BODOLAND UNIVERSITY

Curriculum Structures for NEP 4 Year UG Programme

BSC IT (Bachelor of Information Technology)

Year 2023

PROGRAMME STRUCTURE AND DETAILED CURRICULUM

BODOLAND UNIVERSITY

DEBARGAON, KOKRAJHAR

Assam

Bodoland University
B.Sc. Information Technology
1st Semester

Paper	Code No. & Credits	Title
Major Paper	ITBMAJ1014	Programming Fundamentals Using C& C++
Minor Paper	ITBMIN1014	Discrete Mathematics-I
IDC-1	ITBIDC1013	Computer Fundamentals
AEC-1	ITBAEC1012	AEC-1
SEC-1	ITBSEC1013	ICT Hardware
VAC-1	ITBVAC1014	Desktop Publishing (DTP)

2nd Semester

Major Paper	ITBMAJ1024	Digital Logic & Computer Organizations
Minor Paper	ITBMIN1024	Mathematics-II(Graph Theory)
IDC-2	ITBIDC1023	Introduction of Programming Languages.
AEC-2	ITBAEC1022	AEC-2
SEC-1	ITBSEC1023	Object Oriented Programming.
VAC-2	ITBVAC1024	Social Media Technology.

3rd Semester

Major Paper	ITBMAJ2014	Data Base Management System.
Major Paper	ITBMAJ2024	Operating System.
Minor Paper	ITBMIN2014	Shell Programming Using Linux
IDC-3	ITBIDC2013	Basic of Web Designing
AEC-3	ITBAEC2012	AEC-3
SEC-3	ITBSEC2013	Introduction to SQL.

4th Semester

Major Paper	ITBMAJ2034	Data Structure
Major Paper	ITBMAJ2044	Software Engineering
Major Paper	ITBMAJ2054	Data Communication & Computer Network-I.
Minor Paper	ITBMIN2024	Introduction to Java Programming.
AEC-4	ITBAEC2022	AEC-4
Internship	ITBINT2012	Internship-1

5th Semester

Major Paper	ITBMAJ3014	Design and Analysis Algorithm.
Major Paper	ITBMAJ3024	Internet & Web Technology
Major Paper	ITBMAJ3034	Theory of Computation.
Major Paper	ITBMAJ3044	PHP Programming
Minor Paper	ITBMIN3014	Introduction of Python Programming.

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6th   Semester

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Major Paper	ITBMAJ3054	**Computer Graphics**
Major Paper	ITBMAJ3064	**Artificial Intelligence**
Major Paper	ITBMAJ3074	**System Administration Using Linux.**
Major Paper	ITBMAJ3084	**Compiler Design.**
Minor Paper	ITBMIN3024	**Introduction To R-Programming**

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7th   Semester

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Major Paper	ITBMAJ4014	**Data Mining & Warehousing**
Major Paper	ITBMAJ4024	**Digital Image Processing**
Major Paper	ITBMAJ4034	**Computer Network-II**
Major Paper	ITBMAJ4044	**Numerical Methods & Probability**
Or		
Major Paper	ITBREM4014	**Research Methodology.**
Minor Paper	ITBMIN4014	**Introduction to Data Science Using Python.**

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8th   Semester
Group-A

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Major Paper	ITBMAJ4054	**Distributed System.**
Major Paper	ITBADL4014	**Introduction to Cloud Computing.**
Major Paper	ITBADL4024	**Microprocessor.**
Major Paper	ITBADL4034	**Cyber Security**
Minor Paper	ITBMIN4024	**Internet of Things.**

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Group-B

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Major Paper	ITBMAJ4054	**Distributed System.**
Minor Paper	ITBMIN4024	**Internet of Things.**
Research Paper	ITBREP40112	**Dissertation (Research)**

1ST SEMESTER						
Paper Code, Credit and Paper Title	Course	L+T+P	Credit	End Semester Marks	Internal Marks	Total
ITBMAJ1014: Programming Fundamentals using C/C++	Major	3+0+1	4	50(Theory)+20(Practical)	30	100
ITBMIN1014: Mathematics-I (Discrete Mathematics)	Minor	3+0+1	4	50(Theory)+20(Practical)	30	100
ITBIDC1013: Computer Fundamentals	Inter-disciplinary Course (IDC)	2+0+1	3	60(Theory)+20(Practical)		80
AEC1012	Ability Enhancement Course	2	2	50(Theory)		50
ITBSEC1013: ICT Hardware	Skill Enhancement Course (SEC)	2+0+1	3	60(Theory)+20(Practical)		80
ITBVAC1014: Desktop Publishing (DTP)	Value Added Course (VAC)	3+0+1	4	50(Theory)+20(Practical)	30	100
Total			20			510

2ND SEMESTER						
Paper Code, Credit and Paper Title	Course	L+T+P	Credit	End Semester Marks	Internal Marks	Total
ITBMAJ1024: Digital Logic and Computer Organization	Major	3+0+1	4	50(Theory)+20(Practical)	30	100
ITBMIN1024: Mathematics-II (Graph Theory)	Minor	2+1+1	4	50(Theory)+20(Practical)	30	100
ITBIDC1023: Introduction to Programming Languages	Inter-disciplinary Course (IDC)	2+0+1	3	60(Theory)+20(Practical)		80
AEC1022	Ability Enhancement Course		2	50(Theory)		50
ITBSEC1023: Object Oriented Programming using C++	Skill Enhancement Course (SEC)	2+0+1	3	60(Theory)+20(Practical)		80
ITBVAC1024: Social Media Technology	Value Added Course (VAC)	3+0+1	4	50(Theory)+20(Practical)	30	100
Total			20			510

3RD SEMESTER						
Paper Code, Credit and Paper Title	Course	L+T+P	Credit	End Semester Marks	Internal Marks	Total
ITBMAJ2014: Database Management System	Major	3+0+1	4	50(Theory)+20(Practical)	30	100
ITBMAJ2024: Operating Systems	Major	3+0+1	4	50(Theory)+20(Practical)	30	100

Paper Code, Credit and Paper Title	Course	L+T+P	Credit	End Semester Marks	Internal Marks	Total
ITBMIN2014: Shell Programming Using Linux	Minor	3+0+1	4	50(Theory)+20(Practical)	30	100
ITBIDC2013: Basics of Web Designing	Inter-disciplinary Course (IDC)	2+0+1	3	60(Theory)+20(Practical)		80
AEC2013:	Ability Enhancement Course	2	2	50(Theory)		50
ITBSEC2013: Introduction to SQL	Skill Enhancement Course (SEC)	2+0+1	3	60(Theory)+20(Practical)	20	80
Total			20			510

4TH SEMESTER						
Paper Code, Credit and Paper Title	Course	L+T+P	Credit	End Semester Marks	Internal Marks	Total
ITBMAJ2034: Data Structures	Major	3+0+1	4	50(Theory)+20(Practical)	30	100
ITBMAJ2044: Software Engineering	Major	3+0+1	4	50(Theory)+20(Practical)	30	100
ITBMAJ2054: Data Communication (Computer Network-I)	Major	3+0+1	4	50(Theory)+20(Practical)	30	100
ITBMIN2024: Introduction to Java Programming	Minor	4+0+1	4	50(Theory)+20(Practical)	30	100
AEC2022:	Ability Enhancement Course	2	2	50(Theory)		50
ITBINT2012 INTERSHIP	Internship		2			50
Total			20			500

5TH SEMESTER						
Paper Code, Credit and Paper Title	**Course**	**L+T+P**	**Credit**	**End Semester Marks**	**Internal Marks**	**Total**
ITBMAJ3014: Design And Analysis of Algorithm	Major	3+0+1	4	50(Theory)+20(Practical)	30	100
ITBMAJ3024: Internet And Web Technology	Major	3+0+1	4	50(Theory)+20(Practical)	30	100
ITBMAJ3034: Theory Of Computation	Major	2+1+1	4	50(Theory)+20(Practical)	30	100
ITBMAJ3044: PHP Programming	Major	3+0+1	4	50(Theory)+20(Practical)	30	100
ITBMIN3014: Introduction to Python Programming	Minor	4+0+1	4	50(Theory)+20(Practical)	30	100
Total			20			500

6TH SEMESTER						
Paper Code, Credit and Paper Title	**Course**	**L+T+P**	**Credit**	**End Semester Marks**	**Internal Marks**	**Total**
ITBMAJ3054: Computer Graphics	Major	2+1+1	4	50(Theory)+20(Practical)	30	100
ITBMAJ3064: Artificial Intelligence	Major	3+0+1	4	50(Theory)+20(Practical)	30	100
ITBMAJ3074: System Administration Using Linux	Major	3+0+1	4	50(Theory)+20(Practical)	30	100
ITBMAJ3084: Compiler Design	Major	3+0+1	4	50(Theory)+20(Practical)	30	100
ITBMIN3024: Introduction to R Programming	Minor	3+0+1	4	50(Theory)+20(Practical)	30	100
Total			20			500

7TH SEMESTER						
Paper Code, Credit and Paper Title	Course	L+T+P	Credit	End Semester Marks	Internal Marks	Total
ITBMAJ4014: Data Mining And Warehousing	Major	3+0+1	4	50(Theory)+20(Practical)	30	100
ITBMAJ4024: Digital Image Processing	Major	3+0+1	4	50(Theory)+20(Practical)	30	100
ITBMAJ4034: Computer Networks-II	Major	3+0+1	4	50(Theory)+20(Practical)	30	100
ITBMAJ4044: Numerical Methods and Probability OR ITBREM4014: Research Methodology	Major Or Research Methodology	2+1+1 or 3+1+0	4	50(Theory)+20(Practical) or 50(Theory)+20(Tutorial)	30 or 30	100 or 100
ITBMIN4014: Introduction to Data Science using Python Programming	Minor	3+0+1	4	50(Theory)+20(Practical)	30	100
Total			20			500

In B.Sc.IT 8th Semester Learners may choose either Group-A or Group-B

8TH SEMESTER (Group-A)						
Paper Code, Credit and Paper Title	Course	L+T+P	Credit	End Semester Marks	Internal Marks	Total
ITBMAJ4054: Distributed Systems	Major	3+0+1	4	50(Theory)+20(Practical)	30	100
ITBADL4014: Introduction to Cloud Computing	Advance Learning	3+0+1	4	50(Theory)+20(Practical)	30	100

Paper Code, Credit and Paper Title	Course	L+T+P	Credit	End Semester Marks	Internal Marks	Total
ITBADL4024: Microprocessor	Advance Learning	3+0+1	4	50(Theory)+20(Practical)	30	100
ITBADL4034: Cyber Security	Advance Learning	3+0+1	4	50(Theory)+20(Practical)	30	100
ITBMIN4024: Internet of Things (IOT)	Minor	3+0+1	4	50(Theory)+20(Practical)	30	100
Total			20			500

8TH SEMESTER (Group-B)						
Paper Code, Credit and Paper Title	Course	L+T+P	Credit	End Semester Marks	Internal Marks	Total
ITBMAJ4054: Distributed Systems	Major	3+0+1	4	50(Theory)+20(Practical)	30	100
ITBMIN4024: Internet of Things (IOT)	Minor	3+0+1	4	50(Theory)+20(Practical)	30	100
ITBREP40112 Dissertation	Research Project		12			300
Total			20			500

Programme Specific Outcomes (PSOs):

After completion the course Learner would be able to -

PSO-1: Develop their ability to recognize problems in the actual world and come up with appropriate solution.

PSO-2: Develop critical thinking abilities to help them thrive in life.

PSO-3: Assemble a team or collaborate with others to accomplish a shared objective.

PSO-4: Designed, implemented and evaluated a computer-based system.

PSO-5: Comprehensive computational abilities across multiple disciplines to satisfy the standards of the world.

PSO-6: Establish a career in the public, private or government sectors with honourable ideals.

ITBMAJ1014: Programming Fundamentals using C/C++
(Credit: 4, Total Marks: 100)
(Theory: 50 Marks, Practical: 20 Marks, Internal: 30 Marks)

Course learning Objectives
• To learn about procedure oriented and Object-Oriented approach to problem solving
• To acquire knowledge on reusability of program instructions using functions
• To learn about memory allocation and de-allocation techniques, preprocessor directives
• To construct and use of classes and objects.
• To explore Inheritances, overloading techniques and exceptions
• To acquire knowledge on various files stream classes and file handling operations

Course Learning Outcomes
• Learners would be able to understand the significance of procedural and object oriented concept to solve problems
• Enable learners to grow skills of writing effective c++ program instructions, functions, apply memory allocation techniques
• Enable learners to construct programs using classes and objects
• Learners would be able to solve problems on inheritances and file handling concepts and overloading of operators and function.
• Learners would be able to know about exceptions and handle them in programs.
• Learners would acquire problem solving skills to tackle real world problems

Theory: 60 Lectures
Unit-1: Fundamentals of C and C++   (12 Lectures, 10 Marks)
History of C and C++, Token (Identifiers, Keywords, Constants, Operators), Comments, data types (fundamental & derived), variable, expressions, Character I/O, Console I/O, Program structure (include, Global variables & functions, main()), control structures (Conditional, loops, jump statements)

Unit-2: Utility of Arrays, Function and memory allocation   (12 Lectures, 15 Marks)
Array (1D & 2D manipulation), function- definitions, Accessing and returning values, static & dynamic memory allocation using malloc, calloc, realloc, free, new and delete operators, concept of pointers

Unit-3: Object Oriented Paradigm   (18 Lectures, 13 Marks)
Principles of Object-Oriented Programming, Defining & Using Classes, Constructors & Destructor and their types, Constructor Overloading, Class Variables & Functions, Objects as parameters, Access specifiers, scope resolution operator, Files (Text & Binary) and their operations, Understanding the Preprocessor Directives,

Unit-4: Overloading & Exception Handling   (18 Lectures, 12 Marks)
Need of Overloading functions and operators, overloading functions by number and type of arguments, Overloading of Operators (including assignment operators, unary operators), Introduction to Inheritance (Multi-Level Inheritance, Multiple

Inheritance), Polymorphism (Virtual Functions, Pure Virtual Functions), Basics of Exception Handling (using try, catch and throw)

Suggested Readings

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

ITBMAJ1014 LAB: Programming Fundamentals using C/C++ Lab

1. WAP to print the sum and product of digits of an integer.
2. WAP to reverse a number.
3. WAP to compute the sum of the first n terms of the following series

   S = 1+1/2+1/3+1/4+……
4. WAP to compute the sum of the first n terms of the following series

   S =1-2+3-4+5…………….
5. Write a function that checks whether a given string is Palindrome or not. Use this function to find whether the string entered by user is Palindrome or not.
6. Write a function to find whether a given no. is prime or not. Use the same to generate the prime numbers less than 100.
7.WAP to compute the factors of a given number.
8. Write a macro that swaps two numbers. WAP to use it.
9. WAP to print a triangle of stars as follows (take number of lines from user):

```
        *
       ***
      *****
     *******
    *********
```

10. WAP to perform following actions on an array entered by the user:
    i) Print the even-valued elements
    ii) Print the odd-valued elements
    iii) Calculate and print the sum and average of the elements of array

iv) Print the maximum and minimum element of array

v) Remove the duplicates from the array

vi) Print the array in reverse order

The program should present a menu to the user and ask for one of the options. The menu should also include options to re-enter array and to quit the program.

11. WAP that prints a table indicating the number of occurrences of each alphabet in the text entered as command line arguments.

12. Write a program that swaps two numbers using pointers.

13. Write a program in which a function is passed address of two variables and then alter its contents.

14. Write a program which takes the radius of a circle as input from the user, passes it to another function that computes the area and the circumference of the circle and displays the value of area and circumference from the main() function.

15. Write a program to find sum of n elements entered by the user. To write this program, allocate memory dynamically using malloc() / calloc() functions or new operator.

16. Write a menu driven program to perform following operations on strings:

a) Show address of each character in string

b) Concatenate two strings without using strcat function.

c) Concatenate two strings using strcat function.

d) Compare two strings

e) Calculate length of the string (use pointers)

f) Convert all lowercase characters to uppercase

g) Convert all uppercase characters to lowercase

h) Calculate number of vowels

i) Reverse the string

17. Given two ordered arrays of integers, write a program to merge the two-arrays to get an ordered array.

18. WAP to display Fibonacci series (i)using recursion, (ii) using iteration

19. WAP to calculate Factorial of a number (i)using recursion, (ii) using iteration

20. WAP to calculate GCD of two numbers (i) with recursion (ii) without recursion.

21. Create Matrix class using templates. Write a menu-driven program to perform following Matrix

operations (2-D array implementation):

a) Sum b) Difference c) Product   d) Transpose

22. Create the Person class. Create some objects of this class (by taking information from the user). Inherit the class Person to create two classes Teacher and Student class. Maintain the respective information in the classes and create, display and delete objects of these two classes (Use Runtime Polymorphism).

23. Create a class Triangle. Include overloaded functions for calculating area. Overload assignment operator and equality operator.

24. Create a class Box containing length, breath and height. Include following methods in it:

a) Calculate surface Area

b) Calculate Volume

c) Increment, Overload ++ operator (both prefix & postfix)

d) Decrement, Overload -- operator (both prefix & postfix)

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e) Overload operator == (to check equality of two boxes), as a friend function

f) Overload Assignment operator

g) Check if it is a Cube or cuboid

Write a program which takes input from the user for length, breath and height to test the above class.

25. Create a structure Student containing fields for Roll No., Name, Class, Year and Total Marks. Create 10 students and store them in a file.

26. Write a program to retrieve the student information from file created in previous question and print it in following format:

Roll No. Name Marks

27. Copy the contents of one text file to another file, after removing all whitespaces.

28. Write a function that reverses the elements of an array in place. The function must accept only one pointer value and return void.

29. Write a program that will read 10 integers from user and store them in an array. Implement array using pointers. The program will print the array elements in ascending and descending order.

ITBMIN1014: Mathematics-I (Discrete Mathematics)
(Credit: 4, Total Marks: 100)
(Theory: 50 Marks, Practical: 20 Marks, Internal: 30 Marks)

Course learning objectives
- To understand and retain the basics of sets theory
- To apply permutation and combinations methods
- To learn groups and their properties
- To analyze generating functions in recurrences
- To apply logical connectives to form well defined formulae
- To evaluate predicate calculus and their applications to find an efficient solution

Course Learning Outcomes
- Learners would be able to learn and understand the importance of set theory
- It would enable learners to apply permutation and combinations methods for data occurrences in relations
- Learners would be able to analyze recurrence relations.
- Learners would be able to develop Well-formed Formulae
- Learners could apply different methods to evaluate and congregate well-organized solution

Theory: 60 Lectures

Unit-1: Introduction to sets, relations and Functions   (20 Lectures, 14 Marks)

Sets - finite and Infinite sets, functions, relations, Properties of Binary Relations, Closure, Partial Ordering Relations; counting - Pigeonhole Principle, Permutation and Combination; Mathematical Induction, Principle of Inclusion and Exclusion, Relation, Properties of relations, Equivalence of Relation, partial ordered set (POSET), Function, Properties of Functions, Different types of Functions.

Unit-2: Algebraic Structures   (14 Lectures, 10 Marks)

Group, subgroup, normal group, Group properties.

Unit-3: Recurrences   (14 Lectures, 13 Marks)

Recurrence Relations, generating functions, Linear Recurrence Relations with constant coefficients and their solution, Substitution Method, Recurrence Trees, Master Theorem

Unit-4: Prepositional Logic   (12 Lectures, 13 Marks)

Logical Connectives, Well-formed Formulas, Tautologies, Equivalences, Inference Theory, predicate calculus.

Suggested Readings:

1) C.L. Liu , D.P. Mahopatra, Elements of Discrete mathematics, 2nd Edition , Tata McGraw Hill, 1985,
2) Kenneth Rosen, Discrete Mathematics and Its Applications, Sixth Edition ,McGraw Hill 2006
3) T.H. Coremen, C.E. Leiserson, R. L. Rivest, Introduction to algorithms, 3rd edition Prentice Hall on India, 2009
4) M. O. Albertson and J. P. Hutchinson, Discrete Mathematics with Algorithms , John wiley Publication, 1988
5) J. L. Hein, Discrete Structures, Logic, and Computability, 3rd Edition, Jones and Bartlett Publishers, 2009
6) D.J. Hunter, Essentials of Discrete Mathematics, Jones and Bartlett Publishers, 2008.

ITBMIN1014 LAB: Mathematics-I (Discrete Mathematics) LAB

1. C++ Program to Evaluate Truth Value of Conjuction.
2. C++ program to Evaluate Truth Value of Disjuction.
3. Write a c++ program to print the union of two sets.
4. Write a c++ program to print the intersection of two sets.
5. Write a c++ program to find and print all the elements in the Cartesian product of two sets.
6. Write a c++ program to print the subtraction of two sets.
7. Write a c++ program to print the power of two sets.
8. Write a c++ program to print the proper subset of sets.
9. Write a c++ program to print the symmetric difference of two sets.

