

What is Multimedia, Text, Graphics, Animation, Audio, images, Video, Multimedia Application in Education, Entertainment, Marketing.

2.6 Computer Software 3 Hrs.

Relationship between Hardware and Software; System Software, Application Software, compiler, names of some high level languages, free domain software.

3. Operating Systems 13 Hrs.

3.1 Disk Operating System

Simple DOS Commands, Simple File Operations, Directory Related Commands.

3.2 Microsoft Windows

An overview of different versions of Windows,

Basic Windows elements, File management through Windows.

Using essential accessories : Systems tools - Disk cleanup, Disk Defragmenter, Entertainment, Games, Calculator, Imaging - Fax, Notepad, Paint, WordPad.

3.3 Linux

An overview of Linux, Basic Linux elements: system Features, Software Features. File Structure, File handling in Linux, Installation of Linux : H/W, S/W requirements, Preliminary steps before installation, specifics on Hard drive repartitioning and booting a Linux System.

4. Word Processing 10 Hrs.

Word processing concepts : Saving, Closing, Opening and existing document, Selecting text, Editing text, Finding and replacing text, printing documents, Creating and Printing Merged Documents, Character and Paragraph Formatting, Page Design and Layout.

Editing and Proofing Tools : Checking and correcting spellings. Handling Graphics. Creating Tables and Charts. document Templates and Wizards.

5. Spreadsheet Package 10 Hrs.

Spreadsheet Concepts. Creating, Saving and Editing a Workbook, Inserting, Deleting Work Sheets, Entering data in a cell / formula Copying and Moving data from selected cells, Handling operators in Formulae, functions; Mathematical, Logical, Statistical, Text Financial, Data And Time functions, Using Function Wizard*.

Formatting a Worksheet : Formatting Cells - changing data alignment, changing date, number, character, or currency format, changing font, adding borders and colors, Printing worksheets, Charts and Graphs - Creating, Previewing, Modifying Charts.

Integrating word processor, spread sheets, web pages*.

6. Presentation Package 6 Hrs.

Creating, Opening and Saving Presentations, Creating the Look of Your Presentation, Working in Different Views, Working with Slides, Adding and Formatting Text, Formatting Paragraphs, Checking Spelling and Correcting Typing Mistakes, Making Notes

Pages and Handouts, Drawing and Working with Objects, Adding Clip Art and Other Pictures, Designing Slide Shows, Running and Controlling a Slide Show, Printing Presentations*.

7. Information Technology and Society 4 Hrs.

Application of Information Technology in Railways, Airlines, Banking, Insurance, Inventory control, Financial systems, Hotel management, Education, Video games, Telephone exchanges, Mobile phones, Information kiosks, special effects in Movies.

***NOTE :** The underlying concepts may be illustrated using MS Office package.

MOD 2 : BUSINESS SYSTEMS

Detailed Syllabus

1. Introduction to Business Data Processing

6 Hrs.

Overview of Business Systems : Management functions, Levels of management, Information requirements for planning, coordination and control for various levels in Business, Industry and Government.

Profile of data in Business systems : Large volumes of data and data handling implicit Identification of relevant data. Classification of data elements by function and by source, Primary and Secondary. Historical data for reference and analysis. Need for ensuring accurate, reliable and timely processing of data. Basic tasks in Business data processing, data origination, capture, sorting, merging, calculating, summarizing, managing output-results, storing and retrieving transmission, both interim and final Examples of business data processing and applications, Payroll, Financial, Accounting, Inventory, etc.

Computer System as a potential tool to meet business data processing needs, facilities available in computerized systems for data capture; online and offline; validation; storage; storage; processing and output; Transmission.

2. Concept of Files 2 Hrs.

Master and transaction files, File organization : sequential, relative and indexed, Modes of processing; batch, online and real-time.

3. Principles and Techniques of Programming 6 Hrs.

Introduction to programming : program

definition, life cycle, characteristics of a good program, data handling (flowcharts, pseudo codes)

Report production and file updation; simple report generation, overview of control break procedure for report production.

Operation on files : Input, output and I/O; processing a file, multiple handing file updation; sequential file updation, random file update.

Programming paradigms : Unstructured programming, structured programming, procedural programming, modular programming

Program design : Top down and bottom up design, program documentation

4. Visual FoxPro 38 Hrs.

Introduction to Visual FoxPro : The menu system, File Types, The Toolbars, Visual Design and Wizards, The Command Window and the View Window, Other features of Visual FoxPro Interface. 2 Hrs.

Tables in Visual FoxPro : Creating a New Table, Table Wizard, Using Table Designer, Using Tables, Opening a table, Working on a table, Modifying a table.

Managing Data : Switching from Browse to Edit display, Entering and Editing Data, Appending data, Editing data, Moving through a Table, Go To Record command, Find and Replace, Deleting a Record, Altering the Display of the Browse window. 2 Hrs.

Using Queries : Creating a Query, Query Wizard, Query Designer, Running the Query, Using the Query, the Cross Tab Wizard, modifying the Query, the Query Designer.4 Hrs.

Using Forms : AutoForms, the Form Wizard, choosing Fields, choosing a Style, choosing Sort Order, Generating the Form, Using Forms, running a Form, using the Form's Control Panel. 2 Hrs.

Using the Report Wizard : Auto Reports, Using the Report Wizard, using the Group / Total Report Wizard, Printing Reports, filtering records for the printed report. Mailing Labels and Mail Merge, Working with Mail Labels, the Label Wizard, Using Mail Merge, the Mail Merge Wizard. 4 Hrs.

Working from the Command Window : Using the Command Window, creating a new table,

modifying the structure of the table, displaying and editing the data, deleting and Recalling the records, using commands : RUN, SET, DEFAULT, DISPLAY, LIST? using logical expressions, logical functions, relational operators, logical operators, IIF () function, Sorting a table, creating Indexes, Setting the index order, Re indexing, Filtering data, Use of Macro (&) command, Data Functions, Use of multiple tables. 4 Hrs.

Working with Relational Databases in Visual FoxPro : Concept of relational databases, Entering and Viewing data using the Form Wizard, Query Wizard to work with Relational databases, Using One-to-many Report Wizard, Using the view Window, Using queries and SQL, Queries versus Views, The Query designer, working with multiple tables, directing output, viewing SQL code, maximizing the Table View, running the Query, One-to-many and Many-to-one Queries, filtered Joins, a grouped Query, The SQL SELECT command, Other SQL commands, Using Visual FoxPro databases 8 Hrs

Visual FoxPro Utilities : Importing and Exporting data using Import Wizard, Editing text, Edit menu, Formate menu, Spelling tool, Object Linking and Embedding, Programming and developing applications using Visual FoxPro : An overview of programming, Creating files, Running the program, input/output, Variables, Simple output using? Command, Getting Input from the User, @.....SAY.....GET command, Picture clauses, Control Flow, Looping, Selection, EXIT and LOOP, Procedures and Parameters, scope of variables and Passing Parameters, User-Defined Functions, Using the Menu-Designer, using the Project Manager, Techniques of writing efficient FoxPro Programming codes. 12 Hrs.

5. Business Applications 8 Hrs.

Design, analysis and development of : Computerized Financial Accounting. Computerized Inventory Control, Computerized Payroll, Computerized Invoicing application.

MOD 3 : INTERNET AND WEB DESIGN

Detailed Syllabus

1. Introduction to Internet 2 Hrs.

Internet, Growth of Internet, Owners of the Internet, Anatomy of Internet. APRANET and

Internet history of the World Wide Web, Basic Internet Terminology, Net etiquette.

Internet Applications-Commerce on the Internet, Governance on the Internet, Impact of Internet on Society - Crime on / through the Internet.

2. Internet Technology and Protocols 8 Hrs.

Internet Protocols, TCP/IP : IP Address and its Format, TCP/IP Based packages, SLIP, PPP.

Network and Network Devices : - Network Architecture, Ethernet, FDDI and ATM. Characteristics of Local Area Network & Wide Area Network : Topology, Protocols and media, Implementation, Transmission, access method and Technologies, special consideration for the Blinds.

Addressing in Internet : DNS, Domain Name and their organization, understanding the Internet Protocol Address.

Client Server Concepts, their Architecture and applications.

Getting Connected - Items needed to connect, Levels of Connectivity

3. World Wide Web 6 Hrs.

Evolution of WWW, Basic features, WWW Browsers, WWW Servers, HTTP, Universal Resource Locator (URL), Search Engines and their Categories, Searching Criterion, WWW and Hypertext.

4. Browsers 6 Hrs.

Basic features, Bookmarks, history, Progress indicators, Customization of browsers, Saving and Printing web pages, Netscape Communicator, Internet Explorer.

5. Electronic Mail 8 Hrs.

Introduction to e-mail. Email Networks and Servers, Email Protocols - SMTP, POP3, IMAP4, MIME6.

Structure of an Email - Email Address, Email Header, Body and Attachments.

Email Clients : Netscape Mail Clients, Outlook Express, Web based E-mail. Email encryption - Address Book, Signature File

6. File Transfer Protocol 3 Hrs.

Introduction to FTP and Terminology, FTP Servers and Authentication, Line Mode FTP and Common Commands, GUI Based FTP Clients, Browser Based FTP Clients.

7. Telnet 4 Hrs.

Introduction to Telnet, Establishing Telnet Connection, Using Telnet with Netscape, Telnet Protocol, Terminal Emulation, User Authentication

8. User and Internet Relay Chat 1 Hrs.

Usenet - its components, News Groups, Searching and subscribing New Groups, News Servers

Concept of chatting and IRC, Client Software for Chat, Chat Servers, Smiley.

9. Web Publishing 4 Hrs.

Overview, web hosting, Documents Interchange Standards, Components of Web Publishing, Document Management, Web Page Design Consideration and Principles, Search Engines, How to register a Web Site on search Engines, Publishing Tools.

10. HTML 9 Hrs.

Document Layout, Header Elements, Section Headings, Block-oriented elements, Lists, Inline elements, Visual markup, Hypertext links, Uniform Resource Locators (URLs), Images, Forms, Tables, and Special Characters.

11. Introduction to Interactivity Tools 4 Hrs.

ASP, VB Script, JAVA Script, JAVA and Front Page.

12. Multimedia and Graphic 4 Hrs.

VRML and Authoring Tools for Graphic Web Editors.

13. Internet Management Security Concepts, Information Privacy and Copyright Issues 3 Hrs.

Overview of Internet Security; Firewalls. Internet Security Management Concepts and Information Privacy and Copyright Issues.

MOD 4.1 : PROGRAMMING AND PROBLEM SOLVING THROUGH 'C' LANGUAGE

Detailed Syllabus

1. Introduction to Programming 4 Hrs.

The Basic Model of Computation, Algorithms, Flow-charts, Programming Languages, compilation, Linking and Loading, Testing and Debugging, Documentation.

2. Algorithms for Problem Solving 12 Hrs.

Exchanging values of two variables, summation of a set of numbers, Decimal Base

to Binary Base conversion, Reversing digits of an integer, GCD (Greatest Common Division) of two numbers, Test whether a number is prime, Organize numbers in ascending order, Find square root of a number, factorial computation, Fibonacci sequence, Evaluate 'sin x' as sum of a series, Reverse order of elements of an array, Find largest number in an array, Print elements of upper triangular matrix, multiplication of two matrices, Evaluate a Polynomial.

3. Introduction to 'C' Language 4 Hrs.

Character set, Variables and Identifiers, Built-in Data Types, Variable Definition, Arithmetic operators and expressions, Constants and Literals, Simple assignment statement, Basic input/output statement, Simple 'C' programs

4. Conditional Statements and Loops 8 Hrs.

Decision making within a program, Conditions, Relational Operators, Logical Connectives, if statement, if-else statement, Loops : while loop, do while, for loop, Nested loops, Infinite loops, Switch statement, structured Programming

5. Arrays 6 Hrs.

One dimensional arrays : Array manipulation; Searching, Insertion, Deletion of an element from an array; Finding the largest/smallest element in an array; Two dimensional arrays, Addition/Multiplication of two matrices, Transpose of a square matrix; Null terminated strings as array of characters, Representation sparse matrices.

6. Functions 6 Hrs.

Top down approach of problem solving, Modular programming and functions, Standard Library of C functions, Prototype of a function : Formal parameter list, Return Type, Function call, Block structure, Passing arguments to a Function : call by reference, call by value, Recursive Functions, arrays as function arguments

7. Structures and Unions 6 Hrs.

Structure variable, initialization, structure assignment, nested structure, structures and functions, structures and arrays : arrays of structures, structures containing arrays, unions

8. Pointers 6 Hrs.

Address operators, pointer type declaratio,

pointer assignment, pointer initialization, pointer arithmetic, functions and pointers, Arrays and Pointers, pointer arrays.

9. Self Referential Structures and Linked Lists 4 Hrs.

Creation of a singly connected linked list, Traversing a linked list, Insertion into a linked list, Deletion from a linked list

10. File Processing 4 Hrs.

Concept of Files, File opening in various modes and closing of a file, Reading from a file, Writing onto a file.

M4.2 : PROGRAMMING THROUGH VISUAL BASIC

Detailed Syllabus

1. Integrated Development Environment

2 Hrs.

Elements of VB IDE : Menu bar, Toolbars, Project explorer, Toolbox, Properties window, Form designer, form layout, Immediate, Locals and Watch window, Edit, View, Run, Debug, Object Browser.

2. Managing Projects

4 Hrs.

Concepts of VB project, creating the Project, Opening, Renaming and Saving the projects. Elements of user interface, Designing the User Interface, creating forms and code modules, Aligning the controls.

Programming an application : Programming the command buttons, Label, TextBox, Grouping controls, and Running the application.

Visual development and event-driven programming : Common properties methods and common events.

Customizing the environment : Editor tabs, general tab, docking tab, and environment tab

3. Visual Basic Programming Elements 4 Hrs.

Variables : Declaring variables, Data Types, Converting variables types, User defined data types, Forcing variables declarations, scope of variables, Lifetime of a variable.

Constants; Collections objects, Arrays-Declaring Arrays, Sorting Arrays, Control Arrays, Dynamic Arrays.

Procedures : Sub procedures, and Function procedure. Control flow Statements, Looping Statements and iteration, Conditional Statements.

The Input / Output : Input Box, Output Box, Form Printing methods

4. Working with Forms

8 Hrs.

The appearance of forms, Form properties, Events, and Methods, Controlling one form within another.

Menus : Designing menus using Menu Editor, Programming menu commands, Using Access and shortcut keys, Popup Menus, Manipulating menus at runtime, Adding ToolBar, Mouse conflicts, Dragging list items, Connecting Menus to Event Procedures.

5. Basic ActiveX Controls

8 Hrs.

The TextBox control, Basic properties, Manipulating the control's text, Text selection, Search and replace operations, Capturing keystrokes.

List Box and ComboBox controls; Basic properties; Listbox control's Methods; Arrows, Indexing with the ListBox control, Searching a sorted list, ScrollBar and Slider controls, ScrollBar control, ScrollBar control's events, Timer Control.

Common Dialog Control : Color Common Dialog Box; Font dialog box, Open Dialog, Save As Common Dialog Boxes, Print Dialog Box, Help Common Dialog box, File controls.

6. Advanced ActiveX Controls

6 Hrs.

The Rich TextBox control : The RTF language, Text manipulation properties, The Rich TextBox control's methods, Text formatting properties, Text alignment properties.

The MS Hierarchical Flex Grid Control : Basic Properties, Working with Multiple Cells, Cell Appearance and Alignment, Sorting the grid, Merging cells.

7. Graphics with Visual Basic

4 Hrs.

Form, PictureBox, ImageBox controls, Sizing images : Loading and saving Images, Setting picture and image properties, Exchanging image through the clipboard.

Coordinate systems : Scale properties and methods. The Drawing Methods : Drawing text, Drawing lines, Drawing boxes, Circle Method, Drawing Modes, Drawing Curves, Manipulating pixels, Specifying colors, Specifying gradients, Using the Paint-Picture method.

Processing images, Optimizing issues : refresh Transparent Drawings.

8. Multiple Document Interface (MDI) 3 Hrs.

Feature of an MDI Forms, Loading MDI Forms and Child Forms. Positioning Child Forms. The ActiveForm Property. Tracking Child Windows.

Unloading MDI Forms with QueryUnload / UnLoad

9. Error Handling 3 Hrs.

Types of error, Error detection. Runtime error handling : Setting up error traps, writing an error handler, exiting an error handler, Err Object.

10. Windows APIs & DLL 2 Hrs.

Accessing the Win32 API. API Text Viewer, Dynamic-Link-Libraries (DLL) : Declaring a DLL Procedure, Calling a DLL Procedure, Special Considerations when calling a DLL with special data types.

11. Object Oriented Programming with Visual Basic. 10 Hrs.

Preliminary concepts : Classes, Instances, objects, Derived Classes and Base classes, Class inheritance, Dynamic binding, creating object variables, forms as classes, Creating & manipulating runtime controls, using the object browser, Object Linking and Embedding (OLE)

Building ActiveX Components : Modules and Class Modules, raising errors with in a class, Encapsulating Database Operations

Developing Active X Controls : User drawn and Existing Visual Basic Controls, The user control object, Designing a simple control, Designing and Using Property Pages, The lens-effect control, Intertnet-enabled controls.

12. Database Programming with Visual Basic 6 Hrs.

Client-Server Programming : File server vs Distributed client server, Advantages of Client / Server.

Using ActiveX Data Objects : Understanding of Universal Data Access, OLEDB, and ADO, Browse, Create, Delete records of a database using the ADO Data Control. ADO Recordset Objects, Cursor Types in ADO. Retrieve, Alter, Search Data using ActiveX Data Objects. Using Properties, Methods, Events, Events and Collections of the Recordset Objects. Using SQL : The format of SQL statements, Querying Data using SQL. Handle ActiveX Data Objects errors.

DOEACC "A" LEVEL COMPUTER COURSE

OBJECTIVE OF THE COURSE :

The Government of India has estimated a sharp growth in requirement of computer trained personnel in India. But Govt. has been suffering from the shortage of computer personnel at all levels & the shortfall cannot be met by the Govt. supported Institutions. With a view of fulfill the need, Govt. has offered ACCREDITATION to some reputed private and public sector institutions to conduct the "O-Level Course". After completion of the course participants will be confident enough to take up full time Computer career in any responsible position as "Computer Programmer Assistant". ICE(I) H.O. has been granted FULL ACCREDITATION by the DOE Govt. of India for the "A-Level Course" w.e.f. 02.04.97. vide Registration No. AFULL-002 ACCR No.-004.

BLOCK SYLLABUS - "A" LEVEL COURSE		
<i>Papers</i>	<i>Contents</i>	<i>Marks</i>
A-01	IT TOOLS AND APPLICATIONS	100
A-02	BUSINESS SYSTEMS	100
A-03	COMPUTER ORGANIZATION	100
A-04	" C " LANGUAGE / VISUAL BASIC	100
A-05	STRUCTURED SYSTEM ANALYSIS AND DESIGN	100
PRACTICAL	BASED ON PAPER A-01 TO PAPER A-04	100
A-06	DATA STRUCTURES THROUGH "C" LANGUAGE	100
A-07	INTRODUCTION TO DATABASE MANAGEMENT SYSTEMS	100
A-08	BASICS OF OS, UNIX AND SHELL PROGRAMMING	100
A-09	DATA COMMUNICATION & COMPUTER NETWORKS	100
A-10	INTRODUCTION TO OBJECT ORIENTED PROGRAMMING & C++ / INTRODUCTION TO OBJECT ORIENTED PROGRAMMING THROUGH JAVA / COMPUTER GRAPHICS	100
PRACTICAL	BASED ON PAPER A-05 TO PAPER A-10	100
	PROJECT	

"A" LEVEL SYLLABUS IN DETAILS

A-01 : IT TOOLS AND APPLICATIONS
Same as Module 1 of "O" Level Syllabus

A-02 : BUSINESS SYSTEMS
Same as Module 2 of "O" Level Syllabus

A-03 : COMPUTER ORGANIZATION

Detailed Syllabus

- 1. Digital Components 10 Hrs.**
Overview of computer organization : Logic gates, Adders, Flip-flops (as 1 bit memory device), Encoders, Decoders, Multiplexers, Registers, Shift Registers, Counters, RAM, ROM
- 2. Data Representation 4 Hrs.**
Number system, Hexadecimal numbers, ASCII code, Two's complement, addition, subtraction, overflow, Floating point representation.
- 3. Register Transfer & Micro Operations 4 Hrs.**
Bus and memory transfers, Three state Bus Buffers, Binary ADDER, Binary Incrementer, Arithmetic circuit, Logic and Shift Micro-operations, ALU
- 4. Basic Computer Organization 4 Hrs.**
Instruction codes, Direct and indirect address, Timing and Control Signal generation, Instruction Cycle, Memory Reference Instructions, Input Output instructions.
- 5. Central Processing Unit 8 Hrs.**
General Register Organization, Memory Stack, One address and two address Instructions, Data transfer, arithmetic, logical and shift instructions, Software and hardware interrupts (only brief introduction), Arithmetic and Instruction Pipelines.
- 6. Computer Arithmetic 6 Hrs.**
Addition and Subtraction with signed magnitude data, Multiplication Algorithms - Hardware Algorithm and Booth Algorithm, division Algorithm.
- 7. Input-Output Organization 8 Hrs.**
Asynchronous Data transfer - Handshaking, Asynchronous Serial Transfer, Interrupt Initiated I/O, DMA transfer, Interfacing

Peripherals with CPU (Introduction), Keyboard, Mouse, Printer, Scanner, Network card.

- 8. Memory Organization 8 Hrs.**
ROM, RAM, Hard Disk, CD-ROM, Cache Memory - Direct mapping scheme, Virtual Memory concept.
- 9. Assembly Language Programming 8 Hrs.**
Machine and Assembly Language, Turbo Assembler, Simple examples in Turbo Assembler.

A-04 : " C " LANGUAGE / VISUAL BASIC
Same as Module 4 of "O" Level Syllabus

A-05 : STRUCTURED SYSTEM ANALYSIS AND DESIGN

Detailed Syllabus

- 1. Introction 3 Hrs.**
System Definition and concepts: General Theory systems, Manual and automaned syhstems, Real-life Business Sub-Systems. System Environments and Boundaries. Realtime and distributed systems. Basic principles of successful systems. Approach to system development : Structured System Analysis and Design, Prototype, Joint Application Development.
- 2. Systems Analyst 1 Hrs.**
Role and Need of Systems Analyst. Qualifications and responsibilities System Analysis as a Profession.
- 3. System Development Cycle 3 Hrs.**
Introduction to Systems Development Life Cycle (SDLC). Various phases of SDLC : Study, analysis, Design, Development, Implementation, Maintenance Systems documentation consideration : Principles of Systems Decumentation, Types of documentation and their importance, Enforcing documentation discipline in an organization.
- 4. System Planning 6 Hrs.**
Data and fact gathering techniques : Interviews, Group Communication - Questionnaires, Presentations & Site Visits. Assessing Project Feasibility: Technical, Operational, Economic, Cost Benefits Analysis, Schedule, Legal and contractual, Political. Modern Methods for

determining system requirements : Joint Application, Development Program, Prototyping, Business Process Re-engineering. System Selection Plan and Proposal.

5. Modular and Structured Design 3 Hrs.

Module specifications. Top-down and bottom-up design. Module coupling and cohesion. structure Charts

6. System Design and Modeling 15 Hrs

Process Modeling, Logical and physical design, Conceptual Data Modeling : Entity-Relationship Analysis, Entity-Relationship Modeling, ERDs and DFDs, Concepts of Normalization. Process Description : Structured English, Decision Tree, Decision Tables. Documentation : Data Dictionary, Recording Data Descriptions.

7. Input and Output 8 Hrs.

Classification of forms, Input/output forms design. User-interface design, Graphical interfaces. Standards and guidelines for GUI design. Designing Physical Files and Data bases : Designing Fields, Designing Physical Records, Designing Physical Files, Designing Databases. Introduction to CASE Tools, Features, Advantages and Limitations of CASE Tools, Awareness about some commercial CASE Tools.

8. System Implementation and Maintenance 3 Hrs.

Planning considerations. Conversion methods, procedures and controls, System acceptance criteria. system Evaluation and Performance. Testing and Validation. Preparing User Manual. Maintenance Activities and Issues.

9. Computer System Audit and Security 2 Hrs

Audit of Computer System Usage. Types of Threats to Computer System and Control Measures : Threat and Risk Analysis, Disaster Recovery and Contingency Planning, Viruses.

10. OO Analysis / Design 10 Hrs

Introduction to UML OO Development Life Cycle and Modeling. Static and dynamic modeling. Comparison of OO and Module-oriented Approach. Modelling using UML.

11. Introduction to Management Information System (MIS) 6 Hrs.

Meaning and role of MIS. Systems approach to MIS.

Types of information systems : Transaction Processing System,

Management Information System, Decision support System, Expert System

Case Studies (Illustrative) : MIS for Accounting and Finance Function,

MIS for Marketing System.

A-06: DATA STRUCTURES THROUGH 'C' LANGUAGE

Detailed Syllabus

1. Basic concepts of data representation

3 Hrs

Abstract data types : Fundamental and derived data types. Representation, primitive data structures.

