SYLLABUS FOR BCA MAJOR WITH HONOURS

SEM. VII

4th Year [Four Year Under Graduate Program with Honours] (FYUGPHONS)

Under Single Major Single Minor

(To be implemented from Session 2023-24)

Proposed Syllabus for four years B.C.A (Major) Programme							
Year	**Semester**	**Paper Code**	**Paper**	**Credits**	**Periods/Week**	**Exam. Marks**	**Total Marks**
3rd Year	**VII**	UBCAMAJ47017	Machine Learning	3	3	60	60
		UBCAMAJ47017 T	Machine Learning (Tutorial)	1	1	00	
		UBCAMAJ47018	LaTeX Programming	3	3	40	60
		UBCAMAJ47018 L	LaTeX Programming (Lab)	1	1	20	
		UBCAMAJ47019	R Programming	3	3	40	60
		UBCAMAJ47019 L	R Programming (Lab)	1	1	20	
	VIII	UBCAMAJ48020	**Project / Dissertation**	4	4		
		UBCAMAJ48021	**Research Methodology**	4	4		
		UBCAMAJ48022	**Field Word / Case Studies**	4	4		
		UBCAMAJ48023	**Seminar Presentation / Group Discussion**	4	4		

NOTE: Tutorials should involve problem solving session/activity related to the subject taught.

SYLLABUS FOR BCA MAJOR WITH HONOURS

Discipline: Science ☐ Arts, Humanities & Social Science ☐

Commerce ☐ BBA ☐ BCA [√]

Subject Name: BCA

Subject Code: **UBCAMAJ47017** (Will be provided by the University)

Semester: Semester I ☐ Semester II ☐ Semester III ☐ Semester IV ☐

Semester V ☐ Semester VI ☐ Semester VII [√] Semester VIII ☐

Course Name: **MACHINE LEARNING**

Course Code: (Will be provided by the University)

Course Credit: Theoretical 3 Practical/Tutorial 1

Marks Allotted: Theoretical 60 Practical/Tutorial 0

Continuing Evaluation Attendance

Course Type (tick the correct alternatives):

Major Core	[√]	AEC	☐
Interdisciplinary/ DSE	☐	SEC	☐
Minor / Generic Elective	☐	VAC	☐
Research Project/Dissertation	☐	Vocational	☐

Is the course focused on employability / entrepreneurship? YES [√] NO ☐

Is the course focused on imparting life skill? YES [√] NO ☐

Is the course based on Activity ? YES [√] NO ☐

Remarks by Chairman, UG BOS, if any

UG BOS Meeting Reference Number: Date:

Course Code: **UBCAMAJ47017**

Course Name: **MACHINE LEARNING**

Brief Course Description

This course provides a comprehensive introduction to Machine Learning, covering fundamental concepts, statistical learning methods, regression techniques, classification and clustering algorithms, regularization, and neural networks. Students will learn how intelligent systems can learn from data and apply machine learning techniques to solve real-world problems across diverse domains.

Prerequisite(s) and/or Note(s)

Students should have basic knowledge of programming, mathematics, statistics, and data structures. Practical sessions using Python, R, MATLAB, or WEKA will accompany theoretical concepts, and students are encouraged to undertake mini-projects and case studies for hands-on learning.

Course Objectives

The course aims to introduce students to the principles and methodologies of machine learning, develop their ability to preprocess and analyze data, apply machine learning algorithms for prediction and classification tasks, evaluate model performance, and understand the role of neural networks in intelligent systems.

Course Outcomes

Upon successful completion of this course, students will be able to understand and apply fundamental machine learning concepts and techniques. They will preprocess and analyze data, develop predictive models using regression, classification, clustering, and neural networks, and evaluate model performance effectively. Students will gain proficiency in using machine learning tools and software for intelligent system development. They will also be able to solve real-world problems through data-driven decision-making and predictive analytics.

Knowledge Acquired

Students will acquire knowledge of machine learning fundamentals, statistical learning techniques, regression models, classification and clustering methods, dimensionality reduction, regularization techniques, neural network architectures, and their applications in solving real-world problems.

Skills Gained

Students will develop skills in data analysis, machine learning model development, predictive analytics, feature engineering, data visualization, algorithm implementation, model evaluation, and the use of machine learning tools and software platforms.

Competency Developed

Upon successful completion of the course, students will be able to design, implement, evaluate, and optimize machine learning models for various applications. They will demonstrate the ability to analyze complex datasets, develop intelligent predictive systems, apply neural network techniques, and use machine learning methodologies in research, industry, and interdisciplinary problem-solving environments.

Detailed Syllabus		
4th Year: Semester 7		
UBCAMAJ47017	**MACHINE LEARNING**	**[Credits: 3, Lectures 45]**

Unit 1: Introduction **(7 Lectures)**

Concept of Machine Learning, Applications of Machine Learning, Key elements of Machine Learning, Supervised vs. Unsupervised Learning - Characteristics, Applications, Challenges, Statistical Learning: Bayesian Method, The Naive Bayes Classifier.

Unit 2: Machine Learning and Linear Algebra **(5 Lectures)**

Plotting of Data, Vectorization, Matrices and Vectors: Addition, Multiplication, Transpose and Inverse using available tool such as Python, R Programming, MATLAB, and WEKA.

Unit 3: Linear Regression **(5 Lectures)**

Concept of linear regression- Prediction using Linear Regression, Gradient Descent, Linear Regression with one variable and with multiple variables, Polynomial Regression.

Unit 4: Logistic Regression **(4 Lectures)**

Concept of logistic regression - Classification using Logistic Regression, Logistic Regression vs Linear Regression, Logistic Regression with one variable and with multiple variables.

Unit 5: Regularization **(4 Lectures)**

Concept of Regularization, Regularization and its utility- The problem of Overfitting, Application of Regularization.

Unit 6: Classification and Clustering Techniques **(10 Lectures)**

Concept of Classification and Clustering- Classification Algorithms - K-Nearest Neighbour (KNN), Decision Trees, Naïve Bayes Classifier, Support Vector Machine (SVM) - Clustering Techniques- K-Means Clustering, Hierarchical Clustering, and Density based clustering- Dimensionality Reduction - Principal Component Analysis (PCA), Feature Reduction Techniques

Unit 7: Neural Networks **(10 Lectures)**

Concept of Artificial Neural Networks (ANN), Biological Neuron vs Artificial Neuron, Structure of Neural Networks: Input Layer, Hidden Layer, and Output Layer - Activation Functions: Sigmoid, ReLU, and Softmax, Perceptron and Multilayer Perceptron (MLP)- Feedforward and Backpropagation Neural Networks - Training of Neural Networks: Weights, Biases , Applications of Neural Networks in Image Recognition, Speech Processing, Prediction Systems and various other fields.

Suggested Readings:

1. Brett Lantz, Machine Learning with R: Expert techniques for predictive modeling, 3rd Edition, Packt Publishing, 2019

2. K. P. Murphy, Machine Learning: A Probabilistic Perspective. MIT Press, 2012.

3. P. Harrington, Machine Learning in Action. Manning Publications, 2012

4. C. M. Bishop, Pattern Recognition and Machine Learning. Springer, 2016.

5. S. Marsland, Machine Learning: An Algorithmic Perspective. 1st Ed. Chapman and Hall, 2009

Web Resources:

1. www.towardsdatascience.com
2. https://machinelearningmastery.com

UBCAMAJ47017L	MACHINE LEARNING	[Credits: 1, Lecture Hours:15]

Machine Learning tutorial as assigned and advised by teacher(s).

SYLLABUS FOR BCA MAJOR WITH HONOURS

Discipline: Science ☐ Arts, Humanities & Social Science ☐
Commerce ☐ BBA ☐ BCA [√]

Subject Name: BCA
Subject Code: **UBCAMAJ47018** (Will be provided by the University)
Semester: Semester I ☐ Semester II ☐ Semester III ☐ Semester IV ☐
Semester V ☐ Semester VI ☐ Semester VII [√] Semester VIII ☐
Course Name: **LaTeX PROGRAMMING**
Course Code: (Will be provided by the University)
Course Credit: Theoretical 3 Practical/Tutorial 1
Marks Allotted: Theoretical 40 Practical/Tutorial 20
Continuing Evaluation Attendance

Course Type (tick the correct alternatives):

Major Core	[√]	AEC	☐
Interdisciplinary/ DSE	☐	SEC	☐
Minor / Generic Elective	☐	VAC	☐
Research Project/Dissertation	☐	Vocational	☐

Is the course focused on employability / entrepreneurship? YES [√] NO ☐
Is the course focused on imparting life skill? YES [√] NO ☐
Is the course based on Activity ? YES [√] NO ☐

Remarks by Chairman, UG BOS, if any

UG BOS Meeting Reference Number: Date:

Course Code: **UBCAMAJ47018**

Course Name: **LaTeX PROGRAMMING**

Brief Course Description

This course introduces LaTeX, a powerful document preparation system widely used for creating scientific, technical, academic, and professional documents. Students will learn to create well-structured documents, format text, insert tables, figures, equations, references, and prepare reports, articles, and research papers using LaTeX.

Prerequisite(s) and/or Note(s):

Basic computer literacy and familiarity with document editing are recommended. No prior programming experience is required.

Course Objectives

The course aims to provide students with the knowledge and practical skills required to create professional-quality documents using LaTeX, including the preparation of academic reports, research papers, presentations, and technical documents.

Course Outcomes

Upon successful completion of this course, students will be able to create and organize LaTeX documents using appropriate document classes, sections, formatting styles, and structured content. They will gain proficiency in typesetting mathematical expressions, equations, matrices, theorems, and proofs, as well as creating professional tables, figures, cross-references, and bibliographies using BibTeX. Students will also be able to design academic presentations with Beamer, manage large documents using multiple files, and develop complete research reports, dissertations, and thesis documents that meet professional and academic publishing standards.

Knowledge Acquired

Students will gain knowledge of LaTeX syntax, document structure, text formatting, mathematical typesetting, table and figure creation, bibliography management, and document customization techniques.

Skills Gained

Students will develop skills in creating, editing, formatting, and managing professional documents, mathematical equations, references, and presentations efficiently using LaTeX tools and packages.

Competency Developed

Upon completion of the course, students will be able to independently design and produce high-quality academic and technical documents, research papers, project reports, and presentations using LaTeX while following professional publishing standards.

Detailed Syllabus		
4th Year: Semester 7		
UBCAMAJ47018	**LaTeX PROGRAMMING**	**[Credits: 3, Lectures 45]**

UNIT 1 – INTRODUCTION TO LATEX AND DOCUMENT (10 Lectures)

History of LaTeX and difference between TeX and LaTeX, advantages for scientific writing, LaTeX distributions such as TeX Live and MiKTeX and online editors such as Overleaf and TeXstudio, basic document anatomy using documentclass, preamble, begin document, and end document, standard document classes article, report, and book, essential packages geometry, graphicx, hyperref, amsmath, and amssymb, title page creation using title, author, date, maketitle, and the abstract environment, sectioning commands section, subsection, subsubsection, paragraph, and subparagraph, text formatting using textbf, textit, underline, font size commands from tiny to Huge, and textcolor, lists using itemize, enumerate, and description environments including nested lists, and page layout basics using geometry for margins, pagestyle, fancyhdr for headers and footers, and pagenumbering.

UNIT 2 – MATHEMATICAL TYPESETTING (10 Lectures)

Math modes for inline math using dollar signs and parentheses and displayed math using square brackets, double dollar signs, and the equation environment, Greek letters, mathematical symbols, operators such as sum, int, frac, and sqrt, subscripts and superscripts, limits, stacked expressions, delimiters including parentheses, brackets, braces, and automatic sizing using left and right, arrays and matrices using matrix, pmatrix, and bmatrix environments from amsmath, multiline equations using align, gather, and multline environments with alignment points, numbered versus unnumbered equations using tag and notag, and theorem-like environments including theorem, lemma, proof, and definition via the amsthm package.

UNIT 3 – FIGURES, TABLES, AND CROSS-REFERENCING (9 Lectures)

External images using include graphics, the figure environment, caption, and label, figure placement specifiers htbp and the concept of floating environments, creating tables using the tabular environment with column specifiers l, c, r, and p width, horizontal lines using hline, toprule, midrule, and bottomrule via booktabs and vertical lines, advanced tables using multicolumn and multirow, cross-referencing using label, ref, pageref, and eqref, automatic lists using tableofcontents, listoffigures, and listoftables, hyperlinks using the hyperref package for clickable links, URLs using url, and footnotes using footnote.

