BHARTI

VISHWAVIDYALAYA

DURG (C.G.)

Website - www.bhartiuniversity.org, Email–bhartiuniversity.in@gmail.com

SCHEME OF EXAMINATION

&

SYLLABUS

For

Bachelor of Science (Honors) Computer Science

UNDER

FACULTY OF SCIENCE

(Approved by Board of Studies)

Session: 2021-2022

EXAMINATION SCHEME

B. Sc. (Honors) Computer Science

B. Sc. (Honors) examination will be conducted in six SEMESTER

SEMESTER– I

THEORY

PAPER CODE	SUBJECT	CREDITS	THEORY MARKS	TEACHER ASSESSMENT	TOTAL MARKS
BSHCS-101	Programming Fundamentals using C^{++}	4	70	30	100
BSHCS-102	Computer System Architecture	4	70	30	100
GE-I	A. Physics-I B. Mathematics-I	4	35	15	50
AECC	English Communication / MIL	2	35	15	50
ECA	Operational Research for Computer Science	2	35	15	50

PRACTICAL

PAPER CODE	SUBJECT	CREDITS	PRACTICAL MARKS	TEACHER ASSESSMENT	TOTAL MARKS
BSHCSL-101	Programming Fundamentals using C^{++}	2	35	15	50
BSHCSL-102	Computer System Architecture	2	35	15	50
GEL-I	Generic Elective - Practical-I	2	35	15	50

B. Sc. (Honors) Computer Science

SEMESTER–II

THEORY

PAPER	COURSE	CREDITS	THEORY MARKS	TEACHER ASSESSMENT	TOTAL MARKS
BSHCS-201	Programming in JAVA	4	70	30	100
BSHCS-202	Discrete Structures	4	70	30	100
GE-II	A. Physics-II B. Mathematics-II	4	35	15	50
AECC	Environmental Science	2	35	15	50
ECA	ECA-Extracurricular activity/ Tour, Industrial training/ Field visit, NSS/ Swachhta/ vocational Training/ Sports/ others	2	35	15	50

PRACTICAL

PAPER	COURSE	CREDITS	PRACTICAL MARKS	TEACHER ASSESSMENT	TOTAL MARKS
BSHCSL-201	Programming in JAVA	2	35	15	50
BSHCSL-202	Discrete Structures	2	35	15	50
GEL-II	Generic Elective - Practical-II	2	35	15	50

B. Sc. (Honors) Computer Science

SEMESTER–III

THEORY

PAPER	COURSE	CREDITS	THEORY MARKS	TEACHER ASSESSMENT	TOTAL MARKS
BSHCS-301	Data Structures	4	70	30	100
BSHCS-302	Operating Systems	4	70	30	100
BSHCS-303	Computer Networks	4	70	30	100
GE-III	A. Physics-III B. Mathematics-III	4	35	15	50
SEC - 1	Select one from the pool of sec courses offered by different department	2	35	15	50

PRACTICAL

PAPER	COURSE	CREDITS	PRACTICAL MARKS	TEACHER ASSESSMENT	TOTAL MARKS
BSHCSL-301	Data Structures	2	35	15	50
BSHCSL-302	Operating Systems	2	35	15	50
BSHCSL-303	Computer Networks	2	35	15	50
GEL-III	Generic Elective - Practical-III	2	35	15	50

B. Sc. (Honors) Computer Science

SEMESTER–IV

THEORY

PAPER	COURSE	CREDITS	THEORY MARKS	TEACHER ASSESSMENT	TOTAL MARKS
BSHCS-401	Design and Analysis of Algorithms	4	70	30	100
BSHCS-402	Software Engineering	4	70	30	100
BSHCS-403	Database Management Systems	4	70	30	100
GE-IV	A. Physics-IV B. Mathematics-IV	4	35	15	50
SEC -2	Select one from the pool of sec courses offered by different department	2	35	15	50

PRACTICAL

PAPER	COURSE	CREDITS	PRACTICAL MARKS	TEACHER ASSESSMENT	TOTAL MARKS
BSHCSL-401	Design and Analysis of Algorithms	2	35	15	50
BSHCSL-402	Software Engineering	2	35	15	50
BSHCSL-403	Database Management Systems	2	35	15	50
GEL-IV	Generic Elective - Practical-IV	2	35	15	50

B. Sc. (Honors) Computer Science

SEMESTER–V

THEORY

PAPER	COURSE	CREDITS	THEORY MARKS	TEACHER ASSESSMENT	TOTAL MARKS
BSHCS-501	Internet Technologies	4	70	30	100
BSHCS-502	Theory of Computation	4	70	30	100
DSE-l	DSE-l- Theory	4	70	30	100
DSE-2	DSE-2- Theory	4	70	30	100

PRACTICAL

PAPER	COURSE	CREDITS	PRACTICAL MARKS	TEACHER ASSESSMENT	TOTAL MARKS
BSHCSL-501	Internet Technologies	2	35	15	50
BSHCSL-502	Theory of Computation	2	35	15	50
DSE-l	DSE-l- Lab	2	35	15	50
DSE-2	DSE-2- Lab	2	35	15	50

B. Sc. (Honors) Computer Science

SEMESTER–VI

THEORY

PAPER	COURSE	CREDITS	THEORY MARKS	TEACHER ASSESSMENT	TOTAL MARKS
BSHCS-601	Artificial Intelligence	4	70	30	100
BSHCS-602	Computer Graphics	4	70	30	100
DSE-3	DSE-3-Theory	4	70	30	100
DSE-4	DSE-4-Theory	4	70	30	100

PRACTICAL

PAPER	COURSE	CREDITS	PRACTICAL MARKS	TEACHER ASSESSMENT	TOTAL MARKS
BSHCSL-601	Artificial Intelligence	2	35	15	50
BSHCSL-602	Computer Graphics	2	35	15	50
DSE-3	Lab	2	35	15	50
DSE-4-Project	Dissertation/ Project work followed by seminar	2	35	15	50

* As per UGC CBCS guidelines, University / departments have liberty to offer GE and SEC courses offered by one department to students of other departments. The No. of GE course is four. One GE course is compulsory in first 4 semesters each.

Minimum One Skill Enhancement course shall be proposed by each department (4 CREDITSs) [4 L or 2 L+ 2 P or l L+3 P or 3L+ l T] 1P = 2 hours.

***CREDITS= L+T+P/2**

Where, **L**-Lecture**, T**-Tutorial and **P-** Practical

Total CREDITS=144

SCHEME FOR PRACTICAL EXAMINATION

EXPERIMENT	MARKS
Experiment	25
Viva-voce	10
Teacher Assessment	15
TOTALMARKS	50

COMPUTER SCIENCE -DSE 1-4 (ELECTIVES)

DSE-1: SYSTEM PROGRAMMING

DSE-2: NUMERICAL METHODS

DSE-3: MODELING AND SIMULATION

DSE-4: ADVANCED ALGORITHMS

DSE-5: MACHINE LEARNING

DSE-6: INTRODUCTION TO DATA SCIENCES

SKILL ENHANCEMENT COURSE (ANY TWO)

SEC-I: Android Programming

SEC-2: PHP Programming

NAME OF THE GENERIC ELECTIVE SUBJECTS OFFERED BY YOUR DEPARTMENT

1. GE-I: Programming Fundamentals using C^{++}
2. GE-II: Programming in JAVA
3. GE-III: Data Structures
4. GE-IV: Design and Analysis of Algorithms

CORE SUBJECTS (HONOURS IN COMPUTER SCIENCE)

Semester I

COMPUTER SCIENCE (C-I): Programming Fundamentals using C++ (BSHCS-101)

CREDITS: 4

UNIT-I:

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

Data Types, Variables, Constants, Operators and Basic I/O: 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), Using Basic Header Files (stdio.h, iostream.h, conio.hetc).

Expressions, Conditional Statements and Iterative Statements: 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-II:

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

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

Derived Data Types (Structures and Unions): Understanding utility of structures and unions, Declaring, initializing and using simple structures and unions, Manipulating individual members of structures and unions, Array of Structures, Individual data members as structures, Passing and returning structures from functions, Structure with union as

members, Union with structures as members.

UNIT-III:

Pointers and References in C^{++}: Understanding a Pointer Variable, Simple use of Pointers (Declaring and Dereferencing Pointers to simple variables), Pointers to Pointers, Pointers to structures, Problems with Pointers, Passing pointers as function arguments, Returning a pointer from a function, using arrays as pointers, Passing arrays to functions. Pointers vs. References, Declaring and initializing references, Using references as function arguments and function return values

UNIT-IV:

Memory Allocation in C++: Differentiating between static and dynamic memory allocation, use of malloc, calloc and free functions, use of new and delete operators, storage of variables in static and dynamic memory allocation

File I/O, Preprocessor Directives: Opening and closing a file (use of fstream header file, ifstream, ofstream and fstream classes), Reading and writing Text Files, Using put(), get(), read() and write() functions, Random access in files, Understanding the Preprocessor Directives (#include, #define, #error, #if, #else, #elif, #endif, #ifdef, #ifndef and #undef), Macros

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

UNIT-V:

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

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

Reference Books

1. HerbtzSchildt, "C^{++}: The Complete Reference", Fourth Edition, McGraw Hill.
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", FirstCreate space Inc, O-D Publishing, LLC USA.
10. Walter Savitch, "Problem Solving with C++", Pearson Education, 2007.
11. Stanley B. Lippman, JoseeLajoie, Barbara E. Moo, "C++ Primer", Published by Addison-Wesley, 5th Edition, 2012

PROGRAMMING FUNDAMENTALS USING C++ PRACTICAL

(BSHCSL-101)

CREDITS: 2

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 shouldalso 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 enteredas 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 itscontents.

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

15. Write a program to find sum of n elements entered by the user. To write this program, allocatememory 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 Matrixoperations (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 respectiveinformation 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 assignmentoperator 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

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

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 andprint 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 onlyone pointer value and return void.
29. Write a program that will read 10 integers from user and store them in an array. Implement arrayusing pointers. The program will print the array elements in ascending and descending order.

Reference Books

1. HerbtzSchildt, "C++: The Complete Reference", Fourth Edition, McGraw Hill.
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.

COMPUTER SYSTEM ARCHITECTURE (BSHCS-102)

CREDITS: 4

UNIT-I: Introduction

Logic gates, boolean algebra, combinational circuits, circuit simplification, flip-flops and sequential circuits, decoders, multiplexers, registers, counters and memory units.

UNIT-II: Data Representation and Basic Computer Arithmetic

Number systems, complements, fixed and floating point representation, character representation, addition, subtraction, magnitude comparison, multiplication and division algorithms for integers

UNIT-III: Basic Computer Organization and Design

Computer registers, bus system, instruction set, timing and control, instruction cycle, memory reference, input-output and interrupt, Interconnection Structures, Bus Interconnection design of basic computer.

UNIT-IV: Central Processing Unit

Register organization,arithmetic and logical micro-operations, stackorganization, micro programmed control. Instruction formats, addressing modes, instruction codes, machine language, assembly language, input output programming, RISC, CISC architectures, pipelining and parallel architecture.

UNIT-V: Memory Organization

Cache memory, Associative memory, mapping.

Input-Output Organization

Input / Output: External Devices, I/O Modules, Programmed I/O, Interrupt-Driven I/O, Direct Memory Access, I/O Channels.