2. Introduction to Algorithm Design and Data Structures. 6 Hrs

Design and analysis of algorithm : Algorithm definition, comparison of algorithms. Topdown and bottom up approaches to algorithm design. Analysis of Algorithm; Frequency count, Complexity measures in terms of time and space. Structured approach to programming.

3. Arrays 5 Hrs

Representation of arrays : single and multidimensional arrays. Address calculation using column and row major ordering. Various operations on Arrays. Vectors. Application of arrays : Matrix multiplication, Sparse polynomial representation and addition.

4. Stacks and Queues 8 Hrs.

Representation of stacks and queues using arrays and linked-list. Circular queues, Priority Queue and D-Queue. Applications of stacks : Conversion from infix to postfix and prefix expressions, Evaluation of postfix expression using stacks.

5. Linked lists 8 Hrs

Singly linked list; operations on list. Linked stacks and queues. Polynomial representation and manipulation using linked lists. Circular linked lists, Doubly linked lists. Generalized list structure. Sparse Matrix representation using generalized list structure.

6. Trees 10 Hrs

Binary tree traversal methods : Preorder, In-order, Postordered traversal. Recursive and non-recursive Algorithms for above mentioned

Traversal methods. Representation of trees and its applications : Binary tree representation of a tree. Conversion of forest into tree. Threaded binary trees; Lexical binary trees. Decision and game trees. Binary search tree : Height balanced (AVL) tree, B-trees.

7. Searching, Sorting and complexity 10 Hrs

Searching : Sequential and binary searches, Indexed search, Hashing Schemes. Sorting : Insertion, selection, bubble, Quick, merge, radix, Shell, Heap sort. comparison of time complexity.

8. Graphs 10 Hrs

Graph representation : Adjacency matrix, Adjacency lists, Adjacency Multicasts, Traversal schemes : Depth first search, Breadth first search.

Spanning tree : Definition, Minimal spanning tree algorithms.

Shortest Path algorithms (Prime's and Kruskal's).

A-07:INTRODUCTION TO DATABASE MANAGEMENT SYSTEMS

Detailed Syllabus

1. Introduction to Database Management Systems (DBMS) 4 Hrs

Why Database, Characteristics of Data In Database, DBMS, What is database Advantage of DBMS.

2. Database Architecture and Modeling 3 Hrs

Conceptual, physical and logical database models, Role of DBA, Database Design.

3. Entity Relationship Model 2 Hrs

Components of ER Model, ER Modeling Symbols. Super Class and Sub class types, Attribute inheritance. specialization. Generalization Categorization.

4. Relational DBMS Model 3 Hrs

Introduction to Relational DBMS. RDBMS Terminology.

5. Database Normalization 6 Hrs

Keys, Relationships, first Normal Form., Functional dependencies, Second Normal form, Third Normal Form, Boyce-Codd Normal form, Fourth Normal Form, Fifth Normal form, Case study.

6. Relational Algebra and Relational Calculus 6 Hrs

Relational Algebraic operations, Tuple

Relational calculus, domain Relational Calculus.

7. Introduction to SQL 14 Hrs

History of SQL. Characteristics of SQL. Advantages of SQL. SQL in Action SQL data types and Literals. Types of SQL commands. SQL Operators and their precedence. Tables, views and Indexes. Queries and Sub queries. Aggregate functions. Insert, Update and Delete operations. Joins, Unions, Intersection, Minus. Cursors in SQL, Embedded SQL.

8. Back up and Recovery 6 Hrs

Database backups. Why plan backups? Hardware protection and redundancy. Transaction logs. Importance of backups. Database recovery. Data storage. Causes of failures. Recovery concepts and terminology. Recovery facilities. Recovery techniques. Detached transaction actions, Disaster Database Management System.

9. Database Security and Integrity 4 Hrs

Types of Integrity constraints. Restrictions on integrity constraints. Data security Risks. Complex user management requirements. Dimensions of security. Data security requirements. Database users. Protecting data with in the database. Granting and revoking privileges and roles. System viability Factors. Authenticating users to the database.

10. Design and Development of Database Applications on Commercial RDBMS Platforms : 12 Hrs

Student is expected to achieve a level of competence in at least one of the standard commercial RDBMS products under desktop or multi-user environment to be able to develop a small to medium application; the student must also acquire skills for independently designing on-line database applications. The skills required for design and development are; Database design. Applications design. SQL. Embedded SQL. Trouble-shooting. Performance tuning and documentation.

In application design, focus should be on on-line applications in database environments; the students should get sufficient insight into issues in menu design, screen design, data validations in data entry screens, report designs and an overview of GUI design. These skills must be demonstrated through the course project including the project report and viva-voce.

A-08: BASICS OF OS, UNIX AND SHELL PROGRAMMING

Detailed Syllabus

- 1. Operating System Concepts 8 Hrs**

Overview of OS. Services offered. System calls. Process management. Scheduling and Threads. Memory management. Swapping File System. Directory Structure. UNIX Architecture : Multi-user and multitasking. Kernel and shell. The file system. Relation between process and file. The building block approach the command line. Command Syntax. Internal & external commands The two schools (AT & T and Berkeley). The graphical user interface (GUI). seeking help (man), open source software and Linux.
- 2. The File System 3 Hrs**

Types of files in Unix. Structure of the file system. File System types. Parent-child relationship. Directory handling and navigation (mkdir, rmdir, pwd and cd). The PATH variable. Absolute and relative pathnames. The .and..directories. Creating, viewing (cat), copying (cp), renaming (mv) and deleting (rm) files. Listing files (ls), Viewing through pg, tail and head command.
- 3. File Attributes 2 Hrs**

Structure of the inode. Brief discussion on partitions and file systems. Analyzing the ls -l output. File type and permissions (chmod). Significance of directory permissions. Hard and soft Links (ln and ln -s). Concept of ownership. The /etc/passwd and /etc/group files. Changing ownership (chown and chgrp). Modification and access times. Default file and directory permissions (umask).
- 4. The vi Editor 3 Hrs**

The three modes. Basic navigation (h, j, k, l). Moving to a specific line number (G). The repeat factor. The input mode commands (i,a,r,s and o). Saving and quitting (:w, :x and :q). Text deletion (x and X). Using operators in deleting and copying text (d, y and p). Undoing and repeating commands (u and.). Pattern search (/and n) and substitution (:s). Moving text from one file to the other. Customization features : abbreviation (:abb), key mapping (:map) and setting vi parameters (:set). The file exrc.
- 5. The Shell as Interpreter 3 Hrs**

The major shells : Bourne Shell, C shell, Korn and Bash. The shell's interpretive cycle. Wild-
- 6. Process Management 4 Hrs**

cards. Escaping and quoting. Difference between single and double quotes. The three standard files and redirection (>, < and >>). Connecting commands with pipes (|). Command substitution. Shell variables and how they determine system behavior. Aliases and Command history, Environment variables, setting terminal (Sty.)
- 7. Networking Tools 6 Hrs**

Process basics, Process States, Process State Transition, Process Control Block (PCB). Parent-child relationship. The different segments of a process. Internal and external commands. Process creation basics (fork(), exec() and wait()). Role of init in process creation and in spawning user shells. Exporting variables (export) and consequences. Exit status of a process (\$?). Displaying process attributes (ps), Killing processes (kill), Running commands in background (& and nohup). Job control (fg, bg and [Ctrl-z]) scheduling processes (cron).
- 8. The X-Window System 12 Hrs**

Features of TCP/IP : reliability, retransmission, rerouting. The client-server mechanism. Hostnames and IP addresses. Role of /etc/hosts in host-address resolution. Advantages of using domains. DNS and the Internet domain structure. Testing network connectivity (ping). Email basics; the mail command. Remote login (telnet) and remote file transfer (ftp). The HTTP protocol and the World Wide Web. Hypertext, hyperlinks and markup. HTML concepts (very brief). Analysis of the URL.
- 9. Filters and Regular Expressions 3 Hrs**

The X Architecture : the reversed client-server mechanism. Role of the window manager. Common Desktop Environment. Running programs remotely using xhost and telnet. The DISPLAY variable and the display options of X Clients. Common X client options. The .xinitrc initialization file. Common x clients : xterm, xclock and xclipboard.
- 10. The awk Filter 3 Hrs**

Using wc, head, tail and cut commands. Translating characters (tr.) Specifying file and searching for a pattern (grep). Performing substitution (sed). Enhancing power of grep and sed with regular expressions.
- 10. The awk Filter 3 Hrs**

Selection criteria and action. Splitting a Line

into fields and using printf. Using regular expressions. Computation using decimal numbers. The BEGIN and END sections. Using arrays with both numeric and nonnumeric subscript. String handling using built-in functions. Programming constructs : if, for while. Using awk in pipelines.

11. Shell Programming 6 Hrs

Shell scripts, and execution methods. User's initialization file (profile and rc, etc.). The dot command. Interactive execution and command one arguments (\$1, \$2, etc). Meta Characters - syntactic (&&, (), & ll, ;;, <, > etc.), pattern matching, substitute shell variables. Quoting, Test Command. Control flow : For, if, While, Case. The Here document, String handling and computation using expr. Setting positional parameters (set command), and shift. Shell functions, Interrupt handling (trap), Korn and Bash shell features, let command, arrays.

12. C Programming Tools 4 Hrs

Compiling a C program (cc). Multi module programs. Header files. System Calls and Library functions. The I/O functions. Static and shared libraries. The make utility and makefiles. Creating archives (ar).

13. UNIX Internals 6 Hrs

Kernel basics, processes and files, system calls. User mode and kernel mode. The file system, disk architecture, block I/O. How inode stores all blocks of a file. File system layout. The Superblock. Process Management. The magic number. Kernel processes and user processes. Process states. Process table.

14. Administering File Systems 4 Hrs.

Device files. Block and character devices. Partitions and file systems (in detail). Types of file systems. Mounting local and networked file systems (mount, umount and ' etc/fstab). File system checking (fsck). Compressing files (compress, gzip and zip). Checking free space and disk usage (df and du). Finding files (find). Backing up files (tar, dump cpio, dd), creation of user, deletion of user.

15. General System Administration 3 Hrs

The role and powers of the system administrator. Becoming super user (su). User administration (useradd, usermod, userdel and passwd). Understanding /etc/passwd and /etc/shadow. Role of init in startup and shutdown.

Understanding /etc/inittab. Enforcing security with set-user-id and sticky bit.

A-09: DATA COMMUNICATION AND COMPUTER NETWORKS

Detailed Syllabus

1. Fundamentals of Data Communications 3 Hrs.

Introduction, Communication Systems, Signal and data, Channel Characteristics, Transmission modes, Synchronous and asynchronous transmission

2. Transmission Media 6 Hrs.

Guided Media (Twisted pair, Co-axial cable, Optical fiber), Unguided Media (Radio, VHF, microwave, satellite), Infrared Transmission, Fibre Optics Communication : Components (Source, Channel Detector)

3. Data Modems 4 Hrs.

Concept of Modulation, Pulse Code Modulation (PCM), Shift Keying [ASK, FSK, PSK, QPSK, DPSK], Encoding techniques and CODEC, Classification of Modems, Standards and Protocols, Protocols used by Modem to Transfer files, Establishing a Connection

4. Multichannel Data Communication 2 Hrs.

Circuits, channels and multichanneling, Multiplexing [FDM, TDM, CDM, WDM] Access Techniques (FDMA, TDMA, Spread Spectrum Techniques and CDMA), Digital hierarchies [SONET/SDH]

5. Networking Fundamentals 5 Hrs.

An overview of networking

Switching techniques : Circuit Switching, Packet switching, Datagram, Virtual circuit and Permanent Virtual Circuit, Connectionless and connection oriented communication, Message switching, Cell switching(ATM)

Network Topologies : Bus Topologies, Examples of bus topology : Ethernet, Local Talk, Ring Topology Examples of tokening topology IBM Token Ring, FDDI (Fiber Distributed Data Interface), Star Topologies, Example of Star Network : ATM (Asynchronous Transmission Mode)

6. OSI Model and TCP/IP Suite 9 Hrs.

Network architectures, Layering the communication process, The need for layered solutions, Open Systems Interconnection (OSI) model, TCP/IP protocol, Data

transmission by TCP and Ethernet, Data encapsulation, Data routing. An Error Reporting Mechanism - The Internet Control Message Protocol, (ICMP), User Datagram Protocol (UDP), TCP/IP services and applicaion protocols (The Client/Server Model, Telnet, File Transfer Protocol (FTP), Trivial File Transfer Protocol (TFTP), Simple Mail Transfer Protocol (SMTP), Network File System (NFS), Simple Network Management Protocol (SNMP), Domain Name System (DNS), Internet Architecture

7. Data Link Protocol 4 Hrs.

Protocol, Transmission Control Procedure : Synchronous Protocols, Asynchronous Data Link Control (DLC) Protocols.

Character Orientated Protocols (COP) : Binary Synchronous Protocol (Bisync or BSC)

Bit Orientated Protocols (BOP) : X.25 CCITT standard for packet data transmission, Synchronous Data Link Control Protocol (SDLC), High Level Data Control Protocol (HDLC), Transmission Control Procedure Types, Non-procedure, Basic Control Procedure, HDLC Procedure

8. Local Area Network (LAN) 8 Hrs.

Baseband versus Broadband, Media access control, LAN hardware, LAN operating systems, Transmission media.

Implementing LAN : Implementation of LAN using coaxial cables,

Implementation of LAN using twisted pair, Implementation of LAN using fiber optic cables, Implementation of LAN using wireless technology, Fast LAN, Nonstandard LANs

Extending LAN : Fiber Optic Extension, Repeaters, Bridges, Router, Gateways, Switching Hubs, Virtual LANs

9. Wide Area Network (WAN) 6 Hrs.

Network using WAN and network services : Host to Terminal Connection, LAN to LAN Connection, Remote LAN connection, LAN to LAN connection

Router concepts : Forwarding Function, Filtering Function

Routing Method (Static and dynamic routing)

Local Routing : ARP (Address Resolution Protocol) Table, Distributed routing, Hierarchical Routing, Distance-Vector Protocol, Link - State protocol, Communication protocols over WAN

10. Data Transmission Networks 8 Hrs.

Telephone networks : Dial up Telephone networks, Leased Line, X.25 The Integrated Services Digital Network (ISDN) : narrow band ISDN, Broadband ISDN Service Frame Relay, Congestion Control, Cell Relay, ATM Structure

11. Wireless Communication 3 Hrs.

Cellular Radio, Telephony (GSM), VSAT

12. Security and Privacy 2 Hrs.

Network Security, firewall, VPN

A-10.1: INTRODUCTION TO OBJECT ORIENTED PROGRAMMING AND C++

Detailed Syllabus

1. Principles of Object Oriented Programming (OOP) 3 Hrs.

Basic concepts of OOP, Comparison of procedural programming and OOP, Advantages of OOP, OOP Languages, Definitions : Class Objects, Concepts of inheritance and encapsulation, Operator overloading, Dynamic binding, Over view of OOP using C++, Basic program construction : main and functions, Program statements, Class declaration, Comments, C++ compilaition

2. Elements of C++ Language 6 Hrs.

Tokens and identifiers : Character set and symbols, Keywords, C++ identifiers, Variables and constants : Integers & characters, Constants and symbolic constants, Dyanamic initialization of variables, Reference variables, Enumerated variables. Data Types : Basic data types, Arrays and strings, User defined data types. Operators : Arithmetic relational operators and operator precedence, Logical operators, Manipulators, Type conversions and type cast operators, Console I/O : cin, cout functions, Control statements : The if statement, if-else;, else...if : switch statements, Loops : for and while-do statements, Break, continue, go to

3. Functions 6 Hrs.

Simple functions : Declaration of functions, Calling functions, Function definition. Passing arguments and returning values : Passing constants and variables, Pass by value. Return statement, types of functions, Passing and returning structure variables : Reference variables and arguments : Overloaded functions, Inline functions, Default arguments, Returning by reference.

- 4. Classes and Objects 6 Hrs.**
Declaration of classes and objects in C++, Class definition, Declaration of members : objects as date time, Objects as functin arguments, Array of objects, Returning objects from function, Structures and classes.
- 5. Constructors and Destructors 4 Hrs.**
Basic constructors, parameterized constructors with default arguments Dynamic initialization of objects, Use of copy constructor, Shallok copying and deep copying, Dynamic constructors, Destructors, Constrains on constructors and destructors
- 6. Operator Overloading 6 Hrs.**
Overloading unary operators : Operator keyword, Arguments and return vaues Laminations of increment operators. Overloading binary operators : Arithmetic operators Examples : Addition of polar coordinates and concatenation of strings. Multiple overloading, Comparison operators, Arithmetic assignment operators.
Data and type conversions : Conversion between basic types, Conversion between objects and basic types, Conversion between objects of different classes, Constraints on type conversion.
- 7. Derived Classes and Inheritance 8 Hrs.**
Derived classes and base class : Defining a derived class, Accessing the base class members. The protected access specifier. Derived class constructors. Overriding the member functions. Class hierarchies : Abstract base class, Constructors and member functions. Inheritance : Public and private inheritance, Access combinations and usage of access specifiers, Classes and structures. Multiple inheritance : Member functions in multiple inheritance, Constructors in multiple inheritance, Ambiguity in multiple inheritance.
- 8. Pointers 4 Hrs.**
Addresses and pointers : The address of operator & pointers variables, Accessing the variable pointed to pointer to void. Pointers and Arrays. Pointers and functions : Passing simple variables, Passing arrays, Pointers and strings : Pointers to string constants. Strings as function arguments, Arrays of pointers to strings. Memory management using new and delete operators. Pointers to objects. Pointers to pointers.
- 9. Virtual Functions 4 Hrs.**
Virtual functions and polymorphism, Friend functions, Static functions, Comparison or macros and inline function.
- 10. Streams 4 Hrs.**
Stream classes : Streams class hierarchy, Header files, los flags, Stream manipulators. String streams, Character stream classes, Object I/O, File streams, Disk I/O with member function
- 11. Exception Handling 3 Hrs.**
Use of exception handling, Try block, Catch handler, Throw statement, Exception specification.
- 12. Class Libraries 4 Hrs.**
Class Libraries : String class, Stack class, Container class hierarchy, Array class, Date. list and queue classes. User defined classes. Microsoft Foundation Classes (MFC) (Overview only)
- 13. Advanced Classes 2 Hrs.**
Templates : Generic functions, Generic Class, Template : class and Template functions. Over-riding of generic functions. Containers and Nested classes. Aggregation.
- 14. Testing and debugging simple programs 2 Hrs.**
- A-10.2: INTRODUCTION TO OBJECT-ORIENTED PROGRAMMING THROUGH JAVA.**
Detailed Syllabus
- 1. The JAVA Language 30 Hrs.**
- 1.1 Introduction to JAVA 02 Hrs.**
An overview of JAVA. JAVA Applets and Application.
Difference between Java Script and JAVA.
Object-oriented programming features.
- 1.2 Data types, Variable & Arrays 03 Hrs.**
Java Token & Keywords. Integers types. Floating point types
The JAVA class libraries, Declaring a variable. Dynamic initialization.
the scope and lifetime of variable. Type conversion and casting.
Arrays : One-dimensional arrays, Multidimensional arrays.
Alternative array declaration syntax.
- 1.3 Operators 2 Hrs.**
Arithmetic operations. The Bitwise operators.

	Relational operators. Boolean logical operators The assignment operator. The ? Operator Operator precedence		Applet fundamentals. The transient and volatile modifiers. Using instance of native methods.
1.4	Control statements	3 Hrs.	2. The JAVA Library
	Selection statements. Iteration statements. Jump statements.		2.1 String handling
			The string constructor. Special string operations Character extraction. String Searching & Comparison. Data conversion using value of (). String buffer.
1.5	Introduction classes and objects	4 Hrs.	2.2 Exploring JAVA Lang
	Class fundamentals. Declaring objects. Assigning object reference variables. Introducing methods. Constructors. The this keyword. Garbage collection. The Finalize () method. A stack class. Overloading constructors. Using objects as parameters. Arguments passing. Returning objects. Recursion.		Simple type wrappers. Runtime Memory management Array copy. Object. Clone () and the cloneable interface. Class & Class loader Math functions : Transcendental functions, Exponential Rounding functions, Miscellaneous math methods Compiler, Thread, thread Group and Runnable Throwable. Security manager.
1.6	Inheritance	4 Hrs.	2.3 The utility classes
	Inheritance basics. Member access and inheritance. Using super class. Creating a multilevel hierarchy. Method overriding. Dynamic method dispatch. Using abstract classes. Using final with inheritance. The object class.		The enumeration interface. Vector & Stack Dictionary. Hash-table. String tokenizer. Bitset. Date : Date comparison, String and time zones Random, Observer interface
1.7	Packages and Interfaces	3 Hrs.	2.4 Input/Output – Exploring JAVA I/O
	Packages : Defining a package, Understanding classpath, Importing Packages. Interfaces : Defining an interface, Implementing interfaces, Applying Interfaces, Variable in interfaces.		The JAVA I/O classes and interface. File Namefilter & Directories. I/O stream classes : File input stream, File output stream, Byte array input stream, Byte array output stream, Filtered streams Buffered streams : Buffered input stream, Buffered output stream, Push back input stream, Sequence input stream Print stream. Random Access File
1.8	Exception handling	3 Hrs.	2.5 Networking
	Exception handling fundamentals. Exception types. Uncaught exceptions. Using try and catch. JAVA's build-in exceptions User defined exception subclasses.		Socket overview. Reserved sockets, Proxy servers Internet addressing : Domain naming services (DNS) JAVA and the net : The networking classes and interfaces Inet address : Factory methods, Introspection TCP/IP server sockets. Data Grams : Datagram packet. Datagram server and client
1.9	Multithreaded Programming	3 Hrs.	
	The JAVA thread model. The main thread. Creating a thread. Alive () and join (). Suspend () and resume (). Thread priorities Synchronization. Interthread communication		
1.10	I/O, Applets and Other Topics	3 Hrs.	
	I/O Basics : Streams, The stream classes, The predefined streams, Reading console input, Writing console output, Reading and writing files.		

2.6 The applet class 05 Hrs.

The applet class. Applet architecture.
An applet skeleton : Initialization and termination, Overriding update ()
Status window
Handling events : The event class, Processing mouse events.
Handling keyboard events.
HTML applet tag. passing parameters to applets.
Applet context and show document (). The audioclip & appletstub interface
Outputting to the console

2.7 Swing 05 Hrs.

Swing & its features.
Text Fields, Buttons, Toggle Buttons. Check Boxes and Radio Buttons
Viewports, Scrolling, Sliders and Lists
Combo Boxes, Progress Bars, Tooltips, Separators and Choosers
Layered Panes, Tabbed Panes, Split Panes, and Layouts
Menus and Toolbars.
Windows, Desktop Panes, Inner Frames, and Dialog Boxes
Tables and Trees. Text Components.

2.8 Image 02 Hrs.

File formats
Image fundamentals : creating, loading and displaying
Image observer. Double buffering. Media Tracker

2.9 JAVA Database Connective (JDBC) 03 Hrs.

Introduction to JDBC. Type of JDBC connectivity
Accessing relational database from java programs
Establishing database connections

A10.3: COMPUTER GRAPHICS

Detailed Syllabus

1. Introduction and Applications 3 Hrs.

History (From simple picture to photo realism), What is CG, GUI
Applications : Presentation graphics, painting an drawing, photo editing, scientific visualization, image processing, digital art, education and training, entertainment, CAD in

architecture, mechanical engineering, aeronautical and automobile industry, simulation, animation, video games.

2. Graphic Devices 3 Hrs.

Display devices : Random-scan and Raster scan monitors, Color CRT, Plasma panel displays, LCD Panels,
Plotters, Film recorders, Graphics workstations, Display processors, Graphics software, Input/Output Devices, touch panels, light pens, graphics tablets.

3. 2 D Drawing Geometry 10 Hrs.

Mathematics for computer graphics : A brief concept of Trigonometry, Polar coordinates Parametric Functions, Vectors (scalar product, cross product), Matrices (scalar multiplication, matrix addition and multiplication, matrix inverse)

2D transformation : Use of homogeneous coordinate systems, Translation, scaling, rotation, mirror reflection, Rotation about an arbitrary point, Zooming and panning, Rubber band methods, dragging, Parametric representation of a line segment.

4. Conics and Curves 6 Hrs.

Bresenham's circle drawing algorithm, Generation of ellipses through transformation on circles, Curve drawing; Parametric representation, need for cubic curves, Drawing cubic Bezier and B-Spline curves (No derivations needed), Condition for smoothly joining curve segments

5. Graphic Operations 10 Hrs.

Windowport and viewport; Elimination of totally visible and totally invisible lines with respect to a rectangular window using line end point codes, Explicit line clipping algorithm, Sutherland cohen algorithm, Mid point subdivision algorithm

Filling : Stack based and queue based seed fill algorithms, Scan line seed fill algorithm, Generation of bar charts, pie charts. Character generation

6. 3D Graphics 10 Hrs.

