Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore
Shri Vaishnav Institute of Computer Applications

Name of the Program: BSC (Data Science) / BCA (BDA- IBM)

COURSE CODE	CATEGORY	COURSE NAME	L	T	P	CREDITS	TEACHING & EVALUATION SCHEME				
							THEORY			PRACTICAL	
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
BSCDS201	Major / Minor	Data Structures	2	0	2	3	60	20	20	30	20

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit;
Q/A – Quiz/Assignment/Attendance, MST - Mid Sem Test.
***Teacher Assessment** shall be based on following components: Quiz/Assignment/project/Participation in class (Given that no component shall be exceed 10 Marks)

Course Educational Objectives (CEOs):

- Allow to assess how the choice of data structures and algorithm design methods impacts the performance of programs.
- To choose the appropriate data structure and algorithm design method for a specified application.
- To solve problems using data structures such as linear lists, stacks, queues, binary trees, binary search trees, and graphs and writing programs for these solutions.
- To efficiently implement the different data structures and solutions for specific problems.

Course Outcomes (Cos): students will be able to

- Analyze the concepts of algorithm evaluation and find time and space complexities for searching and sorting algorithms.
- Implement linear data structure such as stacks, queues, linked lists and their applications.
- Implement basic operations on binary trees.
- Demonstrate the representation and traversal techniques of graphs and their applications on data.

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UNIT - I

Introduction, searching and sorting: Algorithm specification: Introduction, Recursive algorithms, Data Abstraction, Performance Analysis: Space complexity, time complexity, asymptotic notation, Searching: Linear and Binary search algorithms, Sorting: Bubble sort, Selection sort, Insertion sort, quick sort, merge sort.

UNIT - II

Stacks and Queues: Stacks, stacks using dynamic arrays, queues, circular queues usingdynamicarrays, Evaluation of an expression: Expressions, evaluating postfix expression, conversion of infix expression to postfix expression.

UNIT –III

Linked Lists: Single linked lists, Representing chains, operations for chains, operations for circularly linked lists, doubly linked lists, Polynomials: Representation, adding polynomials, sparse matrix representation, linked stacks and queues.

UNIT-IV

Trees: Introduction: Terminology, representation of trees, binary trees: abstract data type, Properties of binary trees, binary tree representation, binary tree traversals: Inorder, preorder, postorder, Binary search trees: Definition, searching BST, insert into BST, delete from a BST, Height of a BST.

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UNIT-V

The Graph ADT: Introduction, definition, graph representation, elementary graph operations: BFS, DFS, Spanning trees, minimum cost spanning tree: Prim's, Kruskal's algorithms.

Text Books:

1. Fundamental of Data Structures in C – 2ndEdition, Horowitz, Sahani, AndersonFreed, University Press
2. TremblyandSORRENSON,"Introduction to Data Structure with Applications".
3. TennenBaum A.M.,"Data Structures using C & C++"; PHI
4. YashwantKanetkar, "Understanding Pointers in C", BPB.

Reference Books:

1. Data Structures and Algorithm Analysis in C – 2nd Edition, Mark Allen Weiss, Pearson
2. Classic Data Structures – 2nd Edition, Debasis Samantha, PHI

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List of Programs:

1. Write a program to create a two dimensional array and perform add, subtract and multiplication operations.
2. Write a program to create a two dimensional array using dynamic memory allocation.
3. Write a program to implement stack.
4. Write a program to convert infix expression into postfix expression.
5. Write a program to check balanced parentheses for a given infix expression.
6. Write a program to evaluate postfix expression.
7. Write a program to implement queue.
8. Write a program to implement circular queue.
9. Write a program to implement link list with insert, delete, search, view, anddelete function.
10. Write a program to implement ordered link list.
11. Write a program to add two polynomials.
12. Write a program to create doubly link list.
13. Write a program to implement tree with insert, delete and search function.
14. Write a program for in order, post order and preorder traversal of tree.
15. Write a program for binary search and sequential search using recursion.
16. Write a program for bubble sort and sequential search.
17. Write a program for insertion sort and quick sort.

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BSCDS202	Major	Java Programming	2	0	2	3	60	20	20	30	20

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Course Education Objectives (CEOs):

- To familiarize the students with Object Oriented Methodology.
- Students must be able to understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.
- Students must have the ability to write a computer program to solve specified problems.
- Students must be able to use the Java SDK environment to create, debug and run simple Java programs.
- Students must learn the concepts of JDBC and concepts of OOPs using Java.

Course Outcomes (COs):

- Understand different programming paradigms, Evolution of programming languages, Programming styles.
- Differentiate and compare structured and object oriented approach. Also understand OO design and analysis concepts.
- Design efficient solutions for real world problems.
- Explain the concept of class and objects with access control to represent real world entities.

