

BHAKTA KAVI NARSINH MEHTA UNIVERSITY**Major/Minor****Syllabus of B.C.A & B.Sc. (IT) (Honors with Research) as per NEP-2020****Faculty of Science****Effective from June 2026****Subject: Computer Science****SEMESTER- VII****SUMMARY OF THE SYLLABUS**

Sem No.	Sr. No.	Category of Course	Course Title	Course Level	Credit	Teaching Hrs.	SEE Marks	CCE Marks	Total Marks	Exam Duration
Sem-7	1	Major-17	Application Development Using Flutter (Theory)	6.0	Theory – 04	Theory – 60	50	50	100	2:00 Hrs
	2	Major-18	Application Development Using Flutter (Practical)	6.0	Practical – 04	Practical – 120	50	50	100	2:00 Hrs
	3	Major-19	Research Methodology 1	6.0	Theory – 04	Theory – 60	50	50	100	2:00 Hrs
	4	Minor-7	NoSQL Database: MongoDB	6.0	Theory – 03 Practical – 01	6 Theory – 45 Practical – 30	50	50	100	2:00 Hrs
	5	RP	Research Project	6.0	06	-	As Per BKNM University Guideline			

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Course Level	6.0	Internal Marks	50
Programme	Bachelor of Computer Application	External Marks	50
Semester	7	Practical Internal	0
Category of Course	Major-17	Practical External	0
Course Credit	4	Prac. External Exam Duration	-
Teaching Hours	Theory-60 Practical-0	Total	100
Course Code		Exam Duration	2:00 Hrs
Course Title	Application Development Using Flutter (Theory)		

Objectives:

- To introduce the fundamentals and history of Flutter and its role in cross-platform mobile application development.
- To understand the architecture and features of Flutter framework.
- To learn the basics of Dart programming language including data types, variables, operators, and control statements.
- To develop understanding of Object-Oriented Programming (OOP) concepts used in Dart.
- To explore different Flutter widgets and layouts for building user interfaces.
- To design interactive user interfaces using various Flutter controls and containers.
- To learn handling of gestures, forms, dialogs, and navigation components in Flutter.
- To understand the use of animations, themes, and UI customization in Flutter applications.
- To develop Flutter applications that integrate Firebase, local storage, HTTP services, camera, and notifications.

Outcomes:

- Explain the architecture, features, advantages, and limitations of Flutter.
- Install and configure Flutter development environment on Windows.
- Apply Dart programming concepts to build Flutter applications.
- Develop applications using Flutter widgets and layout structures.
- Design UI components using containers, text fields, buttons, lists, grids, and navigation widgets.
- Implement forms, validations, gestures, and user interactions in Flutter apps.
- Create visually appealing applications using themes, animations, and UI customization techniques.
- Integrate Flutter applications with Firebase, SQLite, and HTTP services.
- Build complete cross-platform mobile applications using Flutter framework.

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Course Contents

UNIT		Hours
Unit 1 Introduction to Flutter and Dart Programming	Introduction to Flutter - History of Flutter - Features of Flutter - Advantage of Flutter - Disadvantages of Flutter - Flutter Installation for windows - Flutter Architecture Introduction to Dart Programming - Data Type - Variables and Functions - Operators - Decision Making and Loops - Continue and Break - Final and Const Keyword - OOP Concepts	15
Unit 2 Flutter Widgets, Layouts and State Management	Flutter Basics - Flutter Widget - Types Of Widgets - State Management Widget - Flutter Scaffold - constructor and properties of the Scaffold widget class - Flutter Layouts - Flutter Gestures system - Gestures and pointers - Gesture Detector - Flutter State Management - Flutter IDE	15
Unit 3 Flutter UI Components and Controls	Flutter Container and Controls - Flutter Container - Flutter Row and Column - Flutter Text - Flutter TextField - Flutter Buttons	15

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	• Flutter Stack • Flutter Forms • Flutter Alert Dialogs • Flutter Icons • Flutter Images • Flutter Card • Flutter Tabbar • Flutter Drawer • Flutter Lists • Flutter GridView • Flutter Toast • Flutter Checkbox • Flutter Radio Button • Flutter Progress Bar • Flutter SnackBar • Flutter Tooltip • Flutter Slider • Flutter Switch • Flutter Charts • Bottom Navigation Bar • Flutter Themes • Flutter Table • Flutter Calendar • Flutter Animation	
Unit 4 Flutter Design, Animations and Data Handling	Design & Animations • Customizing Fonts in Flutter • Flutter - Skeleton Text • Flutter - Themes • Flutter - Lazy Loader • Flutter - UI Orientation • Flutter - Animation in Route Transition • Flutter - Physics Simulation in Animation • Flutter - Radial Hero Animation • Flutter - Hinge Animation • Flutter - Lottie Animation	15