References:

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
3. W. Stallings, Computer Organization and Architecture Designing for Performance, 8th Edition, Prentice Hall of India,2009
4. Digital Design, M.M. Mano, Pearson Education Asia

COMPUTER SYSTEM ARCHITECTURE PRACTICAL (BSHCSL-102)

CREDITS: 2

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 *4096 words* *16 bits per word*	*Instruction format* *0* *3 4* *15* *Opcode* *Address*

Basic Computer Instructions

Memory Reference			Register Reference		Input-Output		
Symbol	Hex		Symbol	Hex	Symbol	Hex	
AND	0xxx	Direct Addressing	CLA	E800	INP	F80 0	
ADD	2xxx		CLE	E400	OUT	F40 0	
LDA	4xxx		CMA	E200	SKI	F20 0	
STA	6xxx		CME	E100	SKO	F10 0	**Optional**
BUN	8xxx		CIR	E080	ION	F08 0	
BSA	Axxx		CIL	E040	IOF	F04 0	
ISZ	Cxxx		INC	E020			
AND_I	1xxx	Indirect	SPA	E010			
ADD_I	3xxx		SNA	E008			
LDA_I	5xxx		SZA	E004			

STA_I	7xxx	Addressing	SZE	E002		
BUN_I	9xxx		HLT	E001		
BSA_I	Bxxx					
ISZ_I	Dxxx					

Refer to Chapter-5 of Morris Mano for description of instructions.

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
   b. CLE
   c. CMA
   d. CME
   e. CIR
   f. CIL
   g. INC
   h. SPA
   i. SNA
   j. SZA
   k. SZE
   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
   b. AND
   c. LDA
   d. STA
   e. BUN
   f. BSA
   g. ISZ
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 298with 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

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.

References:

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
3. W. Stallings, Computer Organization and Architecture Designing for Performance, 8th Edition, Prentice Hall of India,2009
4. Digital Design, M.M. Mano, Pearson Education Asia

GE-I: PHYSICS: MATHEMATICAL PHYSICS-I (BSHP-101)

CREDITS: 4

The emphasis of course is on applications in solving problems of interest to physicists. The students are to be examined entirely on the basis of problems, seen and unseen.

UNIT-I:

Calculus-I

Recapitulation: Introduction to Cartesian spherical and cylindrical coordinate system, Intuitive ideas of plotting of curves with example of different curves. Elementary ideas of differentiation of function and Integration of function, multiple integrals (line, surface, volume) and its application with simple curves Approximation: Taylor theorems of single variable.

UNIT-II:

Calculus-II

First order and Second Order Differential equations, First Order Differential equations and integrating factor.Homogeneous Equations with constant coefficients,Particular Integral.Calculus of functions of more than one variable: Partial derivatives, exact and inexact differentials. Integrating factor with simple illustration.

UNIT-III:

Vector Calculus-I

Recapitulation of vectors: Properties of vectors under rotations. Scalar product and its invariance under rotations.Vector product, Scalar triple product and their interpretation in terms of area and volume respectively.Scalar and Vector fields.Vector Differentiation: Directional derivatives and normal derivative.Gradient of a scalar field and its geometrical interpretation.Divergence and curl of a vector field.Del and Laplacian operators.Vector identities.

UNIT-IV:

Vector Calculus-II

Vector Integration: Ordinary Integrals of Vectors. Multiple integrals, Jacobian.Notion of infinitesimal line, surface and volume elements.Line, surface and volume integrals of Vector fields. Flux of a vector field. Gauss' divergence theorem, Green's and Stokes Theorems and their applications (no rigorous proofs).

UNIT-V:

Dirac Delta function and its properties:

Definition of Dirac delta function.Representation as limit of a Gaussian function and rectangular function. Properties of Dirac delta function.

References:

1. Higher engineering Mathematics, B.S.Grewal(Khanna Publishers)
2. Theory and Problems of vector analysis, M.R.Spiegel(Schaum's Outline series)
3. Mathematical Methods for Physicists, G.B. Arfken, H.J. Weber, F.E. Harris, 2013, 7th Ed., Elsevier.
4. An introduction to ordinary differential equations, E.A. Coddington, 2009, PHI learning
5. Differential Equations, George F. Simmons, 2007, McGraw Hill.
6. Mathematical Tools for Physics, James Nearing, 2010, Dover Publications.
7. Mathematical methods for Scientists and Engineers, D.A. McQuarrie, 2003, Viva Book
8. Advanced Engineering Mathematics, D.G. Zill and W.S. Wright, 5 Ed., 2012, Jones and Bartlett Learning
9. Advanced Engineering Mathematics, Erwin Kreyszig, 2008, Wiley India.
10. Essential Mathematical Methods, K.F.Riley&M.P.Hobson, 2011, Cambridge Univ. Press

GEL-I: PHYSICS: MATHEMATICAL PHYSICS-I- LAB-I (BSHPL-101)

CREDITS: 2

The aim of this Lab is not just to teach computer programming and numerical analysis but to emphasize its role in solving problems in Physics.

- *Highlights the use of computational methods to solve physical problems*
- *The course will consist of lectures (both theory and practical) in the Lab*
- *Evaluation done not on the programming but on the basis of formulating the problem*
- *Aim at teaching students to construct the computational problem to be solved*
- *Students can use any one operating system Linux or Microsoft Windows*

Topics (Description with Applications):

Introduction and Overview Computer architecture and organization, memory and Input/output devices Basics of scientific computing Binary and decimal arithmetic, Floating point numbers, algorithms, Sequence, Selection and Repetition, single and double precision arithmetic, underflow &overflow emphasize the importance of making equations in terms of dimensionless variables, Iterative methods Errors and error Analysis Truncation and round off errors, Absolute and relative errors, Floating point computations. Review of C & C++ Programming fundamentals Introduction to Programming, constants, variables and data types, operators and Expressions, I/O statements, scanf and printf, c in and c out, Manipulators for data formatting, Control statements (decision making and looping statements) (*If---statement. If---else Statement. Nested if Structure. Else---if Statement. Ternary Operator.Goto Statement. Switch Statement. Unconditional and Conditional Looping.While Loop. Do-While Loop. FOR Loop. Break and Continue Statements. Nested Loops*), Arrays (*1D & 2D*) and strings, user defined functions, Structures and Unions, Idea of classes and objects Programs: Sum & average of a list of numbers, largest of a given list of numbers and its location in the list, sorting of numbers in ascending descending order, Binary search Random number generation Area of circle, area of square, volume of sphere, value of $\boldsymbol{\pi}$ Solution of Algebraic and Transcendental equations by Bisection, Newton Raphson and Secant methods Solution of linear and quadratic equation, solving $\alpha = \tan\alpha$; $I = \text{Io}\,[(\sin\alpha)/\alpha]2$ in optics Interpolation by Newton Gregory Forward and Backward difference formula, Error estimation of linear interpolation Evaluation of trigonometric functions e.g. *sin θ, cos θ, tan θ, etc.* Numerical differentiation (Forward and Backward difference formula) and Integration (Trapezoidal and Simpson rules), Monte Carlo

method Given Position with equidistant time data to calculate velocity and acceleration and vice versa. Find the area of B-H Hysteresis loop

Also attempt some problems on differential equations like:

1. Solve the coupled first order differential equations for four initial conditions. Plot x vs y for each of the four initial conditions on the same screen for $0 \leq t \leq 15$.
2. The ordinary differential equation describing the motion of a pendulum. The pendulum is released from rest at an angular displacement α. Use the RK4 method to solve the equation for $\alpha = 0.1$, 0.5 and 1.0 and plot$P$ as a function of time in the range $0 \leq t \leq 8\pi$. Also, plot the analytic solution valid in the small P ($sinP \approx P$).
3. Solve differential equation with the boundary conditions and plot y and dy/dx against x in the given range. Both should appear on the same graph.

References:

1. Introduction to Numerical Analysis, S.S. Sastry, 5th Edn. , 2012, PHI Learning Pvt. Ltd.
2. Schaum's Outline of Programming with C^{++}. J. Hubbard, 2000, McGraw-Hill Pub.
3. Numerical Recipes in C: The Art of Scientific Computing, W.H. Pressetal, 3rd Edn. , 2007, Cambridge University Press.
4. A first course in Numerical Methods, U.M. Ascher& C. Greif, 2012, PHI Learning.
5. Elementary Numerical Analysis, K.E. Atkinson, 3 r d Edn. , 2 0 0 7 , Wiley India Edition.
6. Numerical Methods for Scientists & Engineers, R.W. Hamming, 1973, Courier Dover Pub.
7. An Introduction to computational Physics, T.Pang, 2nd Edn. , 2006,Cambridge Univ. Press

GE-I: MATHEMATICS- I: ALGEBRA AND TRIGONOMETRY PART- I

(BSHM-101)

CREDITS: 4

UNIT-I:

Elementary operations on matrices, Inverse of a matrix. Linear independence of row and column matrices, Row rank,column rank and rank of a matrix. Equivalence of column and row ranks.

UNIT-II:

Application of matrices to a system of linear (both homogeneous and non homogeneous) equations. Theorems on consistency of a system of linear equations.

UNIT-III

Solutions of cubic equations (Cardons method), Biquadratic equation. Mappings, Equivalence relations and partitions.

UNIT-IV

Lagrange's theorem and its consequences. Fermat's and Euler's theorems. Normal sub groups. Quo tient group, Permutation groups. Even and odd permutations. The alternating groups An. Cayley's theorem.

TRIGONOMETRY :

UNIT- V

De-Moivre's theorem and its applications. Direct and inverse circular and hyperbolic functions.

TEXT BOOK :

1. I.N. Herstein, Topiesin Algebra, Wiley Eastern Ltd., NewDelhi, 1975
2. K.B. Datta, Matrix and Linear Algebra, Prentice Hall of India Pvt. Ltd. New Delhi, 2000.
3. Chandrika Prasad, Text-Book on Algebra and Theory of equations, Pothishala Private Ltd., Allahabad.
4. S. L. Loney, Plane Trigonometry Part II, Macmillan and Company, London.

References:

1. P.B. Bhattacharya, S.K. Jain and S. R. Nagpaul, First Course in linear Algebra, Wiley Eastern, NewDelhi, 1983.
2. P.B. Bhattacharya, S. K. Jain and S. R. Nagpaul, Basic Abstract Algebra (2 edition), Cambridge University Press, Indian Edition,1997.
3. S.K. Jain, A. Gunawardenaand P.B. Bhattacharya, Basic linear Algebra with MATLAB, Key College Publishing (Springer-Verlag),2001.
4. H.S. Halland S. R. Knight, Higher Algebra, H.M.Publications,1994.
5. R. S. Vermaand K. S. Shukla, Text Book on Trigonometry, PothishalaPvt. Ltd., Allahabad.

GEL-I: MATHEMATICS- I: ALGEBRA PART- I PRACTICAL

(BSHM-L-101)

CREDITS: 2

1. Elementary operations on matrices
2. Inverse of a matrix.
3. Linear independence of row and column matrice
4. rankofamatrix
5. Application of matrices to a system of linear (both homogeneous and non homogeneous) equations.
6. Theorems on consistency of a system of linear equations.
7. Lagrange's theorem and its consequences
8. Euler's theorems. Normal subgroups.
9. Quotient group, Permutation groups.
10. Even and odd permutations.