ITBIDC1013: Computer Fundamentals
(Credit: 3, Total Marks: 80)
(Theory: 60 Marks, Practical: 20 Marks)

Course learning objectives
- To learn and acquaint with various applications of computer systems
- To apply human interface systems
- To identify and analyze various components of a computer system
- To acquire knowledge on recent technologies in software industry

Course Learning Outcomes
- Learners could apply computer systems in various fields
- Learners could be acquainted with various input and output devices
- It would help achieve learners with identification of computer components and peripherals to assemble and de-assemble parts
- Learners gain knowledge on current trends in technologies

Theory: 45 lectures

Unit-1: Introduction to Computer Systems & Data Representation   **(**10 Lectures, 13 Marks)
Introduction to computer system and its characteristics, uses, types and Application of computer in various areas (Education, Medical, Ticketing, Media House, Animation Industry, Research etc.), Number systems and character representation, binary arithmetic

Unit-2: Human Computer Interface and Memories   **(**15 Lectures, 17 Marks)
Software and its types, Operating system as user interface, utility programs, Input and output devices (with connections and practical demo), keyboard, mouse, joystick, scanner, OCR, OMR, bar code reader, web camera, monitor, printer, plotter, Memory-Primary, secondary, auxiliary memory, RAM, ROM, cache memory, hard disks, optical disks, flash drives(memory cards, pen drives)

Unit-3: Computer Organization and Architecture   (10 Lectures, 17 Marks)
C.P.U and its functions, registers, system bus, main memory unit, cache memory, Inside a computer, SMPS, Motherboard, Ports and Interfaces, expansion cards, ribbon cables, memory chips, processors

Unit-4: Overview of Emerging Technologies   (10 Lectures, 13 Marks)
Bluetooth, cloud computing, big data, data mining, mobile computing and embedded systems

Suggested Readings:
1. A. Goel, Computer Fundamentals, Pearson Education, 2010.
2. P. Aksoy, L. DeNardis, Introduction to Information Technology, Cengage Learning, 2006
3. P. K.Sinha, P. Sinha, Fundamentals of Computers, BPB Publishers, 2007.

ITBIDC1013 LAB: Computer Fundamentals LAB

Practical exercises based on MS Office/ Open Office tools using document preparation and spreadsheet handling packages.

MS Word

1. Prepare **a grocery list** having four columns (Serial number, The name of the product, quantity and price) for the month of April, 06.

   - Font specifications for Title (Grocery List): 14-point Arial font in bold and italics.
   - The headings of the columns should be in 12-point and bold.
   - The rest of the document should be in 10-point Times New Roman.
   - Leave a gap of 12-points after the title.

2. Create a **telephone directory**.
   - The heading should be 16-point Arial Font in bold
   - The rest of the document should use 10-point font size
   - Other headings should use 10-point Courier New Font.
   - The footer should show the page number as well as the date last updated.

3. Design a **time-table form** for your college.
   - The first line should mention the name of the college in 16-point Arial Font and should be bold.
   - The second line should give the course name/teacher's name and the department in 14-point Arial.
   - Leave a gap of 12-points.
   - The rest of the document should use 10-point Times New Roman font.
   - The footer should contain your specifications as the designer and date of creation.

4. BPB Publications plans to release a new book designed as per your syllabus. Design the **first page of the book** as per the given specifications.
   - The title of the book should appear in bold using 20-point Arial font.
   - The name of the author and his qualifications should be in the center of the page in 16-point Arial font.
   - At the bottom of the document should be the name of the publisher and address in 16-point Times New Roman.
   - The details of the offices of the publisher (only location) should appear in the footer.

5. Create the following one page documents.
   a. Compose a note inviting friends to a get-together at your house, Including a list of things to bring with them.
   b. Design a certificate in landscape orientation with a border around the document.
   c. Design a Garage Sale sign.
   d. Make a sign outlining your rules for your bedroom at home, using a numbered list.

6. Create the following documents:
   (a) A newsletter with a headline and 2 columns in portrait orientation, including at least one image surrounded by text.

      (b) Use a newsletter format to promote upcoming projects or events in your classroom or college.

7.   Convert following text to a table, using comma as delimiter

      Type the following as shown (do not bold).

      Color, Style, Item
      Blue, A980, Van
      Red, X023, Car
      Green, YL724, Truck
      Name, Age, Sex
      Bob, 23, M
      Linda, 46, F
      Tom, 29, M

9. Enter the following data into a table given on the next page.

Salesperson	Dolls	Trucks	Puzzles
Kennedy, Sally	1327	1423	1193
White, Pete	1421	3863	2934
Pillar, James	5214	3247	5467
York, George	2190	1278	1928
Banks, Jennifer	1201	2528	1203
Atwater, Kelly	4098	3079	2067
Pillar, James	5214	3247	5467
York, George	2190	1278	1928
Banks, Jennifer	1201	2528	1203
Atwater, Kelly	4098	3079	2067

Add a column Region (values: S, N, N,S,S,S) between the Salesperson and Dolls columns to the given table Sort your table data by Region and within Region by Salesperson in ascending order:

In this exercise, you will add a new row to your table, place the word "Total" at the bottom of the Salesperson column, and sum the Dolls, Trucks, and Puzzles columns.

10.   Wrapping of text around the image.

11.   Following features of menu option must be covered

FILE	Complete menu
EDIT	Complete menu
VIEW	Complete menu
INSERT	Complete menu
FORMAT	Complete menu
TABLE	Complete menu
WINDOW	Complete menu
HELP	Complete menu
TOOLS	All options except Online collaboration, Tools on Macro, Templates

MS Excel

1.   Enter the Following data in Excel Sheet

REGIONAL SALES PROJECTION

State	Qtr1	Qtr2	Qtr3	QTR4	Qtr Total	Rate	Amount
Delhi	2020	2400	2100	3000	15		
Punjab	1100	1300	1500	1400	20		
U.P.	3000	3200	2600	2800	17		
Haryana	1800	2000	2200	2700	15		
Rajasthan	2100	2000	1800	2200	20		

TOTAL
AVERAGE

(a) Apply Formatting as follow: I.Title in

   TIMES NEW ROMAN

   ii.   Font Size - 14

   iii.   Remaining text - ARIAL, Font Size -10

   iv.   State names and Qtr. Heading Bold, Italic with Gray Fill Color.

   v.   Numbers in two decimal places.

   vi.   Qtr. Heading in center Alignment.

   vii.   Apply Border to whole data.

(b) Calculate State and Qtr. Total

(c) Calculate Average for each quarter

(d) Calculate Amount = Rate * Total.

2. Given the following worksheet

	A	B	C	D
1	Roll No.	Name	Marks	Grade
2	1001	Sachin	99	
3	1002	Sehwag	65	
4	1003	Rahul	41	

| 5 | 1004 | Sourav | 89 |
| 6 | 1005 | Har Bhajan | 56 |

Calculate the grade of these students on the basis of following guidelines:

If Marks	Then Grade
>= 80	A+
>= 60 < 80	A
>= 50 < 60	B
< 50	F

3. Given the following worksheet

	A	B	C	D	E	F	G
1	**Salesman**		**Sales in (Rs.)**				
2	No.	Qtr1	Qtr2	Qtr3	Qtr4	Total	Commission
3	S001	5000	8500	12000	9000		
4	S002	7000	4000	7500	11000		
5	S003	4000	9000	6500	8200		
6	S004	5500	6900	4500	10500		
7	S005	7400	8500	9200	8300		
8	S006	5300	7600	9800	6100		

Calculate the commission earned by the salesmen on the basis of following Candidates:

If Total Sales	Commission
< 20000	0% of sales
> 20000 and < 25000	4% of sales
> 25000 and < 30000	5.5% of sales
> 30000 and < 35000	8% of sales
>= 35000	11% of sales

The total sales are sum of sales of all the four quarters.

4. A company XYZ Ltd. pays a monthly salary to its employees who consist of basic salary, allowances & deductions. The details of allowances and deductions are as follows:

   Allowances

   • HRA Dependent on Basic

       30% of Basic if Basic <=1000

       25% of Basic if Basic>1000 & Basic<=3000

       20% of Basic if Basic >3000

   • DA Fixed for all employees, 30% of Basic

   • Conveyance Allowance Rs. 50/- if Basic is <=1000 Rs.

       75/- if Basic >1000 & Basic<=2000

Rs. 100 if Basic >2000

- Entertainment Allowance NIL if Basic is
    <=1000 Rs. 100/- if Basic > 1000

Deductions

- Provident Fund   6% of Basic
- Group Insurance Premium Rs. 40/- if Basic is <=1500

    Rs. 60/- if Basic > 1500 & Basic<=3000

    Rs. 80/- if Basic >3000

Calculate the following:

Gross Salary   = Basic + HRA + DA + Conveyance + Entertainment

Total deduction = Provident Fund + Group Insurance Premium

Net Salary   = Gross Salary – Total Deduction

5. Create Payment Table for a fixed Principal amount, variable rate of interests and time in the format below:

No. of Instalments	5%	6%	7%	8%	9%
3	XX	XX	XX	XX	XX
4	XX	XX	XX	XX	XX
5	XX	XX	XX	XX	XX
6	XX	XX	XX	XX	XX

6. Use an array formula to calculate Simple Interest for given principal amounts given the rate of Interest and time

Rate of Interest	8%
Time	5 Years

Principal	Simple Interest
1000	?
18000	?
5200	?

7. The following table gives 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

(a) Calculate total sale year wise.

(b) Calculate the net sale made by each salesman

(c) Calculate the maximum sale made by the salesman

(d) Calculate the commission for each salesman under the condition.

(*i*) If total sales >4,00,000 give 5% commission on total sale made by the salesman.

(*ii*) Otherwise give 2% commission.

(*e*) Draw a bar graph representing the sale made by each salesman. (*f*)

Draw a pie graph representing the sale made by salesman in 2000.

8. Enter the following data in Excel Sheet

PERSONAL BUDGET FOR FIRST QUARTER

Monthly Income (Net): 1,475

EXPENSES	JAN	FEB	MARCH	QUARTER TOTAL	QUARTER AVERAGE
Rent600.00	600.00	600.00			
Telephone	48.25	43.50	60.00		
Utilities	67.27	110.00	70.00		
Credit Card	200.00	110.00	70.00		
Oil	100.00	150.00	90.00		
AV to Insurance	150.00				
Cable TV	40.75	40.75	40.75		

Monthly Total

Calculate Quarter total and Quarter average.

(a) Calculate Monthly total.

(b) Surplus = Monthly income - Monthly total.

(c) What would be total surplus if monthly income is 1500.

(d) How much does telephone expense for March differ from quarter average.

(e) Create a 3D column graph for telephone and utilities.

(f) Create a pie chart for monthly expenses.

9. Enter the following data in Excel Sheet

TOTAL REVENUE EARNED FOR SAM'S BOOKSTALL

Publisher name	1997	1998	1999	2000	total
A	Rs. 1,000.00	Rs. 1100.00	Rs. 1,300.00	Rs. 800.00	
B	Rs. 1,500.00	Rs. 700.00	Rs. 1,000.00	Rs. 2,000.00	
C	Rs. 700.00	Rs. 900.00	Rs. 1,500.00	Rs. 600.00	
D	Rs. 1,200.00	Rs. 500.00	Rs. 200.00	Rs. 1,100.00	
E	Rs 800.00	Rs. 1,000.00	Rs. 3,000.00	Rs. 560.00	

(a) Compute the total revenue earned.

(b) Plot the line chart to compare the revenue of all publisher for 4 years.

(b) Chart Title should be _Total Revenue of sam's Bookstall (1997-2000)'

(c) Give appropriate categories and value axis title.

10. Generate 25 random numbers between 0 & 100 and find their sum, average and count. How many no. are in range 50-60.

ITBSEC1013: ICT Hardware
(Credit 3, Total Marks 80)
(Theory: 60 Marks, Practical: 20 Marks)

Course learning objectives
- To understand and identify various components of a computer system hardware
- To make learners familiar with multimedia components
- To acquaint with CPU elements & peripheral devices

Course Learning Outcomes
- It enables learners acquiring knowledge on computer hardware
- Learners become familiar with various hardware trouble shooting tools
- It would enable learners with distinguishing digital and conventional media
- Learner would be able to explain the importance of hardware equipments

Theory: 45 Lectures

UNIT-1: Introduction to Computer Systems **(**15 Lectures, 17 Marks)
Evolution of computer system, Modern computer, Classification of computer, Personal Computer hardware: Monitor, Keyboard, Mouse, Scanner, printer, speaker, SMPS, BIOS, Disk Drives- Logical structure and file system, FAT, NTFS, Hard disk tools: Disk cleanup, error checking, defragmentation, scanning for virus, formatting, Trends in HDD, SSD, and Cloud storage.

UNIT-2: Introduction to Multimedia (10 Lectures, 15 Marks)
Definition of multimedia, Components of multimedia, Web and Internet multimedia applications, Transition from conventional media to digital media, Audio software and hardware, MIDI, Video and Animation

UNIT-3: Processor and peripherals (10 Lectures, 15 Marks)
Intel processor family, Latest trends in processor, Motherboard and its types, Sockets and slots, power connectors, Peripheral connectors, Bus slots, USB, pin connectors, ROM, RAM, different kinds of RAM, RAM upgradation, Cache and Virtual Memory concept

UNIT-4: Network Peripherals (10 Lectures, 13 Marks)
Network Interface Card, network cabling, I/O Box, Switches, RJ 45 connectors, Patch panel, Patch cord, racks, IP address.

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

ITBSEC1013 LAB: ICT Hardware LAB

Experiment-1: Identification of peripherals of a computer, components of a CPU and its functions.
Experiment-2: Draw the block diagram of CPU along with configuration of each peripheral
Experiment-3: Disassemble and assemble the PC back to working condition
Experiment-4: installation of software
Experiment-5: Formatting and partitioning a hard drive
Experiment-6: Configuration for dual booting
Experiment-7 Basic commands in Linux
Experiment-8: Hardware Troubleshooting:
      i) Fixing error in booting due to improper assembly or defective peripherals.
      ii) Fixing malfunctioning CPU due to system software problems

Experiment-8: Configuration of browsers to block pop ups, block active x downloads to avoid viruses and/or worms

ITBVAC1014: Desktop Publishing (DTP)
(Credit 4, Total Marks: 100)
(Theory: 50 Marks, Practical: 20 Marks, Internal: 30 Marks)

Course learning objectives
- To learn and get familiar with computer based system interfaces
- To apply tools for word processing documents
- To apply drawing tools
- To design customized images with standard editing tools

Course Learning Outcomes
- Enable Learners to handle systems with ease
- Learner could develop good document publishing skills
- Learners could expertise in creative designing
- Learners would develop skills to create and enhance pictures to give a quality look

Theory 60 Lectures

UNIT - 1: System Interface   (10 Lectures, 8 Marks)

Introduction to Computer System, Characteristics of Computer, CUI based O/S, GUI based O/S, O/S types and functions, System Software, Application Software, Utility Software, Creating of Files and Folders, Directory management activities, Basic file operations (copy, paste, rename, move, delete etc.)

UNIT - 2: Document Processing   (15 Lectures, 15 Marks)

Need of Documentation, creating a document, editing and formatting a document, saving and printing a document, inserting text and graphics(image, shapes, symbols, equations), inserting columns, fonts and styles, Clip arts, Header and Footer, frame option, arrange text, image control, indent/tabs, layout, tool bar, page setting, Paper Style, Working with Tables, Linking objects, Page Layout, Word Wrapping, Paragraph settings, Hyphenation, Alignment, Spell checker, Thesaurus.

UNIT - 3: Drawing Tools   (15 Lectures, 12 Marks)

Logo Designing, Illustration making, Frame Settings, Graphical Tools, Bitmap & Shadow Effects, Special Effects such as Perspective, Blending, Text Settings into objects, Alignment Setting, Tabs, Power Line, Power Clip, Contour, Import & Export Facility

UNIT - 4: Image Editing Tools   (20 Lectures, 15 Marks)

Understanding various image types (BMP, JPG, JPEG, PNG etc.), Import and Export of Image, Layers and Objects, Marquee Tool, Magnetic Tool, Slice Tool, Patch Tool, Clone Stamp Tool, Gradient Tool, Smudge Tool, Blur Tool, Text Tool, Image Crop and Rotation,

Lighting adjustment, Blemish correction, Fill and Stroke Option, Histogram, Group, Ungroup, Lock Object, Color Range, Feather, Filter, Blur.

Suggested Readings:
1. Desk Top Publishing from A to Z by Bill Grout and Osborne; McGraw Hill
2. DTP (Desk Top Publishing) for PC user by Houghton; Galgotia Publishing House Pvt. Ltd., Daryaganj, New Delhi
3. https://help.libreoffice.org/6.1/en-US/text/swriter/main0000.html?DbPAR=WRITER
4. https://help.libreoffice.org/6.1/en-US/text/sdraw/main0000.html?DbPAR=DRAW
5. https://inkscape.org/learn/

ITBVAC1014 LAB: Desktop Publishing (DTP) LAB

<u>Tools to be used-</u> MS Word/Pagemaker/OpenOffice Writer/LibreOffice writer/LibreOfficeDraw/ CorelDraw/Photoshop/InkScape

1. Prepare **a grocery list** having four columns (Serial number, The name of the product, quantity and price) for the month of May, 2023.

   a. Font specifications for Title (Grocery List): 14-point Arial font in bold and italics.
   b. The headings of the columns should be in 12-point and bold.
   c. The rest of the document should be in 10-point Times New Roman.
   d. Leave a gap of 12-points after the title.

2. Design a **time-table form** for your college.
   - The first line should mention the name of the college in 16-point Arial Font and should be bold.
   - The second line should give the course name/teacher's name and the department in 14-point Arial.
   - Leave a gap of 12-points.
   - The rest of the document should use 10-point Times New Roman font.
   - The footer should contain your specifications as the designer and date of creation.

3. XYZ Publications plans to release a new book designed as per your syllabus. Design the **first page of the book** as per the given specifications.
   - The title of the book should appear in bold using 20-point Arial font.
   - The name of the author and his qualifications should be in the center of the page in 16-point Arial font.
   - At the bottom of the document should be the name of the publisher and address in 16-point Times New Roman.
   - The details of the offices of the publisher (only location) should appear in the footer.

4. Convert following text to a table, using comma as delimiter

Type the following as shown (do not bold).
Color, Style, Item
Blue, A980, Van
Red, X023, Car
Green, YL724, Truck
Name, Age, Sex
Bob, 23, M
Linda, 46, F
Tom, 29, M

5. Enter the following data into a table given on the next page.

Salesperson	Dolls	Trucks	Puzzles
Kennedy, Sally	1327	1423	1193
White, Pete	1421	3863	2934
Pillar, James	5214	3247	5467
York, George	2190	1278	1928
Banks, Jennifer	1201	2528	1203
Atwater, Kelly	4098	3079	2067
Pillar, James	5214	3247	5467
York, George	2190	1278	1928
Banks, Jennifer	1201	2528	1203
Atwater, Kelly	4098	3079	2067

Add a column Region (values: S, N, N, S, S, S) between the Salesperson and Dolls columns to the given table Sort your table data by Region and within Region by Salesperson in ascending order.

In this exercise, you will add a new row to your table, place the word "Total" at the bottom of the Salesperson column, and sum the Dolls, Trucks, and Puzzles columns.

6. Wrapping of text around the image.

7. Formatting a given file by using undo/redo, repeat, cut, copy, paste, delete, duplicate and clone utilities

8. Inserting objects in the drawing, aligning, ordering, grouping and ungrouping of those objects

9. Use of mode edit tools i.e. to line, to curve, to stretch, and rotate

10. Creating special effects i.e. transform roll-up, envelop roll up, add perspective, extrude roll up, contour roll up, power line, power clip, clear effects

11. To insert character and paragraph text in a drawing and frame, setting of tabs, indents, bullets and spacing in paragraph text

12. Using tools such as spell checker, and thesaurus

13. Using find and replace text utility and type assist

14. Considering any image (BMP, .JPG, JPEG, PNG etc.) implement the following actions on it using image editing tool-

   i) Cropping

   ii) Cloning

   iii) Change color

   iv) Filtering

   v) Blurring

   vi) Rotation

ITBMAJ1024: Digital Logic and Computer Organization
(Credit 4, Total Marks: 100)
(Theory: 50 Marks, Practical: 20 Marks, Internal: 30 Marks)

Course Learning Objectives
- To make familiar with basic digital logic gates and number system.
- To understand and apply logic gates in hardware components.
- To learn the fundamental concepts of digital computer organization and its design.
- To develop a basic understanding of designing an architecture of a digital computer system.

Course Learning Outcomes
- Learners would be able to simplify digital logic gates.
- Learner would be able to differentiate between combinational circuits and sequential circuits.
- Learners acquire the concept of representation of data.
- Learners could determine various stages of instruction format, addressing modes and illustrate interrupts and their handling.
- Learners could understand the design of computer system architecture and explain how CPU communicates with memory and I/O devices.

Theory 60 Lectures
Unit-1: Introduction to Logic Gates and Data Representation (18 lectures, 14 Marks)
Boolean algebra, Logic gates, combinational circuits, sequential circuits, flip-flops, encoders, decoders, multiplexers, registers, counters. Number systems, complements, fixed and floating point representation, character representation, addition, subtraction, magnitude comparison, multiplication and division of integers

Unit-2: Basic Computer Organization and Design (22 lectures, 17 Marks)
Computer registers, bus system and its basic design, instruction set, timing and control, instruction cycle, memory reference, input -output and interrupt, Register organization, arithmetic and logical micro-operations, stack organization, micro programmed control, Instruction formats, addressing modes, instruction codes, assembly language, I/O programming, RISC, CISC architectures, basics of pipelining and parallel architecture.

