FACULTY OF COMPUTER SCIENCE & IT

SYLLABUS

of

Bachelor of Computer Applications

(Semester III-IV)

(Under Credit Based Continuous Evaluation Grading System)

Batch: 2023-26
Session: 2024-25

The Heritage Institution

KANYA MAHA VIDYALAYA JALANDHAR
(Autonomous)

PROGRAMME SPECIFIC OUTCOMES

Bachelor of Computer Applications
(Session 2024-25)

Program Specific Outcomes

PSO1: Apply skills for development of software and websites for providing efficient solution to IT based problems

PSO2: Comprehend development process in IT industry through ethical, defined and innovative techniques.

PS03: Achieve leadership role and team player role to be able to work in multidisciplinary areas at various job roles.

PSO4: Identify and demonstrate the implementation of various tools and technologies involved in the field of Information Technology.

PSO5: Demonstrate proficiency in the field of Programming, Web development and IT enabled services.

Kanya Maha Vidyalaya, Jalandhar (Autonomous)

SCHEME AND CURRICULUM OF EXAMINATIONS OF THREE YEAR DEGREE PROGRAMME

Bachelor of Computer Applications

Credit Based Continuous Evaluation Grading System (CBCEGS)
Session 2024-25

Bachelor of Computer Applications Semester - III										
Course Code	Course Title	Course Type	Hours per week	Credit		Marks				Examination Time (in Hours)
			L-T-P	L-T-P	Total	Total	Ext.		CA	
							L	P		
BCAL-3111	Foundation of Data Science	C	4-0-0	4-0-0	4	100	80	-	20	3
BCAL-3112	Database Management System-II	C	4-0-0	4-0-0	4	100	80	-	20	3
BCAL-3113	Computational Problem Solving	C	4-0-0	4-0-0	4	100	80	-	20	3
BCAL-3114	Numerical Methods and Statistical Techniques	C	4-0-0	4-0-0	4	100	80	-	20	3
BCAP-3115	Lab on Computational Problem Solving	C	0-0-4	0-0-2	2	50	-	40	10	3
BCAP-3116	Lab on Database Management System-II	C	0-0-4	0-0-2	2	50	-	40	10	3
AECE - 3221	* Environmental Studies (Compulsory)	AC	1-0-2	1-0-1	2	50	30	10	10	3
SECP - 3512	* Personality Development	AC	2-0-0	2-0-0	2	50	40	-	10	3
	Total				24	600				

Note:

C - Compulsory

AC - Audit Course

* Marks of these courses will not be added in total marks and only grades will be provided.

Kanya Maha Vidyalaya, Jalandhar (Autonomous)

SCHEME AND CURRICULUM OF EXAMINATIONS OF THREE YEAR DEGREE PROGRAMME

Bachelor of Computer Applications
Credit Based Continuous Evaluation Grading System (CBCEGS)

Session 2024-25

Bachelor of Computer Applications Semester- IV										
Course Code	**Course Title**	**Course Type**	**Hours per week**	**Credit**		**Marks**				**Examination Time (in Hours)**
			L-T-P	**L-T-P**	**Total**	**Total**	**Ext.**		**CA**	
							L	**P**		
BCAL-4111	Data Structures	C	4-0-0	4-0-0	4	100	80	-	20	3
BCAL-4112	Information Systems	C	4-0-0	4-0-0	4	100	80	-	20	3
BCAL-4113	Internet Applications	C	4-0-0	4-0-0	4	100	80	-	20	3
BCAL-4114	Applied and Discrete Mathematics	C	4-0-0	4-0-0	4	100	80	-	20	3
BCAP-4115	Lab on Data Structures	C	0-0-4	0-0-2	2	50	-	40	10	3
BCAP-4116	Lab on Internet Applications	C	0-0-4	0-0-2	2	50	-	40	10	3
SECS- 4522	* Social Outreach	AC	2-0-0	2-0-0	2	50	-	40	10	1
	Total					22	550			

Note:

C - Compulsory

AC - Audit Course

* Marks of these courses will not be added in total marks and only grades will be provided.

Bachelor of Computer Applications Semester – III
(Session 2024-25)
COURSE CODE: BCAL-3111
FOUNDATION OF DATA SCIENCE

Course Outcomes:

After passing course the student will be able to:

CO1: Comprehend basic concepts of Data Science along with its components and process.

CO2: Interpret various data collection tools.