References:

1. P.B. Bhattacharya, S.K. Jain and S. R. Nagpaul, First Course in linear Algebra, Wiley Eastern, NewDelhi, 1983.
2. P.B. Bhattacharya, S. K. Jain and S. R. Nagpaul, Basic Abstract Algebra (2 edition), Cambridge University Press, Indian Edition,1997.
3. S.K. Jain, A. Gunawardenaand P.B. Bhattacharya, Basic linear Algebra with MATLAB, Key College Publishing (Springer-Verlag),2001.

AECC- ENGLISH LANGUAGE

CREDITS: 2

UNIT I: COMMUNICATION

THEORY AND TYPES

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

UNIT II: SPEAKING SKILLS

Monologue Dialogue Group Discussion Effective Communication/ Mis- Communication, Interview Public Speech.

UNIT III: READING AND UNDERSTANDING

Close Reading Comprehension Summary Paraphrasing Analysis and Interpretation Translation (from Indian language to English and vice-versa) Literary/Knowledge Texts.

UNIT IV WRITING SKILLS

Documenting Report Writing Making notes Letter writing.

UNIT-V FUNCTIOANL GRAMMAR

Parts of Speech, Word order / Types of Sentences, Questions (Affirmative and Negative),Present Perfect – Simple & Continuous, Present Perfect and Past Simple, Future Tense, Articles, Prepositions, Modals, Conjunctions, Quantifiers and Voice.

REFERENCE BOOKS:

English Language and Indian Culture - Published by M.P. Hindi Grant Academy Bhopal.

ECA- OPERATIONAL RESEARCH FOR COMPUTER SCIENCE

CREDITS: 2

UNIT–I:

Introductory Linear Algebra

System of linear equations, Matrices, Rank and Determinant of a matrix, Linearly dependent and independent vectors, Basis of a matrix.

UNIT–II:

Linear programming - I

Optimization Problems, Introduction to LP Formulation, Convex sets, Extreme points, Geometry of Linear Programs, Basic feasible solutions (BFS), Neighborhoods, Local and global optima, ProfitableColumn, Pivoting, Simplex Algorithm with initial BFS, Graphical method

UNIT–III:

Linear programming - II

Degeneracy and Bland's Anticycling rule (Definition), Simplex Algorithm without initial BFS, Artificial variable techniques – two phase method, M-Charnes method, special cases in LPP.

UNIT–IV:

Duality

Definition of the dual problem, primal-dual relationships, economic interpretation of duality, complementary slackness conditions.

Transportation Models

Transportation Algorithm, Assignment model, Hungarian Method

UNIT–V:

Introduction to Queuing Models

Elements of Queuing Model, Exponential distribution, Poisson Distributions, Poisson QueuingModels, Single Server model, Multiple Server model

Introduction to Markov Chains

Introduction to Markov chains, transition probabilities, classification of states, Steady state probabilities, Absorbing states

Reference Books

1. G. Hadley: Linear Programming. Narosa, 2002 (reprint).

2. A. Ravindran, D. T. Phillips and James J. Solberg: Operations Research-Principles and Practice,John Wiley & Sons, 2005.
3. Hamdy A. Taha: Operations Research-An Introduction, Prentice Hall, 8th Edition, 2008.
4. F.S. Hillier. G.J. Lieberman: Introduction to Operations Research- Concepts and Cases, 9thEdition, Tata McGraw Hill. 2010.

Semester II

PROGRAMMING IN JAVA (BSHCS-201)

CREDITS: 4

UNIT I: Introduction to Java

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, 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 II: Arrays, Strings and I/O

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 III: Object-Oriented Programming Overview

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, Interfaces, Packages, Enumerations, Autoboxing and Metadata 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.

UNIT IV: Exception Handling, Threading, Networking and Database Connectivity

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 manipulatingdatabases using JDBC.

UNIT V: Applets and Event Handling

Java Applets: 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, textfields, layout managers, menus, events and listeners; Graphic objects for drawing figures such as lines, rectangles, ovals, using different fonts. Overview of servlets.

Reference Books

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, Gary Corness, "Core Java 2 Volume 1 - Fundamentals)", 9th Edition, PrinticeHall.
5. Cay S. Horstmann, Gary Corness, "Core Java 2 Volume 2 - Advanced Features)", 9th Edition,Printice Hall.
6. Bruce Eckel, "Thinking in Java", 3rd Edition, PHI, 2002.
7. E. Balaguruswamy, "Programming with Java", 4th Edition, McGraw Hill.
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 Create Space Independent Publishing Platform, 2009.
11. John R. Hubbard, "Programming with JAVA", Schaum's Series, 2nd Edition, 2004.

PROGRAMMING IN JAVA PRACTICAL (BSHCSL-201)

CREDITS: 2

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 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 String Buffer classs likeset CharAt(, setLength(), append(), insert(), concat() and equals().
9. Write a program to create a "distance" class with methods where distance is computed in termsof 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 afunction.
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 URL Connection 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 mouse Clicked(), mouse Entered(), mouse Exited(), mouse Pressed, mouse Released() and mouse Dragged().
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.

Reference Books

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.

DISCRETE STRUCTURES (BSHCS-202)

CREDITS: 4

UNIT-I: Introduction:

Sets - finite and Infinite sets, uncountable 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.

UNIT-II: Growth of Functions:

Asymptotic Notations, Summation formulas and properties, Bounding Summations, approximation by Integrals

UNIT-III: Recurrences:

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

UNIT-IV: Graph Theory

Basic Terminology, Models and Types, multigraphs and weighted graphs, Graph Representation, Graph Isomorphism, Connectivity, Euler and Hamiltonian Paths and Circuits, Planar Graphs, Graph Coloring, Trees, Basic Terminology and properties of Trees, Introduction to Spanning Trees

UNIT-V: Prepositional Logic

Logical Connectives, Well-formed Formulas, Tautologies, Equivalences, Inference Theory

Recommended Books:

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

DISCRETE STRUCTURES PRACTICAL (BSHCSL-202)

CREDITS: 2

Practicals based on the theory

Recommended Books:

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

GE-II: PHYSICS: ELECTRICITY AND MAGNETISM

(BSHPL-201)

CREDITS: 4

UNIT-I:

Electric Field and Electric Potential

Electric field: Electric field lines. Electric flux.Gauss' Law with applications to charge distributions with spherical, cylindrical and planar symmetry.

Conservative nature of Electrostatic Field.Electrostatic Potential.Laplace's and Poisson equations.The Uniqueness Theorem.Potential and Electric Field of a dipole. Force andTorque on a dipole.

Electrostatic energy of system of charges.Electrostatic energy of a charged sphere.Conductors in an electrostatic Field. Surface charge and force on a conductor. Capacitance of a system of charged conductors.Parallel-plate capacitor.Capacitance of an isolated conductor. Method of Images and its application to: (1) Plane Infinite Sheet and (2) Sphere.

UNIT-II:

Dielectric Properties of Matter

Electric Field in matter.Polarization, Polarization Charges.Electrical Susceptibility and Dielectric Constant. Capacitor (parallel plate, spherical, cylindrical) filled with dielectric. Displacement vector **D**. Relations between **E**, **P** and **D**. Gauss' Law in dielectrics.

UNIT-III:

Magnetic Field

Magnetic force between current elements and definition of Magnetic Field **B**. Biot-Savart's Law and its simple applications: straight wire and circular loop. Current Loop as a Magnetic Dipole and its Dipole Moment (Analogy with Electric Dipole). Ampere's Circuital Law and its application to (1) Solenoid and (2) Toroid. Properties of **B**: curl and divergence. Vector Potential. Magnetic Force on (1) point charge(2) current carrying wire (3) between current elements. Torque on a current loop in a uniform Magnetic Field.

Magnetic Properties of Matter: Magnetization vector (**M).** Magnetic Intensity(**H).** Magnetic Susceptibility and permeability.Relation between **B, H, M**. Ferromagnetism.B-H curve and hysteresis.

UNIT-IV:

Electromagnetic Induction

Faraday's Law.Lenz's Law.Self Inductance and Mutual Inductance.Reciprocity Theorem. Energy stored in a Magnetic Field. Introduction to Maxwell's Equations. Charge Conservation and Displacement current.

UNIT-V:

Electrical Circuits

AC Circuits: Kirchhoff's laws for AC circuits. Complex Reactance and Impedance. Series LCR Circuit: (1) Resonance, (2) Power Dissipation and (3) Quality Factor, and (4) Band Width. Parallel LCR Circuit.

Network theorems: Ideal Constant-voltage and Constant-current Sources. Network Theorems: Thevenin theorem, Norton theorem, Superposition theorem, Reciprocity theorem, Maximum Power Transfer theorem.Applications to dc circuits.

References:

1. Electricity, Magnetism & Electromagnetic Theory, S. Mahajan and Choudhury, 2012, Tata McGraw
2. Electricity and Magnetism, Edward M. Purcell, 1986 McGraw-Hill Education
3. Introduction to Electrodynamics, D.J. Griffiths, 3rd Edn., 1998, Benjamin Cummings.
4. Feynman Lectures Vol.2, R.P.Feynman, R.B.Leighton, M. Sands, 2008, Pearson Education
5. Elements of Electromagnetics, M.N.O. Sadiku, 2010, Oxford University Press.
6. Electricity and Magnetism, J.H.Fewkes&J.Yarwood. Vol.I, 1991, Oxford Univ. Press.

GEL-II: ELECTRICITY AND MAGNETISM LAB-I

(BSHPL-201)

CREDITS: 2

1. Use a Multimeter for measuring (a) Resistances, (b) AC and DC Voltages, (c) DC Current, (d) Capacitances, and (e) Checking electrical fuses.
2. To study the characteristics of a series RC Circuit.
3. Measurement of field strength B and its variation in a solenoid (determine dB/dx)
4. To verify the Thevenin Theorem.
5. To verify the Norton theorem.
6. To verify the Superposition, and Maximum power transfer theorems.
7. To study response curve of a Series LCR circuit and determine its (a) Resonant frequency, (b) Impedance at resonance, (c) Quality factor Q, and (d) Band width.
8. To study the response curve of a parallel LCR circuit and determine its (a) Anti-resonant frequency and (b) Quality factor Q.
9. To determine self-inductance of a coil by Rayleigh's method.
10. To determine the mutual inductance of two coils by Absolute method.
11. To determine the frequency of AC Mains using Sonometer.

References:

1. Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, 1971, Asia Publishing House
2. A Text Book of Practical Physics, I.Prakash& Ramakrishna, 11th Ed., 2011, Kitab Mahal
3. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers
4. A Laboratory Manual of Physics for undergraduate classes, D.P.Khandelwal, 1985, Vani Pub.
5. Engineering Practical physics S.Panigrihi and B.Mallick, 2015, Cengage Learning.

GE-II: MATHEMATICS- II: CALCULUS-I (BSHM-102)

CREDITS: 4

DIFFERENTIAL CALCULUS:

UNIT-I:

Definition of the limit of a function. Basic properties of limits. Continuous functions and classification of discontinuties.

UNIT-II:

Asymptotes.Curvature.Tests for concavity and convexity. Points of inflexion. Multiple points.

INTEGRAL CALCULUS:

UNIT-III:

Integration of transcendental functions. Reduction formulae. Definite integrals.

ORDINARY DIFFERENTIAL EQUATIONS:

UNIT-IV:

Degree and order of a differential equation. Equations reducible to the linear form. Exact differential equations. First order higher degree equations solvable for x, y, p. Clairaut's form and singular solutions.