Transformations : Right handed coordinate system with vertical y-axis, Transformation matrices for translation, scaling, and rotation around axes

Parallel Projection : Multiviews – front, top and side views, Oblique view – Projection on xy plane with rays along a given direction

Perspective Projection : Transformation matrix to yield one vanishing point perspective view with viewpoint lying on z axis. Effect of translating the object, Computing the vanishing point, Numerical examples

Hidden surface removal : Back face removal, Floating horizon technique

7. Animation 2 Hrs.

Basics of animation, Tweeking an Morphing

8. Graphic Standards 8 Hrs.

Introduction to Open GL. – Command Syntax, rendering pipeline, related libraries setting Windows to an arbitrary colour. Drawing point, line and polygon drawing dashed lines, learn use of vertex arrays specify desired colours. smoothly shading.

9. Multimedia 8 Hrs.

Concepts of hypertext/hypermedia

Multimedia applications : Education, video conferencing, training, entertainment, and electronic encyclopedias

Music and Sound : Audio Basic Concepts, Analog Vs digital Audio Basic Concepts

MIDI Hardware, MIDI Messages, MIDI File

Video : Basic Concepts, Analogue Video and Digital Video

Images and Graphics : Basic Concepts, Image Formats, Graphics Format, File Format, Image Quality and Graphic Systems

Compression; Image Compression, Compression Requirements, Standards (JPEG, MPEG and H. 261)

Multimedia Hardware – CD ROM, Audio speaker, Sound Card, Video Cameras, Scanners, Multimedia platforms

Currently available multimedia software

DOEACC "B" LEVEL COMPUTER COURSE

OBJECTIVE OF THE COURSE :

The course has been designed to take the participants through the full spectrum of computer studies & will impart an absolute & in-depth knowledge for various field of computer applications & management. After completion of this course participants will be confident enough to take up a full time computer career in responsible position as System Analyst / Software Engineer.

BLOCK SYLLABUS - " B " LEVEL COURSE

Semester I Papers	Contents	Marks
B1.1	IT TOOLS AND APPLICATIONS	100
B1.2	BUSINESS SYSTEMS	100
B1.3	COMPUTER ORGANIZATION	100
B1.4	" C " LANGUAGE / VISUAL BASIC	100
B1.5	STRUCTURED SYSTEM ANALYSIS AND DESIGN	100
PRACTICAL 1	BASED ON PAPER B1.1 TO PAPER B1.4	100

Semester II	BLOCK SYLLABUS - "B" LEVEL COURSE	
<i>Papers</i>	<i>Contents</i>	<i>Marks</i>
B2.1	DATA STRUCTURES THROUGH "C" LANGUAGE	100
B2.2	INTRODUCTION TO DATABASE MANAGEMENT SYSTEMS	100
B2.3	BASICS OF OS, UNIX AND SHELL PROGRAMMING	100
B2.4	DATA COMMUNICATION & COMPUTER NETWORKS	100
B2.5	INTRODUCTION TO OBJECT ORIENTED PROGRAMMING & C++ / INTRODUCTION TO OBJECT ORIENTED PROGRAMMING THROUGH JAVA / COMPUTER GRAPHICS	100
PRACTICAL 2	BASED ON PAPER B1.5 TO PAPER B2.5	100
PROJECT		
Semester III		
B3.1	MANAGEMENT FUNDAMENTALS AND INFORMATION SYSTEMS	100
B3.2	BASIC MATHEMATICS	100
B3.3	SOFTWARE ENGINEERING & CASE TOOLS	100
B3.4	OPERATING SYSTEMS	100
B3.5	NETWORKING & MOBILE COMMUNICATIONS	100
PRACTICAL 3	BASED ON PAPER B3.3 TO PAPER B3.5	100
Semester IV		
B4.1	COMPUTER BASED STATISTICAL & NUMERICAL TECHNIQUES	100
B4.2	DISCRETE STRUCTURE	100
B4.3	SOFTWARE TESTING AND QUALITY MANAGEMENT	100
B4.4	COMPUTER GRAPHICS & MULTIMEDIA	100
B4.5	INTERNET TECHNOLOGIES & TOOLS	100
PRACTICAL 4	BASED ON PAPER B4.3 TO PAPER B4.5	100

Semester V	BLOCK SYLLABUS - "B" LEVEL COURSE	
<i>Papers</i>	<i>Contents</i>	<i>Marks</i>
B5.1	PROFESSIONAL AND BUSINESS COMMUNICATION	100
B5.2	OBJECT ORIENTED DATABASE MANAGEMENT SYSTEM	100
B5.3	NETWORK MANAGEMENT & INFORMATION SECURITY	100
B5.4	ELECTIVE	100
B5.5	ELECTIVE	100
	ELECTIVE PAPERS	
BE1	EMBEDDED SYSTEM	
BE2	AI & APPLICATIONS	
BE3	E-BUSINESS	
BE4	PRINCIPALS OF MODELING & SIMULATION	
BE5	PARALLEL ARCHITECTURE & COMPUTING	
BE6	SOFTWARE PROJECT MANAGEMENT	
BE7	APPLIED BIO-INFORMATICS	
BE8	DIGITAL IMAGE PROCESSING	
BE9	ACCOUNTING & FINANCIAL MANAGEMENT	
BE10	APPLIED OPERATION RESEARCH	
Semester VI	PROJECT	

"B" LEVEL SYLLABUS IN DETAILS

Semester I & II - Same as "A" Level

B3.1: MANAGEMENT FUNDAMENTALS & INFORMATION SYSTEMS

Detailed Syllabus

- 1. Introduction to Management 2 Hrs.**
Understanding the meaning and definitions and Management. Nature of Management and art or science. Importance of Management in today's organization. An overview management processes – Planning, Organizing, Staffing, Directing, Coordinating and controlling, Evolution of Management Thought – the classical school. The Behaviour Approach, the Management Science Approach, the Contingency Approach and the systems Approach.
- 2. Planning 4 Hrs.**
Strategy, plan, policy and programs : purpose of planning, Mission, Vision and goal setting; and SWOT Analysis. Forecasting – need of forecasting in Planning; Types of Planning; and tools of Forecasting – Moving Average, Exponential Smoothing and Regression Models.
- 3. Organizing 6 Hrs.**
Principles and structure of organization, Theories and types of organization, Concept of Authority, Responsibility, Power Delegation & Centralisation of Authority, Span of Control Formal and informal organizations
- 4. Staffing 2 Hrs.**
Meaning nature and principles of staffing, Job Rotation, Job enrichment, Job enlargement
- 5. Directing (incl. Decision Making)**
Communications in the Organization, Motivational Theories, Leadership, Decision Making.
- 6. Controlling 2 Hrs.**
Concepts and Principle of Controlling, Basis Control Processes, Open Loop, Closed Loop and Feed forward Control Mechanisms, Essentials of a good control system.
- 7. Production and Operations Management 10 Hrs.**
Production planning, aggregate planning, MRP, Selective inventory control EOQ and ordering systems, Production methods – job, batch, flow, continuous production; CAM and FMS, Quality control – Quality Costs, Statistical Quality Control; Control charts and their uses.
- 8. Marketing Management 10 Hrs.**
Overview of Marketing function, Product, Price, Promotion and Distribution strategies, Marketing research and its role
- 9. Financial Management 10 Hrs.**
Accounting Principles, balance sheet and profits and loss statements. Working capital Management, Cost concepts, break even analysis, Investment decisions – Pay Back Period, NPV, IRR.
- 10. Human Resources Management 10 Hrs.**
Nature and Function of HRM, Human Resource Planning – HR information system, Performance appraisal System, Rewards and Incentive schemes
- 11. Information Systems, Organization, Management & Strategy 10 Hrs.**
Emergence of Digital Firm in the existing era of IT, information needs of management at various level of an organization, flow of information in the organization; top down, bottom up and integrated.
Approaches to information Systems : Technical Approach, Behavioural Approach and Socio Technical Approach.
Types of information Systems in Organization : Decision Support System, MIS, Expert System, Knowledge Management System, Transaction Processing System
Importance of information systems in supporting various level of business strategy formulations and decision makings. Software and Hardware Requirements for developing efficient information System. (It is expected that such discussion should cover the latest developments taking place in software and hardware).
- 12. Information Systems and Managerial Functional Areas 12 Hrs.**
Understanding various processes/decisions involved in Production and Operations management, and determining their information needs. Developing necessary information systems for Production and Operations management and their integration with the overall enterprise information systems.
Processes and decisions required for effective and efficient Sales and Marketing Management;

need for necessary information systems for them and their integration with other information systems in an organization.

Appreciating the information requirement of a finance manager for various financial decisions in an organization and how suitable information systems can be designed to meet their requirements; integration of financial information system with that of the enterprise information system.

Determining information requirements of a personnel manager and his/her need for necessary information systems for better decisions. Integrating Personnel Management related information systems with overall information system in an organization.

13. Current Issues in Information Systems 8 Hrs.

Role of Intranet and internet in the development of various information systems in an organization, E-Commerce, Enterprise Resource Planning (ERP), Role of information Systems in Supply Chain Management, Information Systems and Customer Relation Management (CRM).

B3.2 : BASIC MATHEMATICS

Detailed Syllabus

1. Complex Numbers 4 Hrs.

Complex number system, graphical representation, polar form, vector form, De Moivre's Theorem, roots of a complex number, complex conjugates. [1] Ch. 1.

2. Matrices and Determinants 9 Hrs.

Introduction to Matrices : Notion of matrix, sum and product of matrices, triangular scalar, diagonal matrices, identity matrix, transpose of a matrix, symmetric, skew symmetric and orthogonal matrices; Linear system of Equations; System of non-homogeneous equations, Gauss elimination method, Cramer's rule, systems of homogeneous equations : Rank of a Matrix : Linear independence and dependence of vectors, rank of matrix; Inverse of a Square Matrix : Adjoint, adjoint of a product minor of an adjoint, Inverse of a matrix, Gauss Jordan elimination method; determinants, Determinants; Determinants of square matrices and their properties, minors, cofactors, evaluation of determinants : The characteristics, equation of matrix : Characteristic roots and

characteristics vectors [1] \$6.1 - V6.7, [1] \$ 7.1 - \$ 7.3

3. Differential Calculus 15 Hrs.

Preliminaries : Binomial theorem, Trigonometric functions and their graphs, trigonometric formulae. Real numbers and real line, coordinates, equation of a line and circle, functions, shifting graphs, a^x , $\log_a x$ trigonometric functions [2a] \$9.1 - 9.2[2a]\$10.1,\$ 10.6,[2b] \$5.1 - 5.6 [3] \$P1 - 5.

Limits and Continuity : Rate of change and limits, rules for finding limits, L'Hospital's rule. continuity, tangent lines. [3] \$1.1 - 1.6.

Derivatives : Derivative of a function, differentiation rules, implicit differentiation, mean value theorem, extreme values, asymptotes. [3] \$2.1,2,2.4, 3.1 - 3.3, 3.5

4. Integral Calculus 12 Hrs.

Integration : Indefinite integrals, Technique of integration-basic formulas integration by parts, partial fractions, trigonometric substitutions, integration by substitution, definite integrals, statement (only) of fundamental theorem, properties of integrals, area, evaluating definite integrals. [3] \$4.1, 4.3, 4.6, 4.7, 4.8

5. Infinite Series 8 Hrs.

Infinite Series : Limits of sequences and series, theorems for calculating limits, infinite series, integral test ratio test, comparison test, alternate series, Taylor and Maclaurin series. [3] \$8.1 - 8.7, 8.9

6. Analytical Geometry 8 Hrs.

Conic Sections, Parameterized curves, Polar coordinates : Conic sections and quadratic equations, classifying conics,. [3] \$9...1, 9.2

7. Vectors 4 Hrs.

Vectors in plane, Cartesian coordinates and vectors in space, dot products and cross products. [3] \$10.1 - 10.4

Note : Use of a software package such as Matlab/Maple/the software supplied with the supplementary reaching [1] is strongly encouraged.

B3.3 : SOFTWARE ENGINEERING & CASE TOOLS

Detailed Syllabus

1. Software Engineering Fundamentals 4 Hrs.

Definition of software product and process. Software Crisis, Software development paradigms, Software lifecycle models : Build & Fix Model, Waterfall Model, Prototyping

Model, Iterative Enhancement Model, Evolutionary Development Model and Spiral Model.

2. Software Requirements Analysis & Specification 8 Hrs.

System specification, Software requirements specification (SRS) standards, Formal specification methods, Specification tools, Requirements validation and management.

3. Software Process 4 Hrs.

Software Process and Models, Tools and Techniques of Process Modeling, Product and Process.

4. Software Design 6 Hrs.

Software architecture, Modular design - cohesion and coupling, Process - oriented design, Data-oriented design, User-interface design, Real-time software design.

5. CASE Tools 4 Hrs.

Relevance of CASE tools, High-end low-end CASE tools, Automated support for data dictionaries, DFD, ER diagrams.

6. Coding and Testing 6 Hrs.

Choice of Programming languages, Coding standards, Introduction to Testing Process, Functional & Structural Testing Activities like Unit, Integration & System Testing, Testing tools and workbenches.

7. Configuration Management 5 Hrs.

Concepts in Configuration Management, The Configuration Management Process : Planning and setting up configuration Management, Perform Configuration Control, Status Monitoring and Audits.

The ACIC Configuration Management Plan.

8. Software Maintenance 6 Hrs.

What is software maintenance, Maintenance Process & Models, Reverse Engineering, Software Re-engineering, Configuration Management issues and concept, Configuration planning & techniques, Software versions and change control process, Documentation.

9. Software Quality and Metrics 5 Hrs.

Software quality assurance, Debugging and reliability analysis, Program complexity analysis, Software quality and metrics.

10. Object-oriented SW Engineering 6 Hrs.

OO Concepts and Approach, OO Analysis, Domain Analysis, OOA Process and Object

Models, OO Design, System Design process and models, Design patterns. Quality Assurance and Metrics, Testing and Verification of OO programs.

11. Advance Software Engineering Topics 6 Hrs.

Cleanroom approach and strategy, Functional specification and design, Component-based software engineering process, Reusability and Metrics, Reengineering Essentials, Software Agents.

B3.4: OPERATING SYSTEMS

Detailed Syllabus

1. Overview 8 Hrs.

Introduction : Operating Systems, Multi programmed Batched system, Time sharing systems, Parallel and Distributed Systems, Real Time Systems, Computer System Structures : I/O structure, Structure, Storage Hierarchy, Hardware, Protection, General System, Architecture.

Operating System Structures : System components, Operating System Service System Calls, System programs, System Structure, System Design and Implementation, System Generation, Virtual Machines.

2. Process Management 10 Hrs.

Processes : Process Concept, Process Scheduling, Operation on Processes, Cooperating Processes, Interprocess Communication.

CPU Scheduling : Scheduling Criteria, Scheduling Algorithms, Multiple Processor Scheduling, Real Time Scheduling, Algorithm Evaluation.

Process Synchronization : The Critical Section Problem, Synchronization Hardware, Semaphores, Classical Problems of Synchronization, Critical Regions, Monitors.

Deadlocks : Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock, Combined Approach to Deadlock Handling.

3. Storage Management 10 Hrs.

Memory Management : Logical versus Physical Address Space, Swapping, Contiguous Allocation, paging, Segmentation, Segmentation with paging.

Virtual Memory : Demand Paging, Performance of Demand Paging, Page

Replacement Algorithms, Thrashing, Demand Segmentation.

File System Interface : Access Methods, Directory Structure, Protection, Consistency Semantics.

File System Implementation : File System Structure, Allocation Methods, Free Space Management, Directory Implementation, Efficiency and Performance, Recovery.

4. I/O Systems 8 Hrs.

I/O Systems : I/O Hardware, Application I/O Interface, Kernel I/O Subsystem, Transforming I/O Requests to Hardware Operations, Performance

Secondary-Storage Structure : Disk-Structure, Disk Scheduling, Disk Management, Swap-Space Management, Disk Reliability, Stable Storage Implementation.

Tertiary-Storage Structure : Tertiary-Storage Devices, Operating-System Jobs, Performance Issues

5. Distributed Systems 10 Hrs.

Network Structures : Topology, Network Types, Communication, Design Strategies.

Distributed System Structures : Network Operating Systems, Distributed Operating Systems, Remote Service, Robustness, Design Issues.

Distributed File Systems : Naming and Transparency, Remote File Access, Stateful versus Stateless Service, File Replication.

Distributed Coordination : Event Ordering, Mutual Exclusion, Atomicity, Concurrency Control, Deadlock Handling, Election Algorithms, Reaching Agreement

6. Protection & Security 8 Hrs.

Protection : Goals of Protection, Domain of Protection, Access Matrix, Implementation of Access Matrix, Revocation of Access Rights.

Security : The Security Problem, Authentication, One-Time Passwords, Program Threats, System Threats Threat Monitoring, Encryption, Computer-Security Classifications.

7. Case Studies 6 Hrs.

The Unix System, The Linux System, Window NT.

B3.5: NETWORKING AND MOBILE COMMUNICATIONS

Detailed Syllabus

1. Overview of Computer Networks 6 Hrs.

Overview of OSI Model : Significance of Layered Model, PDUs, SDUs, IDUs, Higher Layer Protocols.

Network Classification, Switching and Components

2. Multiple Access Technologies for Wireless Communication 4 Hrs.

FDMA, TDMA : Fixed TDM, Pure ALOHA and Slotted ALOHA

CDMA : Spread Spectrum Techniques

3. Mobile Data Communication 10 Hrs.

Cellular Telephony, Radiopropagation : Small Scale Fading and Multipath Fading, Speech Coding, Error Coding and Error Correction.

Mobility Management, Hand off Management : Soft Hand off and Hard Hand off. Switching and authentication, MTSO Interconnections.

Circuit Switched Data Services on Cellular Networks, Packet Switched Data Services on Cellular Networks.

4. Personal Wireless Communication Systems 5 Hrs.

Personal Communication Systems (PCS) Architecture, Cordless Telephony (CT2), Digital Enhanced Cordless Telecommunications (DECT), Personal Access Communication System (PACS), Personal Handy Phone System (PHS).

5. Digital Cellular Systems and Standards (2G) 10 Hrs.

Global System for Mobile Communication (GSM) System Overview : GSM Architecture. European TDM, Digital Cellular Standard, GSM Protocol model, GSM mobility management, Short Message Service (SMS) security aspects.

Analog Mobile Phone Service (AMPS) : IS - 136 North American TDMA Standard.

Code Division Multiple Access (CDMA) : IS95 Digital Cellular Standard.

General Packet Radio Service (GPRS) : GPRS Architecture, GPRS Network, Inter faces and Procedures (2.5G).

6. Third Generation Mobile Services (3G) 6 Hrs.

UMTS and International Mobile Telecommunications (IMT-2000), W-C DMA and CDMA 2000, Quality of Service in 3G.

7. Wireless Local Area Networks (WLAN) : IEEE 802.11 8 Hrs.

Components and working of WLAN, Transmission Media for WLAN : Radio Waves, Narrow Band Technology, Direct Sequence Spread Spectrum Technology (DSSS), Frequency Hopping Spread Spectrum technology (FHSS), Infracted technology.

IEEE 802.11 standards and WLAN types : Ad-hoc WLAN, Infrastructure WLAN.

Protocols for WLAN : MACA Protocol, MACAW Protocol.

8. Wireless Application Protocol (WAP) 4 Hrs.

WAP Model and Architecture, WAP Gateway, WAP Protocols and WML, Introduction to Bluetooth technology.

9. Wireless in Local Loop (WLL) 2 Hrs.

WLL Architecture, WLL Technologies, WLL Products,

10. VSAT systems and Networks Security 5 Hrs.

Satellite as a switch, Components of VSAT system, VSAT topologies and Access schemes, Network Security : Cryptography, Symmetric key, public-private key Algorithms, Security in Wireless Communication.

B4.1: COMPUTER BASED STATISTICAL & NUMERICAL TECHNIQUES

Detailed Syllabus

I. Numerical Techniques 15 Hrs.

1. Data Representation 2 Hrs.

Fixed point numbers, Floating point numbers, Finite Data representation.

2. Systems of Linear Algebraic Equations 7 Hrs.

Matrix equation, Methods of triangular matrices, Cramer's rule, Gauss elimination with row pivoting, Jacobi and Gauss-Seidel iterations.

3. Interpolation 3 Hrs.

Lagrange interpolation, Newton's general interpolating formula.

4. Numerical Integration 3 Hrs.

Trapezoidal rule, Simpson's rule

II. Statistical Techniques 45 Hrs.

5a. Probability Theory I 5 Hrs.

Sample spaces, Events, Rules of probability, Conditional probability, Independent events,

Baye's Theorem, Probability distributions, Continuous random variables, Probability density functions, Expected value of a random variable, Moment, Moment generating functions, Product Moments, Covariance.

5b. Probability Theory II 5 Hrs.

Multivariate distributions, Marginal distributions, Conditional distributions

6. Special Probability Distributions 10 Hrs.

Bernoulli distribution, Binomial distribution, Poisson distribution, Geometric distribution, Uniform distribution, Exponential distribution, Gamma distribution, Chi-square distribution, Sampling Distribution, Normal distribution, Bivariate Normal distribution

7. Distribution of the mean, Distribution of the mean : finite population, Chi-square distribution, t-distribution, F-distribution, Order statistics, Central Limit Theory, Algorithmic computation of statistical parameters.

8. Estimation 5 Hrs.

Unbiased estimators, Method of moments, Method of maximum likelihood.

9. Hypothesis Testing 6 Hrs.

Testing statistical hypothesis, Losses and risks, Tests concerning proportions, Test Concerning, Tests concerning differences between means, Tests concerning variances. Goodness of fit.

10. Correlation & Regression 4 Hrs.

Correlation & Linear regression, Method of least squares

Note : In practical the candidates should be exposed to the use of Statistical Software like Excel, SPSS, SAS, Matlab Mathematics etc.

B4.2 : DISCRETE STRUCTURES

Detailed Syllabus

1. Sets, Relations & Functions 8 Hrs.

Sets, subsets & operations to sets, finite and infinite sets. Relations & properties of relations, equivalence, compatibility, partial order relation, Poset, lub, glb, maximal & minimal elements of a poset. Functions, inverse functions, composition of functions, recursive functions.

2. Mathematical Logic 8 Hrs.

Logic operators, Truth tables, Normal Forms, Propositional Calculus, Theory of Inference and deduction, Predicate Calculus.

3. Boolean Algebra 6 Hrs.

Boolean functions, min & max terms,

simplification of Boolean function with Karnaugh Map & Quine McClusky method, Lattices.

4. Number Theory 5 Hrs.

Greatest Common Divisors, Euclidean Algorithms, Fibonacci Numbers, Complexity of Euclidean Algorithms, Congruences and Equivalence Relation, Public Key Encryption Schemes, Dividends.

5. Groups & Subgroups 7 Hrs.

Group axioms, permutation groups, subgroups, cosets, normal subgroups, semi-groups, free semi-groups, monoids, sequential machines, error correcting codes, modular arithmetic grammars.

6. Combinatorics & Recurrence Relations 9 Hrs.

Basic Theorems on permutation and combinations. Pigeon hole principle, principle of inclusion and exclusion, Ordinary & exponential generating functions, recurrence relation, solving recurrence relation by substitution, solving recurrence relation by conversion to linear recurrence relation.

7. Graph theory 10 Hrs.

Basic definitions trees and graphs, connectivity of a graph, cut points, cycles, Hamiltonian graph, Trees, different characterization of trees, bipartite graph, planar and Dual graphs. Euler theorem. Algorithms on graphs and trees like Breadth first search & Depth first search, Dijkstra's algorithm for shortest path, Floyd's algorithm for all pair shortest paths, Kruskal's and Prim's algorithm for Minimum cost spanning tree.

8. Finite State Machines and Languages 7 Hrs.

Languages, Representation of Special languages and Grammars, Finite State Machines, Semigroups, machines and Languages. Machines and Regular Languages, Simplification of Machines.

B4.3 : SOFTWARE TESTING AND QUALITY MANAGEMENT

Detailed Syllabus

1. Testing Software 2 Hrs.

Software Testing and its importance, A Brief History of Testing, Module Testing, Integration Testing, Top-down versus bottom up testing, Mixed testing, Comparison of Various methods.

2. Software Faults and Failures 4 Hrs.

Types of faults, Origins of Software Defects.

The Cost of Repairing Defects, Minimizing the Costs of Repairing Defects, Classifying Defects and Defect Metrics, The Defect Tracking System.

3. Verification and Validation 6 Hrs.

Verification Testing, Coding standards, Walk-Through, Formal Inspection, Verifying Requirements, Verifying Functional Design, Validation Test Criteria, Design metrics, Correctness Proofs.

4. Testing Techniques and Strategies 10 Hrs.

White-Box Testing : Flow graph notation, Cyclomatic Complexity, Graph matrices, Control Structure and Loop Testing, Dataflow

Testing. Black-Box Testing : Graph-based testing methods, Equivalence partitioning, Boundary Value Analysis, Orthogonal Array testing.

Unit Testing, Integration Testing, System Testing, Exhaustive Testing, The Debugging Process, Metrics and Quality Assurance of Tests.

5. Building Tests and Test Plans 8 Hrs.

Designing and Creating Tests, Maintaining Checklists, White-box Test Cases and Test Procedures, Test Data Selection and Outputs, Black-box test cases and test procedures, Input and Output Events, Error Guessing, Planning and Creating Test Plans.

6. Testing Specialized Systems and Applications 10 Hrs.

Graphical User Interface (GUI) Testing, Usability Testing, Client/Server Architectures and Web Testing, Testing OO Systems, Data Warehouse Testing, Volume and Stress Testing, Testing for Real Time and Embedded Systems.

