BS - S 5734

I YEAR I SEMESTER PAPER– i MATHS FOR DATA SCIENCE

Objective

The course is a brief overview of the basic tools from Linear Algebra and Multivariable Calculus that will be needed in subsequent course of the program.

Outcome

By completing the course the students will have been reminded of the basic tools of Linear Algebra and Multivariable Calculus needed in subsequent courses in the program notably:

- Fundamental properties of matrices, their norms, and their applications.
- Differentiating/Integrating multiple variable functions and the role of the gradient and the hessian matrix.
- Basic properties of optimization problems involving matrices and functions of multiple variables.

Unit-I

Matrices and Basic Operations, Special structures Matrices and Basic Operations, Interpretation of matrices as linear mappings and some examples.

Square Matrices, Determinants, Properties of determinants, singular and non-singular matrices, examples, finding an inverse matrix.

Unit-II

Eigen values and Eigenvectors Characteristic Polynomial, Definition of Left/Right Eigen values and Eigenvectors, Caley – Hamilton theorem, singular value Decomposition. Interpretation of Eigen values/vectors.

Unit-III

Linear Systems Definition, applications, solving linear systems, linear inequalities, linear programming.

Unit-IV

Real-valued functions of two or more variables. Definition, examples, simple demos. applications.

Unit-V

Analysis elements Distance, Limits, Continuity. Differentiability, the gradient and the Gaussian.

Optimization problems Simple examples, motivation, the role of the Hessian maxima and minima and related extreme conditions.

Integration Double integrals, Fubini's theorem, properties, applications.

References

1. Gilbert Strang, *Linear Algebra and its Applications*. Thomson /Brooks Cole (Available in a Greek Translation).
2. Thomas M. Apostol, Calculus, Wiley, 2nd Edition, 1991 ISBN 960-07-0067-2.
3. Michael Spivak. *Calculus*, publish or Perish, 2008, ISBN 978-0914098911.
4. Ross L. Finney, Maurice D.Weir . and Frank R. Giordano. Thomas's Calculus. Pearson
   12th Edition 2009.
5. David C. Lay, Linear Algebra and Its Applications, 4th Editoin.
6. Yourself saad, Iterative Methods for spare Linear Systems.

Student Activity:

1. Find the Eigenvectors of A = { 1 1 1 1,2 3 4 5,3 4 5 6}
2. Find orthogonal S =Spam{(1 1 1 1),(1 4 4 0),(-1 4 4 0),(-1 2 2 0)}

I YEAR I SEMESTER MATHS FOR DATA SCIENCE

Tutorial

1. Study various applications of Matrices.
2. Study different polynomial functions and their uses.
3. Take one real world example and apply the Linear System solution.
4. Study some real valued functions and its applications.
5. Study and solve one optimization problem.

BS-5 2018

SEMESTER-I

Semester	Course Code	Course Title	Hours	Credits
I	C1	Fundamentals of Computer and C-Programming	60	4

Course Objectives

1. To explore basic knowledge on computers
2. Learn how to solve common types of computing problems.
3. Learn basic constructs of computer programming languages
4. Learn data types and control structures of C
5. Learn to map problems to programming features of C
6. Learn to write good portable C programs.

Course Outcomes

Upon successful completion of the course, a student will be able to:

1. Appreciate and understand the working of a digital computer
2. Analyze a given problem and develop an algorithm to solve the problem
3. Improve upon a solution to a problem
4. Use the 'C' language constructs in the right way
5. Design, develop and test programs written in 'C'

UNIT-I

Introduction to computers - Characteristics and limitations of computer, Block diagram of computer, types of computers, computer generations. Number systems: binary, hexadecimal and octal numbering system. Input and output devices: Keyboard and mouse, inputting data in other ways

Types of Software: system software, Application software, commercial, open source, domain and free ware software, Memories: primary, secondary and cache memory.

UNIT-II

Problem Analysis and its Tools: Problem solving technique and Program Development Life Cycle, Problem Definition, Algorithm, Flow Charts, Types of Errors, Testing and Debugging.
Basics of C: Historical development of C Language, Basic Structure of C Program, C Character Set, Identifiers and Keywords, constants, variables, Data types.

Operators and expressions: Arithmetic, Relational, Logical, Assignment, Unary, Conditional and Bitwise operators.Type conversions. Input and output statements: getchar( ), getch( ), getche( ), putchar( ), printf( ), scanf( ), gets( ), puts( )

UNIT-III

Control statements: Decision making statements: if, if else, else if ladder, switch statements. Loop control statements: while loop, for loop and do-while loop. Jump Control statements: break, continue and goto.
Arrays: one dimensional Array, two dimensional arrays.

UNIT-IV

Strings: Input/ Output of strings, string handling functions, table of strings
Functions: Function Prototype, definition and calling. Return statement. Nesting of functions. Categories of functions. Recursion, Parameter Passing by address & by value. Local and Global variables. Storage classes: automatic, external, static and register.

UNIT-V

Pointers: Pointer data type, Pointer declaration, initialization, accessing values using pointers. Pointer arithmetic. Pointers and arrays, pointers and functions.
Structures and Unions : Using structures and unions, use of structures in arrays and arrays in structures. Comparison of structure and Union.