UNIT-V:

Linear differential equations of second order.Transformation of the equation by changing the dependent variable/the independent variable.

TEXT BOOK:

1. Gorakh Prasad, Differential Calculaus, Pothishala Private Ltd. Allahabad.
2. Gorakh Prasad, Integral Calculus, Pothishala Private Ltd. Allahabad.
3. D. A. Murray Introductory Course in Differential Equations, Orient Longman (India), 1976.

References:

1. Gabriel Klambauer, Mathematical Analysis, Marcel Dekkar, Inc. New York, 1975.
2. N. Piskunov, Differential and Integral Calculus, Peace Publishers, Moscow.
3. E. A. Codington, An Introduction to Ordinary Differential Equations, PrenticsHall of India, 1961.

4. H.T.H. Piaggio, Elementary Treatise on Differential Equations and their Applications, C.B.S. Publishe & Distributors, Dehli, 1985.
5. W.E. Boyce and P.O. Diprima, Elementary Differential Equations and Boundary Value Problems, John Wiley, 1986.

GEL-II: MATHEMATICS- II: CALCULUS- I PRACTICAL

(BSHM-L-102)

CREDITS: 2

1. Asymptotes, Curvature.
2. Tests for concavity and convexity
3. Points of inflexion. Multiple points
4. Degree and order of a differential equation.
5. Equations reducible to the linear form. Exact differential equations.
6. First order higher degree equations
7. Clairaut's form and singular solutions
8. Linear differential equations of second order
9. Transformation of the equation by changing the dependent variable
10. Transformation of the equation by changing the independent variable

References:

1. Gabriel Klambauer, Mathematical Analysis, Marcel Dekkar, Inc. New York, 1975.
2. N. Piskunov, Differential and Integral Calculus, Peace Publishers, Moscow.
3. E. A. Codington, An Introduction to Ordinary Differential Equations, Prentics Hall of India,1961.
4. H.T.H. Piaggio, Elementary Treatise on Differential Equations and their Applications, C.B.S. Publishe & Distributors, Dehli, 1985.
5. W.E. Boyce and P.O. Diprima, Elementary Differential Equations and Boundary Value Problems, John Wiley, 1986.

AECC- ENVIRONMENTAL SCIENCE

CREDITS: 2

UNIT–I:

General: Environmental segments, environmental degradation, environmental impact assessment. Concept of Ecosystem: Fundamental of Ecology and Ecosystem, components of ecosystem, food-chain, foodweb, trophic levels, energy flow, cycling of nutrients, major ecosystem types (forest, grass land and aquatic ecosystem).

UNIT-II:

Air Pollution: Atmospheric composition, energy balance, classification of air pollutants, source and effect of pollutants – Primary (CO, SOx, NOx, particulates, hydrocarbons), Secondary [photochemical smog, acid rain, ozone, PAN (Peroxy Acetyl Nitrate)], green house effect, ozone depletion, atmospheric stability and temperature inversion, Techniques used to control gaseous and particulate pollution, ambient air quality standards.

UNIT-III:

Water Pollution: Hydrosphere, natural water, classification of water pollutants, trace element contamination of water, sources and effect of water pollution, types of pollutants, determination and significance of D.O., B.O.D.,C.O.D. in waste water, Eutrophication, methods and equipment used in waste water treatment preliminary, secondary and tertiary.

UNIT-IV:

Land Pollution & Noise Pollution: Lithosphere, pollutants (agricultural, industrial, urban waste, hazardous waste), their origin and effect, collection of solid waste, solid waste management, recycling and reuse of solid waste and their disposal techniques (open dumping, sanitary land filling, thermal, composting).Noise Pollution: Sources, effect, standards and control.

UNIT-V:

Environmental Biotechnology: Definition, current status of biotechnology in environmental protection, bio-fuels, bio-fertilize, bio-surfactants, bio-sensor, bio-chips, bio-reactors. Pollution Prevention through Biotechnology: Tannery industry, paper and pulp industry, pesticide industry, food and allied industry.

TEXT BOOKS:

1. Environment and Ecology by Piyush Kant Pandey and Dipti Gupta (Sum India Publication)
2. A Textbook of Environmental Chemistry and Pollution Control by S.S. Dara (S. Chand

and Company)

REFERENCE BOOKS:

1. Masters, G.M. Introduction to Environment Engineering and Science (Prentice Hall of India).
2. Environmental Chemistry by A.K. Dey (Eastern Ltd.).Environmental Chemistry by B.K. Sharma (Krishna Prakashan).
3. Nebel B.J. Environmental Science (Prentice Hall of India-1987).
4. Environmental Biotechnology by S.N. Jogdand (Himalaya Publishing House).
5. Introduction to Environmental Biotechnology by A.K. Chatterji (Prentice Hall of India).

Semester III

DATA STRUCTURES (BSHCS-301)

CREDITS: 4

UNIT–I:

Arrays

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

Stacks

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

UNIT–II:

Linked Lists

Singly, Doubly and Circular Lists (Array and Linked representation); Normal and Circular representation of Stack in Lists; Self Organizing Lists; Skip Lists

UNIT–III:

Queues

Array and Linked representation of Queue, De-queue, Priority Queues

Recursion

Developing Recursive Definition of Simple Problems and their implementation; Advantagesand Limitations of Recursion; Understanding what goes behind Recursion (Internal Stack Implementation)

UNIT–IV:

Trees

Introduction to Tree as a data structure; Binary Trees (Insertion, Deletion, Recursive andIterative Traversals on Binary Search Trees); Threaded Binary Trees (Insertion, Deletion, Traversals); Height-Balanced Trees (Various operations on AVL Trees).

Searching and Sorting

Linear Search, Binary Search, Comparison of Linear and Binary Search, Selection Sort,Insertion Sort, Insertion Sort, Shell Sort, Comparison of Sorting Techniques

UNIT–V:

Hashing

Introduction to Hashing, Deleting from Hash Table, Efficiency of Rehash Methods, Hash Table Reordering, Resolving collusion by Open Addressing, Coalesced Hashing, Separate Chaining, Dynamic and Extendible Hashing, Choosing a Hash Function, Perfect Hashing Function

Reference Books:

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 andC++:, Second edition, PHI, 2009.
4. Robert L. Kruse, "Data Structures and Program Design in C++", Pearson.
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, 3rdedition, 2011
7. Aaron M. Tenenbaum, Moshe J. Augenstein, Yedidyah Langsam, "Data Structures Using Java,2003.
8. Robert Lafore, "Data Structures and Algorithms in Java, 2/E", Pearson/ Macmillan ComputerPub,2003
9. John Hubbard, "Data Structures with JAVA", McGraw Hill Education (India) Private Limited; 2edition, 2009
10. Goodrich, M. and Tamassia, R. "Data Structures and Algorithms Analysis in Java", 4th Edition,Wiley
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.

DATA STRUCTURES PRACTICAL (BSHCSL-301)

CREDITS: 2

1. Write a program to search an element from a list. Give user the option to perform Linear orBinary search. Use Template functions.
2. WAP using templates to sort a list of elements. Give user the option to perform sorting usingInsertion 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 overloadoperator +).
4. Implement Doubly Linked List using templates. Include functions for insertion, deletion andsearch of a number, reverse the list.
5. Implement Circular Linked List using templates. Include functions for insertion, deletion andsearch 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 Listimplementation.
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. (ii) 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 likefinding the successor / predecessor of an element, insert an element, inorder traversal.
23. WAP to implement various operations on AVL Tree.

Reference Books:

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 andC++:, Second edition, PHI, 2009.
4. Robert L. Kruse, "Data Structures and Program Design in C++", Pearson.
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, 3rdedition, 2011
7. Aaron M. Tenenbaum, Moshe J. Augenstein, Yedidyah Langsam, "Data Structures Using Java,2003.

OPERATING SYSTEMS(BSHCS-302)

CREDITS: 4

UNIT–I: Introduction

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.

UNIT–II: Operating System Organization

Processor and user modes, kernels, system calls and systemprograms.

Process Management

System view of the process and resources, process abstraction, processhierarchy, threads, threading issues, thread libraries; Process Scheduling, non-pre-emptive and pre-emptive scheduling algorithms; concurrent and processes, critical section, semaphores, methods for inter-process communication; deadlocks.

UNIT–III: Memory Management

Physical and virtual address space; memory allocation strategies -fixedand variable partitions, paging, segmentation, virtual memory

UNIT–IV: File and I/O Management

Directory structure, file operations, file allocation methods, devicemanagement.

UNIT–V:

Protection and Security

Policy mechanism, Authentication, Internal access Authorization.

Recommended Books:

1. A Silberschatz, P.B. Galvin, G. Gagne, Operating Systems Concepts, 8th 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 2008 5th Edition, Prentice Hall of India.
5. M. Milenkovic, Operating Systems- Concepts and design, Tata McGraw Hill 1992.

OPERATING SYSTEMS PRACTICAL (BSHCSL-302)

CREDITS: 2

C/ C++ programs

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, CPUtype 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.

Recommended Books:

1. A Silberschatz, P.B. Galvin, G. Gagne, Operating Systems Concepts, 8th 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 2008 5th Edition, Prentice

Hall of India.

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

COMPUTER NETWORKS (BSHCS-303)

CREDITS: 4

UNIT–I: Introduction to Computer Networks

Network definition; network topologies; network classifications; network protocol; layered network architecture; overview of OSI reference model; overview of TCP/IP protocol suite.

UNIT–II: Data Communication Fundamentals and Techniques

Analog and digital signal; data-ratelimits; digital to digital line encoding schemes; pulse code modulation; parallel and serial transmission; digital to analog modulation-; multiplexing techniques- FDM, TDM; transmission media.

UNIT–III: Networks Switching Techniques and Access mechanisms

Circuit switching; packetswitching- connectionless datagram switching, connection-oriented virtualcircuit switching; dial-up modems; digital subscriber line; cable TV for data transfer.

Data Link Layer Functions and Protocol

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.

UNIT–IV: Multiple Access Protocol and Networks

CSMA/CD protocols; Ethernet LANS; connectingLAN and back-bone networks- repeaters, hubs, switches, bridges, router and gateways;

Networks Layer Functions and Protocols

Routing; routing algorithms; network layer protocolof Internet- IP protocol, Internet controlprotocols.

UNIT–V: Transport Layer Functions and Protocols

Transport services- error and flow control,Connection establishment and release- three wayhandshake;

Overview of Application layer protocol

Overview of DNS protocol; overview of WWW &HTTP protocol.

Reference Books

1. B. A. Forouzan: Data Communications and Networking, Fourth edition, THM PublishingCompany Ltd 2007.
2. A. S. Tanenbaum: Computer Networks**,** Fourth edition**,** PHI Pvt. Ltd 2002

COMPUTER NETWORKS PRACTICAL (BSHCSL-303)

CREDITS: 4

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.

Reference Books

1. B. A. Forouzan: Data Communications and Networking, Fourth edition, THM PublishingCompany Ltd 2007.
2. A. S. Tanenbaum: Computer Networks**,** Fourth edition**,** PHI Pvt. Ltd 2002

GE-III: PHYSICS: MATHEMATICAL PHYSICS-II

(BSHPL-301)

CREDITS: 4

The emphasis of the course is on applications in solving problems of interest tophysicists. Students are to be examined on the basis of problems, seen and unseen.

