

B. Sc. in Information Technology

Under

CHOICE BASED CREDIT SYSTEM



**Submitted to
Gauhati University**

**By
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Gauhati University,
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The CBCS provides an opportunity for the students to choose courses from the prescribed courses comprising core, elective/minor or skill based courses.

1. Types of courses in CHOICE BASED CREDIT SYSTEM (CBCS)

1.1 Core Course: A course, which should compulsorily be studied by a candidate as a core requirement is termed as a Core course.

1.2 Elective Course: Generally a course which can be chosen from a pool of courses and which may be very specific or specialized or advanced or supportive to the discipline/ subject of study or which provides an extended scope or which enables an exposure to some other discipline/subject/domain or nurtures the candidate's proficiency/skill is called an Elective Course.

1.2.1 Discipline Specific Elective (DSE) Course: Elective courses offered by the main discipline/subject of study are referred to as Discipline Specific Electives.

1.2.2 Project work/Dissertation is considered as a special course involving application of knowledge in solving / analyzing /exploring a real life situation / difficult problem. A candidate studies such a course on his own with an advisory support by a teacher/faculty member. The work done will have to be submitted in writing as a dissertation.

1.2.3 Generic Elective (GE) Course: Elective courses that are generic or interdisciplinary by nature are called Generic Electives. Students will have to choose one elective each in the first four semesters from the lists GE1 to GE4 given in this syllabus.

1.3 Ability Enhancement Courses (AEC)

The Ability Enhancement (AE) Courses are the course that leads to Knowledge enhancement. These are of two types.

1.3.1 AE Compulsory Course (AECC): Environmental Studies, English Communication/MIL Communication.

1.3.2 AE Elective Course (AEEC): AEEC courses are value-based and/or skill-based and are aimed at providing hands-on-training, competencies, skills, etc. These courses are to be chosen from a pool of courses designed to provide value-based and/or skill-based instruction.

2. B.Sc in INFORMATION TECHNOLOGY Programme Details

2.1 Programme Objectives:

Students who choose B.Sc in IT Programme, develop the ability to think critically, logically, analytically and to use and apply current technical concepts and practices in the core development of solutions in the form of Information technology.

The knowledge and skills gained with a degree in Computer Science prepare graduates for a broad range of jobs in education, research, government sector, business sector and industry.

The program covers the various essential concepts in Computer Science. The course lays a structured foundation of Computer fundamentals, Numerical methods, Data structure, Algorithm and Complexity analysis, Software Engineering, Programming Concepts in various languages(C, C++, Java, Visual Basic etc.), Computer Networking, System Programming and Administration, Operating System, Digital Image Processing, Embedded systems, Computer Architecture, Microprocessor, PHP programming, Numerical methods, Combinatorial optimization, Computer Graphics and Database management system.

An exceptionally broad range of topics covering current trends and technologies in computer science: Programming in Python, Cyber Security, Data mining, R-Programming, Data Sciences, Artificial Intelligence and Android Programming. Also, to carry out the hand on sessions in Computer lab using various Programming languages and tools to have a deep conceptual understanding of the topics to widen the horizon of students' self-experience.

2.2 Programme Learning Outcomes:

The completion of the B.Sc in IT Programme shall enable a student to:

- i) To communicate technical information both orally and in writing
- ii) Apply the knowledge gained in core courses to a broad range of advanced topics in computer science, to learn and develop sophisticated technical products independently.
- iii) To design, implement, and evaluate computer-based system, process, component, or program to meet desired needs by critical understanding, analysis and synthesis
- iv) Identify applications of Computer Science in other fields in the real world to enhance the career prospects
- v) Realize the requirement of lifelong learning through continued education and research.
- vi) Use the concepts of best practices and standards to develop user interactive and abstract application
- vii) Understand the professional, ethical, legal, security, social issues and responsibilities

2.3 Programme Structure:

The BIT programme is a three-year course divided into six-semesters. A student is required to complete 148 credits for the completion of course and the award of degree.

		Semester	Semester
Part – I	First Year	Semester I : 22	Semester II : 22
Part – II	Second Year	Semester III: 28	Semester IV: 28
Part – III	Third Year	Semester V:24	Semester VI:24

2.4 Prerequisite

Students who want to take admission in B.Sc - IT Programme, must have passed Higher Secondary (Science) or equivalent level examination having Mathematics as a subject and securing minimum pass mark in Mathematics at Higher Secondary level.

2.5 Programme Implementation Requirement:

The B.Sc - IT programme is a three-year course divided into six-semesters. For proper implementation of the UGCBCS programme the following infrastructure are necessary:

- a) Sufficient lab facilities with computers and software
- b) At least 7 full time teaching faculties.

2.6 Instruction for questions paper setter:

Question Paper setter should set from the prescribed text books, mentioned in the syllabus.

3. Credit allocation (B.Sc in IT)

Course	*Credits	
	Theory + Practical	Theory+Tutorial
I Core Course (6 credits)		
(14 papers)	$14 \times 4 = 56$	$14 \times 5 = 70$
Core Course Practical / Tutorial* (14 Papers)	$14 \times 2 = 28$	$14 \times 1 = 14$
I. Elective Course (6 credits) (8 Papers)		
A.1. Discipline Specific Elective(4 Papers)	$4 \times 4 = 16$	$4 \times 5 = 20$
A.2. Discipline Specific Elective Practical/ Tutorial* (4 Papers)	$4 \times 2 = 8$	$4 \times 1 = 4$
B.1. Generic Elective/ Interdisciplinary (4 Papers)	$4 \times 4 = 16$	$4 \times 5 = 20$
B.2. Generic Elective Practical/ Tutorial* (4 Papers)	$4 \times 2 = 8$	$4 \times 1 = 4$

Optional dissertation or project work in place of one Discipline Specific Elective paper (6 credits) in 5th semester

1.Ability Enhancement Compulsory Courses (AECC) (2 Papers of 4 credit each)	2x4=4	2x4=8
Environmental Science		
English Communication		
2. Skill Enhancement Courses (SEC) (Minimum 2) (2 Papers of 4 credit each)	2x4=8	2x4=8
Total credit	148	148

Optional dissertation or project work in place of one Discipline Specific Elective paper (6 credits) in 5th semester

1.Ability Enhancement Compulsory Courses (AECC) (2 Papers of 4 credit each)	2x4=8	2x4=8
Environmental Science		
English Communication		
2. Skill Enhancement Courses (SEC) (Minimum 2) (2 Papers of 4 credit each)	2x4=8	2x4=8
Total credit	148	148

*Wherever there is practical, there will be no tutorial and vice-versa

CBCS Course Structure for B.Sc. (IT)
SEMESTER WISE PLACEMENT OF THE COURSES

Se me ste r	CORE COURSE (14)	Ability Enhancement Compulsory Course (AECC) (2)	Skill Enhancement Course (SEC) (2)	Elective: Discipline Specific DSE (4)	Elective: Generic(GE)(4)
I	Computer Fundamental and Programming (ITB-HC- 1016)	ENG-AE-1014			GE-1
	Mathematics-I (ITB-HC-1026)				
II	Data Structure and algorithm (ITB-HC-2016)	ENV-AE-2014			GE-2
	Digital Logic (ITB-HC-2026)				
III	Computer Organization (ITB-HC-3016)		SEC -1		GE-3
	Operating System (ITB-HC-3026)				
	Database Management System (ITB-HC-3036)				
IV	Programming in JAVA (ITB-HC-4016)		SEC -2		GE-4
	Software Engineering (ITB-HC-4026)				
	Data Communication and Computer Networks (ITB-HC-4036)				
V	Compiler Design (ITB-HC-5016)			DSE -1	
	Web Technology (ITB-HC-5026)			DSE -2	
VI	System Administration using Linux (ITB-HC-6016)			DSE-3	
	Computer Graphics (ITB-HC-6026)			DSE -4	

Paper Code: ITB-HC-1016: Means: ITB (Subject code), HC (Course type: Honours Core), 1(Semester), 01(first paper of the semester), 6(credit).

Skill Enhancement Course (SEC)

SEC 1 (choose one)

- SEC-1A: UNIX/LINUX Programming (ITB-SE-3014)
- SEC-1B: Programming in Python (ITB-SE-3024)
- SEC-1C: HTML Programming (ITB-SE-3034)
- SEC-1D: English (ITB-SE-3044)

SEC 2 (choose one)

- SEC-2A: Android Programming (ITB-SE-4014)
- SEC-2B: PHP Programming (ITB-SE-4024)
- SEC-2C: R Programming (ITB-SE-4034)

Discipline Specific Electives (DSE)

DSE 1 (choose one)

- DSE-1A: E-commerce (ITB-HE-5016)
- DSE-1B: Object –oriented analysis and Design (ITB-HE-5026)
- DSE-1C: Computer Oriented Optimization Techniques (ITB-HE-5036)

DSE-2

- DSE-2A: Project Work / Dissertation (ITB-HE-5046)

DSE 3, DSE 4 (choose two)

- DSE-3A, DSE-4A: Microprocessor (ITB-HE-6016)
- DSE-3B, DSE-4B: Data Mining and Warehousing (ITB-HE-6026)
- DSE-3C, DSE-4C: Artificial Intelligence (ITB-HE-6036)

GE 1 (choose one)

- GE-1A: ICT Hardware (ITB-HG-1016)
- GE-1B: Office Automation (ITB-HG-1026)

GE 2 (Choose one)

- GE-2A: Mathematics - II (ITB-HG-2016)
- GE-2B: Programming in C++ (ITB-HG-2026)

GE 3 (choose one)

- GE-3A: Multimedia and Application (ITB-HG-3016)
- GE-3B: Computer Oriented Numerical Methods (ITB-HG-3026)

GE 4 (choose one)

- GE-4A: Theoretical Foundation of Computing (ITB-HG-4016)
- GE-4B: Information Security and Cyber Laws (ITB-HG-4026)

Detailed Syllabus

ITB-HC-1016: COMPUTER FUNDAMENTALS AND PROGRAMMING

Total Lectures: 60 Credits: 6 (Theory: 04, Lab: 02)

Fundamentals

Lectures :17

Major components of a Digital Computer (A brief introduction of CPU, Main memory, Secondary memory devices and I/O devices) Keyboard, monitor, mouse, printers, Secondary storage devices (floppy disks, hard disks and optical disks), backup system and why it is needed ? Bootstrapping a Computer. Representation of numbers (only a brief introduction to be given) and characters in computer. ASCII. EDCDIC and Gray codes. Interpreter, Assembler, Linker and Loader. Definition and concepts of algorithm and its different implementations-pseudo code, flowchart and Computer programs.

Number System: Binary, Hexadecimal, Octal, BCD, and conversions of number systems. Representation of signed integers, Sign and magnitude, 1's complement and 2's complement representation. Arithmetic operations using 2's complement representation and conditions for overflow/underflow and its detection.

Introduction to C

Lectures :17

Elementary data types , variables, constants and identifiers. Integer, character floating point and string constants . variable declarations. Syntax and semantics. Reserved word. Initialization of variable during declarations Constant data types. Expression in C, precedence and associativity of C operators, unary, binary and ternary operators. C arithmetic operators, assignment operators, relational operators, logical operators and bit –wise operators . L-value and R-value. Side effects of operators. Expression statement. Conditional Statement-if, if-else, switch, Iterative Statement-white, do-while, for.

Other Statement –break , continue, goto, return, null Statement, block Statement. Function: function declaration. Calling a function. Parameters –Call by value, Call by reference and its absence in C. Recursion and how it works. Cast and sizeof operator. Automatic type Conversion.

Simple programs like programs to compute an arithmetic expression, unit conversion, the sum of a series (like trigonometric series), GCD, factorial (both recursive and non-recursive version), fibonacci number (both recursive and non-recursive version), generation of prime numbers, reversing digits of an integer, finding the square root of a number, prime factors of an integer, base conversion of numbers, test if three points

form a triangle and classify triangles as right angled, isosceles, equilateral etc., roots of a quadratic equation, generation of simple patterns of characters on screen.

Arrays and pointers

Lectures :12

Storage classes : Automatic, External, Static, Register. Scope and lifetime of variables. Arrays and pointers and corresponding operators. Pointer arithmetic. Programs using arrays and pointers like sum, average, minimum, maximum of an array of numbers. Add and delete an element of an array. Merge two sorted arrays. String manipulation programs like string concatenation, palindrome, reverse, copy etc. Matrix manipulation like Sum of rows, columns, and diagonal elements of a matrix, transpose of a matrix.

Searching and Sorting

Lectures :4

Linear search, binary search. Selection sort and bubble sort.

Structures and Files:

Lectures :10

Structure – declaration and use. Structure member resolution and structure pointer member resolution operators. Programs to show the use of structure. Standard C library.

Files in C—opening, closing, reading and writing of files. Seeking forward and backward. Simple examples of file handling programs.

LABORATORY

At least 20 programming assignments have to be done by each student from the following list. The assignments should be selected in such a way that all the features of C language are included.

1. Write a program to convert a given temperature value from Fahrenheit scale to Centigrade scale and vice versa.
2. Write a program to display ASCII value of a character.
3. Write a program to check whether a number is perfect or not.
4. Write a program to find out the biggest of three numbers using nested if.
5. A company insures its drivers if either of the following
 - conditions are satisfied Driver is married.
 - Driver is an unmarried, male and above 30
 - years of age. Driver is unmarried, female and above 25 years of age.

Write a program to decide if a driver is to be insured using logical operators.

6. Write a program to read a list of positive integers terminated by -1 and display the odd and even numbers separately and also their respective counts.
7. Write a program to read values of n and x and print the value of y using switch case where
 - a. $y=n+x$ when $n=1$
 - b. $y=1+x/n$ when $n=2$
 - c. $y= n+3x$ when $n=3$
 - d. $y=1+nx$ when $n>3$ or $n<1$.
8. Write a program to n values of sales and then calculate the commission on sales amount where the commission is calculated as follows:
 - a. If sales \leq Rs.500, commission is 5%.
 - b. If sales > 500 but ≤ 2000 , commission is Rs 35 plus 10% above Rs 500.
 - c. If sales > 2000 but ≤ 5000 , commission is Rs 185 plus 12% above Rs.2000.
 - d. If sales > 5000 ,commission is 12.5%.
9. Write a program to find out minimum, maximum, sum and average of n numbers without using array.
10. Program to find mean and standard deviation (SD) for a set of n numbers without using array.
11. Write a program to find out the roots of a quadratic equation. Use proper testing to find checks for real and complex roots.
12. Write a program to print the digits of a number in words. (eg. if a number 841 is entered through the keyboard your program should print -Eight Four One.)
13. Write a program to print the PASCAL Triangle up to the n-th row where n is an input to the program.