Text Books:

1. E. Balagurusway, "Programming in C", Tata McGrwal Hill.
2. Computer fundamentals and c programming in c by Reemathareja, oxford university press

Reference Books

1. Introduction to C programming by REEMA THAREJA from OXFORD UNIVERSITY PRESS
2. E Balagurusamy: —COMPUTING FUNDAMENTALS & C PROGRAMMING Tata McGraw-Hill, Second Reprint 2008, ISBN 978-0-07-066909-3.
3. Ashok N Kamthane: Programming with ANSI and Turbo C, Pearson Edition Publ, 2002.
4. Henry Mullish&HuubertL.Cooper: The Spirit of C An Introduction to modern Programming, Jaico Pub. House,1996.
5. Y kanithkar, let us C BPB, 13 th edition-2013, ISBN:978-8183331630,656 pages.

RECOMMENDED CO-CURRICULAR ACTIVITIES:

(Co-curricular activities shall not promote copying from textbook or from others work and shall encourage self/independent and group learning)

A. Measurable

1. Assignments (in writing and doing forms on the aspects of syllabus content and outside the syllabus content. Shall be individual and challenging)
2. Student seminars (on topics of the syllabus and related aspects (individual activity))
3. Quiz (on topics where the content can be compiled by smaller aspects and data (Individuals or groups as teams))
4. Study projects (by very small groups of students on selected local real-time problems pertaining to syllabus or related areas. The individual participation and contribution of students shall be ensured (team activity

B. General

1. Group Discussion
2. Try to solve MCQ's available online.
3. Others

RECOMMENDED CONTINUOUS ASSESSMENT METHODS:

Some of the following suggested assessment methodologies could be adopted;

1. The oral and written examinations (Scheduled and surprise tests),
2. Closed-book and open-book tests,
3. Problem-solving exercises,
4. Practical assignments and laboratory reports,
5. Observation of practical skills,
6. Individual and group project reports like "Creating Text Editor in C"
7. Efficient delivery using seminar presentations,
8. Viva voce interviews.
9. Computerized adaptive testing, literature surveys and evaluations,
10. Peers and self-assessment, outputs form individual and collaborative work

Semester	Course Code	Course Title	Hours	Credits
I	C1-P	Hardware and C Programming Lab	30	1

SEMESTER-I

Hardware Lab:

1. Identify various Memory components of the Computer.
2. Identify Various Cables and their uses
3. Identify various Network Devices.
4. Assembling and Disassembling of Computers.

B.Sc. (CBCS) Degree

First semester

Data Science

Paper I – Maths for Data Science

(Effective from 2020-21 admitted Batch)

Model Question Paper

Total Marks: 75 **Time: 3hours**

Section-A

(Answer any Five questions) 5X5 25

1) Prove that $\begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ a^2 & b^2 & c^2 \end{vmatrix}$ = (a-b)(b-c)(c-a)

2) Write any five properties of the determinant with examples

3) Find the Characteristic roots of the matrix A $\begin{vmatrix} ! & 4 \\ 3 & 2 \end{vmatrix}$

4) Solve the equations x+y+z=9 ; 2x+5y+72 52; 2x+y-z 0 by cramer's rule

5) Define a) Solution b) Feasible Solution c) Basic Solution

6) If f: R→R is a function defined by $f(x) = \frac{|x-2|}{x-2}$ where x‡2

f(x)=0 where x=2 then prove that $\lim_{x\to 2} f(x)$ does not exists

7) Find Lf' (0) and Rf' (0) if $f(x) = 2 + x$ if X 0

$f(x) = 2 -$ x ix x·

8) Find ∇ f at the point (1,1,-2) if f=x^3+y^3+3xyz

Section-B

(5X10) 50

9a) If A=$\begin{vmatrix} 1 & 3 & 4 \\ 3 & -1 & 6 \\ -1 & 5 & 1 \end{vmatrix}$ prove that $(A^T)^{-1} = (A^{-1})^T$

(or)

b) Solve the equations by matrix inverse method

$2x+y+z=11$; $5x+2y+2z=18$; $x+3y+3z=14$

10) State and Prove Cayley-Hamilton theorem

(or)

b) Find characteristic roots and corresponding characteristic vectors of the matrix

$$A = \begin{pmatrix} 5 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{pmatrix}$$

11. a) Solve the system of equations by Gauss-elimination method
$x + 2y + z = 4$; $2x-3y-z=-3$; $3x+y+2z=3$

(OR)

b) The manager of oil refinery must decide on the optimum mix of 2 possible blending process of which the inputs and outputs productions rules as follows

	Input		Out put	
Process	Crude A	Crude B	Crude A	Crude B
1	6	4	6	9
2	5	6	5	5

The maximum amount available of crude A and B also 250 units and 200 units respectively market demand shows that at least 150 units of gas line X and 130 units of gas line Y. Must be produced. The profit per production ran from process 1 and process 2 are Rs. 450/- and Rs. 500/- respectively formulate the problem for maximize the profit

12. a) Examine the continuity of $f(x) = 2x$ if $0 < x < 1$ $f(x) = 3$ if $x=1$ $f(x) = 4x$ if $1 < x < 2$ at the point $x=1$

OR

b) Examine for continuity the function f defined by $f(x) = |x| + |x-1|$ at $x = 0,1$

13. a) if $f(x) = x\left(\frac{e^{1/x} - e^{-1/x}}{e^{1/x} + e^{-1/x}}\right)$ if $x \neq 0$

$= 0$ if $x=0$ S.T f is not derivable at '0'

(OR)

b) PT $\nabla r = \frac{\bar{r}}{r}$ where $\bar{r} = xi + yj + zk$