UNIT-I:

Fourier Series

Periodic functions. Orthogonality of sine and cosine functions, Dirichlet Conditions (Statement only).Expansion of periodic functions in a series of sine and cosine functions and determination of Fourier coefficients.Complex representation of Fourier series.Expansion of functions with arbitrary period.Expansion of non-periodic functions over an interval.Even and odd functions and their Fourier expansions.Application.Summing of Infinite Series.

UNIT-II:

Frobenius Method and Special Functions

Singular Points of Second Order Linear Differential Equations and their importance.Frobenius method and its applications to differential equations.Legendre, Bessel, Hermite and Laguerre Differential Equations. Properties of Legendre Polynomials: Rodrigues Formula, Generating Function, Orthogonality. Simple recurrence relations. Bessel Functions of the First Kind: Generating Function, simple recurrence relations.

UNIT-III:

Some Special Integrals

Beta and Gamma Functions and Relation between them.Expression of Integrals in terms of Gamma Functions. Error Function (Probability Integral).

UNIT-IV:

Partial Differential Equations

Solutions to partial differential equations, using separation of variables: Laplace's Equation in problems of rectangular, cylindrical and spherical symmetry.

UNIT-V:

Special Theory of Relativity

Non-inertial frames and fictitious forces.Uniformly rotating frame.Laws of Physics in rotating coordinate systems.Centrifugal force.Coriolis force and its applications.

Michelson-Morley Experiment and its outcome.Postulates of Special Theory of Relativity.Lorentz Transformations.Simultaneity and order of events.Lorentz contraction.Time dilation.Relativistic transformation of velocity, frequency and wave number.Relativistic addition of velocities.Variation of mass with velocity.Massless Particles.Mass-energy Equivalence.

References:

1. Mathematical Methods for Physicists: Arfken, Weber, 2005, Harris, Elsevier.
2. Fourier Analysis by M.R. Spiegel, 2004, Tata McGraw-Hill.
3. Mathematics for Physicists, Susan M. Lea, 2004, Thomson Brooks/Cole.
4. Differential Equations, George F. Simmons, 2006, Tata McGraw-Hill.
5. Partial Differential Equations for Scientists & Engineers, S.J. Farlow, 1993, Dover Pub.
6. Mathematical methods for Scientists & Engineers, D.A. McQuarrie, 2003, Viva Books

GEL-III: MATHEMATICAL PHYSICS-II LAB-I (BSHPL-301)

CREDITS: 2

The aim of this Lab is to use the computational methods to solve physical problems. Course will consist of lectures (both theory and practical) in the Lab. Evaluation done not on the programming but on the basis of formulating the problem

Topics	**Description with Applications**
Introduction to Numerical computation software Scilab	Introduction to Scilab, Advantages and disadvantages,Scilab environment, Command window, Figurewindow, Edit window, Variables and arrays, Initialisingvariables in Scilab, Multidimensional arrays, Subarray,Special values, Displaying output data, data file, Scalarand array operations, Hierarchy of operations, Built inScilab functions, Introduction to plotting, 2D and 3Dplotting (2), Branching Statements and program design,Relational & logical operators, the while loop, for loop,details of loop operations, break & continue statements,nested loops, logical arrays and vectorization (2) Userdefined functions, Introduction to Scilab functions,Variable passing in Scilab, optional arguments,preserving data between calls to a function, Complexand Character data, string function, Multidimensionalarrays (2) an introduction to Scilab file processing, fileopening and closing, Binary I/o functions, comparingbinary and formatted functions, Numerical methodsanddeveloping the skills of writing a program (2).

Curve fitting, Least square fit, Goodness of fit, standard deviation	Ohms law to calculate R, Hooke's law to calculate springConstant
Solution of Linear system of equations by Gauss elimination method and Gauss Seidal method. Diagonalization of matrices, Inverse of a matrix, Eigenvectors, eigen values problems	Solution of mesh equations of electric circuits (3 meshes) Solution of coupled spring mass systems (3 masses)
Solution of ODE First order Differential equation Euler, modified Euler and Runge-Kutta second order methods Second order differential equation Fixed difference method	First order differential equation • Radioactive decay • Current in RC, LC circuits with DC source • Newton's law of cooling • Classical equations of motion Second order Differential Equation • Harmonic oscillator (no friction) • Damped Harmonic oscillator • Over damped • Critical damped • Oscillatory • Forced Harmonic oscillator
Using Scicos / xcos	Generating square wave, sine wave, saw tooth wave Solution to harmonic oscillator Study of beat phenomenon Phase space plots

References:

1. Mathematical Methods for Physics and Engineers, K.F Riley, M.P. Hobson and S. J. Bence, 3rd ed., 2006, Cambridge University Press
2. Complex Variables, A.S. Fokas&M.J. Ablowitz, 8th Ed., 2011, Cambridge Univ. Press

3. First course in complex analysis with applications, D.G. Zill and P.D. Shanahan, 1940, Jones & Bartlett
4. Simulation of ODE/PDE Models with MATLAB®, OCTAVE and SCILAB: Scientific and Engineering Applications: A.V. Wouwer, P. Saucez, C.V. Fernández. 2014 Springer
5. Scilab by example: M. Affouf 2012, ISBN: 978-1479203444
6. Scilab(A free software to Matlab): H.Ramchandran, A.S.Nair. 2011 S.Chand& Company
7. Scilab Image Processing: Lambert M. Surhone. 2010 Betascript Publishing

GE-III: MATHEMATICS- III: VECTOR ANALYSIS AND GEOMETRY

PART- I (BSHM-103)

CREDITS: 4

VECTOR ANALYSIS:

UNIT-I:

Scalar and vector product of three vectors.Product of fourvectors.

Reciprocal Vectors.

UNIT-II:

Vectorintegration.

UNIT- III:

General equation of second degree. Tracing of conics.

UNIT- IV:

Sphere.Cone.Cylinder.

UNIT-V:

CentralConicoids.Paraboloids.Planesectionsofconicoids.

Genera tinglines.

TEXT BOOKS :

1. N. Saran and S.N. Nigam, Introduction to vector Analysis, Pothishala Pvt. Ltd. Allahabad.
2. Gorakh Prasad and H. C. Gupta, Text Book on Coordinate Geometry, Pothishala Pvt. Ltd., Allahabad.
3. R.J.T. Bell, Elementary Treatise on Coordinate Geometry of three dimensions, Machmillan India Ltd.1994.

References:

1. Murray R. Spiegel, Theory and Problems of Advanced Calculus, SchaumPublishing Company, NewYork.
2. Murray R. Spiegel, Vector Analysis, SchaumPublishing Company, New York.

3. Shanti Narayan, AText Book of Vector Calculus, S. Chand&Co., New Delhi.
4. S. L. Loney, The Elements of Coordinate Geometry, Macmillan and Company,london.
5. P.K. Jain and Khalil Ahmad, A Text Book of Analytical Geometry of two Dimensions, Wiley Eastern Ltd.,1994.
6. P.K. Jain and Khalil Ahmad, A Text Book of Analytical Geometry of three Dimensions, Wiley Eastern Ltd.,1999.
7. N. Saran and R.S. Gupta, Analytical Geometry of three Dimensions, PothishalaPvt.Ltd.Allahabad.

GEL-III: MATHEMATICS- III: PRACTICAL (BSHML-103)

CREDITS: 2

PRESENTATION-I

PRESENTATION-II

Semester IV

DESIGN AND ANALYSIS OF ALGORITHMS (BSHCS-401)

CREDITS: 4

UNIT–I:

Introduction: Basic Design and Analysis techniques of Algorithms, Correctness of Algorithm.

Algorithm Design Techniques: Iterative techniques, Divide and Conquer, Dynamic Programming, Greedy Algorithms.

UNIT–II:

Sorting and Searching Techniques

Elementary sorting techniques–Bubble Sort, InsertionSort, Merge Sort, Advanced Sorting techniques - Heap Sort, Quick Sort, Sorting in Linear Time - Bucket Sort, Radix Sort and Count Sort, Searching Techniques, Medians & Order Statistics, complexity analysis;

UNIT–III:

Lower Bounding Techniques

Decision Trees

Balanced Trees

Red-Black Trees

UNIT–IV:

Advanced Analysis Technique

Amortized analysis

UNIT–V: Graphs

Graph Algorithms–Breadth First Search, Depth First Search and its Applications,Minimum Spanning Trees.

String Processing

String Matching, KMP Technique

Recommended Books:

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

DESIGN AND ANALYSIS OF ALGORITHMS PRACTICAL

(BSHCSL-401)

CREDITS: 2

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.

Recommended Books:

1. T.H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein Introduction toAlgorithms, PHI, 3rd Edition 2009

2. Sarabasse& A.V. Gelder Computer Algorithm – Introduction to Design and Analysis,Publisher – Pearson 3rd Edition 1999

SOFTWARE ENGINEERING(BSHMB-402)

CREDITS: 4

UNIT–I:

Introduction

The Evolving Role of Software, Software Characteristics, Changing Nature of Software, Software Engineering as a Layered Technology, Software Process Framework, Framework and Umbrella Activities, Process Models, Capability Maturity Model Integration (CMMI).

UNIT–II:

Requirement Analysis

Software Requirement Analysis, Initiating Requirement EngineeringProcess, Requirement Analysis and Modeling Techniques, Flow Oriented Modeling, Need for SRS, Characteristics and Components of SRS.

UNIT–III:

Software Project Management

Estimation in Project Planning Process, Project Scheduling.

Risk Management

Software Risks, Risk Identification, Risk Projection and Risk Refinement, RMMM Plan.

UNIT–IV:

Quality Management

Quality Concepts, Software Quality Assurance, Software Reviews, Metrics for Process and Projects.

Design Engineering

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

UNIT–V:

Testing Strategies & Tactics

Software Testing Fundamentals, Strategic Approach to Software Testing, Test Strategies for Conventional Software, Validation Testing, System Testing, Black-Box Testing, White-Box Testingand their type, Basis Path Testing.

Recommended Books:

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 PublishingHouse, 2003.
3. K.K. Aggarwal and Y. Singh, Software Engineering (revised 2nd Edition), New Age International Publishers, 2008.
4. I. Sommerville, Software Engineering (8th edition), Addison Wesle, 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.

SOFTWARE ENGINEERING PRACTICAL (BSHCSL-402)

CREDITS: 2

S. No	Practical Title
1.	• Problem Statement, • Process Model
2.	Requirement Analysis: • Creating a Data Flow • Data Dictionary, Use Cases
3.	Project Management: • Computing FP • Effort • Schedule, Risk Table, Timeline chart
4.	Design Engineering: • Architectural Design • Data Design, Component Level Design
5.	Testing: • Basis Path Testing

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 employeeswithin 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

Recommended Books:

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),

DATABASE MANAGEMENT SYSTEMS(BSHMB-403)

CREDITS: 4

UNIT–I:

Introduction

Characteristics of database approach, data models, database system architectureand dataindependence.

Entity Relationship(ER) Modeling

Entity types, relationships, constraints.

UNIT–II:

Relation data model

Relational model concepts, relational constraints, relational algebra, SQLqueries

UNIT–III:

Database design

Mapping ER/EER model to relational database, functional dependencies,Lossless decomposition, Normalforms(upto BCNF).