14. Write a function to return the HCF of two positive integers. Write a main function to read two positive integers and print their HCF and LCM by using the above function.
15. Write a program to convert a decimal number into binary number using function.
16. Write a program to display the result of sine series using function.
17. Write a program to find the sum of the following series

$$1+x-x^3/3!+x^5/5!-x^7/7!+ \dots \text{corrected up to the 3 decimal place.}$$

18. Write a program to read n numbers in a sorted array and insert a given element in a particular position
19. Write functions to compute the factorial of a number using both recursive and non-recursive procedure.
20. Write a program to print the values of ${}^n C_r$ and ${}^n P_r$ for given positive integers n

$${}^n C_r = \frac{n!}{r!(n-r)!} \quad {}^n P_r = \frac{n!}{(n-r)!}$$

r > 0. Use a function

21. Write a program to display the first n Fibonacci numbers using function.
22. Write a program to display the prime numbers within a given range. Write a function to check whether a given integer is prime or not and use it.
23. Write a program to Multiply two matrices using function
24. Write a program to display the upper Triangle and lower Triangle of a given square matrix using function.
25. Write a function to check if a given square matrix is symmetric or not. Write a main function to implement it.
26. Write a program to read a m X n matrix and calculate the Row sum and Column Sum of the matrix
27. Write a function to read in an integer and print the representation of the number using the sign and magnitude representation scheme using 8 bits. The program should check for overflow/under flow conditions. The left most bit is to be used as the sign bit.
28. Write a program to merge two sorted arrays.
29. Write a program to implement selection sort using function.
30. Write a program to count the number of vowels in a string.
31. Write a program to concatenate two strings using function (without using library function).
32. Write a program to convert a string from upper case to lower case and vice versa.
33. Write a program to swap two numbers using function (pass the pointers).
34. Write a program to sort n number of strings in ascending order using pointer.
35. Write a program using pointers to copy a string to another string variable (without using library function).
36. Declare a structure of a student with details like roll number, student name and total marks. Using this, declare an array with 50 elements. Write a program to

read details of n students and print the list of students who have scored 75 marks and above.

37. Create a structure to store the following information of employees.

a. Employee's number, name, pay and date of joining.

It has been decided to increase the pay as per

the following rules: Pay \leq Rs.3000 :

20% increase

Pay \leq Rs.6000 but $>$ Rs.3000 :15% increase Pay $>$ Rs.6000 : no increase

Write a program to implement the above structure.

38. Write a program to read a text file and count the number of vowels in the text file.

39. Write a program to copy a text file to another file.

Suggested Reading:

Programming with C, B.S. Gottfried, Tata McGraw Hill. Programming in ANSI C, E.Balagurusamy, TataMcGrawHill

The C Programming Language, B.W. Kernighan and D.M.Ritchie, PHI Computer Fundamentals, Anita Goel, Pearson, 2010.

ITB-HC-1026: MATHEMATICS- I

Total Lectures: 60 Credits : 6 (Theory : 05, Tutorial : 01)

Unit1: Sets, Relations and Functions

Lectures: 10

Sets, relations, properties of binary relations, closures of relation, equivalence relations, equivalence classes and partitions. Partial ordering relations and lattices. Functions, one-to-one and onto, principles of mathematical induction.

Unit2: Graph Theory

Lectures: 10

Basic Definition of graph. Connectivity of graph, cut points cycles, Hamiltonian graphs, trees, different Characterization of trees, bipartite graph, Algorithms on graph, Breadth first search, Depth first search.

Unit3: Combinatorics

Lectures: 10

Basic of counting principles, principle of inclusion exclusion, application of inclusion and exclusion. Pigeonhole principle, generalized Pigeonhole principle and its application, permutations and combinations, permutations with repetitions,

combinations with repetitions, permutations of sets with indistinguishable objects.

Unit4: Matrices

Lectures: 10

Row and column operations, vectors and matrices, partitioning of matrices, representing relations using matrices, Determinant of a square matrix, minor, cofactor, the Cayley-Hamilton theorem, inverse of a matrix, product form of inverse. Rank of a matrix. Solutions of simultaneous linear equations, existence of solutions, solution by Gaussian elimination, Eigen values and Eigen vectors.

Unit5: Logic

Lectures: 10

Connectives, truth tables, normal forms CNF, DNF, Converting expressions to CNF and DNF, Theory of inference, Propositional calculus. Boolean Algebra. Predicate calculus (only introduction), predicates and quantifiers.

Unit6: Vector Space

Lectures: 10

Definition and examples of vector spaces. Elementary properties of \mathbb{R} as a vector space. Subspaces of a vector space. Union, intersection and sum of two subspaces. Subspaces generated by a subset of a vector space. Definition, example and properties of linearly independent and dependent set of vectors. Basis and dimension of a vector space. Examples of finite dimensional vector spaces.

Suggested Readings :

1. Discrete Mathematical Structure, Kolman /Rahman Pearson Education.
2. Discrete Mathematics and its Applications, K. H. Rosen, Mc-Graw Hill International Ed.
3. Discrete Mathematics structures with applications to Computer Science, J. P. Tremblay and R.Manohar, Mc-Graw Hill.
4. Discrete Mathematics, N. Ch. S.N. Iyengar, K. A. Venkatesh, V. M. Chandrasekaran, P. S. Arunachalam, Vikash Publishing House Pvt. Ltd.

ITB-HG-1016: ICT HARDWARE

Total Lectures: 60 Credits : 6 (Theory : 04, Lab : 02)

UNIT I: Evolution of computer system, Modern computer, Classification of computer, Personal computer hardware: Monitor, Keyboard, Mouse, Scanner, printer, speaker

Lectures: 12

UNIT II: Hard Disk Drive: logical structure and file system, FAT, NTFS. Hard disk tools: Disk cleanup, error checking, de fragmentation, scanning for virus, formatting, installing additional HDD. New trends in HDD. Floppy Disk Drive

Lectures: 12

UNIT III: Optical Media, CDROM, theory of operation, drive speed, buffer, cache, CD-r, CD-RW, DVD ROM, DVD technology, preventive maintenance for DVD and CD drives, New Technologies. Driver installation, Writing and cleaning CD and DVD.

Lectures :12

UNIT IV: Processor: Intel processor family. Latest trends in processor, Motherboard, Sockets and slots, power connectors. Peripheral connectors. Bus slots, USB, pin connectors. Different kinds of motherboards. RAM, different kinds of RAM. RAM up gradation. Cache and Virtual Memory concept.

Lectures :12

UNIT V: SMPS. BIOS. Network Interface Card, network cabling, I/O Box, Switches, RJ 45 connectors, Patch panel, Patch cord, racks, IP address.

Lectures :12

LABORATORY

Each student should do at least 6 assignments (tasks) from the following list.

Objectives:

The Practical introduces the students to a personal computer and its basic peripherals, the process of assembling a personal computer, installation of system software like Windows OS, LINUX OS, device drivers. Basic system administration in Linux which includes: Basic Linux commands in bash, Create hard and symbolic links, Text processing, using wildcards In addition hardware and software level troubleshooting process, tips and tricks would be covered.

Different ways of hooking the PC on to the network and internet from home and workplace and effectively usage of the internet. Configuring the TCP/IP setting. Usage of web browsers, email, newsgroups and discussion forums would be covered. In addition, awareness of cyber hygiene, i.e., protecting the personal computer from getting infected with the viruses, worms and other cyber attacks would be introduced.

Task 1: Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor.

Task 2: Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva.

Task 3: Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.

Task 4: Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot with both windows and Linux. Lab instructors should verify the installation and follow it up with a Viva

Task 5: Basic commands in Linux

Task 6: Hardware Troubleshooting: Students have to be given a PC which does not boot due to improper assembly or defective peripherals. They should identify the problem and fix it to get the computer back to working condition. The work done should be verified by the instructor and followed up with a Viva

Task 7: Software Troubleshooting: Students have to be given a malfunctioning CPU

due to system software problems. They should identify the problem and fix it to get the computer back to working condition. The work done should be verified by the instructor and followed up with a Viva.

Task 8: The test consists of various systems with Hardware / Software related troubles, Formatted disks without operating systems. Installation of antivirus software, configure their personal firewall and windows update on their computer. Then they need to customize their browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

BOOKS RECOMMENDED:

1. Comdex: Hardware and Networking Course Kit::
DreamTech press
2. PC hardware: A beginners
Guide: Ron Gilster: Tata Mc Graw Hill.

ITB-HG-1026: OFFICE AUTOMATION

Total Lectures: 60 Credits: 6 (Theory: 02, Lab: 04)

UNIT 1: Word Processing (15 Lectures)

Introduction to Word Processing , Features , Learning document window, Creating , Saving & Closing a document, Opening an Existing document , Editing a Document , Formatting Features (Paragraph Formats, Aligning text & paragraph, Border and Shading, Header & Footers, Bullet & Numbering) , Inserting & Editing a Table , Inserting Picture, Checking & Spelling Correction, Page Setup , Print Preview , Printing a document , Mail Merge , Document Template & Wizards.

UNIT 2: Spreadsheet (15 Lectures)

Introduction to Spreadsheet, creating, saving and editing a workbook, Inserting, deleting Worksheets, Opening & Moving around in existing worksheets, working with Formula & Cell referencing, Functions, working with ranges - creating, editing and selecting ranges, Format Feature: AutoFormat Feature, Changing alignment, Character styles, Date Format, Border & Colors etc. Previewing & Printing a worksheet, Creating Charts & Graphs. Database in worksheet, macro, linking and embedding

UNIT 3: Presentation Tools (15 Lectures)

Creating & saving Presentations , Opening an existing Presentation, Working in different views, Working with slides, Adding and Formatting Text, Formatting Paragraphs, Checking Spelling and correcting typing mistakes , Adding clip art and other pictures, Inserting Animation, Designing slide shows, Running and controlling slide show, Printing Presentation.

Portable Document Format: storing, creation, conversion.

UNIT 4: DTP Software (15 Lectures)

Local language pack in Office Packages: installation and use, Document design using any DTP package, Graphics design and manipulation using any currently available package

Practical / Lab work to be performed

(N.B: Students have to perform the following experiments and they are encouraged to work in the Linux platform)

1. Create a new folder and do the following:
 - Make a word processing document in it.
 - Make a Spreadsheet document in it.
 - Make a new folder in it
 - Rename the initial folder
 - Move the initial folder
 - Copy the initial folder.
 - Delete the initial folder
2. Implement the various well known features of the operating system such as Painting, System tools, Entertainment tools etc.
3. Implement various display properties by right clicking on the Desktop.
4. Explore the taskbar
5. Set the wall paper and screen saver.
6. Set the data/time.

Word Processing Tool

1. Create a document and
 - a. Put Bullets and Numbers
 - b. Apply various Font parameters.
 - c. Apply Left, Right, and Centre alignments.
 - d. Apply hyperlinks
 - e. Insert pictures
 - f. Insert ClipArt
 - g. Show the use of WordArt
 - h. Add Borders and Shading
 - i. Show the use of Find and Replace.
 - j. Apply header/footers
2. Create any document and show the use of File → versions.
3. Create any document and show the difference between paste and paste special.
4. Create a document to show the use of Washout/Watermark.
5. Implement the concept of mail merge.
6. Implement the concept of macros.
7. Implement the concept of importing a file/document.
8. Implement the concept of merging the documents.
9. Create a student table and do the following:
 - a. Insert new row and fill data
 - b. Delete any existing row

- c. Resize rows and columns
- d. Apply border and shading
- e. Apply merging/splitting of cells
- f. Apply sort
- g. Apply various arithmetic and logical formulas.

10. Create your resume using General Templates.

Spreadsheet Tool

1. Create a student worksheet containing roll numbers, names and total marks. Open a document in Word and insert the excel worksheet using:-
 - i) Copy/Paste
 - ii) Embedding
 - iii) Linking
2. The term wise marks for APS class of 20 students are stored in 3 separate sheets named term1, term2 and term3. Create 4th worksheet that contains student names and their total and average marks for the entire year. Give proper headings using headers. Make the column headings bold and italic. The 4th worksheet should contain college name as the first line. Make it bold, italic and center it.
3. Using a simple pendulum, plot 1-T and 1-T² graph.

I	t1	t2	t3	Mean(t)	T=t/20	T ²
70						
80						
90						
100						

4. Consider the following employee worksheet:-

Full Name (First Last)	Grade 1/2/3	Basic Salary	HRA	PF	Gross	Net	(VA) Vehicle Allowance

HRA is calculated as follows:

Grade HRA %(of Basic)

1 40%

2 35%

3 30%

Gross = Basic +

HRA + VA Net =

Gross –PF

PF is 8% for all Grades

VA is 15000, 10000 and 7000 for Grades 1, 2 and 3.

- i) Find max, min and average salary of employees in respective Grade
 - ii) Count no. of people where VA>HRA
 - iii) Find out most frequently occurring grade.
 - iv) Extract records where employee name starts with “A” has HRA>10000
 - v) Print Grade wise report of all employees with subtotals of net salary and also grand totals. Use subtotal command.
 - vi) Extract records where Grade is 1 or 2 and salary is between 10000 and 20000 both inclusive.
5. In a meeting of a marketing department of an organization it has been decided that price of selling an item is fixed at Rs40. It was resolved to increase the sell of more of more items and getting the profit of Rs40,000/.Use Goal Seek of find out how many items you will have to sell to meet your profit figure.
6. To study the variation in volume with pressure for a sample of an air at constant temperature by plotting a graph for P – V and P-I/V. Sample observations are:-

Pressure(P)	Volume (V)	I/V	PV	P/V
75	20			
78.9	19			
83.3	18			
88.2	17			

7. Plot the chart for marks obtained by the students (out of 5) vs. frequency (total number of students in class is 50).
8. Create the following worksheet(s) containing an year wise sale figure of five salesmen in Rs.

Salesman	2002	2003	2004	2005
MOHAN	10000	12000	20000	50000
MITRA	15000	18000	50000	60000
SHIKHA	20000	22000	70000	70000
ROHIT	30000	30000	100000	80000
MANGLA	40000	45000	125000	90000

Apply the following Mathematical & Statistical functions:

- i) Calculate the commission for each salesman under the condition :-
 - a) If total sales is greater than Rs. 3, 00,000/-, then commission is 10% of total sale made by the salesman.
 - b) Otherwise, 4% of total sale.
- ii) Calculate the maximum sale made by each salesman.

- iii) Calculate the maximum sale made in each year.
- iv) Calculate the minimum sale made by each salesman.
- v) Calculate the minimum sale made in each year.
- vi) Count the no. of sales persons.
- vii) Calculate the cube of sales made by Mohan in the year 2002.
- viii) Find the difference in sales by salesman Mitra between the year 2002 and 2003. Find the absolute value of difference.
- ix) Also calculate the Mode, Stddev, Variance, Median for the sale made by each salesman.
- ix) Calculate the year wise Correlation coefficient between the sales man Mohan and Mitra year wise

9. The following table gives an year wise sale figure of five salesmen in Rs.

Salesman	2000	2001	2002	2003
S1	10000	12000	20000	50000
S2	15000	18000	50000	60000
S3	20000	22000	70000	70000
S4	30000	30000	100000	80000
S5	40000	45000	125000	90000

- v) Calculate total sale year wise.
 - vi) Calculate the net sales made by each salesman
 - vii) Calculate the commission for each salesman under the condition :-
 - a) If total sales is greater than Rs. 4, 00,000/-, then commission is 5% of total sale made by the salesman.
 - b) Otherwise, 2% of total sale.
 - viii) Calculate the maximum sale made by each salesman.
 - ix) Calculate the maximum sale made in each year.
 - x) Draw a bar graph representing the sale made by each salesman.
 - xi) Draw a pie graph representing the sale made by salesmen in year 2001.
10. Consider the following worksheet for APS 1st year students:-

S.No.	Name	PH	CH	BY	MT	CS	Total Marks	%	Grade
1									
2									

Grade is calculated as follows:-

If % ≥ 90 Grade A If % ≥ 80 & < 90 Grade B If % ≥ 70 & < 80 Grade C
 If % ≥ 60 & < 70 Grade D
 Otherwise students will be declared fail.

