

SRI VENKATESWARA UNIVERSITY
DEGREE COURSE IN BACHELOR OF COMPUTER APPLICATIONS (BCA)
BIG DATA & MACHINE LEARNING
New Course Introduced under CBCS W.E.F. 2021-22

SCHEME OF INSTRUCTIONS AND EXAMINATIONS
I SEMESTER

S.No	Paper Code	Subject	Hours/Week	No of Credits	Max.Marks Internal assessment	Max. Marks University Exam	Total Marks
1.		English – I	4	3	25	75	100
2.		Language(H/T/S) – I	4	3	25	75	100
3.		Life Skill Course – I	2	2	-0-	50	50
4.		Skill Development Course – I	2	2	-0-	50	50
5.	C1	Essential Mathematics for Machine Learning	4	3	25	75	100
	C1-P	Essential Mathematics for Machine Learning Lab	2	2	-0-	50	50
6	C2	Introduction to Computers and Data Analytics using Excel	4	3	25	75	100
	C2-P	Data Analytics using Excel Lab	2	2	-0-	50	50
7.	C3	Problem Solving using C	4	3	25	75	100
	C3-P	Problem Solving using C - Lab	2	2	-0-	50	50
Total			30	25	125	625	750

SRI VENKATESWARA UNIVERSITY
BCA DEGREE COURSE IN BIGDATA & MACHINE LEARNING
FIRST YEAR - I SEMESTER
(Syllabus under CBCS w.e.f. 2021-22)

Core Course Paper - C1: ESSENTIAL MATHEMATICS FOR MACHINE LEARNING
(Total hours of teaching – 60 @ 04 Hrs./Week, Credits 3)

Course Objectives

The goal of this course is to provide mathematical foundations of Machine Learning and Data Science. In broad brush, this course aims to:

Provide a thorough introduction to both fundamental and advanced topics of linear algebra necessary for machine learning and data science

Build mathematical foundations of calculus, probability and statistics

Provide an appreciation for applications of ML and Data Science

Course Outcomes

After successful completion of this course, the student will be able to;

1. Understand the core theoretical concepts serve as foundations of Machine Learning and Data Science
2. Understand the core theoretical concepts of calculus, probability theory and statistics that serve as foundations of Machine Learning and Data Science
3. Formulate and implement basic problems in machine learning and data science

UNIT-I

Operations on vectors: linear combination, norm, inner product, angle, distance, correlation coefficient

Span, basis, linear independence, orthonormal vectors, vector spaces, Gram-Schmidt orthogonalization

UNIT-II

Matrices Notation, Application Examples and Basic Operations

Matrix-vector product, Interpretations, Application Examples, Matrix-matrix product

Systems of Linear Equations, Formulation, Inverses, Left-inverse, Right-inverse, Inverse, Pseudo-inverse, Connection with the linear equations

UNIT-III

EigenValue Decomposition (EVD)

Curse of Dimensionality and Principal Component Analysis (Application of EVD) Singular Value Decomposition (SVD)

Least-squares Formulation

Calculus module: Functions, Derivatives, Gradient, Hessian, Jacobian, Anti-Derivatives

UNIT-IV

Probability Theory overview, Probability models, Axioms of probability, Conditional probability Bayes theorem, Law of total probability

Independence, Combinatorics

Discrete random variable, probability mass function, Continuous random variable, probability density function

Introduction to Inference

UNIT-V

Overview of supervised learning, ML nomenclature, problem setup and train-test split

Note:

1. Concentration on numerical problems only.
2. Proofs of theorems and Derivations of expressions are omitted.

Text Books:

1. S.Boyd and L. Vandenberghe. Introduction to Applied Linear Algebra - Vectors, Matrices, and Least Squares. Cambridge University Press, 2019
2. M. P. Deisenroth, A. A. Faisal and Cheng Soon Ong. Mathematics for Machine Learning. Cambridge University Press, 2019

Reference Book:

1. G. Strang. Introduction to Linear Algebra. 2016
2. J. A. Gubner, Probability and Random Processes for Electrical and Computer Engineers, Cambridge University Press, 2006.
3. S. L. Miller and D. Childers, Probability and Random Processes: With Applications to Signal Processing and Communications. • A. Papoulis and S.U. Pillai, Probability, Random Variables, and Stochastic Processes.

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Practical Paper - C1P: ESSENTIAL MATHEMATICS FOR MACHINE LEARNING LAB
(Total hours of teaching – 30 @ 02 Hrs./Week, Credits 2)

1. Basic matrix and vector operations
2. Advanced matrix and vector operations
3. Linear independence,
4. Matrix rank
5. Solving a system of linear equations
6. Least-squares application: data-fitting
7. Eigen value decomposition.
8. Probability distributions
9. Statistical Inference
10. Statistical tests interpretation of output

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Core Course Paper – C1: ESSENTIAL MATHEMATICS FOR MACHINE LEARNING

(Statistical tables and Electronic Calculators are allowed)MODEL QUESTION PAPER

Time: 3 hours

Marks: 75 marks

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer any five of the following questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks

PART – A

Answer any Five of the following question.