UNIT 4 – BIBLIOGRAPHY AND CITATION MANAGEMENT (8 Lectures)

Manual bibliography using the bibliography versus automated BibTeX workflow, BibTeX fundamentals for creating and structuring a bib file with common entry types article, book, in proceedings, misc, and tech report, bibliography fields including author, title, journal, year, volume, pages, publisher, doi, and url, citation commands cite, citep, and citet with the natbib package, bibliography styles plain, unsrt, alpha, abbrv, and IEEE-style formatting, the compiling workflow latex to bibtex to latex to latex, managing bib files with reference managers such as JabRef or directly in Overleaf, and avoiding common errors with special characters in BibTeX.

UNIT 5 – BEAMER PRESENTATIONS AND STRUCTURING LARGE DOCUMENTS

(8 Lectures)

Beamer class for presentations with frames and title frames, frame content using frametitle, block environments such as theorem, alert, and example, columns environment, and overlays using pause, uncover, only, and item overlay specifications, beamer themes including outer, inner, color, and font themes with professional themes such as Madrid, Berlin, and Singapore, including figures, tables, and mathematics inside Beamer frames, the handout option in documentclass, structuring large documents such as theses and project reports, modular writing using input versus include and creating a master root file, selective compilation using includeonly, standard thesis front matter including title page, certificate, declaration, acknowledgments, abstract, table of contents, list of figures and tables, and abbreviations, chapter-wise organization with separate files and consistent preamble packages, and appendices using the appendix command.

Suggested Readings:

1. **Tobias Oetiker, Hubert Partl, Irene Hyna, and Elisabeth Schlegl,** *The Not So Short Introduction to LaTeX2e* (also known as *lshort*), Free online edition.
2. **Stefan Kottwitz,** *LaTeX Beginner's Guide*, Packt Publishing.
3. **Leslie Lamport,** *LaTeX: A Document Preparation System*, 2nd Edition, Addison-Wesley.

UBCAMAJ47018 LaTeX PROGRAMMING [Credits: 1, Lecture Hours:15]

Students are advised to do laboratory/practical practice not limited to, but including the following types of problems:

1. Create a basic LaTeX article. Add a title, your name as author, and today's date using \title, \author, \date, and \maketitle. Write an abstract. Create two sections and one subsection under each. Make one sentence bold and one sentence italic.
2. Write a LaTeX document using the report class. Add a title page. Create three sections. Inside the first section, add a bulleted list with three items. Inside the second section, add a numbered list with three items. Set page margins to 1 inch on all sides using the geometry package.
3. Make a document with a description list containing three items labeled "Introduction," "Method," and "Conclusion." Change the font size of the heading to \Large using \Large. Add page numbers at the bottom using \pagestyle{plain}.
4. Write a document containing four simple inline math expressions (e.g., $a+b=c$) and two displayed equations using the equation environment. Use at least one fraction (\frac) and one square root (\sqrt).
5. Create a document with a 2×2 matrix using the pmatrix environment. Write one multiline equation using the align environment with two lines aligned at the = sign. Use Greek letters \alpha and \beta somewhere in the document.
6. Define a theorem environment using the amsthm package. Write one theorem statement and one proof environment below it. Include one numbered equation inside the theorem.
7. Insert one image using \includegraphics inside a figure environment. Add a caption ("Figure 1: Sample Image") and a label. In the text, refer to the figure using \ref.
8. Create a simple table with 3 columns and 4 rows using the tabular environment. Use |c|c|c| for centered columns with vertical lines. Add \hline after the header row and at the end. Give it a caption.
9. Make a document with one figure and one table. Add an automatic Table of Contents using \tableofcontents. Use the hyperref package to make the table of contents entries clickable.
10. Create a .bib file with exactly three entries: one @article, one @book, and one @misc. Write a short paragraph in LaTeX citing all three sources using \cite. Compile using latex → bibtex → latex → latex to generate the bibliography. Use the plain style.
11. Write a document using the manual thebibliography environment. Add three entries with \bibitem and cite them in the text using \cite. Keep the formatting simple.
12. Create a Beamer presentation with exactly 5 slides: a title slide, three slides with bullet points, and one slide with a simple equation ($E=mc^2$). Use any one theme, e.g., \usetheme{Madrid}.
13. Make a 4-slide Beamer presentation. On the second slide, use the \pause command so that bullet points appear one by one. On the third slide, add an example block using \begin{example}.
14. Create a main.tex file that uses \input to include two separate files: intro.tex and conclusion.tex. The main file should contain the preamble and a title page. Each included file should contain one section with one paragraph.
15. Create a one-page mini project report containing: (a) a title page with title and author, (b) two sections, (c) one simple equation, (d) one figure with caption, (e) one table with 2 columns and 3 rows, and (f) one bibliography entry (either manual or BibTeX).

SYLLABUS FOR BCA MAJOR WITH HONOURS

Discipline: Science ☐ Arts, Humanities & Social Science ☐

Commerce ☐ BBA ☐ BCA [√]

Subject Name: BCA

Subject Code: **UBCAMAJ47019** (Will be provided by the University)

Semester: Semester I ☐ Semester II ☐ Semester III ☐ Semester IV ☐

Semester V ☐ Semester VI ☐ Semester VII [√] Semester VIII ☐

Course Name: **R PROGRAMMING**

Course Code: (Will be provided by the University)

Course Credit: Theoretical 3 Practical/Tutorial 1

Marks Allotted: Theoretical 40 Practical/Tutorial 20

Continuing Evaluation Attendance

Course Type (tick the correct alternatives):

Major Core	[√]	AEC	☐
Interdisciplinary/ DSE	☐	SEC	☐
Minor / Generic Elective	☐	VAC	☐
Research Project/Dissertation	☐	Vocational	☐

Is the course focused on employability / entrepreneurship? YES [√] NO ☐

Is the course focused on imparting life skill? YES [√] NO ☐

Is the course based on Activity ? YES [√] NO ☐

Remarks by Chairman, UG BOS, if any

UG BOS Meeting Reference Number: Date:

Course Code: **UBCAMAJ47019**

Course Name: **R PROGRAMMING**

Brief Course Description

This course introduces the fundamentals of R programming for data analysis, statistical computing, and visualization. Students will learn R syntax, data structures, control statements, data manipulation, graphical representation of data, and basic statistical analysis techniques using R. The course emphasizes practical applications of R in data science and analytics.

Prerequisite(s) and/or Note(s)

Basic knowledge of computer fundamentals and elementary mathematics/statistics is desirable. No prior programming experience is required.

Course Objectives

The course aims to provide students with a strong foundation in R programming, data handling, statistical analysis, and data visualization. It enables learners to develop analytical skills and apply R tools for solving real-world data-driven problems.

Course Outcomes

Upon successful completion of this course, students will be able to write and execute R programs, manage and analyze datasets, create meaningful data visualizations, perform statistical and probabilistic analyses, and apply R programming techniques to solve real-world data-driven problems. They will develop the ability to use R as an effective tool for data analysis, decision-making, research, and advanced studies in data science and analytics.

Knowledge Acquired

Students will gain knowledge of R programming concepts, data structures, control structures, data manipulation techniques, visualization methods, statistical analysis, probability distributions, and hypothesis testing using R.

Skills Gained

Students will develop skills in writing R programs, managing and analyzing datasets, creating informative visualizations, performing statistical computations, and importing/exporting data from various sources.

Competency Developed

Upon completion of the course, students will be able to use R effectively for data analysis, statistical modeling, visualization, and decision-making tasks, preparing them for advanced studies and careers in data science, analytics, and research.

Detailed Syllabus		
4th Year: Semester 7		
UBCAMAJ47019	R PROGRAMMING	[Credits: 4, Lectures 60]

Unit 1: Introduction to R Programming **(3 Lectures)**

Overview of R programming: Evolution of R language, features of R programming language, what is R? , Why R? , Advantages of R over Other Programming Languages, Downloading and installing of R language, setting up the R environment - Interactivity and Code Execution: R basic syntax - R Studio - R command Prompt, R script file, comments

Unit 2: Data Structures in R **(8 Lectures)**

Vectors: Creating vectors using c(), Indexing and subsetting vectors in R, Operations on Vectors, Understanding vectorized operations and efficiency – *Matrices* : Creating matrices using matrix(), *Basic matrix operations* : addition, subtraction, multiplication, Transposing matrices - *Lists* : Creating lists with list(), Nested lists and their components, Indexing and extracting values from lists, Manipulating list components – *Arrays* : Creating arrays using array(), Manipulating and transforming array data - *Data Frames:* Introduction to Data Frames, Manipulating Data Frames, Indexing, filtering, and subsetting data frames, Applying functions to columns, Aggregating and summarizing data- *Factors:* Categorical data representation with factors, Modifying and Working with Ordinal Factors in R, Merging and Simplifying Factor Levels in R, Converting factors to other data types.

Unit 3: Control Structures in R **(7 Lectures)**

Conditional Statements: Basic if and else statements, else if and multiple conditions, Vectorized conditions with ifelse() - Loops in R : For Loop, Nested For Loops, break and next statements, While Loop, Repeat Loop.

Unit 4: Variables, Data Types and operators **(5 Lectures)**

Concept of Variables: Variable assignment, Finding Variable, Deleting Variables – Atomic Data Types in R (Numeric, Integer, Logical, Character, Complex and Raw) - Operators in R: Arithmetic Operators, Logical Operators, Comparison Operator, Assignment Operators.

Unit 5: Data Manipulation and Cleaning **(7 Lectures)**

Working with Strings : String manipulation - Data Cleaning: Handling missing values with is.na() and na.omit() - Reshaping Data : Reshaping data frames with reshape(), melt(), cast() - Data Import and Export: Reading data from CSV, Excel, and other formats.

Unit 6: Data Visualization in R **(7 Lectures)**

Concept of Plotting, Base R plotting functions: plot(), hist(), boxplot(), Customizing plots (titles, labels, colors), Saving plots to file (PDF, PNG) - Visualizations with ggplot2: ggplot2 package, Creating scatter plots, bar plots, histograms, and more, Faceting in ggplot2: Splitting Data into Subplots, Themes in ggplot2 - 3D Visualizations: concept of 3D visualization, Generating 3D scatter plots, surface plots.

Unit 7: R in Statistical Analysis and Resampling Techniques **(8 Lectures)**

Concept of R in Statistics: R as a tool for statistical analysis, calculation: mean, median, mode, variance, standard deviation, creating frequency tables and cross-tabulations - Probability Distributions in R: Normal Distribution in R, Plotting of Normal Distribution over Histogram in R - Hypothesis Testing: hypothesis testing concepts, T-tests, Chi-squared tests.

Suggested Readings:

1. The Book of R by Tilman M. Davies, no starch press (San Francisco)

2. The Art of R programming by Norman Matloff, no starch press(San Francisco)

3 R for Beginners by Emmanuel Paradis

UBCAMAJ47019L R PROGRAMMING [Credits: 1, Lecture Hours:15]

Students are advised to do laboratory/practical practice not limited to, but including the following types of problems:

1. Download and install R-Programming environment and install basic packages using install. Packages() command in R.
2. Learn all the basics of R-Programming (Data types, Variables, Operators etc.)
3. Implement R-Loops with different examples.
4. Learn the basics of functions in R and implement with examples.
5. Implement data frames in R. Write a program to join columns and rows in a data frame using c bind () and r bind () in R.
6. Implement different String Manipulation functions in R.
7. Implement different data structures in R(Vectors ,Lists ,Data Frames)
8. Create a data set and do statistical analysis on the data using R.
9. Write an R program to demonstrate variable declaration, data types, arithmetic operations, and output display.
10. Create two vectors and perform addition, subtraction, multiplication, division, and indexing operations.
11. Create two matrices and perform matrix addition, subtraction, multiplication, and transpose operations.
12. Create a list containing student information (Name, Roll No., Marks, Grade) and demonstrate accessing and modifying list elements.
13. Create a three-dimensional array and display specific elements, rows, and columns.
14. Create a student data frame and perform sorting, filtering, subsetting, and column-wise calculations.
15. Create nominal and ordinal factors, modify factor levels, and convert factors into character and numeric formats.
16. Write an R program using if-else and nested if-else statements to determine grades based on student marks.
17. Write R programs using for, while, and repeat loops to generate multiplication tables and factorials.
18. Perform string concatenation, substring extraction, case conversion, and string length calculation.
19. Create a dataset with missing values and use is.na() and na.omit() to identify and remove missing entries.
20. Read data from a CSV file, perform basic analysis, and export the processed data to a new CSV file.
21. Create a histogram, bar chart, boxplot, and pie chart using sample datasets.
22. Create scatter plots, bar plots, and histograms with appropriate labels and themes using ggplot2.
23. Calculate mean, median, mode, variance, and standard deviation. Perform a t-test and Chi-Square test on a given dataset and interpret the results.
24. Write an R Program for "Hello World ".
25. Write an R Program to Add Two Vectors
26. Find the Sum, Mean and Product of the Vector in R Programming
27. Create an R Program to Take Input From the User
28. Create an R Program to Find the Minimum and Maximum
29. How to create R Multiplication Table
30. Write a R Program to Check Prime Number
31. Write a R Program to check Armstrong Number
32. Write a R Program to Print the Fibonacci Sequence
33. Write a R Program to Check for Leap Year
34. Write a R Program to Check if a Number is Odd or Even in R Programming
35. Write a R Program to print the elements of a vector.