7. Testing Measurements and Tools 8 Hrs.

Why We Measure, Test Standards, Software Size and Complexity, Function Point Analysis, Complexity Measures, Test Coverage metrics, Product Defects, Process Measures.

Test Tools : Test Planning and Management Tools, Static Analyzers, Test Data Generators, Coverage Analyzers.

8. Quality Assurance and Standards 12 Hrs.

Quality and Quality Assurance (QA), Techniques of quality Assurance, Software Testing and QA, Software Development Models, Configuration Management, Quality management models (ISO, SPICE, IEEE, and

CMM), Quality Models for Websites, Software and Quality Metrics, Software Reliability.

B4.4 : COMPUTER GRAPHICS AND MULTIMEDIA SYSTEMS

Detailed Syllabus

1. Graphics Hardware 3 Hrs.

Colour Monitor, Graphics Accelerator cards.

2. Transformation and Projections 12 Hrs.

Matrix Representation and Homogeneous Coordinates, Two-Dimension Transformation.

Composite Transformations, Transformations Relative to a Fixed point, Reflections.

Line Drawing – Bresenham's Algorithm.

Three-Dimensional Transformations

Projections : Parallel, Perspective and Isometric Viewpoints.

3. Clipping 4 Hrs.

Sutherland-Cohen Algorithm, Cyrus-Beck Algorithm.

4. Hidden Line and Surface Removal 6 Hrs.

Z-Buffer-Algorithms, Depth Sort (Painter's Algorithm), Area Subdivision Method.

5. Curves and Surfaces 10 Hrs.

Curves : Circle Drawing, Parametric Curves, Bezier Curves and B-Spline Curves.

6. Light and Shading Models 6 Hrs.

Illumination Modeling, Shading Models for Polygons, Shading Algorithms : Flat Gouraud and Phong. Ray Tracing.

7. Graphics Standards Open GL 6 Hrs.

Introduction to Open GL : Command Syntax, Rendering, Pipeline, Drawing Point, Lines, Polygon, Curve Drawing, Smooth Shading.

8. Multimedia 13 Hrs.

Introduction to Multimedia : Hardware Networking, Software-Applications, Environment, CD-Rom, WROM Optical Drives, Flat Panel Displays.

Non Temporal Media : Text, Hypertext, Images, Images Operations, CCD Cameras, Scanner, Frames, Grabbers, Formats.

Audio : Digital Audio, Wave Files, Music MIDI.

Graphics Animation : Tweaking, Morphing Simulation Acceleration, Motion Specification.

Video : Analog Video-Operations, Digital Video, compression, MPEG, JPEG, Operations.

Multimedia Authoring Systems.

B4.5 : INTERNET TECHNOLOGIES AND TOOLS

Detailed Syllabus

1. Introduction to Internet and its Applications 4 Hrs.

History of Internet, Internet Architecture : How Domain Name System Works, How Routers Work, Internet's Client/Server Architecture.

Internet Service Providers, Accessing the Internet, Applications and Services, ISDN, Internet/Television Connection, Network Computers (NCs), Digital Subscriber Line (DSL), Satellite and Palmtop Connections

2. Internet Infrastructure 4 Hrs.

Communication media, Backbone, Network Access Points, Points of Presence Internet Servers, Remote Access Servers, RADIUS, Domain Name Service.

3. Internet Protocols 8 Hrs.

Layered Protocol Architecture, TCP/IP, SMTP, FTP, HTTP

4. Internetworking with TCP/IP 6 Hrs.

Internet Addressing, DHCP and Static IP, IP Address Classes, IP Subnets, Routing Protocols-BGP, IGRP, OSPF, Address Resolution Protocol (ARP)

5. IP Networks QOS and Multimedia Applications 6 Hrs.

RSVP, MPLS, VOIP, MGCP

6. Internet Protocol Version 6 (IPv6) 4 Hrs.

Addressing Format, Routing, ICMP, DHCP, Plug & Play Support in IPv6, Real-Time Support in IPv6.

7. IP Multicasting 4 Hrs.

Reverse Path Forwarding (RPF), Multicast Addressing, Internet Group Membership Protocol, Multicast Discovery Protocol.

8. Internet Security 4 Hrs.

SNMP, Proxy Servers, Firewalls, VPN, Smurf Attacks, on ISP : How Virus works on Internet, How Cookies, Passports and Web Tracking Work, Cryptography, Privacy and Digital Certificates, Parental Controls on the Internet.

9. World Wide Web 10 Hrs.

Uniform Resource Locator, Web Pages, Web Servers, Web Browser, URLs, Imagemaps and Interactive Forms, Working of Web Sites with Databases, Search engines and Search techniques, How Hypertext Works, SGML,

HTML, VRML. Scripting Languages : Client side scripts, Serverside scripts.

Web Graphics : GIF Format, JPEG Format

Dynamic HTML, SGML, Active Server Pages, Extensible Markup Language (XML), Telnet, FTP and Downloading files, Push Technology, Agents, How Programming Languages work, CGI, Java Applets, ActiveX, Java Script, Visual Basic Script, Pert Script

10. communicating on the Internet 4 Hrs.

How Email works, Email Spam and Blocking, Usenet Newsgroups Work,

Internet Chat and Instant Messaging, Phone Calls on the Internet

11. Internet Multimedia Technologies 6 Hrs.

Multimedia : Definitions, Requirements, Inherited Constraints of Internet, Audio and Video on the Internet, Standardized data

Formals for Multimedia, Multimedia Compression : JPEG, MPEG, Streamed Data Transfer, Multicast IP and Mbone, Virtual Reality, Animation on the Web.

B5.1: PROFESSIONAL AND BUSINESS COMMUNICATION

Detailed Syllabus

1. Introduction 2 Hrs.

What is Communication?

Goal of Communication.

Effective Communication.

Communication Competence

2. Forms of Technical Communication 4 Hrs.

Technical Reports

Forms, Memos, Letters, and e-mail

Graphics

Reports

3. Communication Processes 12 Hrs.

Oral Communication techniques

Public speaking skills

Negotiating skills

Facilitator and participant skills in meetings

Written Communication techniques and principles.

Reading and Comprehension skills.

4. The Art of Listening 4 Hrs.

Benefits of Effective Listening

Hearing versus Listening

A Model of Listening

Gender Differences and Listening

Assessing Your Listening Effectiveness

Improving YOur Listening Skills

How to Talk So that Others Will Listen

5. Interpersonal Network 4 Hrs.

Defining Interpersonal Communication

The Impact of Conversations on Relationships

Formal and Informal Communication

Vertical versus Horizontal Organizations

Communication Styles

Communication Climate

Job Productivity and Satisfaction at Work Place.

Building Interpersonal Skills in the Workplace.

6. Communication in Groups and Teams 4 Hrs.

The Elements of Successful Group Communication

Types of Small Groups Operaing in an Organization

Demographic Variables That Affect Group Life

The Group Decision-Making Process

Tools for Effective Problem Solving

Performing Effectively in Teams

Managing Meeting Mania

How to Stand Out at Someone Else's Meeting

7. Resumes and Interviews 2 Hrs.

Introduction to Resumes

Cover Letters

The Employment Interview

Surviving the Group Employment Interview

The Informational Interview

The Performance Appraisal Interview

8. Making Presentations I 2 Hrs.

Facets of Professional Presentations

Understanding Your Audience and the Speaking Occasion

Establishing Your Presentation Goals

Selecting the Best Format for Your Presentation

9. Making Presentations II 4 Hrs.

Brainstorming

Developing Logical Sequences for YOur Messages

Supporting Ideas : Generating Appeals and Gathering Evidence.

Setting and Achieving Your Image Goals : Optimizing Your PERC-Quotient.

10. Managing Techno-Life 2 Hrs.

Changing Role of Communication Technology in the Workplace.

Communication Competence and Life-Long Learning

Communication Technology Today

Human Technology and the Virtual Office

Techno-Life in the next decade.

B5.2 : OBJECT ORIENTED DATABASE MANAGEMENT SYSTEMS

Detailed Syllabus

1. Overview of Object Oriented Concepts

Need for Object Oriented Programming :

Procedural Languages, The Object Oriented Approach, Advantages of Object Oriented Programming.

Characteristics of Object Oriented Languages : Objects, Classes, Inheritance, Reusability, New Data Types, Polymorphism and Over Loading.

2. Object Oriented Analysis and Design

8 Hrs.

Object Structure Concepts : Object Or User Defined Types, Object Identifiers.

Attribute Types (Literal Multimedia), Relationships, Object Behavioural Concepts.

Methodology for Object Oriented Design : Booch Methodology, Chen and Chen Methodology, Collections and Aggregates, Composite Objects. Object clustering, Integrity Constraints & Use, Instance Operations Extensibility class or Type Operations Extensibility.

Design Modelling, System Design Life Cycle : Model Type, Iteration Hierarchy, Packaging Strategy, Check Pointing Strategy.

3. Object Oriented Programming 6 Hrs.

An Overview of C++ Programming/Smalltak/Java, Loops and Decisions, Structures and Functions, Objects and Classes, Arrays and Pointers, Inheritance, Virtual Functions.

4. Overview of Advanced Database Technology 12 Hrs.

Traditional Database Models & SQL : Limitations of Relational Model – Need for Object Orientation; Conceptual Database Design : ANSI/SPARC3 Level Architecture : Logical Database Design and Physical and Database Design – Overview.

Transaction Processing : Types of Failures of Applications, Definition of Transaction Schedules and Recoverability, Serialisability of Schedules, Levels of Transaction Consistency, Deadlocks, Nested Transaction, Long Duration Transactions, Transaction Performance, Transaction Bench Marking, Transaction as implemented in Contemporary Database Management Systems.

Distributed Data Bases : Motivation for Distributed Databases, Distributed Databases Concepts, Types of Distribution, Architecture of Distributed Databases, Design of Distributed Databases, Distributed Query Processing, Recovery in Distributed Systems, commit

Protocols for Distributed Databases, Multi-Database Systems, Federated Databases. Asynchronous Replication Concepts; Distributed Database Features in Contemporary Database management Systems.

Emerging Database Trends : Object-Oriented Databases, Active Databases Deductive Databases, Concepts of Next Generation Databases, Data Warehouses, Online Analytical Processing (OLAP) and Executive information Systems, Graphic User Interface (as COGNOS), Data Mining, Parallel Query Processing : Multi-media databases.

5. Object Oriented Database Systems (including Object Relational Database Systems)

Relational vs Object Oriented Database Systems : Semantic Database Systems, Object Hierarchies – Generalization, Specialization, Aggregation, E-R model, RM/ T, SDM, SAM, Daplex, IFO.

The architecture of Object Oriented Database, Query Languages for OO Database Gemstone/ 02/Orion/Objectstone, Object Relational Database Management System (ORDBMS) – Oracle 8i, 9i, DB2.

6. Distributed Object Oriented Systems Standards (OMG & CORBO) 6 Hrs.

Object Management Group (OMG), ODMG Compliance, CORBA.

7. Security Authorization 3 Hrs.

Security Granularity, US-DOD Certified Security Compliance, Security Implementation, Private or Personal Database Authorization.

B5.3: NETWORK MANAGEMENT & INFORMATION SECURITY

Detailed Syllabus

1. Introduction to Information Security 4 Hrs.

Attributes of Information Security : Confidentiality, Integrity, Availability.

Threats & Vulnerabilities : Unauthorized Access, Impersonation, Denial of Service, Malicious Software; Trap Doors, Logic Bomb, Trojan, Horses; Viruses, Worms & Bacteria : Security Strategies & Processes; Importance of Security Policies and Audits.

2. Identification & Authentication 5 Hrs.

Definitions, Types of authentication, Password Authentication, Password Vulnerabilities & Attacks : Brute Force & Dictionary Attacks.

Password Policy & Discipline, Single Sign-on–Kerberos, Alternate Approaches : Biometrics : Types of Biometric Techniques : False Rejection, False Acceptance, Cross Over Error Rates.

3. Access Control 6 Hrs.

Background, Subjects and Objects, Access Control Techniques : Mandatory Access Control Discretionary Access Control, Access control Lists, Role Based Access Control.

Access Control Structures, Window NT & Unix Access Control methods, Access Control Method : Bell-La Padula Model, Biba Integrity-Model.

Biba Integrity Model.

4. Security Policy Design 6 Hrs.

Definition : Security Policy Document

Risk Management : Risk Assessment : Identification of assets, Identification of Threats to assets, Risk Calculation : Annualized Loss Expectancy (ALE).

Security Policy Framework : Components of an enterprise Network, Elements of a Security Architecture.

Design and Implementation : Physical Security Controls, Logical Security Controls, Infrastructure & Data Integrity, Policies and Procedures for Staff : Secure Backups, Equipment Certification, Audit Trails.

Security Awareness Training.

Incident Handling : Preparation, Detection of an Incident, Responding to an Incident, Recovering from and Incident Building and Incident Response Team.

5. Cryptograph 6 Hrs.

Cryptography Basics : Plain Text, Cipher Text, Encryption Algorithm, Decryption Algorithm; Requirements for Cryptography.

Cryptanalysis and attacks, Conventional Symmetric Encryption Algorithms : Symmetric vs Asymmetric, Block and Stream ciphers, DES Double and Triple DES, Cryptographic Modes.

Key Distribution, Link Encryption & End-End Encryption. Steganography.

6. Public Key Infrastructure & Message Authentication 6 Hrs.

Public Key Cryptography Principles & Applications, Algorithms : RSA, Diffe-Hellman Key Exchange, DSS, Elliptic curve.

One way Hash Functions : Message Digest, MDS, SHA1.

Digital Signatures : Public Key Infrastructure : Digital Certificate Authorities.

Network Security 9 Hrs.

Overview of IPV4 : OSI Model, Maximum Transfer Unit, IP, TCP, ICMP; ARP, RARP and DNS; Ping, Traceroute.

Network Attacks : Buffer Overflow, IP Spoofing, TCP Session Hijacking, Sequence Guessing, Network Scanning : ICMP, TCP sweeps, Basic Port Scans; Denial of Service Attacks : SYN Flood, Teardrop attacks, Land, Sumurf Attacks.

Virtual Private Network Technology : Tunneling, IPSEC : Traffic Protocols : Authentication Headers, ESP Internet Key Exchange (IKE), Security Association PPTP, L2TP.

7. Network Management 9 Hrs.

Network Management Architecture & Applications : Management Standards and Models

Network Management Functions – Configuration : Configuration Management Configuration Database & Reports, ASN. 1

Network Management Functions : Fault : Management, Identification and isolation, Security : Protecting Sensitive Information, Host and user Authentication.

SNMP v1, SNMP, v3 : Structure of Management Information, Std, Management Information Base, SNMPv1 Protocol.

Network Management Accounting & Performance Functions : Accounting Management Performance Management, Network Usage, Metrics and Quotas.

8. Web Security & Application Security

6 Hrs.

Web Servers & Browsers : Security features, server privileges, active pages, script, Security configuration setting for browsers, security of active content : JAVA, JAVA Script, Active x, plug-ins, cookies.

SSL & SET, Secured Mail : PEM and PGP.

Firewalls & Intrusion Detection Systems 8 Hrs.

Firewall Characteristics & Design Principles, Types of Firewalls : Packet Filtering Router, Application Level Gateway or Proxy, Content Filters, Bastion Host.

Firewall Architectures : Dual Horned Host, Screening Router, Screened Host, Screened Subnet.

Firewall logs, Intrusion Detection Systems : Components of an IDS, Placement of IDS Components, Types of IDS : Network Based IDS, File Integrity Checkers, Host Based IDS; IDS Evaluation parameters.

11. Law & Investigation

5 Hrs.

IT Act 2000 : Objectives, Provisions, Offenses
Cyber crimes : Crimes against the computer, Crimes using a computer, Investigation Issues : Cyber Forensics.

BE1: EMBEDDED SYSTEMS

Detailed Syllabus

1. Introduction to Embedded Systems 4 Hrs.

Definition of Embedded Systems, Difference between General Purpose Computers & Embedded Systems, Categories of Embedded Systems, Requirements of Embedded Systems, Trends in Embedded Systems : Processors, Memory, RTOS, Embedded OS, Programming Languages, Development Tools.

2. Embedded Hardware 10 Hrs.

Princeton (Von Neumann) VS Harvard Architecture CISC VS RISC, Microcoded VS Hard Wired Design, Processor Internal Architecture. Memory Organization, ISA (Instruction Set Architecture), Interrupts & Interrupt Handling, Peripheral for Processors like ADC, DAC, RTC, LCD, LED, Switches, etc. Advanced Processors like ARM, 960 etc.

3. Digital Signal Processing 4 Hrs.

Review of DSP concepts, DSP processors, DSP Architecture, Modulation techniques

4 Embedded Software

10 Hrs.

Development Tools for Embedded Software, Assemblers, Compilers, Linkers, Profilers etc., Coding Strategies for obtaining Optimized Time & Space requirements, Simulators & Emulators, Debugging Embedded Software, Testing Embedded Software, Device Drivers.

5. RTOS

12 Hrs.

Real Time OS Kernel Architecture, Scheduling Algorithms : Priority Based, Shortest Job first, Round-Robin, FIFO etc.

Task Synchronization : Mutual Exclusion, Semaphores.

Timers, Embedded Operating Systems, Mobile Operating Systems, Prototyping RTOS or EOS on a Hardware Platform.

6. Embedded Communication Systems

10 Hrs.

Standards for Embedded Communication, USART, SPI, I2C, CAN, USB, Firewire, Ethernet, Wireless communications like IrDA, Bluetooth, 802.11 etc., Security Issues in Embedded Communication.

7. Embedded Application Development

Writing Codes for serial communication in C or CPP, MP3 decoding using C, Java Enabled Information on Appliances, Mobile Java Application (Jini), Embedded Database Applications, Voice-over IP.

BE2: ARTIFICIAL INTELLIGENCE AND APPLICATIONS

Detailed Syllabus

1. General Issues and Overview of AI 2 Hrs.

The AI problems, What is an AI technique? Characteristics of AI application.

2. Problem Solving, Search and Control Strategies 4 Hrs

General Problem solving, Production Systems, Control strategies Forward and backward chaining.

Exhaustive Searches : Depth first Breadth first search.

3. Heuristic Search Techniques 7 Hrs.

Hill climbing, Branch and Bound technique, Best first search & A algorithm, AND/OR graphs, Problem reduction & AO algorithm, Constraint Satisfaction problems, Means Ends Analysis.

4. Game Playing 6 Hrs.

Minimax search procedure, Alpha-Beta cutoffs, Additional Refinements.

5. Knowledge Representations 10 Hrs.

First order predicate calculus, Skolemization, Resolution Principle & Unification, Inference Mechanisms, Horn's clauses, Semantic Networks, Frame Systems and Value Inheritance, Scripts, Conceptual Dependency.

6. AI Programming Languages 10 Hrs.

PROLOG. : Introduction
Clauses : Facts, goal and rules
Prolog Unification mechanism
Arithmetic Operator
List Manipulations
Fail and Cut predicates

7. Natural Language Processing 3 Hrs.

Parsing techniques, Context - free grammar, Recursive Transitions Nets (RTN), Augmented Transition Nets (ATN) Case and Logic grammars, Semantic Analysis.

8. Planning 3 Hrs.

Overview - An Example Domain : The Blocks World, Component of Planning Systems, Goal Stack Planning (linear planning), Non-linear Planning using goal sets.

9. Handling Uncertainty 5 Hrs.

Probability theory, Bayes theorem and Bayesian networks, Certainty Factor, Fuzzy Logic.

10. Expert Systems 4 Hrs.

Introduction to expert system, Knowledge Acquisition, Case studies : MYCIN

11. Neural Network 6 Hrs.

Perception, Back propagation networks, Hopfield Networks.

BE3: E-BUSINESS

Detailed Syllabus

1. E-Business Models 8 Hrs.

Business-to-Business Models, Business to Consumer Models, Collaborative Business Models.

2. E-Business Architecture 4 Hrs.

Web Architecture & CGI, Applet/Servlet, Client Server Architecture, Component based Architecture.

3. E-Procurement Systems 6 Hrs.

E-Auctions, E-Tender, Reverse Auctions.

4. E-Customer Relationship Management 8 Hrs.

Call Centre, Partner Relationship Management,

E-Service Management E-Marketing, Business Intelligence Systems, Data Mining Models.

5. Public Key Infrastructure & Digital Signature 8 Hrs.

Data Encryption Standards, RSA, Public and private keys, Digital Signature, Digital Certification, MIME.

6. Internet Security and Firewall Systems 8 Hrs.

IPSec protocol, S-HTTP, Secure Socket Layer (SSL), IP Spoofing, Firewall Systems, Packet Filtering Firewall, Application Level Firewall, Circuit level Firewall.

7. E-Payment Systems 8 Hrs.

SET Protocols, E-Check, E-Cash, Micro payment Systems, Smart Card, Electronic Fund Transfer.

8. E-Markets 6 Hrs.

Web Advertising, Online Market Research, Market Making

9. Cyber Law 4 Hrs.

IT Act of India

BE4: PRINCIPLES OF MODELLING AND SIMULATION

Detailed Syllabus

1. System models and System studies 4 Hrs

Concept of a system, Systems : continuous / discrete, deterministic / stochastic, open closed

Classification of mathematical models - static/dynamic, linear / nonlinear, deterministic stochastic.

Principles used in modeling, System studies - interacting subsystems and examples System design and Analysis.

2. What is Simulation?

When simulation is appropriate, Advantages and disadvantages of simulation, Areas of application. Continuous system simulation, Model formulation through differential equations, Discrete event simulation, Steps in a simulation study.

3. Concept in Discrete - Event Simulation 8 Hrs

The Event Scheduling Time Advance Algorithm, World Views, Manual Simulation Using Event Scheduling, List Processing.

4. (a) Random-Number Generation 10 Hrs

Properties of Random Numbers,

Generation of Pseudo-Random Numbers, Combined Linear Congruential Generators, Test for Random Numbers - Frequency Tests, Runs Tests, Gap Test, Test for Autocorrelation

(b) Random - Variate Generation

Inverse Transform Technique - Exponential distribution, Uniform Distribution, Triangular Distribution, Direct Transformation for the Normal and Lognormal Distribution continuous Distribution without a closed form inverse.

(c) Monte Carlo Method

Evaluation of Integral-Hit or Miss Method, evaluation of α , Rejection Method.

- 5. Simulation Examples 7 Hrs**
Simulation of Queuing System, Simulation of Inventory System, Other examples of simulation - A reliability problem.
- 6. Queuing Models 5 Hrs**
Characteristics of Queuing Systems, Queuing Notation, Long-Run Measures of Performance of Queuing Systems, Steady-State Behaviour of Infinite-Population Markovian Models - M/M/1, M/M/c.
- 7. Simulation software 5 Hrs**
Selection of Simulation software, Simulation in C++, Introduction to GPSS, Simulation package - ARENA, Trends in simulation software : High - Fidelity Simulation, Data Exchange Standards. Embedded Simulation.
- 8. Input Modelling 5 Hrs.**
Data collection, Identifying the distribution with data, Selecting the family of distribution, Parameter estimation, Goodness -Fit Tests - Chi - square - Test.
- 9. Verification and Validation of Simulation Models 5 Hrs**
Model Building - Verification and Validation, Verification of Simulation Models, Calibration and Validation of Models : Face Validity, Validation of Model Assumptions, Input-Output Validation.
- 10. Output Analysis for Simulation Model**
Stochastic nature of Output Data, Measure of Performance and their Estimation - Point Estimation, Interval Estimation, Output Analysis for Terminating simulation, Output Analysis for Steady-State Simulation.

BE5: PARALLEL COMPUTING

Detailed Syllabus

- 1. Introduction 2 Hrs.**
What is Parallel Computing? The Scope Paralle Computing, Issues in Parallel Computing.
- 2. Parallel Computer Architecture 10 Hrs.**
A Taxonomy of Parallel Architectures, Control Mechanism, Address-space Organization, Interconnection Networks, Processors Granularity.
SIMD Architecture : Overview of SIMD Architecture, Design and Performance Issues.
MIMD Architecture : Shared Memory Architecture, Uniform and Non-uniform Memory Access Multi Processors, Parallel Vector Processors (PVP), Symmetric Multiple Processors (SMP), CC-NUMA, NUMA and COMA Architectures.
Distributed Memory Architecture : Cluster Architecture – Design and other Issues MPP Architecture.
- 3. Interconnection Networks 8 Hrs.**
Basics of Interconnections Networks : Interconnecting Environments, Network Components, Network Characteristics, Network Performance Metrics
Network Topologies and Properties : Topologies and Functional Properties, Routing Schemes and Functions, Networking Topologies.
Buses, Crossbar and Multistage Switches : Multiprocessors Buses, Crossbar Switches Multistage Interconnection Networks, Comparison of Switched Networks.
Gigabit Network Technologies : Fiber Channel and FDDI Rings, Fast Ethernet and Gigabit Ethernet, Myrinet for SAN/LAN Construction
- 4. Parallel Programming 18 Hrs.**
Paradigms and Programmability : Algorithmic Paradigms, Programmability issues Parallel Programming Examples
Parallel Programming Models : Implicit Parallelism, Explicit Parallel Models, Other Paralle Programming Models
Shared Memory Programming : The POSIX Threads (Pthreads) Model, The open MP Standard
Message-Passing Programming : The Message Passing Paradigm, Message

Passing Interface (MPI), Parallel Virtual Machine (PVM)

Data Parallel Programming : The Data Parallel Model, The Fortran 90 Approach, Other Data Parallel Approaches.