Unit-3: Memory Organization (10 lectures, 10 Marks)
Memory units, Memory hierarchy design and characteristics, Cache memory, Associative memory, mapping (associative, direct, set associative), memory access methods(Sequential & random access)

Unit-4: Input-Output Organization (10 lectures, 9 Marks)
Input / Output: External Devices, I/O Modules, Programmed I/O, Interrupt-Driven I/O, Direct Memory Access, I/O Channels.

Suggested Readings:

1. M. Mano, Computer System Architecture, Pearson Education 1992
2. A. J. Dos Reis, Assembly Language and Computer Architecture using C++ and JAVA, Course Technology, 2004 th
3. W. Stallings, Computer Organization and Architecture Designing for Performance, 8 Edition, Prentice Hall of India,2009
4. M.M. Mano , Digital Design, Pearson Education Asia,2013
5. Carl Hamacher, Computer Organization, Fifth edition, McGrawHill, 2012.

ITBMAJ1024 LAB: Digital Logic and Computer Organization LAB

Digital Logic

1) List and verify the truth table of common Digital IC of the TTL series and display.

2) Common logic gates are AND gate, OR gate, NOT gate, NAND gate, NOR gate, EXOR gate.

3) Verification of DeMorgan's Theorems.

4) Design a Half adder using digital logic gates. Verify its truth table.

5) Design a Full adder using digital logic gates. Verify its truth table.

6) Design of R-S Flip Flop; modify it to D Flip Flop. Verify the truth tables.

7) Design of a J-K Flip flop, verify the truth table.

Computer Organization

1. Create a machine based on the following architecture:

Register Set

IR	DR	AC	AR	PC	FGI	FGO	S	I	E
0 15	0 15	0 15	011	011	1 Bit	1 Bit	1 Bit	1 bit	1 Bit

Memory	Instruction format
4096 words 16 bits per word	0 3 4 15 Opcode | Address
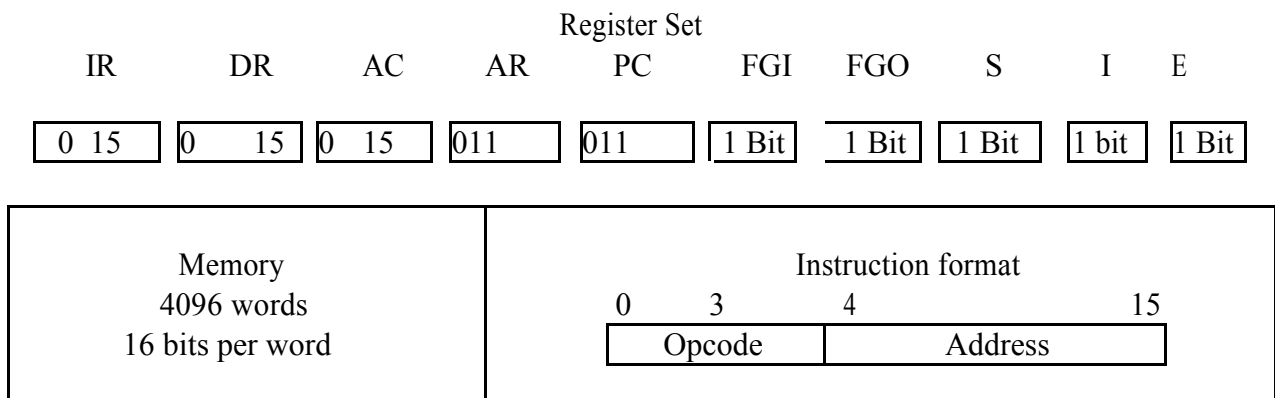
Basic Computer Instructions

Memory Reference			Register Reference		Input-Output		
Symbol	Hex		Symbol	Hex	Symbol	Hex	
AND	0xxx		CLA	E800	INP	F800	
ADD	2xxx	.	CLE	E400	OUT	F400	
LDA	4xxx	Direct	CMA	E200	SKI	F200	
STA	6xxx	Addressing	CME	E100	SKO	F100	
BUN	8xxx		CIR	E080	ION	F080	Optional
BSA	Axxx		CIL	E040	IOF	F040	
ISZ	Cxxx		INC	E020			
AND_I	1xxx		SPA	E010			
ADD_I	3xxx		SNA	E008			
LDA_I	5xxx	Indirect	SZA	E004			
STA_I	7xxx	Addressing	SZE	E002			
BUN_I	9xxx		HLT	E001			
BSA_I	Bxxx						
ISZ_I	Dxxx						

2. Create the micro operations and associate with instructions as given in the chapter(except interrupts). Design the register set, memory and the instruction set. Use this machine for the assignments of this section.

3. Create a Fetch routine of the instruction cycle.

4. Simulate the machine to determine the contents of AC, E, PC, AR and IR registers in hexadecimal after the execution of each of following register reference instructions:

a. CLA	e. CIR	i. SNA
b. CLE	f. CIL	j. SZA
c. CMA	g. INC	k. SZE
d. CME	h. SPA	l. HLT

Initialize the contents of AC to $(A937)_{16}$, that of PC to $(022)_{16}$ and E to 1.

5. Simulate the machine for the following memory-reference instructions with I= 0 and address part = 082. The instruction to be stored at address 022 in RAM. Initialize the memory word at address 082 with the operand B8F2 and AC with A937. Determine the contents of AC, DR, PC, AR and IR in hexadecimal after the execution.

a. ADD	f. BSA
b. AND	g. ISZ
c. LDA	
d. STA	
e. BUN	

6. Simulate the machine for the memory-reference instructions referred in above question with I= 1 and address part = 082. The instruction to be stored at address 026 in RAM. Initialize the memory word at address 082 with the value 298. Initialize the memory word at address 298 with operand B8F2 and AC with A937. Determine the contents of AC, DR, PC, AR and IR in hexadecimal after the execution.

7. Modify the machine created in Practical 1 according to the following instruction format:

Instruction format

0	2	3 4	15
Opcode		I	Address

a. The instruction format contains a 3-bit opcode, a 1-bit addressing mode and a 12-bit address. There are only two addressing modes, I = 0 (direct addressing) and I = 1 (indirect addressing).

b. Create a new register I of 1 bit.

c. Create two new microinstructions as follows :

i. Check the opcode of instruction to determine type of instruction (Memory Reference/Register Reference/Input-Output) and then jump accordingly.
ii. Check the I bit to determine the addressing mode and then jump accordingly.

ITBMIN1024: Mathematics-II (Graph Theory)
(Credit 4, Total Marks 100)
(Theory: 50 Marks, Practical: 20 Marks, Internal: 30 Marks)

Course learning objectives
- To understand and retain the basics of sets theory
- To apply permutation and combinations methods
- To learn groups and their properties
- To analyze generating functions in recurrences
- To apply logical connectives to form well defined formulae
- To evaluate predicate calculus and their applications to find an efficient solution

Course Learning Outcomes
- Learners would be able to learn and understand the importance of set theory
- It would enable learners to apply permutation and combinations methods for data occurrences in relations
- Learners would be able to analyze recurrence relations.
- Learners would be able to develop Well-formed Formulae
- Learners could apply different methods to evaluate and congregate well-organized solution

Theory 60 Lectures

Unit-1: Basic Terminologies and Graph Representation   (18 Lectures, 12 Marks)
  Graph, Models and types, sub graphs, degrees and graphical sequences, walks, trails, paths, cycles, Multi graphs and weighted graphs, Graph Isomorphism, bipartite graphs

Unit-2: Trees   (16 Lectures, 13 Marks)
  Basic Terminology and properties of Trees, Characterizations of trees, Connectivity, Introduction to Spanning Trees, number of trees, Algorithms on graph, Breadth first search, Depth first search.

Unit-3: Euler and Hamiltonian Paths and Circuits   (10 Lectures, 12 Marks)
  Basic Characterizations, Necessary/sufficient conditions, Tutte's Perfect matching theorem and consequences

Unit-4: Colouring & Planar Graphs   (16 Lectures, 13 Marks)
  Introduction to Graph colouring, Edge-colorings of bipartite graphs, Brook's theorem, Planar Graphs, Euler's formula and its consequences, Kuratowski's Characterization, Basic Directed graphs.

Suggested Readings
1. J.A Bondy and U.S.R Murthy, Graph Theory with Applications, Macmillan, 1976.
2. D.B. West, Introduction to Graph Theory, P.H.I 1999.

ITBMIN1024 LAB: Mathematics-II (Graph Theory) LAB

1. Write a Program to represent Graphs using the Adjacency Matrices and check if it is a complete graph.
2. Write a Program to accept a directed graph G and compute the in-degree and out-degree of each vertex.
3. Given a graph G, write a Program to find the number of paths of length n between the source and destination entered by the user.
4. Write a Program to implement the Kruskal's algorithm to generate a minimum cost spanning tree.
5. Write a program to implement the Prim's algorithm to generate a minimum cost spanning tree.
6. Write a program to implement Euler Circuit problem.
7. Write a program to implement Hamiltonian Cycle.
8. Given an adjacency matrix of a graph, write a program to check whether a given set of vertices {v1,v2,v3.....,vk} forms an Euler path / Euler Circuit (for circuit assume vk=v1).
9. Given a full m-ary tree with i internal vertices, Write a Program to find the number of leaf nodes.

ITBIDC1023: Introduction to Programming Languages
(Credit: 3, Total Marks=80)
(Theory: 60 Marks, Practical: 20 Marks)

Course learning objectives
- To understand the basic programming features.
- To provide concepts on derived data types.
- To employ the utilities of basic conditional and looping statements for solving problems.
- To develop programs to solve problems.

Course Learning Outcomes
- Learners would be able to acquire enough knowledge on programming constructs.
- Enable learners to utilize basic statements for writing efficient programs.
- Learners could extend their knowledge for developing programs i.e solutions for real-time problems.

Theory 45 Lectures

Unit-1: Introduction to Programming fundamentals   (12 Lectures, 13 Marks)

History of Programming Languages and its Generations, Brief Introduction to C and C++, Overview of Procedural Programming and Object-Orientation Programming, Using main() function(), Header Files, Compiling and Executing Simple Programs in C++, 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 (getc, getchar, putc, putcharetc), Formatted and Console I/O (printf(), scanf(), cin, cout)

Unit-2 Expressions, Conditional Statements and Iterative Statements   (10 Lectures, 17 Marks)

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-3: Functions and Arrays   (15 Lectures, 17 Marks)

Declaration and Definition of Functions, Call by Value, Call by Reference, Functions returning value, Void functions, Return data type of functions, Functions parameters, Functions with variable number of Arguments.
One Dimensional Arrays (Declaring and Defining an Array, Initializing an Array, Accessing individual elements in an Array, Manipulating array elements using loops), Various types of arrays (integer, float and character arrays / Strings), Two-dimensional Arrays (Declaring, Defining and Initializing Two Dimensional Array), Working with arrays

Unit-4: Derived Data Types (Structures and Unions)   (8 Lectures, 13 Marks)

Understanding utility of structures and unions, Declaring, initializing and using simple structures and unions, manipulating individual members of structures and unions, Array of Structures and unions.

Suggested Readings:

1. HerbtzSchildt, "C++: The Complete Reference", Fourth Edition, McGraw Hill.2003 2. BjarneStroustrup, "The C++ Programming Language", 4th Edition, Addison-Wesley ,
2013.
3.   BjarneStroustroup, "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.

ITBIDC1023 LAB: Introduction to Programming Languages LAB

1) WAP to print the sum and product of digits of an integer.

2) WAP to reverse a number.

3) WAP to compute the sum of the first n terms of the following
    series S = 1+1/2+1/3+1/4+……

4) WAP to compute the sum of the first n terms of the following
    series S =1-2+3-4+5…………….

5) Write a function that checks whether a given string is Palindrome or not.
    Use this function to find whether the string entered by user is Palindrome
    or not.

6) Write a function to find whether a given no. is prime or not. Use the same to
    generate the prime numbers less than 100.

7) WAP to compute the factors of a given number.

8) Write a macro that swaps two numbers. WAP to use it.

9) WAP to print a triangle of stars as follows (take number of lines from user):

```
        *
       ***
      *****
     *******
    *********
```

10) WAP to perform following actions on an array entered by the user:
    a. Print the even-valued elements
    b. Print the odd-valued elements
    c. Calculate and print the sum and average of the elements of array

      d. Print the maximum and minimum element of array

      e. Remove the duplicates from the array

      f. Print the array in reverse order

The program should present a menu to the user and ask for one of the options. The menu should also include options to re-enter array and to quit the program.

11) WAP that prints a table indicating the number of occurrences of each alphabet in the text entered as command line arguments.

12) Write a program that swaps two numbers using pointers.

13) Write a program in which a function is passed address of two variables and then alter its contents.

14) Write a program which takes the radius of a circle as input from the user, passes it to another function that computes the area and the circumference of the circle and displays the value of area and circumference from the main() function.

ITBSEC1023: Object Oriented Programming (OOPS) using C++
(Credit 3, Total Marks 80)
(Theory: 60 Marks, Practical: 20 Marks)

Course Learning Objectives
- To learn and understand programming paradigms.
- To explore and apply programming constructs in problem solving.
- To analyze different object oriented features.
- To develop programs incorporating exceptions and file handling Operations.

Course Learning Outcomes
- Learners could make a distinction among different programming paradigms.
- Learners could implement various programming constructs in problem solving.
- Learners could illustrate the issues involving object oriented aspect.
- Learners could acquire skills addressing solutions to real world problems.

Theory 45 Lectures
Unit-1: Introduction to C++   **(7 Lectures, 11 Marks)**
History of C++, Overview of Procedural Programming and Object-Oriented Programming, Using main () function, Header Files, Compiling and Executing Simple Programs in C++.

Unit-2: Programming Fundamentals   **(8 Lectures, 15 Marks)**
Data types, Variables, Operators, Expressions, Arrays, Keywords, Naming Convention, Decision making constructs (if, switch), Looping (for, while, do…while), Type Casting, Input-output statements, Functions, Command Line Arguments/Parameters, Static and dynamic memory allocation, Pointer and Reference Variables, Pointers vs. References

Unit-3: Object Oriented Concept   (20 Lectures, 21 Marks)

Overview of Abstraction, Encapsulation, Inheritance, and Polymorphism, Creating Classes and objects, Access Specifiers, Constructor, destructor, Implementation of Inheritance (Single and multilevel), Implementation of Polymorphism (Function Overloading , Operator Overloading and Function Overriding), Implementing Compile-time & Runtime polymorphism

Unit-4: Exception and File Handling   (10 Lectures, 13 Marks)

Using try, catch, throw, creating user defined exceptions, File I/O Basics, File Operations (Open, read, write, and close)

ITBSEC1023 LAB: Object Oriented Programming using C++ LAB

1) WAP to print the sum and product of digits of an integer.

2) WAP to reverse a number.

3) WAP to compute the sum of the first n terms of the following
   series S = 1+1/2+1/3+1/4+……

4) WAP to compute the sum of the first n terms of the following
   series S =1-2+3-4+5…………….

5) Write a function that checks whether a given string is Palindrome or not.
   Use this function to find whether the string entered by user is Palindrome
   or not.

6) Write a function to find whether a given no. is prime or not. Use the same to
   generate the prime numbers less than 100.

7) WAP to compute the factors of a given number.

8) Write a macro that swaps two numbers. WAP to use it.

9) WAP to print a triangle of stars as follows (take number of lines from user):

                         *
                        ***
                       *****
                      ****
                     ****

10) WAP to perform following actions on an array entered by the user:
    a. Print the even-valued elements
    b. Print the odd-valued elements
    c. Calculate and print the sum and average of the elements of array
    d. Print the maximum and minimum element of array
    e. Remove the duplicates from the array
    f. Print the array in reverse order

    g. The program should present a menu to the user and ask for one of
        the options. The menu should also include options to re-enter array
        and to quit the program.

11) WAP that prints a table indicating the number of occurrences of each alphabet

in the text entered as command line arguments.

12) Write a program that swaps two numbers using pointers.

13) Write a program in which a function is passed address of two variables and then alter its contents.

14) Write a program which takes the radius of a circle as input from the user, passes it to another function that computes the area and the circumference of the circle and displays the value of area and circumference from the main() function.

15) Write a program to find sum of n elements entered by the user. To write this program, allocate memory dynamically using malloc() / calloc() functions or new operator.

16) Write a menu driven program to perform following operations on strings:
   a. Show address of each character in string
   b. Concatenate two strings without using strcat function.
   c. Concatenate two strings using strcat function.
   d. Compare two strings
   e. Calculate length of the string (use pointers)
   f. Convert all lowercase characters to uppercase
   g. Convert all uppercase characters to lowercase
   h. Calculate number of vowels
   i. Reverse the string

17) Given two ordered arrays of integers, write a program to merge the two-arrays to get an ordered array.

18) WAP to display Fibonacci series (i)using recursion, (ii) using iteration

19) WAP to calculate Factorial of a number (i)using recursion, (ii) using iteration

20) WAP to calculate GCD of two numbers (i) with recursion (ii) without recursion.

21) Create Matrix class using templates. Write a menu-driven program to perform following Matrix
   a. operations (2-D array implementation):
   b. a) Sum b) Difference c) Product   d) Transpose

22) Create the Person class. Create some objects of this class (by taking information from the user). Inherit the class Person to create two classes Teacher and Student class. Maintain the respective information in the classes and create, display and delete objects of these two classes (Use Runtime Polymorphism).

23) Create a class Triangle. Include overloaded functions for calculating area. Overload assignment operator and equality operator.

24) Create a class Box containing length, breath and height. Include following methods in it:
   a. Calculate surface Area
   b. Calculate Volume
   c. Increment, Overload ++ operator (both prefix & postfix)
   d. Decrement, Overload -- operator (both prefix & postfix)
   e. Overload operator == (to check equality of two boxes), as a friend function
   f. Overload Assignment operator

g. Check if it is a Cube or cuboid

25) Write a program which takes input from the user for length, breath and height to test the above class.

26) Create a structure Student containing fields for Roll No., Name, Class, Year and Total Marks. Create 10 students and store them in a file.

27) Write a program to retrieve the student information from file created in previous question and print it in following format:
    1. Roll No. Name Marks

28) Copy the contents of one text file to another file, after removing all whitespaces.

29) Write a function that reverses the elements of an array in place. The function must accept only one pointer value and return void.

ITBVAC1024: Social Media Technology
(Credit: 4, Total Marks: 100)
(Theory: 50 Marks, Practical: 20 Marks, Internal: 30 Marks)

Course Learning Objectives
- To make familiar with trending social media platforms.
- To utilize social media tools for content creation.
- To acquire knowledge on setting up of social communication media channel.
- To get acquainted with AI based social media tools for messaging and collaborative marketing.
- To analyze social media marketing tools.

Course Learning Outcomes
- Learners would be able to identify different social media platforms.
- Learners could design and develop an effective blogging.
- Learners could apply media tools for real-time transmission of content.
- Learners could be able to set up video marketing strategies and advertising.
- Learners could upload and download essential information through media channel.
- Learners would be able to recognize the changing pattern of social media contributions and marketing.

Theory 60 Lectures
Unit-1: Introduction   (12 Lectures, 12 Marks)
Introduction to Social Media, Managing Information – Aggregators, Google Alerts, Handling E-mail and G-drive, getting your company ready for Social Media Content Management – Touch point analysis, Scheduling, Creating content, Managing content programs, Planning Worksheets.

Unit-2: Introduction to Blogs   (10 Lectures, 10 Marks)

About Blogger, Tumblr, Word press, Influencers Who are they? How to find them? How to use them to benefit your brand?

Unit-3: Social Communication media   (20 Lectures, 17 Marks)

Creating groups and pages, Tips and Guides – Posts, Paid Promotion Ads, Contests, Long form video platforms, Setting up a channel, Managing content - Video Flow - Google Pages for YouTube Channel - Verify Channel Webmaster Tool – Adding Asset - Associated Website Linking - Custom Channel URL - Channel ART - Channel Links - Channel Keywords - Branding Watermark - Featured Contents on Channel - Channel Main Trailer - Uploading Videos - Uploading Defaults - Creator Library - Practical Examples.

Unit-4: Instant Messaging, Collaborative Marketing & Crowd sourcing (18 Lectures, 11 Marks)

Set-up and usage Tips, LinkedIn - Tips and Guides, Consumer-generated content, Review of profiles, Pinterest - Visual social media and bookmarking, Set-up and management, Free Launching jobs, AI based tools used in Social Media: Chat Bots/Messenger Bots

Suggested Readings:

1. Social Marketing in India 1st Edition (Sameer Deshpande, Philip Kotler, Nancy R. Lee)
2. Marketing with Social Media (Linda Coles)
3. The Social Media Marketing Book (Dan Zarrella)
4. Social Media Marketing 1st Edition (Michael R. Solomon, Tracy Tuten)
5. The Art of Social Media: Power Tips for Power Users (Guy Kawasaki, Peg Fitzpatrick

ITBVAC2014 LAB: Social Media Technology Practical LAB

1. Creating E-mail Account and uses of G-drive

2. Create a group in WhatsApp/Telegram for academic purpose.

3. Create account in academic social media platform (at least five)

4. Create a Blog for review of product.

5. Create a Blog for academic purpose.

6. Managing Video Communication setup using different tools.

7. Hashtag activism (a project-based activity to teach students about social justice, human rights, equality)

8. Use any social media platform like facebook to circulate your review on various epic books

9. Make a Youtube Channel for publishing your creativity.

ITBMAJ2014: Database Management System (DBMS)
(Credit: 4, Total Marks: 100)
(Theory: 50 Marks, Practical: 20 Marks, Internal: 30 Marks)

Course Learning Objectives
- To provide the basics of data management.
- To learn and acquire skills to design and develop databases.
- To create and manipulate databases.
- To write efficient queries to retrieve data based on the requirements.
- To validate the data before storing it in the databases through constraints.