- i) Calculate Grade using if function
- ii) Sort the data according to total marks

- iii) Apply filter to display the marks of the students having more than 65% marks.
- iv) Draw a pie chart showing % marks scored in each subject by the topper of the class.
- v) Draw the doughnut chart of the data as in (iv)
- vi) Enter the S.No. of a student and find out the Grade of the student using VLOOKUP.
- vii) Extract all records where name
 - a) Begins with "A"
 - b) Contains "A"
 - c) Ends with "A"

Presentation Tool

1. Make a presentation of College Education System using
 - a. Blank Presentation
 - b. From Design Template
 - c. From Auto Content Wizard
2. Make a presentation on "Wild Life" and apply the following:
 - a. Add audio and video effects
 - b. Apply various Color Schemes
 - c. Apply various animation schemes.
 - d. Apply Slide Show

REFERENCE BOOKS

1. Anita Goel, Computer Fundamentals, Pearson, 2012

ITB-HC-2016: DATA STRUCTURE AND ALGORITHM

Total Lectures: 60 Credits : 6 (Theory : 04, Lab : 02)

UNIT 1

Fundamentals

Lectures : 10

Concept of Data Types, elementary structure, words and their interpretations, packed words

UNIT 2

Arrays : Types, memory representation, address translation functions for one & two dimensional arrays, different examples.

Linked Structure

Lectures : 10

Singly and doubly linked list, circular and non circular, list manipulation with pointers, example involving insertion and deletion of elements and their comparative studies with implementations using array structure

UNIT 3

Lectures : 10

Stacks and Queues

Definitions, representation using array and linked list structure, application of stack and queues in simulation, postfix conversion and evolution of arithmetic expressions

UNIT 4

Lectures :

10

Binary Trees:

Definition, quantitative properties, memory representation, Trees traversal algorithms (recursive and non-recursive), threaded trees. BFS and DFS

UNIT 5

Sorting and Searching

Lectures :10

Linear and binary search algorithms, performance and complexity, binary search trees (construction, insertion , deletion and search) Concept of optimal binary search trees. Terminology, performance evaluation, sorting algorithms (non recursive, recursive description, Complexity, advantages and disadvantage, implementation) Bubble sort, insertion sort, selection sort, heap sort, quick sort, merge sort & radix sort. External Sorting.

UNIT 6

Analysis of Algorithm

Lectures: 10

Time and Space complexity of algorithms, average case and worst case analysis, asymptotic notation as a measure of algorithm complexity, O and notations. Analysis of sorting algorithms- Selection sort, Bubble sort, Insertion sort, Heap sort, Quick sort and analysis of searching algorithms – linear search and binary search.

LABORATORY

Write programs using C language

Each student should do at least 12 assignments from the following list.

1. Implement binary search and linear search algorithms on arrays.
2. Implement following sorting algorithms :
 - i) Bubble sorting
 - ii) Insertion sort
 - iii) Heap sort
 - iv) Quick sort
 - v) Merge sort
3. Write a program to create a singly linked list and insert an element at the beginning, end, and at a given position of the linked list.
4. Write a program to create a singly linked list and delete an element from any position of the linked list.
5. Write a program to create a singly linked list. Write functions for
 - i. counting the number of elements in a list
 - ii. to search for a given element in a list. If the item has been found then it should return the position at which the item was found; otherwise it should return -1 to indicate not found.
6. Write a function to concatenate two linked lists.
7. Write a function to merge two sorted linked lists.
8. Write a program to create a doubly linked list and insert an element at any position.
9. Write a program to create a doubly linked list and delete an element from a given position.
10. Write a program to create a circular linked list and insert / delete an element at any position.
11. Write a program to implement a stack using
 - i) array structure
 - ii) linked list structure
12. Write a program to implement two stacks using a single array.
13. Write a program to evaluate a postfix expression using stack.
14. Write a program to convert an infix expression into a postfix expression.
15. Write a program to implement a queue using array.

16. Write a program to implement a queue using linked list.
17. Write a program to implement a circular queue using array.
18. Write a program to implement a circular queue using linked list.
19. Write a program to create a binary search tree using link representation and display the elements in preorder, in order and post order using recursive function.
20. Write a program to create a binary search tree using link representation and
 - i) search
 - ii) delete an item from the binary search tree.

Suggested Readings:

1. Data Structure , Horowitz and Sahani, Narosa
2. Introduction to Data Structures in C, A.N.Kamthane, Pearson, 2007.
3. Data Structure using C and C++, Langsam, Augentein&Tanenbaum, PHI
4. Data Structures using C, S.K.Bandyopadhyay, K.N.Dey, Pearson.

ITB-HC-2026: DIGITAL LOGIC

Total Lectures: 60 Credits : 6 (Theory : 05, Tutorial: 01)

Unit1: Boolean algebra and Logic gates

Lectures: 12

Boolean operators, axiomatic definition of Boolean algebra, Rules (postulates and basic theorems) of Boolean algebra, dual and complement of Boolean expression, Canonical form and Standard form, Sum of product and product of sum for m. Conversion between Boolean expression and truth table. Boolean expression and their simplification by algebraic method, Karnaugh map method (till four variable k-map) and Quine Mc Cluskey method, Don't care condition.

Logic gates:

Different types of gates, Implementation of logic expression with logic gates.

Unit2: Combinational circuit

Lectures: 12

Adder: half adder, full adder, parallel binary adder, Subtractors: half subtracter and full subtracter, Magnitude comparator, Decoder, Encoder, Application examples of decoder and encoder, Multiplexer, Demultiplexer, Application examples of multiplexer and demultiplexer, programmable logic Array (PLA)

Unit3: Sequential Circuit

Lectures : 12

Simple RS flipflop or latch, Clocked RS flipflop, D flipflop, JK flipflop, T flipflop, Edge triggered flipflop (SR, D, JK), Asynchronous preset and clear inputs, master Slave Flip Flop, JK Master slave flip flop., edge triggering and level triggering. Analysis of Clocked Sequential circuits, State Reduction and Assignment, Flip–Flop Excitation tables. Design Procedure for sequential circuits.

Unit4: Counters

Lectures: 12

Ripple counters: Binary Ripple Counter, BCD Ripple Counter. Synchronous Counters: Binary Counter, Binary Up and down Counter, BCD Counter, Timing Sequences. Ring counter and Johnson counter. Counter design using state diagram, state table and state equation.

Unit5: Registers and the Memory Unit

Lectures : 12

Registers: Shift registers (serial in serial out, serial in parallel out, parallel in serial out, parallel in parallel out), Registers with parallel Load, Bidirectional shift register with parallel

load.

Memory Unit: Semiconductor memory: RAM, RAM Family, Examples of RAM: Integrated circuit Memory, Magnetic core Memory, Cache memory. Flash memory, Basic flash memory, Comparison of flash memory with other memories, SIMM and DIMM.

Suggested Reading

1. Digital Logic and Computer Design, Morris M. Mano
2. Digital Fundamentals, Floyd and Jain

ITB-HG-2016: MATHEMATICS-II

Total Lectures: 60 Credits : 6 (Theory : 05, Tutorial: 01)

Unit-1: Sequence and Series

Lectures: 12

Sequence of real numbers, bounded, convergent and non-convergent sequences. Uniqueness of the limit and bounds of a convergent sequence. Cauchy sequence, Cauchy's general principle of convergence (proof of the necessary part only). Sub sequences, convergence and divergence of monotonic sequences. Algebraic operations on limit (statements of the theorems without proof). Infinite series, statements of basic properties of infinite series (without proof). Absolute and conditional convergence. Tests for convergence : Comparison test, Ratio test.

Unit-2: Trigonometry

Lectures :12

Geometrical representation of complex numbers the Argand plane. Polar form of a complex number. Modulus, amplitude and their various properties. De Moivre's theorem. Expansion of $\cos(x)$ and $\sin(x)$ in positive integral powers of x . Gregory's series, Hyperbolic functions.

Unit-3 : Abstract Algebra

Lectures: 12

Group Theory :

Definition and examples of groups. Per mutation group and cyclic group. Subgroups and Cosets Lagrange's theorem on the order of a subgroup of a finite group. Normal subgroups. Quotient groups. Homomorphism of Group; properties of Homomorphism ; isomorphism of group.

Ring Theory :

Definition and examples. Simple properties of Rings. Integral domain, Field and their elementary properties.

Unit-4

Lectures: 12

Relation between the roots and Coefficients of a general Polynomial equation in one variable. Transformation of equations Descartes' rule of signs, Symmetric functions of roots; Solution of Cubic equation by Cardon's Methods.

Unit-5: Calculus

Lectures: 12

Roll's theorem, Lagrange's Mean Value theorem and Taylor's theorem. Meaning of the sign of derivative. Indeterminate forms, maxima and minima (single variable).

Suggested Readings :

1. Higher Algebra (Classical); S. K. Mapa; Ashok Prakashan, Kolkata.
2. Higher Trigonometry, Das and Mukherjee, U. N. Dhur and Sons.
3. A course in Abstract Algebra; V. K. Khanna & K. S. K. Bhambri, Vikas Pub. House, Pvt. Ltd., New Delhi.
4. Modern Algebra; S. Singh and Q. Zameer ruddin; Vikas Pub. House, Pvt. Ltd., New Delhi.

ITB-HG-2026:Programming in C++

Total Lectures: 60 Credits : 6 (Theory : 04, Lab : 02)

UNIT 1: Introduction to C++ (3 Lectures)

History of C and C++, Overview of Procedural Programming and Object-Orientation Programming, Using main() function, Compiling and Executing Simple Programs in C++.

UNIT 2: Data Types, Variables, Constants, Operators and Basic I/O (5 Lectures)

Declaring, Defining and Initializing Variables, Scope of Variables, Using Named Constants, Keywords, Data Types, Casting of Data Types, Operators (Arithmetic, Logical and Bitwise), Using Comments in programs, Character I/O, Formatted and Console I/O (cin, cout), Using Basic Header Files (stdio.h, iostream.h, conio.hetc).

UNIT 3: Expressions, Conditional Statements and Iterative Statements (6 Lectures)

Simple Expressions in C++ (including Unary Operator Expressions, Binary Operator Expressions), Understanding Operators Precedence in Expressions, Conditional Statements (if construct, switch-case construct), Understanding syntax and utility of Iterative Statements (while, do-while, and for loops), Use of break and continue in Loops, Using Nested Statements (Conditional as well as Iterative)

UNIT 4: Functions and Arrays (6 Lectures)

Utility of functions, Call by Value, Call by Reference, Functions returning value, Void functions, Inline Functions, Return data type of functions, Functions parameters, Differentiating between Declaration and Definition of Functions, Command Line Arguments/Parameters in Functions, Functions with variable number of Arguments.

Creating and Using One Dimensional Arrays (Declaring and Defining an Array, Initializing an Array, Accessing individual elements in an Array, Manipulating array elements using loops), Use Various types of arrays (integer, float and character arrays / Strings) Two-dimensional Arrays (Declaring, Defining and Initializing Two Dimensional Array, Working with Rows and Columns), Introduction to Multi-dimensional arrays

UNIT 5: Derived Data Types (Structures and Unions) (6 Lectures)

Understanding utility of structures and unions, Declaring, initializing and using simple structures and unions, Manipulating individual members of structures and unions, Array of Structures, Individual data members as structures, Passing and returning structures from functions, Structure with union as members, Union with structures as members.

UNIT 6: Pointers and References in C++ (6 Lectures)

Understanding a Pointer Variable, Simple use of Pointers (Declaring and Dereferencing Pointers to simple variables), Pointers to Pointers, Pointers to structures, Problems with Pointers, Passing pointers as function arguments, Returning a pointer from a function, using arrays as pointers, Passing arrays to functions. Pointers vs. References, Declaring

and initializing references, Using references as function arguments and function return values

UNIT 7: Memory Allocation in C++ (6 Lectures)

Differentiating between static and dynamic memory allocation, use of new and delete operators, storage of variables in static and dynamic memory allocation

UNIT 8: File I/O, Preprocessor Directives (6 Lectures)

Opening and closing a file (use of fstream header file, ifstream, ofstream and fstream classes), Reading and writing Text Files, Using put(), get(), read() and write() functions, Random access in files, Understanding the Preprocessor Directives (#include, #define), Macros

UNIT 9: Using Classes in C++ (6 Lectures)

Principles of Object-Oriented Programming, Defining & Using Classes, Class Constructors, Constructor Overloading, Function overloading in classes, Class Variables & Functions, Objects as parameters, Specifying the Protected and Private Access, Copy Constructors, Overview of Template classes and their use.

UNIT 10: Overview of Function Overloading and Operator Overloading (5 Lectures)

Need of Overloading functions and operators, Overloading functions by number and type of arguments, Looking at an operator as a function call, Overloading Operators (including assignment operators, unary operators)

UNIT 11: Inheritance, Polymorphism and Exception Handling (5 Lectures)

Introduction to Inheritance (Multi-Level Inheritance, Multiple Inheritance), Polymorphism (Virtual Functions, Pure Virtual Functions), Basics Exceptional Handling (using catch and throw, multiple catch statements), Catching all exceptions, Restricting exceptions, Rethrowing exceptions.

Practical / Lab work to be performed

1. Write a program to find greatest of three numbers.
2. Write a program to find gross salary of a person
3. Write a program to find grade of a student given his marks.
4. Write a program to find divisor or factorial of a given number.
5. Write a program to print first ten natural numbers.
6. Write a program to print first ten even and odd numbers.
7. Write a program to find grade of a list of students given their marks.
8. Create Matrix class. Write a menu-driven program to perform following Matrix operations (2-D array implementation):
 - a) Sum
 - b) Difference
 - c) Product
 - d) Transpose

Reference Books

1. HerbtzSchildt, "C++: The Complete Reference", Fourth Edition, McGraw Hill.2003
2. BjarneStroustrup, "The C++ Programming Language", 4th Edition, Addison-Wesley , 2013.
3. BjarneStroustrup, "Programming -- Principles and Practice using C++", 2nd Edition, Addison-Wesley 2014.
4. E Balaguruswamy, "Object Oriented Programming with C++", Tata McGraw-Hill Education, 2008.
5. Paul Deitel, Harvey Deitel, "C++ How to Program", 8th Edition, Prentice Hall, 2011.
6. John R. Hubbard, "Programming with C++", Schaum's Series, 2nd Edition, 2000.
7. Andrew Koeni, Barbara, E. Moo, "Accelerated C++", Published by Addison-Wesley , 2000.
8. Scott Meyers, "Effective C++", 3rd Edition, Published by Addison-Wesley, 2005.
9. Harry, H. Chaudhary, "Head First C++ Programming: The Definitive Beginner's Guide", First Create space Inc, O-D Publishing, LLC USA.2014
10. Walter Savitch, "Problem Solving with C++", Pearson Education, 2007.
11. Stanley B. Lippman, JoseeLajoie, Barbara E. Moo, "C++ Primer", Published by Addison-Wesley, 5th Edition, 2012

ITB-HC-3016: COMPUTER ORGANIZATION

Total Lectures: 60 Credits : 6 (Theory : 05, Tutorial: 01)

Unit1: Introduction

Lectures: 10

Functional units of a computer, basic instructions, interconnection of functional units, bus structure, memory locations, memory addresses, memory operations, instruction and instruction sequencing (straight Line sequencing and branching), addressing modes, introduction to assembly language, stack, subroutine, I/O instructions.

Unit2: Register Transfer Logic

Lectures: 10

Introduction, inter register transfer, arithmetic microoperation, logic microoperation, shift microoperation, Conditional control statements, fixed point binary data, instruction code, design of a simple computer.

Unit3: Processor logic design

Lectures: 10

Processor organization, design of arithmetic and logic unit, status register, design of accumulator .

Unit4: Control logic design

Lectures: 10

Hardware control, microprogrammed control block diagram, symbolic microprogram, microprogrammed CPU organization.

