



SARDAR PATEL UNIVERSITY, BALAGHAT

School of Computer Application

Syllabus under NEP

Course: Bachelor of Computer Applications (BCA)

Semester: VII

Branch: Computer Science and Application

w.e.f. Academic Session: 2025-26

Subject: Android Programming (BCAMA701T)

UNIT - I: Introduction to Android

Overview of mobile operating systems and Android architecture (Linux kernel, libraries, Android runtime, application framework). Features of Android and version history (Cupcake to latest release). **Setting up Android development environment:** Android Studio, SDK tools, AVD (emulator). Structure of an Android project (manifest, Java/Kotlin files, resources, Gradle). **Activity lifecycle:** onCreate, onStart, onResume, onPause, onStop, onDestroy. **Intents:** explicit and implicit intents, intent filters. Introduction to fragments and fragment lifecycle.

UNIT - II: User Interface Design

Layouts: LinearLayout, RelativeLayout, ConstraintLayout, FrameLayout, TableLayout. UI components: TextView, EditText, Button, ImageView, CheckBox, RadioButton, Spinner, ProgressBar, RecyclerView and Adapter pattern for dynamic lists. **Event handling:** onClick, onTouch, listeners, callback methods. Menus: options menu, context menu, popup menu. **Dialogs:** AlertDialog, DatePickerDialog, TimePickerDialog. Designing adaptive and responsive UIs for multiple screen sizes and orientations. **Material design principles:** themes, styles, colors, typography.

UNIT - III: Data Storage and Management

Shared Preferences for lightweight key-value storage. Internal and external file storage (read/write operations). **SQLite database:** creating tables, CRUD operations, queries. **Content providers:** accessing data across applications. **Room Database:** entities, DAO, database class, LiveData integration. Data persistence and caching strategies. Working with JSON and XML data formats.

UNIT - IV: Connectivity and Multimedia

Networking in Android: HTTP, REST APIs, JSON parsing with Volley/Retrofit. Consuming web services and handling asynchronous tasks. **Background processing:** AsyncTask, Services, Broadcast Receivers, WorkManager. **Notifications:** types, building notification channels, push notifications (Firebase Cloud Messaging). **Multimedia handling:** capturing images and video using camera, playing audio/video with MediaPlayer and ExoPlayer. **Location-based services:** GPS, Google Maps API, geofencing. **Sensors:** accelerometer, gyroscope, proximity sensor, light sensor. Permissions model in Android (runtime permissions).

UNIT - V: Deployment and Advanced Topics

Testing and debugging Android applications (Logcat, breakpoints, unit testing with JUnit, UI testing with Espresso). **Performance optimization:** memory management, battery optimization, efficient layouts. **Security considerations:** secure data storage, encryption, secure communication, app signing. **Publishing apps on Google Play Store:** APK vs. AAB, signing, versioning, release process. **Introduction to cross-platform frameworks:** Flutter, React Native, Kotlin Multiplatform. **Emerging trends:** AI/ML integration in apps (TensorFlow Lite), AR/VR applications, IoT integration with Android Things. Case studies of successful Android applications and best practices.



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Reference Books

1. **Professional Android** – Reto Meier & Ian Lake
2. **Android Programming: The Big Nerd Ranch Guide** – Bill Phillips, Chris Stewart, Kristin Marsicano
3. **Beginning Android Programming with Android Studio** – Jerome DiMarzio
4. **Android Programming for Beginners** – John Horton
5. **Learning Android Application Development** – Rick Rogers, John Lombardo, Zigurd Mednieks, Blake Meike
6. **Head First Android Development** – Dawn Griffiths & David Griffiths
7. **Android Development with Kotlin** – Marcin Moskala, Igor Wojda

Android Programming Practical Problem List (BCAMA701P)

Basics of Android

1. Create a simple “Hello World” Android application.
2. Develop an app that displays a welcome message using an explicit intent.
3. Build an app that demonstrates the activity lifecycle (onCreate, onStart, onResume, etc.).
4. Create an app with multiple activities and navigate between them using intents.

User Interface Design

5. Design a login form using TextView, EditText, and Button controls.
6. Create a registration form with validation (email, password, phone number).
7. Build a calculator app with basic arithmetic operations.
8. Develop a list-based app using RecyclerView to display student names.