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	Forms & Gestures • Form Validation in Flutter • Designing a Form Submission Page in Flutter • Flutter - Gestures • Flutter - Read and Write Data on Firebase • Gallery Access and Camera in Flutter • Camera Access in Flutter • SQLite and local storage • Shared preferences • Background local notifications in Flutter • HTTP GET Response in Flutter	
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Suggested Reading:

References Book:

- Flutter in Action By Eric Windmill 1st Edition Manning Publications
- Beginning Flutter: A Hands-On Guide to App Development By Marco L. Napoli 1st Edition Wiley Publications
- Flutter Cookbook By Simone Alessandria 1st Edition Packt Publishing
- Learning Dart By Ivo Balbaert 2nd Edition Packt Publishing
- Programming Flutter: Native, Cross-Platform Apps the Easy Way By Carmine Zaccagnino 1st Edition Pragmatic Bookshelf Publications
- Flutter Complete Reference: Create beautiful, fast and native apps for any device
- Beginning App Development with Flutter By Rap Payne 1st Edition Apress Publications

Web site References:

- <https://flutter.dev>
- <https://dart.dev>
- <https://docs.flutter.dev/reference/tutorials>
- <https://www.javatpoint.com/flutter>
- <https://www.geeksforgeeks.org/flutter>
- <https://www.tutorialspoint.com/flutter>
- <https://www.w3schools.com/flutter>

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Programme	Bachelor of Computer Application		External Marks	00
Semester	7		Practical Internal	50
Category of Course	Major-18		Practical External	50
Course Credit	4		Prac. External Exam Duration	2:00 Hrs
Teaching Hours	Theory-0 Practical-120		Total	100
Course Code			Exam Duration	-
Course Title	Application Development Using Flutter (Practical)			

Objectives:

- To introduce the fundamentals and history of Flutter and its role in cross-platform mobile application development.
- To understand the architecture and features of Flutter framework.
- To learn the basics of Dart programming language including data types, variables, operators, and control statements.
- To develop understanding of Object-Oriented Programming (OOP) concepts used in Dart.
- To explore different Flutter widgets and layouts for building user interfaces.
- To design interactive user interfaces using various Flutter controls and containers.
- To learn handling of gestures, forms, dialogs, and navigation components in Flutter.
- To understand the use of animations, themes, and UI customization in Flutter applications.
- To develop Flutter applications that integrate Firebase, local storage, HTTP services, camera, and notifications.

Outcomes:

- Explain the architecture, features, advantages, and limitations of Flutter.
- Install and configure Flutter development environment on Windows.
- Apply Dart programming concepts to build Flutter applications.
- Develop applications using Flutter widgets and layout structures.
- Design UI components using containers, text fields, buttons, lists, grids, and navigation widgets.
- Implement forms, validations, gestures, and user interactions in Flutter apps.
- Create visually appealing applications using themes, animations, and UI customization techniques.
- Integrate Flutter applications with Firebase, SQLite, and HTTP services.
- Build complete cross-platform mobile applications using Flutter framework.

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Unit 2 Flutter Widgets, Layouts and State Management	Flutter Basics - Flutter Widget - Types Of Widgets - State Management Widget - Flutter Scaffold - constructor and properties of the Scaffold widget class - Flutter Layouts - Flutter Gestures system - Gestures and pointers - Gesture Detector - Flutter State Management - Flutter IDE	30
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Suggested Reading:

References Book:

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- Flutter Cookbook By Simone Alessandria 1st Edition Packt Publishing
- Learning Dart By Ivo Balbaert 2nd Edition Packt Publishing
- Programming Flutter: Native, Cross-Platform Apps the Easy Way By Carmine Zaccagnino 1st Edition Pragmatic Bookshelf Publications
- Flutter Complete Reference: Create beautiful, fast and native apps for any device
- Beginning App Development with Flutter By Rap Payne 1st Edition Apress Publications

Web site References:

- <https://flutter.dev>
- <https://dart.dev>
- <https://docs.flutter.dev/reference/tutorials>
- <https://www.javatpoint.com/flutter>
- <https://www.geeksforgeeks.org/flutter>
- <https://www.tutorialspoint.com/flutter>
- <https://www.w3schools.com/flutter>

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Course Level	6.0	Internal Marks	50
Programme	Bachelor of Computer Application	External Marks	50
Semester	7	Practical Internal	0
Category of Course	Major-19	Practical External	0
Course Credit	4	Prac. External Exam Duration	-
Teaching Hours	Theory- 60 Practical-00	Total	100
Course Code		Exam Duration	2:00 Hrs
Course Title	Research Methodology 1		

Objectives:

- To introduce students to scientific research concepts and methodology.
- To understand research problem formulation and research design.
- To develop skills in literature review and data collection methods.
- To prepare students for independent academic research.

Outcomes:

- Understand research concepts and scientific thinking.
- Identify research problems and formulate objectives.
- Design appropriate research methodologies.
- Conduct literature surveys using digital tools.
- Apply ethical research practices.

Course Contents

UNIT		Hours
Unit 1 Introduction to Research Methodology	• Meaning and objectives of research. • Types of research: Basic, Applied, Descriptive, Analytical. • Research process and scientific methods. • Research in Computer Applications. • Research ethics and plagiarism awareness.	15
Unit 2 Research Problem Formulation	• Identification of research problems. • Sources of research ideas. • Statement of problem. • Hypothesis formulation, Variables and research questions.	15

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Unit 3 Research Design	• Meaning and importance of research design. • Types of research design. • Exploratory and experimental research. • Sampling design and sampling techniques. • Validity and reliability.	15
Unit 4 Literature Review & Data Collection Methods	Literature Review: ➤ Meaning and importance. ➤ Review sources: • Research journals. • Conference papers. • Online repositories. ➤ Citation styles (APA/IEEE). ➤ Reference management tools Data Collection Methods: ➤ Primary and secondary data. ➤ Questionnaire design. ➤ Interviews and surveys. ➤ Observation method. ➤ Online data collection tools.	15

Suggested Reading:

- ❖ Practical Component
 - Research problem identification exercise.
 - Literature review using Google Scholar.
 - Citation management using tools.
 - Questionnaire preparation.
 - Mini research proposal preparation.
- ❖ Suggested Practical Tools
 - Google Scholar
 - Zotero / Mendeley
 - Grammarly plagiarism checker
 - Google Forms

References Book:

- C. R. Kothari – Research Methodology: Methods and Techniques.
- Ranjit Kumar – Research Methodology.
- John Creswell – Research Design

Course Level	6.0		Internal Marks	25
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Semester	7	Practical Internal	25
Category of Course	Minor-7	Practical External	0
Course Credit	4	Prac. External Exam Duration	-
Teaching Hours	Theory-45 Practical-30	Total	100
Course Code		Exam Duration	2:00 Hrs
Course Title	NoSQL Database: MongoDB		

Objectives:

- Understand the fundamentals of database systems and the limitations of traditional RDBMS.
- Explain the concept of NoSQL databases, their features, advantages, and real-world use cases.
- Identify and differentiate between various types of NoSQL databases such as key-value, document, column-oriented, and graph databases.
- Compare SQL and NoSQL databases based on structure, scalability, and performance.
- Understand MongoDB architecture including databases, collections, documents, and JSON/BSON formats.
- Perform CRUD operations in MongoDB using various methods and query operators.
- Apply querying techniques such as filtering, projection, sorting, and pagination (limit/skip).
- Design efficient data models using schema design principles, relationships, and embedding vs referencing.
- Implement indexing and aggregation techniques to optimize performance and analyze data.
- Manage MongoDB databases through backup, restore, security (authentication/authorization), and integrate MongoDB with applications using Node.js.

Outcomes:

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- Describe the basic concepts of database systems and identify limitations of relational databases.
- Explain NoSQL database concepts, types, features, and their practical applications.
- Differentiate between SQL and NoSQL databases based on use cases, scalability, and data models.
- Demonstrate understanding of MongoDB architecture including collections, documents, and data formats (JSON/BSON).
- Perform CRUD operations in MongoDB using appropriate commands and query operators.
- Apply filtering, projection, sorting, and pagination techniques to retrieve specific data efficiently.
- Design effective MongoDB data models using embedding, referencing, and relationship concepts.
- Implement indexing and aggregation framework to improve query performance and data analysis.