CO3: Analyze different application areas and challenges of data science.

CO4: Work with Power BI for visualization of data.

L-T-P: 4-0-0   **Max. Marks: 100**
Credits: 4   **Theory: 80**
Examination Time: 3 Hours.   **CA: 20**

Instructions for Paper Setter -

Eight questions of equal marks (16 marks each) are to set, two in each of the four sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be divided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section

UNIT-I

Introduction to Data Science: Meaning, Evolution, Need and Components of Data Science, Data Science Process. Difference between Data Science and Business Intelligence.

Understanding Data Analytics: Need, Characteristics – Four Vs.

UNIT- II

Data Collection: Data Collection sources, Data collection methods – Primary data collection methods – Interviews, Questionnaires and Secondary data collection methods. Data collection Tools – online and offline.

Types of Data Analytics: Descriptive. Predictive, Diagnostic, Prescriptive.

UNIT-III

Domain Data Analysis: Exploratory and Confirmatory data analysis

Application Areas and Challenges in Data Science. Technical Skills of a data Analyst.

Job Roles in Data Science.

UNIT-IV

Data Storytelling: Benefits and Best Practices, data visualization.

Introduction to Power BI: Need, Features, Components, Architecture and Services. Creating a Sample dashboard.

References / Textbooks:

1. Qurban A Memon, Shakeel Ahmed, Data Science: Theory, Analysis and Applications, CRC Press (2019), 1st edition.
2. Ulrika Jagare, Data Science for Dummies, Wiley (2019)
3. Joel Grus, Data Science from Scratch, O'Reilly (2015), 1st Edition
4. Pulkit Bansal, Data Science Uncovering the Reality, Notion Press (2020), 1st Edition
5. Davy Cielen, Arno D.B.Meysman, Mohamed Ali, Introducing Data Science: Big Data, Machine Learning, Dreamtech Press (2016)
6. Roger Peng, Elizabeth Matsui, The Art of Data Science, Lulu.com (2016)
7. Ramesh Sharda, DursunDelen and Efraim Turban, Business Intelligence, Analytics and Data Science: A Managerial Perspective, Pearson Education (2019), 4th Edition
8. Reza Rad, Basics of Power BI Modeling, Radacad Publications (September (2020)), Ist Edition
9. Reza Rad, Leila Etaati, Getting started with Power Query in Power BI and Excel, Radacad Publishers, Edition One.

Bachelor of Computer Applications Semester – III
(Session 2024-25)
COURSE CODE: BCAL–3112
DATABASE MANAGEMENT SYSTEM-II

Course Outcomes:
After passing course the student will be able to:

CO1: Gain knowledge of transaction management and Concurrency control.

CO2: Create, manage and access database using PL/SQL.

CO3: Create and manage database using NoSQL

CO4: Comprehend the implementation of queries using MongoDB

L-T-P: 4-0-0   Max. Marks: 100
Credits: 4   Theory: 80
Examination Time: 3 Hours.   CA: 20

Instructions for Paper Setter -

Eight questions of equal marks (16 Marks each) are to set, two in each of the four sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be divided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section.

UNIT-I

SQL: Join methods & sub query, Union, Intersection, Minus, Indexes, Views.

Transaction Management-ACID Properties, Concurrency Control, Security amongst users.

UNIT-II

PL/SQL: Introduction, advantages and limitations, block structure, constant and variables, input and output, control statements, data-types. Triggers, functions and procedures, cursors, packages, exceptions.

Big Data: Meaning, Characteristics, Benefits, CAP Theorem

UNIT III

NoSQL: Overview, Need of NoSQL, Structured Data Vs. Unstructured Data, Types of Database in NoSQL, Features of NoSQL, Advantages of NoSQL, Eventual Consistency, ACID vs BASE Properties.

MongoDB: Overview, Install MongoDB server, Environment, Create Database, Data Model, Collection (Creation and Deletion), Data types in MongoDB, CRUD: Create, Update, Delete And Query Database.

UNIT IV

SQL to MongoDB Mapping, Projection. Sorting, Limiting and Counting records. Indexes in MongoDB: Creation of Index, Options, Dropping and fetching of Index. Analyze Query performance, Plan and Profiler. MongoDB Aggregation Query: Aggregate Framework (sum,

avg, min, max, push, first, etc). Replication and Sharding, MapReduce Function. Creating database backup.