SYLLABUS FOR BCA MAJOR WITH HONOURS

SEM. VIII

4th Year [Four Year Under Graduate Program with Honours] (FYUGPHONS)

Under Single Major Single Minor

(To be implemented from Session 2023-24)

Proposed Syllabus for four years B.C.A (Major) Programme							
Year	**Semester**	**Paper Code**	**Paper**	**Credits**	**Periods/Week**	**Exam. Marks**	**Total Marks**
4th Year	**VIII**	UBCAMAJ48020	**Project / Dissertation**	4	4		
		UBCAMAJ48021	**Research Methodology**	4	4		
		UBCAMAJ48022	**Field Word / Case Studies**	4	4		
		UBCAMAJ48023	**Seminar Presentation / Group Discussion**	4	4		

NOTE: Tutorials should involve problem solving session/activity related to the subject taught.

SYLLABUS FOR BCA MAJOR WITH HONOURS

Discipline: Science ☐ Arts, Humanities & Social Science ☐

Commerce ☐ BBA ☐ BCA [√]

Subject Name: BCA

Subject Code: UBCAMAJ48020 (Will be provided by the University)

Semester: Semester I ☐ Semester II ☐ Semester III ☐ Semester IV ☐

Semester V ☐ Semester VI ☐ Semester VII ☐ Semester VIII [√]

Course Name: **PROJECT / DISSERTATION**

Course Code: (Will be provided by the University)

Course Credit: Theoretical 4 Practical/Tutorial

Marks Allotted: Theoretical Practical/Tutorial

Continuing Evaluation Attendance

Course Type (tick the correct alternatives):

Major Core	[√]	AEC	☐
Interdisciplinary/ DSE	☐	SEC	☐
Minor / Generic Elective	☐	VAC	☐
Research Project/Dissertation	☐	Vocational	☐

Is the course focused on employability / entrepreneurship? YES [√] NO ☐

Is the course focused on imparting life skill? YES [√] NO ☐

Is the course based on Activity ? YES [√] NO ☐

Remarks by Chairman, UG BOS, if any

UG BOS Meeting Reference Number: Date:

Course Code: **UBCAMA48020**

Course Name: **PROJECT / DISSERTATION**

Brief Course Description

The Project/Dissertation course provides students with an opportunity to apply the knowledge and skills acquired throughout their academic program to investigate, design, develop, and implement a solution to a real-world problem. Students undertake independent or guided research, software development, system design, data analysis, or interdisciplinary projects, culminating in a comprehensive report and presentation of their findings.

Prerequisite(s) and/or Note(s)

Students should have successfully completed the core courses of the program and possess a sound understanding of relevant theoretical and practical concepts. The project topic should be approved by the department and carried out under the supervision of a faculty guide. Regular progress reviews, documentation, and final presentation are mandatory components of the course.

Course Objectives

The course aims to develop students' ability to identify and analyze real-world problems, conduct independent research, apply appropriate methodologies and technologies, and produce innovative solutions. It also seeks to enhance critical thinking, project planning, technical writing, and professional communication skills.

Course Outcomes

Upon successful completion of the course, students will be able to formulate research or project objectives, apply domain knowledge to solve practical problems, utilize appropriate tools and techniques, prepare technical documentation, and effectively present and defend their work before an academic audience.

Knowledge Acquired

Students gain in-depth knowledge of a specific topic within their discipline through literature review, problem analysis, methodology selection, implementation, testing, and evaluation. They also acquire an understanding of research methods, project management principles, and professional standards relevant to their field.

Skills Gained

The course helps students develop analytical, technical, research, programming, design, documentation, and presentation skills. It also strengthens problem-solving abilities, teamwork, time management, decision-making, and the effective use of modern tools and technologies.

Competency Developed

Students develop the competency to independently plan, execute, and manage complex projects or research studies. They become capable of addressing real-world challenges, producing quality technical outputs, communicating results professionally, and demonstrating readiness for higher studies, research, entrepreneurship, or industry employment.

Detailed Syllabus
4th Year: Semester 8
UBCAMAJ48020 MINOR PROJECT / DISSERTATION [4 Credits]

MINOR PROJECT / DISSERTATION GUIDELINES

1. GENERAL RULES AND ELIGIBILITY

1.1 The Minor Project is compulsory for students enrolled in the final year/semester of the UG programme.

1.2 The project carries **4 credits** and is intended to provide practical exposure to problem-solving and application development.

1.3 Projects may be undertaken individually or in groups of not more than three students with departmental approval.

1.4 The project topic must be approved by the concerned faculty supervisor within the first three weeks of the semester.

1.5 The project should address a practical problem or application in Computer Science and related disciplines.

2. TOPIC SELECTION AND APPROVAL

2.1 Project topics may be selected from areas such as:

- Programming and Software Development
- Web Technologies
- Mobile Applications
- Database Systems
- Artificial Intelligence
- Data Science
- Cyber Security
- Cloud Computing
- Internet of Things (IoT)

2.2 Students shall submit a brief synopsis (1–2 pages) containing:

- Project Title
- Problem Statement
- Objectives
- Proposed Methodology
- Expected Outcome

2.3 The supervisor shall review and approve the topic before commencement of the work.

3. SUPERVISION AND PROGRESS MONITORING

3.1 Each student/group shall work under the guidance of a faculty supervisor.

3.2 Students shall meet the supervisor periodically to discuss project progress.

3.3 A simple progress record may be maintained containing:

- Date of Meeting
- Work Completed
- Future Plan
- Supervisor Remarks

3.4 A project review may be conducted during the middle of the semester.

4. DOCUMENTATION AND REPORT FORMAT

4.1 Students shall submit a project report in printed and PDF format.

4.2 The report should contain:

Chapter 1: Introduction

- Background
- Problem Statement
- Objectives

Chapter 2: System Design / Methodology

- Tools and Technologies Used
- System Architecture or Flowchart

Chapter 3: Implementation and Results

- Screenshots
- Output and Discussion

Chapter 4: Conclusion and Future Scope

References

4.3 Report Specifications

- Font: Times New Roman, 12 pt
- Line Spacing: 1.5
- Paper Size: A4
- Proper page numbering and headings

5. SUBMISSION SCHEDULE

5.1 Synopsis Submission: Week 3

5.2 Progress Review: Mid-Semester

5.3 Final Report and Project Submission: End of Semester

6. EVALUATION AND ASSESSMENT

The project shall be evaluated out of **80 marks** as follows:

Component	Weightage
Project Progress / Review	20 Marks
Final Report	40 Marks
Project Implementation and Demonstration	10 Marks
Viva-Voce and Final Presentation	10 Marks
Total	**80 Marks**

6.1 The final presentation shall be approximately **10–15 minutes**, followed by a brief viva-voce.

6.2 Students must demonstrate the working of the project during evaluation.

6.3 A minimum of **40% marks** is required to pass the project course.

7. DELIVERABLES

Students shall submit:

1. Project Report (Printed/PDF)
2. Source Code / Project Files
3. Presentation Slides (PPT/PDF)
4. Demonstration of the Project

8. GENERAL CONDUCT

8.1 Students shall maintain professional conduct throughout the project work.

8.2 All project-related decisions made by the Department and Supervisor shall be final.

UBCAMAJ48020 PROJECT / DISSERTATION

Project/ Dissertation as assigned and advised by teacher(s).

SYLLABUS FOR BCA MAJOR WITH HONOURS

Discipline: Science ☐ Arts, Humanities & Social Science ☐

Commerce ☐ BBA ☐ BCA [√]

Subject Name: BCA

Subject Code: UBCAMAJ48021 (Will be provided by the University)

Semester: Semester I ☐ Semester II ☐ Semester III ☐ Semester IV ☐

Semester V ☐ Semester VI ☐ Semester VII ☐ Semester VIII [√]

Course Name: **RESEARCH METHODOLOGY**

Course Code: (Will be provided by the University)

Course Credit: Theoretical 4 Practical/Tutorial

Marks Allotted: Theoretical Practical/Tutorial

Continuing Evaluation Attendance

Course Type (tick the correct alternatives):

Major Core	[√]	AEC	☐
Interdisciplinary/ DSE	☐	SEC	☐
Minor / Generic Elective	☐	VAC	☐
Research Project/Dissertation	☐	Vocational	☐

Is the course focused on employability / entrepreneurship? YES [√] NO ☐

Is the course focused on imparting life skill? YES [√] NO ☐

Is the course based on Activity ? YES [√] NO ☐

Remarks by Chairman, UG BOS, if any

UG BOS Meeting Reference Number: Date:

Course Code: **UBCAMAJ48021**

Course Name: **RESEARCH METHODOLOGY**

Brief Course Description

The Research Methodology course introduces students to the principles, methods, and techniques of scientific research. It covers the process of identifying research problems, formulating objectives and hypotheses, conducting literature reviews, collecting and analyzing data, and preparing research reports. The course emphasizes ethical research practices and equips students with the knowledge required to undertake academic, scientific, and industry-oriented research projects.

Prerequisite(s) and/or Note(s)

Students should have a basic understanding of their subject area and fundamental analytical skills. Familiarity with data interpretation, academic writing, and computer applications is desirable. The course may include practical exercises involving literature surveys, research proposal preparation, data analysis, and report writing to provide hands-on research experience.

Course Objectives

The course aims to develop an understanding of research concepts, methodologies, and ethical practices. It seeks to equip students with the ability to identify research problems, formulate research questions, design appropriate methodologies, collect and analyze data, and communicate research findings effectively through professional reports and presentations.

Course Outcomes

Upon successful completion of the course, students will be able to formulate research problems, conduct comprehensive literature reviews, select suitable research designs, apply qualitative and quantitative research methods, analyze data using appropriate techniques, and prepare well-structured research reports in accordance with academic and professional standards.

Knowledge Acquired

Students acquire knowledge of research philosophies, research designs, sampling techniques, data collection methods, statistical and analytical tools, hypothesis testing, research ethics, and scientific documentation. They also gain an understanding of the complete research process from problem identification to dissemination of findings.

Skills Gained

The course enhances research, analytical, critical thinking, problem-solving, data collection, data analysis, academic writing, and presentation skills. Students learn to use research tools and techniques effectively, evaluate information critically, and interpret findings for evidence-based decision-making.

Competency Developed

Students develop the competency to independently conduct systematic and ethical research, analyze complex problems using scientific methods, generate meaningful insights from data, and communicate research outcomes effectively. These competencies prepare them for higher studies, professional research careers, innovation, and evidence-based decision-making in academic and industry settings.

Detailed Syllabus

4th Year: Semester 8

UBCAMAJ48021	RESEARCH METHODOLOGY	[4 Credits]

UNIT-1 Introduction to Research (7 Lectures)

Concept of research, definition, characteristics of good research, Application of Research, Meaning and sources of Research problem, characteristics of good Research problem, Research process, outcomes, application of Research, Meaning and types of Research hypothesis, Review of Literature, importance of Review of Literature.

UNIT-2 Types of Research (10 Lectures)

Motivation and objectives – Research methods vs Methodology. Research Design- meaning, need, types of research design, features of good Research design, Experiments, surveys and case study. Types of research – Descriptive and Analytical, Applied and Fundamental, Quantitative and Qualitative, Conceptual and Empirical, concept of applied and basic research process, Criteria of good research.

UNIT-3 Sampling, Data Collection and analysis (10 Lectures)

Types and sources of data – Primary and secondary, Methods of collecting data, Concept of sampling and sampling methods – sampling frame, sample, characteristics of good sample, simple random sampling, purposive sampling, convenience sampling, snowball sampling, classification and tabulation of data, graphical representation of data, graphs and charts – Histograms, frequency polygon and frequency curves, bell shaped curve and its properties. Statistical Methods for Data Analysis: statically package (SPSS for student t-test, ANOVA, etc.), hypothesis testing.

UNIT-4 Research Report (6 Lectures)

Research report and its structure, journal articles – Components of journal article. Explanation of various components. Structure of an abstract and keywords, components and structure of thesis and dissertations. Referencing styles and bibliography.

UNIT-5 Ethics in Research (5 Lectures)

Plagiarism - Definition, different forms, consequences, unintentional plagiarism, copyright infringement, collaborative work, Intellectual property right (IPR) and patent law, Qualities of good Researcher.