UNIT		Hours
Unit 1 Introduction to NoSQL	• Introduction to Database Systems • Limitations of Relational Databases (RDBMS) • What is NoSQL? • Types of NoSQL Databases • Key-Value Stores • Document Databases • Column-Oriented Databases • Graph Databases • Features and Advantages of NoSQL • Use cases of NoSQL databases • SQL vs NoSQL comparison	10
Unit 2 Introduction to MongoDB	• MongoDB concepts - Databases, collections, and documents • Downloading Installing MongoDB, MongoDB shell and Compass • Introduction to JSON and BSON format CRUD Operations and Querying • Creating Databases and Collections • Insert Operations ◦ insertOne()	15

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	○ insertMany() • Read Operations ○ find(), findOne() • Update Operations ○ updateOne(), updateMany() • Delete Operations ○ deleteOne(), deleteMany() • Projection in MongoDB • Query Operators ○ Comparison Operators (\$gt, \$lt, \$eq) ○ Logical Operators (\$and, \$or, \$not) ○ Element Operators ○ Array Operators • Sorting Documents • Limit and Skip methods	
Unit 3 Data Modeling, Indexing and Aggregation	• MongoDB Data Modeling Concepts • Schema Design Principles • Embedded vs Referenced Documents • Relationships in MongoDB ○ One-to-One ○ One-to-Many ○ Many-to-Many • Indexing in MongoDB • Types of Indexes • Creating and Dropping Indexes • Performance Optimization • Aggregation Framework • Aggregation Pipeline Stages ○ \$match ○ \$group ○ \$project ○ \$sort	10
Unit 4 Administration and Application Development	• Backup and Restore Database • Import and Export Data • User Authentication and Authorization • Role-Based Access Control • Replication Concept	10

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	• Sharding Concept • MongoDB with Node.js Introduction • Connecting MongoDB with Application • CRUD Operations using Node.js	
Practical		30

Suggested Reading:

References Book:

- Mastering MongoDB 7.0 (Fourth Edition) – Marko Aleksendrić et al. (2024)
- Mastering NoSQL Databases with MongoDB – Greyson Chesterfield (2024)
- Mastering MongoDB: A Comprehensive Guide to NoSQL Database Excellence – Frahaan Hussain & Kameron Hussain (2024)
- MongoDB in Action (Third Edition) – Arek Borucki (2025)
- MongoDB: Learning NoSQL Databases Made Easy – Feri Sulianta (2025)

Web site References:

- MongoDB Inc. Documentation → <https://www.mongodb.com/docs/>
- W3Schools MongoDB Tutorial → <https://www.w3schools.com/mongodb/>
- GeeksforGeeks MongoDB Guide → <https://www.geeksforgeeks.org/mongodb-tutorial/>
- MongoDB University → <https://university.mongodb.com/>
- TutorialsPoint MongoDB Tutorial → <https://www.tutorialspoint.com/mongodb/index.htm>
- freeCodeCamp → <https://www.freecodecamp.org/>

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INTERNAL EVALUATION SCHEME		
NO	Particulars	Marks
1	Mid Semester Exam (Mandatory)	25
2	Class Test	05
3	Open book exam/test	05
4	Open note exam/test	05
5	Self-test/ Online test	05
6	Essay/Article writing	05
7	Quizzes/Objective test	05
8	Class assignment	05
9	Home assignment	05
10	Reports Writing	05
11	Research/Dissertation	05
12	Case Studies	05
13	Viva/Oral exam	05
14	Group Discussion	05
15	Role Play	05
16	Paper presentation/Seminar	05
17	Language Lab work	05
18	Interview	05
19	Craft work	05
20	Co-curricular work	05
21	Field Assignment	05
22	Poster Presentation	05
23	Attendance	05
24	Project Work	05
	Total	50

Note: Sr.No.1 is mandatory. Select any five from Sr.No.2 to 24. Each Contains five marks. Student should secure 18 Marks for passing in internal Exam.

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Paper Style

Ques. No.	Particulars	From which Unit	Marks
1	Questions (Any Two Out Of Four)	1	10
2	Questions (Any Two Out Of Four)	2	10
3	Questions (Any Two Out Of Four)	3	10
4	Questions (Any Two Out Of Four)	4	10
5	Questions (Any Two Out Of Four)	From Each Unit	10
		Total Marks	50