(5X5=25M)

1	
2	
3	
4	
5	
6	
7	
8	

PART – B

Answer All The Questions. Each question carries 10 marks

(5X10= 50M)

9	(A) OR (B)
10	(A) OR (B)
11	(A) OR (B)
12	(A) OR (B)
13	(A) OR (B)

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Core Course Paper – C2: INTRODUCTION TO COMPUTERS AND DATA ANALYTICS
USING EXCEL

(Total hours of teaching – 60 @ 04 Hrs./Week Credits 3)

Course Objectives:

1. The objective of the course is to introduce the concepts of computer fundamental & their applications for the efficient use of Excel software in data analysis.

Course Learning Outcomes:

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

1. Understand the evolution and functionality of a Digital Computer.
2. Understand hardware and software components
3. Have exposure to Excel software package
4. Understand various functions & formulae used in data analysis, preparing charts etc.
5. Apply data analysis tools like pivot table, goal seek, scenarios etc.

UNIT- I

Introduction to Computers: Characteristics and limitations of computer, Block diagram of computer, types of computers, uses of computers, computer generations, **Types of Hardware:** Input devices and output devices, **Memories:** Primary memory, Secondary Memory, and cache memory,

UNIT -II

Types of Software: System software, Application software, commercial, open source, domain and free ware software

Microsoft Excel:

Fundamentals of Excel: Features of MS-Excel, Excel Program Screen, the Ribbon, Office button and Quick Access tool bar, Worksheets, rows, columns, cells.

UNIT -III

Worksheet basics: Creating a new workbook, Opening a Workbook, Saving a Workbook, Workbooks, Entering labels, values, and formulas in worksheet

Editing a worksheet: Editing cell contents - cutting, copying and pasting cells – Find and Replace - Undo, Inserting rows and columns, Deleting rows and columns

Formatting Options: Adjusting row height and column width - Formatting cell values, conditional formatting

UNIT -IV

Formulas and Functions: Formulas: Enter and edit formula in Excel, operators used in formula, cell references in formula

Functions: Definition, Inserting a function in Excel, Types of functions in Excel: Mathematical, Statistical, Logical, Text, Date & Time functions

Working with Data ranges: Sorting: Sorting on single column, sorting on multiple columns, Filtering: Filtering data using AutoFilter

UNIT- V

Working with Charts: Different types of charts, Creating a chart, Parts of chart, Changing chart type, changing chart options

Analyzing and Organizing Data: Data Validation, Scenarios, SubTotals

Working with PivotTables: Creating a PivotTable, Specifying PivotTable data, Working with PivotTable Layout

Text Books:

1. Fundamentals Of Computers by Reema Thareja from Oxford University Press
2. Microsoft Excel 2007, Custom Guide Inc, 2007

Reference Books:

1. Rajaraman, Introduction to Information Technology, PHI
2. Peter Norton, Introduction to Computers, Sixth edition, Tata McGraw Hill (2007).
3. Microsoft Office 2007 Fundamentals, 1st Edition By Laura Story, Dawna Walls
4. Working in Microsoft Office – Ron Mansfield - TMH.
5. MS Office 2007 in a Nutshell –Sanjay Saxena – Vikas Publishing House.

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Practical Paper – C2P: DATA ANALYTICS USING EXCEL LAB
(Total hours of teaching – 30 @ 02 Hrs./Week, Credits 2)

1. Prepare your class time table using different Text formatting
2. Create a payslip with details of employee salary
3. Prepare an Excel sheet to calculate students result and grades based on their marks
4. Prepare an excel sheet to enter some strings and perform the following text functions
 - a. Find length of strings
 - b. Convert strings into uppercase and lowercase
 - c. Remove extra spaces in the strings
 - d. Extract substrings from the strings
5. Prepare an excel sheet to perform the following statistical analysis
 - a. Find mean of the values
 - b. Find mode of the values
 - c. Calculate standard deviation
 - d. Find largest and smallest values
6. Draw different types of charts for weather analysis of 5 successive years
7. Prepare an excel sheet for creating a pie chart for budget analysis
8. Prepare an excel sheet to illustrate the sorting
9. Prepare an excel sheet to illustrate the filtering
10. Prepare an excel sheet to illustrate the concept of sub totals
11. Prepare an excel sheet for restricting data entry using data validation feature
12. Create and demonstrate to analyze the data using a pivot table

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Core Course Paper – C2: DATA ANALYTICS USING EXCEL

MODEL QUESTION PAPER

Time: 3 hours

Marks: 75 marks

Note: This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer any five of the following questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks

PART – A

Answer any Five of the following question.