Unit5: I/O Subsystem

Lectures: 10

Program controlled I/O, Interrupts: enabling and disabling interrupts, handling interrupts from multiple sources (priority control), DMA, structure and working of hard disk, CDROM, printer.

Unit6: Memory subsystem

Lectures: 10

Semiconductor memory, SRAM, DRAM, ROM, speed size and cost, Cache memory, Mapping functions, replacement algorithms.

Suggested Reading:

1. Computer System Architecture, M.Morris Mano, PHI publication
2. Computer Architecture, Hamachar, Vranesic and Zaky.

ITB-HC-3026: OPERATING SYSTEM

Total Lectures: 60 Credits : 6 (Theory : 04, Lab : 02)

Unit1: Introduction

Lectures: 12

What is an operating system, evolution of operating systems. simple batch systems, time-sharing systems, personal computer systems, parallel systems, distributed systems, real time systems. functions of an operating systems.

Unit2 : Memory Management

Lectures: 12

logical versus physical address space, swapping. contiguous allocation, paging, segmentation, fragmentation, segmentation with paging. protection.

Virtual Memory: paging, demand paging, page replacement algorithms, , page tables, TLBs- translation lookaside buffers, inverted page tables, thrashing.

Unit3: Processes and Threads

Lectures: 12

Processes: Process model, process creation, process termination, Process hierarchies, process states , implementation of processes.

Threads: The thread model, thread usage, threads in user space and kernel, threads in linux
Interprocess Communication: race conditions, critical regions, mutual exclusion with busy waiting, sleep and wakeup, semaphores, message passing, mail box, interprocess communication in linux. **Classical IPC problems:** the dining philosophers problem, the readers and writers problem, the sleeping barber problem.

Scheduling: introduction to scheduling, scheduling in batch system and interactive systems, scheduling in real time systems, policy versus mechanism, thread scheduling.

Unit4: Deadlocks

Lectures : 12

System model, conditions for deadlock , conditions for deadlock modeling, deadlock detection with one and multiple resource of each type ,recovery from deadlock , deadlock avoidance, deadlock prevention .

Secondarystorage Structure: Disk structure, disk scheduling, disk management, disk reliability .

Device Management: Techniques for device management, dedicated devices, shared devices, storage devices, buffering,

Input/Output:

Principles of I/O hardware: I/O devices, device controller, memory mapped I/O, direct memory access

Principle of I/O software: programmed I/O, interrupt driven I/O, I/O using DMA.

I/O software layers: Interrupt handlers, device drivers, device independent I/O software, Userspace I/O software.

Disks: Disk formatting, disk arm scheduling algorithm.

Unit5: File System

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File Concept, file structure, file types, file access, file attributes, file operation, directory structure, directory operations, linux file system ,file system structure, implementing files, implementing directories, shared files ,file system reliability, file system performance, allocation methods, freespace management. file system calls in linux. Structure of ext2 file system. ext3 file system and journalling.

Practical

Each student should do at least 12 assignments from the following list.

1. Write a program to create a child process that starts looping and then terminates.
1. Write a program to Show that the child can be set up to ignore a signal from its parent.
2. Write a program to Show that a process can ignore a signal.

3. Write a program to Create a thread in which prints "We are proud to be Indians" and terminates.
4. Write a program to demonstrate how to "wait" for thread completions by using the Pthread join routine. Threads are explicitly created in a joinable state.
5. Write a program to create a thread in which print "We are proud to be Indians" and pass multiple arguments using structure during its creation.
6. Write a program to compute the dot product of two vectors.
7. Write a program to compute the dot product of two vectors and also show the use of mutex variables.
8. Write a program to create threads, the main thread creates three threads. Two of these threads increment a counter variable while third thread watches the value of the counter variable. When the counter variable reaches a predefined limit, the waiting thread is signaled by one of the incrementing threads. The waiting thread "awakens" and then modifies the counter. The program continues until the incrementing threads reach a final value and also print the final value.
9. Write a program to fork() a child process so that we have two processes running: Each process communicates via a semaphore. The respective process can only do its work (not much here) When it notices that the semaphore track is free when it returns to 0. Each process must modify the semaphore accordingly.
10. Write a program to show how 2 processes can talk to each other using kill() and signal(). We will fork() 2 process and let the parent send a few signals to it's child.
11. Write a program to show attaching and detaching shared memory.
12. Write a program to show the communication between two processes through shared memory.
13. Write a program to implement Banker's Algorithm.
14. Write a program to simulate synchronization of Sleeping Barber problem.
15. Write a program to simulate Dining Philosophers Algorithm.

Suggested reading:

1. Tanenbaum — Modern Operating Systems
2. Silberschatz , Galvin, Gang , Operating system concepts

ITB-HC-3036: DATABASE MANAGEMENT SYSTEMS

Total Lectures: 60 Credits : 6 (Theory : 04, Lab : 02)

Unit1: File structure

Lectures: 15

Record storage and primary file organization: memory hierarchies and storage devices, Storage of Databases, Placing file records on disks: Records and its Types, Files, Fixed length records and variable length records, Record Blocking, allocating file blocks on disks, operation on files.
Issues in Physical Design: Concept of indexes

Unit2: Overview of Database Management System:

Lectures: 15

Definition of Database, Traditional File Approach vs. DBMS approach, Characteristics of The Database approach, DBMS user, Role of a DBA, Advantage of using DBMS, DBMS architecture, Data independence
ANSI/SPARC 3 level architecture.

Unit3: Relational Models

Lectures: 15

Fundamental integrity rules: entity integrity, referential integrity, Relational algebra (Select , Project,Cross ,Product , theta join, equi join, natural join, outer join),Set Operation ANSI SQL –92Standard: DDL, DML, SQL constructs (Select .. From... Where... Group by Having ... Order by....), Insert, Delete, Update, View, Definition and use, nested quires, Constraints

considers (NOT NULL , UNIQUE, Check Primary key. Foreign key)

Unit4: Database Design

Lectures: 15

Conceptual model, logical model, physical model. ER model as a tool for conceptual design entities, attributes and relationships, weak and strong entities, conversion of ER model into relational schema.

Normalization: informal design guidelines for relational schemas (overview level), functional dependencies, different types of keys. Normal forms (first, second, third, BCNF).

PRACTICAL

Each student should do at least 6 assignments from the following list.

1. Create a table ***Employee*** with the following columns: Emp_no (numeric) primary key
Emp_name(strng) Join_date (Date)Basic_pay_fixed_at (numeric) Date_of_birth (Date)

Insert the following data into the table.

Emp_no.	Emp_name	Join_date	Basic_pay_fixed_at	Date_of_birth
1001	Charles Babbage	01-Jun-2000	8000.00	03-10-1973
1002	George Boole	01-Jul-2001	5000.00	04-12-1972
1003	E.F. Codd	01-Jun-2001	8000.00	06-03-1969
1004	Bill Gates	01-Jul-2003	5000.00	09-10-1995
1005	Tony Greig	01-Aug-2004	8000.00	04-05-1985

2. Create the following two tables and insert data into the tables.

Player (Roll no.→Primary Key)

Roll no.	Name
10	Vijay Amrithraj
20	Leander Paes
30	Mahesh Bhupathi
40	Sania Mirza

Match (Match_no→Primary key, Roll no→Foreign key)

Match_no	Roll_no.	Match_Date	Opponent
1	20	10-Jul-2008	Washington
2	30	12-Jan-2008	Sampras
3	20	12-Aug-2008	Borg
4	30	20-Mar-2008	Vijay

Perform the following two operations:

- (i) Perform EQUIJOIN operation to retrieve data from both the files.
- (ii) Perform OUTERJOIN operation to retrieve the unmatched records.

3. Design an ER diagram for a **BANK** database schema. To consider that each Bank can have multiple branches, and each branch can have multiple Accounts and Loans for customer. Also to specify the non weak & weak entity types, key attributes & key types, relationship types, instances, constraints and participations.

3. Create a table **Student** taking the attributes given bellow

Roll_no, Student_name, Address,
Date_of_admission,
Class Section and Contact_no.

Write appropriate queries to perform the following operations:

- a) To insert values in the Student table.
- b) To delete values from Student table
- c) To list the names of all students which roll_no > 20.
- d) To search for students who got admitted before 01-01-2006.
- e) To change the name of the student whose roll number is 10 to Amar.

4. Create tables **Department** and **Employee** with the

attributes given bellow. Employee (EmpNo ,
Empname, Address, Dno)
Department (Dno,

Dname, Location) Dno in

Employee is a foreign key.

Write appropriate queries to perform the following operations:

- a) To insert values in the tables.
- b) To retrieve the names and addresses of all Employees working in the Finance department.
- c) To print the location where Administration department is located.

d) to delete all information regarding a particular employee.

5. Create table *Student* and *Course* taking the attributes given below. Student (Roll_no, Name, Semester, Course_no(Foreign key)) Course (Course_no, Course_name)

Write appropriate queries for the following operations:

- a) To retrieve names of all students who are admitted to the course '_BCA'.
- b) To retrieve the names of all students whose course name is '_BCA' and who are in the 3rd semester.
- c) To display details of all courses in which more than 100 students got admitted.
- d) For course being offered, display the course name and number of students admitted to the course.

6. Create tables *Employee*, *Department*, *Location*, *Works_on*, and *Project* taking the attributes given below.

Employee (Fname, Lname, Empno, Bdate, Address, Salary,

Dnumber) Department (Dname,Dnumber,Mgrno)

Locations(Dnumber,

DLocation) Works_on(Empno,

Pnumber, Hours_per_day)

Project(Pname, Pnumber, Location,Dnumber

(Foreign)) Dependent(Empno,

Dependent_name, Sex, DOB, Relationship)

Write appropriate queries for the following operations:

- a) Retrieve the names and addresses of all employees who work in the Finance department.

- b) To retrieve the names of all employees who works on all the projects controlled by department number 6
- c) For each department, print the name of the department and the name of the manager of the department.
- d) Retrieve the location where the Administration department is located.

- e) For every project located in Mumbai list the project number, the controlling department and department manger's name and address.
- f) Find out how many employees are there in each department.
- g) Find the total salary of all employees of the -Research department, as well as the maximum, minimum and average salary in this department
- h) Retrieve the name of all employees who have no dependent.
- i) Alter the -Employee table by deleting the coloumn Bdate.
- j) Retrieve the Fname, Lname of all employees whose salary is higher than average salary.
- k) For each department retrieve the department number, the number of employee in the department and their average salary.
- l) Retrieve the name of all employees who have two or more dependent
- m) Retrieve the details of all employees who works on project number 1,2,3

7. Create Table

Client_master (Client_no, name, address, Bdue)

Product_master(P_number,Description,saleprice,costprice)

Sales_master(Salesmno,Sname,Addres,Salamnt,Remarks)

Sales_order(O_no,Client_no,Odate,Delyaddr,Salesmno)

Sales_order_detail(Order_no,Product_no, Qtyorder,
product_rate,Qty_dispatched)

Write appropriate queries to perform the following operations:

- i) List name of all clients having _a' as the second letter in their names.
- ii) Retrieve the description and total Qty sold for each product.
- iii) Find product no. and description of non moving products (i.e product

- not being sold). iv) For each product being sold, list the product number and the total amount (in Rs.) sold.
- v) List all client who stay in Bangalore or Mumbai
- vi) List the clients who stay in a city whose First letter is M
- vii) Find the names of clients who had purchased the item Trouser.
- viii) Find out if T-Shirt has been ordered by any client
and if so print the details of the client.
- ix) List details of all products whose unit price is more than Rs. 5000.00.
- x) Calculate the total amount (in Rs.) purchased by each client that has purchased items amounting more than Rs. 20000.

8. Create table

Author(Author_id, Name, City, Country)

Catalog (Book_id, Title, Author1_id, Author2_id, Publisher_id, Category_id, Year, Price) Publisher(Publisher_id, Name, City, Country)

Order_details(Order_no, Book_id, Quantity)

Category(Category_id, Description)

Order_summary(Order_no, Member_id, Odate,

Amount, Ostatus) Member(Member_id,

Name, Address, Contact)

Assume that all books have at most two authors.

Write appropriate queries to perform the following operations:

- Retrieve the title, author, and publisher names of all books published in 1999 and 2006.
- Retrieve the title of all books whose one author is A Tanenbum.
- Get the details of all books whose price is greater than the average price of the books.
- Get the names of all the books for which an order has been placed.
- Get the names of all authors who have more than ten books in the catalog.
- Get the details of the authors whose books are being sold from the book club.
- Get the title and price of all books whose price is greater than the maximum of the category average.

Suggested reading:

1. Introduction to database management system, C.J. Date
2. Fundamentals of data base management system, Elmasri & Navathe
3. . Database systems – concepts and application in database , S K Singh

ITB-SE-3014: UNIX/LINUX Programming

Credits 4 (Theory 2: Practical 2)

Theory: 20 Lectures Practical: 20 Lectures

UNIT 1: Introduction (6 Lectures)

What is linux/unix Operating systems, difference between linux/unix and other operating systems, Features and Architecture, Various Distributions available in the market, Installation, Booting and shutdown process, System processes (an overview), External and internal commands, Creation of partitions in OS, Processes and its creation phases – Fork, Exec, wait

UNIT 2: User Management and the File System (6 Lectures)

Types of Users, Creating users, Granting rights, User management commands, File quota and various file systems available, File System Management and Layout, File permissions, Login process, Managing Disk Quotas, Links (hard links, symbolic links)

UNIT 3: Shell introduction and Shell Scripting (8 Lectures)

What is shell and various type of shell, Various editors present in linux, Different modes of operation in vi editor, What is shell script, Writing and executing the shell script, Shell variable (user defined and system variables), System calls, Using system calls, Pipes and Filters, Decision making in Shell Scripts (If else, switch), Loops in shell, Functions, Utility programs (cut, paste, join, tr, uniq utilities), Pattern matching utility (grep)

Practical / Lab work to be performed Based on Linux

1. Write a shell script to check if the number entered at the command line is prime or not.
2. Write a shell script to modify `—call` command to display calendars of the specified months.
3. Write a shell script to modify `—call` command to display calendars of the specified range of months.
4. Write a shell script to accept a login name. If not a valid login name display message
—
Entered login name is invalid.
5. Write a shell script to display date in the mm/dd/yy format.
6. Write a shell script to display on the screen sorted output of `—whol` command along with the total number of users.

7. Write a shell script to display the multiplication table any number,
8. Write a shell script to compare two files and if found equal asks the user to delete the duplicate file.
9. Write a shell script to find the sum of digits of a given number

10. Write a shell script to merge the contents of three files, sort the contents and then display them page by page.
11. Write a shell script to find the LCD(least common divisor) of two numbers.
12. Write a shell script to perform the tasks of basic calculator.
13. Write a shell script to find the power of a given number.
14. Write a shell script to find the binomial coefficient $C(n, x)$.
15. Write a shell script to find the permutation $P(n,x)$.
16. Write a shell script to find the greatest number among the three numbers.
17. Write a shell script to find the factorial of a given number.
18. Write a shell script to check whether the number is Armstrong or not.
19. Write a shell script to check whether the file have all the permissions or not.
20. Program to show the pyramid of special character —*|.