Reference/ Textbooks:

1. C.J. Date, An Introduction to Database Systems, Pearson Education 2000.
2. H. F. Korth&Silverschatz, A., Database System Concepts, Tata McGraw Hill, 2010.
3. Elmasri&Navathe, Fundamentals of Database Systems, Addison-Wesley, 2011.
4. Hoffer, Prescott, Mcfadden, Modern Database Management, Paperback International, 2012.
5. Adam Fowler, "NoSQL For Dummies", Wiley, First Edition, 2015.
6. Gerardus Blokdyk, "NoSQL A Complete Guide", 5STARCooks, Second Edition, 2021.

Note: The latest editions of the books should be followed.

Course Outcomes:

After passing course the student will be able to:

CO1: Comprehend basics of Python programming like operators, data types, control structures, etc.

CO2: Apply list and directories for handling and accessing data through iterations.

CO3: Implement various built-in and user defined function to solve mathematical problems.

CO4: Comprehend Object Oriented Programming and modules in Python.

Bachelor of Computer Applications Semester – III
(Session 2024-25)
COURSE CODE: BCAL–3113
COMPUTATIONAL PROBLEM SOLVING

L-T-P: 4-0-0   **Max. Marks: 100**

Credits: 4   **Theory: 80**

Examination Time: 3 Hours.   **CA: 20**

Instructions for Paper Setter -

Eight questions of equal marks(16 Marks each) are to set, two in each of the four sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be divided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section

UNIT-I

Introduction to Python: Process of Computational Problem Solving, Python Programming Language

Data and Expressions: Literals, Variables and Identifiers, Operators, Expressions, Statements and Data Types

Control Structures: Boolean Expressions (Conditions), Logical Operators, Selection Control, Nested conditions, Debugging

UNIT-II
Lists: List Structures, Lists (Sequences) in Python, Iterating Over Lists (Sequences) in Python
Dictionaries: Dictionaries and Files, Looping and dictionaries, advanced text parsing
Iteration: While statement, definite loops using For, Loop Patterns, Recursive Functions, Recursive Problem Solving, Iteration vs. Recursion

UNIT-III
Functions: Fundamental Concepts, Program Routines, Flow of Execution, Parameters & Arguments
Files: Opening Files, Using Text Files, String Processing, Exception Handling

UNIT-IV
Objects and Their Use: Introduction to Object Oriented Programming
Modular Design: Modules, Top-Down Design, Python Modules
Using Databases and SQL: Database Concepts, SQLite Manager Firefox Add-on, SQL
basics summary, basic Data Modeling, Programming with multiple tables.

References/Textbooks:

1. Charles Severance, Python for Informatics, Version 0.0.7.
2. Charles Dierbach, Introduction to Computer Science Using Python: A Computational Problem-SolvingFocus, Wiley Publications, 2012.
3. Guttag John V, Introduction To Computation And Programming Using Python, PHI, 2014.
4. Jeeva Jose and Sojan P. Lal, Introduction to Computating& Problem Solving Through Python, Khanna Publishers, 2015.
5. Mark J. Guzdial, Introduction to Computing and Programming in Python, PearsonEducation, 2015.
6. Kenneth Lambert, Fundamentals of Python, Course Technology, Cengage Learning, 2015
7. Mark Lutz, Learning Python, O'Reilly Media, 2013

Note: The latest editions of the books should be followed.

Bachelor of Computer Applications Semester – III
(Session 2024-25)
COURSE CODE: BCAL–3114
NUMERICAL METHODS AND STATISTICAL TECHNIQUES

L-T-P: 4-0-0   **Max. Marks: 100**
Credits: 4   **Theory: 80**
Examination Time: 3 Hours.   **CA: 20**

Course Outcomes:

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

CO1: Solve non-linear and linear equations using different methods.

CO2: Comprehend interpolation and numerical integration.

CO3: Calculate different means and deviations using statistical techniques.

CO4: Comprehend correlation, curve fitting and regression for finding solutions to various statistical problems

Bachelor of Computer Applications Semester – III
(Session 2024-25)
COURSE CODE: BCAL–3114
NUMERICAL METHODS AND STATISTICAL TECHNIQUES

L-T-P: 4-0-0
Credits: 4
Examination Time: 3 Hours.

Max. Marks: 100
Theory: 80
CA: 20

Instructions for Paper Setter -

Eight questions of equal marks (16 marks each) are to set, two in each of the four sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be divided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section. Students can use non-storage and non-programmable scientific calculator.