Course Learning Outcomes
- Learners would be able to understand and maintain the real world data.
- Learners could develop efficient skills to manipulate databases.
- Learners could validate data for storage in the database.

Theory 60 Lectures
Unit-1: Introduction to DBMS & ER Modeling　　　(14 Lectures, 14 Marks)
　　　Database, DBMS, Characteristics of database approach, data models, database system architecture and data independence, Entity types, relationships, constraints

Unit-2.Relation data model　　　(20 Lectures, 15 Marks)
　　　Relational model concepts, relational constraints, relational algebra, SQL queries

Unit-3.Database design and Transaction Processing　　　(18 Lectures, 14 Marks)
　　　Mapping ER model to relational database, functional dependencies, Lossless decomposition, Normal forms (upto BCNF), ACID properties, concurrency control

Unit-4.File Structure and Indexing　　　(8 Lectures, 7 Marks)
　　　Operations on files, File of Unordered and ordered records, overview of File organizations, Indexing structures for files(Primary index, secondary index, clustering index)

Suggested Readings:
1. R. Elmasri, S.B. Navathe, Fundamentals of Database Systems 6th　　　Edition,　　　Pearson Education, 2010.
2. R. Ramakrishanan, J. Gehrke, Database Management Systems 3rd Edition, McGraw-Hill

3. A. Silberschatz, H.F. Korth, S. Sudarshan, Database System Concepts 6th　　　Edition, McGraw Hill, 2010.
4. R. Elmasri, S.B. Navathe Database Systems Models, Languages, Design and application Programming, 6th Edition, Pearson Education, 2013.

ITBMAJ2014 LAB:Database Management System (DBMS) LAB

Create and use the following database schema to answer the given queries.

EMPLOYEE Schema				
Field	Type	NULL	KEY	DEFAULT
Eno	Char(3)	NO	PRI	NIL
Ename	Varchar(50)	NO		NIL
Job_type	Varchar(50)	NO		NIL
Manager	Char(3)	Yes	FK	NIL
Hire_date	Date	NO		NIL
Dno	Integer	YES	FK	NIL
Commission	Decimal(10,2)	YES		NIL
Salary	Decimal(7,2)	NO		NIL

DEPARTMENT Schema				
Field	Type	NULL	KEY	DEFAUL T
Dno	Integer	No	PRI	NULL
Dname	Varchar(50)	Yes		NULL
Location	Varchar(50)	Yes		New Delhi

Query List

1.Query to display Employee Name, Job, Hire Date, Employee Number; for each employee with the Employee Number appearing first.

2.Query to display unique Jobs from the Employee Table.

3.Query to display the Employee Name concatenated by a Job separated by a comma.

4.Query to display all the data from the Employee Table. Separate each Column by a comma and name the said column as THE_OUTPUT.

5.Query to display the Employee Name and Salary of all the employees earning more than $2850.

6.Query to display Employee Name and Department Number for the Employee No= 7900.

7.Query to display Employee Name and Salary for all employees whose salary is not in the range of Rs.1500 and Rs.2850.

8.Query to display Employee Name and Department No. of all the employees in Dept 10 and Dept 30 in the alphabetical order by name.

9.Query to display Name and Hire Date of every Employee who was hired in 1981.

10.Query to display Name and Job of all employees who don't have a current Manager.

11.Query to display the Name, Salary and Commission for all the employees who earn commission.

12.Sort the data in descending order of Salary and Commission.

13.Query to display Name of all the employees where the third letter of their name is 'A'

14.Query to display Name of all employees either have two 'R's or have two 'A's in their name

and are either in Dept No = 30 or their Manger's Employee No = 7788.

15. Query to display Name, Salary and Commission for all employees whose Commission Amount is 14 greater than their Salary increased by 5%.

16. Query to display the Current Date.

17. Query to display Name, Hire Date and Salary Review Date which is the 1st Monday after six months of employment.

18. Query to display Name and calculate the number of months between today and the date each employee was hired.

19. Query to display the following for each employee <E-Name> earns < Salary> monthly but wants < 3 * Current Salary >. Label the Column as Dream Salary.

20. Query to display Name with the 1st letter capitalized and all other letter lower case and length of their name of all the employees whose name starts with _J', 'A' and _M'.

21. Query to display Name, Hire Date and Day of the week on which the employee started.

22. Query to display Name, Department Name and Department No for all the employees.

23. Query to display Unique Listing of all Jobs that are in Department # 30.

24. Query to display Name, Dept Name of all employees who have an _A' in their name.

25. Query to display Name, Job, Department No. And Department Name for all the employees working at the Dallas location.

26. Query to display Name and Employee no. Along with their Manger's Name and the Manager's employee no; along with the Employees' Name who do not have a Manager.

27. Query to display Name, Dept No. And Salary of any employee whose department No. and salary matches both the department no. And the salary of any employee who earns a commission.

28. Query to display Name and Salaries represented by asterisks, where each asterisk (*) signifies $100.

29. Query to display the Highest, Lowest, Sum and Average Salaries of all the employees

30. Query to display the number of employees performing the same Job type functions.

31. Query to display the no. of managers without listing their names.

32. Query to display the Department Name, Location Name, No. of Employees and the average salary for all employees in that department.

33. Query to display Name and Hire Date for all employees in the same dept. as Blake.

34. Query to display the Employee No. And Name for all employees who earn more than the average salary.

35. Query to display Employee Number and Name for all employees who work in a department with any employee whose name contains a _T'.

36. Query to display the names and salaries of all employees who report to King.

37. Query to display the department no, name and job for all employees in the Sales department.

ITBMAJ2024: OPERATING SYSTEMS (OS)
(Credit: 4, Total Marks: 100)
(Theory: 50 Marks, Practical: 20 Marks, Internal: 30 Marks)

Course Learning Objective
- To understand the various types and functions of Operating Systems.
- To learn the process and various scheduling algorithms.
- To explore various issues in inter-process communications and address them.
- To evaluate the Memory management algorithms, allocation methods and virtual memory implementations.
- To analyze file and I/O management in Operating System.

Course Learning Outcomes
- Learners would be able to distinguish different operating systems.
- Learners would be able to explain algorithms used for process scheduling.
- Learners could suitable address process management issues.
- Learners could explain file management strategies and protective measures.

Theory 60 Lectures

Unit-1. Introduction to OS and its organization   (16Lectures, 16 Marks)

Basic OS functions, resource abstraction, types of operating systems–multiprogramming systems, batch systems , time sharing systems; operating systems for personal computers & workstations, process control & real time systems, Processor and user modes, kernels, system calls and system programs.

Unit-2.Process Management   (20 Lectures, 15 Marks)

System view of the process and resources, process abstraction, process hierarchy, threads, threading issues, thread libraries; Process Scheduling, non-pre-emptive, and pre-emptive scheduling algorithms, FCFS, Shortest Job first, Round Robin, Priority scheduling, concurrent and processes, critical section, semaphores, methods for inter-process communication; deadlocks.

Unit-3. Memory Management   (10 Lectures, 12 Marks)

Physical and virtual address space; memory allocation strategies –fixed and variable partitions, paging, segmentation, virtual memory

Unit-4. File and I/O Management, **Protection and Security**   (14 Lectures, 7 Marks)

Directory structure, file operations, file allocation methods, device management, Policy mechanism, Authentication, Internal access Authorization.

Suggested Readings:

1. A Silberschatz, P.B. Galvin, G. Gagne, Operating Systems Concepts, 8 Edition, John Wiley Publications 2008.

2. A.S. Tanenbaum, Modern Operating Systems, 3rd Edition, Pearson Education 2007.

3. G. Nutt, Operating Systems: A Modern Perspective, 2nd Edition Pearson Education 1997.

4. W. Stallings, Operating Systems, Internals & Design Principles , 5th Edition, Prentice Hall of India. 2008.

5. M. Milenkovic, Operating Systems- Concepts and design, Tata McGraw Hill 1992.

ITBMAJ2024: Operating Systems Lab

1. WRITE A PROGRAM (using *fork()* and/or *exec()* commands) where parent and child execute:

   a) same program, same code.

   b) same program, different code.

   c) before terminating, the parent waits for the child to finish its task.

2. WRITE A PROGRAM to report behaviour of Linux kernel including kernel version, CPU type and model. (CPU information)

3. WRITE A PROGRAM to report behaviour of Linux kernel including information on configured memory, amount of free and used memory. (memory information)

4. WRITE A PROGRAM to print file details including owner access permissions, file access time, where file name is given as argument.

5. WRITE A PROGRAM to copy files using system calls.

6. Write program to implement FCFS scheduling algorithm.

7. Write program to implement Round Robin scheduling algorithm.

8. Write program to implement SJF scheduling algorithm.

9. Write program to implement non-preemptive priority based scheduling algorithm.

10. Write program to implement preemptive priority based scheduling algorithm.

11. Write program to implement SRJF scheduling algorithm.

12. Write program to calculate sum of n numbers using *thread* library.

13. Write a program to implement first-fit, best-fit and worst-fit allocation strategies.

ITBMIN2014: Shell Programming Using Linux
(Credit 4, Total Marks 100)
(Theory: 50 Marks, Practical: 20 Marks, Internal: 30 Marks)

Course Learning Objectives
- To understand and make effective use of Linux utilities.
- To develop skills on handling file system, process management and inter-process communication.
- To make familiar with Linux shells.
- To analyze shell scripting elements to provide solutions to certain problems.

Course Learning Outcomes
- Enables learners to grasp different Linux services.
- Learners could handle file systems and processes.
- Learners would be able to write scripts on Linux Shells.

Theory 60 **Lectures**

UNIT 1: Introduction   (20 Lectures, 14 Marks)

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, Processes and its creation phases – Fork, Exec, wait

UNIT 2: User Management and the File System   (20 Lectures, 13 Marks)

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, Links (hard links, symbolic links)

UNIT 3: Shell introduction   (8 Lectures, 8 Marks)

What is shell and various type of shell, various editors present in linux, Different modes of operation in vi editor, gedit

UNIT 4: Shell Scripting   (12 Lectures, 15 Marks)

What is shell script, Shell variable (user defined and system variables), Writing and executing the shell script, 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)

Suggested Readings

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

ITBMIN2014 LAB : Shell Programming Using Linux LAB

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 —cal command to display calendars of the specified months.

3. Write a shell script to modify —cal 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 —who 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 53

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 "*".

ITBIDC2013: Basics of Web Designing
(Credit: 3, Total Marks: 80)
(Theory: 60 Marks, Practical: 20 Marks)

Course Learning Objectives
- To learn and understand the basic internet terms and applications.
- To get familiar with divergent web designing tools.
- To design and develop simple web applications.

Course Learning Outcomes
- Learners would be able to utilize basic internet applications.
- Learners would be able to analyze and deploy web applications.

Theory 45 Lectures

UNIT-1: Internet Terms (4 Lectures, 11 Marks)

Web page, Home page, Website, Internet Browsers, URL, Hypertext, ISP, Web server, download and upload, online and offline

UNIT-2: Internet Applications (6 Lectures, 13 Marks)

WWW, Telnet, FTP, E-mail, Social Networks, Search Engines, Video Conferencing, E-commerce, M-Commerce, VOIP, Blogs

UNIT-3: Introduction to Web Design (20 Lectures, 21 Marks)

Introduction to Hypertext Markup Language (html), DHTML, XML, Document type definition, Creating Web pages, Lists, Hyperlinks, Tables, Web forms, Inserting images, Frames, Hosting options and Domain name registration, Customized Features

Unit-4: JavaScript Fundamentals (15 Lectures, 15 Marks)

Data types and variables, functions, methods and events, controlling program flow, built-in objects and operators.

Suggested Readings:
1) HTML-A Beginner's Guide, Tata McGraw-Hill Education, 2009
2) Ivan Bayross, Web Enabled Commercial Application Development Using Html, Dhtml, javascript, Perl Cgi , BPB Publications, 2009
3) J. A. Ramalho, Learn Advanced HTML 4.0 with DHTML, BPB Publications, 2007
4) D.R. Brooks, An Introduction to HTML and Javascript for Scientists and Engineers, Springer W. Willard,2009
5) Ken Arnold, James Gosling, David Homes, "The Java Programming Language", 4th Edition, 2005.
6) James Gosling, Bill Joy, Guy L Steele Jr, GiladBracha, Alex Buckley"The Java Language Specification, Java SE 8 Edition (Java Series)", Published by Addison Wesley, 2014.
7) Joshua Bloch, "Effective Java" 2nd Edition,Publisher: Addison-Wesley, 2008.
8) Cay S. Horstmann, GaryCornell, "Core Java 2 Volume 1, 9th Edition,Printice Hall.2012
9) Bruce Eckel, "Thinking in Java", 3rd Edition, PHI, 2002.
10) E. Balaguruswamy, "Programming with Java", 4th Edition, McGraw Hill.2009.

11) Paul Deitel, Harvey Deitel, "Java: How to Program", 10th Edition, Prentice Hall, 2011.
12) David J. Eck, "Introduction to Programming Using Java", Published by CreateSpace Independent Publishing Platform, 2009.
13) John R. Hubbard, "Programming with JAVA", Schaum's Series, 2nd Edition, 2004.

ITBIDC2013: Basics of Web Designing LAB

1. Create HTML document with following formatting – Bold, Italics, Underline, Colors, Headings, Title, Font and Font Width, Background, Paragraph, Line Brakes, Horizontal Line, Blinking text as well as marquee text.

2. Create HTML document with Ordered and Unordered lists, Inserting Images, Internal and External linking

3. Create HTML document that contains a table.

4. Create Form with Input Type, Select and Text Area in HTML.

5. Create an HTML containing Roll No., student's name and Grades in a tabular form.

6. Create an HTML document (having two frames) which will appear as follows: About This frame would show the Department 1 contents according to the link clicked by the user on the left Department 2 frame. Department 3

7. Create an HTML document containing horizontal frames as follows: Department Names (could be along with Logos) Contents according to the Link clicked

8. Create a website of 6 – 7 pages with different effects as mentioned in above problems.

9. Create HTML documents (having multiple frames) in the following three formats: Frame1 Frame 2 Frame1 Frame 2 Frame 3

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

    i) Text Box 82 , ii) Option/radio buttons, iii) Check boxes , iv) Reset and Submit buttons

11. Write a program to get the URL/location of code (i.e. java code) and document(i.e. html file).

12. Write a program to demonstrate different mouse handling events using Javascript like

    i) mouseClicked(),
    ii) mouseEntered(),
    iii) mouseExited(),
    iv) mousePressed,
    v) mouseReleased() and
    vi) mouseDragged().

13. Write a program to demonstrate different keyboard handling events in Javascript

ITBSEC2013: Introduction to SQL
(Credit: 3, Total Marks: 80)
(Theory: 60 Marks, Practical: 20 Marks)

Course Learning Objectives
- To learn and understand the basic features of SQL.
- To get familiar with SQL commands.
- To design and develop efficient queries.
- To analyze performance tuning.

Course Learning Outcomes
- Learners would be able to acquire knowledge on SQL constructs.
- Learners would be able to employ efficient queries to access databases.
- Learners could evaluate and utilize complex queries for performance tuning.
- Enable learners to develop solution to real-time problems.

Theory 45 Lectures

Unit-1: Overview of SQL   (5 Lectures, 12 Marks)

Introduction to SQL, Types of SQL, its Features & Advantages, Database,

Unit-2: Data Types and variables   (5 Lectures, 12 Marks)

Data Types (Integer, float, NUMBER/DECIMAL, CHARACTER/VARCHAR/VARCHAR2, DATE etc.), Use of Variables

Unit-3: SQL commands & Functions   (25 Lectures, 21 Marks)

DDL, DML, CREATE TABLE, DROP TABLE, ALTER TABLE, UPDATE ….SET…., INSERT, DELETE; SQL constructs (SELECT .. FROM… WHERE… GROUP BY ….. HAVING… ORDER BY….), SELECT, DISTINCT, FROM, WHERE, IN, BETWEEN, GROUPBY, HAVING, ORDERBY, View, Definition and use, nested quires, Constraints (NOT NULL , UNIQUE, Check, Primary key, Foreign key), Joining two or more tables using equi-join, Cartesian product and Union, In-built functions like SUM, AVG, COUNT, MAX, MIN, user-defined functions

Unit-4: Performance Tuning   (10 Lectures, 15 Marks)

Understanding Composite Index, Avoid inefficient constructs, unhiding function, OR clause, Sub queries, JOINS + GROUP BY clause

Suggested Readings

1) Vikram Vaswani, MySQL: The Complete Reference, McGraw Hill Professional, 2004, ISBN 0072224770, 9780072224771

2) Paul DuBois, MySQL, Pearson Education, (4th Edition), 2008, ISBN 0132704641, 9780132704649

3) Robert D. Schneider, MySQL Database Design and Tuning, 2005, ISBN-10 : 8131700828
ISBN-13 : 978-8131700822

4) MySQL Administrator's Guide and Language Reference by MySQL AB, 2nd Edition, 27 April 2006, ISBN-10 : 0672328704, ISBN-13 : 978-0672328701.

ITBSEC2013 LAB: Introduction to SQL LAB

(MySQL may be used for LAB)

1.Create a table Employee with the following columns:

Emp_no (numeric) primary key

Emp_name (string)

Join_date (Date)

Basic_pay_fixed_at (numeric)

Date_of_birth (Date)

2.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
23	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. Create a table Student taking the attributes given below

Roll_no, Student_name, Address, Date_of_addmission, 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 column 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:
a) Retrieve the title, author, and publisher names of all books published in 1999 and 2006.
b) Retrieve the title of all books whose one author is 'A Tanenbum'.
c) Get the details of all books whose price is greater than the average price of the books.
d) Get the names of all the books for which an order has been placed.
e) Get the names of all authors who have more than ten books in the catalog.
 f) Get the details of the authors whose books are being sold from the book club.
g) Get the title and price of all books whose price is greater than the maximum of the category average.

ITBMAJ2034: Data Structure
(Credit 4, Total Marks 100)
(Theory: 50 Marks, Practical: 20 Marks, Internal: 30 Marks)

Course Learning Objective

    1) To make acquainted with fundamentals of data structures used in problem solving

    2) To understand the applications of different data structures in computer programs

    3) To empirically analyze linear and non-linear data structures

    4) To utilize efficient searching and sorting algorithms for handling simple and complex data structures

Course Learning Outcome

    1) Learners could recognize and understand the usage of common data structures

    2) Learners could utilize the concept of data structures in problem solving

    3) To analyze the various data structures and its operations

    4) To evaluate problems involving simple and complex data structures

    5) To become accustomed with adapting appropriate data structure for creating solutions

Theory: 60 Lectures

Unit-1: Arrays   **(6 Lectures, 8 Marks)**

Single and Multi-dimensional Arrays, Array Initialization, Array manipulations, Sparse Matrices (Array Representation)

Unit-2: Stacks, Queues and Linked Lists   **(20 Lectures, 19 Marks)**

Implementing single / multiple stack/s in an Array, Prefix, Infix and Postfix expressions, Utility and conversion of these expressions from one to another; Applications of stack; Limitations of Array representation of stack, Normal and Circular representation of Stack in Lists, Array representation of Queue, De-queue, Priority Queues; Singly, Doubly and Circular Lists (Array and Linked representation), Array and Linked representation of Stack and Queue), Sparse Matrices (Linked Representation)

Unit-3: Recursion & Trees   **(24 lectures, 14 Marks)**

Developing Recursive Definition of Simple Problems and their implementation; Advantages and Limitations of Recursion; Understanding what goes behind Recursion (Internal Stack Implementation), Introduction to Tree as a data structure; Binary Trees (Insertion, Deletion, Recursive and Iterative Traversals on Binary Search Trees); Concepts on Threaded Binary Trees and AVL Trees

Unit-4: Searching, Sorting, Hashing   **(10 Lectures, 9 Marks)**

Linear Search, Binary Search, Comparison of Linear and Binary Search, Bubble Sort, Selection Sort, Insertion Sort, Shell Sort, Comparison of Sorting Techniques, Introduction to Hashing, Deleting from Hash Table, Hash Table Reordering, Resolving collision by closed hashing (Open Addressing), open hashing(Separate chaining), Choosing a Hash Function, Perfect Hashing Function

Suggested Readings:

1.Adam Drozdek, "Data Structures and algorithm in C++", Third Edition, Cengage Learning, 2012.

2.SartajSahni, Data Structures, "Algorithms and applications in C++", Second Edition, Universities Press, 2011.