UNIT-6 ICT Tools for Research (7 Lectures)

Role of computers/ITC in research, maintenance of data using software such as Mendeley, Zotero, Endnote, Overleaf, Tabulation and graphical presentation of research data and software tools. Web search : Use of Internet, using search engines and advanced search tools.

Suggested Readings:

1 Kothari C. R, Research Methodology

2. Donald Cooper & PS Schindler(2009)Business Research Methods, 9th edition, Tata McGraw Hill.

3. Uma Sekaran (2010) Research Methods for Business, 4th edition, Wiley.

4 Ranjit Kumar (2009) Research Methodology, 2nd edition, Pearson Education

5 Naresh Malhotra and S Dash (2009) Marketing Research, 5th edition, Pearson Prentice Hall.

6 Michael V. P, Research Methodology.

7 Fred N. Kerlinger : Foundations of Behavioral Research.

UBCAMAJ48021 RESEARCH METHODOLOGY

Research Methodology as assigned and advised by teacher(s).

SYLLABUS FOR BCA MAJOR WITH HONOURS

Discipline: Science ☐ Arts, Humanities & Social Science ☐

Commerce ☐ BBA ☐ BCA [√]

Subject Name: BCA

Subject Code: UBCAMAJ48022 (Will be provided by the University)

Semester: Semester I ☐ Semester II ☐ Semester III ☐ Semester IV ☐

Semester V ☐ Semester VI ☐ Semester VII ☐ Semester VIII [√]

Course Name: **FIELD WORK / CASE STUDY**

Course Code: (Will be provided by the University)

Course Credit: Theoretical 4 Practical/Tutorial

Marks Allotted: Theoretical Practical/Tutorial

Continuing Evaluation Attendance

Course Type (tick the correct alternatives):

Major Core	[√]	AEC	☐
Interdisciplinary/ DSE	☐	SEC	☐
Minor / Generic Elective	☐	VAC	☐
Research Project/Dissertation	☐	Vocational	☐

Is the course focused on employability / entrepreneurship? YES [√] NO ☐

Is the course focused on imparting life skill? YES [√] NO ☐

Is the course based on Activity ? YES [√] NO ☐

Remarks by Chairman, UG BOS, if any

UG BOS Meeting Reference Number: Date:

Course Code: **UBCAMAJ48022**

Course Name: **FIELD WORK / CASE STUDIES**

Brief Course Description

The Field Work / Case Studies course provides students with practical exposure to real-world environments, organizations, industries, communities, or technology-based systems. Through field visits, observations, surveys, interviews, and case study analysis, students gain firsthand experience of professional practices and develop a deeper understanding of theoretical concepts by examining their application in actual situations.

Prerequisite(s) and/or Note(s)

Students should possess a basic understanding of the core concepts covered in their program of study. Field work and case study activities must be conducted under the guidance of faculty members or industry mentors. Students are required to maintain records of observations, prepare reports, and present their findings based on the assigned field visits or case studies.

Course Objectives

The course aims to bridge the gap between theory and practice by exposing students to real-world scenarios. It seeks to develop analytical thinking, observation skills, problem-solving abilities, and an understanding of professional practices through systematic investigation and evaluation of actual cases and field situations.

Course Outcomes

Upon completion of the course, students will be able to analyze real-world problems, collect and interpret relevant data, evaluate practical solutions, and prepare professional reports. They will also be able to relate theoretical knowledge to practical situations and effectively communicate their observations and recommendations.

Knowledge Acquired

Students acquire practical knowledge of organizational processes, industry practices, operational challenges, and real-life applications of concepts learned in the classroom. They also gain an understanding of data collection methods, case analysis techniques, and contemporary issues relevant to their discipline.

Skills Gained

The course enhances observation, communication, analytical, research, documentation, reporting, and presentation skills. Students also develop teamwork, interpersonal interaction, critical thinking, and decision-making abilities through direct engagement with real-world environments and case-based learning.

Competency Developed

Students develop the competency to investigate and evaluate practical situations, identify challenges, propose suitable solutions, and make informed decisions based on evidence and analysis. They become capable of applying academic knowledge in professional contexts and adapting effectively to workplace and societal requirements.

Detailed Syllabus

4th Year: Semester 8

UBCAMAJ48022 FIELD WORK / CASE STUDIES

GUIDELINES for FIELD WORK

DOCUMENT INFORMATION

Item	Details
Programme	BCA
Academic Level	4th Year / 8th Semester
Component	Field Work/ Case Studies
Credit	4 Credits (Recommended)
Full Marks	80
Engagement Hours	Approximately 60 Hours
Nature	Practical, Industry-Oriented, Research-Based
Evaluation Type	Continuous + Final Assessment
Submission Mode	Printed + Digital Soft Copy
Recommended Citation Style	Standard Journal's style

TABLE OF CONTENTS

1. INTRODUCTION

Field Work components are important academic requirements designed to bridge the gap between theoretical computer science education and real-world industrial practice. These components enable students to gain practical exposure, analytical skills, research competency and professional communication abilities. The topic of the Field Work will be decided by the institutional authority (Coordinator of Field Work).

2. RULES AND REGULATIONS

The following rules are mandatory for all students:

a) ***Attendance Requirement***: Students must attend at least 80% engagement hours.
b) ***Original Work Requirement***: Submissions must be original and independently prepared.
c) ***AI Tools may be used only for***: Grammar checking, Formatting assistance, Code debugging assistance and Literature exploration.

3. **Students must NOT:**

a) Submit AI-generated reports directly
b) Fabricate data or observations
c) Use AI to generate fake interviews or findings

4. Confidentiality Obligation: Students must protect all confidential organizational information obtained during field work activities.

5. Supervisor Approval: Every topic must receive prior approval fromAcademic Supervisor / Departmental Coordinator.

6. Mandatory Documentation: Students must maintain

(i) Weekly progress reports

(ii) Attendance records and

(iii) Evidence of work completed.

7. Ethical Conduct: Students must behave professionally while interacting with organizations, clients, employees and stakeholders.

8. Unauthorized Access Prohibition: Students must not Access restricted systems, Attempt penetration testing without authorization, Download sensitive data and Share internal information.

9. Academic Integrity: Plagiarism above the permitted limit shall lead to disciplinary action.

10. Presentation Requirement: All students must

(i) Deliver oral presentation and/or

(ii) Attend viva voce examination.

11. Minimum Report Quality: Reports must follow prescribed formatting.

12. Industry Interaction Etiquette: Students must

(i) Communicate respectfully,

(ii) Maintain punctuality and

(iii) Follow workplace protocols.

13. Digital Submission: Soft copy submissions must include –

(i) PDF report

(ii) Source files

(iii) Presentation slides

(iv) Supporting appendices

3. FIELD WORK GUIDELINES

3.1 Field Work is a supervised practical engagement where students work with organizations, industries or research environments to gain real-world exposure related to their course. The topic of the Field Work will be decided by the institutional authority (Coordinator of Field Work).

3.2 Phase wise duration of suggested schedule

Phase	Activity	Duration
Phase 1	Topic Selection & Approval	1 Week
Phase 2	Organization Confirmation	1 Week
Phase 3	Proposal Submission	1 Week
Phase 4	Field Engagement	4–6 Weeks
Phase 5	Weekly Reviews	Continuous
Phase 6	Report Writing	2 Weeks
Phase 7	Final Submission	1 Week
Phase 8	Presentation & Viva	As Scheduled

3.3 RULES AND REGULATIONS FOR FIELD WORK

The following rules are strictly mandatory:

1. Students must obtain official approval before beginning field work.
2. Unauthorized organizations are not permitted.
3. Students must maintain daily attendance records.
4. Students must follow all organizational rules.
5. Mobile phone misuse during work hours is prohibited.
6. Sharing organizational information publicly is prohibited.
7. Students must not photograph restricted areas without permission.
8. All observations must be genuine and evidence-based.
9. Weekly reports must be submitted on time.
10. Students must maintain professional communication.
11. Proxy attendance is strictly prohibited.
12. Use of pirated or unauthorized software is prohibited.
13. Students must comply with cybersecurity laws and ethics.
14. Any misconduct may result in cancellation of field work.
15. Final evaluation requires supervisor certification.

3.4. Structure of Weekly Progress Report

1. Week Number
2. Activities Completed
3. Learning Outcomes Achieved
4. Challenges Faced
5. Next Week Plan

3.5. Structure of Final Report

Preliminary Pages

1. Cover Page
2. Certificate
3. Declaration
4. Acknowledgement
5. Abstract
6. Table of Contents
7. List of Figures
8. List of Tables
9. List of Abbreviations

Chapter 1: Introduction

- Organization Overview
- Background
- Objectives
- Scope of Work

Chapter 2: Activities Performed

Chapter 3: Analysis and Findings

Chapter 4: Learning Outcomes

Chapter 5: Conclusion

References

Appendices

- Attendance Sheet
- Weekly Reports
- Screenshots
- Certificates
- Additional Evidence

3.6 PRESENTATION AND/OR VIVA-VOCE

Presentation Duration: **10–15 Minutes**

Viva Duration : 10 Minutes

3.7 FIELD WORK ASSESSMENT

Component	Marks
Proposal Quality	10
Attendance & Participation	10
Weekly Reports	10
Industry Supervisor Feedback	10
Final Report	20
Presentation	10
Viva Voce	10
TOTAL	80

3.8 Few sample topics of Field work

EDUCATION SECTOR

1. **Study of Computer Laboratory Management in Educational Institutions**
   - Survey hardware, software, maintenance practices, and utilization.
2. **Digital Learning Tools Used in Schools and Colleges**
   - Analyze adoption, effectiveness, and challenges.
3. **ICT Infrastructure Assessment in Rural Schools**
   - Evaluate computer and internet availability.

BUSINESS & INDUSTRY

4. **Computerization of Small and Medium Enterprises (SMEs)**
   - Study software usage, record management, and automation levels.
5. **Use of ERP Systems in Local Industries**
   - Investigate benefits and implementation challenges.
6. **Digital Transformation in Retail Businesses**
   - Analyze billing systems, inventory software, and digital payments.

BANKING & FINANCE

7. Adoption of Digital Payment Systems by Local Merchants
   - Survey UPI, QR payments, and customer preferences.
8. **Computerized Banking Services and Customer Satisfaction**
   - Study online banking, mobile banking, and ATM services.

HEALTHCARE

9. **Hospital Information Management Systems**
    - Examine digital patient records and appointment systems.
10. **Use of Technology in Diagnostic Centers**
    - Study data management and reporting systems.

GOVERNMENT & PUBLIC SERVICES

11. **E-Governance Services in Local Government Offices**
    - Analyze online citizen services and user experiences.
12. **Digital Record Management in Municipal Offices**
    - Study data storage, retrieval, and security practices.

CYBERSECURITY

13. **Cybersecurity Awareness Among College Students**
    - Conduct surveys and analyze awareness levels.
14. **Information Security Practices in Small Organizations**
    - Study password policies, backups, and data protection methods.

TECHNOLOGY & SOCIETY

15. **Internet Usage Patterns Among Students**
    - Analyze educational and recreational internet usage.
16. **Impact of Social Media on Academic Performance**
    - Survey students and evaluate trends.
17. **Smartphone Usage and Digital Dependency Among Youth**
    - Collect and analyze behavioral data.

IT INFRASTRUCTURE

18. **Network Infrastructure Study of an Organization**
    - Analyze network design, security, and maintenance.
19. **Cloud Computing Adoption in Local Businesses**
    - Study cloud services, benefits, and challenges.
20. **IT Asset Management Practices in Institutions**
    - Examine procurement, maintenance, and disposal of IT equipment.

GUIDELINES for CASE STUDIES

DOCUMENT INFORMATION

Item	Details
Programme	BCA
Academic Level	4th Year / 8th Semester
Component	Case Studies
Credit	4 Credits (Recommended)
Full Marks	80
Engagement Hours	Approximately 60 Hours
Nature	Practical, Industry-Oriented, Research-Based
Evaluation Type	Continuous + Final Assessment
Submission Mode	Printed + Digital Soft Copy
Recommended Citation Style	Standard Journal's style

TABLE OF CONTENTS

1. INTRODUCTION

Case Study components are important academic requirements designed to bridge the gap between theoretical computer science education and real-world industrial practice. These components enable students to gain practical exposure, analytical skills, research competency and professional communication abilities. The topic of the Case Study will be decided by the institutional authority (Coordinator of Case Study).