Data Storage and Management

9. Create an app that stores and retrieves user preferences using SharedPreferences.
10. Develop an app that stores student records in SQLite database and displays them in a ListView.
11. Implement CRUD operations (Insert, Update, Delete, Select) using SQLite.
12. Build an app that reads and writes data to a file in internal storage.

Connectivity and Multimedia

13. Create an app that fetches JSON data from a REST API and displays it.
14. Develop a weather app using an online API (e.g., OpenWeatherMap).
15. Build an app that sends and receives SMS messages.
16. Create a location-based app that shows the user’s current location using Google Maps.
17. Develop an app that captures an image using the device camera and displays it.
18. Build a music player app that plays audio files from local storage.

Deployment and Advanced Topics

19. Create an app that sends push notifications (using Firebase Cloud Messaging).
20. Develop a mini-project app (e.g., To-Do List, Student Portal, or Expense Tracker) and publish it on the emulator/Play Store.



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Subject: R Programming (BCAMA702T)

UNIT - I: Introduction to R Programming

Overview of R and its applications in data analysis and statistics. Installing R and RStudio environment. Basic syntax, data types (numeric, character, logical, factor). Variables, operators, and expressions. Input/output operations in R. Writing and executing simple R scripts.

UNIT - II: Data Structures in R

Vectors, lists, matrices, arrays, and data frames. Factors and categorical data. Indexing, slicing, and subsetting data structures. Applying functions to data structures (apply, lapply, sapply). Importing and exporting data (CSV, Excel, text files).

UNIT - III: Control Structures and Functions

Conditional statements (if, else, switch). Loops (for, while, repeat). Writing user-defined functions. Scope of variables and function arguments. Built-in functions in R. Error handling and debugging.

UNIT - IV: Data Manipulation and Visualization

Data cleaning and transformation using dplyr and tidyr. Handling missing values and outliers. Basic plotting with plot(), hist(), boxplot(). Advanced visualization using ggplot2. Creating bar charts, scatter plots, line graphs, and pie charts. Customizing plots (labels, themes, colors).

UNIT - V: Statistical Analysis and Applications

Descriptive statistics: mean, median, variance, standard deviation. Probability distributions (normal, binomial, Poisson). Hypothesis testing: t-test, chi-square test, ANOVA. Correlation and regression analysis. Introduction to machine learning in R (classification, clustering basics). Case studies and applications of R in business, healthcare, and research.

Reference Books

1. **The Art of R Programming** – Norman Matloff
2. **R for Everyone: Advanced Analytics and Graphics** – Jared P. Lander
3. **Hands-On Programming with R** – Garrett Grolemund
4. **R Programming for Data Science** – Roger D. Peng
5. **R Cookbook** – Paul Teetor
6. **Data Manipulation with R** – Phil Spector
7. **ggplot2: Elegant Graphics for Data Analysis** – Hadley Wickham



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R Programming Practical Problem List (BCAMA702P)

Basics of R

1. Write a program to print "Hello World" in R.
2. Create variables of different data types (numeric, character, logical, factor) and display them.
3. Perform arithmetic operations (addition, subtraction, multiplication, division) on two numbers.
4. Write a script to take user input and display the result.

Data Structures

5. Create a vector and perform operations like sum, mean, max, min.
6. Create a matrix and perform row-wise and column-wise operations.
7. Create a list containing vectors, matrices, and data frames, then access elements.
8. Create a data frame of student records (name, age, marks) and display specific columns.
9. Import a CSV file into R and display its contents.

Control Structures and Functions

10. Write a program using if-else to check whether a number is even or odd.
11. Write a program using a loop to print the multiplication table of a given number.
12. Create a user-defined function to calculate factorial of a number.
13. Write a function to calculate the sum of squares of numbers in a vector.
14. Demonstrate error handling using try-catch in R.

Data Manipulation and Visualization

15. Use dplyr to filter students scoring above 60 marks from a data frame.
16. Use tidyr to reshape data from wide format to long format.
17. Create a histogram of marks obtained by students.
18. Create a scatter plot showing relationship between height and weight of students.
19. Use ggplot2 to create a bar chart of sales data with customized colors and labels.