3.Aaron M. Tenenbaum, Moshe J. Augenstein, YedidyahLangsam, "Data Structures Using C and C++:, Second edition, PHI, 2009.

4. Robert L. Kruse, "Data Structures and Program Design in C++", Pearson,1999.

5.D.S Malik, Data Structure using C++,Second edition, Cengage Learning, 2010.

6.Mark Allen Weiss, "Data Structures and Algorithms Analysis in Java", Pearson Education, 3rd edition, 2011

7.Aaron M. Tenenbaum, Moshe J. Augenstein, YedidyahLangsam, "Data Structures Using Java, 2003.

8.Robert Lafore, "Data Structures and Algorithms in Java, 2/E", Pearson/ Macmillan Computer Pub,2003

9.John Hubbard, "Data Structures with JAVA", McGraw Hill Education (India) Private Limited; 2 edition, 2009

10.Goodrich, M. and Tamassia, R. "Data Structures and Algorithms Analysis in Java", 4th Edition, Wiley,2013

11.Herbert Schildt, "Java The Complete Reference (English) 9th Edition Paperback", Tata McGraw Hill, 2014.

12. D. S. Malik, P.S. Nair, "Data Structures Using Java", Course Technology, 2003.

ITBMAJ2034: Data Structures LAB

1.Write a program to search an element from a list. Give user the option to perform Linear or Binary search. Use Template functions.

2.WAP using templates to sort a list of elements. Give user the option to perform sorting using Insertion sort, Bubble sort or Selection sort.

3.Implement Linked List using templates. Include functions for insertion, deletion and search of a number, reverse the list and concatenate two linked lists (include a function and also overload operator +).

4.Implement Doubly Linked List using templates. Include functions for insertion, deletion and search of a number, reverse the list.

5.Implement Circular Linked List using templates. Include functions for insertion, deletion and search of a number, reverse the list.

6.Perform Stack operations using Linked List implementation.

7.Perform Stack operations using Array implementation. Use Templates.

8. Perform Queues operations using Circular Array implementation. Use Templates.

9.Create and perform different operations on Double-ended Queues using Linked List implementation.

10. WAP to scan a polynomial using linked list and add two polynomial.

11.WAP to calculate factorial and to compute the factors of a given no.
        (i)using recursion, (ii) using iteration

12) WAP to display fibonacci series (i)using recursion, (ii) using iteration

13.WAP to calculate GCD of 2 number (i) with recursion (ii) without recursion

14. WAP to create a Binary Search Tree and include following operations in tree:
   (a) Insertion (Recursive and Iterative Implementation)
   (b) Deletion by copying
   (c) Deletion by Merging
   (d) Search a no. in BST
   (e) Display its preorder, postorder and inorder traversals Recursively
   (f) Display its preorder, postorder and inorder traversals Iteratively
   (g) Display its level-by-level traversals
   (h) Count the non-leaf nodes and leaf nodes
   (i) Display height of tree
   (j) Create a mirror image of tree
   (k) Check whether two BSTs are equal or not
15. WAP to convert the Sparse Matrix into non-zero form and vice-versa.
16. WAP to reverse the order of the elements in the stack using additional stack.
17. WAP to reverse the order of the elements in the stack using additional Queue.
18. WAP to implement Diagonal Matrix using one-dimensional array.
19. WAP to implement Lower Triangular Matrix using one-dimensional array.
20. WAP to implement Upper Triangular Matrix using one-dimensional array.
21. WAP to implement Symmetric Matrix using one-dimensional array.
22. WAP to create a Threaded Binary Tree as per inorder traversal, and implement operations like finding the successor / predecessor of an element, insert an element, inorder traversal.
23. WAP to implement various operations on AVL Tree.

ITBMAJ2044: Software Engineering
(Credit 4, Total Marks 100)
(Theory: 50 Marks, Practical: 20 Marks, Internal: 30 Marks)

Course Learning Objective
1) To learn and understand the layered technology implicated in software engineering.
2) To gather knowledge on system engineering and data modeling concepts.
3) To explore the various design processes.
4) To analyze software testing and implement quality control strategies.

Course Learning Outcome
1) Learners could explain the process involved in software engineering.
2) Learners could compute the impact of various risks involved in software development.
3) It enables learners to adapt suitable software model for problem solving.
4) Learners could design and build test cases for software testing and quality management.

Theory: 60 Lectures

Unit-1: Introduction   (10 Lectures, 7 Marks)

The Evolving Role of Software, Software Characteristics, Changing Nature of Software, Software Engineering as a Layered Technology, Software Process Framework, SDLC model (Waterfall, iterative and incremental, prototype, Agile), Capability Maturity Model Integration (CMMI).

Unit-2: Requirement Analysis and Software Project Management (24 Lectures, 19 Marks)

Software Requirement Analysis, Initiating Requirement Engineering Process, Requirement Analysis and Modeling Techniques, Flow Oriented Modeling, Need for SRS, Characteristics and Components of SRS, Estimation in Project Planning Process, Project Scheduling, Software Risks, Risk Identification, Risk Projection and Risk Refinement, RMMM Plan.

Unit-3: Design Engineering   (10 Lectures, 10 Marks)

Design Concepts, Architectural Design Elements, Software Architecture, Data Design at the Architectural Level and Component Level, coupling and cohesion, Mapping of Data Flow into Software Architecture, Modeling Component Level Design

Unit-4: Software testing and Quality Management   (16 Lectures, 14 Marks)

Software Testing Fundamentals, Strategic Approach to Software Testing, Test Strategies for Conventional Software, Validation Testing, System testing, Black-Box Testing, White-Box Testing and their type, Basis Path Testing, Quality Concepts, Software Quality Assurance, Software Reviews, Metrics for Process and Projects.

Suggested Readings:

1.R.S. Pressman, Software Engineering: A Practitioner's Approach (7th Edition), McGraw-Hill, 2009.

2.P. Jalote, An Integrated Approach to Software Engineering (2nd Edition), Narosa Publishing House, 2003.

3. K.K. Aggarwal and Y. Singh, Software Engineering (2nd Edition), New Age International Publishers, 2008.

4.I. Sommerville, Software Engineering (8th edition), Addison Wesley, 2006.

5.D. Bell, Software Engineering for Students (4th Edition), Addison-Wesley, 2005.

6.R. Mall, Fundamentals of Software Engineering (2nd Edition), Prentice-Hall of India, 2004.

ITBMAJ2044 LAB: Software Engineering Lab

Students are to design/build the following items for the sample projects mentioned underneath-

i) Entity Relationship (ER) diagram
ii) Data Dictionary
iii) Data Flow Diagram
iv) Normalization on the database tables (1NF, 2NF, 3NF & BCNF)

Sample Projects:

1. Criminal Record Management: Implement a criminal record management system for jailers, police officers and CBI officers

2. DTC Route Information: Online information about the bus routes and their frequency and fares

3. Car Pooling: To maintain a web based intranet application that enables the corporate employees within an organization to avail the facility of carpooling effectively.

4. Patient Appointment and Prescription Management System

5. Organized Retail Shopping Management Software

6. Online Hotel Reservation Service System

7. Examination and Result computation system

8. Automatic Internal Assessment System

9. Parking Allocation System

10. Wholesale Management System.

ITBMAJ2054: Data Communication & Computer Network-I
(Credit 4, Total Marks 100)
(Theory: 50 Marks, Practical: 20 Marks, Internal: 30 Marks)

Course Learning Objectives
- To provide knowledge on data communication system.
- To get familiar with divergent methods of modulation.
- To analyze various services of layered architecture.

Course Learning Outcomes
- Learners acquire basic understanding of data communication.
- Learners get familiar to various modulation techniques.
- Learners could analyze and evaluate various protocols or services of layered architecture.

Theory: 60 Lectures

Unit-1: Introduction to Data Communication & Network   (20 Lectures, 16 Marks)

Data communication, Components of data communication, Data transmission mode, data communication measurement, Definition of Computer network, Types of Network, Network Topologies, Analog and digital signal, data-rate limits, digital to digital line encoding schemes, pulse code modulation, digital to analog modulation, Multiplexing techniques- FDM, TDM, Transmission media, Discrete Fourier Transform, Discrete Cosine Transform, Circuit switching, packets witching- connectionless datagram switching, connection oriented virtual circuit switching, dial-up modems, digital subscriber line, cable TV for data transfer.

Unit-2: Data Link Layer functions, Multiple Access Protocol and LANs   (15 Lectures, 15 Marks)

Error detection and error correction techniques, data-link control- framing and flow control, error recovery protocols- stop and wait ARQ, go-back-n ARQ, Point to Point Protocol on Internet, CSMA/CD protocols, Ethernet LANS, connecting LAN and back-bone networks, repeaters, hubs, switches, bridges, router and gateways.

Unit-3: Network & Transport Layer Protocols   (20 Lectures, 10 Marks)

Routing; routing algorithms; network layer protocol of Internet- IP protocol, Internet control protocols, Transport services- error and flow control, Connection establishment and release- three way handshake

Unit-4: Overview of Application Layer Protocol   (5 Lectures, 9 Marks)

Overview of DNS protocol, WWW & HTTP protocol.

Suggested Readings

B. A. Forouzan: Data Communications and Networking, Fourth edition, THM ,2007.

A. S. Tanenbaum: Computer Networks, Fourth edition, PHI , 2002

ITBMAJ2054: Data Communication & Computer Network-I LAB

1. Simulate Cyclic Redundancy Check (CRC) error detection algorithm for noisy channel.
2. Simulate and implement stop and wait protocol for noisy channel.
3. Simulate and implement go back n sliding window protocol.
4. Simulate and implement selective repeat sliding window protocol.
5. Simulate and implement distance vector routing algorithm
6. Simulate and implement Dijkstra algorithm for shortest path routing.

ITBMIN2024: Introduction to Java Programming
(Credit: 4, Total Marks: 100)
(Theory: 50 Marks, Practical: 20 Marks, Internal: 30 Marks)

Course Learning Objectives
- To learn and understand the basic features of Java.
- To acquire skills on programming fundamentals.
- To apply the principles of object-oriented programming paradigm.
- To employ reusability for effective usage of code.
- To explore and utilize the exception handling concepts in Java.

Course Learning Outcomes
- Learners would be able to explain fundamental features of Java.
- Learners developed skills on Java programming concepts.
- Learners could implement programming constructs to solve problems.
- Learners could develop applications to solve real-world problems.

Theory: 60 Lectures

Unit-1: Java programming fundamentals   **(12 Lectures, 12 Marks)**
Java Architecture and Features, Understanding the semantic and syntax differences between C++ and Java, Compiling and Executing a Java Program, Variables, Constants, Keywords, Data Types(primitive & non-primitive), Operators (Arithmetic, Logical and Bitwise) and Expressions, Comments, Doing Basic Program Output, Decision Making Constructs (conditional statements and loops) and Nesting, Java Methods (Defining, Scope, Passing and Returning Arguments, Type Conversion and Type and Checking, Built-in Java Class Methods),

Unit-2. Arrays, Strings and I/O   **(10 Lectures, 11 Marks)**
Creating & Using Arrays (One Dimension and Multi-dimensional), Referencing Arrays Dynamically, Java Strings: The Java String class, Creating & Using String Objects, Manipulating Strings, String Immutability & Equality, Passing Strings To & From Methods, String Buffer Classes. Simple I/O using System.out and the Scanner class, Byte and Character streams, Reading/Writing from console and files.

Unit-3. Object-Oriented Programming (OOP) Overview   **(20 Lectures, 15 Marks)**
Principles of Object-Oriented Programming, Defining & Using Classes, Controlling Access to Class Members, Class Constructors, Method Overloading, Class Variables & Methods, Objects as parameters, final classes, Object class, Garbage Collection.
Inheritance: (Single Level and Multilevel, Method Overriding, Dynamic Method Dispatch, Abstract Classes), Interfaces and Packages, Extending interfaces and packages, Package and Class Visibility, Using Standard Java Packages (util, lang, io, net), Wrapper Classes, Autoboxing/Unboxing, Enumerations and Metadata.
Exception types, uncaught exceptions, throw, built-in exceptions, Creating your own exceptions; Multi-threading: The Thread class and Runnable interface, creating single and multiple threads, Thread prioritization, synchronization and communication, suspending/resuming threads. Using java.net package, Overview of TCP/IP and Datagram programming. Accessing and manipulating databases using JDBC.

Unit-4. Applets and Event Handling   **(18 Lectures, 12 Marks)**

Java Applets: Introduction to Applets, Writing Java Applets, Working with Graphics, Incorporating Images & Sounds. Event Handling Mechanisms, Listener Interfaces, Adapter and InnerClasses. The design and Implementation of GUIs using the AWT controls, Swing components of Java Foundation Classes such as labels, buttons, text fields, layout managers, menus, events and listeners; Graphic objects for drawing figures such as lines, rectangles, ovals, using different fonts. Overview of Servlets.

Suggested Readings

1. Ken Arnold, James Gosling, David Homes, "The Java Programming Language", 4th Edition, 2005.

2. James Gosling, Bill Joy, Guy L Steele Jr, GiladBracha, Alex Buckley"The Java Language Specification, Java SE 8 Edition (Java Series)", Published by Addison Wesley, 2014.

3. Joshua Bloch, "Effective Java" 2nd Edition,Publisher: Addison-Wesley, 2008.

4. Cay S. Horstmann, GaryCornell, "Core Java 2 Volume 1 ,9th Edition,Printice Hall.2012

5. Cay S. Horstmann, Gary Cornell, "Core Java 2 Volume 2 - Advanced Features)", 9th Edition, Printice Hall.2013

6. Bruce Eckel, "Thinking in Java", 3rd Edition, PHI, 2002.

7. E. Balaguruswamy, "Programming with Java", 4th Edition, McGraw Hill.2009.

8. Paul Deitel, Harvey Deitel, "Java: How to Program", 10th Edition, Prentice Hall, 2011.

9. "Head First Java", Orielly Media Inc. 2nd Edition, 2005.

10. David J. Eck, "Introduction to Programming Using Java", Published by CreateSpace Independent Publishing Platform, 2009.

11. John R. Hubbard, "Programming with JAVA", Schaum's Series, 2nd Edition, 2004.

ITBMIN2024LAB: Introduction to Java Programming Lab

1. To find the sum of any number of integers entered as command line arguments
2. To find the factorial of a given number
3. To learn use of single dimensional array by defining the array dynamically.
4. To learn use of .lenth in case of a two dimensional array
5. To convert a decimal to binary number
6. To check if a number is prime or not, by taking the number as input from the keyboard
7. To find the sum of any number of integers interactively, i.e., entering every number from the keyboard, whereas the total number of integers is given as a command line argument
8. Write a program that show working of different functions of String and StringBufferclasss like setCharAt(, setLength(), append(), insert(), concat()and equals().
9. Write a program to create a —distance class with methods where distance is computed in terms of feet and inches, how to create objects of a class and to see the use of this pointer
10. Modify the —distance class by creating constructor for assigning values (feet and inches) to the distance object. Create another object and assign second object as reference variable to another object reference variable. Further create a third object

which is a clone of the first object.

11. Write a program to show that during function overloading, if no matching argument is found, then java will apply automatic type conversions(from lower to higher data type)

12. Write a program to show the difference between public and private access specifiers. The program should also show that primitive data types are passed by value and objects are passed by reference and to learn use of final keyword

13. Write a program to show the use of static functions and to pass variable length arguments in a function.

14. Write a program to demonstrate the concept of boxing and unboxing.

15. Create a multi-file program where in one file a string message is taken as input from the user and the function to display the message on the screen is given in another file (make use of Scanner package in this program).

16. Write a program to create a multilevel package and also creates a reusable class to generate Fibonacci series, where the function to generate fibonacii series is given in a different file belonging to the same package.

17. Write a program that creates illustrates different levels of protection in classes/subclasses belonging to same package or different packages

18. Write a program —DivideByZero that takes two numbers a and b as input, computes a/b, and invokes Arithmetic Exception to generate a message when the denominator is zero.

19. Write a program to show the use of nested try statements that emphasizes the sequence of checking for catch handler statements.

20. Write a program to create your own exception types to handle situation specific to your application (Hint: Define a subclass of Exception which itself is a subclass of Throwable).

21. Write a program to demonstrate priorities among multiple threads.

22. Write a program to demonstrate multithread communication by implementing synchronization among threads (Hint: you can implement a simple producer and consumer problem).

23. Write a program to create URL object, create a URLConnection using the openConnection() method and then use it examine the different components of the URLand content.

24. Write a program to implement a simple datagram client and server in which a message that is typed into the server window is sent to the client side where it is displayed.

25. Write a program that creates a Banner and then creates a thread to scrolls the message in the banner from left to right across the applet's window.

26. Write a program to get the URL/location of code (i.e. java code) and document(i.e. html file).

27. Write a program to demonstrate different mouse handling events like mouseClicked(), mouseEntered(), mouseExited(), mousePressed, mouseReleased() and mouseDragged().

28. Write a program to demonstrate different keyboard handling events.

29. Write a program to generate a window without an applet window using main() function. 30. Write a program to demonstrate the use of push buttons.

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ITBINT2012: Internship

(Credit: 2, Total Marks: 50)

ITBMAJ3014: Design and Analysis of Algorithm
(Credit 4, Total Marks 100)
(Theory: 50 Marks, Practical: 20 Marks, Internal: 30 Marks)

Course Learning Objectives
- To understand and apply fundamental techniques of designing algorithms.
- To comprehend and utilize searching and sorting techniques.
- To develop skills in designing efficient algorithms to handle data.

Course Learning Outcomes
- Learners would be able to implement Algorithm Design Techniques.
- Learners could analyze and utilize appropriate searching and sorting techniques in solving problems.
- Learners could implement suitable algorithms for creating solutions to the real-world problems.

Theory: 60 Lectures

Unit-1: Introduction to Algorithm Design Techniques   (10 Lectures, 10 Marks)
Basic Design and Analysis techniques of Algorithms, Correctness of Algorithm, Iterative techniques, Divide and Conquer, Dynamic Programming, Greedy Algorithms.

Unit-2: Sorting and Searching Techniques   (20 Lectures, 15 Marks)
Elementary sorting techniques–Bubble Sort, Insertion Sort, Merge Sort, Advanced Sorting techniques - Heap Sort, Quick Sort, Sorting in Linear Time - Bucket Sort, Radix Sort and Count Sort, Searching Techniques, complexity analysis

Unit-3: Lower Bounding Techniques, Balanced Trees and Graphs   (16 Lectures, 14 Marks)
Decision Trees, Red-Black Trees, Graph representation, Algorithms–Breadth First Search, Depth First Search and its Applications, Minimum Spanning Trees

Unit-4: String Processing and Advanced Analysis Technique   (14 Lectures, 11 Marks)
String Matching, KMP Technique, Amortized analysis, Introduction to IP Complete Problems.

Suggested Readings:
1. T.H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein Introduction to Algorithms, PHI, 3rd Edition 2009
2. Sarabasse& A.V. Gelder Computer Algorithm – Introduction to Design and Analysis, Publisher – Pearson 3rd Edition 1999

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ITBMAJ3014: Design and Analysis of Algorithms Lab

1. i) Implement Insertion Sort (The program should report the number of comparisons)
    ii) Implement Merge Sort(The program should report the number of comparisons)
2. Implement Heap Sort(The program should report the number of comparisons)
3. Implement Randomized Quick sort (The program should report the number of comparisons)
4. Implement Radix Sort
5. Create a Red-Black Tree and perform following operations on it:
    i.   Insert a node
    ii. Delete a node
    iii. Search for a number & also report the color of the node containing this number.
6. Write a program to determine the LCS of two given sequences
7. Implement Breadth-First Search in a graph
8. Implement Depth-First Search in a graph
9. Write a program to determine the minimum spanning tree of a graph

For the algorithms at S.No 1 to 3 test run the algorithm on 100 different inputs of sizes varying from 30 to 1000. Count the number of comparisons and draw the graph. Compare it with a graph of nlogn.

ITBMAJ3024: Internet and Web Technology
(Credit 4, Total Marks 100)
(Theory: 50 Marks, Practical: 20 Marks, Internal: 30 Marks)

Course Learning Objectives
- To acquire basic knowledge on internet and its features.
- To learn and understand about web browsers.
- To apply HTML basics for designing webpage.
- To utilize scripting language for database connectivity.
- To design and Implement Graphical User Interface tools.

Course Learning Outcomes
- Learners would be able to describe Internet and its architecture.
- Learners utilize search engines.
- Learners Implement html and Java scripting language for designing interactive website.
- Learners design and implement GUI tools to build user friendly website that is responsive and efficient.

Theory 60 Lectures

Unit-1: Overview of the Internet and its architecture　　　(12 Lectures, 10 Marks)
　　　A brief history of Internet-ARPANET, Internet services-email, telnet, ftp , Internet components- web page, home page, web site, types of Internet connection- dial-up, DSL, Broadband, VSAT, WiFi, Firewall, IP addresses and its working Principles, domain name system, URL

Unit-2: Web Browsers, Web Servers and **HTML Basics**　　　(13 Lectures, 12 Marks)
　　　Web browsers-Internet Explorer, Google Chrome, Netscape Navigator etc., Web browser helper applications, Web servers-APACHE, Web server architecture
　　　Basic HTML, HTML tags, creating list in HTML, hyperlinks, HTML forms, tables in HTML, frames in HTML, Insertion of image, Audio, Video files, DHTML, XML-Introduction, Need for XML, Advantages of XML, simple XML programs, Document Type Definition(DTD).