2. RULES AND REGULATIONS

The following rules are mandatory for all students:

i. Attendance Requirement: Students must attend at least 80% engagement hours.
ii. Original Work Requirement: Submissions must be original and independently prepared.
iii. AI Tools may be used only for: Grammar checking, Formatting assistance, Code debugging assistance and Literature exploration.

a. Students must NOT:

- Submit AI-generated reports directly
- Fabricate data or observations
- Use AI to generate fake interviews or findings

b. Confidentiality Obligation: Students must protect all confidential organizational information obtained during case study activities.

c. Supervisor Approval: Every topic must receive prior approval from Academic Supervisor / Departmental Coordinator.

d. Mandatory Documentation: Students must maintain

(i) Weekly progress reports

(ii) Attendance records and

(iii) Evidence of work completed.

e. Ethical Conduct: Students must behave professionally while interacting with organizations, clients, employees and stakeholders.

f. Unauthorized Access Prohibition: Students must not Access restricted systems, Attempt penetration testing without authorization, Download sensitive data and Share internal information.

g. Academic Integrity: Plagiarism above the permitted limit shall lead to disciplinary action.

h. Presentation Requirement: All students must

(i) Deliver oral presentation and/or

(ii) Attend viva voce examination.

i. Minimum Report Quality: Reports must follow prescribed formatting.

j. Industry Interaction Etiquette: Students must

(i) Communicate respectfully,

(ii) Maintain punctuality and

(iii) Follow workplace protocols.

k. Digital Submission: Soft copy submissions must include –

(i) PDF report

(ii) Source files

(iii) Presentation slides

(iv) Supporting appendices

3. CASE STUDY GUIDELINES

3.1 Case study is a supervised practical engagement where students work with organizations, industries or research environments to gain real-world exposure related to their course. The topic of the Case study will be decided by the institutional authority (Coordinator of Case study).

3.2 Step-by-step Case study Methodology

Step 1: Topic Selection

Step 2: Literature Review

Step 3: Problem Definition

Step 4: Data Collection

Step 5: Technical Analysis

Step 6: Comparative Evaluation

Step 7: Findings and Recommendations

Step 8: Report Writing

Step 9: Presentation Preparation

Step 10: Final Presentation and Viva

3.3 RULES AND REGULATIONS FOR CASE STUDY

The following rules are strictly mandatory:

i. Students must obtain official approval before beginning Case study.

ii. Unauthorized organizations are not permitted.

iii. Students must maintain daily attendance records.

iv. Students must follow all organizational rules.

v. Mobile phone misuse during work hours is prohibited.

vi. Sharing organizational information publicly is prohibited.

vii. Students must not photograph restricted areas without permission.

viii. All observations must be genuine and evidence-based.

ix. Weekly reports must be submitted on time.

x. Students must maintain professional communication.

xi. Proxy attendance is strictly prohibited.

xii. Use of pirated or unauthorized software is prohibited.

xiii. Students must comply with cybersecurity laws and ethics.

xiv. Any misconduct may result in cancellation of Case study.

xv. Final evaluation requires supervisor certification.

3.4. Structure of Weekly Progress Report

i. Week Number
ii. Activities Completed
iii. Learning Outcomes Achieved
iv. Challenges Faced
v. Next Week Plan

3.5. Structure of Final Report

Preliminary Pages

i. Cover Page
ii. Certificate
iii. Declaration
iv. Acknowledgement
v. Abstract
vi. Table of Contents
vii. List of Figures
viii. List of Tables
ix. List of Abbreviations

Chapter 1: Introduction

- Background
- Problem statement
- Objectives
- Scope
- Research significance
- Limitations

Chapter 2: Literature Review

Chapter 3: Methodology

Chapter 4: Case Analysis: Findings and Discussion

Chapter 5: Conclusion

References

Appendices

- Attendance Sheet
- Weekly Reports
- Screenshots
- Certificates
- Additional Evidence

3.6 PRESENTATION AND/OR VIVA-VOCE

Presentation Duration: **10–15 Minutes**

Viva Duration: **10 Minutes**

3.7 CASE STUDY ASSESSMENT

Component	Marks
Topic Selection & Proposal	10
Literature Review	10
Technical Analysis	20
Report Quality	15
Presentation	15
Viva Voce	10
TOTAL	80

3.8 Few sample topics of Case study

1. Impact of Artificial Intelligence on Education

- Study AI tools used by students and teachers.
- Analyze benefits, challenges, and future trends.

2. Cybersecurity Awareness Among College Students

- Conduct surveys on password practices, phishing awareness, and online safety.

3. Analysis of UPI-Based Digital Payment Systems in India

- Compare security, usability, and adoption of different UPI apps.

4. Case Study of Cloud Computing Adoption in Small Businesses

- Investigate how local businesses use cloud services and their benefits.

5. Social Media Usage and Its Impact on Student Productivity

- Analyze screen time, study habits, and academic performance.

6. E-Commerce Growth and Consumer Behavior

- Study customer preferences on online shopping platforms.

7. Security Analysis of Public Wi-Fi Networks

- Identify risks and suggest security measures.

8. Role of IoT in Smart Home Automation

- Analyze popular IoT devices, applications, and security concerns.

9. Case Study of Online Learning Platforms

- Compare features, effectiveness, and student satisfaction.

10. Impact of Chatbots on Customer Service

- Evaluate chatbot performance in banking, e-commerce, or telecom sectors.

11. Analysis of Data Privacy Issues in Mobile Applications

- Study app permissions and user awareness regarding data collection.

12. Computerization of Hospital Management Systems

- Examine how hospitals manage patient records and appointments digitally.

13. Case Study of Railway Reservation Systems

- Analyze architecture, booking process, and challenges.

14. Impact of Automation on IT Jobs

- Study how AI and automation are changing job roles.

15. Comparative Study of Programming Languages for Beginners

- Compare Python, Java, C++, and JavaScript based on learning curve and applications.

16. Blockchain Technology in Banking and Finance

- Study applications, benefits, limitations, and future prospects.

17. Green Computing Practices in Educational Institutions

- Analyze energy-efficient computing methods and sustainability initiatives.

18. Cybercrime Trends and Prevention Strategies

- Study common cybercrimes and awareness levels among users.

19. Analysis of Mobile Banking Applications

- Compare security features, usability, and customer satisfaction.

20. Role of Computer Science in Smart City Development

- Study digital infrastructure, traffic management, and e-governance systems.

SYLLABUS FOR BCA MAJOR WITH HONOURS

Discipline: Science ☐ Arts, Humanities & Social Science ☐

Commerce ☐ BBA ☐ BCA [√]

Subject Name: BCA

Subject Code: UBCAMAJ48023 (Will be provided by the University)

Semester: Semester I ☐ Semester II ☐ Semester III ☐ Semester IV ☐

Semester V ☐ Semester VI ☐ Semester VII ☐ Semester VIII [√]

Course Name: **GROUP DISCUSSION / SEMINAR PRESENTATION**

Course Code: (Will be provided by the University)

Course Credit: Theoretical 4 Practical/Tutorial

Marks Allotted: Theoretical Practical/Tutorial

Continuing Evaluation Attendance

Course Type (tick the correct alternatives):

Major Core	[√]	AEC	☐
Interdisciplinary/ DSE	☐	SEC	☐
Minor / Generic Elective	☐	VAC	☐
Research Project/Dissertation	☐	Vocational	☐

Is the course focused on employability / entrepreneurship? YES [√] NO ☐

Is the course focused on imparting life skill? YES [√] NO ☐

Is the course based on Activity ? YES [√] NO ☐

Remarks by Chairman, UG BOS, if any

UG BOS Meeting Reference Number: Date:

Course Code: **UBCAMAJ48023**

Course Name: **GROUP DISCUSSION / SEMINAR PRESENTATION**

Brief Course Description

The Group Discussion/ Seminar Presentation course is designed to enhance students' communication, presentation, critical thinking, and collaborative learning abilities. Students are required to study contemporary topics, emerging technologies, research trends, or discipline-specific issues and present their findings through seminars and structured group discussions. The course promotes active participation, knowledge sharing, and professional interaction.

Prerequisite(s) and/or Note(s)

Students should possess a basic understanding of the subject area and demonstrate the ability to gather, analyze, and present information from credible sources. Topics may be assigned by faculty members or selected by students with prior approval. Active participation, presentation delivery, discussion involvement, and submission of relevant reports or presentation materials are essential requirements of the course.

Course Objectives

The course aims to develop students' ability to investigate and understand contemporary issues, communicate ideas effectively, engage in meaningful academic discussions, and present information in a clear and organized manner. It also seeks to foster confidence, teamwork, leadership, and analytical thinking through collaborative learning activities.

Course Outcomes

Upon successful completion of the course, students will be able to prepare and deliver effective presentations, participate constructively in group discussions, critically evaluate different viewpoints, communicate ideas with clarity and confidence, and demonstrate professional presentation and interpersonal skills in academic and professional settings.

Knowledge Acquired

Students acquire knowledge of current developments, emerging trends, research findings, and practical issues related to their field of study. They also gain an understanding of presentation techniques, discussion methodologies, information gathering, and effective communication strategies used in academic and professional environments.

Skills Gained

The course enhances public speaking, presentation, communication, listening, research, analytical, and teamwork skills. Students develop the ability to organize information, defend viewpoints with logical arguments, participate in discussions effectively, and utilize presentation tools and technologies for professional communication.

Competency Developed: Students develop the competency to communicate complex ideas effectively, collaborate with peers, lead and participate in discussions, evaluate information critically, and present findings confidently before diverse audiences. These competencies prepare them for professional careers, higher education, research activities, and leadership roles in multidisciplinary environments.

GROUP DISCUSSION (GD): GUIDELINES AND EVALUATION FRAMEWORK

The Group Discussion (GD) aims to develop students' communication skills, critical thinking ability, teamwork, leadership qualities, and confidence in expressing ideas on academic, social, technological, and contemporary issues.

Learning Outcomes

Upon successful completion of the Group Discussion activity, students will be able to:

1. Communicate ideas effectively in a group setting.
2. Present logical arguments supported by relevant facts and examples.
3. Listen actively and respond constructively to others' viewpoints.
4. Demonstrate leadership, teamwork, and decision-making skills.
5. Analyze and discuss contemporary issues from multiple perspectives.
6. Develop confidence in public speaking and interpersonal communication.

GUIDELINES FOR CONDUCTING GROUP DISCUSSION

1. Group Formation

- Each group shall consist of **4–6 students**.
- Groups may be formed by the instructor.
- Every student must actively participate in the discussion.

2. Topic Selection

Topics should be selected by the instructor and the domains are given below:

- Emerging technologies and innovations
- Artificial Intelligence and Machine Learning
- Environmental and sustainability issues
- Education and social development
- Current national and international affairs
- Ethical and professional issues in technology
- Entrepreneurship and innovation
- Any other topic approved by the instructor

3. Discussion Procedure

- The topic shall be announced before the discussion session.
- Students may be given **5–10 minutes** for preparation.
- The discussion duration shall be **10–15 minutes** per group.
- One student may initiate the discussion, but all members are expected to contribute.
- Participants should support their opinions with logical reasoning, examples, and relevant facts.
- Students should avoid personal remarks, interruptions, and aggressive behavior.
- The discussion should conclude with a summary of key points and findings.

4. Code of Conduct

Students shall:

- Respect differing opinions and viewpoints.
- Use professional and appropriate language.
- Listen attentively to other participants.
- Encourage balanced participation among group members.
- Maintain discipline and decorum throughout the discussion.
- Focus on the topic and avoid irrelevant arguments.

Evaluation Criteria

Criterion	Marks
Subject Knowledge and Content Relevance	20
Communication Skills and Clarity of Expression	10
Logical Reasoning and Analytical Ability	20
Teamwork, Listening, and Interaction Skills	10
Leadership, Initiative, and Confidence	10
Overall Participation and Professional Conduct	10
Total	**80**

Expected Outcomes

Students are expected to demonstrate:

- Effective oral communication skills.
- Analytical and critical thinking abilities.
- Confidence in expressing and defending ideas.
- Respect for diverse opinions and collaborative problem-solving.
- Professional behaviour suitable for academic and workplace environments.

Recommended Books and Reference Materials for Group Discussion

Reference Books

1. Raman, M., & Sharma, S. (2018). *Technical Communication: Principles and Practice* (3rd ed.). New Delhi: Oxford University Press.
2. Rizvi, A. M. (2017). *Effective Technical Communication* (2nd ed.). New Delhi: McGraw Hill Education.
3. Carnegie, D. (2019). *The Art of Public Speaking*. Courier Dover Publications.

SEMINAR PRESENTATION: GUIDELINES AND EVALUATION FRAMEWORK

The Seminar Presentation component aims to develop students' abilities in technical communication, literature review, independent learning, critical analysis, presentation skills, and professional interaction. It provides an opportunity for students to explore emerging topics, synthesize information from scholarly sources, and present their findings effectively.

Learning Outcomes

Upon successful completion of the Seminar Presentation activity, students will be able to:

1. Conduct independent study on a selected technical or interdisciplinary topic.
2. Analyze and synthesize information from scholarly articles, books, and technical reports.
3. Prepare professional-quality presentation materials.
4. Deliver technical presentations with confidence and clarity.
5. Respond effectively to questions and engage in academic discussions.
6. Demonstrate ethical use of information through proper citation and referencing.