Statistical Analysis

20. Perform correlation and regression analysis on a dataset (e.g., marks vs. study hours).



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Subject: Research Methodology (BCAMA703T)

UNIT - I: Introduction to Research

Meaning, objectives, and significance of research. Types of research: basic, applied, qualitative, quantitative. Research process and steps involved. Characteristics of good research. Ethical issues in research.

UNIT - II: Research Problem and Design

Identifying and defining a research problem. Review of literature and gap analysis. Hypothesis formulation: types and characteristics. Research design: exploratory, descriptive, experimental, case study. Sampling methods: probability and non-probability sampling.

UNIT - III: Data Collection Methods

Primary and secondary data. Tools for data collection: questionnaires, interviews, observations, schedules. Designing effective questionnaires and surveys. Measurement scales: nominal, ordinal, interval, ratio. Reliability and validity of data.

UNIT - IV: Data Analysis and Interpretation

Data preparation: coding, editing, tabulation. Descriptive statistics: mean, median, mode, variance, standard deviation. Inferential statistics: correlation, regression, chi-square test, t-test, ANOVA. Use of statistical software (SPSS, R, Excel) for data analysis. Interpretation of results and drawing conclusions.

UNIT - V: Report Writing and Presentation

Structure of a research report: introduction, methodology, results, discussion, conclusion. Guidelines for writing research papers, dissertations, and project reports. Referencing styles: APA, MLA, and IEEE. Plagiarism and academic integrity. Oral presentation of research findings: use of visual aids, PowerPoint, posters.

Reference Books

1. **Research Methodology: Methods and Techniques** – C.R. Kothari & Gaurav Garg
2. **Research Methodology: A Step-by-Step Guide for Beginners** – Ranjit Kumar
3. **Methodology of Research in Social Sciences** – O.R. Krishnaswamy & M. Ranganathan
4. **Business Research Methods** – Donald R. Cooper & Pamela S. Schindler
5. **Research Methods for Computer Science** – J. Glenn Brookshear
6. **Research Methods: A Practical Guide for Students and Researchers** – D. Remenyi



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Subject: Data Visualization & Business Intelligence (BCAMI704T)

UNIT - I: Introduction to Business Intelligence (BI)

Definition, scope, and importance of BI. Evolution of BI and its role in decision-making. Components of BI: data sources, ETL, data warehouse, reporting. BI architecture and tools overview (Power BI, Tableau, QlikView). Applications of BI in business domains.

UNIT - II: Fundamentals of Data Visualization

Principles of effective data visualization. Types of charts and graphs: bar, line, pie, scatter, histogram, heatmap. Choosing the right visualization for data types. Storytelling with data: clarity, simplicity, and impact. Common mistakes in visualization and how to avoid them.

UNIT - III: Data Preparation and Modeling

Data collection and cleaning techniques. Handling missing values and outliers. Data integration from multiple sources. Introduction to data modeling: star schema, snowflake schema. Measures, dimensions, and hierarchies in BI tools.

UNIT - IV: BI Tools and Dashboards

Introduction to BI tools: Power BI, Tableau, Google Data Studio. Creating interactive dashboards and reports. Filters, slicers, and drill-down features. KPI (Key Performance Indicators) and metrics tracking. Case studies of BI dashboards in real-world scenarios.

UNIT - V: Advanced Topics and Applications

Predictive analytics and machine learning integration in BI. Real-time analytics and streaming data visualization. Big data and BI: Hadoop, Spark integration. Cloud-based BI solutions (Azure, AWS, Google Cloud). Ethical issues in BI: privacy, data governance, security. Future trends in BI and visualization (AI-driven insights, augmented analytics).

Reference Books

1. **Business Intelligence: A Managerial Approach** – Efraim Turban, Ramesh Sharda, Dursun Delen
2. **Data Visualization: A Practical Introduction** – Kieran Healy
3. **Storytelling with Data: A Data Visualization Guide for Business Professionals** – Cole Nussbaumer Knaflic
4. **The Data Warehouse Toolkit** – Ralph Kimball & Margy Ross
5. **Learning Tableau** – Joshua N. Milligan
6. **Microsoft Power BI Cookbook** – Brett Powell
7. **Data Science for Business** – Foster Provost & Tom Fawcett