UNIT–IV:

Transaction Processing

ACID properties, concurrency control

UNIT–V:

File Structure and Indexing

Operations on files, File of Unordered and ordered records, overview of File organizations, Indexing structures for files(Primary index, secondary index, clustering index), Multilevel indexingusing B and B^+ trees.

Books Recommended:

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,2002.
3. A. Silberschatz, H.F. Korth, S. Sudarshan, Database System Concepts 6th Edition, McGrawHill, 2010.
4. R. Elmasri, S.B. Navathe Database Systems Models, Languages, Design and applicationProgramming, 6th Edition, Pearson Education, 2013.

DATABASE MANAGEMENT SYSTEMS PRACTICAL

(BSHCSL-403)

CREDITS: 2

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	DEFAULT
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 withthe 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 andname 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 rangeof $1500 and $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 nameand 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 Amountis 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 sixmonths of employment.
18. Query to display Name and calculate the number of months between today and the date eachemployee 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 lengthof 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'semployee 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 departmentwith 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.

Books Recommended:

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,2002.
3. A. Silberschatz, H.F. Korth, S. Sudarshan, Database System Concepts 6th Edition, McGrawHill, 2010.
4. R. Elmasri, S.B. Navathe Database Systems Models, Languages, Design and applicationProgramming, 6th Edition, Pearson Education, 2013

GE-IV: PHYSICS: MATHEMATICAL PHYSICS-III (BSHP-401)

CREDITS: 4

The emphasis of the course is on applications in solving problems of interest to physicists. Students are to be examined on the basis of problems, seen and unseen.

UNIT-I:

Complex Analysis

Brief Revision of Complex Numbers and their Graphical Representation. Euler's formula, De Moivre's theorem, Roots of Complex Numbers. Functions of Complex Variables.Analyticity and Cauchy-Riemann Conditions.Examples of analytic functions.

UNIT-II:

Singular functions: poles and branch points, order of singularity, branch cuts. Integration of a function of a complex variable.Cauchy's Inequality.Cauchy's Integral formula.Simply and multiply connected region.Laurent and Taylor's expansion.Residues and Residue Theorem.Application in solving Definite Integrals.

UNIT-III:

Integrals Transforms:

Fourier Transforms: Fourier Integral theorem. Fourier Transform. Examples.Fourier transform of trigonometric,Gaussian, finite wave train & other functions.Representation of Dirac delta function as a Fourier Integral.

UNIT-IV:

Fourier transform of derivatives, Inverse Fourier transform, Convolution theorem. Properties of Fourier transforms (translation, change of scale, complex conjugation, etc.). Application of Fourier Transforms to differential equations: One dimensional Wave and Diffusion/Heat Flow Equations.

UNIT-V:

Laplace Transforms: Laplace Transform (LT) of Elementary functions. Properties of LTs: Change of Scale Theorem, Shifting Theorem. LTs of Derivatives and Integrals of Functions, Derivatives and Integrals of LTs. LT of Unit Step function, Dirac Delta function, Periodic

Functions. Convolution Theorem. Inverse LT. Application of Laplace Transforms to Differential Equations: Damped Harmonic Oscillator, Simple Electrical Circuits.

References:

1. Mathematical Methods for Physics and Engineers, K.F Riley, M.P. Hobson and S. J. Bence, 3rd ed., 2006, Cambridge University Press
2. Mathematics for Physicists, P. Dennery and A. Krzywicki, 1967, Dover Publications
3. Complex Variables, A.S.Fokas&M.J.Ablowitz, 8th Ed., 2011, Cambridge Univ. Press
4. Complex Variables and Applications, J.W. Brown &R.V. Churchill, 7th Ed. 2003, Tata McGraw-Hill
5. First course in complex analysis with applications, D.G. Zill and P.D. Shanahan, 1940, Jones & Bartlett

GEL-III: PHYSICS: MATHEMATICAL PHYSICS-III LAB-I

(BSHP-L-401)

CREDITS: 2

Scilab based simulations experiments based on Mathematical Physics problems like

1. Solve differential equations: $dy/dx = e^{-x}$ with y = 0 for x = 0 $dy/dx + e^{-x}y = x2$

$d^2y/dt^2 + 2\ dy/dt = -y\ d^2y/dt^2 + e^{-t}dy/dt = -y$

2. Dirac Delta Function: Evaluate complex integrals .
3. Fourier Series: Program to sum (0.2)^n

Evaluate the Fourier coefficients of a given periodic function (square wave)

4. Frobenius method and Special functions. Plot $Pn(x)$, jv(x) and show recursion relation
5. Calculation of error for each data point of observations recorded in experiments done in previous semesters (choose any two).
6. Calculation of least square fitting manually without giving weightage to error. Confirmation of least square fitting of data through computer program.
7. Evaluation of trigonometric functions e.g. *sin θ,* Given Bessel's function at N points find its value at an intermediate point. Complex analysis: Integrate 1/(x2+2) numerically and check with computer integration.
8. Integral transform: FFT of $^{(-x2)}$

References:

1. Mathematical Methods for Physics and Engineers, K.F Riley, M.P. Hobson and S. J. Bence, 3rd ed., 2006, Cambridge University Press
2. Mathematics for Physicists, P. Dennery and A. Krzywicki, 1967, Dover Publications
3. Simulation of ODE/PDE Models with MATLAB®, OCTAVE and SCILAB: Scientific and Engineering Applications: A. VandeWouwer, P. Saucez, C. V. Fernández. 2014 Springer ISBN: 978-3319067896
4. Scilab by example: M. Affouf, 2012. ISBN: 978-1479203444
5. Scilab(A free software to Matlab): H.Ramchandran, A.S.Nair. 2011 S.Chand& Company
6. Scilab Image Processing: Lambert M. Surhone. 2010 Betascript Publishing

GE-IV: MATHEMATICS- II: DIFFERENTIAL EQUATIONS

(BSHM-402)

CREDITS: 4

UNIT-I:

Series solutions of differential equations- Power series method, Bessel and Legendre functions and their properties-convergence, recurrence and generating relations

UNIT-II:

Orthogonality of functions, Sturm-Liouville problem, Orthogonality of eigen- functions, Reality of eigen values, Orthogonality of Bessel functions and Legendrepolynomials.

UNIT-III:

Laplace Transformation- Linearity of the Laplace transformation, Existence theorem for Laplace transforms, Laplace transforms of derivatives and integrals, Shifting theorems. Differentiation and integration of transforms.

UNIT-IV:

Convolution theorem.Solution of integral equations and systems of differential equations using the Laplace transformation.

UNIT-V:

Partial differential equations of the first order.Lagrange's solution.

References:

1. Erwin Kreysizig, Advanced Engineering Mathematics, John Wiley & Sons, Inc., New York,1999.
2. D.A. Murray, Introductory Course on Differential Equations, Orient Longman, (India), 1967.
3. A.R. Forsyth, A Treatise on Differential Equations, Macmillan and Co. Ltd.,London.
4. Lan N. Sneddon, Elements of Partial Differential Equations, McGraw-Hill Book Company,1988.
5. Francis B. Hilderbrand, Advanced Calculus for Applications, Prentice Hall of India Pvt. Ltd., New Delhi,1977.
6. Jane Cronin, Differential equations, Marcel Dekkar,1994.

7. Frank Ayres, Theory and Problems of Differential Equations, McGraw-Hill Book Company,1972.
8. Richard Bronson, Theory and Problems of Differential Equations, McGraw-Hill, Inc., 1973.
9. A.S. Gupta, Calculus of variations with-Applications, Prentice-Hall ofIndia, 1997.R.CourantandD.Hilbert,MethodsofMathematicalPhysics,Vots.I&II,Wiley.

GEL-IV: MATHEMATICS- IV: PRACTICAL (BSHM-L-402)

CREDITS: 2

PRESENTATION-I

PRESENTATION-II

Semester V

INTERNET TECHNOLOGIES (BSHCS-501)

CREDITS: 4

UNIT–I:

Java

Use of Objects, Array and Array List class

UNIT–II:

JavaScript

Data types, operators, functions, control structures, events and event handling.

UNIT–III:

JDBC

JDBC Fundamentals, Establishing Connectivity and working with connection interface,Working with statements, Creating and Executing SQL Statements, Working with Result Set Objects.

UNIT–IV:

JSP

Introduction to JavaServer Pages, HTTP and Servlet Basics, The Problem with Servlets,The Anatomy of a JSP Page, JSP Processing, JSP Application Design with MVC, Setting Up the JSP Environment, Implicit JSP Objects, Conditional Processing, Displaying Values, Using an expression to Set an Attribute, Declaring Variables and Methods, Error Handling and Debugging, Sharing DataBetween JSP Pages, Requests, and Users, Database Access.

UNIT–V:

Java Beans

Java Beans Fundamentals, JAR files, Introspection, Developing a simple Bean, Connecting to DB

Recommended Books:

1. Web Enabled Commercial Application Development Using Html, Dhtml, javascript, PerlCgi By Ivan Bayross, BPB Publications, 2009.
2. BIG Java Cay Horstmann, Wiley Publication , 3rd Edition., 2009
3. Java 7, The Complete Reference, Herbert Schildt, 8th Edition, 2009.
4. The Complete Reference J2EE, TMH, Jim Keogh, 2002.
5. Java Server Pages, Hans Bergsten, Third Edition, O'Reilly Media December 2003.

INTERNET TECHNOLOGIES PRACTICAL (BSHCSL-501)

CREDITS: 2

Create event driven program for following:

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. A person deposits Rs 1000 in a fixed account yielding 5% interest. Compute the amount in theaccount at the end of each year for n years.
6. Read n numbers. Count the number of negative numbers, positive numbers and zeros in the list.

Recommended Books:

1. Web Enabled Commercial Application Development Using Html, Dhtml,javascript, PerlCgi By Ivan Bayross, BPB Publications, 2009.
2. BIG Java Cay Horstmann, Wiley Publication , 3rd Edition., 2009
3. Java 7, The Complete Reference, Herbert Schildt, 8th Edition, 2009.
4. The Complete Reference J2EE, TMH, Jim Keogh, 2002.
5. Java Server Pages, Hans Bergsten, Third Edition, O'Reilly Media December 2003.

THEORY OF COMPUTATION(BSHCS-502)

CREDITS: 4

UNIT–I:

Languages

Alphabets, string, language, Basic Operations on language, Concatenation, KleeneStar

UNIT–II:

Finite Automata and Regular Languages

Regular Expressions, Transition Graphs, Deterministics 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–III:

Context free languages-I

Context free grammars, parse trees, ambiguities in grammars and languages, Pushdown automata (Deterministic and Non-deterministic),

UNIT–IV:

Context free languages-II

Pumping Lemma, Properties of context free languages,normal forms.