GUIDELINES FOR CONDUCTING SEMINAR PRESENTATION

1. Topic Selection

- The seminar topic should be relevant to the student's discipline or an emerging interdisciplinary area.
- Topics should be selected from recent developments, research articles, industrial applications, technological innovations, or societal challenges.
- Students are encouraged to consult reputed journals, conference proceedings, and technical magazines.
- The topic must be approved by the faculty supervisor before preparation begins.

2. Preparation of Seminar

- Students should thoroughly understand the selected topic before preparing the presentation.
- The seminar should be based on a critical review of relevant literature rather than simple compilation of information.
- Presentation slides should contain concise points, diagrams, charts, tables, figures, and illustrations instead of lengthy paragraphs.
- All sources of information, figures, and data must be properly acknowledged.
- A seminar synopsis/report may be submitted before the presentation, as prescribed by the department.

3. Preparation of Presentation Slides

- Use a simple, professional, and readable slide design.
- Font size should be sufficiently large (preferably 20 points or above) for clear visibility.
- Slides should not be overcrowded with text or graphics.
- Each slide should have an appropriate title and slide number.
- Graphs, charts, and figures should be clearly labelled and easily readable.
- Animations and transition effects should be used minimally and only when they improve understanding.
- Images and figures should maintain proper aspect ratios and visual quality.
- A conclusion slide and a references slide should be included.

4. Presentation Procedure

- Each student shall deliver a seminar presentation of **10 minutes**, followed by a **5 minutes question-and-answer session**.
- Students should introduce themselves and provide an overview of the topic at the beginning.
- The significance, objectives, methodology, findings, and conclusions should be clearly presented.
- Students should maintain eye contact with the audience and avoid reading directly from slides or notes.
- Voice projection, clarity of speech, and effective body language are expected.
- Time management should be strictly maintained.

5. Question and Answer Session

- Students should listen carefully to each question before responding.
- Responses should be clear, concise, and technically sound.
- Students should address the entire audience while answering questions.
- Constructive academic discussion should be encouraged.
- Differences of opinion should be handled professionally and respectfully.

Evaluation Criteria

Criterion	Marks
Topic Selection and Literature Survey	10
Technical Content and Subject Knowledge	20
Organization and Quality of Presentation Slides	15
Communication Skills and Delivery	10
Critical Analysis and Interpretation	10
Ability to Answer Questions	10
Professional Conduct and Time Management	5
Total	**80**

Expected Outcomes

Students are expected to demonstrate:

- Ability to independently explore technical topics.
- Effective presentation and communication skills.
- Critical thinking and analytical abilities.
- Competence in reviewing and synthesizing literature.
- Confidence in public speaking and academic interaction.
- Professional and ethical conduct in technical communication.

Recommended Books and Reference Materials

Reference Books

1. Alley, M. (2013). *The Craft of Scientific Presentations* (2nd ed.). Springer.
2. Reynolds, G. (2019). *Presentation Zen: Simple Ideas on Presentation Design and Delivery* (3rd ed.). New Riders.
3. Duarte, N. (2012). *HBR Guide to Persuasive Presentations*. Harvard Business Review Press

Online Resources

1. IEEE Xplore Digital Library
2. SpringerLink
3. ScienceDirect (Elsevier)
4. Google Scholar
5. MIT OpenCourseWare

SYLLABUS FOR BCA WITH HONOURS WITH RESEARCH

SEM. VII

4th Year [Four Year Under Graduate Program with Honours with Research] (FYUGPHWRS)

Under Single Major Single Minor

(To be implemented from Session 2023-24)

Proposed Syllabus for four years B.C.A (Major) Programme							
Year	**Semester**	**Paper Code**	**Paper**	**Credits**	**Periods/Week**	**Exam. Marks**	**Total Marks**
3rd Year	**VII**	UBCAMAJ47017	Data Science	3	3	60	60
		UBCAMAJ47017 T	Data Science (Tutorial)	1	1	00	
		UBCAMAJ47018	Network Security	3	3	40	60
		UBCAMAJ47018 L	Network Security (Tutorial)	1	1	20	
		UBCAMAJ47019	R Programming	3	3	40	60
		UBCAMAJ47019 L	R Programming (Lab)	1	1	20	
	VIII	UBCAMAJ48020	**Research Methodology**	4	4		
		IARD	**MAJOR RESEACRH PRJECT / DISSERTATION**	12	12		

NOTE: Tutorials should involve problem solving session/activity related to the subject taught.

SYLLABUS FOR BCA WITH HONOURS WITH RESEARCH

Discipline: Science □ Arts, Humanities & Social Science □

Commerce □ BBA □ BCA [√]

Subject Name: BCA

Subject Code: **UBCAMAJ47017** (Will be provided by the University)

Semester: Semester I □ Semester II □ Semester III □ Semester IV □

Semester V □ Semester VI □ Semester VII [√] Semester VIII □

Course Name: **DATA SCIENCE**

Course Code: (Will be provided by the University)

Course Credit: Theoretical 3 Practical/Tutorial 1

Marks Allotted: Theoretical 60 Practical/Tutorial 0

Continuing Evaluation Attendance

Course Type (tick the correct alternatives):

Major Core	[√]	AEC	□
Interdisciplinary/ DSE	□	SEC	□
Minor / Generic Elective	□	VAC	□
Research Project/Dissertation	□	Vocational	□

Is the course focused on employability / entrepreneurship? YES [√] NO □

Is the course focused on imparting life skill? YES [√] NO □

Is the course based on Activity ? YES [√] NO □

Remarks by Chairman, UG BOS, if any

UG BOS Meeting Reference Number: Date:

Course Code: **UBCAMAJ47017**

Course Name: **DATA SCIENCE**

Brief Course Description

Data Science is an interdisciplinary field that combines statistics, mathematics, computer science, and domain knowledge to extract meaningful insights from data. This course provides a comprehensive introduction to the principles, methods, and tools used in data science for data collection, cleaning, analysis, visualization, and predictive modeling. Students will learn how to transform raw data into valuable information that supports decision-making and problem-solving across various domains such as business, healthcare, education, finance, and research. The course emphasizes both theoretical foundations and practical applications using modern data science techniques and tools.

Prerequisite(s) and/or Note(s)

Students should have a basic understanding of mathematics, statistics, and computer programming concepts. Familiarity with data handling, spreadsheets, and logical problem-solving will be beneficial. Prior exposure to programming languages such as Python or R is desirable but not mandatory.

Course Objectives

This course aims to introduce students to the fundamental concepts, techniques, and tools of Data Science. It focuses on data collection, preprocessing, analysis, visualization, and interpretation to support data-driven decision-making. The course also provides exposure to statistical methods, machine learning techniques, and real-world applications of data science.

Knowledge Acquired

Upon completion of the course, students will gain knowledge of the Data Science lifecycle, data preprocessing methods, exploratory data analysis, statistical techniques, machine learning algorithms, and data visualization principles. They will understand how data can be transformed into meaningful insights for solving business, scientific, and societal problems.

Skills Gained

Students will develop practical skills in handling and analyzing large datasets, performing statistical analysis, creating visualizations, and implementing machine learning models using modern data science tools and programming environments. They will also learn to communicate analytical findings effectively through reports and presentations.

Competency Developed

The course develops competency in applying data science methodologies to real-world problems, extracting actionable insights from complex datasets, and building predictive models for decision support. Students will be able to work independently or as part of a team in data-driven projects while adhering to ethical and professional standards in data analysis.

Detailed Syllabus		
4th Year: Semester 7		
UBCAMAJ47017	**DATA SCIENCE**	**[Credits: 3, Lectures 45]**

Unit 1: History of data science **(10 Lectures)**

Brief history of data science, data science as conjunction of computer science and domain knowledge - Definition of data science, features, application in real world - Data science life cycle - capture, maintain, process, analyze, communicate, Turning data into actionable knowledge- Basic ideas of different Data Science Toolkit: R, Python, Excel, Weka and GitHub.

Unit2: R Programming Basics **(8 Lectures)**

Overview of R, R data types and objects, reading and writing data, Control structures, functions, scoping rules, dates and times, Loop functions, debugging tools, Simulation, code profiling

Unit3: Getting and Cleaning Data **(8 Lectures)**

Obtaining data from the web, from APIs, from databases and from colleagues in various formats, basics of data cleaning and making data —tidy

Unit4: Exploratory Data Analysis **(9 Lectures)**

Essential exploratory techniques for summarizing data, applied before formal modeling commences, eliminating or sharpening potential hypotheses about the world that can be addressed by the data, common multivariate statistical techniques used to visualize high-dimensional data.

Unit 5: Reproducible Research **(10 Lectures)**

Concepts and tools behind reporting modern data analyses in a reproducible manner, to write a document using R markdown, integrate live R code into a literate statistical program, compile R markdown documents using knitr package and related tools, and organize a data analysis so that it is reproducible and accessible to others.

Suggested Readings

1. D.Cielen, Arno D.B.Meysman, M.Ali, Introducing Data Science, Dreamtech Press.
2. Rachel Schutt, Cathy O'Neil, "Doing Data Science: Straight Talk from the Frontiline" by Schroff/O'Reilly, 2013.
3. Foster Provost, Tom Fawcett, "Data Science for Business "What You Need to Know About Data Mining and Data-Analytic Thinking" by O'Reilly, 2013.
4. John W. Foreman, "Data Smart: Using data Science to Transform Information into Insight" by John Wiley & Sons, 2013.
5. Ian Ayres, "Super Crunchers: Why Thinking-by-Numbers Is the New Way to Be Smart" Ist Edition by Bantam, 2007.
6. Eric Seigel, "Predictive Analytics: The Power to Predict who Will Click, Buy, Lie, or Die", 1st Edition, by Wiley, 2013.
7. Matthew A. Russel, "Mining the Social Web: Data mining Facebook, Twitter, Linkedln, Goole+, GitHub, and More", Second Edition, by O'Reilly Media, 2013

UBCAMAJ47017T	DATA SCIENCE	[Credits: 1, Lecture Hours:15]

Data Science tutorial as assigned and advised by teacher(s).

SYLLABUS FOR BCA WITH HONOURS WITH RESEARCH

Discipline: Science □ Arts, Humanities & Social Science □

Commerce □ BBA □ BCA [√]

Subject Name: BCA

Subject Code: **UBCAMAJ47018** (Will be provided by the University)

Semester: Semester I □ Semester II □ Semester III □ Semester IV □

Semester V □ Semester VI □ Semester VII [√] Semester VIII □

Course Name: **NETWORK SECURITY**

Course Code: (Will be provided by the University)

Course Credit: Theoretical 3 Practical/Tutorial 1

Marks Allotted: Theoretical 60 Practical/Tutorial 0

Continuing Evaluation Attendance

Course Type (tick the correct alternatives):

Major Core	[√]	AEC	□
Interdisciplinary/ DSE	□	SEC	□
Minor / Generic Elective	□	VAC	□
Research Project/Dissertation	□	Vocational	□

Is the course focused on employability / entrepreneurship? YES [√] NO □

Is the course focused on imparting life skill? YES [√] NO □

Is the course based on Activity ? YES [√] NO □

Remarks by Chairman, UG BOS, if any

UG BOS Meeting Reference Number: Date:

Course Code: **UBCAMAJ47018**

Course Name: **NETWORK SECURITY**

Brief Course Description

Network Security is a specialized area of cybersecurity that focuses on protecting computer networks, devices, applications, and data from unauthorized access, misuse, cyberattacks, and security breaches. This course introduces students to the principles, technologies, and practices used to secure modern communication networks. Topics include network vulnerabilities, threats and attacks, cryptography, firewalls, intrusion detection systems, authentication mechanisms, secure communication protocols, and network security management. The course combines theoretical concepts with practical approaches to safeguarding digital assets in networked environments.

Prerequisite(s) and/or Note(s)

Students should have a basic understanding of computer networks, operating systems, and internet technologies. Familiarity with networking concepts such as TCP/IP, network protocols, and network devices will be beneficial. Basic knowledge of computer security concepts is desirable but not mandatory.

Course Objectives

This course aims to provide students with a strong foundation in network security principles and practices. It focuses on identifying network vulnerabilities, understanding cyber threats, implementing security controls, and applying defensive mechanisms to protect network resources. The course also introduces modern security technologies and best practices for maintaining secure communication systems.

Knowledge Acquired

Upon successful completion of the course, students will gain knowledge of network security architecture, common network attacks, cryptographic techniques, authentication methods, firewalls, intrusion detection and prevention systems, virtual private networks (VPNs), and security policies. They will understand how security mechanisms are designed and implemented to ensure confidentiality, integrity, and availability of information.