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- Demonstrate the behaviour of programs involving the basic programming constructs like control structures, constructors, string handling and garbage collection.
- Use overloading methodology on methods and constructors to develop application programs.
- Demonstrate the user defined exceptions by exception handling keywords (try, catch, throw, throws and finally).
- Describe the backend connectivity process in java program by using JDBC drivers. 14. Develop Java application to interact with database by using relevant software component (JDBC Driver).

Syllabus:

UNIT – I

OOPS OVERVIEW: Introduction to OOPs, Features of OOPs, Advantages of OOPs, Different types of programming approaches.

INTRODUCTION TO JAVA: What is java, History of java, Java features, Introduction to Eclipse IDE, Explanation about java compiler, JVM, JRE, JDK, Bytecode, How to run Eclipse ide.

JAVA COMPONENTS : Constant, variable, token, literal, Identifiers, datatypes, keywords, All types of operators, Command line arguments, Taking user input

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UNIT - II

CONTROL STRUCTURE: Conditional statements-if, if else, nested if, ladder else if, Unconditional statements- switch case, Looping statements.

CLASS AND OBJECT: What is class and object, Data members and methods, Inner classes and types.

CONSTRUCTORS: What is constructor, Advantages, Types with examples.

UNIT – III

ARRAY: What is array, Array declaration with syntax, Types-1d, 2d and 3d with examples each.

STRING HANDLING: String introduction, String class with methods with examples, StringBuilder class with methods and examples, StringBuffer class with examples.

INHERITANCE: Introduction, Types with examples, Interface with example, Use of super, Use of abstract with example.

UNIT – IV

POLYMORPHISM: What is polymorphism, Types of polymorphism.

EXCEPTION HANDLING: What is exception, Types, Predefined exceptions, User-defined exceptions.

MULTI-THREADING:Introduction, Advantages. Multi-threading concept, Lifecycle of Thread, Thread priority, Thread interface, Thread synchronization.

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UNIT – V

PACKAGE: What is package, Benefits of using package, Types, Predefined package, User-defined package.

FILE HANDLING: Java I/O, Pre-defined file i/o methods, Stream and types, File classes, File operations with examples.

JDBC: Introduction to java database, what is JDBC, JDBC Connectivity.

Reference Books:

1. E. Balagurusamy, “Programming with Java: A Primer”, TMH.
2. Patrick Naughton and HerbertzSchildt, “Java-2: The Complete Reference”, TMH.
3. Horstmann, “Computing Concepts with Java 2 Essentials”, John Wiley.
4. Daniel Liang, “Introduction to Java Programming”, Pearson.
5. Decker and Hirshfield, “Programming Java: A Introduction to Programming Using JAVA”, Vikas Publication.
6. N.P. Gopalan and J. Akilandeswari, “Web Technology- A Developer’s Perspective”, PHI.

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List of Experiments:

1. Write a Java program that prompts the user for an integer and then prints out all prime numbers up to that Integer.

2. Write a Java program for sorting a given list of names in ascending order.

3. Write a Java program that checks whether a given string is a palindrome or not.

Ex: MADAM is a palindrome.

4. Write a Java Program that reads a line of integers, and then displays each integer, and the sum of all the integers (use String Tokenizer class).

5. Write a Java program that displays the number of characters, lines and words in a text file.

6. Write a Java program that reads a file and displays the file on the screen, with a line number before each line.

7. Write a Java program that illustrates how run time polymorphism is achieved.

8. Write a Java program for creating multiple threads a) Using Thread class. b) Using Runnable interface.

9. Write a java program that illustrates the following a) Handling predefined exceptions. b) Handling user defined exceptions.

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			THEORY			PRACTICAL		Th	T	P	CREDITS
			END SEM	MST	Q/A	END SEM	Q/A				
BSCDSMA 201	DC	**Discrete Mathematics and Algebra**	60	20	20	-	-	3	0	-	3

Course Objective

To introduce the students with the fundamentals of the discrete mathematics linear algebra.

Course Outcomes

After the successful completion of this course students will be able to:

1. *Understand the mathematical logic.*
2. *Apply the concept of mathematical logic.*
3. *Understand the structure of vector spaces.*
4. *Construct and use the basis for vector spaces.*
5. *Apply the techniques of matrices to the linear transformations.*
6. *Analyse and solve the system of linear simultaneous equations.*

Course Content:

UNIT – I

Sets and functions, propositions, logical connectives, truth value of propositions, truth tables, tautology and contradiction, logical equivalence, algebra of propositions.

UNIT – II

Boolean algebra, and its properties, algebra of propositions, De-Morgan's law, order relation in Boolean algebra, least upper bound and greatest lower bond, application to switching circuits, equivalent circuits.