Unit-3: JavaScript Fundamentals and JDBC connectivity　　　(20 lectures, 16 Marks)
　　　History of JavaScript, Client side Scripting languages, Data types, operators, functions, control structures, Events and Event handling, JavaScript Libraries- string, date and time, Regular expressions, Creating interactive documents using JavaScript.
　　　JDBC Fundamentals, Establishing Connectivity and working with connection interface, Working with statements, Creating and Executing SQL Statements, Working with Result Set Objects.

Unit-4: Applets and Event Handling   (15 Lectures, 12 Marks)

Introduction to Applets, Writing Java Applets, Working with Graphics, Incorporating images & Sounds, Event Handling Mechanisms, Listener Interfaces, Adapter and Inner Classes, The design and Implementation of GUIs using the AWT controls, Swing components of Java Foundation Classes such as labels, buttons, text fields, layout managers, menus, events and listeners, Graphic objects for drawing figures such as lines, rectangles, ovals, using different fonts

Suggested Readings

1. HTML-A Beginner's Guide, Tata McGraw-Hill Education, 2009
2. Ivan Bayross, Web Enabled Commercial Application Development Using Html, Dhtml, javascript, Perl Cgi , BPB Publications, 2009
3. J. A. Ramalho, Learn Advanced HTML 4.0 with DHTML, BPB Publications, 2007
4. D.R. Brooks, An Introduction to HTML and Javascript for Scientists and Engineers, Springer W. Willard,2009
5. Ken Arnold, James Gosling, David Homes, "The Java Programming Language", 4th Edition, 2005.
6. James Gosling, Bill Joy, Guy L Steele Jr, GiladBracha, Alex Buckley"The Java Language Specification, Java SE 8 Edition (Java Series)", Published by Addison Wesley, 2014.
7. Joshua Bloch, "Effective Java" 2nd Edition,Publisher: Addison-Wesley, 2008.
8. Cay S. Horstmann, GaryCornell, "Core Java 2 Volume 1, 9th Edition,Printice Hall.2012
9. Bruce Eckel, "Thinking in Java", 3rd Edition, PHI, 2002.
10. E. Balaguruswamy, "Programming with Java", 4th Edition, McGraw Hill.2009.
11. Paul Deitel, Harvey Deitel, "Java: How to Program", 10th Edition, Prentice Hall, 2011.
12. David J. Eck, "Introduction to Programming Using Java", Published by CreateSpace Independent Publishing Platform, 2009.
13. John R. Hubbard, "Programming with JAVA", Schaum's Series, 2nd Edition, 2004.

ITBMAJ3024 LAB: Internet and Web Technology LAB

HTML

Practical exercises based on concepts listed in theory using HTML.

1. Create HTML document with following formatting – Bold, Italics, Underline, Colors, Headings, Title, Font and Font Width, Background, Paragraph, Line Brakes, Horizontal Line, Blinking text as well as marquee text.
2. Create HTML document with Ordered and Unordered lists, Inserting Images, Internal and External linking
3. Create HTML document with Table:

4. Create Form with Input Type, Select and Text Area in HTML.

5. Create an HTML containing Roll No., student's name and Grades in a tabular form.

6. Create an HTML document (having two frames) which will appear as follows:

About Department 1 Department 2 Department 3	This frame would show the contents according to the link clicked by the user on the left frame.

7. Create an HTML document containing horizontal frames as follows:

Department Names (could be along with Logos)

Contents according to the Link clicked

8. Create a website of 4 to 6 pages with different effects as mentioned in above problems.

9. 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

JAVASCRIPT
   1) Print a table of numbers from 5 to 15 and their squares and cubes using alert.
   2) Print the largest of three numbers.
   3) Find the factorial of a number n.
   4) Enter a list of positive numbers terminated by Zero. Find the sum and average of these numbers.
   5) Write a program to get the URL/location of code (i.e. java code) and document(i.e. html file).
   6) Write a program to demonstrate different mouse handling events like mouseClicked(), mouseEntered(), mouseExited(), mousePressed, mouseReleased() and mouseDragged().
   7) Write a program to demonstrate different keyboard handling events.
   8) Write a program to generate a window without an applet window using main() function.
   9) Write a program to demonstrate the use of push buttons.

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ITBMAJ3034: Theory of Computation
(Credit: 4, Total Marks: 100)
(Theory: 50 Marks, Practical: 20 Marks, Internal: 30 Marks)

Course Learning Objectives
- To learn basic operations on language.
- To apply the formal models of computation and their relationships with formal languages.
- To utilize regular and context free languages.
- To evaluate models of computation.

Course Learning Outcomes
- Learners would be able to know about language characteristics.
- Learners would be able to implement regular languages and context free languages.
- Learners would be able to assess different models of computation.
- Learners would be able to design models of computation machine to recognize simple language.

Theory: 60 Lectures

Unit-1: Languages   (10 Lectures, 10 Marks)

Alphabets, string, language, Basic Operations on language, Concatenation, Union, Kleene Star.

Unit-2: Finite Automata and Regular Languages   (18 Lectures, 14 Marks)

Regular Expressions, Transition Graphs, Deterministic and non-deterministic finite automata, NFA to DFA Conversion, Regular languages and their relationship with finite automata, Pumping lemma and closure properties of regular languages.

Unit-3: Context free languages   (17 Lectures, 15 Marks)

Context free grammars, parse trees, ambiguities in grammars and languages, Pushdown automata (Deterministic and Non-deterministic), Properties of context free languages, normal forms.

Unit-4: Turing Machines and Models of Computations   (15 Lectures, 11 Marks)

Turing Machine as a model of computation, Universal Turing Machine, Language acceptability, decidability, halting problem, Recursively enumerable and recursive languages.

Suggested Readings

1.Daniel I.A.Cohen, Introduction to computer theory, John Wiley,1996

2.Lewis & Papadimitriou, Elements of the theory of computation , PHI 1997.

3.Hoperoft, Aho, Ullman, Introduction to Automata theory, Language & Computation –3rd Edition, Pearson Education. 2006

4.P. Linz, An Introduction to Formal Language and Automata 4th edition Publication Jones Bartlett, 2006

ITBMAJ3034 LAB: Theory of Computation LAB

1) Design a Finite State Machine (FSM) that accepts all strings over input symbols {0, 1} having three consecutive 1's as a substring.
2) Design a Finite State Machine (FSM) that accepts all strings over input symbols {0, 1} which are divisible by 3.
3) Design a Finite State Machine (FSM) that accepts all decimal string which are divisible by 3.
4) Design a Push Down Automata (PDA) that accepts all string having equal number of 0's and 1's over input symbol {0, 1} for a language 0n1n where n >= 1.
5) Design a Program to create PDA machine that accept the well-formed parenthesis.
6) Design a PDA to accept WCWR where w is any binary string and WR is reverse of that string and C is a special symbol.
7) Design a Turing Machine that calculates 2's complement of given binary string.
8) Design a Turing Machine which will increment the given binary number by 1.
9) Design a Turing Machine that's accepts the following language anbncn where n>0.
10) Design a Turing Machine to accept WR where w is any binary string and WR is reverse of that string.

ITBMAJ3044: PHP Programming
(Credit: 4, Total Marks: 100)
(Theory: 50 Marks, Practical: 20 Marks, Internal: 30 Marks)

Course Learning Objectives
- To learn and understand PHP and its features.
- To acquire basic skills on semantics and syntax of PHP scripting language.
- To implement PHP and HTML to build a web form page.
- To design and employ dynamic websites and web applications for interacting with databases.

Course Learning Outcomes
- Learners would be able to acquire knowledge on PHP fundamentals.
- Learners develop skills on PHP scripts to handle HTML forms.
- Learners could implement scripting language to design and set up web applications.
- Learners develop PHP programs to solve general web application development tasks.

Theory 60 Lectures

UNIT 1: Introduction to PHP (12 Lectures, 12 Marks)

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 associatively.

UNIT 2: PHP control structures & Handling HTML form (18 Lectures, 13 Marks)

PHP IF Else conditional statements (Nested IF and Else), Switch case, while, For and Do While Loop, Goto, Break, Continue and Exit, Capturing Form Data, GET and POST form methods, Dealing with multi value fields, Redirecting a form after submission

UNIT 3: String Manipulation, Regular Expression and Array (22 Lectures, 16 Marks)

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

UNIT 4: PHP Functions (8 Lectures, 9 Marks)

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

ITBMAJ3044: PHP Programming LAB

(N.B: Student has to perform any ten of the following experiments)

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.

Suggested Readings

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 Professsional, 2008.
5. David Sklar, Adam Trachtenberg, "PHP Cookbook: Solutions & Examples for PHP Programmers", 2014.

ITBMIN3014: Introduction to Python Programming
(Credit: 4, Total Marks: 100)
(Theory: 50 Marks, Practical: 20 Marks, Internal: 30 Marks)

Course Learning Objectives
- To learn and understand basic features of programming.
- To understand and apply programming constructs to solve problems.
- To apply various built-in and user-defined types and functions in applications.
- To know and analyze file operations.

Course Learning Outcomes
- Learners would be able to acquire knowledge on programming fundamentals.
- Learners develop modular python programs to solve computational problems.
- Learners could use lists, sets, tuples and dictionary in applications.
- Learners could utilize a suitable programming construct and data structure for searching and sorting problems.
- Learners would be able to operate files handling functions.

Theory 60 Lectures

UNIT 1: Problem Solving through Computer   (10 Lectures, 10 Marks)
Problem definition, Concept of problem solving, Flowchart, decision table, algorithms, Structured programming concepts, Programming methodologies viz. top-down and bottom-up programming, Program design, Types of errors in programming, Debugging, Documentation, Concept of OOPS.

UNIT 2: Introduction to Python   (24 Lectures, 17 Marks)
Structure of a Python Program, Elements of Python, Python Interpreter, Using Python as calculator, Python shell, Indentation, Data types (List, set, Tuple, Dictionary, compound data types), 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). Input and

Output Statements, Control statements (Branching, Looping, Conditional Statement, the return statement, Recursion, Stack diagrams for recursive functions, Multiple assignment, Exit function, Difference between break, continue and pass, Defining Functions, Working with Arguments, Tables, Two-dimensional tables

UNIT 3: Arrays, Strings and Lists, Searching and Sorting   (18 Lectures, 14 Marks)
String as a compound data type, Length, Traversal and the for loop, String slices, String comparison, A find function, Looping and counting, List values, Accessing elements, List length, List membership, Lists and for loops, List operations, List deletion, Cloning lists, Nested lists Linear and Binary Search, Bubble sort, Selection sort and Insertion sort.

UNIT 4: Python File Operations   (8 Lecture, 9 Marks)
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.

<u>ITBMIN3014 LAB: Introduction to Python LAB</u>

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>=50 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 method to calculate GCD of two numbers.
6) Write a program to print all prime number between a range(for example between 1 and 100).
7) Write a program to compare three numbers and print the largest one.
8) Write a program to find factorial of the given number.
9) Write a program to find sum of the following series for n terms: 1 – 2/2! + 3/3! - - - - - n/n!
10) Write a program to calculate the sum and product of two compatible matrices
11) Write a function that takes a string input and checks if it is a palindrome or not.
12) Write a list function to convert a string into a list, as in list ('abc') gives [a, b, c].
13) Write a program to implement linear and binary search on lists.
14) Write a program to sort a list using insertion sort and bubble sort and selection sort.
15) Write a program to read and write files.

Suggested Readings and Materials

1. T. Budd, Exploring Python, TMH, 1st Ed, 2011
2. Python Tutorial/Documentation www.python.or 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

6th SEMESTER

ITBMAJ3054: COMPUTER GRAPHICS
(Credit 4, Total Marks 100)
(Theory: 50 Marks, Practical: 20 Marks, Internal: 30 Marks)

Course Learning Objectives
- To learn and understand the basic elements of Computer Graphics.
- To focus and apply fundamental techniques of graphics for modeling, rendering and interaction aspects of computer graphics.
- To emphasize and utilize the basic principles needed for surface determination.

Course Learning Outcomes
- Learners would be able to describe Graphical Input and output devices along with display devices.
- Learners could implement algorithms for drawing line, circle, ellipse, for line clipping, polygon clipping and filling.
- Learners could implement 2D, 3D object representation, Transformation, projections.
- Learners could implement visible surface determination algorithms, Illumination models and surface rendering methods and color models.

Theory: 60 Lectures

Unit-1: Introduction to Graphics and its Hardware   (17 Lectures, 13 Marks)

Basic elements of Computer graphics-line, shape, form, texture, space, imagery, typography, color, Applications of Computer Graphics (cartography, Medical diagnostics, Education, Computer Games etc.), Input Devices- Keyboard, Mouse, Trackball & Space ball, Joystick, Data Glove, Digitizers, Image Scanners, Touch panels, Light Pens systems, Output display devices-Refresh CRT, Raster-Scan display and Random-scan display, Direct view storage tubes, Emissive & Non-emissive flat-panel, Displays Plasma panels, Thin-film electrostatic displays, LED and LCD monitor,
Architecture of Raster and Random scan display devices

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Unit-2: Fundamental Techniques in Graphics   (18 Lectures, 15 Marks)

Color display techniques-Beam penetration method and Shadow-mask method, Raster scan line, circle and ellipse drawing, thick primitives, Polygon filling, line and polygon clipping algorithms, Bresenham's line drawing algorithm, mid-point circle drawing algorithm, Cohen and Sutherland line clipping algorithm, Sutherland Hodgeman algorithm, 2D and 3D Geometric Transformations, 2D and 3D Viewing Transformations (Projections- Parallel and Perspective), Vanishing points.

Unit-3: Geometric Modeling   (10 Lectures, 10 Marks)

Representation of curves & surfaces, Bezier curve and Hermite curve (Definition, properties, algorithms)

Unit-4: Visible Surface Determination and Rendering   (15 Lectures, 12 Marks)

Definition, algorithms for visible surface detection – Depth buffer method, A-buffer method, Ray- casting method, curved surfaces, Hidden surface elimination, Basic illumination models-Ambient light, diffuse reflection, Specula reflector and Phong model, Basic color models and Computer Animation (Definition and types)

Suggested Readings

1. J.D.Foley, A.Van Dan, Feiner, Hughes Computer Graphics Principles & Practice 2nd edition Publication Addison Wesley 1990.
2. D.Hearn, Baker: Computer Graphics, Prentice Hall of India 2008.
3. D.F.Rogers Procedural Elements for Computer Graphics, McGraw Hill 1997.
4. D.F.Rogers, Adams Mathematical Elements for Computer Graphics, McGraw Hill 2nd edition 1989.

ITBMAJ3054: Computer Graphics LAB
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1. Write a program to implement Bresenham's line drawing algorithm.
2. Write a program to implement mid-point circle drawing algorithm.
3. Write a program to clip a line using Cohen and Sutherland line clipping algorithm.
4. Write a program to clip a polygon using Sutherland Hodgeman algorithm.
5. Write a program to apply various 2D transformations on a 2D object (use homogenous coordinates).
6. Write a program to apply various 3D transformations on a 3D object and then apply parallel and perspective projection on it.
7. Write a program to draw Hermite/Bezier curve.

ITBMAJ3064: ARTIFICIAL INTELLEGENCE
(Credit: 4, Total Marks: 100)
(Theory: 50 Marks, Practical: 20 Marks, Internal: 30 Marks)

Course Learning Objectives
- To identify problems where artificial intelligence techniques will be applicable.
- To learn how to solve AI based problems with appropriate techniques.
- To participate in the design of intelligent systems and to learn from experience with appropriate knowledge representation.
- To deal with problem involving uncertainty and inconsistency.

Course Learning Outcomes
- Learners would be able to identify problems relating to artificial intelligence.
- Learners would learn how to solve AI based problems with appropriate techniques.
- Learners would be able to design intelligent systems learning from experience and with appropriate knowledge representation.
- Learners would solve problems involving uncertainty and inconsistency.

Theory: 60 Lectures
Unit-1: Introduction (6 Lectures, 8 Marks)

Introduction to Artificial Intelligence, Background and Applications, Turing Test and Rational Agent, approaches to AI, Introduction to Intelligent Agents- their structure, behavior and environment.

Unit-2: Problem Solving and Searching Techniques (20 Lectures, 17 Marks)

Problem Characteristics, Production Systems, Control Strategies, Breadth First Search, Depth First Search, Hill climbing and its Variations, Heuristics Search Techniques: Best First Search, A* algorithm, Constraint Satisfaction Problem, Means-End Analysis, Introduction to Game Playing, Min-Max and Alpha-Beta pruning algorithms.

Unit-3: Knowledge Representation (20 Lectures, 15 Marks)

Introduction to First Order Predicate Logic, Resolution Principle, Unification, Semantic Nets, Conceptual Dependencies, Frames and Scripts, Production Rules, Conceptual Graphs,
Basics of PROLOG (Programming in Logic)

Unit-4: Uncertainty, Inconsistencies and Natural Language (14 Lectures, 10 Marks)

Truth Maintenance System, Default Reasoning, Probabilistic Reasoning, Bayesian Probabilistic Inference, Possible World Representations, Parsing Techniques, Context-Free and Transformational Grammars, Recursive and Augmented Transition Nets.

Suggested Readings

1. DAN.W. Patterson, Introduction to A.I and Expert Systems – PHI, 2007.
2. Russell &Norvig, Artificial Intelligence-A Modern Approach, LPE, Pearson Prentice Hall, 2nd edition, 2005.
3. Rich & Knight, Artificial Intelligence – Tata McGraw Hill, 2nd edition, 1991.
4. W.F. Clocksin and Mellish, Programming in PROLOG, Narosa Publishing House, 3rd edition, 2001.
5. Ivan Bratko, Prolog Programming for Artificial Intelligence, Addison-Wesley, Pearson Education, 3rd edition, 2000.

ITBMAJ3064: Artificial Intelligence Lab
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1. Write a prolog program to calculate the sum of two numbers.
2. Write a prolog program to find the maximum of two numbers.
3. Write a prolog program to calculate the factorial of a given number.
4. Write a prolog program to calculate the nth Fibonacci number.
5. Write a prolog program, insert_nth(item, n, into_list, result) that asserts that result is the list into_list with item inserted as the n'th element into every list at all levels.
6. Write a Prolog program to remove the Nth item from a list.
7. Write a Prolog program, remove-nth(Before, After) that asserts the After list is the Before list with the removal of every n'th item from every list at all levels.
8. Write a Prolog program to implement append for two lists.
9. Write a Prolog program to implement palindrome(List).
10. Write a Prolog program to implement max(X,Y,Max) so that Max is the greater of two numbers X and Y.
11. Write a Prolog program to implement maxlist(List,Max) so that Max is the greatest number in the list of numbers List.
12. Write a Prolog program to implement sumlist(List,Sum) so that Sum is the sum of a given list of numbers List.
13. Write a Prolog program to implement two predicates evenlength(List) and oddlength(List) so that they are true if their argument is a list of even or odd length respectively.
14. Write a Prolog program to implement reverse(List,ReversedList) that reverses lists.
15. Write a Prolog program to implement maxlist(List,Max) so that Max is the greatest number in the list of numbers List using cut predicate.
16. Write a Prolog program to implement GCD of two numbers.
17. Write a prolog program that implements Semantic Networks/Frame Structures.

ITBMAJ3074: SYSTEM ADMINISTRATION USING LINUX
(Credit: 4, Total Marks: 100)
(Theory: 50 Marks, Practical: 20 Marks, Internal: 30 Marks)

Course Learning Objectives
- To make learners understand the basic standards of system administration.
- To acquaint with essential features of Linux and apply it for administration of system.
- To acquire knowledge on file system and develop skills for processes management.
- To analyze administrative commands for system management.
- To utilize proficiency in user authentication process and network management.

Course Learning Outcomes
- Learners would become familiar with basic concepts on system administration using Linux.
- Learners would develop understanding of file system and processes for proper working of the system.
- Learners would be able to apply system administration commands to solve various technical issues.
- Learners would be able to manage user validation and network trouble shooting.

Theory 60 Lectures

Unit-1: Introduction to Linux System Administration　　　　(10 Lectures, 12 Marks)

About System Administration, Duties of System Administrator, Basic features of the Linux operating system, Installation requirements, Partitioning the Hard drive in Linux, Installing the Linux system, installing and configuring software in Linux, Linux kernel program, system Startup and Shutdown, Standard I/O, Standard error, redirection and piping.

Unit-2: Basics of Linux file system　　　　(12 Lectures, 13 Marks)

File System hierarchy and types, absolute and relative path names, Basic commands for files and directories- ls, cp, mv, rm, mkdir, rmdir, more, creating and viewing files, mounting and unmounting file systems and partitions, Structure of /etc/fstab file and its purpose, I-node, directories, hard link, symbolic link, setting user and group ownership of files and access permissions, study of different linux shells (sh, bash, csh, zsh), Environment variable, Bash variables, login vs non-login shells, Shell script basics

Unit-3: Process Organization　　　　(14 Lectures, 12 Marks)

Basic commands for starting and stopping processes, basic process attributes and their role in access control, Examining the list of running processes on the system and understand the data presented there, background process, sending signals to processes and modifying process priorities, job control, crontab file format, backup and restore procedure, configuring the print queue, selecting the printer driver, editing the printer configuration, deleting printer setting, default printer.