Reference Books

1. Sumitabha, Das, Unix Concepts And Applications, Tata McGraw-Hill Education, 2006
2. Michael Jang RHCSA/ RHCE Red Hat Linux Certification: Exams (Ex200 & Ex300) (Certification Press), 2011
3. Nemeth Synder & Hein, Linux Administration Handbook, Pearson Education, 2nd Edition, 2010
4. W. Richard Stevens, Bill Fenner, Andrew M. Rudoff, Unix Network Programming, The sockets Networking API, Vol. 1, 3rd Edition,2014

ITB-SE-3024: Programming in Python
Credits 4 (2+2)
Theory: 20 Lectures Practical: 20 Lectures

UNIT 1: Planning the Computer Program (2 Lecture)
Concept of problem solving, Problem definition, Program design, Debugging, Types of errors in programming, Documentation

UNIT 2: Techniques of Problem Solving (2 Lecture)
Flowcharting, decision table, algorithms, Structured programming concepts, Programming methodologies viz. top-down and bottom-up programming

UNIT 3: Overview of Programming (4 Lecture)
Structure of a Python Program, Elements of Python

UNIT 4: Introduction to Python (4 Lecture)
Python Interpreter, Using Python as calculator, Python shell, Indentation, Atoms, Identifiers and keywords, Literals, Strings, Operators (Arithmetic operator, Relational operator, Logical or Boolean operator, Assignment, Operator, Ternary operator, Bit wise operator, Increment or Decrement operator).

UNIT 5: Creating Python Programs (4 Lecture)
Input and Output Statements, Control statements (Branching, Looping, Conditional Statement, Exit function, Difference between break, continue and pass.), Defining Functions, Default arguments.

UNIT 6: Python File Operations (4 Lecture)
Understanding read functions, read(), readline() and readlines(), Understanding write functions, write() and writelines(), Programming using file Operations, Reading config files in python, Writing log files in python.

Practical / Lab work to be performed

Section: A (Simple programs)

1. Write a menu driven program to convert the given temperature from Fahrenheit to Celsius and vice versa depending upon user's choice.
2. WAP to calculate total marks, percentage and grade of a student. Marks obtained in each of the three subjects are to be input by the user. Assign grades according to the following criteria :
Grade A: Percentage ≥ 80
Grade B: Percentage ≥ 70 and < 80
Grade C: Percentage ≥ 60 and < 70
Grade D: Percentage ≥ 40 and < 60
Grade E: Percentage < 40
3. Write a menu-driven program, using user-defined functions to find the area of rectangle, square, circle and triangle by accepting suitable input parameters from user.
4. Write a program to display the first n terms of Fibonacci series.
5. Write a program to find factorial of the given number.
6. Write a program to find sum of the following series for n terms:
$$1 - \frac{2}{2!} + \frac{3}{3!} - \dots - \frac{n}{n!}$$
7. Write a program to calculate the sum and product of two compatible matrices.

Section: B (Visual Python)

All the programs should be written using user defined functions, wherever possible.

1. Write a menu-driven program to create mathematical 3D objects
(i) curv, (ii) sphere (iii) cone (iv) arrow (v) ring (vi) cylinder.
2. Write a program to read n integers and display them as a histogram.
3. Write a program to display sine, cosine, polynomial and exponential curves.
4. Write a program to plot a graph of people with pulse rate p vs. height h. The values of p and h are to be entered by the user.
5. Write a program to calculate the mass m in a chemical reaction. The mass m (in gms) disintegrates according to the formula $m = \frac{60}{(t+2)}$, where t is the time in hours. Sketch a graph for t vs. m, where $t \geq 0$.
6. A population of 1000 bacteria is introduced into a nutrient medium. The population p grows as follows:

$$P(t) = \frac{15000(1+t)}{(15 + e^t)}$$

where the time t is measured in hours. WAP to determine the size of the population at given time t and plot a graph for P vs t for the specified time interval.

7. Input initial velocity and acceleration, and plot the following graphs depicting equations of motion:
- (i) velocity wrt time ($v=u+at$)
 - (ii) distance wrt time ($s=u*t+0.5*a*t*t$)
 - (iii) distance wrt velocity ($s=(v*v-u*u)/2*a$)
8. Write a program to show a ball bouncing between 2 walls. (Optional)

Reference Books

1. T. Budd, Exploring Python, TMH, 1st Ed, 2011
2. Python Tutorial/Documentation www.python.org 2015
3. Allen Downey, Jeffrey Elkner, Chris Meyers , How to think like a computer scientist : learning with Python , Freely available online.2012
4. <http://docs.python.org/3/tutorial/index.html>
5. <http://interactivepython.org/courselib/static/pythonds>
6. <http://www.ibiblio.org/g2swap/byteofpython/read/>

ITB-SE-3034: HTML Programming

Credits 4 (2+2)

Theory: 20 Lectures Practical: 20 Lectures

UNIT 1: The Basics (3 Lectures)

Introduction to HTML, the Head, the Body, Colors, Attributes, Check box, Radio Button, Text, TextArea, Lists, ordered and unordered

UNIT 2: HTML Formatting (3 Lectures)

New Paragraph, Line Break, Blank Space, Preformatted text, Div element Bold text, Important text, Italic text, Emphasized text, Marked text, Small text, Deleted text, Inserted text, Subscript text, Superscript text, HTML quotations, HTML Comments, HTML colors

UNIT 3: Links (3 Lectures)

Introduction, Relative Links, Absolute Links, Link Attributes, Using the ID Attribute to Link within a Document

UNIT 4: Images (2 Lectures)

Putting an Image on a Page, Using Images as Links, Putting an Image in the Background

UNIT 5: Tables (5 Lectures)

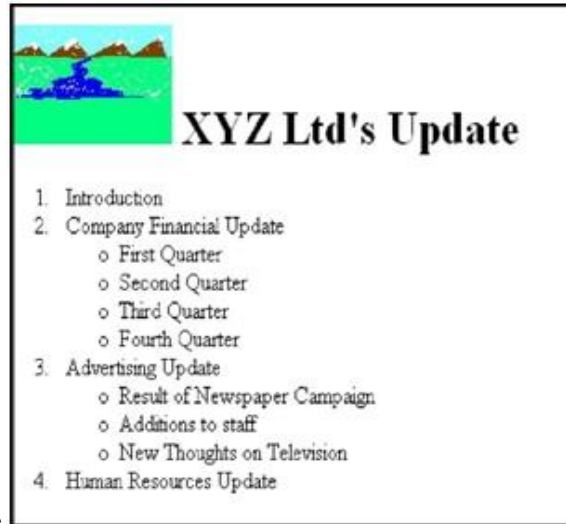
Creating a Table, Table Headers, Captions, Spanning Multiple Columns, Styling Table

UNIT 6: Forms (4 Lectures)

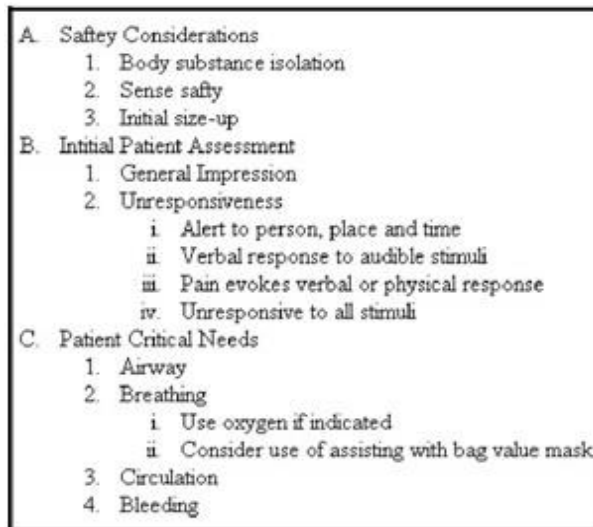
Basic Input and Attributes, Other Kinds of Inputs, Styling forms with CSS, Where To Go From Here

Practical / Lab work to be performed

1. Create an HTML document with the following formatting options:
 - (i) Bold
 - (ii) Italics
 - (iii) Underline
 - (iv) Headings (Using H1 to H6 heading styles)
 - (v) Font (Type, Size and Color)
 - (vi) Background (Colored background/Image in background)
 - (vii) Paragraph
 - (viii) Line Break
 - (ix) Horizontal Rule
 - (x) Pre tag
2. Create an HTML document which consists of:
 - (i) Ordered List
 - (ii) Unordered List
 - (iii) Nested List



(iv) Image



3. Create an HTML document which implements Internal linking as well as External Linking.

4. Create a table using HTML which consists of columns for Roll No., Student's name and grade.

Result		
Roll No	Name	Grade

5. Create a Table with the following view:

			Place an Image Here	

6. Create a form using HTML which has the following types of controls:

- (i) Text Box
- (ii) Option/radio buttons
- (iii) Check boxes
- (iv) Reset and Submit buttons

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Email:

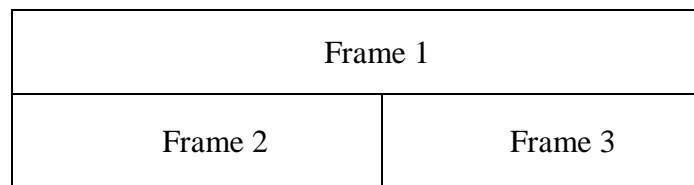
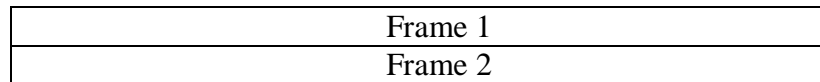
How did you hear about XYZ News Magazine and Emails?

Here on the Web In a magazine Television Other

Would you like to be on our regular mailing list?

Yes, we love junk emails

7. Create HTML documents (having multiple frames) in the following three formats:



Reference Books

1. Virginia DeBolt , Integrated HTML and CSS A Smarter, Faster Way to Learn Wiley / Sybex , 2006
2. Cassidy Williams, Camryn Williams Introduction to HTML and CSS, O'Reilly, 2015

CODE: ITB-SE-3044:: English

ITB-HG-3016: Multimedia and Applications

Credits 6 (4+2)

Theory: 60 Lectures Practical: 60 Lectures

UNIT 1: Multimedia (6 Lectures)

Introduction to multimedia, components, uses of multimedia, multimedia applications, virtual reality

UNIT 2: Text (4 Lectures)

Fonts & Faces, Using Text in Multimedia, Font Editing & Design Tools, Hypermedia & Hypertext

UNIT 3: Images (6 Lectures)

Still Images – bitmaps, vector drawing, 3D drawing & rendering, natural light & colors, computerized colors, color palettes, image file formats.

UNIT 4: Sound (6 Lectures)

Digital Audio, MIDI Audio, MIDI vs Digital Audio, Audio File Formats

UNIT 5: Video (8 Lectures)

How video works, analog video, digital video, video file formats, video shooting and editing.

UNIT 6: Animation (10 Lectures)

Principle of animations, animation techniques, animation file formats.

UNIT 7: Internet and Multimedia (6 Lectures)

www and HTML, multimedia on the web – web servers, web browsers, web page makers and site builders.

UNIT 8: Making Multimedia (14 Lectures)

Stages of a multimedia project, Requirements to make good multimedia, Multimedia Hardware-Macintosh and Windows production Platforms, Hardware peripherals-Connections, Memory and storage devices, Multimedia software and Authoring tools.

Practical / Lab work to be performed

Practical exercises based on concepts listed in theory using Flash/ GIMP/ PhotoShop/ Animation Tools/ Image Editors/ Video Editors. **Optional**

Implement the followings using Flash-

1. Create an animation using the tools panel and the properties panel to draw the following – Line, pe , oval, circle, rectangle , square, pencil , brush , lasso tool
2. Create an animation using text tool to set the font , size , color etc.
3. Create an animation using **Free transform tool** that should use followings-Move Objects
Skew Objects Stretch Objects Rotate Objects Stretch Objects while maintaining proportion Rotate Objects after relocating the center dot
4. Create an animation using layers having following features-Insert layer, Delete layer, guide layer, Mask layer.
5. Modify the document (changing background color etc.)using the following tools
Eraser tool Hand tool Ink bottle tool Zoom tool Paint Bucket tool Eyedropper tool
6. Create an animation for bus car race in which both starts from the same point and car wins the race.
7. Create an animation in which text Hello gets converted into GoodBye (using motion/shape tweening).
8. Create an animation having five images having fade-in fade-out effect.
9. Create an scene to show the sunrise (using multiple layers and motion tweening)
10. Create an animation to show the ripple effect.
11. Create an animation (using Shape tweening and shape hints) for transforming one shape into another.
12. Create an animation for bouncing ball (you may use motion guide layer).

References Books

1. Tay Vaughan, —Multimedia: Making it workl, TMH, Eighth edition.2011
2. Ralf Steinmetz and KlaraNaharstedt, —Multimedia: Computing, Communications Applicationsl, Pearson.2012
3. Keyes, —Multimedia Handbookl, TMH,2000.
4. K. Andleigh and K. Thakkar, —Multimedia System Designl, PHI.2013

ITB-HG-3026: Computer Oriented Numerical Methods

Credits 6 (Theory: 4 Practical: 2)

Theory: 60 Lectures Practical: 60 Lectures

UNIT 1: (8 Lectures)

Floating point representation and computer arithmetic, Significant digits, Errors: Round-off error, Local truncation error, Global truncation error, Order of a method, Convergence and terminal conditions, efficient computations

UNIT 2: (12 Lectures)

Bisection method, Secant method, Regula-Falsi method, Newton-Raphson method, Newton's method for solving nonlinear systems, Gauss elimination method (with row pivoting) and Gauss-Jordan method, Gauss Thomas method for tridiagonal systems

UNIT 3: (10 Lectures)

Iterative methods: Jacobi and Gauss-Seidel iterative methods, Interpolation: Lagrange's form and Newton's form

UNIT 4: (12 Lectures)

Finite difference operators, Gregory Newton forward and backward differences Interpolation, Piecewise polynomial interpolation: Linear interpolation, Cubic spline interpolation (only method), Numerical differentiation: First derivatives and second order derivatives, Richardson extrapolation

UNIT 5: (9 Lectures)

Numerical integration: Trapezoid rule, Simpson's rule (only method), Newton-Cotes open formulas.
Extrapolation methods: Romberg integration, Gaussian quadrature, Ordinary differential equation: Euler's method

UNIT 6: (9 Lectures)

Modified Euler's methods: Heun method and Mid-point method, Runge-Kutta second methods, Heun method without iteration, Mid-point method and Ralston's method Classical 4th order Runge-Kutta method, Finite difference method for linear ODE

Practical / Lab work to be performed

1. Find the roots of the equation by bisection method.
2. Find the roots of the equation by secant/Regula-Falsi method.
3. Find the roots of the equation by Newton's method.

4. Find the solution of a system of nonlinear equation using Newton's method.
5. Find the solution of tridiagonal system using Gauss Thomas method.
6. Find the solution of system of equations using Jacobi/Gauss-Seidel method.
7. Find the cubic spline interpolating function.
8. Evaluate the approximate value of finite integrals using Gaussian/Romberg integration.
9. Solve the boundary value problem using finite difference method.

Note: Programming is to be done in any one of Computer Algebra Systems:
MATLAB / MATHEMATICA / MAPLE.

Reference Books

1. Laurence V. Fausett, Applied Numerical Analysis, Using MATLAB, Pearson, 2/e (2012)
2. M.K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Methods for Scientific and Engineering Computation, New Age International Publisher, 6/e (2012)
3. Steven C Chapra, Applied Numerical Methods with MATLAB for Engineers and Scientists, Tata McGraw Hill, 2/e (2010).

CODE: ITB-HC-4016: PROGRAMMING IN JAVA

Total Lectures : 60 Credits : 6 (Theory : 04, Lab : 02)

UNIT-I Lectures: 15

Java language basics: Basic features, Java virtual machine concepts. Data types:- primitive data types and variables. Java Key words, integer and floating point data type, character and Boolean types, declaring and initialization variables. Java operators, Expressions, Statements-- selection statements, control statements, iterative statements, jump statements.