5. Performance Metrics and Benchmarks 6 Hrs.

Performance Metrics for Parallel Systems : Run Time, Speedup, Efficiency Cost.

Scalability and Speedup Analysis : Amdah's Law : Fixed Problem Size, Gustafson's Law : Fixed Time, Sun and Ni's Law : Memory Bounding, Isoperformance Models.

Sources of Parallel Overheads : Interprocessor Communication, Load Imbalance Extra Computation.

System and Application Benchmarks : Micro Benchmarks. Parallel Computing Benchmarks, Business and TPC Benchmarks, SPEC Benchmark Family.

6. Parallel Algorithms and Applications

Sorting Algorithms, Searching Algorithms, Dynamic Programming, Matrix Multiplication, Dense Matrix Computations, Sparse Matrix Computations.

BE6: SOFTWARE PROJECT MANAGEMENT

Detailed Syllabus

1. Review of software engineering concepts 4 Hrs.

Principles of software engineering, Features of good software, Quality Requirement in different Application Areas.

2. Software Process 6 Hrs.

Software Process and Models, Tools and techniques of Process Modeling. Product and Process.

3. Introduction to Project Management 4 Hrs.

Definition of the project, Project specification and parameters, Principles of Project management, Project management life cycle.

4. Software Project Planning 8 Hrs.

Project activities and Work Breakdown Structure (WBS), Criteria for completeness in the WBS, Activity Resource Requirements and Cost Joint Project Planning Session, Project Management Plan.

5. Project Economics 10 Hrs.

Project Costing, Empirical Project Estimation Techniques, Decomposition Techniques,

Algorithmic methods, Automated Estimation Tools.

6. Project Scheduling and Tracking Techniques 6 Hrs.

Why projects are delayed? Effort Estimation Techniques, Task Network and Scheduling Methods, Monitoring and Control Progress, Graphical Reporting Tools.

7. Risk Analysis and Management 6 Hrs.

Risk Concepts and Identification, Risk Assessment and Control, Risk Components and Drivers, Risk Tracking and Monitoring, Risk Mitigation and Management.

8. Software Metrics and Project Management 8 Hrs.

Measures, Metrics and Indicators, Process and project metrics, Statistical Metrics and Process Monitoring, Function-point and project management.

9. Project Control and Closure 4 Hrs.

Defect Collection and Audit, Casual and Pareto Analysis, Project Closure Analysis

10. Project Management Issues with regard to New Technologies 6 Hrs.

Object-oriented Methodology, Web-based Projects, Embedded Systems.

BE7: APPLIED BIOINFORMATICS

Detailed Syllabus

1. Basic concepts of Molecular Biology 12 Hrs.

Proteins, Nucleic Acids : DNA, RNA
Molecular Genetics : Genes and Genetic code, Transcription,
Translation and Protein synthesis, Chromosomes
Genome : Maps and Sequences, Sequencing Techniques,
Human Genome project
Sequence Databases

2. Strings, Graphs and Algorithms 6 Hrs.

Strings,
Graphs,
Algorithms

3. Pairwise and Multiple Alignment 10 Hrs.

Pairwise Alignment : Global alignment, Local alignment,
Scoring functions, General gap and affine gap penalty.

Multiple Sequence alignment : SP (Sun of Pairs) measure, Star alignments, Tree Alignments.

4. Database Homology Search 8 Hrs.

Scoring Matrices, BLAST Algorithm, Significance of Alignments, PSI and PHI Blast.

5. DNA sequence Fragment Assemble 4 Hrs.

Background, Heuristics : Finding Overlaps Fragments, Alignment and Consensus.

6. Markov Chain 8 Hrs.

Markov Chain, Modelling the beginning and end of sequences, Markov Chains for discrimination, Predicting CpG islands problem, Higher Order Markov Chains, Finding prokaryotic genes.

7. Hidden Markov Models 12 Hrs.

Hidden Markov Models, Forward and Backward algorithm, Viterbi algorithm, Application : Modeling Protein sequence families, Multiple alignment.

BE8: DIGITAL IMAGE PROCESSING

Detailed Syllabus

1. Introduction to Digital Image Processing

1 Hr.

What is Digital Image Processing? Fundamental steps in Digital Image Processing. Components of an Image Processing System.

2. Image Sensing and Representation 4 Hrs.

Elements of Visual Perception Image Sensing and Acquisition : Fundamentals of CCD Camera, Fundamentals of Scanner.

Image Sampling and Quantisation : Basic Concepts of Sampling and Quantisation. Representation of images and Image File formats, Gray level and Spatial Resolution.

Relationship between Pixels : Neighbourhood, Adjacency, Connectivity, Boundaries Distance Measures.

3. Image Enhancement 10 Hrs.

Basic Gray Level Transformations, Histogram Possing : Histogram Equalisation, Histogram Matching, Use of Histogram Statist.

Spatial Domain Filtering :

Smoothing filters : Linear smoothing filters, Non smoothing filters.

Sharpening filters : Use of first derivative based filters, Use of Laplacian for enhancement.

4. Transform Domain Representation and Processing 12 Hrs.

Fourier transform and its properties : Two-dimensional Discrete Fourier transform and its inverse, Concept of Linear Transformation, Basis Functions and Basis Images, Discrete Cosine transform, Eigen-Vector Base Transform (KLT), Haar Transform.

Transform Domain Filtering : Correspondence between filtering in Spatial and Frequency. Domain, Low-pass filters, High-pass filters.

Wavelets and Multi-resolution processing

5. Image Restoration 6 Hrs.

A Model of the Image Degradation/Restoration Process, Mean-square Error Restoration (Wiener Filtering), Constrained least Squares Filtering, Restoration by Homomorphic filtering, Geometric Transformation and image registration.

6. Binary Image Analysis 4 Hrs.

Thresholding, Morphological Processing Dilation, Erosion, Opening and Closing, Hit-or-Miss transformation.

Sketetonisation

Descriptors for Binary Regions

7. Colour Image Processing 4 Hrs.

Color Models, Color Transformation : Tone and Color Processing, Histogram Processing.

Smoothing and Sharpening : Colour Image Smoothing. Colour Image Sharpening.

8. Texture Analysis 4 Hrs.

Statistical Texture Description : Co-occurrence Matrix, Edge Frequency, Texture Energy, Fractal Texture Description.

Colour Texture Description

9. Compression 10 Hrs.

Fundamentals : Coding Redundancy, Inter-pixel Redundancy, Psycho-visual Redundancy, Fidelity Criterion.

Image Compression Models : Source Encoder and Decoder, Channel Encoder and Decoder. Elements of Information Theory.

Error-free Compression : Variable Length Coding, Bit-plane Coding, Loss less Predictive Coding.

Lossy Compression : Lossy Predictive Coding, Transform Coding, Wavelet Coding.

Hierarchical and Progressive Coding.

JPEG Compression standards : Basics of

JPEG, Introduction to JPEG-2000 Video Compression : Basics of MPEG-1, Introduction to MPEG-4.

- 10. Introduction to Image Understanding (Computer Vision) and Applications 5 Hrs.** Understand acquisition, characteristics, processing and display of digital image being used in common computer-based applications like Medical Image Processing, Remote Sensing, Document Image Processing, Content based Image Retrieval etc.

BE9: ACCOUNTANCY AND FINANCIAL MANAGEMENT

Detailed Syllabus

1. Financial Accounting : An Introduction

10 Hrs.

Meaning and nature of Accounting – Accounting as a language of the business and Accounting as an information system, Accounting Process and the final output of the accounting system. Principles of Accounting and Double Entry System, Recording of transactions in Journal, Recording transactions in Cash Book (Single Column only), Sales Book and Purchase Book, Posting of transaction into ledger and the preparation of Trial Balance.

2. Preparation of Final Financial statements

12 Hrs.

Preparation of Final Accounts - Profit and Loss Account and Balance Sheet (with simple adjustments), Preparation of Statements of Changes in Financial Statements – Funds Flow Statement and Cash Flow Statement.

3. Analysis of Financial Statement

6 Hrs.

Horizontal (Trend) Analysis and Vertical (Common-Size) Analysis, Ratio Analysis – Liquidity Ratios, Turnover Ratios, Profitability Ratios, Solvency Ratios and Market Ratios, Du Pont Analysis, Analysis of Statements of Changes in Financial Position – Funds Flow Statement and Cash Flow Statement.

4. Cost Accounting : An Introduction

5 Hrs.

Meaning, nature and importance of Cost Accounting System in an organization, Elements of Costs and various cost concepts – Direct and Indirect Costs. Fixed and Variable Costs. Sunk Cost, Opportunity Cost, Out of Pocket and Imputed Costs, Preparation of Cost Sheet.

5. Overheads

2 Hrs.

Allocation, Apportionment and Absorption of Overheads

6. Cost Accumulation System

4 Hrs.

Job Costing System (Simple treatment), Process Costing System (Simple treatment)

7. Variable and Absorption Costing

4 Hrs.

Estimation of profit under - Absorption Costing System and under Variable Costing System (Simple Cases), Understanding and appreciating the differences in profits calculated under both the systems, Importance of Variable Costing for decision making.

8. Cost-Volume-Profit Analysis

4 Hrs.

Understanding the nature of variable cost and fixed cost (total as well as per unit), contribution, P/V Ratio, Break-Even-Point, Assumptions of Cost-Volume-Profit Analysis and Studying the relation between cost, volume and profit, Graphical Analysis of Break-Even-Point and Profit-Volume Relation, Use of Cost-Volume-Profit Analysis for Decision Making, Limitations of Cost-Volume-Profit Analysis.

9. Budgeting

4 Hrs.

Meaning, objectives and importance of budgeting in an organisation, Different types of Budgets including preparation of Cash Budget, fixed and flexible budgets, Zero-Base Budgeting.

10. Financial Management : An Introduction

5 Hrs.

Nature, objectives and scope, Financial decision-making and types of financial decisions. Role of a finance manager in a firm, Basic axioms of Financial Management, Risk-Return framework for financial decision – making.

11. Time value of Money and Mathematics of Finance

5 Hrs.

Time value of money and the opportunity cost of money, Present value and future value and interest rate and discount rate, Annuities and their types, Numerical related to the calculation of present values and future value.

12. Capital Budgeting Decisions

6 Hrs.

Nature and kinds of capital budgeting decisions, Techniques of evaluating capital budgeting decisions – Payback Period, Accounting Rate of Return, NPV, IRR and Profitability Index.

13. Cost of Capital and Sources of Finance

5 Hrs.

Basic valuation model, Concept of cost of Capital – Weighted Average Cost and Marginal Cost. Cost of Debt and Cost of Equity – simple cases, Various long – term sources of funds for a firm.

14. Capital Structure and Dividend Decisions

4 Hrs.

Concept of Capital Structure, Financial Leverage and Capital Structure, Determinants of Capital Structure, Dividend and its forms – cash dividend, right and bonus shares, and buy-back of shares, Determinants of Dividend Policy of a firm.

15. Working Capital Management 4 Hrs.

Basics of Working Capital Management : Meaning of Gross and Net Working Capital, Components of Working Capital, Risk-Return framework for Working Capital Decisions.

Determinants of working capital requirement, Sources of Financing Working Capital requirement.

BE10 : APPLIED OPERATIONS RESEARCH

Detailed Syllabus

1. Overview of OR Modeling 2 Hrs.

Defining the problem and gathering data, Formulating mathematical model, Testing the Model and Preparing to Apply the Model.

2. Linear Programming 15Hrs.

Model Formulation and Case Studies : Assumptions of Linear Programming Models and Model Building, Practical Case Studies. (Practicals : Use of Microsoft or Lotus Spreadsheet use to formulate a case study is recommended).

Linear Programming Methodology : The Geometry of Linear Programming Problem, the Algebra of Simplex Method and Computational Aspects of the Simplex Algorithm, the Revised Simplex Method (Practical exercise, development or software for revised simplex is recommended).

Duality Theory in Linear Programming and Economic Interpretation or Duality : Formulation or Dual Linear Programs, Duality Theorems (without proofs)

(Tutorial on practical case studies and interpretation or duality in those cases)

Special Linear Programming Problems : Transportation Problem and its Structure Assignment Problem (Hungarian Method) (Development or software for Hungarian method is recommended)

3. Integer Programming and Job Sequencing Models 9Hrs.

Integer Programming Models, Examples or Resource Allocation Problems, Handling Non-linearities : Fixed Charge Problem, Dichotomies, Handling Discrete Variables. Traveling Salesman Problem and Branch and Bound Algorithm (for Binary Linear Programming) (Practicals : development or code for solution to Traveling Salesman, Problem using branch and bounding and Hungarian method is recommended)

Job Sequencing models : Sequencing Problem and their integer programming formulations,

Johnson's algorithm for processing in jobs-two machines and n-jobs-three machines, Processing 2 jobs through n machines; graphical solution. (Tutorial on developing model for job sequencing with precedence constraints as an integer programming model)

4. Network Analysis 6 Hrs.

Examples of Network Flow Problems, Shortest-Path Problems : Dijkstra's Algorithm. Applications of the Shortest-Path Problem

Max Flow Problems : Flow on a Network, Labelling Routine, Labelling Algorithm for the Max-Flow Problem, Min-Cut and Max-Flow Min-Cut Theorem.

(A practical model from logistics or transportation sector may be suggested for a technical report)

5. Project Scheduling by PERT/CPM 6 Hrs.

Project Management, Applications of PERT and CPM, Diagrammatic Representation, Critical Path calculations by network analysis and CPM method, Determination of floats, Program evaluation and review Technique.

(Practicals : Use of MSProject is recommended)

6. Markov Chains and Basic Queueing Models 6 Hrs.

Introduction to discrete time Markov Chains : Chapman-Kolmogorov Equations Introduction to Continuous Time Markov Chains : Examples of Birth and Death Processes, Kolmogorov's Forward Differential Equations.

Markovian Queues

(Practicals : Development of software modules for simulating Markovian queues from Manufacturing/Communication examples is recommended)

7. Dynamic Programming 6 Hrs.

Deterministic Dynamic Programming and Examples from Finite Horizon Decision Problems, Bellman's Optimality Principle and solution techniques

(Tutorial on Dynamic Programming Approach to a Distribution Network is recommended)

8. Inventory Models 6 Hrs.

Introduction to Inventory and Applications

Deterministic Models : The EOQ models with Non-Zero Lead Time, EOQ with Shortages.

9. Game Theory 4 Hrs.

Introduction to Game Theoretic Models, Zero-sum Games; Concepts of Pure Strategies and Mixed Strategies, Graphical and Linear Programming-based Solutions.

PROJECTS

Detailed Syllabus :

There are two project at 'B' Level. The first project may be started after successful completion of any five papers out of the first ten papers of 'B' Level and may be submitted when the candidate appears for the examination for the last paper(s) of the first ten papers of 'B' Level.

A. FIRST PROJECT : 1. SALIENT FEATURES OF THE FIRST PROJECT :

Will be individual effort only, Carries 100 marks out of which 80 marks would be for the project, evaluation and 20 marks for the viva-voice. To qualify for a pass, a candidate must obtain at least 50%, The Society will arrange for an expert to conduct the viva-voce.

2. GUIDELINES FOR FIRST PROJECT : 1) The project should have been carried out, during the course, over a duration of three months (full time) or six months (part time). Every candidate should do a project individually and no grouping is allowed. The project will be carried out, under the guidance of the institute if he/she is through the institute conducting an accredited course. The direct candidate, in any case, will be doing a project in an organization. In that case he/she will carry out the project under the guidance of experts / professionals, ii) The project will be carried out, under the guidance of the institute if he/she is through the institute conducting an accredited course. The direct candidate, in any case, will be doing a project in an organization. In that case he/she will carry out the project under the guidance of experts / professionals, iii) The project report should be submitted covering the aspects specified in the PROJECT PROFILE of FIRST PROJECT, iv) Reports in fulfilment of any other examination/context will not be entertained, v) The project report should have a certificate as per the proforma given in para 2.8 by the candidate and one of the following :- a) the institute where the candidate is undergoing an accredited course or, b) the expert-guide in the case of a direct candidate., vi) The project report with due endorsement in the form of a certificate will be submitted together with DD for Rs. 500/- (Rupees Five hundred only) favouring "DOEACC", payable at New Delhi, to the Society, vii) The Society will arrange for viva of candidate relating to the project.

PROFORMA FOR CERTIFICATE FOR PROJECT

This is to certify that this is a bonafide record of the project work done satisfactorily

at by Mr. / Mrs.

(DOECC Registration No.) in partial fulfilment of 'B' Level examination.

This report or a similar report on the topic has not been submitted for any other examination and does not form part of any other course undergone by the candidate.

Signature of Candidate

SIGNATURE

Name :

PLACE:DATE : Name & Seal of the Institution (with BPROV. No. / Organization)

3. PROJECT PROFILE OF FIRST PROJECT :

i) MODEL - 1: Topic for the project can be any subsystem of a system software or tool or any scientific or a fairly complex algorithmic situation, ii) The aim of this type is to highlight the abilities of algorithmic formulation, program and data flow representation, modular programming, optimized code preparation, systematic documentation and other associated aspects of software engineering.

The project can be in C or COBOL or C++ Language and the program code should contain at least 300 lines. The assessment would be through the project report, which should portray : a) programming style, structured design, minimum coupling and high cohesion. No procedure should, however, be longer than 50 to 60 lines, b) good commenting and annotating of the code and flow of representation, such that meaningful code, with good readability and ease of maintenance, results., design specifications, depicting the methods adopted and giving a simple data dictionary, for each data, to cover name, type and validity aspects., test case samples, enough in number, to adequately cover the possible chances of common errors., e) User Manual, in its full entity.,

- ii) MODEL-2 : A typical business application. The aim of this is to highlight the stages involved in a typical business oriented project development, though on a miniature scale and simulated environment. The appropriate use of DBMS towards any Business Application, along with adequate level of system analysis and structured design and deployment of specific tools / products would be the underlying activity, in preparing this project.
- iii) The subject has to be selected from a typical business / management application. The emphasis should be on selecting a system / subsystem which shows the DBMS and system analysis aspects to a greater degree. Any small and simple business system may be selected, although candidates are advised to use their knowledge and creativity, to select typical and intelligent applications, rather than run-of-the-mail themes, such as simple pay roll calculation or Issue-Return portion of an inventory scheme etc. The evaluation stage would give due weightage for them eselection, problem analysis, fact finding techniques and initial design, which are as close to real-life Indian business situations as possible.
- iv) The project should be carried out in any of the X base family products which is equivalent to dBASE IV / FOXPRO or in COBOL Language. The code can be generated out of 4 GL Interface, like screen builder and report generator, application generator / program code generators, or can be totally hand-coded or a combination of both. The documentation is to contain the actual steps involved is such 4 GL - generated codes and, possibly, a layout of such definition screen which has been filled by the candidate, to generate the code. The source is expected to be around 500 lines.
- v) MODEL 3 : Project related to firmware development / networking / a specialized area of research & development.
- vi) The aim of this type of project is to boost the interest of the student in addressing problems related to networking / data communication / firmware development like interfaces, device drivers, etc. or address / implement some specific research & development type of problems / algorithms.
- vii) The subject is to be related from the above areas depending on the interest of the student. Since this is a specialised field / class of projects, the interest / calibre of the student plays a vital role and hence the problem needs to be selected on the initiative of the student.
- viii) The project could be implemented using C or C++ or a specialised package depending on the problem. If the project is related to hardware development the stress should be on the design aspects / imporvements of the existing designs.
- ix) The project document must contain the detailed justification on the need for slecting the problem, its improtance, its advantages / limitations and comparison with related work etc.

ASSESSMENT OF FIRST PROJECT

The assessment of the project would be through the project report, which should portrayry : a) requirements leading to the project, those which were the result of systems analysis, b) the design aspect DBMS oriented documentation which describes the structure and organization of the database, well annotated source code, supplemental documentation, which can serve as a data analysis and data flow description, c) a simple data dictionary of the elements, which from the structure. The number of tables / files, which make up the DBMS, should not be less than three, d) details about I/O

screens and facilities, for on-screen querying printer oriented reports and built in housekeeping routines which help disk management and file integrity, are to be included to a limited extent, e) details of acceptance tests which should be in adequate number and should include error cases., f) User Manual in its full entity.

VIVA-VOCE OF THE PROJECT :

1. Requirement specification : will have sections as below : a) Application Area : eg Production / Inventory / Finance / Marketing / Human Resources Management / Library / Training etc., b) System / Subsystem : eg. Invoicing & Accounts Receivables, Purchase & Accounts payable Budget & Accounts with variance analysis : Production / Sales monitoring : Material Requirement Planning (MRP) etc., c) End User(s) : eg Finance Controller, Marketing Manager, Production Manager, Personnel Deptt., d) Main Output required :

Type	Medium	Frequency
eg Reports/Statements	Print	Annual/Monthly/Daily/Qtrly
Responses to Queries	VDU	As and when needed
Cumulative Sales	Disk	Monthly

- e-i) Brief description of the present, if any., ii) Need for review - list major deficiencies / defects in the present system.
- f) User Profile : There may be several groups with different needs.
- g) Performance criteria for the proposed system eg : The following aspects are expected to be handled by the new systems (if applicable)-i) Volume of transactions (Data handling), Control aspects, Timeliness, Archival.
11. Data Dictionary : a) This should give a catalogue of the (Data) elements used in the system / sub system developed. b) The following are the details required. Write NA if NOT applicable.

Data Name

Aliases, if any

Length (Size)

Type, Numeric

Alpha

Binary etc.

Is it an input or program / system generated ?

SOURCE : Validity Criterion : (Minimum, Maximum etc.) may also relate to other data items (interrelated) Default value, if any, Security - access rights - who can read / modify. Where used in the system. -a) Reference to Data Structure / File, b) Procedures / Modules which use.

User Manual : Contents - Suggested Chapter - Installation, Hardware Requirements, Systems Requirements, Installation Procedure - including security aspects like password, protection, backup, controls etc., Menu choices and their actions - Screen formats, Error messages, Output Sample Case. This is equally applicable to direct candidates.

3. Project Report : The Project report may contain broadly the following sections - i) Certificate as given in Section 2.8, ii) Contents, iii) Abstract / Synopsis : giving a brief of the problem area, its importance, need, how it has been implemented, testing / results, advantages and limitations of the system.

Chapter 1 : INTRODUCTION - Objective of the system, Justification and need for the system, Advantages of the system, Previous work or related systems, how they are used.

Chapter 2 : Design of the System - Hardware, Software requirements, System requirements, System specifications, Block diagram of the system, DFDs / Algorithm / Flow Charts etc., along with explanations / descriptions.

Chapter 3 : Implementation & Coding.

Chapter 4 : Testing & Test results : sample test data / output screen printouts etc. need to be presented with description.

Chapter 5 : Results and conclusion.

- Appendix :
- A. Program listing
 - B. Details about the specialised packages (if any)
 - C. Details of hardware products / chip specifications (if any)
 - D. Any other background material

B. FINAL PROJECT : The duration of the final project is 500 Hrs.

1. BACKGROUND OF THE FINAL PROJECT : Design of any computer science curriculum expect the final project to be an important part of the curriculum, since it gives an opportunity to the student to use the methodologies / techniques taught in several courses. Further, doing this project in an industry gives opportunity for the student to appreciate industrial approach to computerization. Unfortunately, there are too many students seeking opportunities for doing project in the industry, with the result industry is not able to supervise the work or make necessary resources available for the project. This note is to help a student to get most out of whatever opportunities become available. Students should try to use good software engineering practices.

It is not possible for the industry to allocate to complete development project to a student(s). A student should ensure that he / she understands what is expected by preparing a requirement document (of his / her understanding) and get it reviewed by the guide in the industry. Design document should also be reviewed and code should be peer reviewed. As user manual has to be prepared and reviewed, testing has to be thorough and at various levels, followed by an acceptance test based on the requirements document and the user manual. Lastly, a few demonstration cases must be prepared and included with the source file. Note that there will be a difference in the nature of the requirements document based on whether it is regular development or implementation of a few modules based on an existing it after ensuring (acceptance testing) that it meets the expectation. Often some students are asked to build an application using a software package. In this case naturally, programming will be minimal. But the student can and should follow all other steps of the SW development cycle.

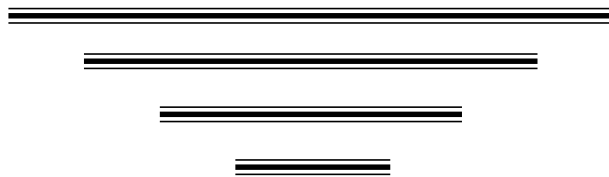
It is preferable if the Computer Science department to which the student belongs is actively interested in the project. Hence, it is desirable to have three reviews. First is after the requirements document is ready and student presents it to faculty committee for giving suggestions to enhance the value of the work. Second is mid way to ensure that progress is satisfactory. Third is the project viva to which industry guide / supervision should be invited.