Unit-4: Managing user accounts and Network configuration　　　　(24 Lectures, 13 Marks)

Adding user, password, creating groups, adding and deleting groups, viewing user account information, understanding the 'root' account, implementing sudo, file ownership and access permission, system monitoring and logging, monitoring memory usage, disk space usage and I/O activity, logging and its necessity, customizing system

log information, IP address classes and netmasks, Network Address, Netmask and Gateway, configuring Interface with ifconfig, adding routes, ping, netstat, traceroute, telnet, Understanding the significance of the /etc/services file and well known port numbers, Basics of configuring NFS, NIS, DNS, FTP, Squid Proxy, DHCP server, iptables and firewall, Basic Network Security Issues.

Suggested Readings
1) Richard Peterson, Linux: The Complete Reference 6th Edition, McGraw Hill Education, 2008
2) Aeleen Frisch , Essential System Administration , O'REILLY, 3rd ed., 2002
3) Evi Nemeth, Garth Snyder, Trent R. Hein, Ben Whaley , UNIX and Linux System Administration , 4th ed., 2010
4) Sobel M.: A Practical Guide to Linux Commands, Editors, and Shell Programming, Pearson Education, 2006
5) Red Hat Linux, Proffitt, PHI
6) Introduction to system Administration, IBM series, PHI

ITBMAJ3074: SYSTEM ADMINISTRATION USING LINUX LAB

1. Installation of Linux System

2. Partitioning Hard drive in Linux

3. Installing and configuring software in Linux

4. Basic commands for files and directories- ls, cp, mv, rm, mkdir, rmdir, more, creating and viewing files, mounting and unmounting file systems and partitions

5. Creating, managing Users Accounts, Groups, and Permissions

6. Managing Processes

7. Configuring Device files

8. Learn the significance and usage of /etc/services file, /etc/hosts file

9. Configure a LAN in Linux environment, Configure the NIC using ifconfig command,

10. Starting and stopping network services in Linux system, exploring the following commands
    a. ifup
    b. ifdown
    c. ping

11. Exercising remote login using ssh (The secure shell) and remote copy using scp (secure copy)

ITBMAJ3084: COMPILER DESIGN
(Credit: 4, Total Marks: 100)
(Theory: 50 Marks, Practical: 20 Marks, Internal: 30 Marks)

Course learning Objectives
- To acquire knowledge of different phases of compiler.
- To understand about the NFA, DFA and lexical analyzer.
- To understand the parser and its types i.e. Top-Down and Bottom-Up parsers and construction of LR, SLR and LALR parser table.
- To understand the target machine's run time environment, its instruction set for code generation and techniques used for code optimization.

Course learning Outcomes
- Learner would be able to understand the significance of compiler.
- Learner could be able to differentiate the NFA and DFA.
- Learner could be able to construct the parser.
- Learner would be able to design code generation and implementation of code optimization.

Theory: 60 Lectures

Unit 1: Introduction   (10 Lectures, 8 Marks)
Compiler, Phases of compiler. Overview of working of a compiler, linker, loader.

Unit 2: Lexical Analysis   (14 Lectures, 11 Marks)
NFA, DFA, conversion from NFA to DFA. Regular expression, Regular expression to NFA conversion. Minimization of DFA, Structure of Lexical analyze, use of finite automata to write lexical analyzer .

Unit 3: Syntax analysis   (14 Lectures, 16 Marks)
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).

Unit 4: Code generation and Optimization   (22 Lectures, 15 Marks)
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, Target code generation issues; register allocation, Runtime storage management. DAG, basic blocks, Common sub expression elimination, variable propagation, code motion, strength reduction, elimination of dead code.

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

ITBMAJ3084: Compiler Design Lab

1. Write a program to generate tokens forgiven lexeme
2. Write a c program to find whether the string is parsing or not.
3. Write a program to implement simple lexical analyzer using c language.
4. Write a program to generate syntax tree.
5. write a program to construct NFA for the given regular expression
6. write a program to construct DFA for the given regular expression
7. Write a program to implement symbol table using c language.

ITBMIN3024: INTRODUCTION TO R-PROGRAMMING
(Credit: 4, Total Marks: 100)
(Theory: 50 Marks, Practical: 20 Marks, Internal: 30 Marks)

Course Learning Objectives
- To understand and gain familiarity with R-programming environment
- To apply various R-programming constructs to solve computational problems
- To work on different file handling operations
- To utilize visualizing tools for analyzing the data
- To gain knowledge on different data preprocessing activities and building applications

Course Learning Outcomes
- Learners would be able to work on R-programming environment
- Learners would be able to use R- programming constructs to solve problems
- To work on different file handling operations
- Learners would visualize data using R-tools such as Histogram, Box Plot, Bar chart etc.
- Learners would employ data manipulation tools to resolve different data preprocessing.

Theory 60 Lectures

Unit 1 Introduction to R   (12 Lectures, 12 Marks)

Overview of R, Installation and configuration of R programming environment, R data types and objects- R Reserved Words, Variables & Constants, R Operators and Operator Precedence, Decision and Loop- if…else, for loop, while loop, break & next, functions, scoping rules, Loop functions, debugging tools, Simulation, code profiling

Unit 2 Data Structures and charts   (18 Lectures, 15 Marks)

Vectors, Matrices and Lists, Data Frames and Factors, Slicing, Selection and Filtering, Visualizing data using Bar chart, Pie Chart, scatter plot, line plot, Histogram, Box Plot

Unit-3 : File Reading and Writing   (12 Lectures, 10 Marks)

Basic concept of files, basic file handling operations, Read/write data using text files, csv files and excel sheet, Retrieving data from websites

Unit-4 : Data Manipulation and GUI   (18 Lectures, 13 Marks)

Clean data-Missing and Duplicate Values, Sorting, Data Type Conversion, Merging and Joining Data Frames, Group By and Pivot Tables, Working with Date/Time Data, Building application, interacting with database connectivity.

Suggested Readings

1) Norman Matloff, The Art of R Programming - A Tour of Statistical Software Design, No Starch Press.2011

2) Cotton, R., Learning R: a step by step function guide to data analysis. 1st edition. O'reilly Media Inc

3) https://jrnold.github.io/r4ds-exercise-solutions/index.html

4) https://www.r-project.org/

5) https://cran.r-project.org/

ITBMIN3024: INTRODUCTION TO R-PROGRAMMING LAB

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) Write a function that tests whether a user input number is a palindrome or not
8) Implement linear search.
9) Implement binary search.
10) Implement matrices addition, subtraction and Multiplication
11) Write a program to print all prime number between a range (eg. between 1 and 100).
12) Write a program to compare three numbers and print the largest one.
13) Write a program to find factorial of the given number.
14) Write a program to find the sum of the digits of a number

ITBMAJ4014: DATAMINING AND WAREHOUSING

(Credit 4, Total Marks: 100)

(Theory: 50 Marks, Practical: 20 Marks, Internal: 30 Marks)

Course Learning Objectives

- To learn and understand data mining techniques and warehousing.
- To generate association rules from real-life datasets.
- To analyze different clustering methods and classification tools for identifying similar groups of datasets.
- To gather knowledge on building data warehouse for mining applications.

Course Learning Outcomes

- Learners would be able to gain knowledge on data mining and warehousing techniques.
- Learners would utilize resultant interesting rules for appropriate prediction of data.
- Learners would be able to evaluate suitable clustering methods for grouping similar data.
- Learners would be able to acquire knowledge on building warehouse application.

Theory 60 Lectures

UNIT-1: Overview of Data Mining and Warehousing (12 Lectures, 10 Marks)

Predictive and descriptive data mining techniques, supervised and unsupervised learning techniques, process of knowledge discovery in databases, pre-processing methods, Data Visualization, Warehousing (Definition, Features and Advantages)

UNIT-2: Association Rule Mining (14 Lectures, 12 Marks)

Association rule Definition, Market Basket Analysis, Mining association rules, frequent sets and border sets, algorithms for mining association rules –Apriori algorithm, Border set algorithm, Concepts of Maximal frequent sets and closed frequent sets

UNIT-3: Clustering, Classification and Regression (22 Lectures, 18 Marks)

Clustering definition, Concept of Similarity measure and Distance Measure, Different types of data in clustering, Partition Vs Hierarchical Clustering, Density based clustering methods-DBSCAN, Clustering versus Classification, decision tree construction principle, decision tree generation algorithms –CART, ID3, The Problem of over fitting and techniques for reducing it, Scalability and Data management issues in data mining algorithms, measures of interestingness

Unit-4: Warehouse Architecture (13 Lectures, 10 Marks)

Warehouse architectures, Data warehouse vs Data Marts, Design Strategies, Modeling

Suggested Readings

1) A.K. Puzari, Data Mining Techniques, University Press.
2) J. Han and M. Kamber. Data Mining: Concepts and Techniques. Morgan Kaufman. 2001.
3) P. Tan, M. Steinbach and V. Kumar, Introduction to Data Mining, Pearson Education (LPE), 2009.
4) G.K. Gupta, Introduction to Data Mining with Case Studies, PHI, 2006.
5) Alex Berson, Stephen J.Smith, "Data warehousing Data mining and OLAP", Tata McGraw- Hill, 2nd Edition, 2007
6) PualrajPonnaiah, Wiley, "Data Warehousing Fundamentals", Student Edition, 2004.
7) Ralph Kimball, Wiley, "The Data warehouse Life Cycle Toolkit", Student Edition, 2006

ITBMAJ4014: DATAMINING AND WAREHOUSING LAB

(Preferred Platform C/C++/python)

1. Write a computer program to implement A priori algorithm using two different data structures for storing the item sets in the level wise generation of candidate sets.

2. Write a computer program to implement A priori algorithm using hashing to store the item sets in the level wise generation of candidate sets.

3. Write a computer program to implement the Pincer Search algorithm.

4. Write a computer program to implement the DIC (Dynamic Item set) algorithm.

5. Write a computer program to implement the Promoted Border Algorithm.

6. Write a computer program to implement the k-means algorithm and test it using the different similarity measures stated in the syllabus.

7. Write a computer program to implement the PAM algorithm.

8. Write a computer program to implement the CLARA algorithm.

9. Write a computer program to implement the CLARANS algorithm.

10. Write a computer program to implement the DBSCAN algorithm.

11. Write a computer program to implement the BIRCH algorithm.

12. Write a computer program to implement the CART algorithm.

13. Write a computer program to implement the ID3 algorithm.

ITBMAJ4024: DIGITAL IMAGE PROCESSING
(Credit 4, Total marks 100)
(Theory: 50 Marks, Practical: 20 Marks, Internal: 30 Marks)

Course Learning Objectives
- To study the image fundamentals and mathematical transforms necessary for image processing.
- To distinguish between various Spatial and Frequency domain filtering techniques.
- To get familiar with Image Restoration and compression techniques for making data communication easier.
- To work on design and development of Morphological Images and Image Segmentation.

Course Learning Outcomes
- Learners would be able to grasp the fundamental concepts of a digital image processing
- Learners would know how to analyze images in the frequency as well as spatial domain.
- Learners would be able to evaluate the techniques of image restoration and image compression.
- Learners would be able to interpret various image segmentation techniques.

Theory: 60 Lectures

Unit-1. Basics of Image Processing   (8 Lectures, 8 Marks)

Light, Brightness adaption and discrimination, Pixels, coordinate conventions, Imaging Geometry, Perspective Projection, sampling and quantization.

Unit-2. Spatial and Frequency domain filtering   (12 Lectures, 13 Marks)

Intensity transformations, contrast stretching, histogram equalization, Correlation and convolution, Smoothing filters, sharpening filters, gradient and Laplacian, Fourier Transforms and properties, FFT (Decimation in Frequency and Decimation in Time Techniques), Convolution, Correlation, 2-D sampling, Discrete Cosine Transform, Frequency domain filtering

Unit-3. Image Restoration and compression   (25 Lectures, 18 Marks)

Basic Framework, Interactive Restoration, Image deformation and geometric transformations, image morphing, Restoration techniques, Noise characterization, Noise restoration filters, Adaptive filters, Linear, Estimation of Degradation functions, Restoration from projections,
compression-Encoder-Decoder model, Types of redundancies, Lossy and Lossless compression, Entropy of an information source, Shannon's 1st Theorem, Huffman Coding, Arithmetic Coding, Bit-plane encoding, JPEG, Wavelet based Image Compression- Discrete Wavelet Transform (DWT), Continuous Wavelet Transform, 2-D wavelet Transform.

Unit-4. Morphological Image Processing & Segmentation   (15 Lectures, 11 Marks)

Basics, SE, Erosion, Dilation, Opening, Closing, Hit-or-Miss Transform, Boundary Detection, Hole filling, Connected components, convex hull, thinning, thickening, skeletons, pruning, Boundary detection based techniques, Point, line detection, Edge detection, local processing, regional processing, Hough transform, Thresholding, Segmentation

Suggested Readings

1. R C Gonzalez , R E Woods, Digital Image Processing, 3rd Edition, Pearson Education.2008.
2. A K Jain, Fundamentals of Digital image Processing, Prentice Hall of India.1989.
3. K R Castleman, Digital Image Processing, Pearson Education.1996
4. Schalkoff, Digital Image Processing and Computer Vision, John Wiley and Sons.1989.
5.Rafael C. Gonzalez, Richard E. Woods, Steven Eddins,' Digital Image Processing using MATLAB', Pearson Education, Inc., 2004.

ITBMAJ4024 LAB: DIGITAL IMAGE PROCESSING LAB

1. Write program to read and display digital image using MATLAB or SCILAB
   a. Become familiar with SCILAB/MATLAB Basic commands
   b. Read and display image in SCILAB/MATLAB
   c. Resize given image
   d. Convert given color image into gray-scale image
   e. Convert given color/gray-scale image into black & white image
   f. Draw image profile
   g. Separate color image in three R G & B planes
   h. Create color image using R, G and B three separate planes
   i. Flow control and LOOP in SCILAB
   j. Write given 2-D data in image file

2. To write and execute image processing programs using point processing method
   a. Obtain Negative image
   b. Obtain Flip image
   c. Thresholding
   d. Contrast stretching

3. To write and execute programs for image arithmetic operations
   a. Addition of two images
   b. Subtract one image from other image
   c. Calculate mean value of image
   d. Different Brightness by changing mean value

4. To write and execute programs for image logical operations
   a. AND operation between two images
   b. OR operation between two images
   c. Calculate intersection of two images
   d. Water Marking using EX-OR operation
   e. NOT operation (Negative image)

5. To write a program for histogram calculation and equalization using
   a. Standard MATLAB/SCILAB function
   b. Program without using standard MATLAB/SCILAB functions
   c. C Program

6. To write and execute program for geometric transformation of image
   a. Translation
   b. Scaling
   c. Rotation
   d. Shrinking
   e. Zooming

7. To understand various image noise models and to write programs for
   a. image restoration
   b. Remove Salt and Pepper Noise
   c. Minimize Gaussian noise
   d. Median filter and Weiner filter

8. Write and execute programs to remove noise using spatial filters
   a. Understand 1-D and 2-D convolution process
   b. Use 3x3 Mask for low pass filter and high pass filter

9. Write and execute programs for image frequency domain filtering
   a. Apply FFT on given image
   b. Perform low pass and high pass filtering in frequency domain
   c. Apply IFFT to reconstruct image

10. Write a program in C and MATLAB/SCILAB for edge detection using different edge detection mask

11. Write and execute program for image morphological operations erosion and dilation.

12. To write and execute program for wavelet transform on given image and perform inverse wavelet transform to reconstruct image.

ITBMAJ4034: COMPUTER NETWORKS-II
(Credit: 4, Total Marks: 100)
(Theory: 50 Marks, Practical: 20 Marks, Internal: 30 Marks)

Course learning Objectives
- To get familiar with various service protocols in the transport layer.
- To understand and utilize socket programming concepts.
- To gather knowledge about the different network applications.
- To understand LAN and implement TCP/IP.

Course learning Outcomes
- Learner would be able to understand the significance of service protocols in Transport layer.
- Learner would be able to write socket programs.
- Learner could gain familiarity with various applications of network.
- Learner could setup LAN considering TCP/IP.

Theory 60 Lectures

UNIT 1: Transport Layer Protocols   (14 Lectures, 12 Marks)
Transport layer services, connection oriented Vs connectionless service protocols, circuit switching Vs packet switching, TCP, UDP, SCTP protocol.

UNIT 2: Socket Programming   (20 Lectures, 13 Marks)
Socket Introduction, TCP Sockets, TCP Client/Server Example, Signal handling, I/O Multiplexing using Sockets, Socket Options, UDP Sockets, UDP Client Server example, Address Lookup using Sockets.

UNIT 3: Network Applications   (12 Lectures, 14 Marks)
Network traffic, Remote Terminal Access, Remote Logging, Email, WWW, HTTP.

UNIT 4: LAN Administration   (14 Lectures, 11 Marks)
Network fundamentals, types of Networks, Network Topologies, Client Server Model, Linux and TCP/IP Networking, Network Management and Debugging.

Suggested Readings
1. W. Richard Stevens, Bill Fenner, Andrew M. Rudoff, Unix Network Programming, The sockets Networking API, Vol. 1, 3rd Edition, PHI.2003
2. B. A. Forouzan: Data Communications and Networking, Fourth edition, THM Publishing Company Ltd.,2003
3. Nemeth Synder & Hein, Linux Administration Handbook, Pearson Education, 2nd Edition,2010
4. R. Stevens, Unix Network Programming, PHI 2nd Edition, 1990.

ITBMAJ4034 LAB: COMPUTER NETWORKS-II LAB

Practical / Lab work to be performed Practical exercises based on concepts listed in theory.
(Recommended Platform:- Python, C, C++)

1. 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.

2. Write a server socket program using TCP/IP 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

3. Write a connection oriented TCP/IP socket program where a client will request for a file to the server and the server will send the file to client. The IP address of the server and file name will be given as command line argument (Use loopback interface).

ITBMAJ4044: NUMERICAL METHODS AND PROBABILITY
(Credit: 4, Total Marks: 100)
(Theory: 50 Marks, Practical: 20 Marks, Internal: 30 Marks)

Course Learning Objectives
- To learn and understand the accuracy and precision in representation of numbers and its significance.
- To find the roots of the equation using non-linear and linear equation methods.
- To understand one point iterative method for finding true roots.
- To explore linear interpolation, extrapolation and integration methods for finding values of approximation.
- To comprehend probabilistic methods to solve real world problems.
- To develop numerical solutions for computational problems.

Course Learning Outcomes
- Learners would be able to represent numbers with accuracy and precision.
- Learners could apply various methods to find roots of the equation.
- Learners would be able to calculate the numerical integration results with great accuracy.
- Learners would be able to implement methods of probability and numerical solutions for solving real world problems.

Theory 60 Lectures

Unit-1: Representation of numbers   (5 Lectures, 6 Marks)
Floating point representation and computer arithmetic, Significant digits, Errors: Round-off error, truncation error

Unit-2: Solution of non-linear and simultaneous linear equation (13 Lectures, 15 Marks)
Non-linear equation-Bisection method, Secant method, Regula–Falsi method, Newton–Raphson method, linear equation-Basic elimination method, Gaussian elimination method, Gauss Jordan method, Iterative methods-Jacobi and Gauss-Seidel iterative methods

Unit-3: Interpolation, integration and extrapolation   (27 Lectures, 20 Marks)
Lagrange's form and Newton's form, Finite difference operators, Gregory Newton forward and backward differences Interpolation Piecewise polynomial interpolation: Linear interpolation, Numerical differentiation: First derivatives and second order derivatives,
Numerical integration-Trapezoidal rule, Simpson's rules
Extrapolation methods-Romberg integration, Gaussian quadrature, Ordinary differential equation: Euler's method, Runge-Kutta second and fourth order methods.

Unit-4 : Probability   (15 Lectures, 9 Marks)
Measure of central tendency:Mean, Median and Mode, Probability, Probability distribution, Binomial, Poison and normal distribution, Mathematical expectations, moments, correlation, regression.

Suggested Readings

1.M.K.Jain, S.R.K.Iyenger, R.K.Jain, — Numerical methods for Scientific and Engineering Computation, Wiley Easterns.

2. K.E. Atkinson, —An introduction to numerical analysis, J.Willey and Sons.

3. Laurence V. Fausett, Applied Numerical Analysis, Using MATLAB, Pearson, 2/e (2012)

4. Steven C Chapra, Applied Numerical Methods with MATLAB for Engineers and Scientists, Tata McGraw Hill, 2/e (2010)

ITBMAJ4044: NUMERICAL METHODS AND PROBABILITY LAB

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 system of equations using Jacobi/Gauss-Seidel method.
6. Evaluate the approximate value of finite integrals using Gaussian/Romberg integration.
7. Solve the boundary value problem using finite difference method.