UNIT–V:

Turing Macines and Models of Computations

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

Recommended Books:

1. Daniel I.A.Cohen, Introduction to computer theory – John Wiley (1996 2nd Edition).
2. Lewis & Papadimitriou, Elements of the theory of computation – II Edition PHI 1997.
3. Hoperoft, Aho, Ullman, Introduction to Automata theory, Language & Computation **–3rd** Edition 2006, Pearson Education.
4. P. Linz, An Introduction to Formal Language and Automata 4th edition Publication JonesBartlett 2006

THEORY OF COMPUTATIONPRACTICAL (BSHCSL-502)

CREDITS: 2

Theory of ComputationTutorial

Recommended Books:

1. Daniel I.A.Cohen, Introduction to computer theory – John Wiley (1996 2nd Edition).
2. Lewis & Papadimitriou, Elements of the theory of computation – II Edition PHI 1997.
3. Hoperoft, Aho, Ullman, Introduction to Automata theory, Language & Computation **–3rd** Edition 2006, Pearson Education.
4. P. Linz, An Introduction to Formal Language and Automata 4th edition Publication JonesBartlett 2006

Semester VI

ARTIFICIAL INTELLIGENCE (BSHCS-601)

CREDITS: 4

UNIT–I:

Introduction

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–II:

Problem Solving and Searching Techniques

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–III:

Knowledge Representation

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

UNIT–IV:

Dealing with Uncertainty and Inconsistencies

Truth Maintenance System, Default Reasoning, Probabilistic Reasoning, Bayesian Probabilistic Inference, Possible World Representations.

UNIT–V:

Understanding Natural Languages

Parsing Techniques, Context-Free and Transformational Grammars, Recursive and Augmented Transition Nets.

BOOKS RECOMMENDED:

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, PearsonEducation, 3rd edition, 2000.

ARTIFICIAL INTELLIGENCE PRACTICAL (BSHCSL-601)

CREDITS: 2

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 listinto_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 listwith 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 numbersX and Y.
11. Write a Prolog program to implement maxlist(List,Max) so that Max is the greatest number inthe list of numbers List.
12. Write a Prolog program to implement sumlist(List,Sum) so that Sum is the sum of a given list ofnumbers List.
13. Write a Prolog program to implement two predicates even length (List) and odd length (List) sothat they are true if their argument is a list of even or odd length respectively.
14. Write a Prolog program to implement reverse (List, Reversed List) that reverses lists.
15. Write a Prolog program to implement maxlist (List,Max) so that Max is the greatest number inthe 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.

BOOKS RECOMMENDED:

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.

COMPUTER GRAPHICS (BSHCS-602)

CREDITS: 4

UNIT–I:

Introduction

Basic elements of Computer graphics, Applications of Computer Graphics.

UNIT–II:

Graphics Hardware

Architecture of Raster and Random scan display devices, input/output devices.

UNIT–III:

Fundamental Techniques in Graphics

Raster scan line, circle and ellipse drawing, thick primitives, Polygon filling, line and polygon clipping algorithms, 2D and 3D Geometric Transformations, 2D and 3D Viewing Transformations (Projections- Parallel and Perspective), Vanishing points.

UNIT–IV:

Geometric Modeling

Representing curves & Surfaces.

UNIT–V:

Visible Surface determination

Hidden surface elimination.

Surface rendering

Illumination and shading models.Basic color models and Computer Animation.

Books Recommended:

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.

COMPUTER GRAPHICS PRACTICAL (BSHCSL-602)

CREDITS: 2

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 fill a polygon using Scan line fill algorithm.
6. Write a program to apply various 2D transformations on a 2D object (use homogenouscoordinates).
7. Write a program to apply various 3D transformations on a 3D object and then apply paralleland perspective projection on it.
8. Write a program to draw Hermite /Bezier curve.

Books Recommended:

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.

COMPUTER SCIENCE -DSE I-IV (ELECTIVES)

DSE-I: SYSTEMS PROGRAMMING

CREDITS: 4

UNIT–I:

Assemblers & Loaders, Linkers:

One pass and two pass assembler, design of an assembler, Absolute loader, relocation and linkingconcepts, relocating loader and Dynamic Linking.

UNIT–II:

Introduction:

Overview of compilation, Phases of a compiler

Lexical Analysis:

Role of a Lexical analyzer, Specification and recognition of tokens, Symbol table, lex

UNIT–III:

Parsing:

Bottom up parsing- LR parser, yacc.

UNIT–IV:

Intermediate representations

Three address code generation, syntax directed translation, translation of types, control statements

UNIT–V:

Storage organization:

Activation records, stack allocation

Code Generation:

Object code generation

Reference Books

1. Santanu Chattopadhyaya, *Systems Programming*, PHI, 2011.
2. Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, *Compilers:Principles,Techniques, and Tools*, 2nd edition, PrenticeHall, 2006.
3. D. M. Dhamdhere, *Systems Programming*, Tata McGraw Hill, 2011.
4. Leland Beck, D. Manjula, *System Software: An Introduction to System Programming*, 3rd edition, Pearson Education, 2008.
5. Grune D, Van Reeuwijk . K, Bal H. E, Jacobs C J H, Langendoen K, *Modern CompilerDesign*, 2nd edition, Springer, 2012

PRACTICALS-DSE-I LAB: SYSTEMS PROGRAMMING

CREDITS: 2

1. To implement an assembler for a hypothetical language.
2. To get familiar with lex: write a program to recognize numbers, identifiers.
3. To get familiar with yacc: write a desk calculator.

Reference Books

6. Santanu Chattopadhyaya, *Systems Programming*, PHI, 2011.
7. Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, *Compilers:Principles,Techniques, and Tools*, 2nd edition, PrenticeHall, 2006.
8. D. M. Dhamdhere, *Systems Programming*, Tata McGraw Hill, 2011.
9. Leland Beck, D. Manjula, *System Software: An Introduction to System Programming*, 3rd edition, Pearson Education, 2008.
10. Grune D, Van Reeuwijk. K, Bal H. E, Jacobs C J H, Langendoen K, *Modern CompilerDesign*, 2nd edition, Springer, 2012

DSE-II: NUMERICAL METHODS

CREDITS: 4

UNIT–I:

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

UNIT–II:

Bisection method, Secant method, Regula−Falsi method

Newton−Raphson method, Newton's method for solving nonlinear systems

Gauss elimination method (with row pivoting) and Gauss−Jordan method, Gauss Thomas methodfor tridiagonal systems, Iterative methods: Jacobi and Gauss-Seidel iterative methods

UNIT–III:

Interpolation: Lagrange's form and Newton's form

Finite difference operators, Gregory Newton forward and backward differences Interpolation Piecewise polynomial interpolation: Linear interpolation, Cubic spline interpolation (only method),

UNIT–IV:

Numerical differentiation: First derivatives and second order derivatives, Richardson extrapolation

Numerical integration: Trapezoid rule, Simpson's rule (only method), Newton−Cotes open formulas

Extrapolation methods: Romberg integration, Gaussian quadrature, Ordinary differential equation:Euler's method

UNIT–V:

Modified Euler's methods: Heun method and Mid-point method, Runge-Kutta second methods:Heun method without iteration, Mid-point method and Ralston's method

Classical 4^{th} order Runge-Kutta method, Finite difference method for linear ODE14L

REFERNCE BOOKS:

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

1. Find the roots of the equation by bisection method.
2. Find the roots of the equation by secant/Regula−Falsi method.
3. Find the roots of the equation by Newton's method.
4. Find the solution of a system of nonlinear equation using Newton's method.
5. Find the solution of tridiagonal system using Gauss Thomas method.
6. Find the solution of system of equations using Jacobi/Gauss-Seidel method.
7. Find the cubic spline interpolating function.
8. Evaluate the approximate value of finite integrals using Gaussian/Romberg integration.
9. Solve the initial value problem using Euler's method and compare the result with the exactsolutions.
10. Solve the boundary value problem using finite difference method.

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

REFERNCE BOOKS:

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

DSE-III: MODELLING AND SIMULATION

CREDITS: 4

UNIT–I:

System models and System studies

Concept of a System, Deterministic and Stochastic Activities, Continuous and Discrete Systems, System Modeling, Types of Models, Principles used in Modeling, Corporate Model, System Design.

What is Simulation?

Technique of Simulation, The Monte-Carlo Method, Comparison of Simulation and Analytical Methods, Experimental nature of Simulation, Types of System Simulation, Numerical Computation Techniques for Continuous Models, Numerical Computation Techniquesfor Discrete Models, Distributed Lag Models, Cobweb Models.

UNIT–II:

Continuous System Simulation

Continuous System Models, Differential Equations & Applications, Feedback Systems, Simulationof an Autopilot, Interactive systems, Real Time Systems.

Concepts in Discrete Event Simulation

The Event Scheduling / Time Advance Algorithm, World Views, Manual Simulation using Event Scheduling, List Processing: Lists-Basic properties and operations, Use of arrays for List Processing, Using Dynamic Allocation and Linked Lists.

UNIT–III:

Queuing Models

Characteristics of Queuing Systems, Arrival and Service Patterns, Queue Discipline, Long Run Measures of Performance of Queuing Systems, Time-Average Number in System, Server Utilization, Costs in Queuing Problems, Steady State behavior of Infinite Population MarkovianModels, Multiserver Queue: M/M/C/∞/∞.

UNIT–IV:

Simulation software

Comparison of Simulation Packages with Programming Languages, Classification of Simulation Software: General Purpose vs Application Oriented Simulation Packages, Desirable Software Features: General Capabilities, H/w and S/w Requirements, Animation and Dynamic Graphics, Statistical Capabilities, General Purpose Simulation Packages, Object Oriented Simulation, Examples of Application-oriented Simulation packages,

Simulation in GPSS.

Random Number, Non-Uniform random variate Generation and Monte-Carlo Method

Linear Congruential Generators, Testing Random Number Generators: Empirical and Theoretical tests, Non-Uniform Random Variate Generator: Inverse Transform, Composition. Generating Continuous Random Variates: Uniform, Exponential, Gamma, and Normal. Generating Discrete Random Variates: Bernoulli, Binomial, Poisson. Monte-Carlo Method: Evaluation of Integral-Hit orMiss Method.

UNIT–V:

Analysis of Simulation Data

Identifying the Distribution with Data, Types of Simulations with respect to Output Analysis, Stochastic nature of Output Data, Measures of Performance and their Estimation: Point Estimation, Confidence-Interval Estimation, Output Analysis for Terminating Simulations: Statistical Background, Confidence-Intervals with Specified Precision, Output Analysis for Steady State Simulations, Variance-Reduction Technique-Antithetic variates.

Verification and Validation of Simulation Models

Model Building- Verification and Validation, Verification of Simulation Models, Calibration and Validation of Models: Validation of Model Assumptions, Validating Input-output Transformations,Input-Output Validation

References:

1. Raj Jain, Art of Computer Systems Performance Analysis, John Wiley and Sons, Inc,1991
2. Sheldon M. Ross, Simulation, 4thEd., Elsevier 2008
3. Averill M. Law and W. David Kelton, Simulation Modeling and Analysis, 3rdEd., Tata McGraw-Hill, 2003
4. Geofeerey Gordon, System Simulation, 2nd Ed., PHI, 1987
5. Jerry Banks and John S. Carson, Barry L Nelson, Discrete-Event System Simulation, 5thEd.,Prentice Hall, 2010
6. Narsingh Deo, System Simulation with Digital Computers, Prentice Hall of India, 1979

PRACTICALS-DSE-III LAB: MODELLING AND SIMULATION

CREDITS: 2

Practical exercises based on theory

References:

1. Raj Jain, Art of Computer Systems Performance Analysis, John Wiley and Sons, Inc,1991
2. Sheldon M. Ross, Simulation, 4thEd., Elsevier 2008
3. Averill M. Law and W. David Kelton, Simulation Modeling and Analysis, 3rdEd., Tata McGraw-Hill, 2003
4. Geofeerey Gordon, System Simulation, 2nd Ed., PHI, 1987
5. Jerry Banks and John S. Carson, Barry L Nelson, Discrete-Event System Simulation, 5thEd.,Prentice Hall, 2010
6. Narsingh Deo, System Simulation with Digital Computers, Prentice Hall of India, 1979

DSE-IV: ADVANCED DATA STRUCTURES AND ALGORITHMS

CREDITS: 4

UNIT–I:

Advanced Data Structures

Fibonacci heaps, Priority Queues. Dynamic Data Structures.