UNIT-I
Introduction: Numerical Methods, Numerical methods versus numerical analysis, Types of Error, Errors and Measures of Errors.
Non–linear Equations: Bisection Method and Newton Raphson's Method
Linear Equations: Gauss Elimination Method, Gauss Jordan Method.

UNIT-II
Interpolation: Newton's Methods: Forward Difference Method, Backward Difference Method, and Divided Difference Method.
Numerical Integration: Trapezoidal Rule, Simpson's 1/3 method and Simpson's 3/8 Method

UNIT-III

Statistical Techniques:
Measure of Central Tendency: Arithmetic mean, Median, Mode.
Measures of dispersion: Range, Quartile Deviation, Mean deviation, Standard deviation, Co–efficient of variation.

UNIT –IV
Correlation: Introduction, Karl Pearson's Coefficient of Correlation, Rank Correlation method
Regression: Regression line and regression equations, Regression Coefficient
Non Linear Curve Fitting: Fit a quadratic or polynomial equation, Fit an exponential curve,

References / Textbooks:

1. Amrinder Pal Sngh, Jaspal Singh, Anshuman Sharma, Fundamentals Of Numerical Methods And Statistical Techniques, Lakhanpal Publishers, 4th edition.
2. Kandasamy P.& et AI., Numerical Methods, S. Chand & Company (2006), Reprint Edn. 2006 Edition.
3. B.S. Grewal, Numerical Methods in Engineering & Science, Khanna Publishers (2013), 11th Edition.
4. E. Balagurusamy, Numerical Methods, Tata McGraw Hill Education (2017)
5. H.S.G. Rao, Numerical Methods, IK International Publishing House (2011)
6. S.S. Sastry, Introductory methods of Numerical Analysis, PHI (2012), 5th Edition

L-T-P: 0-0-2   **Max. Marks: 50**
Credits: 2   **Practical: 40**
                                                              CA: 10

Lab based on Computational Problem Solving**.**

Bachelor of Computer Applications Semester – III
(Session 2024-25)
COURSE CODE: BCAP–3116
LAB ON DATABASE MANAGEMENT SYSTEM-II

L-T-P: 0-0-2   **Max. Marks: 50**
   Credits: 2   **Practical: 40**
                                                                   CA: 10

Lab based on Database Management System-II.

Bachelor of Computer Applications Semester – IV
(Session 2024-25)
COURSE CODE: BCAL–4111
DATA STRUCTURES

Course Outcomes:

After passing course the student will be able to:

CO1: Analyze complexity of algorithms to determine their efficiency.

CO2: Comprehend various hashing method, sorting and searching algorithms.

CO3: Comprehend various operations of stack and queue along with different scenarios.

CO4: Comprehend advanced data structures such as tree and graph.

Bachelor of Computer Applications Semester – IV
(Session 2024-25)
COURSE CODE: BCAL–4111
DATA STRUCTURES

L-T-P: 4-0-0
Credits: 4
Examination Time: 3 Hours.

Max. Marks: 100
Theory: 80
CA: 20

Instructions for Paper Setter -

Eight questions of equal marks (16 marks each) are to set, two in each of the four sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be divided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section

UNIT-I

Data Structure: Introduction, Common Operations on Data Structures, Algorithm Complexity, Big O Notation, Time – Space tradeoff between Algorithms.

Arrays: Array Defined, Representing Arrays in Memory, Operations, Bubble Sort, Linear Search, Binary Search and Multidimensional Arrays.

UNIT-II

Hashing: Hash Functions: Division Method, Mid-Square Method & Folding Method and Collision Resolution methods.

Linked Lists: Types of Linked Lists, Representing Linked Lists in Memory, Advantages of using Linked Lists over Arrays, Various Operations on Linked Lists.

UNIT-III

Stacks: Description of STACK structure, Implementation of Stack in memory, Applications of Stacks – Converting Arithmetic expression from infix notation to reverse polish and their subsequent evaluation and Quicksort method.

Queues: Description of queue structure, Implementation of queue in memory, Description of priorities of queues, Dequeues.

UNIT-IV

Trees: Description of Tree Structure and its Terminology, Binary Trees and Binary Search Trees and their representation in Memory and Heapsort.

Graphs: Description of Graph Structure, Implement Graphs in Memory using Adjacency Matrix, PathMatrix and Graph traversal techniques - DFS, BFS.