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

ITBREM4014: RESEARCH METHODOLOGY
(Credit 4, Total Marks 100)
(Theory: 70 Marks, Internal: 30 Marks)

Course Learning Objectives
- To understand and comprehend the basics in research methodology.
- To get familiar with data handling and literature review process.
- To write research papers and know how the review process is carried on.
- To grasp knowledge on thesis writing.
- To grasp knowledge on ethical issues and professional conduct.

Course Learning Outcomes
- Learners would be able to understand the need of research methodology.
- Learners would gain the knowledge of data collection for appropriate research approach.
- Learners would be able to write research papers with the knowledge of literature review.
- Learners would know how to exhibit professional conduct maintaining the ethical issues.

Theory 60 Lectures

Unit-1: Introduction to Research   (17 Lectures, 20 Marks)

What is Research? Types of Research, Why Research, Significance & Status of Research, Major Journals & Publications in Computer Science, Major Research Areas of Computer Science, Identification, selection & Formulation of research Problem, Developing a research Proposal, Planning your research,

Unit-2: Research Data & Literature Survey   (20 Lectures, 25 Marks)

What is data, Types of Data, Mathematical, Statistical and Computer Science views on data analysis, Finding out about your research area, Literature search strategy, Writing critical reviews, Identifying venues for publishing your research.

Unit-3: Writing Papers and the Review Process   (8 Lectures, 15 Marks)

Preparing and presenting your paper. The conference review process, The journal review process

UNIT 4 : Dissertation/Thesis Writing, Ethical Issues and Professional Conduct
                                                 (15Lectures, 15 Marks)

Planning the Dissertation/Thesis, Writing the Dissertation/Thesis, Thesis structure, Writing up schedule, The Oral examination (Viva Voce), Ethics in general, Professional Ethics, Ethical Issues that Arise from Computer Technology

Suggested Readings

1) The Computer Science and Engineering (Editor-in-Chief) By Allen B.Tucker, JR. CRC Press, A CRC Handbook Published in Co-operation with ACM, The Association for Computing.

2) Research Methodology By Kothari C. R., Publisher: New Age International Pvt Ltd Publishers

3) Other standard literatures available in the internet

ITBMIN4014: INTRODUCTION TO DATA SCIENCE USING PYTHON

(Credit: 4, Total Marks :100)

(Theory: 50 Marks, Practical: 20 Marks, Internal: 30 Marks)

Course Learning Objectives

- To learn the basic terminologies of data science that helps discovering the hidden patterns in data.
- To explore the basics of the python programming environment in order to implement it in data science.
- To know how data acquiring and data cleaning techniques assist enormously in the manipulation phase of data.
- To employ how to explore, sort and analyze megadata from various sources and reach to conclusions optimizing business requirements.

Course Learning Outcomes

- Learners would grasp the basic terms data science that assists in the discovery of invisible patterns in data.
- Learners could work on python programming environment supporting data science tasks.
- Learners would know how to do data acquisition and implement data cleaning as a preprocessing activity.
- Learners would be able to explore, sort and analyze enormous amount of data and reach to such conclusions that optimizes business requirements easing the decision making.

Theory 60 Lectures

UNIT 1: Introduction to Data science   (5 Lectures, 10 Marks)

Data science and its importance, Data science tools- version control, markdown, Git, GitHub; Data analysis, Turning data into actionable knowledge

UNIT 2: Python Programming Basics   (15 Lectures, 17 Marks)

Structure of a Python Program, 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). Creating Python Programs, Input and Output Statements, Control statements (Branching, Looping, Conditional Statement, Exit function, Difference between break, continue and pass), Functions

UNIT 3: Getting and Cleaning Data   (8 Lectures, 10 Marks)

Obtaining data from web, APIs, databases and from colleagues in various formats, basics of data cleaning and making data tidy

UNIT 4: Exploratory Data Analysis   (16 Lectures, 13 Marks)

Essential exploratory techniques for summarizing data, applied before formal modeling commences, eliminating or sharpening potential hypotheses about the world that can be addressed by the data, common multivariate statistical techniques used to visualize high dimensional data.

Suggested Readings

1. Rachel Schutt, Cathy O'Neil, "Doing Data Science: Straight Talk from the Frontiline" by Schroff/O'Reilly, 2013.
2. Foster Provost, Tom Fawcett, "Data Science for Business" What You Need to Know About Data Mining and Data-Analytic Thinking" by O'Reilly, 2013.
3. John W. Foreman, "Data Smart: Using data Science to Transform Information into Insight" by John Wiley & Sons, 2013.
4. Ian Ayres, "Super Crunchers: Why Thinking-by-Numbers Is the New Way to Be Smart" Ist Edition by Bantam, 2007.
5. Eric Seigel, "Predictive Analytics: The Power to Predict who Will Click, Buy, Lie, or Die", 1st Edition, by Wiley, 2013.
6. Matthew A. Russel, "Mining the Social Web: Data mining Facebook, Twitter, Linkedln, Goole+, GitHub, and More", Second Edition, by O'Reilly Media, 2013.
7. T. Budd, Exploring Python, TMH, 1st Ed, 2011
8. Python Tutorial/Documentation www.python.or 2015
9. Allen Downey, Jeffrey Elkner, Chris Meyers , How to think like a computer scientist : learning with Python , Freely available online.2012
10.http://docs.python.org/3/tutorial/index.html
11.http://interactivepython.org/courselib/static/pythonds
12. http://www.ibiblio.org/g2swap/byteofpython/read/.

ITBMIN4014: INTRODUCTION TO DATA SCIENCE USING PYTHON LAB

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.

7. Implement linear search.

8. Implement binary search.

9. Implement matrices addition, subtraction and Multiplication

10. Fifteen students were enrolled in a course. There ages were:

     20 20 20 20 20 21 21 21 22 22 22 22 23 23 23

     i)   Find the median age of all students under 22 years

ii) Find the median age of all students

iii) Find the mean age of all students

iv) Find the modal age for all students

v) Two more students enter the class. The age of both students is 23. What is now mean, mode and median?

11. Following table gives a frequency distribution of systolic blood pressure. Compute all the measures of dispersion. Midpoint 95.5 105.5 115.5 125.5 135.5 145.5 155.5 165.5 175.5 Number 5 8 22 27 17 9 5 5 2

12. Obtain probability distribution of, where X is number of spots showing when a six- sided symmetric die (i.e. all six faces of the die are equally likely) is rolled. Simulate random samples of sizes 40, 70 and 100 respectively and verify the frequency interpretation of probability.

13. Make visual representations of data using the base, lattice, and ggplot2 plotting systems, apply basic principles of data graphics to create rich analytic graphics from available datasets.

ITBMAJ4054: DISTRIBUTED SYSTEMS
(Credit: 4, Total Marks: 100)
(Theory: 50 Marks, Practical: 20 Marks, Internal: 30 Marks)

Course Learning Objectives
- To learn the concepts, architectures and models used in distributed systems.
- To illustrate the event ordering techniques and distributed file systems to solve problems in an efficient, reliable and scalable way.
- To understand different consistency models and analyze security in distributed systems.
- To analyze P2P computing and distributed shared memory.

Course Learning Outcomes
- Learners would be able to acquire knowledge on architecture and communication model of distributed systems.
- Learners could explain event ordering methods, snapshots and file system for scalable performance.
- Learners could analyze and implement consistency models, run security and apply different recovery tools to get back the data.
- Learners would be able to use peer-to-peer and get acquainted with distributed shared memory in receiving scalable performance.

Theory 60 Lectures

Unit-1: Introduction to Distributed Systems   (15 Lectures, 12 Marks)

Concepts and types of distributed systems, Architecture, Overview of processes, Taxonomy of Distributed Systems, scalable performance, load balancing and availability Models of computation, shared memory and message passing system, synchronous and asynchronous systems, Communication in Distributed Systems, Remote Procedure Calls and Message Oriented Communications and implementation

Unit 2: Event Ordering and Snapshots   (15 Lectures, 13 Marks)

Global state and snapshot algorithms, distributed snapshots in VMs, clock synchronization, Distributed mutual exclusion, Group based Mutual Exclusion, leader election, deadlock detection, termination detection, Distributed Databases, implementations over a simple distributed system and case studies of distributed databases and systems, Distributed file systems: scalable performance, load balancing, and availability. Examples from Dropbox, Google FS (GFS)/ Hadoop Distributed FS (HDFS), Bigtable/HBase MapReduce, RDD

Unit 3: Consistency control and Recovery   (15 Lectures, 14 Marks)

Data Centric Consistency, Client Centric Consistency, Replica Management, Consistency Protocols, Fault tolerance and recovery: basic concepts, fault models, agreement problems and its applications, commit protocols, voting protocols, Case Studies from Apache Spark, Google Spanner, Amazon Aurora, Block Chain Systems etc, Issues in failure recovery, Checkpoint-based recovery, Log-based rollback recovery, Coordinated checkpointing algorithm, Algorithm for asynchronous checkpointing and recovery

UNIT-4 P2P & Distributed Shared Memory   (15 Lectures, 11 Marks)

Peer-to-peer computing and overlay graphs- Data indexing and overlays, Chord, Content addressable networks, Tapestry, Distributed shared memory- Abstraction and advantages, Memory consistency models, Shared memory Mutual Exclusion.

Suggested Readings

1. M. Van Steen, A.S. Tanenbaum, Distributed Systems, Third Edition, CreateSpace Independent Publishing Platform, 2017.
2. Ajay D. Kshemkalyani and Mukesh Singhal, Distributed Computing: Principles, Algorithms and Systems, Cambridge University Press, 2011.
3. Garg VK. Elements of distributed computing. John Wiley & Sons, 2002.
4. George Coulouris, Jean Dollimore, Tim Kindberg and Gordon Blair, Distributed Systems: Concepts and Design, Fifth Edition, Pearson Education, 2017

ITBMAJ4054: DISTRIBUTED SYSTEMS LAB

1. Write a server (TCP) C/Python program that opens a listening socket and waits to serve client

2. Write a client (TCP) C/Python program that connects with the server program knowing IP address and port number.

3. Get the input string from console on client and send it to server. Further the server echoes back that string to the client.

4. Write a client (UDP) C / Python program that calls sendto to send string to server program knowing IP address and port number.

5. Implement any election algorithm using C/Python.

ITBADL4014: Introduction to Cloud Computing
(Credit 4, Total Marks 100)
(Theory: 50 Marks, Practical: 20 Marks, Internal: 30 Marks)

Course learning Objectives
- To acquire knowledge on the features and services of cloud computing.
- To learn and understand the basic cloud models.
- To understand the cloud Virtualization and use of cloud application tools.
- To understand about the cloud computing security management.

Course learning Outcomes
- Learner would be able to apply the features and services of cloud computing.
- Learner could be able to utilize cloud models for computation.
- Learner would be able to implement the role of cloud virtualization.
- Learner could be able to implement cloud computing security management.

Theory 60 Lectures

Unit 1: Introduction to Cloud Computing   [10 Lectures, 12 Marks]

Overview of Cloud Computing, Evolution, Characteristics, Types of cloud and its Cloud services, Benefits and Applications of cloud computing, Cloud Storage, Cloud services requirements, dynamic infrastructure & Cloud adoption.

Unit 2: Cloud Computing Architecture   [10 Lectures, 17 Marks]

Cloud reference model**,** Platform & Infrastructure as service Software**,** Cloud deployment models**,** Public clouds**,** Private clouds**,** Community cloud & Hybrid clouds**,** Cloud design and implementation using SOA, security, trust and privacy.

Unit 3: Cloud Virtualization and Map Reduce   [20 Lectures, 14 Marks]

Overview of Virtualization techniques, Types of Virtualizations, Implementation Levels of Virtualization Structures, virtualization benefits, server virtualization, hypervisor management software, virtual infrastructure requirements.

Introduction to parallel computing, Map-reduce model, Applications of map reduce, Parallel efficiency of Map-Reduce, Map Reduce infrastructure.

Unit 4: Cloud Security   [10 Lectures, 7 Marks]

Introduction to Security, Cloud Security challenges and Risks, Software-as-a-Service Security, Security Monitoring, Security Architecture Design, Data Security, Application Security, Virtual Machine Security, Identity Management and Access Control.

SUGGESTED READINGS:

1. Dr. Kumar Saurabh, Cloud Computing
2. Raj Kumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, Mastering Cloud Computing

ITBADL4014: Introduction to Cloud Computing lab

1. Installation and configuration of own Cloud.
2. Installation of virtual machine and also install operating system on virtual machine.
3. Study and implementation of infrastructure as Service using Open Stack.
4. Write a Program to Create, Manage and groups User accounts in own Cloud
by Installing Administrative Features
5. Explain amazon RDS/ Google Cloud SQL service and create a database instance in the cloud using
Amazon RDS. Connect the instance and create a database with one table, insert data and show the
records in the table.
6. Write a program for Web feed using PHP and HTML.

ITBADL4024: Microprocessor
(Credit 4, Total Marks 100)
(Theory: 50 Marks, Practical: 20 Marks, Internal: 30 Marks)

Course learning Objectives
- To acquire knowledge on different registers, instruction format and memory.
- To identify the various components of 8085 microprocessor.
- To learn and write assembly language program code for 8085 microprocessor.
- To gather knowledge on 8085 microprocessor interfacing and interrupts.

Course learning Outcomes
- Learners would be to grasp knowledge on Internal Organization of 8085 microprocessor.
- Learners could develop knowledge on 8085 microprocessor architecture.
- Learners would be able to implement assembly language for 8085 microprocessor application.
- Learners get accustomed with 8085 microprocessor interfacing and interrupts handling.

Theory 60 Lectures

Unit1: Internal Organization of 8085A microprocessor   (Lectures 12, 8 Marks)
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, 13 Marks)
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, 8 Marks)
Complete instruction set in detail, programming examples, logic operation, and counters and time delays, stack and subroutine, processing arrays, bit manipulation.

Unit4: Interfacing and Interrupt   (Lectures 24, 21 Marks)
In and OUT instruction, decoding addresses, Interfacing LED, relay, seven segment display, switch, keyboard. 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).

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Suggested Readings:

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

ITBADL4024: MICROPROCESSOR LAB

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 y 5,where x and y are 16 bit numbers.
10. Write a program to find 2's complement of a number.

ITBADL4034: CYBER SECURITY
(Credit:4, Total Marks: 100)
(Theory: 50 Marks, Practical: 20 Marks, Internal: 30 Marks)

Course Learning Objectives
- To learn and understand cyber security fundamentals
- To familiarize the various cyber/ internet crimes and their causes
- To analyze data privacy for cyber security management
- To develop skills on securing the system using safety tools.
- To be aware of the laws imposed for controlling cyber crimes

Course Learning Outcomes
- Learners would be able to explain the concepts of cyber security
- Learners would become aware of cyber crimes and illustrate their reason
- Learners would be able to evaluate different safety tools and apply them in security management
- Learners would gain awareness on different laws of Cyber crimes and legal landscape around the world

Theory 60 Lectures

Unit-1: Overview of Cyber security (8 Lectures, 8 Marks)

Cyber security, increasing threat landscape, Cyber security terminologies- Cyberspace, attack, attack vector, attack surface, threat, risk, vulnerability, exploitation, hacker, Non-state actors, Cyber terrorism, Protection of end user machine, Cyber warfare

Unit-2: Cyber crimes (15 Lectures, 11 Marks)

Cyber crimes targeting Computer systems and Mobiles- data diddling attacks, spyware, logic bombs, DoS, DDoS, APTs, virus, Trojans, ransomware, data breach, Online scams and frauds-email scams, Phishing, Vishing, Smishing, Online job fraud, Online sextortion, Debit/ credit card fraud, Online payment fraud, Cyberbullying, website defacement, Cyber squatting, Pharming, Cyber espionage, Cryptojacking, Darknet- illegal trades, drug trafficking, human trafficking., Social Media Scams & Frauds- impersonation, identity theft, fake news, cyber crime against persons - cyber grooming, child pornography, cyber stalking, Social Engineering attacks, Cyber Police stations, Crime reporting procedure

Unit-3: Data Privacy and Data Security, **Cyber security Management** (17 Lectures, 16 Marks)

Defining data, meta-data, big data, non-personal data, Data protection, Data privacy and data security, Personal Data Protection Bill and its compliance, Data protection principles, Big data security issues and challenges, Data protection regulations of other countries- General Data Protection Regulations(GDPR),2016, Personal Information Protection and Electronic Documents Act (PIPEDA)., Social media- data privacy and security issues,

Cyber security Plan- cyber security policy, cyber crises management plan, Business continuity, Risk assessment, Types of security controls and their goals, Cyber security audit and compliance, National cyber security policy and strategy.

Unit-4: Safety Tools, Issues and Cyber Laws   (20 Lectures, 15 Marks)

Security Governance, Firewalls, Logging and Intrusion Detection systems, Windows and windows XP / NT security, Unix/Linux security, ethics of hacking and cracking, cyber laws-Cyber crime and legal landscape around the world, IT Act, 2000 and its amendments, Limitations of IT Act, 2000. Cyber crime and punishments, Cyber Laws and Legal and ethical aspects related to new technologies- AI/ML, IoT, Blockchain, Darknet and Social media, Cyber Laws of other countries, Case Studies

[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

Suggested Readings

1. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Sumit Belapure and Nina Godbole, Wiley India Pvt. Ltd.
2. Information Warfare and Security by Dorothy F. Denning, Addison Wesley.
3. Security in the Digital Age: Social Media Security Threats and Vulnerabilities by Henry A. Oliver, Create Space Independent Publishing Platform.
4. Data Privacy Principles and Practice by Natraj Venkataramanan and Ashwin Shriram, CRC Press.
5. Information Security Governance, Guidance for Information Security Managers by W. KragBrothy, 1st Edition, Wiley Publication.
6. Auditing IT Infrastructures for Compliance By Martin Weiss, Michael G. Solomon, 2nd Edition, Jones Bartlett Learning
7. G.R.F. Snyder, T. Pardoe, Network Security, Cengage Learning, 2010

ITBADL4034 LAB: CYBER SECURITY LAB PRACTICAL

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.
10) Setting privacy settings on social media platforms.
11) Do's and Don'ts for posting content on Social media platforms.
12) Registering complaints on a Social media platform
13) Prepare password policy for computer and mobile device.
14) List out security controls for computer and implement technical security controls in the personal computer.
15) List out security controls for mobile phone and implement technical security controls in the personal mobile phone.
16) Log into computer system as an administrator and check the security policies in the system.

ITBMIN4024: Internet of Things (IOT).
(Credit 4, Total Marks 100)
(Theory: 50 Marks, Practical: 20 Marks, Internal: 30 Marks)

Course learning Objectives
- To learn about the internet of things (IOT).
- To learn the Internet evolving to connect people to physical things.
- To learn understand the basics of Internet of things and protocols.
- To learn about the middleware for Internet of Things and understand the concepts of Web of Things

Course learning Outcomes
- Learner would be able to understand about the application areas of IOT.
- Learner could be able to understand the architecture for internet of things (IOT).
- Learner would be able to recognize various devices, sensors, actuators, and various processing paradigms for IOT.

Theory 60 Lectures

Unit1: Basics of Internet of things (IOT):   (12 Lectures, 6 Marks)
What is the IoT and why is it important? Elements of an IoT ecosystem, Technology drivers, Business drivers, Trends and implications, Overview of Governance, Privacy and Security Issues.

Unit2: Internet and IOT standard Protocols: (20 Lectures, 15 Marks)
Internet connectivity, internet based communications, IP addressing in IOT, Protocol Standardization for IoT, M2M and WSN Protocols SCADA and RFID Protocols, Issues with IoT Standardization, Unified Data Standards Protocols – IEEE802.15.4, BAC Net Protocol Modbus KNX Zigbee, Network layer APS layer, Security.

Unit3: Architecture and Web of Things: (20 Lectures, 14 Marks)
IoT Open source architecture (OIC), OIC Architecture & Design principles- IoT Devices and deployment models- IoTivity: An Open source IoT stack - Overview- IoTivity stack architecture Resource model and Abstraction.
Architecture Standardization for WoT, Platform Middleware for WoT, Unified Multitier WoT Architecture, WoT Portals and Business Intelligence.

Unit4: Prototyping and IOT Applications: (18 Marks 15 Lectures)
Embedded computing basics, prototyping- Arduino, Intel Galileo, Raspberry, Beaglebone Black and Thingspeak, IoT applications for industry, Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications, Study of existing IoT platforms /middleware etc.

Suggested Readings:

1. Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)", 1st Edition,• VPT, 2014
2. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to• Connecting Everything", 1st Edition, Apress Publications, 2013
3. CunoPfister, Getting Started with the Internet of Things, O"Reilly Media, 2011, ISBN: 978-1-• 4493-9357-1

ITBMIN 4024:   Internet of Things (IOT) lab

To Study of AT89S52 Ultra Development Kit with Development Tool /Environment of Kiel Software for Microcontroller programming.

1. To familiarize with Intel Galileo Gen2 board and understand the procedure of creation and compilation of C source code.
2. Wifi module interfacing with Intel Galileo Gen2 Board.
3. To study of IoT Data Logging using Beaglebone Black and Thingspeak.
4. Turn your smart phone into an IoT device using the IBM Watson IoT Platform cloud-hosted service.
5. LED Control Using Arduino Board.
6. IOT Based Air Pollution Control System.
7. Tds Sensor Interfacing with Arduino.

ITBREP40112: Dissertation
(Credit 12, Total Marks 100)