Classes & Objects: Creating objects, assigning object reference variables. Introducing methods.

Arrays:- Static methods, Constructors, Overloading constructors., Strings, and Vector. This Keyword Using object as parameters:- argument passing, returning objects. Method Overloading , garbage collection , the Finalize() method.

Inheritance and Polymorphism- Inheritance basics, access control, multilevel inheritance, method overriding, abstract classes, polymorphism, Final keyword. Multithreaded programming,

I/O in Java :- I/O basics, Streams and stream classes , reading from and writing to console, reading writing files

UNIT – II

Lectures: 15

Java applets: The Applet Class, Applet Architecture, An Applet skeleton: initialization and termination, handling events, HTML Applet Tag, Control.

UNIT – III

Lectures: 15

Networking : Socket overview -- datagram socket and TCP/IP based server socket, Internet Addressing --- DNS, UR. Event handling Drivers in Java.

UNIT – IV

Lectures: 15

Java Database Connectivity: Establishing a connection(JDBC, ODBC connectivity), transactions with database.

LABORATORY

Each student should do at least 8 assignments from the following list.

1. Design a class to represent a bank account and include the following data members – **Data Members:** name of the depositor, account number, type of a/c, balance amount in the a/c
Methods: to assign initial values, to deposit an amount, to withdraw an amount after checking the minimum balance (Rs.1000), to display the name of the depositor and balance.
2. Write an applet programming to print the first name, last name, sex, address, mobile no. and pin code of an end user passing parameters.
3. Write an applet programming to create three buttons and draw a rectangle on clicking the first button, a solid rounded rectangle on clicking the second button and a solid circle and an arc on clicking the third button.
4. Write a program to create 3 – threads for execution with different priorities.
5. Write a program to create three threads for execution of the natural nos. less than 5 using synchronization concept.
6. Write a java program for a class teacher that contains two fields name and qualification. Extend the class to department that contains data members deptno and deptname. An interface name as college contains one field name of the college. Using the above classes and interface get the appropriate information and display them.
7. Design three classes person, employee and student using the concept of inheritance. Each class should have a constructor of its own properties as name, age, gender and common method showdata().
8. Write a program to create an array of employee name and salary related to the employee. If the salary is greater than Rs.10,000 raise an exception –Salary is greater than Rs.10,000, otherwise display the required information.

9. Design a user interface to insert, update, delete, search and browse a record of employee database for emp_id, emp_name, sex, basic, desig and date_join.
10. Design a menu as Operation and Exit. The Operation menu contains the menu items as Addition, Subtraction, Multiplication, Division and Remainder of two numbers. On clicking the respective menu items perform the desired operation. Further on clicking the Exit menu put a confirmation message as -Do you want to exit- Yes/No?!. If Yes then terminate the application, otherwise it exists.

Suggested Reading

1. Programming in Java, E. Balaguruswamy, Tata Mc-Graw Hill.
2. Patrik Naughton & Herbert Schildt — The complete reference javal

ITB-HC-4026: SOFTWARE ENGINEERING
Total Lectures : 60 Credits : 6 (Theory : 04, Lab : 02)

Unit1 : Introduction

Lectures: 15

Software Processes & Characteristics, Software life cycle Models- Waterfall, Prototype, Evolutionary and Spiral Models Software Requirements analysis & specifications: Requirement engineering, requirement, elicitation techniques like FAST, QFD, requirements analysis using DFD, Data dictionaries, ER Diagrams, Requirements documentation, Nature of SRS, Characteristics & organization of SRS.

Unit2 : Software Project Planning

Lectures: 15

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

Unit3: Software Design

Lectures: 15

Data design, Architectural design, Interface design, Function Oriented Design, Object Oriented Design, Cohesion & Coupling, Classification of Cohesiveness & Coupling, Software Metrics: different types of project metrics.

Unit4 : Software Testing and Maintenance

Lectures: 15

Testing Process, Design of Test Cases, Types of Testing, Functional Testing, Structural Testing, Test Activities, Unit Testing, Integration Testing and System Testing. Debugging Activities Software Maintenance: Management of Maintenance, Maintenance Process, Reverse Engineering, Software Re engineering, Configuration Management, Documentation. Software quality Assurance.

CASE tools Analysis tools, design tools, SQA tools, software testing tools.

LABORATORY

Each student should do at least 3 assignments from the following list.

1. Xpaize.com wants to computerize its sales, purchase & booking of shares through online mode . A user enters his/her user name and password (assigned at the time of registration).

User chooses one of the above actions and finally receives the trasaction/account details on the action chosen.

Perform the following tasks for the above problem.

- a) Develop SRS.
- b) Draw DFDs of level 0 and level 1.
- c) Draw an ER diagram and its related tables.

2. The university wants to computerize its admission process. The system should maintain data of all new students as well as old students , their results issue admission letter , allocate study centre or should also allow students to move from one centre to another study centre.

Perform the following tasks for the above problem.

- a) Develop SRS.
 - b) Draw DFDs of level 0 and level 1.
 - c) Draw an ER diagram and its related tables.
3. A Tic – Tac - Toe is a computer game in which human player and computer makes alternative moves on a 3X3 square. A move consists of marking a previously unmarked square. The player who is first to place three consecutive marks along a straight line (ie along a row , column or diagonal) on the square wins . As soon as the either of the winner wins a message congratulating them is displayed .If neither of the player manages to get three consecutive marks along a straight line and all the squares on the board are filled up , then the game is drawn. The computer always tries to win a game.

Perform the following tasks for the above problem.

- a) Draw DFDs of level 0 and level 1.

b) Draw an ER diagram and its related tables.

4. A supermarket needs to develop the following software to encourage regular customers. For this the customer needs to supply his /her residence address ,telephone number & the driving licence number.Each customer who is registered for this scheme is assigned a unique customer number (CN)by the computer. Based on the generated CN a clerk manually prepares a customer identity card after getting market managers signature on it . A customer can present his customer identity card to the check out staff whenever he makes any purchases.In this case the value of his purchase is credited against his CN.At the end of each year the supermarket intends to award surprise gifts to ten customers who make the highest total purchase over the year.Alsp it intends to award a 22 caret gold coin to every customer whose purchase exceeded Rs. 10,000. The entries against the CN are reset on the last day of every year after the prize winner list are generated.

Perform the following tasks for the above problem.

c) Draw DFDs of level 0 and level 1.

d) Draw an ER diagram and its related tables.

Suggested readings:

1. Rajeev Mall —Software Engineering|| PHI
2. Pressman Roger — Software Engineering A Practitioners Approach|| Tata McGraw Hill
3. James F. Peters, Witold Pedrycz —Software Engineering An Engineering Approach

ITB-HC-4036: DATA COMMUNICATION AND COMPUTER NETWORKS

Total Lectures : 60 Credits : 6 (Theory : 04, Lab : 02)

INTRODUCTION

Lectures: 5

Usage of Computer Network, study of topology, concept of protocol, Connection less and connection Oriented Service, Layered architecture, study of OSI and TCP model.

PHYSICAL LAYER

Lectures: 5

Introduction to Guided and Unguided media, physical description of twisted pair, coaxial cable, and fiber optic cable, Maximum data rate of a channel (Nyquist and shannons law), Basic concepts of Modulation and demodulation, Data encoding techniques (Manchester and Differential Mancestar encoding) . Network connecting devices hub, repeater, bridge, switch, router, and gateway

DATA LINK LAYER LLC

Lectures: 6

Functions and services of DLL, Framing and Framing Methods, Concept of Error Control, Error Correcting code(Hamming code), Error detecting code(CRC), Concept of Flow Control, Piggybacking, Stop-and-Wait sliding window protocol, Pipelining techniques(Go backN, Selective Repeat).

MAC

Lectures: 10

What is MAC? Static Channel Allocation, Dynamic Channel Allocation, Pure ALOHA, Slotted ALOHA, Carrier Sense Protocol, 1-persistent CSMA, Non-Persistent CSMA, CSMA/CD, Ethernet(IEEE 802.3) and Ethernet Frame Format, Basic concept of Wireless LAN(IEEE 802.11), Binary Exponential Backoff Algorithm.

NETWORK LAYER

Lectures :12

Services and Functions of Network Layer, Virtual Circuit and Datagram Subnet, Routing, Distance Vector Routing, the Count-to-Infinity problem, Link State Routing, Congestion (definition and factors of congestion only), Definition of Quality of Service, Traffic shaping, Leaky Bucket and token Bucket Algorithm, Concept of IP Address.

TRANSPORT LAYER

Lectures: 12

Functionality of transport Layer, Establishment and release of connection, TCP and UDP(Overview), Introduction to Sockets and socket primitives, port numbers.

APPLICATION LAYER

Lectures: 10

Concept of E-mail, Telnet, WWW, DNS, HTTP, FTP, URL, SMTP, MIME.

LABORATORY

Each student should do at least 4 assignments from the following list.

Avoid using Loopback Communication for the assignments,1-4:

1. Write a server socket program using TCP/IP in java where the client side will send a request for an existing file to the server side and if the file exists in the server then send the contents of that particular file to the client in reply, otherwise display a message -file does not exist on the server, if exists displays the contents on the client side.
2. Develop a chat application using TCP/IP in java.
3. Develop a client-server application using TCP/IP in java to input user's information and finally send them to the server and store there in a file.
4. Develop a server socket program where the client takes principal, rate of interest and number of years and send them to the server. In the server receive this information and find the simple interest and finally send the result to the client again and display it on the client's VDU.
5. Configure a Local Area Network (Wired/Ethernet) in Linux environment. Configure the network interface card using ifconfig command and also explore ping, ifdown and ifup commands.

Suggested Readings

- 1.Red Hat Linux:Proffitt:PHI
- 2.Introduction to system Administration:IBM series:PHI

ITB-SE-4014:Android Programming

Credits 4 (2+2)

Theory: 20 Lectures Practical: 20 Lectures

UNIT 1: Introduction (2 Lectures)

What is Android and its importance, Brief history about Android, Pre-requisites to learn Android, Development tools, Android architecture-software stack.

UNIT 2: Get started with Android (4 Lectures)

Installation of Android Studio, SDK, emulator, Creating your first Project App, Explore project structure- Manifest, java, res, gradle, Activity, Layout, Common UI components, Creating UI through code, Run the application in Emulator and Android device.

UNIT 3: Activities (3 Lectures)

Creating a new activity, Application context, Intent, Activity Life cycle, Communicating among Activities, connecting to internet resource, WebView.

UNIT 4: Designing User Interface (3 Lectures)

Using Button control, ArrayList, Spinner, ListView, GridView, Adapters, Sidebar Menus, Notification (toast, Status bar), Adding image, audio, Video.

UNIT 5: Background Task and Local File Storage (3 Lectures)

Broadcast Receiver, services in Android, Reading/writing local data, Accessing the Internal File system.

UNIT 6: Database (5 Lectures)

SQLite- Introducing SQLite, SQLiteOpenHelper and creating a database, Opening and closing a database, Inserts, updates, and deletes operation, Data Binding, using content provider, firebase, storing and sharing data in the cloud.

Practical / Lab work to be performed

1. Create an application with two fields (Number 1, Number2). On clicking button the sum of the two numbers are displayed on another text field.
2. Create a Login application with two fields (username and password). On successful login go to next screen, also pass user name to next screen. And on failing login, alert user using Toast.
3. Create an application with two fields (name and value). On clicking button, the value on the two fields passes to the next screen and display it on text field.
4. Create an application with a button. On clicking the button open browser with an URL.(open google page)
5. Create a spinner with names of some countries. On selecting a particular country, Display a toast message with currency name of that country.
6. Create an application with Navigation side bar menu item. On clicking the sidebar menu item, it open activity page of that particular menu item.
7. Create an application with static Broadcast Receiver features. When a SMS comes, it displays an alert message.
8. Create an application to display an image and button. On button click the image is changed. The images are put inside the resource folder.
9. Create an application with a button. On clicking it, notification is displayed on top of the app. When swipe and click it display second activity page.
10. Create an application with two button for start and stop services. On clicking start button it will play default ringtone in the background. On clicking stop button it stops.
11. Create an application to play a video.
12. Create an application with a text field. On clicking the Add button the content of the text field is save to a file in internal memory storage. On clicking the Load button the content of the file in the internal storage is displayed again in the text field.
13. Create an application to create a database in Sqlite with a table of user information (id, name, marks etc.). The application can also perform insert, retrieve, update and delete operation.

Reference Books

1. Grant Allen, Beginning Android 4, A press, 2012.
2. Wei-Meng Lee, Beginning android 4 application Development, John Wiley & sons, Inc, 2012.
3. Android programming for Beginners by John Horto, Packt Publishing Ltd.

ITB-SE-4024: PHP Programming

Credits 4 (2+2)

Theory: 20 Lectures Practical: 20 Lectures

UNIT 1: Introduction to PHP

(4 Lectures)

PHP introduction, inventions and versions, important tools and software requirements (like Web Server, Database, Editors etc.), PHP with other technologies, scope of PHP, Basic Syntax, PHP variables and constants, Types of data in PHP , Expressions, scopes of a variable (local, global), PHP Operators : Arithmetic, Assignment, Relational , Logical operators, Bitwise , ternary and MOD operator, PHP operator Precedence and associativity

UNIT 2: Handling HTML form with PHP

(2 Lectures)

Capturing Form Data, GET and POST form methods, Dealing with multi value fields, Redirecting a form after submission

UNIT 3: PHP conditional events and Loops

(3 Lectures)

PHP IF Else conditional statements (Nested IF and Else), Switch case, while, For and Do While Loop, Goto, Break, Continue and Exit

UNIT 4: PHP Functions

(3 Lectures)

Function, Need of Function, declaration and calling of a function, PHP Function with arguments, Default Arguments in Function, Function argument with call by value, call by reference, Scope of Function Global and Local

UNIT 5: String Manipulation and Regular Expression

(4 Lectures)

Creating and accessing String , Searching & Replacing String, Formatting, joining and splitting String , String Related Library functions, Use and advantage of regular expression over inbuilt function, Use of preg_match(), preg_replace(), preg_split() functions in regular expression

UNIT 6: Array

(4 Lectures)

Anatomy of an Array ,Creating index based and Associative array ,Accessing array, Looping with Index based array, with associative array using each() and foreach(), Some useful Library function

Practical / Lab work to be performed

1. Create a PHP page using functions for comparing three integers and print the largest number.
2. Write a function to calculate the factorial of a number (non-negative integer). The function accept the number as an argument.
3. Write a program to check whether the given number is prime or not.
4. Create a PHP page which accepts string from user. After submission that page displays the reverse of provided string.
5. Write a PHP function that checks if a string is all lower case.
6. Write a PHP script that checks whether a passed string is palindrome or not? (A palindrome is word, phrase, or sequence that reads the same backward as forward, e.g., madam or nurses run)
7. Write a program to sort an array.
8. Write a PHP script that removes the whitespaces from a string.
Sample string : 'The quick " " brown fox' Expected Output : Thequick""brownfox
9. Write a PHP script that finds out the sum of first n odd numbers.
10. Create a login page having user name and password. On clicking submit, a welcome message should be displayed if the user is already registered (i.e.name is present in the database) otherwise error message should be displayed.
11. Write a PHP script that checks if a string contains another string.
12. Create a simple 'birthday countdown' script, the script will count the number of days between current day and birth day.
13. Create a script to construct the following pattern, using nested for loop.
*
* *
* * *
* * * *
* * * * *
14. Write a simple PHP program to check that emails are valid.
15. WAP to print first n even numbers.
16. \$color = array('white', 'green', 'red')
Write a PHP script which will display the colors in the following way :
Output : white, green, red,
•green • red
• white
17. Using switch case and dropdown list display a —Hello! message depending on the language selected in drop down list.
18. Write a PHP program to print Fibonacci series using recursion.
19. Write a PHP script to replace the first 'the' of the following string with 'That'.
Sample : 'the quick brown fox jumps over the lazy dog.'
Expected Result : That quick brown fox jumps over the lazy dog.