References / Textbooks:

1. Seymour Lipschutz, Data Structures with C (Schaum's Outline Series), McGraw Hill Education (2017), 1st Edition
2. Reema Thareja, Data Structures Using C, Oxford Publication (2014), 2nd Edition
3. Sahni Horowitz, Fundamentals of Data Strucetures in C (2008), 2nd Edition
4. Narasimha Karumanchi, Data Structures and Algorithms made easy, Careermonk Publications (2016), 5th Edition
5. S.K. Srivastava and Deepali Srivastava, Data Structures through C, BPB Publications (2004)
6. YedidyahLangsam, Augestein and Tanenbaum, Data Structures using C and C++, Pearson Education India (2015), 2nd Edition

Course Outcomes:

After passing course the student will be able to:

CO1: Identify the importance of data and information management.

CO2: Comprehend development life cycle of information systems.

CO3: Identify the components and applications of Management Information System and Decision Support System.

CO4: Identify the role of Information System in organizations: Accounting Information systems, Inventory control systems and Marketing systems.

L-T-P: 4-0-0   Max. Marks: 100
Credits: 4   Theory: 80
Examination Time: 3 Hours.   CA: 20

Instructions for Paper Setter -

Eight questions of equal marks (16 marks each) are to set, two in each of the four sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be divided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section

UNIT - I

Basic Concepts: Systems, Data, Information, Knowledge, Database Management System. Information needs of business, Sources of information – Primary and Secondary. Online access and capture.

UNIT - II

Information System: Introduction to System, types of Systems, Information System and its types.

Planning Information systems: System Development Life Cycle and Rapid Application Development. Types of Decisions - Structured, Unstructured and Semi Structured.

UNIT - III

Management Information System: Need, Components and Functions of MIS. Planning of MIS, Implementation and Controlling MIS.

Decision Support System: Meaning, Characteristics, Types and Components of DSS.

UNIT - IV

Transaction Processing Systems: Meaning, Characteristics, Components of TPS. Difference between MIS, DSS and TPS.

Case studies of the Information System: Accounting Information systems, Inventory control systems & Marketing systems.

References / Textbooks:

1. Mohammad Azam, Management Information Systems, Tata McGraw Hill Education (2012).
2. Nagpal D.P., Textbook on Management Information System, S.Chand& Company (2011).
3. R. Kelly, Rainer and Casey G. Cegielski, Introduction to Information Systems, Wiley (2015), 4th Edition
4. C. Laudon Kenneth and P. Laudon Jane, Management Information System, Pearson Education (2018), 15th Edition.
5. Brien, Marakas and Behl, Management Information Systems, McGraw Hill Education (2017), 10th Edition
6. Suman Mann SeemaShokeen, Pooja Singh, Information Systems, Dreamtech Press (2020)

Course Outcomes:

After passing course the student will be able to:

CO1: Comprehend basics of internet and email along with their effective use.

CO2: Apply HTML for development of static webpages.

CO3: Implement styling and behavior in webpages through the use of CSS.

CO4: Create and manage websites through the application of WordPress content management system.

Bachelor of Computer Applications Semester – IV
(Session 2024-25)
COURSE CODE: BCAL-4113
INTERNET APPLICATIONS

L-T-P: 4-0-0   **Max. Marks: 100**
Credits: 4   **Theory: 80**
Examination Time: 3 Hours.   **CA: 20**

Instructions for Paper Setter -

Eight questions of equal marks (16 marks each) are to set, two in each of the four sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be divided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section

UNIT-I

Internet: Introduction, working, applications, DNS, IP addresses, Search engine and its working. File Transfer Protocol (FTP), Telnet, HTTP, WWW and its working.

E–Mail Basics: Introduction, Advantage and disadvantage, Protocols and structure of an e–mail message, working of e–mail (sending and receiving messages).

UNIT-II

HTML: Introduction, Features, Program Structure, Headings, Paragraph, Styling, Formatting, Hyperlink, Image, Table, List, Frame, Block, Entities, Form, Form elements, Audio, Video, Embed YouTube Video.

UNIT-III

CSS: Introduction, Advantages and Limitations, types, selector, colors, background, box model, text, font, display, position, z-index, float, clear, rounded corners, 2D Transformations, Transitions and Animations.