Skills Gained

Students will develop practical skills in analyzing network security threats, configuring security devices, implementing access control mechanisms, monitoring network traffic, and applying security tools to detect and mitigate attacks. They will also learn to assess security risks and recommend appropriate countermeasures for protecting network infrastructures.

Competency Developed

The course develops competency in designing, implementing, and managing secure network environments. Students will be capable of identifying security vulnerabilities, responding to cyber incidents, enforcing security policies, and applying industry-standard security practices. They will be prepared to contribute effectively to cybersecurity initiatives and secure network operations in professional and organizational settings.

Detailed Syllabus
4th Year: Semester 7

UBCAMAJ47018	NETWORK SECURITY	[Credits: 3, Lectures 45]

UNIT 1: FUNDAMENTALS OF COMPUTER NETWORKS AND SECURITY (8 Lectures)

Introduction to computer networks, data communication, and networking concepts. Types of networks including LAN, MAN, WAN, PAN, Internet, Intranet, Client-Server, and Peer-to-Peer networks. Network topologies and devices such as Hub, Switch, Router, Modem, Bridge, Repeater, Gateway, and NIC. Overview of the OSI and TCP/IP models and their functions. Fundamentals of cybersecurity, information security, digital asset protection, and the CIA Triad (Confidentiality, Integrity, and Availability).

UNIT 2: CYBER THREATS, ATTACKS AND VULNERABILITIES (8 Lectures)

Introduction to cyber threats, threat landscape, types of criminals , and motives behind cyberattacks. Common malware : viruses, worms, trojans, ransomware, spyware, adware, rootkits, keyloggers, and botnets. Network attacks: phishing, spoofing, password attacks, DoS/DDoS, Man-in-the-Middle (MITM), and session hijacking, categories of attacks : active attack and passive attacks. Social engineering attacks, software vulnerabilities, weak passwords, insider threats, and zero-day exploits. Cybercrime : online fraud, identity theft, cyberbullying, and cyberterrorism.

UNIT 3: NETWORK SECURITY MECHANISMS AND TECHNOLOGIES (10 Lectures)

Fundamentals of authentication and access control, including password-based, 2FA, multi-factor, and biometric authentication, and role-based access control. Introduction to firewalls, intrusion detection and prevention systems (IDS/IPS), antivirus software, and endpoint security. Overview of Virtual Private Networks (VPNs), secure network design concepts such as network segmentation and DMZ, security policies, backup and recovery mechanisms, and best practices for password creation, management, and storage security.

UNIT 4: SECURE COMMUNICATION AND WIRELESS SECURITY (10 Lectures)

Secure communication concepts, encryption, secure protocols, and digital communication risks. Web security: HTTP/HTTPS, SSL/TLS, secure browsing, browser security, cookies, and privacy. Overview of email security, spam, phishing, email encryption, and safe email practices. Wireless network security concepts, Wi-Fi vulnerabilities, common wireless attacks, and security standards such as WEP, WPA, WPA2, and WPA3. Introduction to mobile and IoT security, including Smartphone threats, mobile malware, IoT vulnerabilities, and smart device protection.

UNIT 5: ETHICAL HACKING, CYBER LAWS AND SECURITY PRACTICES

(9 Lectures)

Introduction to ethical hacking, types of hackers, and basic security testing concepts including vulnerability assessment and penetration testing. Cyber ethics: responsible use of technology, digital citizenship, privacy, and online behavior. Cyber laws : data privacy, intellectual property rights, copyright, and piracy. Safe cybersecurity practices such as secure browsing, password management, social media safety, backups, and software updates. Introduction to career opportunities in cybersecurity, including roles such as security analyst, network administrator, ethical hacker, and SOC analyst, along with relevant cybersecurity certifications.

Suggested Readings:

1. "Network Security Essentials" — William Stallings — 7th Edition
2. "Cryptography and Network Security" — William Stallings — 8th Edition
3. "Computer Networking: A Top-Down Approach" — James Kurose & Keith Ross — 8th Edition
4. "Network Security Bible" — Eric Cole — 2nd Edition
5. "Fundamentals of Information Systems Security" — David Kim & Michael Solomon

Reference Books

6. "Cyber Security Essentials" — Charles Brooks
7. "Principles of Computer Security" — WM. Arthur Conklin
8. "Introduction to Computer Security" — Matt Bishop
9. "Hands-On Ethical Hacking and Network Defense" — Michael Simpson
10. "Practical Malware Analysis" — Michael Sikorski
11. "Security+ Guide to Network Security Fundamentals" — Mark Ciampa
12. "Guide to Network Defense and Countermeasures" — Randy Weaver

SYLLABUS FOR BCA WITH HONOURS WITH RESEARCH

Discipline: Science ☐ Arts, Humanities & Social Science ☐

Commerce ☐ BBA ☐ BCA [√]

Subject Name: BCA

Subject Code: **UBCAMAJ47019** (Will be provided by the University)

Semester: Semester I ☐ Semester II ☐ Semester III ☐ Semester IV ☐

Semester V ☐ Semester VI ☐ Semester VII [√] Semester VIII ☐

Course Name: **R PROGRAMMING**

Course Code: (Will be provided by the University)

Course Credit: Theoretical 3 Practical/Tutorial 1

Marks Allotted: Theoretical 40 Practical/Tutorial 20

Continuing Evaluation Attendance

Course Type (tick the correct alternatives):

Major Core	[√]	AEC	☐
Interdisciplinary/ DSE	☐	SEC	☐
Minor / Generic Elective	☐	VAC	☐
Research Project/Dissertation	☐	Vocational	☐

Is the course focused on employability / entrepreneurship? YES [√] NO ☐

Is the course focused on imparting life skill? YES [√] NO ☐

Is the course based on Activity ? YES [√] NO ☐

Remarks by Chairman, UG BOS, if any

UG BOS Meeting Reference Number: Date:

Course Code: **UBCAMAJ47019**

Course Name: **R PROGRAMMING**

Brief Course Description

This course introduces the fundamentals of R programming for data analysis, statistical computing, and visualization. Students will learn R syntax, data structures, control statements, data manipulation, graphical representation of data, and basic statistical analysis techniques using R. The course emphasizes practical applications of R in data science and analytics.

Prerequisite(s) and/or Note(s)

Basic knowledge of computer fundamentals and elementary mathematics/statistics is desirable. No prior programming experience is required.

Course Objectives

The course aims to provide students with a strong foundation in R programming, data handling, statistical analysis, and data visualization. It enables learners to develop analytical skills and apply R tools for solving real-world data-driven problems.

Knowledge Acquired

Students will gain knowledge of R programming concepts, data structures, control structures, data manipulation techniques, visualization methods, statistical analysis, probability distributions, and hypothesis testing using R.

Skills Gained

Students will develop skills in writing R programs, managing and analyzing datasets, creating informative visualizations, performing statistical computations, and importing/exporting data from various sources.

Competency Developed

Upon completion of the course, students will be able to use R effectively for data analysis, statistical modeling, visualization, and decision-making tasks, preparing them for advanced studies and careers in data science, analytics, and research.

Detailed Syllabus
4th Year: Semester 7

UBCAMAJ47019	R PROGRAMMING	[Credits: 4. Lectures 60]

Unit 1: Introduction to R Programming **(3 Lectures)**

Overview of R programming: Evolution of R language, features of R programming language, what is R? , Why R? , Advantages of R over Other Programming Languages, Downloading and installing of R language, setting up the R environment - Interactivity and Code Execution: R basic syntax - R Studio - R command Prompt, R script file, comments

Unit 2: Data Structures in R **(8 Lectures)**

Vectors: Creating vectors using c(), Indexing and subsetting vectors in R, Operations on Vectors, Understanding vectorized operations and efficiency – *Matrices* : Creating matrices using matrix(), *Basic matrix operations* : addition, subtraction, multiplication, Transposing matrices - *Lists* : Creating lists with list(), Nested lists and their components, Indexing and extracting values from lists, Manipulating list components – *Arrays* : Creating arrays using array(), Manipulating and transforming array data - *Data Frames:* Introduction to Data Frames, Manipulating Data Frames, Indexing, filtering, and subsetting data frames, Applying functions to columns, Aggregating and summarizing data- *Factors:* Categorical data representation with factors, Modifying and Working with Ordinal Factors in R, Merging and Simplifying Factor Levels in R, Converting factors to other data types.

Unit 3: Control Structures in R **(7 Lectures)**

Conditional Statements: Basic if and else statements, else if and multiple conditions, Vectorized conditions with ifelse() - Loops in R : For Loop, Nested For Loops, break and next statements, While Loop, Repeat Loop.

Unit 4: Variables, Data Types and operators **(5 Lectures)**

Concept of Variables: Variable assignment, Finding Variable, Deleting Variables – Atomic Data Types in R (Numeric, Integer, Logical, Character, Complex and Raw) - Operators in R: Arithmetic Operators, Logical Operators, Comparison Operator, Assignment Operators.

Unit 5: Data Manipulation and Cleaning **(7 Lectures)**

Working with Strings : String manipulation - Data Cleaning: Handling missing values with is.na() and na.omit() - Reshaping Data : Reshaping data frames with reshape(), melt(), cast() - Data Import and Export: Reading data from CSV, Excel, and other formats.

Unit 6: Data Visualization in R **(7 Lectures)**

Concept of Plotting, Base R plotting functions: plot(), hist(), boxplot(), Customizing plots (titles, labels, colors), Saving plots to file (PDF, PNG) - Visualizations with ggplot2: ggplot2 package, Creating scatter plots, bar plots, histograms, and more, Faceting in ggplot2: Splitting Data into Subplots, Themes in ggplot2 - 3D Visualizations: concept of 3D visualization, Generating 3D scatter plots, surface plots.

Unit 7: R in Statistical Analysis and Resampling Techniques **(8 Lectures)**

Concept of R in Statistics: R as a tool for statistical analysis, calculation: mean, median, mode, variance, standard deviation, creating frequency tables and cross-tabulations - Probability Distributions in R: Normal Distribution in R, Plotting of Normal Distribution over Histogram in R - Hypothesis Testing: hypothesis testing concepts, T-tests, Chi-squared tests.

Suggested Readings:

1. ***The Book of R*** by Tilman M. Davies, no starch press (San Francisco)
2. ***The Art of R Programming – A Tour of Statistical Software Design*** , by : Norman Matloff, no starch press(San Francisco)
3 ***The R Book***, By – Michael J. Crawley, Edition – Second, Published by – Wiley
4. ***R Graphics Cookbook: Practical Recipes for Visualizing Data***, Winston Chang, Edition – Second, Published by – Shroff/O'Reilly

UBCAMAJ47019L R PROGRAMMING [Credits: 1, Lecture Hours:15]

Students are advised to do laboratory/practical practice not limited to, but including the following types of problems:

1. Download and install R-Programming environment and install basic packages using install. Packages() command in R.
2. Learn all the basics of R-Programming (Data types, Variables, Operators etc.)
3. Implement R-Loops with different examples.
4. Learn the basics of functions in R and implement with examples.
5. Implement data frames in R. Write a program to join columns and rows in a data frame using c bind () and r bind () in R.
6. Implement different String Manipulation functions in R.
7. Implement different data structures in R(Vectors ,Lists ,Data Frames)
8. Create a data set and do statistical analysis on the data using R.
9. Write an R program to demonstrate variable declaration, data types, arithmetic operations, and output display.
10. Create two vectors and perform addition, subtraction, multiplication, division, and indexing operations.
11. Create two matrices and perform matrix addition, subtraction, multiplication, and transpose operations.
12. Create a list containing student information (Name, Roll No., Marks, Grade) and demonstrate accessing and modifying list elements.
13. Create a three-dimensional array and display specific elements, rows, and columns.
14. Create a student data frame and perform sorting, filtering, subsetting, and column-wise calculations.
15. Create nominal and ordinal factors, modify factor levels, and convert factors into character and numeric formats.
16. Write an R program using if-else and nested if-else statements to determine grades based on student marks.
17. Write R programs using for, while, and repeat loops to generate multiplication tables and factorials.
18. Perform string concatenation, substring extraction, case conversion, and string length calculation.
19. Create a dataset with missing values and use is.na() and na.omit() to identify and remove missing entries.
20. Read data from a CSV file, perform basic analysis, and export the processed data to a new CSV file.
21. Create a histogram, bar chart, boxplot, and pie chart using sample datasets.
22. Create scatter plots, bar plots, and histograms with appropriate labels and themes using ggplot2.
23. Calculate mean, median, mode, variance, and standard deviation. Perform a t-test and Chi-Square test on a given dataset and interpret the results.
24. Write an R Program for "Hello World ".
25. Write an R Program to Add Two Vectors
26. Find the Sum, Mean and Product of the Vector in R Programming
27. Create an R Program to Take Input From the User
28. Create an R Program to Find the Minimum and Maximum
29. How to create R Multiplication Table
30. Write a R Program to Check Prime Number
31. Write a R Program to check Armstrong Number
32. Write a R Program to Print the Fibonacci Sequence
33. Write a R Program to Check for Leap Year
34. Write a R Program to Check if a Number is Odd or Even in R Programming
35. Write a R Program to print the elements of a vector.