(5X5=25M)

1	
2	
3	
4	
5	
6	
7	
8	

PART – B

Answer All The Questions. Each question carries 10 marks

(5X10= 50M)

9	(A)	OR
	(B)	
10	(A)	OR
	(B)	
11	(A)	OR
	(B)	
12	(A)	OR
	(B)	
13	(A)	OR
	(B)	

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Core Course Paper – C3: PROBLEM SOLVING USING ‘C’
(Total hours of teaching – 60 @ 04 Hrs./Week Credits 3)

Course Objectives:

1. This course aims to provide exposure to problem-solving through programming. It introduces the concepts of the C Programming language.

Course Learning Outcomes:

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

1. Understand the programming languages and flow charts.
2. Apply logical skills to analyse a given problem
3. Develop an algorithm for solving a given problem.
4. Understand ‘C’ language constructs like Iterative statements, Array processing, Pointers, etc.
5. Apply ‘C’ language constructs to the algorithms to write a ‘C’ language program.

UNIT- I

Introduction to Algorithms and Programming Languages: Algorithm – Key features of Algorithms, Flow Charts, Programming Languages – Generations of Programming Languages

Introduction to C: Introduction – Structure of C Program – Writing the first C Program – Files used in C Program – Compiling and Executing C Programs - Programming Examples

UNIT- II

C Fundamentals: Keywords – Identifiers – Basic Data Types in C – Variables – Constants – I/O Operators in C – I/O Statements (scanf, printf)

Decision Control Statements: Introduction to Decision Control Statements – Conditional Branching Statements: simple if, if.else, nested if, switch statements – Programming Examples

UNIT- III

Iterative Control Statements: Iterative Statements – Nested Loops – Break and Continue Statement – Go to Statement

Arrays: Introduction – Declaration of Arrays – Accessing elements of the Array – Storing Values in Array – one dimensional array for inter-function communication – Two dimensional Arrays – two dimensional arrays for inter-function communication

Strings: Introduction – String operations – String functions

UNIT- IV

Functions: Introduction – using functions – Function declaration/ prototype – Function definition – function call – return statement – Passing parameters – Scope of variables – Storage Classes – Recursive functions.

Structure and Unions: Introduction – Nested Structures – Arrays of Structures – Structures and Functions – Unions – Arrays of Unions Variables

UNIT- V

Pointers: Introduction to Pointers – declaring Pointer Variables – Passing Arguments to Functions using Pointer – Pointer and Arrays – Dynamic Memory Allocation

File Handling: Introduction to Files, File modes, File operations, Using Files in C, Reading Data from Files, Writing Data from Files, Detecting the End-of-file

Text Books:

1. Computer Fundamentals and Programming in C by Reema Thareja from Oxford University Press

Reference Books:

1. E Balagurusamy: Computing Fundamentals & C Programming – Tata McGraw-Hill, Second Reprint 2008, ISBN 978-0-07-066909-3.
2. Ashok N Kamthane: Programming with ANSI and Turbo C, Pearson Edition Publ, 2002.
3. Yashavant Kanetkar - Let Us 'C' – BPB Publications.
4. Brian W Kernighan and Dennis M Ritchie - The 'C' Programming language - Pearson publications.

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Practical Paper – C3P: PROBLEM SOLVING USING ‘C’ LAB
(Total hours of teaching – 30 @ 02 Hrs./Week, Credits 2)

1. Write a program to find
 - a. Area of Circle
 - b. Area of triangle
2. Write a Program to find
 - a. simple interest
 - b. Compound Interest
3. Write a program to convert temperature from Celsius to Fahrenheit
4. Write a program to find whether a number is even or odd
5. Write a program to find sum and average of 5 numbers
6. Write a program to check whether the given number is Armstrong or not.
7. Write a program to find the sum of individual digits of a positive integer.
8. Write a program to generate the first n terms of the Fibonacci sequence.
9. Write a program to find both the largest and smallest number in a list of integer values
10. Write a program to calculate factorial of given integer value using recursive functions
11. Write a program for addition of two matrices.
12. Write a program for multiplication of two matrices.
13. Write a program to perform various string operations.
14. Write a program to search an element in a given list of values.
15. Write a C program to
 - a. Write data into a File.
 - b. Read data from a File

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Core Course Paper – C3: PROBLEM SOLVING USING C

MODEL QUESTION PAPER

Time: 3 hours

Marks: 75 marks

Note: This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer any five of the following questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks

PART – A

Answer any Five of the following question.

(5X5=25M)

1	
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PART – B

Answer All The Questions. Each question carries 10 marks

(5X10= 50M)

9	(A)	OR
	(B)	
10	(A)	OR
	(B)	
11	(A)	OR
	(B)	
12	(A)	OR
	(B)	
13	(A)	OR
	(B)	