UNIT-IV

WordPress: Installation, Configuration, Management - Managing Posts, comments, pages, categories, Plugins, Widgets, Tags, images, users, Import and export content, Updating WordPress. Useful Plugins – MailChimp, Creating Gallery, Stripe Checkout, Verified Authorship, Google Maps, Google Analytics.

References / Textbooks:

1. Anshuman Sharma, Fundamentals of Internaet Applications, Lakhanpal Publications, 2016.

2. Ikvinderpal Singh, Internet Applications, Khanna Book Publishing Company, 1st Edition, 2011

3. P. Rizwan Ahmed, Internet & its Applications, Margham Publications, 2013.

4. Douglas E. Corner, Computer Networks and Internet with Internet Applications, Pearson, 4th Edition, 2008.

5. Satish Jain/Vineeta Pillai, Wireless Communication & Networking made Simple, BPB Publishers, 2007.

6. Laura Lerney, Rafe Colburn, Jennifer Kyrnin, Mastering HTML, CSS & Javascript Web Publishing, BPB Publishers, 1st Edition, 2016.

7. Lisa Sabin-Wilson, WordPress for Dummies, Wiley, 8th Edition, 2021.

Bachelor of Computer Applications Semester – IV
(Session 2024-25)
COURSE CODE: BCAL–4114
APPLIED AND DISCRETE MATHEMATICS

Course Outcomes:

After passing course the student will be able to:

CO1: Have knowledge of matrices, sets, relations, propositional logic.

CO2: Have knowledge of Boolean algebra.

CO3: represents world knowledge in symbolic notation through propositional calculus.

CO4: Apply discrete mathematical concepts to obtain analytical and numerical solutions.

Bachelor of Computer Applications Semester – IV
(Session 2024-25)
COURSE CODE: BCAL–4114
APPLIED AND DISCRETE MATHEMATICS

L-T-P: 4-0-0   Max. Marks: 100
Credits: 4   Theory: 80
Examination Time: 3 Hours.   CA: 20

Instructions for Paper Setter -

Eight questions of equal marks (16 Marks each) are to set, two in each of the four sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be divided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section.

UNIT-I
Sets: Definition of sets, subsets, complement of a set, universal set, intersection and union of sets, De-Morgan's laws, Cartesian products, Equivalent sets, Countable and uncountable sets, minset, Partitions of sets.

UNIT-II
Relations: Basic definitions, domain and range of relations, graphs of relations, properties of relations, composition of relation.
Functions: Basic definitions, domain, co-domain and range of functions, types of functions, inverse of a function, composition of function.

UNIT-III
Logic and Propositional Calculus: Proposition and Compound Propositions, basic Logical Operations, Propositions and Truth Tables, Tautologies and Contradictions, Logical Equivalence, Duality law, Algebra of propositions, Conditional and Bi conditional Statements, Arguments, Logical Implication, Propositional Functions, Predicates and Quantifiers, Negation of Quantified Statements, Inference theory of the predicates calculus.

UNIT IV
Matrices: Introduction of a Matrix, its different kinds, matrix addition and scalar multiplication, multiplication of matrices, transpose etc. Square matrices, inverse and rank of a square matrix, properties of determinant, Matrix Inversion method.

References/Textbooks:

1. Seymour Lipschutz, Marc Lars Lipson, Discrete Mathematics (Schaum's outlines Series), McGraw-Hill, 1997.
2. Bernard Kolman, Robert C. Busby, Discrete Mathematical structures for Computer Science, Prentice-Hall, 1984.

3.Alan Doerr, Kenneth Levasseur, Applied Discrete Structures for Computer Science, Galgotia Publications, 1989.

4.J.P.Tremblay. and R Manohar, Discrete Mathematical Structures with Applications to Computer Science, McGraw-Hill, 1997.

Note: The latest editions of the books should be followed.

Bachelor of Computer Applications Semester – IV
(Session 2024-25)
COURSE CODE: BCAP–4115
LAB ON DATA STRUCTURES

L-T-P: 0-0-2   **Max. Marks: 50**
Credits: 2   **Practical: 40**
                                                                               CA: 10

Lab based on Data Structures.

Bachelor of Computer Applications Semester – IV
(Session 2024-25)
COURSE CODE: BCAP–4116
LAB ON INTERNET APPLICATIONS

L-T-P: 0-0-2   **Max. Marks: 50**
Credits: 2   **Practical: 40**
                                                                        CA: 10

Lab Based on Internet Applications.