Reference Books

1. Steven Holzner, "PHP: The Complete Reference Paperback", McGraw Hill Education (India), 2007.
2. Timothy Boronczyk, Martin E. Psinas, "PHP and MYSQL (Create-Modify-Reuse)", Wiley India Private Limited, 2008.
3. Robin Nixon, "Learning PHP, MySQL, JavaScript, CSS & HTML5", 3rd Edition Paperback, O'reilly, 2014.
4. Luke Welling, Laura Thompson, "PHP and MySQL Web Development", 4th Edition, Addition Paperback, Addison-Wesley Professional, 2008.
5. David Sklar, Adam Trachtenberg, "PHP Cookbook: Solutions & Examples for PHP Programmers", 2014.

ITB-SE-4034: R Programming

Credits 4 (2+2)

Theory: 20 Lectures

Practical: 20 Lectures

UNIT 1: Introduction

(6 Lectures)

Overview and History of R, Getting Help, R Data Types and Objects, Subsetting, Vectorized, Operations, Reading and Writing Data.

UNIT 2: Control

(8 Lectures)

Control Structures, Functions, lapply, tapply, split, mapply, apply, Scoping Rules, Coding Standards.

UNIT 3: Simulation

(6 Lectures)

Loop functions, Debugging Tools, Simulation, R Profiler.

Practical / Lab work to be performed

1. Write a program that prints "Hello World" to the screen.
2. Write a program that asks the user for a number n and prints the sum of the numbers 1 to n
3. Write a program that prints a multiplication table for numbers up to 12.
4. Write a function that returns the largest element in a list.
5. Write a function that computes the running total of a list.
6. Write a function that tests whether a string is a palindrome or not.
7. Implement the sorting algorithms: Selection sort, Insertion sort, Bubble Sort
8. Implement linear search and binary search algorithm.
10. Implement matrices addition, subtraction and multiplication

Reference Books

1. William N. Venables and David M. Smith, An Introduction to R. 2nd Edition. Network Theory Limited.2009
2. Norman Matloff, The Art of R Programming - A Tour of Statistical Software Design, No Starch Press.2011

ITB-HG-4016: THEORETICAL FOUNDATION OF COMPUTING

Total Lectures : 60 Credits : 6 (Theory : 05, Tutorial :1)

Unit1: Finite Automata

Lectures: 10

DFA, NFA, NFA with ϵ moves. Equivalence of DFA and NFA. Reduction of the number of states in a finite automata.

Unit2: Regular Languages and Regular Grammar

Lectures: 10

Concept of languages and grammar. Regular expressions. Connection between regular expressions and regular languages. Regular grammars, Right and Left Linear Grammars. Equivalence between Regular languages and Regular grammars.

Unit3: Properties of Regular Languages

Lectures: 10

Closure under simple set operations union, intersection, concatenation, complementation and star closure. proof of pumping lemma for regular language. Proof of nonregularity using Pigeonhole principle and using pumping lemma for regular languages.

Unit4: Context free languages

Lectures : 10

Context free grammars, leftmost and rightmost derivations, derivation trees. Parsing and Ambiguity in grammars and languages. Simplification of Context free Grammars removing useless productions, empty productions and unit productions. Normal forms Chomsky and Greibach normal forms.

Unit5: Pushdown Automata

Lectures:10

Definition and language accepted (acceptance by empty stack and final state and their equivalence). Pushdown Automata and Context free languages. Deterministic PDA and Deterministic Context free Languages.

Suggested Reading

1. An introduction to Formal Languages and Automata, Peter Linz, Narosa.
2. Introduction to Automata Theory, Languages and Computation, Hopcroft and Ullman, Addison Wesley.
3. K. L. P. Mishra, N. Chandrasekaran; Theory of Computer Science (Automata, Languages and Computation), P. H. I.
4. T. H. Cormen, C. E. Leiserson and R. L. Rivest, Introduction to Algorithms, Tata
5. Mcgraw Hill Publishers.

ITB-HG-4026: Information Security and Cyber Laws

Credits 6 (4+2)

Theory: 60 Lectures Practical: 60 Lectures

UNIT 1: Introduction (8 Lectures)

Information Security- History, overview, Definitions, Basic principles, Key Concepts, Security threats and responses, Security classification for information.

UNIT 2: Digital Crime (4 Lectures)

Overview of Digital crime/ Cyber crime, criminology related to computer systems and cyber space

UNIT 3: Information Gathering Techniques (8 Lectures)

Tools of the attacker, information and cyber warfare, scanning and spoofing, password cracking, Sniffing, malicious software, Session Hijacking

UNIT 4: Risk Analysis and Threat (10 Lectures)

Risk analysis, Risk Management, Risk assessment, Key principles of Computer security, Security Policies, Central Mechanisms, Authentication and Authorization techniques, Data Protection, Access Control, Digital Evidence, Computer forensics and Incident Response Plans.

UNIT 5: Introduction to Cryptography and Applications (10 Lectures)

Concepts of cryptography, Types of cryptography, Digital Signature, Digital Signature Certified Codifying techniques, Ciphers (Caesar Cipher, Rail-Fence Cipher), Application of Cryptography

UNIT 6: Safety Tools and Issues (10 Lectures)

Security Governance, Firewalls, Logging and Intrusion Detection systems, Windows and windows XP / NT security, Unix/Linux security, ethics of hacking and cracking

UNIT 7: Cyber laws to be covered as per IT 2008 (10 Lectures)

Chapter 1: Definitions

Chapter 2: Digital Signature And Electronic Signature

[Section 43] Penalty and Compensation for damage to computer, computer system, etc.

[Section 65] Tampering with Computer Source Documents

[Section 66 A] Punishment for sending offensive messages through communication service, etc.

[Section 66 B] Punishments for dishonestly receiving stolen computer resource or communication device

[Section 66C] Punishment for identity theft

[Section 66D] Punishment for cheating by personating by using computer resource [Section 66E] Punishment for violation of privacy

[Section 66F] Punishment for cyber terrorism

[Section 67] Punishment for publishing or transmitting obscene material in electronic form

[Section 67A] Punishment for publishing or transmitting of material containing sexually explicit act, etc. in electronic form
[Section 67B] Punishment for publishing or transmitting of material depicting children in sexually explicit act, etc. in electronic form

[Section 72] Breach of confidentiality and privacy

Practical / Lab work to be performed

1. Demonstrate the use of Network tools: ping, ipconfig, ifconfig, tracert, arp, netstat, whois
2. Use of Password cracking tools : John the Ripper, Ophcrack. Verify the strength of passwords using these tools.
3. Perform encryption and decryption of Caesar cipher. Write a script for performing these operations.
4. Perform encryption and decryption of a Rail fence cipher. Write a script for performing these operations.
5. Use nmap/zenmap to analyse a remote machine.
6. Use Burp proxy to capture and modify the message.
7. Demonstrate sending of a protected word document.
8. Demonstrate sending of a digitally signed document.
9. Demonstrate sending of a protected worksheet.

Reference Books

1. M. Merkow, J. Breithaupt, Information Security Principles and Practices, Pearson Education.2005
2. G.R.F. Snyder, T. Pardoe, Network Security, Cengage Learning, 2010
3. A. Basta, W.Halton, Computer Security: Concepts, Issues and Implementation, Cengage Learning India, 2008

ITB-HC-5016: COMPILER DESIGN
Total Lectures: 60 Credits : 6 (Theory : 04, Lab : 02)

Unit I: Introduction

Lectures : 12

What is a compiler? Phases of compiler. Overview of working of a compiler, linker, loader.

Unit II : Lexical Analysis

Lectures : 12

NFA, DFA, conversion from NFA to DFA. Regular expression. Regular expression to NFA conversion. Minimization of DFA. ,Structuer of Lexical analyzer ,use of finite autometa to write lexical analyser .

Unit III : Syntax analysis

Lectures : 12

Grammar representation. Derivation and parse tree. Ambiguity and possible elimination. Top down parsing. Recursive descent and predictive top down parsing. Elimination of Left recursion. Bottom up parsing. Operator precedence parsing, LR parsing (including SLR and LALR). Er ror detection and recovery. Parser table construction.

Unit IV : Code generation

Lectures : 12

Symbol table contents, implementation. Type checking. Syntax directed translation. Forms of intermediate codes. Abstract Syntax Trees, Directed Acyclic Graph, Three address code. Intermediate code generation for different language constructs , boolean expressions, if, ifelse, while, case or switch. Target code generation issues, registerallocation, Runtime storage management

Unit V : Code Optimisation

Lectures : 12

DAG, basic blocks, Common subexpression elimination, variable propogation, code motion, strength reduction, elimination of dead code, loop optimisation.

Suggested Reading:

1. Aho, Sethi, Ullman; Compilers, Principles, Techniques, Tools, Pearson Education
2. Compiler Design, Santanu Chattopadhyay, P.H.I.

ITB-HC-5026: WEB TECHNOLOGY

Total Lectures : 60 Credits : 6 (Theory : 04, Lab : 02)

Internet Basics:

Lectures: 5

History of the internet , the world wide web, getting connected ,web page, home page, web site, Internet services: email.

Client Server Model:

Lectures: 10

Structure of an HTML document. HTML tags. The HTTP protocol details. Client side software. Web browsers (Netscape/Mozilla as example). DHTML Web server architecture and functions of an web server. JDBC and ODBC. Server side vs client side scripts, advantages and disadvantages of each. Client side and server side scripting languages and their uses. Dynamic web page. CGI scripts, Java Scripts and JSP as examples. PHP and Perl as scripting language. Browser plugins.

Web Object Model: CORBA

Lectures: 5

XML:

Lectures: 10

Well formed XML syntax. references, well formed documents XML semantics. DTD, XML Schema, RELAXNG. Displaying XML on web. XML extensions. Processing XMLfiles,Using programming language and the SAX API,Using a programming language and the DOM API,Using a transformation engine and a filter ,Push Parsing ,Data binding ,Nonextractive XML

Distributed Multitiered Application:

Lectures: 10

J2EE Components ,J2EE Clients, Web Components, Business Components. J2EE Containers, Container Services , Container Types, Enterprise JavaBeans Technology, Java Servlet Technology, JavaServer Pages Technology.

Application server: Persistence, Transaction processing, Concurrency control, Events using, Java Message Service, naming and directory services (JNDI),Security (Java Cryptography Extension (JCE) and JAAS) Deployment of software components in an application server Remote procedure calls using RMI/IIOP. Exposing business methods as Web Services.

J2EE 1.4 API

Lectures:10

Java Message Service API, Java Transaction API, JavaMail API, JavaBeans Activation Framework, Java API for XML Processing, Java API for XMLBased RPC, SOAP with Attachments API for Java, Java API for XML, Registries, J2EE Connector Architecture, JDBC API

Web Security:

Lectures: 10

Firewall, wrapper and Proxy.

Suggested reading:

1. The Inter net Complete, M.L. Young
2. Using CGI by J. Dwight, M. Erwin, R. Niles.
3. Mastering JavaScript and Jscript by J. Jaworski
4. Dynamic HTML by D. Godmann.
5. Understanding HTML by D.P. Nagpal
6. <http://java.sun.com/j2ee>

ITB-HD-5016: E-Commerce Technologies
Credits 6 (4+2)
Theory: 60 Lectures Practical: 60 Lectures

UNIT 1: An introduction to Electronic commerce **(10 Lectures)**

What is E-Commerce (Introduction And Definition), Main activities E-Commerce, Goals of E-Commerce, Technical Components of E-Commerce, Functions of E-Commerce, Advantages and disadvantages of E-Commerce, Scope of E-Commerce, Electronic Commerce Applications, Electronic Commerce and Electronic, Business models (C2B,C2C, B2B, B2C,B2G,G2B,G2C)

UNIT 2: The Internet and WWW **(10 Lectures)**

Evolution of Internet, Domain Names and Internet Organization (.edu, .com, .mil, .gov, .net etc.) , Types of Network, Internet Service Provider, World Wide Web, Internet & Extranet, Role of Internet in B2B Application, building own website, Cost, Time, Reach, Registering a Domain Name, Web promotion, Target email, Banner, Exchange, Shopping Bots

UNIT 3: Internet Security **(10 Lectures)**

Secure Transaction, Computer Monitoring, Privacy on Internet, Corporate Email privacy, Computer Crime(Laws, Types of Crimes), Threats, Attack on Computer System, Software Packages for privacy, Hacking, Computer Virus(How it spreads, Virus problem, virus protection, Encryption and Decryption, Secret key Cryptography, DES, Public Key Encryption, RSA, Authorization and Authentication, Firewall, Digital Signature(How it Works)

UNIT 4: Electronic Data Exchange **(10 Lectures)**

Introduction, Concepts of EDI and Limitation, Applications of EDI, Disadvantages of EDI, EDI model, Electronic Payment System: Introduction, Types of Electronic Payment System, Payment Types, Value Exchange System, Credit Card System, Electronic Fund Transfer, Paperless bill, Modern Payment Cash, Electronic Cash

UNIT 5: Planning for Electronic Commerce **(10 Lectures)**

Planning Electronic Commerce initiates, Linking objectives to business strategies, Measuring cost objectives, Comparing benefits to Costs, Strategies for developing electronic commerce web sites

UNIT 6: Internet Marketing **(10 Lectures)**

The PROS and CONS of online shopping, The cons of online shopping, Justify an Internet business, Internet marketing techniques, The E-cycle of Internet marketing, Personalization e-commerce.

Practical / Lab work to be performed

Web and E- Commerce Technologies LAB (based on the following topics):

1. HyperText Markup Language (HTML): structural setup; page layout; text manipulation; special characters; images; links. Intermediate: image maps; tables; frames, forms; meta tags; web forms.
2. Cascading Style Sheets (CSS) : embedding/linking; HTML element selectors; classes; ID selectors, text manipulation; background; borders and spacing; layout; context selectors and grouping, pseudo-classes; pseudo-elements.
3. JavaScript : writing your first script; creating HTML tags; user input and output; loops and tables; payroll calculator, forms and text fields; validating an email address; radio buttons; check boxes; self-grading tests, image rollovers; slide shows; real-time clock; controllable clock; working with cookies.
4. Perl/CGI 10: sample Perl operations; random numbers; lists; dealing four poker hands; time manipulation; subroutines, hash tables; files; string matching, CGI; registration lists; surveys.
5. SQL and regular expressions: Regular expressions: select; where; order by; insert; update; delete, like; aggregate functions; create table; alter table; drop deterministic functions; non-deterministic functions, basics; repeating; positioning.
6. Beginner: between; in; distinct; group by; aliases; table., nested selects; Sound Ex; join;
7. ASP structural setup: response write; retrieving from forms; retrieving from query string; variables; control constructs; subroutines and functions; session state; application variables; server variables; debugging, reading and writing cookies; server-side includes; response object methods; VBScript functions; error handling; debugging, browser details; CDONTS; files; output from a recordset; global.asa; setup instructions for using IIS and ASP. Flash 3 Create Flash movies of moving and interactive objects.