Industry would appreciate very much if a student uses the SW Engineering methodology, even though they may not be able to guide adequately SW Progress. Interviewers for job are often more interested in the problem solved. Alternatives that could have been tried, and the benefits derived from that application, rather than the implementation details. Hence, a student must put in effort to find answers to questions about the application, which will also enhance the value of the project report.

2. GUIDELINES OF THE FINAL PROJECT : A) Purpose : At this academic level, the project is of some great significance in the testing of a candidate's virtuosity in Information Technology and judge his or her ability to independently take charge of Project/System Development. B) Eligibility: The candidate could be from art institute conducting the accredited course or may be a direct entry

candidate. The project is to be selected by the student reflecting knowledge gained by him / her during the course of study. The subject will be chosen by the student duly approved by a Supervisor / Guide. C) Supervisor / Guide : A Supervisor / Guide should be a person of eminence in the area in which the student has chosen the project. In the case of a candidate from an institute conducting the accredited course, all help including the nomination of the Supervisor / Guide will be rendered by the institute concerned. In the case of direct candidate, the candidate should ensure that the facilities are available in the organization (where the project) is taken up and also the same are extended to them. All 'B' Level candidates are required to get the synopsis of the project and the brief bio-data of the Supervisor / Guide approved from the Society. The synopsis should clearly mention the scope of the project. The project is to be taken up only after obtaining the approval of the Society. D) Topic of the project : Should enable bringing out topics learnt and should be related to applications in the industry / field in real life. E) Methodology : Candidate should undertake a project work involving use of software engineering methodologies, tools and techniques. F) Format : As proposed at DOCUMENTATION FORMAT OF THE FINAL PROJECT. G) Credits : Projects would be of approximately 500 man-hours (including viva-voce) and so certified by the Supervisor / Guide and be presented in the form in consonance with the documentation format (as specified). The project will also include a viva-voce examination. Project evaluation and viva-voce will be conducted by the examiner designated by the Society. The project carries a total of 300 marks. 80% of the marks is earmarked for the project evaluation and 20% for the viva-voce. To qualify for a pass, a candidate must obtain at least 50% in each of project evaluation and viva-voce. Exact location of the viva-voce will be intimated by the examiner designated. H) Time for submission : Project may be submitted when the candidate appears for the last paper in the 5th semester or before the end of the 6th semester. The project is to be submitted along with the following : i) hard copy documentation, ii) a copy of the project on magnetic media (preferably on either 1.2 MB Floppy Disk(s) or 1.44 MB Floppy Disk(s), iii) a demand draft in favour of "DOEACC" for an amount of Rs. 3,000/- (Rupees Three Thousand Only), payable in any nationalized bank in New Delhi.

Although the commencement of the project is left to the candidate / institute, to enable a candidate to have benefit to time, it will be advisable to start it only when the Supervisor gives his concurrence and the candidate has acquired an understanding of related topics. I) Authenticity : Shall be original, of real life value, and not copies from existing material from any source and a certificate to the effect will be provided with the Project, duly countersigned by the Supervisor / Guide.



DOEACC "C" LEVEL COMPUTER COURSE

OBJECTIVE OF THE COURSE :

The objectives of the course is to develop most advanced proficiency in computer science to that participants would be able to function as :

Project leaders in large computerisations projects

- 1 Faculty members to impart training.
- 1 Systems specialists / Manager in large Computer installation
- 1 Consultants
- 1 R & D Scientists

BLOCK SYLLABUS - " C" LEVEL COURSE

<i>Papers</i>	<i>Contents</i>	<i>Marks</i>
C1	COMPUTER ORGANIZATION	100
C2	DATA STRUCTURE THROUGH 'C' LANGUAGE	100
C3	OPERATING SYSTEMS	100
C4	ALGORITHM ANALYSIS & DESIGN	100
C5	OBJECT ORIENTED METHODOLOGY	100
C6	ADVANCED DBMS	100
C7	ADVANCED COMPUTER NETWORKS	100
C8	ADVANCED SOFTWARE ENGINEERING	100
C9	ADVANCED SOFTWARE PROJECT MANAGEMENT	100
C10	COMPUTER GRAPHICS & ANIMATION	100
C11	MULTIMEDIA TECHNOLOGY & VIRTUAL REALITY	100
C12	DISTRIBUTED SYSTEMS	100
C13	DIGITAL SYSTEM DESIGN	100
C14	AI & NEURAL NETWORKS	100
C15	ELECTIVE I	100
C16	ELECTIVE II	100
C17	ELECTIVE III	100
C18	ELECTIVE IV	100
ELECTIVE		
CE1	ADVANCED COMPUTER ARCHITECTURE	
CE2	WIRELES & MOBILE NETWORKS	
CE3	DATA WAREHOUSING & MINING	
CE4	NETWORK SECURITY & CRYPTOGRAPHY	
CE5	IMAGE PROCESSING & COMPUTER VISION	
CE6	SOFTWARE QUALITY MANAGEMENT	
CE7	REAL TIME SYSTEMS	
CE8	LOGIC & FUNCTIONAL PROGRAMMING	
PROJECT		

"C" LEVEL SYLLABUS IN DETAILS

C1: COMPUTER ORGANIZATION

Detailed Syllabus

- 1. Digital Components 10Hrs.**
Overview of computer organization : Logic gates, Adders, Flip-flops (as 1 bit memory device), Encoders, Decoders, Multiplexers, Registers, Shift Registers, Counters, RAM, ROM.
- 2. Data Representation 4 Hrs.**
Number system, Hexadecimal numbers, ASCII code, Two's complement, addition, subtraction, overflow, Floating point representation.
- 3. Register Transfer & Micro Operations 4 Hrs.**
Bus and memory transfers, Three state Bus Buffers, Binary ADDER, Binary Incrementer, Arithmetic circuit, Logic and Shift Micro-operations, ALU
- 4. Basic Computer Organization 4 Hrs.**
Instruction codes, Direct and indirect address, Timing and Control Signal generation, Instruction Cycle, Memory Reference Instructions, Input Output instructions.
- 5. Central Processing Unit 8 Hrs.**
General Register Organization, Memory Stack, One address and two address Instructions, Data transfer, arithmetic, Logical and shift instructions, Software and hardware interrupts (only) brief introduction), Arithmetic and Instruction Pipelines.
- 6. Computer Arithmetic 6 Hrs.**
Addition and Subtraction with signed magnitude data, Multiplication Algorithms - Hardware Algorithm and Booth Algorithm, Division Algorithm.
- 7. Input-Output Organization 8 Hrs.**
Asynchronous Data transfer - Handshaking, Asynchronous Serial Transfer, Interrupt Initiated I/O, DMA transfer, Interfacing Peripherals with CPU (Introduction), Keyboard, Mouse, Printer, Scanner, Network card.
- 8. Memory Organization 8 Hrs.**
ROM, RAM, Hard Disk, CD-ROM, Cache Memory - Direct mapping scheme, Virtual Memory concept.
- 9. Assembly Language Programming 8 Hrs.**
Machine and Assembly Language, Turbo Assembler, Simple examples in Turbo Assembler. 8086 instruction set.

C2: DATA STRUCTURE THROUGH 'C' LANGUAGE

Same as "A" / "B" Level

C3: OPERATING SYSTEMS

Detailed Syllabus

- 1. Overview 8 Hrs.**
Introduction, Computer System Structures, Operating System Structures.
- 2. Process Management 10 Hrs.**
Processes, CPU Scheduling, Process Synchronization, Deadlocks.
- 3. Storage Management 10 Hrs.**
Memory Management, Virtual Memory, File System Interface, File System Implementation.
- 4. I/O Systems 8 Hrs.**
I/O Systems : I/O Hardware, Application I/O Interface, Kernel I/O Subsystems, Transforming I/O Requests to Hardware Operations, Performance.
Secondary Storage Structure, Tertiary Storage Structure.
- 5. Distributed Systems 10 Hrs.**
Network Structures, Distributed System Structures, Distributed File Systems, Distributed Coordination.
- 6. Protection & Security 8 Hrs.**
Protection : Goals and Domain of Protection, Access Matrix and its Application, Revocation of Access Right, Capability Based Systems, Language Based Protection & System.
Security : Authentication, One-Time Password, Program Threats, Threat Monitoring, Encryption, Computer-Security Classification.
- 7. Case Studies 6 Hrs.**
The UNIX System, The Linux Systems, Windows 2000 / XP / NT

C4 : ALGORITHM ANALYSIS AND DESIGN

Detailed Syllabus

- 1. Introduction and Preliminaries : Asymptotic Analysis, Elementary Data Structuring and Algorithmics 6 Hrs.**
Use of the Big-Oh, small o, Big-omega and small omega notation.
Inequalities involving such notation : Data structures like linked lists and heaps, Search trees AVL trees and 2-3 trees, Basic algorithms like quicksort, depth and breadth first search

in graphs, and other simple illustrative examples.

2. Sorting and Selection Algorithms : Worst-case and Randomized 4 Hrs.

Deterministic selection and sorting, Optimality of algorithms for sorting and selection, Randomized algorithms like randomized quick-sort, and expected linear time randomized selection.

3. Graph Algorithms : Connectivity Problems, Shortest Paths and Spanning Trees, Use of various kinds of Heaps and Queues in Graph Algorithms 8 Hrs.

Computing connected components in undirected graph, Computing strongly connected components in undirected graphs, Studying properties of DFS trees, Dijkstra's shortest path algorithm and Prim's minimum spanning tree algorithm, Kruskal's minimum spanning tree algorithm, Use of (binary, binomial, fibonacci) heaps and queues in these algorithms.

4. Network Flows and Bipartite Matchings in Graphs 8 Hrs.

Ford-Fulkerson algorithm and its limitations, Edmonds-Karp algorithms and their analysis, Use of network flows for computing maximal matchings in bipartite graphs.

5. Use of Dynamic Programming for designing efficient Algorithms for Optimization problems. 5 Hrs.

Examples like computing optimal ordering of matrix-chain multiplications and optimal binary search trees, Use of memoization for implementing, dynamic programming, Computing the longest increasing subsequence in an unsorted sequence of numbers, Viewing, Dijkstra's single source shortest path algorithm as an example of dynamic programming, Other examples like knapsack and bin-packing.

6. Use of Divide-and-Conquer in Design and Analysis of Sequential and Parallel Algorithms 5 Hrs.

Divide and Conquer Recurrence relations for Sequential and Parallel running times and numbers of parallel processors, Examples from Sorting and Selection, Strassen kind of Matrix Multiplications, Convex Hull Computation.

7. NP-Completeness and Approximation Algorithms 5 Hrs.

Establishing membership of decision problems

in NP, Establishing that SAT is complete for NP, Working out examples of reductions for other complete problems, Examples of approximation algorithms.

8. Use of Amortization in Algorithm Analysis 7 Hrs.

Simple examples illustrating Amortization like the Binary Counter, Amortized Analysis of Splaying, Amortized Analysis of Costs in Batched Insertions / Deletions in 2-4 trees / Red-Black Trees.

9. Elementary Geometric Problems 8 Hrs.

Algorithms and Data Structures Computing Convex Hulls and Closest Pairs of Points, Computing Segments' intersections in the Plane, Use of Data Structures like Range Search Trees, Priority Search Trees k-d Trees Quad Trees.

10. String Matching Algorithms 4 Hrs.

KMP Algorithm, Boyer - Moore Algorithm.

C5 : OBJECT ORIENTED METHODOLOGY

Detailed Syllabus

1. Program Design Concepts 4 Hrs.

Software evolution and crisis; Procedure-oriented approach; Introduction to common PO-languages; Features of good programs and software quality; advantages and Disadvantages of PO-methodology

2. Object-Oriented Concepts 10 Hrs.

Basic concepts of OO Approach; Evolution of OO methodology and its benefits; paradigms of OO methodology; introduction to OO analysis and design; Measurements; distributed OO technology-CORBA; OMG and standardization.

3. Java Language 12 Hrs.

JAVA Programs; Inheritance and Polymorphism; Exception handling and Multithreading; Inheritance and Polymorphism; I/O in Java; Packages

4. Graphics and User Interfaces 8 Hrs.

Graphics Contexts and Graphics Objects; Drawing graphical entities-lines, arcs, rectangles Drawing Polygons and polylines; Java2D API, User Interface components; Building User Interface with AWT

5. Networking Features 6 Hrs.

Socket overview; Reserved sockets, Proxy servers; Internet addressing; Domain naming services (DNS); JAVA and the net; The

networking classes and interfaces; TCP/IP server sockets; DataGrams

- 6. Java3D 10 Hrs.**
Java Servlets; Java Beans; Java Database Connectivity; Swing-based GUI; Java3D and Applications in 3-dimensional simulations virtual reality and multimedia.

- 7. OO Languages 10 Hrs.**
Salient features of C++, Smalltalk, Modula-3 and Eiffel; comparison of these languages and applications

C6 : ADVANCED DATABASE MANAGEMENT SYSTEMS

Detailed Syllabus

- 1. Relational Databases 15 Hrs.**
Integrity Constraint revisited :- Functional, Multivalued and Join Dependency, Template Algebraic, Inclusion and Generalised Functional Dependency, Chase Algorithms
Query Processing and Optimization : Evaluation of Relational Operations, Transformation of Relational Expressions, Indexing and Query Optimization, Limitations of Relational Data Model, Null Values and Partial Information.
- 2. Deductive Databases 5 Hrs.**
Datalog and Recursion, Evaluation of Datalog program, Recursive queries with negation.
- 3. Objected Oriented and Object Relational Databases 8 Hrs.**
Modeling Complex Data Semantics, Specialization, Generalization, Aggregation and Association, Objects, Object Identity, Equality and Object Reference, Architecture of Object Oriented and Object Relational Databases.
Case Studies : Gemstone, O₂, Object Store, SQL3, Oracle xxi, DB2
- 4. Parallel and Distributed Databases 6 Hrs.**
Distributed Data Storage - Fragmentation & Replication, Location and Fragment Transparency, Distributed Query Processing and Optimization, Distributed Transaction Modeling and Concurrency Control, Distributed Deadlock, Commit Protocols, Design of Parallel Databases, Parallel Query Evaluation.
- 5. Advanced Transaction Processing 6 Hrs.**
Nested and Multilevel Transactions, Compensating Transactions and Saga, Long Duration Transactions, Weak Levels of Consistency, Transaction Work Flows, Transaction Processing Monitors.

- 6. Active Databases and Real Time Databases 4 Hrs.**

Triggers in SQL, Event Constraint and Action : ECA Rules, Query Processing and Concurrency Control, Compensation and Databases Recovery

- 7. Image and Multimedia Databases 6 Hrs.**

Modeling and Storage of Image and Multimedia Data, Data Structures - R-tree, k-d tree, Quadrees, Content Based Retrieval : Color Histograms, Textures etc., Image Features, Spatial and Topological Relationships, Multimedia Data Formats, Video Data Model, Audio & Handwritten Data, Geographic Information Systems (GIS)

- 8. WEB Databases 5 Hrs.**

Accessing Databases through WEB, WEB Servers, XML Databases, Commercial Systems – Oracle xxi, DB2

- 9. Data Mining 3 Hrs.**

Knowledge Representation Using Rules, Association and Classification Rules, Sequential Patterns, Algorithms for Rule Discovery

- 10. Data Warehousing 2 Hrs.**

Data Warehouse Architecture, Multidimensional Data Model, Update Propagation OLAP Queries.

C7: ADVANCED COMPUTER NETWORKS

Detailed Syllabus

- 1. Review of Networking Concepts 10 Hrs.**
Layered Operation, Protocol Suites, Routing, Flow Control, Multiplexing, Synchronization, Security
- 2. Performance Models 12 Hrs.**
Review of Queueing Systems : M / M / S / K Queues, Burke's Theorem, Imbedded Markov Chains, M / G / I Queues.
Delay in Synchronous and Asynchronous Time Division Multiplexing.
Priority Queues : Preemptive and Nonpreemptive queues, application in Ring Networks.
Networks of Queues : Jackson's Theorem, State Dependent Service Rates, Closed Queueing Network.
- 3. Multiaccess Network 6 Hrs.**
Review of ALOHAs and CSMA, Stability in S-ALOHA : Pseudo-Bayesian Algorithm,

Splitting, Algorithms : Tree Algorithm, First come First serve (FCFS) Splitting, Application to ALOHAs and CSMA.

4. Asynchronous Transfer Mode(ATM) 7 Hrs.

Objectives, CBR and VBR Services, ATM Cell, Transmission Path : Virtual Channels, Virtual Channels, Virtual Path, ATM Layer Model : Physical, ATM and AAL Layers, User, Control and Management Planes.

Traffic and Congestion Control : Requirements, attributes, management, control, ABR and GFR traffic management.

5. Integrated Services Digital Networks (ISDN) 4 Hrs.

ISDN Structure : Transmission Structure, User Network Interfaces, Protocol Architecture and Connections, Physical Layer, LAP-D, Signalling System Number 7, ISDN Services, Broadband ISDN : Services, Architecture

6. High Speed Networks 8 Hrs.

Fiber Distributed Data Interface (FDDI) : Physical Layer Description, MAC Protocol, Capacity Allocation, Delay, FDDI II, Distributed Queue Dual Bus (DQDB) : Topology, Protocol Architecture, Fairness, Performance

7. TCP / IP and Internet working 13 Hrs.

Protocol Stack, Internet Protocol : IP Datagram Format, 5 Hrs. Internet

Addressing (IPv4 and IPv6), Interior and Exterior Routing Protocols

Quality of Service in IP Networks 3 Hrs.

User Datagram Protocol (UDP), TCP : Format, Connections, Sliding Window and Flow Control 3 Hrs.

Utility Protocols : Domain, name Service (DNS), SNMP, 2 Hrs.

TELNET, FTP, TFTP, NFS

Electronic Mail : SMTP, X.400, MIME

C8: ADVANCED SOFTWARE ENGINEERING

Detailed Syllabus

1. Software Engineering Concepts 2 Hrs.

S / W Engineering Concepts, S / W Engineering Development Activities, Issues in Managing S / W Development, Software reusability and re-engineering concepts.

2. Software Life Cycle Standards 4 Hrs.

S / W Life Cycle Models : Water Fall, Spiral and Prototype, Comparison and limitations, Standards for Developing Life Cycle Models, Managing Activities and Products, Software Process and Project Management.

3. Object Methodology and Requirement Elicitation 8 Hrs.

Introduction to OO Methodology, Overview of Requirements Elicitation, Requirements Model - Actors and Use Cases, Requirements Elicitation Activities, Managing Elicitation

4. OOA and Design Models 8 Hrs.

Analysis concepts and Activities, Analysis Model, Design concepts and Activities, Design Model : Implementation Process

5. Modeling with UML 12 Hrs.

Basic Structural Modeling, Class Diagrams and Relationships, Packages, Object Diagrams and Representations, Use-case and Interaction Diagrams, Components, Patterns and Frameworks

6. Testing OO Systems and Quality Assurance 10 Hrs.

An overview of Testing, Testing Activities and Techniques, Managing Testing, OO Metrics and Quality Models, Software reliability.

7. Software Architecture 8 Hrs.

Software design Levels, Architectural Styles and Models, Pipes and Filter, Data abstraction and OO organization, Event based invocation, Formal Models and Specifications, Tools for Architectural Design, Formal methods, for software development, Case Study.

8. Software Agents 8 Hrs.

Agents-oriented vs OO Software development Design methods, Multiagent Systems, Use of UML, Agent methodologies in the Industry; component based software engineering.

C9 : ADVANCED SOFTWARE PROJECT MANAGEMENT

Detailed Syllabus

1. Introduction To Software Project Management 2 Hrs.

Software development as a project; Stakeholders in software project; Software product, process, resources, quality and cost; Objectives, issues, and problems relating to software projects.

2. Overview of Project Planning 4 Hrs.

Steps in project planning; Defining scope and objectives; Work breakdown structure; Deliverables and other products; Time, cost, and resource estimation; Alternatives in planning.

3. Project Evaluation 6 Hrs.

Strategic assessment; Technical assessment; Cost-benefit analysis; Cash flow forecasting; Cost-benefit evaluation techniques; Break-even analysis; Risk evaluation.

4. Selection Of Appropriate Project Approach 4 Hrs.

Choosing development technology and methodology; Choice of process model; Rapid application development; Waterfall model; V-process model; Spiral model; Prototyping; Incremental delivery.

5. Software Effort-Estimation 6 Hrs.

Problems in software estimation; Effort estimation techniques; Expert judgement; Estimation by analogy; Delphi technique; Algorithmic methods; Top-down and bottom-up estimation; Function point analysis; Object points; COCOMO model.

6. Activity Planning 4 Hrs.

Network planning model; Activity-on-arrow network; Precedence network; Forward pass; Backward pass; Critical path; Slack and float.

7. Risk Analysis And Management 6 Hrs.

Nature and categories of risk in software development; Risk Identification; Risk assessment; Risk mitigation, monitoring, and management; Evaluating schedule risk using PERT.

8. Resource Allocation 4 Hrs.

Nature of project resources; Identifying resource requirement of activities; Allocating and scheduling resources; Cost of resources; Standard, planned, and actual cost; Cost variance; Time-cost-trade-off.

9. Project Tracking And Control 4 Hrs.

Measurement of physical and financial progress; Earned value analysis; Status reports; Milestone reports; Change control.

10. Contract Management 4 Hrs.

Outsourcing of products and services; Types of contracts; Stages in contract placement; Terms of contract monitoring; Acceptance testing.

11. Managing People And Organizing Teams 4 Hrs.

Organizational behaviour; Recruitment and placement; Motivation; Group behaviour; Individual and group decision making;

Leadership and leadership styles; Forms of organizational structures.

12. Software Quality Assurance 6 Hrs.

Planning for quality; Product versus process quality management; Procedural and quantitative approaches; Defect analysis and prevention; Statistical process control; Pareto analysis; Causal analysis; Quality standards; ISO 9000; Capability Maturity Model; Quality audit.

13. Configuration Management 6 Hrs.

Configuration management process; Software configuration items; Version control; Change control; Configuration audit; Status reporting.

C10 : COMPUTER GRAPHICS & ANIMATION

Detailed Syllabus

1. Basic background 4 Hrs.

2D and 3D Transformations, Cyrus-Beck line clipping algorithm, Polygon clipping

2. 3D Viewing 8 Hrs.

Viewing pipeline, Parallel and Perspective projections, view volumes, clipping

3. Representing Curves and Surfaces 10 Hrs.

Parametric curves, continuity conditions, cubic splines, Hermite interpolation, Bezier curves and surfaces, B-spline curves-uniform nonrational, cubic periodic, open uniform, nonuniform rational types (NURBS), subdividing curves, Displaying spline curves using forward difference scheme, parametric bicubic surfaces

4. Solid Modeling 4 Hrs.

Sweep representation, Constructive solid geometry methods, representation through Octrees, Binary Space Partitioning trees

5. Visible Surface Determination 8 Hrs.

Issues in Visible surface determination - Coherence, perspective view, extents and bounding volume, backface culling, Z-Buffer and A-Buffer Algorithms, use of Binary Space Partitioning trees, representing 3D data using Octrees, Boolean operations on Octrees marching cubes, Visible surface ray tracing.

6. Illumination Models & Rendering 5 Hrs.

Diffuse and Specular illumination model, reflection vector computation, Shading models for polygons – polygon mesh shading, Gouraud and Phong Shading, problems with interpolated shading, Bump mapping, Transparency, Shadows, Ray tracing

7. Introduction to Animation 3 Hrs.

Perception, Animation production, use in film and videos, orientation representation and interpolation – Euler angle representation, motion display considerations

8. Animation - Low Level Control 8 Hrs.

Motion along a curve - computing arc length, speed control – sine interpolation, user specified distance time functions, path following; key-frame systems - shape interpolation, free-form deformations; Morphing – 2D object warping

9. Animation - High Level Control 10 Hrs.

Hierarchical modeling and kinematics - inverse kinematics, Jacobian, rigid body simulation, collision detection, Particle systems – particle generation, attributes, termination, rendering, Flocking behavior - interacting with other members, leader, collision avoidance, modeling water, fire, explosions, waves, clouds.

C11 : MULTIMEDIA TECHNOLOGY AND VIRTUAL REALITY

Detailed Syllabus

1. Introduction : Nature of Multimedia Data 8 Hrs.

Concept of Non-Temporal and Temporal Media. Basic Characteristics of Non-Temporal Media; Images, Graphics, Text,

Basic Characteristics of Temporal Media; Video, Audio, Animation.

Hypertext and Hypermedia.

Presentations : Synchronisation, Events, Scripts and Interactivity Introduction to Authoring Systems

2. Compression of Multimedia Data 16 Hrs.

Basic concepts Compression.

Still Image Compression; JPEG Compression, Features of JPEG 2000.

Video Compression : MPEG -1&2 Compression Schemes, MPEG-4

Natural Video Compression.

Audio Compression Introduction to Speech and Audio Compression.

MP3 Compression Scheme.

Compression of Synthetic Graphical Objects.

3. Multimedia Systems 8 Hrs.

General Purpose Architecture for Multimedia Support : Introduction to Multimedia PC/ Workstation Architecture, Characteristics of MMX instruction set, I/O System : Overview of USB port and IEEE 1394 interface.,

Operating System Support for Multimedia Data : Resource Scheduling with real-time considerations, File System, I/O Device Management.