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			THEORY			PRACTICAL		Th	T	P	CREDITS
			END SEM	MST	Q/A	END SEM	Q/A				
BSCDSMA 201	DC	**Discrete Mathematics and Algebra**	60	20	20	-	-	3	0	-	3

UNIT – III

Groups (definitions and simple examples only), order of an element, subgroup, necessary and sufficient condition for a subgroup, Cosets Lagrange's theorem. Ring and Field (definition and simple examples only).

UNIT – IV

Vector spaces, subspace, linearly independent and dependent vectors. Linear transformation and kernel of linear transformation.

UNIT – V

Matrices, determinants, rank and inverse. Linear transformations. Range space and rank, null space and nullity. Eigenvalues and eigenvectors. Systems of linear equations and their solutions.

Reference Book:

1. M. Artin: Algebra, Pearson.
2. S. D. Dummit and M. R. Foote: Abstract Algebra, Wiley.
3. I. N. Herstein: Topics in Algebra, Wiley.
4. K. Hoffman and R. Kunze: Linear Algebra, Prentice Hall of India.
5. S. Lang, Introduction to Linear Algebra, Wellesley - Cambridge Press.
6. S. Kumaresan, Linear Algebra- A Geometric Approach, Prentice Hall of India.
7. J.P. Trembly R. Manohar, Discrete Mathematical Structures with Applications to Computer Science, Tata Mc Graw Hill Pub. Co. Ltd., New Delhi, 2003.
8. Kenneth H. Rosen, Discrete Mathematics and its Applications, 5/e, Tata Mc Graw Hill Pub. Co. Ltd, New Delhi 2003 5)
9. Richard Johnsonbaugh, Discrete Mathematics, 5/e, Pearson Education Asia, New Delhi, 2002.

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			END SEM	MST	Q/A	END SEM	Q/A				
BSCDSMA 202	DC	**Theory of Probability and Probability Distribution**	60	20	20	-	-	3	0	-	3

Course Objective

To introduce the Students with the Fundamentals of the Probability and Probability Distribution.

Course Outcomes

- *Understand the terminology of probability and the concept of independence.*
- *Apply the addition and multiplication law, and Baye's theorem for calculating probabilities.*
- *Define random variables and understand their probability distribution function.*
- *Understand the concept of mathematical expectation and use of its properties.*
- *Identify and apply discrete and continuous probability distribution.*

Course Content:

UNIT – I

Probability: Introduction, random experiments, sample space, events and algebra of events. Definitions of Probability – classical, statistical, and axiomatic. Conditional Probability, laws of addition and multiplication, independent events, theorem of total probability, Bayes'theorem and its applications.

UNIT – II

Random variables: discrete and continuous random variables, p.m.f., p.d.f. and c.d.f., illustrations and properties of random variables, univariate transformations with illustrations. Two dimensional random variables: discrete and continuous type, joint, marginal and conditional p.m.f, p.d.f., and c.d.f., independence of variables, bivariate transformations with illustrations.

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			END SEM	MST	Q/A	END SEM	Q/A				
BSCDSMA 202	DC	**Theory of Probability and Probability Distribution**	60	20	20	-	-	3	0	-	3

UNIT – III

Mathematical Expectation and Generating Functions: Expectation of single and bivariate random variables and its properties. Moments and Cumulants, moment generating function, cumulant generating function and characteristic function. Uniqueness and inversion theorems (without proof) along with applications. Conditional expectations.

UNIT – IV

Discrete Probability Distributions: Uniform, Binomial, Poisson, Geometric, Negative Binomial and Hyper-geometric distributions along with their characteristic properties and limiting/ approximation cases.

UNIT – V

Continuous probability distributions: Normal, Exponential, Uniform, Beta, Gamma, Cauchy, lognormal and Laplace distributions along with their characteristic properties and limiting/approximation cases.

SUGGESTED READING:

1. Hogg, R.V., Tanis, E.A. and Rao J.M. (2009): Probability and Statistical Inference, Seventh Ed, Pearson Education, New Delhi.
2. Miller, Irwin and Miller, Marylees (2006): John E. Freund's Mathematical Statistics with Applications, (7th Edn.), Pearson Education, Asia.
3. Myer, P.L. (1970): Introductory Probability and Statistical Applications, Oxford &IBH Publishing, New Delhi
4. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, S Chand & Co.
5. E.N. Nadar, Statistics, PHI Learning.
6. P. Mukhopadhya, Mathematical Statistics, New Central Book Agency, Calcutta.
7. Jim Frost, Introduction to Statistics: An Intuitive Guide for Analyzing Data and Unlocking Discoveries, Jim Frost MS.

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