Recommended Books

1. G.S.V.Murthy, E-Commerce Concepts, Models, Strategies- :- Himalaya Publishing House, 2011.
2. Kamlesh K Bajaj and Debjani Nag , E- Commerce , 2005.
3. Gray P. Schneider , Electronic commerce, International Student Edition, 2011,
4. Henry Chan, Raymond Lee, Tharam Dillon, Elizabeth Chang, E Commerce, Fundamentals and Applications, Willey Student Edition, 2011

Total Lectures : 60 Credits : 6 (Theory : 05, Tutorial: 01)

Introduction:

Lectures : 5

What is object oriented programming? Usefulness of object oriented development.

Object Modeling:

Lectures: 15

Objects and classes, Links and Association, advanced links and association concepts, Generalization and Inheritance, grouping constructs, Aggregations, Abstract Classes, Generalization as Extension and Restriction.

Dynamic Modeling:

Lectures: 10

Events and States, Operations, Nested State Diagram, Concurrency, Synchronization of concurrent activities, relation of objects and dynamic models.

Function Modeling

Lectures: 10

Data Flow Diagram, Process, Data Flow, Actor, Data Store, Control Flow, Operations and Constraints, Relation of functional to object and dynamic model.

Design Methodology:

Lectures: 10

Analysis, Problem statement, Design: Breaking a system into a sub systems, Identifying Concurrency, allocating subsystems to processors and tasks, Management of data Stores, Handling Global Resources, Handling Boundary Conditions, Choosing Software Control Implementation, setting trade off priorities.

Object Design:

Lectures: 10

Overview of object design, Combining the Three Models, Design Optimization, Implementation of Control, Adjustment of inheritance, design of association, Object Representation, Physical Packaging and Documentation.

Recommended Books:

1. Object Oriented Modeling and Design, James Rumbaugh, Blaha, Premelani. Eddy, Lorensen

ITB-HD-5036: COMPUTER ORIENTED OPTIMIZATION TECHNIQUES

Total Lectures : 60 Credits : 6 (Theory : 05, Tutorial: 01)

Unit I : Linear Programming Techniques

Lectures: 12

The simplex algorithm, Charma's method of penalties, the two phase algorithm, problem of degeneracy and cycling, Duality theorem, revised simplex algorithm, revised simplex method versus simplex method. Sensitivity analysis, changes in the requirement vector, the cost vector and the coefficient matrix.

Unit II :Transportation and Assignment problem

Lectures: 12

Various algorithms such as the algorithm of stepping stones, Hungarian etc.

Unit III : Nonlinear programming

Lectures: 12

Constraint minima and maxima, necessary and sufficient condition for maxima and minima: KuhnTucker principle, quadratic programming

Unit IV : Queuing theor

Lectures: 12

The exponential distribution, queue disciplines such as M/M/1, M/M/C.

Unit V : Simulation

Lectures: 12

Even type of simulation, Monte Carlo techniques, simulation techniques applied to queues.

Suggested Readings:

1. S.L Gass, -Linear Programming|
2. K.V.Mittal & G Mohan, — Optimization Methods||
3. K.Swarap, P.K.Gupta, M.Mohan, — Operation Research||

CODE: ITB-HD-5046: PROJECT WORK

Total Lectures : 60 Credits : 6 (Lab : 06)

Each student will be assigned some project work at the starting of the 5th semester. The objective of the project is to train the student to independently search, identify and study real-life important topics in CS/IT; to develop skills among students in a particular field of CS/IT; and to expose students to the world of technology, innovation, and research. Each group (group of at most 3 students) is expected to take a unique problem under the guidance/supervision of a faculty member of the department. The problem should be such that the students get a chance to explore one or two technologies in depth and grab good command over those technologies after successful completion of the project. Repetition of the problems already attempted by students of the previous years should not be encouraged unless the problem has exceptionally great research importance and scope. Application problems, if found interesting and arisen at the demand of a particular situation, may also be assigned; but typical information management systems with just two or three simple database tables and/or data- entry forms are to be discouraged. The project may be done in other Institutes/Organizations with prior permission from the concerned department of the College and in this case also one project supervisor should have to be from the concerned department in the College. The work will have to be submitted in the form of a dissertation. Project presentation and evaluation will have to be done as per the regulation of TDC for semester system of G.U. with choice based credit and grading system.

A maximum of Four (04) projects would be assigned to one teacher.

ITB-HC-6016: SYSTEM ADMINISTRATION USING LINUX

Total Lectures : 60 Credits : 6 (Theory : 04, Lab : 02)

Unit I :

Lectures:12

What is System Administration? Duties of a System Administrator. Basic features of the Linux operating system. Installation requirements, Partitioning the Hard drive in Linux, Installing the Linux system, Linux system Startup and Shutdown.

Unit II :

Lectures: 12

Basics of Linux file system: hierarchy and types. commands *ls*, *cp*, *mv*, *rm*, *mkdir*, *rmdir*, *more*, *touch*, *ln*, *mount*, *umount*, *mkfs*,. absolute and relative path names. Linux file types, attributes of file, setting user and group ownership of files and access permissions. mounting and unmounting file systems and partitions. Structure of */etc/fstab* file and its purpose. hard link, symbolic link. Introductions of Shells. Linux environment variables. Basics of Shell Programming

Unit III :

Lectures:12

Program and Process. Foreground process, Background Process, daemons. Basic commands for starting and stopping processes. Examining the list of running processes on the system and understand the data presented there. cron, crontab file format, Standard I/O, Standard error ,redirection and piping.

Unit IV :

Lectures:12

Managing user accounts: Adding a user,password,Creating Groups,adding and deleting groups,viewing useraccount information,structure of */etc/passwd*, */etc/shadow*, */etc/group* files System monitoring and logging, Monitoring memory usage, disk space usage. Backup and Restore procedure

Unit V:

Lectures:12

IP address and IP address classes, subnetting, CIDR, Interface configuring with *ifconfig*, Gateway configuration, adding routes, ping, netstat, traceroute. Understanding the significance of the */etc/services* file and well known port numbers. Server configuration DHCP, NFS, NIS, SAMBA, PROXY..

Suggested Readings

1. Red Hat Linux:Proffitt:PHI
2. Introduction to system Administration : IBM series:PHI
3. Essential System Administration: Frisch:O'REILLY

ITB-HC-6026: COMPUTER GRAPHICS

Total Lectures : 60 Credits : 6 (Theory : 05, Tutorial : 01)

UNIT 1:

Lectures :14

Introduction: computer graphics and its applications.

Graphics Devices:

Input Devices : Keyboard, Mouse, Trackball & Space ball, Joystick, Data Glove, Digitizers, Image Scanners, Touch panels, Light Pens systems.

Output display devices : Refresh CRT, Rasterscan display and Randomscan display technique, color display techniques Beam penetration method and Shadowmask method, Direct view storage tubes, emissive & nonemissive flatpanel displays Plasma panels, Thinfilm electrostatic displays, LED and LCD monitor, Threedimensional viewing devices and VirtualReality systems;

Display processor :Rasterscan systems, Randomscan systems,

UNIT 2:

Lectures: 12

Output primitives: linedrawing algorithms DDA algorithm and Bresenham's Line Algorithm, Mid point Algorithm for Circle and Ellipse Generation, Curve generation.

Attributes for output primitives :

Areafilling Algorithms scanline polygonfill, Nonzerowinding number rule; Scanline curve filling, Boundaryfill algorithm, Flood fill algorithm; Character generation techniques generation of bitmap and outlined font.

UNIT 3 :

Lectures:1

2

2D Geometric Transformations: Basic transformation translation, rotation and Scaling, matrix representations and Homogeneous coordinate representations, Composite transformations among translation, rotation and scaling, General Pivotpoint rotation, General fixedpoint scaling, General scaling directions, Other transformations reflection and shear, Transformation between coordinate Systems, Definition of Affine transformations.

2D viewing: definition, viewing transformation pipeline, window to viewport coordinate transformation.

2D Clipping : Concept and Algorithm: point clipping, line clipping

CohenSutherland algorithm, Area clipping, text clipping, polygon clipping.

Interactive picture construction techniques: Basic positioning methods, constraints, grids, gravity fields, rubberband methods, dragging, painting & rawing.

UNIT 4:

Lectures: 14

3D concepts: Display methods Parallel projection, perspective projection,

3D geometric transformations: Transformation, Translation, Rotation and Scaling around axes, 3D Viewing Projections – Parallel and Perspective.

UNIT 5:

Lectures: 8

Visible surface detection: Definition, Algorithms for visible surface detection – Depth buffer method, Abuffer method, Raycasting method, Curved surfaces, Wireframe Methods

Illumination and Surface rendering: definition and importance, light sources, Basic illumination models Ambient light, Diffuse ref lection, Specula reflector and Phong model, combined diffuse and secular ref lections for multiple light sources, Warn model, Intensity attenuation, Color considerations, Transparency, Shadows.

Suggested Readings:

1. Computer Graphics, D. Hearn and M.P.Baker, PHI Ltd.

ITB-HE-6016: MICROPROCESSOR

Total Lectures : 60 Credits : 6 (Theory : 04, Lab : 02)

Unit1: Internal Organization of 8085A microprocessor **Lectures: 12**

User Programmable registers, PC, SP, accumulator, flags, data bus, address bus, control bus, instruction word size, opcode format, data format, memory addressing, I/O addressing, address decoding for memory and I/O.

Unit2: 8085A microprocessor architecture **Lectures: 12**

Pinout of 8085A microprocessor, multiplexed address/data bus, control and status signal, demultiplexing of control signals, other signals, bus timings, fetch decode and execute cycle, timing diagram for opcode fetch memory read and memory write, interfacing memory and I/O.

Unit3: Assembly language programming in 8085A microprocessor **Lectures: 12**

Complete instruction set in detail, programming examples, logic operation, counters and time delays, stack and subroutine, processing arrays, bit manipulation.

Unit4: Interfacing **Lectures: 14**

In and OUT instruction, decoding addresses, Interfacing LED, relay, seven segment display, switch, keyboard,.

Unit5: Interrupts **Lectures:10**

Vectored interrupts, interrupt priorities, general purpose programmable peripheral devices, 8255A control and status registers, programming 8255A, introduction to 8279, 8254 and 8237 (block diagrams and basic functions).

Suggested Reading :

1. Microprocessor Architecture, Programming and Application with the 8085 by Ramesh S. Gaonkar

PRACTICAL

Each student should do at least 8 assignments from the following list

1. Write a program to add two 8 bit numbers & store it in a memory location 8820h.
2. Write a program to copy a block of memory from one location 8820h to another location 8840h.
3. Write a program to perform the addition of two 16 bit numbers.
4. Write a program to add two numbers & store it in a register e.
5. Write a program to load two unsigned numbers in register b & c. Subtract b from c. If the result is in 2's complement, convert the result in absolute magnitude & display it.
6. Write a program to find the difference of two numbers & store the result in a memory location 8830h.
7. Write a program to find the larger / smaller of two given numbers.
8. Write a program to subtract two numbers and add it to a given memory location.
9. Write a program to perform $x \times y \times 5$, where x and y are 16 bit numbers.
10. Write a program to find 2's complement of a number.

ITB-HE-6026: DATA MINING AND WAREHOUSING

Total Lectures : 60 Credits : 6 (Theory : 05, Tutorial : 01)

Data Warehousing:

Lectures:15

Overview and concepts: Need for Data Warehousing, Basic elements of Data Warehousing, differences between Database Systems and Data Warehouse.

Planning and Requirements: Project planning and management, collecting the requirements. Architecture and Infrastructure: Data Warehouse Architecture and its components, Infrastructure and metadata.

Data Design and Data Representation: Principles of dimensional modeling, advanced topics data extraction, transformation and loading, data quality.

Information Access and Delivery: Matching information to classes of users, OLAP in Data Warehouse, Data warehousing and the web.

Implementation and Maintenance: Physical design process, Data Warehouse deployment, growth and maintenance.

Data Mining

Introduction :

Lectures: 10

Basics of data mining, Different definitions of Data Mining and related concepts, Data mining process Data preparation, data cleaning and data visualization. KDD process.

Data mining techniques: Clustering, Association rules and Decision trees.

Clustering:

Lectures:15

Partitional versus Hierarchical Clustering, types of data in clustering. Partitional clustering methods – kmeans, kmedoids, PAM, CLARA, CLARANS. Hierarchical clustering methods – BIRCH, CURE. Density based clustering methods DBSCAN. Categorical clustering – DBSCAN.

Rule Mining:

Lectures: 10

What is an association rule? Mining association rules, frequent sets and border sets, algorithms for mining association rules – Apriori algorithm, PincerSearch algorithm, Border algorithm. Generalized association rule, quantitative association rule, association rule with item constraint.

Decision Trees:

Lectures:5

Introduction, tree construction principle, decision tree generation algorithms – CART, ID3.

Advanced Topics:

Lectures:5

(only basics of the following topics):

Web mining : Web Content Mining, Web Structure , Mining, Web Usage mining.Spatial mining, Temporal mining – Temporal association rules, sequence mining and GSP algorithm, discovery of frequent episodes.

Suggested Reading:

1. A.K. Puzari, Data Mining Techniques, University Press.
2. J. Han and M. Kamber. Data Mining: Concepts and Techniques. Morgan Kaufman. 2001.

TB-HE-6036: ARTIFICIAL INTELLIGENCE

Total Lectures : 60 Credits : 6 (Theory : 05, Tutorial : 01)

UNIT: I

Lectures: 12

Definition of artificial intelligence, Numerical computation, information storage, repetitive operations, other definitions of artificial intelligence, numeric versus symbolic, algorithm versus non algorithms, area of artificial intelligence, expert system, natural language processing, speech recognition, automatic programming, organization of artificial intelligence system, the underlying assumptions, artificial intelligence techniques.

UNIT : II

Lectures: 12

Is the good solution absolute or relative, production systems, production system characteristics, problem solving: defining the problem as a state space search, Water Jug Problem , Basic problem solving methods : Reason forward from the initial states , Reason backward from the goal states, Problem trees versus Problem Graphs, Knowledge representation: Matching and Indexing.

UNIT: III

Lectures: 12

Heuristic search, Heuristic functions, ORgraph, ANDOR graph, Weak methods: Generate and Test, Hill Climbing, Breadth first search, Best first search OR graph, Problem reduction, Constraints satisfaction, MeansEnd Analysis.

UNIT: IV

Lectures: 12

Game playing: The Minimax Procedure , Adding Alpha Beta Cutoffs, Knowledge Representation using predicate logic, Representing simple facts in logic, Augmenting the representation with computable functions and predicates, Resolution, Conversion to clause form, The basis of resolution, Resolution in propositional logic , The Unification algorithm, Resolution in predicate logic , Resolution algorithm for predicate logic, Introduction to Nonmonotonic Reasoning, Statistical and probabilistic reasoning.

UNIT: V

Lectures: 12

Natural language Understanding, Introduction to Understanding, What makes understanding hard, Understanding single sentences , Keyword matching , Syntactic analysis , semantic analysis , semantic grammars ,Case grammars Learning: Introduction to learning, Random learning and Neural nets, Learning by parameter adjustment, Learning in General Problem Solver (GPS), Concept Learning.

Suggested readings:

1. Artificial Intelligence Elaine Rich McGraw Hill book Co. 1982.
2. Artificial Intelligence PH Winston, Addison Wesley,1983.
3. Artificial Intelligence Concepts, Techniques and Applications Yoshikai Shirai & Junichi Tsujii, John Willeysons.
4. Artificial Intelligence A knowledge based application MW Richaugh ,PWS Rent Publishing, Boston.