4. Delivery of Multimedia data 8 Hrs.

Network and Transport Protocols for Multimedia data

Qos issues

RTP and RSVP.

Video-conferencing and video-conferencing standards.

Overview of Voice / Video over IP.

5. Multimedia Information Management 8 Hrs.

Multimedia Data base Design

Content Based Information Retrieval : Image Retrieval, Video

Retrieval, Overview of MPEG-7, Design of Video-on-Demand Systems

6. Virtual Reality 12 Hrs.

Introduction to Virtual Reality and Virtual Reality Systems

Related Technologies : Tele-operation and Augmented Reality Systems

Interface to the Virtual World - Input; Head and hand trackers, data gloves, haptic input devices

Interface to the Virtual World - Output; Stereo display, head-mounted displays, auto-stereoscopic displays, holographic displays, haptic and force feedback

VRML Programming; Modelling objects and virtual environments

Domain Dependent applications : Medical, Visualisation, Entertainment, etc.

C12 : DISTRIBUTED SYSTEMS

Detailed Syllabus

1. What are distributed systems? Examples of distributed systems, Resource sharing and the web, Challenges in designing distributed systems/

2. Distributed Systems Architecture 4 Hrs.

Distributed Systems architectures, software layers; Architectural Models - Client-server, peer-processes, Mobile code, agents, Network Computers, Thin Clients etc.

3. Networking and Interprocess Communication 6 Hrs.

Types of network, network principles, internet protocols, Network case studies – Ethernet, wireless LAN and ATM, The API for the internet

protocols, External data representation and marshalling, Client-server communication, Group Communication.

4. **Object Interaction : RMI, RPC** **5 Hrs.**
Distributed application programming – Distributed object models, RMI, Invocation semantics, RPC, Events and Notification.
Products Case Study – JAVA RMI, CORBA, COM, SUN RPC and Jini
5. The Operating System Layer, Protection, Processes and Threads, Communication and invocation, Operating System Architecture.
6. **Distributed File Systems** **5 Hrs.**
File Service Architecture, Sun Network File System, The Andrew File System, Recent Advances
7. **Name Services** **3 Hrs.**
Name services and domain name systems, Directory and discovery services, The Global name service, X.500 directory service.
8. **Security** **5 Hrs.**
Overview of security techniques, Cryptographic algorithms, digital signatures, Cryptographic pragmatics.
9. **Distributed Algorithms** **6 Hrs.**
Distributed algorithm design principles and issues such as coordination, agreement. Examine source of difficulties such as timing, interaction models, and failures.
10. **Transactions and Concurrency Control** **6 Hrs.**
Transaction, Nested transactions, Locks, Optimistic Concurrency control, Timestamp ordering and Comparisons of methods for concurrency controls.
11. **Distributed Transactions** **4 Hrs.**
Flat and nested distributed transactions. Atomic commit protocols, and concurrency control in distributed transactions, distributed deadlocks, Transaction Recovery.
12. **Distributed Multimedia Systems** **6 Hrs.**
Characteristics of multimedia data, Quality of Service management, Resource management, Stream Adaption.
13. **Distributed Shared Memory** **4 Hrs.**
Design and implementation issues, Sequential consistency and lvy, Release consistency and Munin and other consistency models.

C13 : DIGITAL SYSTEM DESIGN

Detailed Syllabus

1. **Introduction to Digital System Design** **4 Hrs.**
Introduction to hardware structures and assembly-language concepts, Internal data representation and arithmetic operations in a computer. Basic logic circuits. Overview of design architecture.
2. **Combinational Logic Design** **6 Hrs.**
Boolean Algebra, Symbolic logic, Karnaugh Maps
3. **Combinational Circuits** **6 Hrs.**
Gates, Multiplexes, Decoders and Arithmetic Circuits
4. **Sequential Circuits** **6 Hrs.**
Flip-Flops, Registers and Counters, Memory Devices
5. **Sequential Circuit Design** **10 Hrs.**
Finite State Machines, Representation, Synthesis
6. **VHDL** **14 Hrs.**
Basic Language Elements : Behavioral Modelling; Data flow modelling; Structural modelling; Generics & configuration; Subprogram and Over loading; Packages and Libraries.
7. **Programmable Logic Devices** **7 Hrs.**
ROM, PALs, PLDs & FPGA, FPGA Architecture, FPGA Design Flow
8. **Register Transfers and Datapaths** **7 Hrs.**
Data Control Division, Datapath Design, Control Unit, Algorithmic State Machine Implementation, Case Study
Practical Exercises recommended on VHDL Simulation, VHDL Synthesis, FPGA Schematic Capture, FPGA Simulation.

C-14 : AI AND NEURAL NETWORKS

Detailed Syllabus

1. **Scope of AI and Neural Networks** **2 Hrs.**
AI and related disciplines, AI techniques - search, knowledge - based reasoning, intelligent abstraction, Application areas: Image understanding, Signature Analysis, Robotics, Expert systems, Intelligent Control and Scheduling.
2. **Problem Solving and Search** **6 Hrs.**
State space search, Control strategies : Depth

first search, Breadth first search, Production system.

Problem characteristics : Decomposable, ignorable, recoverable, predictable, Heuristic search : Hill climbing, Best first search, A algorithm: admissibility, monotonicity and related issues, AND-OR graphs AO algorithm, Constraint satisfaction : Cryptoarithmetic.

Game playing : Minimax search, Alpha-Beta pruning.

3. Knowledge Representation and Reasoning **8 Hrs.**

Propositional and predicate logic : Well formed formulae, quantifiers, Prenex normal form, Skolemization, Unification, modus ponens, modus tollens, chain rule, Resolution by refutation.

Rule based Systems : Forward reasoning: Conflict resolution, Backward reasoning: Use of no back-tracking.

Structured Representation of Knowledge : Semantic nets: slots, inheritance, Frames - exception and default handling, Conceptual dependency formalism.

4. Uncertainty Management **8 Hrs.**

Probabilistic reasoning : Bayesian reasoning, Dempster-Shafer theory Certainly factor based reasoning, Fuzzy logic and reasoning, Nonmonotonic and Default reasoning.

5. AI Programming Languages **8 Hrs.**

A brief introduction to AI programming languages.

PROLOG : Syntax, List implementation, Controlling back-tracking by CUT, CUT-FAIL combination, NOT predicate, Iteration, Recursion.

6. Intelligent Planning **4 Hrs.**

Components of Planning System, Plan generation algorithm: Forward state propagation, Backward state propagation, Nonlinear planning using constraint posting.

7. Machine Learning Using Neural Nets **13 Hrs.**

Supervised Learning: Perceptron learning, Widrow-Hoff's ADALINE model : Delta learning rule, Multilayered ADALINES and their training, Application of ADALINES in translation, rotation and size-invariant pattern recognition.

Steepest Descent learning and Back-propagation algorithm, Radial Basis Function Neural nets.

Unsupervised Learning : Discrete and Continuous Hopfield nets : Stability analysis by Liapunov energy functions, Application in travelling salesperson problem.

Bidirectional Associative Memory, Fuzzy Associative Memory, Adaptive Resonance Theory.

Competitive Learning : General scheme of competitive learning, Self-Organizing Feature Map.

Reinforcement Learning : Q-learning, Temporal Difference Learning.

8. Application (Examples only) of AI and Neural Networks **12 Hrs.**

Pattern recognition : Feature extraction, Feature space to pattern space mapping, Realization of the mapping by neural algorithms, Object recognition from images.

Natural language understanding : Syntactic analysis, Top down and bottom up parsing, Augment transition networks, Semantic analysis and case grammars, Scope of neural nets in natural language understanding.

Expert systems : Architecture of an expert system, knowledge acquisition, Validation, verification and management issues, AI and Neural methods for expert system realization.

Control systems: Scope of expert and neural models in process control, Motion planning of mobile robots using neural networks.

CE1: ADVANCED COMPUTER ARCHITECTURE

Detailed Syllabus

1. Introduction And Review **3 Hrs.**

Fundamentals of digital computer and organization

2. Pipelining **8 Hrs.**

Linear pipeline processor : Nonlinear pipeline processor, Instruction pipeline design, Mechanisms for instruction pipelining, Dynamic instruction scheduling, Branch handling techniques, Arithmetic Pipeline Design : Computer arithmetic principles, Static arithmetic pipelines, Multifunctional arithmetic pipelines

3. Storage And Memory Hierachy **8 Hrs.**

Register file, Virtual memory, Cache memories, Cache memory working principles, Cache coherence issues, Cache performance analysis, High bandwidth memories

4. I/O Organization 7 Hrs.

High bandwidth I/O, Bus specifications and Standards.

5. Instruction Level Parallelism 6 Hrs.

Super-scalar processors, VLIW architecture

6. Parallel Computer Models And Program Parallelism 12 Hrs.

Classification of Machines, SISD, SIMD and MIMD, condition of parallelism, data and resource dependencies, hardware and software parallelism, program partitioning and scheduling, grain size latency, program flow mechanism, control flow versus data flow, data flow architecture, demand driven mechanisms, comparison of flow mechanisms.

7. Vector Processor And Synchronous Parallel Processing 9 Hrs.

Vector instruction types, vector access memory schemes, vector and symbolic processors, SIMD architecture and programming principles; SIMD parallel algorithms, SIMD computers and performance enhancement

8. System Interconnect Architectures 7 Hrs.

Network properties and routing, static interconnection networks, dynamic interconnection networks, multiprocessor system interconnects; Hierarchical bus systems, Crossbar switch and multiport memory, Multistage and combining network.

CE2: WIRELESS AND MOBILE NETWORKS

Detailed Syllabus

1. Introduction To Wireless And Mobile Communication 4 Hrs.

Overview of wireless networks, Evolution of Mobile Radio Communication, Study of various Mobile Radio Systems around the world, Examples of Wireless Communication : Paging systems; Cordless Telephony; Cellular Telephony, Comparison of various wireless communication systems, Different generation of wireless networks.

2. Mobile Radio Propagation 4 Hrs.

Types of radio waves, Propagation mechanisms, free-space propagation, land propagation; path loss; slow fading, fast fading (Statistical characteristics of envelope and characteristics of instantaneous amplitude), doppler effect, delay spread, intersymbol interference, coherence bandwidth, Cochannel interference.

3. Cellular Concept 4 Hrs.

Introduction to Cellular system, Cell area, Signal strength and cell parameters, Capacity of a cell,

Frequency Reuse, Cochannel interference, Handoff Management, Cell splitting, Cell sectoring.

4. Wireless Access Techniques 6 Hrs.

Introduction to Multiple access, Frequency division multiple access (FDMA), Time division multiple access, Spread spectrum multiple access; Frequency hopped multiple access (FHMA), Code division multiple access (CDMA), Contention based protocols : Review of ALOHA, Slotted ALOHA, CSMA/CD CSMA/CA, Modulation techniques : FSK; PSK; QPSK

5. Channel Allocation Technologies 4 Hrs.

Static Versus Dynamic allocation, Fixed and dynamic channel allocation schemes Allocation in specialized system structure : Channel allocation in one-dimensional Systems, Reuse partitioning based channel allocation; overlapped cells-based allocation; Channel modeling, Modeling of handoff calls

6. Mobile Systems And Standards 12 Hrs.

Second Generation (2G) Cellular Networks, Global systems for Mobile (GSM) : GSM Architecture, GSM Services and features, GSM Protocol Model and Mobility Management, Short Message Service (SMS) security aspects, Analog Mobile Phone Service (AMPS) : IS-136 North American TDMA standard, Code Division Multiple Access (CDMA) : IS95 Digital Cellular Standard.

Evolution for 2.5G TDMA Standards, General Packet Radio Service (GPRS) : GPRS Architecture, GPRS Network, Interface and Procedures, Enhanced Data rates for Global Evolution (EDGE) : EDGE Architecture and features

Third Generation (3G) Mobile Services, Universal Mobile Telecommunication Systems (UMTS) Architecture and W-CDMA, CDMA 2000, Quality of service in 3G.

7. Wireless Local Area Networks (WLAN) 12 Hrs.

Components and working of WLAN, Transmission Media for WLAN, Radio Waves, Infrared technology, Narrow Band Technology, Modulation Techniques for WLAN, Direct Sequence Spread Spectrum Technology (DSSS), Frequency Hopping Spread Spectrum technology (FHSS)

IEEE 802.11 standards and WLAN types, Ad-hoc networks : characteristics and routing classification, Infrastructure WLAN Protocols for WLAN, MACA Protocol, MACAW Protocol

Features and Goals of Bluetooth, Bluetooth Architecture, Protocol Stack, Bluetooth products and security, Personal Area Networks (PAN)

8. TCP Over Wireless & Ipv6 4 Hrs.

Mobile IP : support of Mobility on the Internet, Mobile TCP, Traffic Routing in Wireless Networks, Circuit switched Data Services, Packet switched Data services

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| <p>9. Wireless In Local Loop (WLL) 3 Hrs.
WLL Architecture, WLL Technologies and frequency spectrum, Local Multipoint Distribution Service (LMDS)</p> <p>10. Satellite Systems 3 Hrs.
Types of satellite systems (LEO, MEO & GEO), Characteristics of satellite systems, Satellite system infrastructure, Call setup, Global Positioning system (GPS)</p> <p>11. Ultra Wideband Technology 2 Hrs.
Ultra wideband (UWB) system characteristics, UWB signal propagation, Current status and application of UWB technology, advantages and Drawbacks of UWB technology, Challenges for UWB technology.</p> <p>12. Multimedia Services Requirements 2 Hrs.
Media codes, File formats, HTTP, Media control protocols, Wireless ATM, SIP</p> | <p>5. Classification And Predictions 8 Hrs.
Different Classification algorithm, including C4.5, CART etc. Use of genie index, decision tree induction, Bayesian classification, neural network technique of back propagation, fuzzy set theory and genetic algorithms,</p> <p>6. Clustering 6 Hrs.
Partition based clustering, hierarchical clustering, model based clustering for continuous and discrete data. Discussion on scalability of clustering algorithms. Parallel approaches for clustering.</p> <p>7. Web Mining 6 Hrs.
Web usage mining, Web content mining, web log attributes. Use of web mining in efficient surfing and personalization.</p> <p>8. Mining Complex Type of Data 4 Hrs.
Data mining issues in object data bases, spatial data bases and multimedia data bases, time series data bases, and text data bases.</p> <p>9. Applications of Data Warehousing And Data Mining 3 Hrs.
Exploration of web sites on data warehousing and data mining applications including bibliography data bases, Corporate Houses and Research labs.
Use of data mining package and data warehousing package, e.g. SAS, IBM tools.</p> |
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CE3 : DATA WAREHOUSING AND MINING

Detailed Syllabus

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| <p>1. Introduction And Background 6 Hrs.
An introduction to the multidisciplinary field of data mining. Discussion on the evolutionary path of database technology that has led to the need for data warehousing and data mining. Stress on importance of its application potential. Introduction to the different key words and techniques.</p> <p>2. Data Warehousing And OLAP 15 Hrs.
Insight of data warehouse and on-line analytical processing, Aggregation Operations, models for data Warehousing, star schema, fact and dimension tables Conceptualization of data warehouse and multidimensional databases. Life cycle of data warehouse development. Relationship between data warehouse and data mining.</p> <p>3. Data Mining Primitives 6 Hrs.
Data preprocessing including data cleaning data integration, data transformation. Definition and Specification of generic data mining task. Description of Data mining query language with few example queries.</p> <p>4. Association Analysis 6 Hrs.
Different methods(algorithms) for mining association rules in transaction based data bases. Illustration of confidence and support. Multidimensional and multilevel association rules. Classification of association rules. Discussion on few association rule algorithms e.g. Apriori frequent pattern growth etc.</p> | <p>CE4: NETWORK SECURITY & CRYPTOGRAPHY
Detailed Syllabus</p> <p>1. Foundations of Cryptography and Security 2 Hrs.
Ciphers and Secret Messages, Security Attacks and Services.</p> <p>2. Mathematical Tools for Cryptography 5 Hrs.
Substitutions and Permutations, Modular Arithmetic, Euclid's Algorithm, Finite Fields, Polynomial Arithmetic.</p> <p>3. Design Principal of Block Ciphers 6 Hrs.
Theory of Blocks Cipher Design, Feistel Cipher Network Structures, DES and Triple DES, Modes of Operation (ECB, CBC, OFB, CFB), Strength (or Not) of DES.</p> <p>4. Block Cipher Algorithms 6 Hrs.
IDEA, CAST, Blowfish, Twofish, Rijndael (AES)</p> <p>5. Pseudo Random Numbers and stream ciphers 5 Hrs.
Pseudo random sequences, Linear Congruential Generators, Cryptographic Generators, Design of Stream Cipher, RC4, RC5</p> |
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| <p>6. Public Key Cryptography 6 Hrs.
Prime Numbers and Testing for Primality, Factoring Large Numbers, Discrete Logarithms RSA, Diffie-Hellman, ElGamal, Introduction of Elliptic Curve Cryptosystems Key Management, Key Exchange Algorithms, Public-Key Cryptography Standards</p> <p>7. Hashes and Message Digests 6 Hrs.
Message Authentication, MD5, SHA-1, RIPEMD, HMAC</p> <p>8. Digital Signatures, Certificates, and Standards 4 Hrs.
Digital Signature Standard (DSS and DSA), Public Key Infrastructure, Digital Certificates and Basics of PKCS Standards.</p> <p>9. Authentication 4 Hrs.
Keyberons V4 and V5, X.509 Authentication Service</p> <p>10. Electronic Mail Security 4 Hrs.
Pretty Good Privacy (PGP), S/MIME, X.400</p> <p>11. IP and Web Security Protocols 5 Hrs.
IPSec and Virtual Private Networks, Secure Sockets an Transport Layer (SSL and TLS)</p> <p>12. System Security : Computer Virus, Firewall and Intrusion Detection 3 Hrs.
Viruses and related threats & countermeasures, Intrusion Detection & Password Management, Firewall Design Principles, Reference : Chapter 18, 19, & 20 of Cryptography an Network Security.</p> <p>13. Electronic Commerce Security 4 Hrs.
Electronic Payment Systems, Secure Electronic Transaction (SET), Protocols (CyberCash, iKey) Ecash (DigiCash), Smart Card Based Systems.</p> | <p>3. Image Enhancement In Frequence Domain 6 Hrs.
2D Discrete Fourier transform and its inverse, filtering in frequency domain, Ideal and Gaussain Low pass filters, high pass filtering, separability property of 2D Fourier transform, Fast Fourier Transform.</p> <p>4. Image Segmentation 8 Hrs.
Line detection, Edge detection, Edge linking and boundary detection, Hough Transform, Thresholding, Region based segmentation</p> <p>5. Morphological Image Processing 6 Hrs.
Logic operations involving binary images, Dilation and Erosion, Opening and closing, Applications to Boundary extraction, region filling, connected component extraction.</p> <p>6. Image Compression 8 Hrs.
Coding redundancy - Huffman coding, LZW coding, run length, run length coding, Lossy compression – Lossy predictive coding, transform coding - DCT, bit allocation, Compression standards – JPEG, video compression</p> <p>7. Image Representation 6 Hrs.
Boundary descriptors, Shape numbers, Fourier descriptors, Texture, Principal Components based description</p> <p>8. 3D Vision 12 Hrs.
Projective geometry, single perspective camera, stereopsis, the fundamental matrix - its estimation from image point correspondences, applications of epipolar geometry in vision, correlation based and feature based stereo correspondence, shape from motion, optical flow</p> |
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CE5 : IMAGE PROCESSING AND COMPUTER VISION

Detailed Syllabus

- 1. Introduction** **4 Hrs.**
Image formation model, representation, spatial and Gray Level resolution, Colour models - RGB, CMY and HIS models
- 2. Image Enhancement In Spatial Domain** **10 Hrs.**
Piecewise Linear transformation functions, Histogram equalization, Histogram specification, image averaging, spatial filters – smoothing and sharpening, Laplacian filter, sobel operator, Canny edge detector

CE6: SOFTWARE QUALITY MANAGEMENT

Detailed Syllabus

- 1. Software Quality** **4 Hrs.**
Basic software quality concepts, Quality Attributes, Software Quality Assurance (SQA), Evolution of SQA, Major SQA activities and issues
- 2. SQA Management And Models** **10 Hrs.**
Establishing quality assurance goals, planning and management, factors affecting SQA effort, Reviews and audits, technical review process; inspection and walkthroughs, standards and Practices; validations
- 3. Defect Reporting And Removal** **10 Hrs.**
Data gathering Error data; Identification an

Categorization of Defects, Analysis of Defect, Defect Correction, Implementation of Correction; Defect density; phase-based defects and removal patterns; defect removal effectiveness and quality planning. Defect prevention process; software testing and quality assurance; various software testing and verification techniques; statistical analysis and interpretation.

4. **Software Reliability Models** **10 Hrs.**
Software reliability; Rayleigh Model; Reliability Growth models; Modeling process; Criteria for Model Evaluation; of relationship of reliability and quality
5. **Software Quality Metrics** **6 Hrs.**
Measuring quality; measurement criteria; product and process quality metrics; metrics for configuration management and software maintenance; examples of metrics programs; complexity metrics and their relationship with testing and quality; metrics for object - oriented software systems
6. **Quality Assurance Models** **6 Hrs.**
ISO 9000, SPICE, BOOTSTRAP and CMM models; weaknesses, strengths and comparison of these models.
7. **Risk Management** **6 Hrs.**
Introduction to risk management; fault tree analysis; risk management breakdown; Hazard identification and categories; risk dangers and evaluation; risk reporting and Assessment; ISO 9000 and CMM compatibility
8. **Data Collection And Maintenance** **4 Hrs.**
Collecting and recording quality data, quality evaluation reports and maintenance; CMM compatibility, automating the software process and data collection; tools and techniques
9. **Setting Up And Evaluation Of Quality Programs** **4 Hrs.**
Software quality program plan design; preparation of templates; testing taxonomy; Estimating software quality; subcontracting and quality auditing; tracking and controlling Quality; effective contract management.

Note : This course must be supported by a case study.

CE7 : REAL-TIME SYSTEMS

Detailed Syllabus

1. **Basic concepts** **7 Hrs.**
Issues in real time computing, structure of a real time system, functional requirements,

temporal requirements, dependability requirements, classification of real time system, timing correctness and predictability : soft Vs hard real-time systems, high performance Vs real-time, introduction to hardware components of real time systems : microcontroller, sensor, actuator, interrupts, sample real time applications : robotics and manufacturing, from small autonomous systems to plant control, data collection and analysis in scientific applications, multimedia systems, real time benchmarks, including discrete event simulations

2. **Real Time Operating systems** **10 Hrs.**
Basic operating system functions required for real-time computing, task management, time management, inter-proces communication, synchronization, memory management, the scheduling problem, static and dynamic scheduling, static scheduling, priority-based scheduling and rate monotonic analysis, dynamic scheduling based on deadline constraints, synchronization, memory management, priority inversion, priority inheritance and priority ceiling protocols, Microkernel OS, survey of real-time operating systems, VxWorks, QNX, RT-Linux
3. **Real Time Communication** **4 Hrs.**
Real time communication requirements, flow control, OSI protocols for real time, fundamental conflicts in protocol design, media access protocol, CAN Bus field bus.
4. **Real Time System Development Methodologic** **10 Hrs.**
Requirement and specification methods, taxonomy of timing constraints, formal methods verification techniques, timing analysis of real-time system, structured design, Concepts of real-time languages, real-time object oriented analysis and design, Unified Modeling Language (UML) and Real-time UML, testing and debugging of real-time systems.
5. **Multiprocessor and Distributed Real-time Systems** **10 Hrs.**
Clocks, global time, distributed clock synchronization algorithms, multiprocessor priority ceiling protocols, end-to-end scheduling, schedulability analysis in distributed systems, Real-time CORBA concepts.
6. **Fault Tolerance Techniques** **6 Hrs.**
Introduction to fault types, fault detection; hardware, software information and time

redundancy, replication, process resilience design diversity, recovery blocks, N-version programming, graceful degradation, concepts of safety critical systems, introduction to reliability evaluation.

7. Real-time Data bases 6 Hrs.

Priority assignment and real-time transaction scheduling in active real-time databases, real-time logging and recovery, multimedia databases.

8. Performance Evaluation 7 Hrs.

Performance measures for Real Time Systems, properties of performance measures, traditional performance measures, modeling, measurement, optimization.

CE8 : LOGIC AND FUNCTIONAL PROGRAMMING

Detailed Syllabus

1. Introduction Computing Paradigm Computing 2 Hrs.

Imperative versus declarative computing, Introduction of Logic and Functional Paradigm.

2. Propositional Logic 8 Hrs.

Propositional Logic: Propositional Concepts, Natural Deduction and Axiomatic system, Semantic Tableaux and Resolution.

3. First Order Predicate Logic 10 Hrs.

Predicate Calculus, Prenex normal forms and Skolemization, Herbrand universe and H-interpretation, Clauses in FOL, Semantic Tableaux and Resolution.

4. Logic Programming 3 Hrs.

Conversion of Clauses to Clausal representation, Interpretation of Logic program (LP), Execution of a Query in Logic Program, Abstract interpreter for LP.