UNIT–II:

Divide and Conquer

Closest pair of points, Integer Multiplication, Convolutions and Fast Fourier Transforms

Greedy

Interval Scheduling, Proving optimality using Stays Ahead and Exchange Arguments.

UNIT–III:

Dynamic Programming

Principles of Dynamic Programming, Weighted Interval Scheduling, Segmented Least Squares, Subset Sums and Knapsacks

UNIT–IV:

Network Flows

Max-flow problem, Ford Fulkerson Algorithm, Maximum flows and Minimum Cuts in a network, Bipartite Matching.

UNIT–V:

NP Completeness

Polynomial time reductions, Reduction via gadgets (satisfiability problem), Efficient Certification and Definition of NP, NP Complete problems, Sequencing problems, Partitioning problems, co-NP and asymmetry of NP.

Books Recommended:

1. Jon Kleinberg and Eva Tardos, Algorithm Design, Pearson Education, 2006
2. Cormen, Leiserson, Rivest and Stein, Introduction to Algorithms, Prentice Hall of India, Third Edition
3. Vijay V. Vazirani, Approximation algorithms, Springer

PRACTICALS-DSE-IV LAB: ADVANCED DATA STRUCTURES AND ALGORITHMS

CREDITS: 2

Tutorials

Books Recommended:

1. Jon Kleinberg and Eva Tardos, Algorithm Design, Pearson Education, 2006
2. Cormen, Leiserson, Rivest and Stein, Introduction to Algorithms, Prentice Hall of India,Third Edition
3. Vijay V. Vazirani, Approximation algorithms, Springer

DSE-V: MACHINE LEARNING

CREDITS: 4

UNIT–I:

Introduction

Concept of Machine Learning, Applications of Machine Learning, Key elements of Machine Learning, Supervised vs. Unsupervised Learning, Statistical Learning: Bayesian Method, The NaiveBayes Classifier

Softwares for Machine Learning and Linear Algebra Overview

Plotting of Data, Vectorization, Matrices and Vectors: Addition, Multiplication, Transpose andInverse using available tool such as MATLAB.

UNIT–II:

Linear Regression

Prediction using Linear Regression, Gradient Descent, Linear Regression with one variable, LinearRegression with multiple variables, Polynomial Regression, Feature Scaling/Selection.

UNIT–III:

Logistic Regression

Classification using Logistic Regression, Logistic Regression vs. Linear Regression, Logistic Regression with one variable and with multiple variables.

UNIT–IV:

Regularization

Regularization and its utility: The problem of Overfitting, Application of Regularization in Linearand Logistic Regression, Regularization and Bias/Variance.

UNIT–V:

Neural Networks

Introduction, Model Representation, Gradient Descent vs. Perceptron Training, Stochastic Gradient Descent, Multilayer Perceptrons, Multiclass Representation, Backpropagation Algorithm.

Recommended Books

1. Ethem Alpaydin, "Introduction to Machine Learning" 2nd Edition, The MIT Press, 2009.
2. Tom M. Mitchell, "Machine Learning", First Edition by Tata McGraw-Hill Education, 2013.
3. Christopher M. Bishop, "Pattern Recognition and Machine Learning" by Springer, 2007.

4. Mevin P. Murphy, "Machine Learning: A Probabilistic Perspective" by The MIT Press, 2012.

PRACTICALS-DSE-V LAB: MACHINE LEARNING

CREDITS: 2

For practical Labs for Machine Learning, students may use softwares like MABLAB/Octave or Python. For later exercises, students can create/use their own datasets or utilize datasets from online repositories like UCI Machine Learning Repository (http://archive.ics.uci.edu/ml/).

1. Perform elementary mathematical operations in Octave/MATLAB like addition, multiplication,division and exponentiation.
2. Perform elementary logical operations in Octave/MATLAB (like OR, AND, Checking forEquality, NOT, XOR).
3. Create, initialize and display simple variables and simple strings and use simple formatting forvariable.
4. Create/Define single dimension / multi-dimension arrays, and arrays with specific values like array of all ones, all zeros, array with random values within a range, or a diagonal matrix.
5. Use command to compute the size of a matrix, size/length of a particular row/column, load datafrom a text file, store matrix data to a text file, finding out variables and their features in the current scope.
6. Perform basic operations on matrices (like addition, subtraction, multiplication) and displayspecific rows or columns of the matrix.
7. Perform other matrix operations like converting matrix data to absolute values, taking the negative of matrix values, additing/removing rows/columns from a matrix, finding the maximum or minimum values in a matrix or in a row/column, and finding the sum of some/allelements in a matrix.
8. Create various type of plots/charts like histograms, plot based on sine/cosine function based ondata from a matrix. Further label different axes in a plot and data in a plot.
9. Generate different subplots from a given plot and color plot data.
10. Use conditional statements and different type of loops based on simple example/s.
11. Perform vectorized implementation of simple matrix operation like finding the transpose of amatrix, adding, subtracting or multiplying two matrices.
12. Implement Linear Regression problem. For example, based on a dataset comprising of existingset of prices and area/size of the houses, predict the estimated price of a given house.

13. Based on multiple features/variables perform Linear Regression. For example, based on a number of additional features like number of bedrooms, servant room, number of balconies, number of houses of years a house has been built – predict the price of a house.
14. Implement a classification/ logistic regression problem. For example based on different featuresof student's data, classify, whether a student is suitable for a particular activity. Based on the available dataset, a student can also implement another classification problem like checking whether an email is spam or not.
15. Use some function for regularization of dataset based on problem 14.
16. Use some function for neural networks, like Stochastic Gradient Descent or backpropagation - algorithm to predict the value of a variable based on the dataset of problem 14.

Recommended Books

1. Ethem Alpaydin, "Introduction to Machine Learning" 2nd Edition, The MIT Press, 2009.
2. Tom M. Mitchell, "Machine Learning", First Edition by Tata McGraw-Hill Education, 2013.
3. Christopher M. Bishop, "Pattern Recognition and Machine Learning" by Springer, 2007.
4. Mevin P. Murphy, "Machine Learning: A Probabilistic Perspective" by The MIT Press, 2012.

DSE-VI: INTRODUCTION TO DATA SCIENCES

CREDITS: 4

UNIT–I:

Data Scientist's Tool Box: Turning data into actionable knowledge, introduction to the tools thatwill be used in building data analysis software: version control, markdown, git, GitHub, R, and RStudio.

UNIT–II:

R Programming Basics: Overview of R, R data types and objects, reading and writing data, Control structures, functions, scoping rules, dates and times, Loop functions, debugging tools,Simulation, code profiling

UNIT–III:

Getting and Cleaning Data: Obtaining data from the web, from APIs, from databases and fromcolleagues in various formats. basics of data cleaning and making data "tidy".

UNIT–IV:

Exploratory Data Analysis: Essential exploratory techniques for summarizing data, applied beforeformal 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.

UNIT–V:

Reproducible Research: Concepts and tools behind reporting modern data analyses in a reproducible manner, To write a document using R markdown, integrate live R code into a literatestatistical program, compile R markdown documents using knitr and related tools, and organize a data analysis so that it is reproducible and accessible to others.

Reference Books

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 DataMining and Data-Analytic Thinking" by O'Reilly, 2013.
3. John W. Foreman, "Data Smart: Using data Science to Transform Information into Insight" byJohn 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.

PRACTICALS-DSE-VI LAB: INTRODUCTION TO DATA SCIENCES

CREDITS: 2

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 nowmean, mode and median ?
11. Following table gives a frequency distribution of systolic blood pressure. Compute all themeasures 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 in R, apply basic principles of data graphics to create rich analytic graphics from

available datasets.

14. Use Git / Github software to create Github account. Also, create a repo using Github.

Reference Books

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 DataMining and Data-Analytic Thinking" by O'Reilly, 2013.
3. John W. Foreman, "Data Smart: Using data Science to Transform Information into Insight" byJohn Wiley & Sons, 2013.
4. Ian Ayres, "Super Crunchers: Why Thinking-by-Numbers Is the New Way to Be Smart" IstEdition 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

SKILL ENHANCEMENT COURSE (ANY TWO)

SEC-I TO SEC-IV

SEC-I: ANDROID PROGRAMMING

CREDITS: 2

UNIT–I:

Introduction: History of Android, Introduction to Android Operating Systems, Android Development Tools, Android Architecture.

UNIT–II:

Overview of object oriented programming using Java: OOPs Concepts: Inheritance, Polymorphism, Interfaces, Abstract class, Threads, Overloading and Overriding, Java Virtual Machine.

UNIT–III:

Development Tools: Installing and using Eclipse with ADT plug-in, Installing Virtual machine for Android sandwich/Jelly bean (Emulator), configuring the installed tools, creating a android project – Hello Word, run on emulator, Deploy it on USB-connected Android device.

UNIT–IV:

User Interface Architecture: Application context, intents, Activity life cycle, multiple screen sizes.

UNIT–V:

User Interface Design: Form widgets, Text Fields, Layouts, Button control, toggle buttons, Spinners (Combo boxes),Images, Menu, Dialog.

Database: Understanding of SQLite database, connecting with the database.

Book Recommended:

1. Android application development for java programmers. By James C. Sheusi. Publisher:Cengage Learning, 2013.

ONLINE READING / SUPPORTING MATERIAL:

1. http://www.developer.android.com
2. http://developer.android.com/about/versions/index.html
3. http://developer.android.com/training/basics/firstapp/index.html
4. http://docs.oracle.com/javase/tutorial/index.htm (Available in the form of free downloadableebooks also).
5. http://developer.android.com/guide/components/activities.html

SEC-II: PHP PROGRAMMING

CREDITS: 2

UNIT–I:

Introduction to PHP

- PHP introduction, inventions and versions, important tools and software requirements (likeWeb 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, ternaryand MOD operator.
- PHP operator Precedence and associativity

UNIT–II:

Handling HTML form with PHP

HTML

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

UNIT–III:

PHP conditional events and Loops

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

UNIT–IV:

PHP Functions

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

UNIT–V:

String Manipulation and Regular Expression

- 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

Array

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

ONLINE READING / SUPPORTING MATERIAL:

1. http://developer.android.com/guide/components/fundamentals.html
2. http://developer.android.com/guide/components/intents-filters.html.
3. http://developer.android.com/training/multiscreen/screensizes.html
4. http://developer.android.com/guide/topics/ui/controls.html
5. http://developer.android.com/guide/topics/ui/declaring-layout.html
6. http://developer.android.com/training/basics/data-storage/databases.html

*** As per UGC CBCS guidelines, University / departments have liberty to offer GE and SEC courses offered by one department to students of other departments. The No. of GE course is four. One GE course is compulsory in first 4 semesters each.**

Minimum One Skill Enhancement course shall be proposed by each department (4 credits) [4 L or 2 L+ 2 P or l L+3 P or 3L+ l T] 1P = 2 hours.

***Credit= L+T+P/2**

Where, **L**-Lecture**, T**-Tutorial and **P-** Practical

Total Credits=144

Reference:

1. **University of Delhi.**