5. Advanced Prolog Concepts 8 Hrs.

Programming in Prolog (Overview), Meta Level Programming and Meta interpreters,

Nondeterministic Programming, Incomplete Data Structure, Second Order Programming in Prolog, Logic grammars: Definite Clause Grammar, A Grammar Interpreter.

6. Functional Programming (FP) Concepts 5 Hrs.

Functions: Mathematical notion of function, Multi-argument functions, Expression composition & equality, Recursive Definitions: Higher Order Functions, Function as data objects, Functions.

7. SML, A Functional Language 13 Hrs.

Introduction to SML: Value and Function Declaration, Bindings and Environments, Polymorphic Function Declarations, Records and Tuples, Local declarations, List and Advanced Features in SML: Manipulation of Lists, Tree manipulation in SML, Graphs as an Application of a List, Structures declaration, Recursive Datatype Declarations, Exception Handling.

8. Lambda Calculus 7 Hrs.

Pure Lambda Calculus, Currying of function (2- - function with more arguments), Substitutions, λ -Conversion Rules, Applied Lambda Calculus, Function definition using λ -notation, Recursive Definitions in λ -Notation.

9. Lazy and Eager Evaluation strategies 4 Hrs.

Evaluation Strategies, Lazy Evaluation: Evaluation Order and strictness of function, Programming with lazy evaluation, Interactive functional program, Dealy of unnecessary computation, Infinite Data Structure, Eager-Evaluation and Reasoning.

APPENDIX

GUIDANCE ON ENTRANCE TEST

GENERAL INSTRUCTIONS

1. The test will be of 1 hour duration
2. In the examination hall, you will be provided a Question Booklet and Answer Sheet.
3. Do not use Fountain Pen or Ball Pen to write on the answer sheet. You must use only a Black lead Pencil.
4. Mark only one answer to each question.
5. You must not write your answers on the question Booklet.
6. You must return both the question booklet and the answer sheet to the Invigilator.
7. On the top portion of answer sheet write your full particulars. The 'Particulars' includes Name, Address, City, Signature of the student and Date of Examination.

STRUCTURE OF ADMISSION TEST

The admission test will have five sections. Each section will have approximately the following number of questions. (You have to choose 1 answer among 4/5 options for each question) 2 marks for each question.

Sections Particulars	No. of Questions	Marks	Test Time
A. Logical Reasoning	10	'2'for each question	1 hour
B. General Awareness	10		
C. General Science	05		
D. Understanding Relationship	05		
E. Problem Solving	20		
Total	50		

SAMPLE TEST PAPER

SECTION - A (LOGICAL REASONING)

Read the following information carefully and answer the questions given below :

(A) There is a family of six persons, P,Q,R,S,T and U. They are Engineer, Doctor, Teacher, Salesman, Manager and Lawyer. (B) There are two married Couples in the family. (C) The Manager is grandfather of U who is an engineer. (D) R, the salesman is married to a lady teacher. (E) The Doctor's is married to the Manager. (F) Q is the mother of U and T.

- Q1. How many male member are there in the family?
a) Two b) Three c) Four d) Data is adequate e) None of these
- Q2. How is P related to T?
a) Grand mother b) Father c) Uncle d) Brother e) Grand father
- Q3. Which of the following is the Pair of couples in the family?
a) PQ b) RS c) PR, QS d) PS, QR e) None
- Q4. Which of the following is the profession of P?
a) Manager b) Salesman c) Doctor d) Teacher e) None
- Q5. PICK the odd man out :
a) Byron b) Shelly c) Keats d) Stevenson e) Tennyson

SECTION - B (GENERAL AWARENESS)

- Q6. Who among the following is the recipient of DADA SAHEB PHALKE award?
a) Raj Kapoor b) Satyajit Roy c) Lata Mangeshkar d) Mrinal Sen e) None
- Q7. Which of the following states have the least number of seats in Lok Sabha?
a) Andhra Pradesh b) Haryana c) Kerala d) Orissa e) Punjab
- Q8. Which of the following is the longest river in India?
a) Ganga b) Brahmaputra c) Sutty d) Jamuna e) Mahananda
- Q9. First Asian Games was held at
a) Delhi b) Colombo c) Seoul d) Dhaka e) None
- Q10. Who among the following won the 'GOLD' at Men's 100m run in Barcelona Olympics in 1992?
a) Frankie Fredericks b) Linford Cristie c) Dennis Mitchel d) Ben Jhonson e) None

SECTION - C (GENERAL SCIENCE)

- Q11. The first Indian Satellite was named
a) Apple b) Rohini c) Aryabhata d) Bhaskara e) None
- Q12. The filament of an electric bulb is made of
a) Tungsten b) Iron c) Nichrome d) Carbon e) None
- Q13. Penicillin is produced from
a) Algae b) Mushroom c) Mould d) Yeast e) None
- Q14. Which of the following vitamins is associated with clotting of blood?
a) A b) B c) C d) K e) None

SECTION - D (UNDERSTANDING RELATIONSHIP)

- Q15. ERRORS : INEXPERIENCE
i) SKILL : ECONOMY ii) TRAIN : MISTAKE iii) LOSSES : CARELESSNESS
iv) SUCCESS : VICTORY
- Q16. HEAD : VEIL
i) HAND : GLOVE ii) LEG : STOCKING iii) FINGER : THIMBLE
iv) WRTIST : MANACLE
- Q17. 'Blood' is related to 'Heart' similarly as 'Air' is related to
a) Nose b) Breathing c) Respiration d) Lungs e) None
- Q18. 'Ship' is related to 'Water' in the same way as 'Train' is related to
a) Passenger b) Path c) Track d) Road e) None

SECTION - E (PROBLEM SOLVING)

- Q19. The highest common factor of 70 and 25 is equal in
a) 35 b) 45 c) 55 d) 65 e) None
- Q20. Simplify $\frac{1/5-1/5 \text{ of } 1/5}{1/5 \text{ of } 1/5-1/5}$ is equal to
a) 1 b) 5 c) 1/5 d) 2/5 e) None
- Q21. $(60-0/06'10)^2 = ?$
a) 10 b) 100 c) 1000 d) 10,000 e) None
- Q22. A sum of a money at compound interest of cent percent, doubles itself in
a) 10 b) 4 years c) 2 years d) 1 year e) None
- Q23. $2a+5b=7$ and $ab=1$. find the value of $8a^2+20b^2$
a) 29 b) 58 c) 49 d) 69 e) None
- Q24. How much does a watch gain or loss per day if its hands coincide every 64 minutes,
a) 90 mins gain per day b) 90 mins loss per day
c) 328/11 mins gained per day d) 32/8/11 mins loss per day
- Q25. 49% of 80=?
a) 2 b) 32 c) 50 d) 200 e) None

List of the University/College Computer Centres

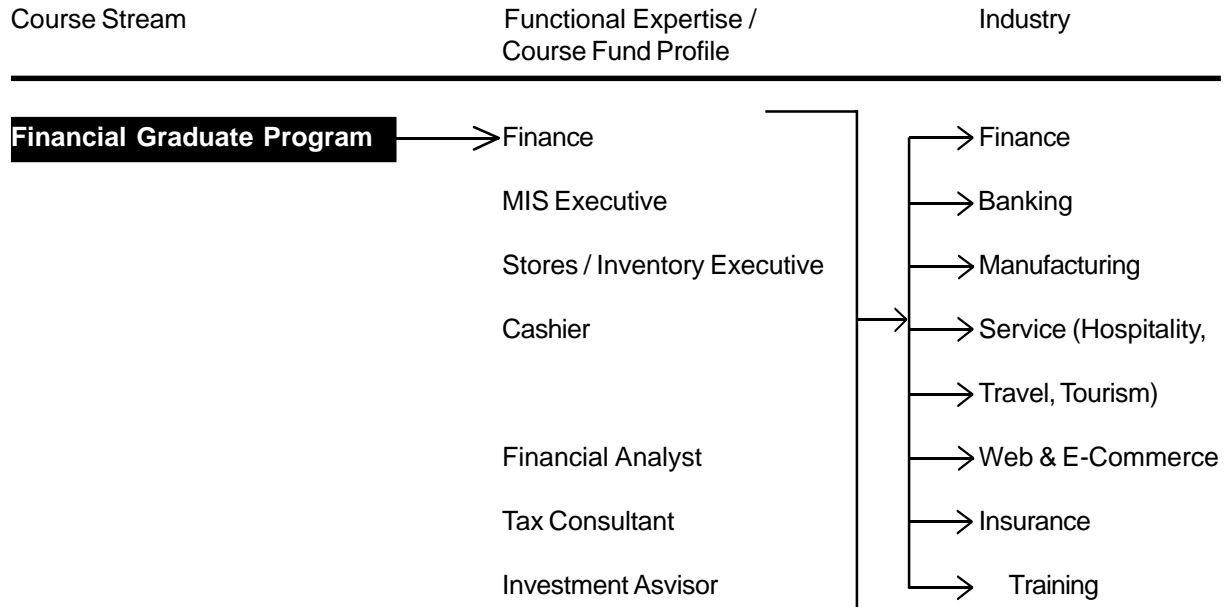
Functioning in Technnical Collaboration with

THE INSTITUTE OF COMPUTER ENGINEERS (INDIA)

College Centres	Contact Number
1. Agartala	Ph.- (0381) 2229680
2. APC	Ph.- 2537-2128
3. Asutosh College	Ph.- 2485-2808
4. B. C. Asansol	Ph.- (95341) 2220663
5. B. K. C. College	Ph.- 2578-1018
6. Baghbazar Womens'	Ph.- 2530-1199
7. Balurghat	Ph.- (03522) 271465
8. Bangabasi College of Commerce	Ph.- 2354-2578
9. Basanti Devi College	Ph.- 2463-0501
10. BCKV	Ph.- (9173) 278342
11. Behala College	Ph.- 2451-0427
12. Berhampore College	Ph.- (03482) 261758
13. Bijay Krishna Girls' College, Howrah,	Ph.- 2650-7602
14. Chakdaha College	Ph.- (9173) - 242582
15. Cooch Behar	Ph.- (03582) 256702
16. Dinabandhu Andrews College, Garia,	Ph.- 2430-1879
17. IT Centre, NBU	Ph.- (0353) 2581199
18. Dum Dum Motijhil College	Ph.- 2579-1783
19. Durgapur Chapter	Ph.- (0343) 2548663
20. East Calcutta Girls College, Laketown	Ph.- 2534-0242
21. Fakir Chand College	Ph.- (9174) 257500
22. Gurudas College, Narikeldanaga	Ph.- 2353-8572
23. Harimohan Ghosh College	Ph.- 2489-0322
24. Heramba Chandra (ASCII)	Ph.- 2461-1846
25. Hooghly Womens' College	Ph.- 2681-9865
26. Jaipuria College	Ph.- 2554-2867
27. Jogamaya Devi College	Ph.- 2485-3425
28. Jogesh Chandra Chaudhuri College	Ph.- 2422-1331
29. K. N. College C. C.	Ph.- (03482) 258390
30. Khargpur College	Ph.- (953222) 2727150
31. Kidderpore College	Ph.- 2459-1761
32. Lalbaba College	Ph.- 2654-5299
33. Mahadebananda Mahavidyalaya	Ph.- 2593-5077
34. Midnapore College	Ph.- (03222) 271423
35. MUC, Womens	Ph.- 95342-2634208
36. Prabhat Kumar College, Contai	Ph.- (03220)-259812
37. R B U Computer Centre	Ph.- 2556-4338
38. R.B.C	Ph.- 2581-7846
39. Raiganj College	Ph.- (03523) 243586
40. Ramananda College	Ph.- (953244) 254791
41. Rastraguru Surendranath College	Ph.- 2594-7068
42. Rishra Bidhan	Ph.- 2672-7863
43. RFM	Ph.- 2664-5047
44. Sarojini Naidu College	Ph.- 2529-6053
45. Sammilani	Ph.- 2462-7656
46. Sarsuna College	Ph.- 2452-4149
47. Siliguri College	Ph.- (0353) 253-6102
48. South Calcutta Girls' College	Ph.- 2475-7453
49. Sreegopal Banerjee College	Ph.- 2684-9779
50. Sreerampore College	Ph.- 2662-6976
51. T.D.B. College, Raniganj	Ph.- (0341) 244-0569
52. Tufanganj Mahavidyalaya	Ph.- 03582-246342
53. Uluberia College	Ph.- 2661-2937
54. Vidyasagar College	Ph.- 2219-1297
55. Vivekananda College, Burdwan	Ph.- (0342) 2545307
56. Vivekananda (Barisha)	Ph.- 2457-4963
57. Vivekananda College, Thakurpukur	Ph.- 2453-1638

ANNEXURE

FINANCIAL CAREER DEVELOPMENT



Curriculum Architecture :

The program has six modules that have been classified

Volume 1 : Basic Accounts and Inventory features

Volume 2 : Advanced Accounts and Inventory features

Volume 3 : VAT, TDS and Services and Tax features

Volume 4 : Payroll and Investment

Volume 5 : Banking Systems

Volume 6 : Management Accounting, Real Life Projects & Case Studies

Financial Graduate Program :

Duration : 6 months

Entry Level : 10+2 with Commerce / B.Com

Course Fees : Rs. 8,000.00
(Instalment available)

Volume 1 : Basic Accounts and Inventory features

- 1 Description of main features and components of Tally.
- 1 Creation and Maintenance of company information required by Tally.

- 1 Basics features to Tally Accounting system :
 - 1 Creation and Maintenance of chart of accounts.
 - 1 Entering voucher details.
 - 1 Generating and printing the books of accounts and financial statemnt.
- 1 Basic features of Tally Inventory System :
 - 1 Creation and Maintenance of the Inventory Masters.
 - 1 Entering voucher details.
 - 1 Generating and printing the Inventory books and report.

Volume 2 : Advanced Accounts and Inventory features

- 1 Maintenances of bill and Invoice details and tracking receivables and payable.
- 1 Creation and Mainteance of cost centres.
- 1 Creation and Mainteance of multiple currencies.
- 1 Creation and Mainteance of stock godowns and stock points.
- 1 Creation and Mainteance of budget and scenarios.
- 1 Performing interest calculations.

- 1 Generating and Printing of information statements.
- 1 System Administration and house keeping features.

Volume 3 : VAT, TDS and Services and Tax features

Creation of a company enabling VAT feature :

- 1 Processing of transactions involving VAT.
- 1 Generating and Printing of VAT computation and VAT forms.
- 1 Enabling TDS and Services Tax features.
- 1 Setting up master for TDS and Service Tax.
- 1 Generating and Printing of TDS and Service Tax reports
- 1 Processing of transactions involving TDS and Service Tax.
- 1 Tax planning & Return filling.

Volume 4 : Payroll and Investment

Payroll Accounting & Statutory Deductions :

- 1 PF, ESI, P.Tax, Demat.
- 1 Payroll Accounting.
- 1 Salary Structure.
- 1 Computation of Salary.
- 1 Generation & Maintenance of Pay Slip.
- 1 Leave Register and Salary Register.

Volume 5 : Banking Systems

- 1 Concept of Banking.
- 1 Various instruments (BG, LC, etc.)
- 1 e-Banking - Debit / Credit Card transaction.
- 1 Online Fund Transfer & Balance Enquiry.
- 1 Loan Project - C C, O D, Term Loan.
- 1 Project & Reporting.
- 1 Interest Calculation.
- 1 Housing Loan.

Volume 6 : Management Accounting, Real Life Projects & Case Studies

- 1 General Management
- 1 Corporate Finance
- 1 Working Capital Management
- 1 Capital Budgeting
- 1 Corporate Financial Analysis
- 1 Management of Receivables
- 1 Inventory Management
- 1 Cost Management
- 1 Accounting for Trading & Service Companies
- 1 Schedules to Balance Sheet
- 1 Project Documentation

**DIPLOMA IN COMPUTER
HARDWARE MAINTENANCE
AND NETWORKING (CHM- “O”
LEVEL)**

1.1-Objective :

The Objective of the CHM - “O” Level course is to train Diploma or Graduates in Electronics / Computers / Electrical / Instrumentation on others to acquire advanced skills in Computer Hardware & Networking for network management, administration, installation, trouble shooting of servers & system software, information security besides development of entrepreneurship skill.

Basic Electrical & Electronics (Electric Current, Transformers, Transistors, Number System, Flip Flops)

Core Hardware (Mapped to Comp TIA A+Core H/W Examination) (Installation, Configuration, Up gradation, Troubleshooting, Motherboard, Processor, Memory, Printers)

Core Operating System Technologies (Mapped to Comp TIA A+Core OS Examination) (Introduction, Windows - 2000, Utilities, Troubleshooting)

Network Administration (Mapped to Comp TIA Network + Examination) (Media & Topologies,

Protocols & Standard, Network Implementation, Network Support)

Linux (Mapped to Comp TIA Linux + Examination) (Installation, Configuration, System Maintenance, Troubleshooting) Windows NT & Windows 2000

Windows NT & Windows 2000 (NT Administration, Resource Management, Diagnostics, Policies, & Profiles, Registry, Backup, Troubleshooting, Active Directory Network in 2000, Security, Web Publishing.

Special Features

- 1 Monitor Repairing
- 1 Repairing of Printers
- 1 PC Assembling

1.2-Course Structure :

CHM - O1	Electronics Components and PC Hardware
CHM - O2	PC Architecture
Practical	<i>PC Debugging Repair & Maintenance</i>
CHM - O3	Computer Peripherals and Networking
CHM - O4	System Software, Diagnostic & Debugging Tools
Practical	<i>Software Installation & Maintenance</i>
CHM - O5	Personality Development & Communication skill

COURSE CALENDAR

Course Name	Entry Level	Output	Duration of Study	Course Fees			
				Admission Fees	1st Instalment	2nd Instalment	
Diploma in Computer Hardware Maintenance & Networking	10+2 (Science) Pass or ITI (one year 10 Pass) in Electrical / Electronics \ Computer / Instrumentation	Installation Services\ Maintenance Engineers (PC), System Administrator, Lab Specialist.	1 year	6,500	3,500	1,500	1,500
Mode of Payment		Mode of Scholarship Facilities :		Mode of Discount Facilities :			
Payable by Draft & Rest Instalment by Post Dated Cheques to be submitted at the time of admission		1) H.S. - (10+2) - 60% to 69% - 10% discount of total course fees		For at a time payment - 5% discount of the total course fees			
		2) H.S. - (10+2) - 70% or above - 15% discount of total course fees		The Draft / Cheque [Kolkata clearance] in favour of “The Institute of Computer Engineers (India)” payable at Kolkata			
<i>“FEES ONCE PAID CANNOT BE REFUNDED”</i>							

NOTE - SERVICE TAX AS APPLICABLE.

Object-Oriented Programming Through JAVA

Objective of the Course

The Course is designed to impart knowledge and skills required to solve real world problems using Object-oriented approach utilizing Java Language constructs. This course covers the subject in two parts, viz, Java Language and Java Library.

After completion of the course students are expected to understand the following :

- v Java Tokens for creating expression and creating datatypes
- v The way various expressions and data types are assembled in packages
- v Implementation of Inheritance, Exception handling and Multithreading in Java
- v Java I/O basics and Applets.;
- v Setting up GUI using AWT/Swing
- v Network Programming in Java
- v Accessing relational databases from Java programmes

Outline of Course

Topic	Minimum No. of Hours
The Java Language	30
The Java Library	30
Lab. Session	60

Detailed Syllabus

1. The JAVA Language

1.1 Introduction to JAVA

An overview of JAVA, JAVA Applets and Applications.

Difference between Java Scripts and JAVA Object-oriented programming features

1.2 Data types, Variables & Arrays

Java Tokens & Keywords, Integer types, Floating point types.

The JAVA class libraries, Declaring a variable, Dynamic initialization,

The scope and lifetime of variable, Type conversion and casting. Arrays :

One-dimensional arrays, Multidimensional arrays. alternative array declaration syntax.

1.3 Operators

Arithmetic operations. The bit wise

operators. Relational operator. Boolean logical operators, Relational operators, The assignment operators, The ? operator, operator precedence.

1.4 Control statements

Selection statements, Iteration statements, jump statements.

Introduction Class fundamentals, Declaring objects. Assignment object reference variables introducing methods, Constructor. The this keyword, Garbage collection. The Finalize() method. A stack class. Over loading constructors. Using objects as parameters. Arguments passing. Returning objects. Recursion.

1.5 Introduction classes and objects

Class fundamentals. Declaring objects. Assigning object reference variables. Introducing methods. Constructors. The this keyword. Garbage collection. The Finalize() method. A stack class. Over loading constructors. Using objects as parameters. Arguments passing. Returning objects. Recursion.

1.6 Inheritance

Inheritance basics, Member access and inheritance. Using upper class. Creating a multilevel hierarchy, method overriding. Dynamic method dispatch, using abstract classes. Using final with inheritance. The object class.

1.7 Packages and Interfaces

Packages : Defining and package, Understanding classpath, Importing packages Interfaces : Defining an interface, Implementing interfaces, Applying interfaces, Variable in interfaces.

1.8 Exception Handling

Exception handling fundamentals. Exception types, Uncaught exceptions Using try and catch Java's build in exception. User defined exception subclasses.

1.9 Multithreaded Programming

Java Thread model. The main thread creating Thread, Alive() and Joint().. Suspend() and resume(). Thread priorities Synchronization. Interthread communication.

1.10 I/O, Applets and Other Topics

I/O, Basics : streams, The stream classes, The predefined Streams, Reading console

input, Writing console output, Reading and Writing files. Applet fundamentals, The transient and volatile modifiers.

2. The JAVA Library

2.1 String Handling

The string constructor. special string operators. Character extraction. String Searching & Comparison. Data conversion using value of (). String buffer.

2.2 Exploring JAVA Lang

Simple type wrappers, Runtime memory management. Array copy. Object. Clone() and the cloneable interface. Class & Class loader. Math functions : Transcendental functions, Exponential functions, Rounding functions, Miscellaneous math methods. Compiler, thread, Thread Group and Runnable. Throwable. Security manager.

2.3 The utility Classes

The enumeration interface. Vector & Stack. Dictionary. Hash-table. string Tokenizer. BitSet. Date : Date comparison, String and time zones. Random. Observer interface.

2.4 Input/Output - Exploring JAVA I/O

The Java I/O classes and interface. File Name filter & Directories.

I/O Stream classes : File input stream, File output stream, Byte array input stream, Byte array output stream, filtered streams. Buffered streams : Buffered input stream, Buffered Output stream, Push. Back input stream. Sequence input stream. Print Stream. Random Access File.

2.5 Networking

Socket overview, Reserved sockets, Proxy servers Internet addressing; Domain naming services (DNS) JAVA and the net; The networking class and interfaces Inet address : Factory methods, Introspection TCP / IP server sockets.

Datagrams : Datagram Packet. Datagram server and client

2.6 The Applet Class

The applet class. Applet Architecture.

An Applet skeleton : Initialization and termination, Overriding update() Status window

Handling events : The event class, Processing mouse events.

Handling keyboard events.

HTML applet tag. Passing parameters to applets.

Applet context and show document(). The AudioClip & AppletStub interface Outputting to the console

2.7 Swing

Swing & its features.

Text Fields, Buttons, Toggle Buttons, Check Boxes and Radio Buttons

Viewports, Scrolling, sliders and Lists

Combo Boxes, Progress Bars, Tooltips, Separators and Choosers

Layered Panes, Tabbed Panes, Split Panes, and Layouts

Menus and Toolbars

Window, Desktop Panes, Inner Frames, and Dialog Boxes

Table and Trees. Text Components

2.8 Images

File formats

Image fundamentals : creating, loading and displaying

Image observer. Double buffering. Media Tracker

2.9 JAVA Database Connectivity (JDBC)

Introduction to JDBC. Types of JDBC connectivity

Accessing relational database from Java programs

Establishing database connections

Eligibility

1. DOEACC qualified
2. BE/B. TECH/MCA/PGDCA
3. Computer Literate with good Programming Skill in C/C++

Course Structure

Total Course Fees Rs. 6000

Special Discount will be offered to ICEI Students

Payment Mode :

50% at the time of admission with Demand Draft or Cheque

Remaining Course Fees Should be Cleared within 2 Months with Post Dated Cheque.

THE INSTITUTE OF COMPUTER ENGINEERS (INDIA)

No. _____

ENROLMENT FORM

Centre _____ Course _____

Name _____

Father's / Gurdian's Name & Profession _____

Permanent Address _____

Local Address _____

ST/SC/OBC _____ Yes / No

Date of Birth / Age / Sex _____ / _____ / _____

Nationality _____ Highest Qualification _____

Ph. No. _____

Educational Qualification

Examination Passed	Univ./Board	Year of Passing	% of Marks Div.	Photograph

Documents to be submitted : (At the time of admission)

a) Attested copies of Marksheet with Certificates b) Two smallest size Photographs. How did you know about us (please * Appropriate Box) :

Advertisement (Newspaper) Friend Out Ex-student Other Specify

DECLARATION BY THE APPLICANT

I hereby declare that the particular furnished above are true to the very best of my knowledge and belief and if admitted to the course I shall abide by the rules & regulations of the institution. I also declare that on admission I will submit myself to the disciplinary jurisdiction of the Head and any other Authority of the institution who may be vested with the authority to exercise discipline. I have read the prospectus and agreed with its terms and conditions.

Date

.....
Signature of the Applicant