SYLLABUS FOR BCA WITH HONOURS WITH RESEARCH

SEM. VIII

4th Year [Four Year Under Graduate Program with Honours with Research] (FYUGPHWRS)

Under Single Major Single Minor

(To be implemented from Session 2023-24)

Proposed Syllabus for four years B.C.A (Major) Programme							
Year	**Semester**	**Paper Code**	**Paper**	**Credits**	**Periods/Week**	**Exam. Marks**	**Total Marks**
4th Year	**VIII**	**UBCAMAJ48020**	**RESEARCH METHODOLOGY**	4	4		
		IARD	**MAJOR RESEACRH PROJECT / DISSERTATION**	12	12		

NOTE: Tutorials should involve problem solving session/activity related to the subject taught.

SYLLABUS FOR BCA WITH HONOURS WITH RESEARCH

Discipline: Science ☐ Arts, Humanities & Social Science ☐

Commerce ☐ BBA ☐ BCA [√]

Subject Name: BCA

Subject Code: **UBCAMAJ48020** (Will be provided by the University)

Semester: Semester I ☐ Semester II ☐ Semester III ☐ Semester IV ☐

Semester V ☐ Semester VI ☐ Semester VII ☐ Semester VIII [√]

Course Name: **RESEARCH METHODOLOGY**

Course Code: (Will be provided by the University)

Course Credit: Theoretical 4 Practical/Tutorial

Marks Allotted: Theoretical Practical/Tutorial

Continuing Evaluation Attendance

Course Type (tick the correct alternatives):

Major Core	[√]	AEC	☐
Interdisciplinary/ DSE	☐	SEC	☐
Minor / Generic Elective	☐	VAC	☐
Research Project/Dissertation	☐	Vocational	☐

Is the course focused on employability / entrepreneurship? YES [√] NO ☐

Is the course focused on imparting life skill? YES [√] NO ☐

Is the course based on Activity ? YES [√] NO ☐

Remarks by Chairman, UG BOS, if any

UG BOS Meeting Reference Number: Date:

Course Code: **UBCAMAJ48020**

Course Name: **RESEARCH METHODOLOGY**

Brief Course Description

The Research Methodology course introduces students to the principles, methods, and techniques of scientific research. It covers the process of identifying research problems, formulating objectives and hypotheses, conducting literature reviews, collecting and analyzing data, and preparing research reports. The course emphasizes ethical research practices and equips students with the knowledge required to undertake academic, scientific, and industry-oriented research projects.

Prerequisite(s) and/or Note(s)

Students should have a basic understanding of their subject area and fundamental analytical skills. Familiarity with data interpretation, academic writing, and computer applications is desirable. The course may include practical exercises involving literature surveys, research proposal preparation, data analysis, and report writing to provide hands-on research experience.

Course Objectives

The course aims to develop an understanding of research concepts, methodologies, and ethical practices. It seeks to equip students with the ability to identify research problems, formulate research questions, design appropriate methodologies, collect and analyze data, and communicate research findings effectively through professional reports and presentations.

Course Outcomes

Upon successful completion of the course, students will be able to formulate research problems, conduct comprehensive literature reviews, select suitable research designs, apply qualitative and quantitative research methods, analyze data using appropriate techniques, and prepare well-structured research reports in accordance with academic and professional standards.

Knowledge Acquired

Students acquire knowledge of research philosophies, research designs, sampling techniques, data collection methods, statistical and analytical tools, hypothesis testing, research ethics, and scientific documentation. They also gain an understanding of the complete research process from problem identification to dissemination of findings.

Skills Gained

The course enhances research, analytical, critical thinking, problem-solving, data collection, data analysis, academic writing, and presentation skills. Students learn to use research tools and techniques effectively, evaluate information critically, and interpret findings for evidence-based decision-making.

Competency Developed

Students develop the competency to independently conduct systematic and ethical research, analyze complex problems using scientific methods, generate meaningful insights from data, and communicate research outcomes effectively. These competencies prepare them for higher studies, professional research careers, innovation, and evidence-based decision-making in academic and industry settings.

Detailed Syllabus

4th Year: Semester 8

UBCAMAJ48020	**RESEARCH METHODOLOGY**	**[Credits : 4]**

UNIT-1 Introduction to Research (7 Lectures)

Concept of research, definition, characteristics of good research, Application of Research, Meaning and sources of Research problem, characteristics of good Research problem, Research process, outcomes, application of Research, Meaning and types of Research hypothesis, Review of Literature, importance of Review of Literature.

UNIT-2 Types of Research (10 Lectures)

Motivation and objectives – Research methods vs Methodology. Research Design- meaning, need, types of research design, features of good Research design, Experiments, surveys and case study. Types of research – Descriptive and Analytical, Applied and Fundamental, Quantitative and Qualitative, Conceptual and Empirical, concept of applied and basic research process, Criteria of good research.

UNIT-3 Sampling, Data Collection and analysis (10 Lectures)

Types and sources of data – Primary and secondary, Methods of collecting data, Concept of sampling and sampling methods – sampling frame, sample, characteristics of good sample, simple random sampling, purposive sampling, convenience sampling, snowball sampling, classification and tabulation of data, graphical representation of data, graphs and charts – Histograms, frequency polygon and frequency curves, bell shaped curve and its properties. Statistical Methods for Data Analysis: statically package (SPSS for student t-test, ANOVA, etc.), hypothesis testing.

UNIT-4 Research Report (6 Lectures)

Research report and its structure, journal articles – Components of journal article. Explanation of various components. Structure of an abstract and keywords, components and structure of thesis and dissertations. Referencing styles and bibliography.

UNIT-5 Ethics in Research (5 Lectures)

Plagiarism - Definition, different forms, consequences, unintentional plagiarism, copyright infringement, collaborative work, Intellectual property right (IPR) and patent law, Qualities of good Researcher.

UNIT-6 ICT Tools for Research (7 Lectures)

Role of computers/ITC in research, maintenance of data using software such as Mendeley, Zotero, Endnote, Overleaf, Tabulation and graphical presentation of research data and software tools. Web search : Use of Internet, using search engines and advanced search tools.

Suggested Readings:

1 Kothari C. R, Research Methodology

2. Donald Cooper & PS Schindler(2009)Business Research Methods, 9th edition, Tata McGraw Hill.

3. Uma Sekaran (2010) Research Methods for Business, 4th edition, Wiley.

4 Ranjit Kumar (2009) Research Methodology, 2nd edition, Pearson Education

5 Naresh Malhotra and S Dash (2009) Marketing Research, 5th edition, Pearson Prentice Hall.

6 Michael V. P, Research Methodology.

7 Fred N. Kerlinger : Foundations of Behavioral Research.

UBCAMAJ48020 RESEARCH METHODOLOGY

Research Methodology as assigned and advised by teacher(s).

SYLLABUS FOR BCA WITH HONOURS WITH RESEARCH

Discipline: Science □ Arts, Humanities & Social Science □

Commerce □ BBA □ BCA [√]

Subject Name: BCA

Subject Code: **IARD** (Will be provided by the University)

Semester: Semester I □ Semester II □ Semester III □ Semester IV □

Semester V □ Semester VI □ Semester VII □ Semester VIII [√]

Course Name: **MAJOR RESEACRH PROJECT / DISSERTATION**

Course Code: (Will be provided by the University)

Course Credit: Theoretical 12 Practical/Tutorial

Marks Allotted: Theoretical Practical/Tutorial

Continuing Evaluation Attendance

Course Type (tick the correct alternatives):

Major Core	[√]	AEC	□
Interdisciplinary/ DSE	□	SEC	□
Minor / Generic Elective	□	VAC	□
Research Project/Dissertation	□	Vocational	□

Is the course focused on employability / entrepreneurship? YES [√] NO □

Is the course focused on imparting life skill? YES [√] NO □

Is the course based on Activity ? YES [√] NO □

Remarks by Chairman, UG BOS, if any

UG BOS Meeting Reference Number: Date:

Course Code: **IARD**

Course Name: **MAJOR RESEACRH PROJECT / DISSERTATION**

Brief Course Description

The IARD Major Research Project / Research Dissertation is a capstone research course designed to provide students with an opportunity to undertake an extensive, independent, and original investigation in a chosen area of study. The course integrates theoretical knowledge, research methodology, and practical application to address significant academic, scientific, technological, social, or industry-related problems. Students are expected to conduct systematic research, analyze findings, and prepare a comprehensive dissertation demonstrating scholarly rigor and innovative thinking.

Prerequisite(s) and/or Note(s)

Students should have successfully completed the required coursework, including research methodology and discipline-specific core subjects. The research topic must be approved by the department and carried out under the guidance of a designated supervisor. Students are required to conduct a literature review, develop a research proposal, collect and analyze data, maintain regular progress reports, and submit a dissertation along with a final presentation and viva voce examination.

Course Objectives The course aims to develop advanced research capabilities by enabling students to identify research gaps, formulate research questions, design and implement appropriate methodologies, and generate meaningful solutions or findings. It seeks to promote independent learning, critical inquiry, innovation, and the application of theoretical knowledge to address real-world challenges through systematic investigation.

Course Outcomes Upon successful completion of the course, students will be able to independently conduct scholarly research, critically evaluate existing literature, apply appropriate research methods and analytical tools, interpret research findings, and produce a well-structured dissertation. They will also be able to communicate research outcomes effectively through professional reports, presentations, and academic discussions.

Knowledge Acquired Students acquire advanced knowledge of research design, data collection techniques, statistical and qualitative analysis methods, scientific writing, research ethics, and domain-specific concepts related to their chosen area of study. They gain a comprehensive understanding of the complete research lifecycle, from problem identification and hypothesis formulation to validation, interpretation, and dissemination of results.

Skills Gained The course strengthens research, analytical, critical thinking, problem-solving, technical writing, data analysis, project management, and presentation skills. Students learn to use modern research tools, software applications, databases, and analytical techniques while developing the ability to work independently and manage complex research tasks effectively.

Competency Developed Students develop the competency to undertake independent and original research, evaluate complex problems using scientific and evidence-based approaches, generate innovative solutions, and communicate research contributions professionally. The course prepares graduates for higher education, doctoral studies, research and development activities, policy formulation, consultancy, entrepreneurship, and leadership roles in academia, industry, and society.

Detailed Syllabus

4th Year: Semester 8

IARD	**MAJOR RESEACRH PROJECT / DISSERTATION [Credits: 12]**

MAJOR RESEACRH PROJECT / DISSERTATION GUIDELINES

1. General Rules and Eligibility

1.1 This project work is compulsory for all students enrolled in the final year of the B.C.A program.

1.2 A student must have cleared all previous semester examinations (or be appearing for no more than two backlogs) to be eligible for project registration.

1.3 Project work carries a total of **12 credits** and is equivalent to the academic engagement over one full semester.

1.4 Each student shall undertake exactly one project. Group projects are permitted only with prior written approval from the Head of Department, with a maximum team size of three students.

1.5 The topic must be submitted for approval within the first two weeks of the semester. No topic changes shall be permitted after the fourth week.

2. Topic Selection and Approval

2.1 Topics must fall within the domain of Computer Science or allied fields (e.g., Artificial Intelligence, Data Science, Cybersecurity, Web Development, Mobile Computing, IoT, Cloud Computing).

2.2 Pure survey or review projects are not permitted unless accompanied by a substantial implementation or comparative analysis component.

2.3 Each student must submit a **Project Synopsis (maximum 3 pages) containing**:

2.3.1 Problem statement and motivation

2.3.2 Clear objectives (minimum three)

2.3.3 Proposed methodology and tools

2.3.4 Expected outcomes and deliverables

2.3.5 Timeline with week-wise milestones

2.4 The Departmental Project Committee shall evaluate and approve or reject the synopsis within five working days.

2.5 Once approved, the topic and scope shall be treated as final. Any modification requires a formal written request and re-approval.

3. Supervision and Monitoring

3.1 Every student shall be assigned a faculty supervisor by the Department.

3.2 A minimum of one formal meeting per week with the supervisor is mandatory. Attendance shall be recorded in a Project Log Book.

3.3 The Log Book must contain:

3.3.1 Date and duration of each meeting

3.3.3 Work completed since the last meeting

3.3.4 Work planned for the next meeting

3.3.5 Supervisor's signature and remarks

3.4 A Mid-Term Review shall be conducted by an internal panel in the eighth week of the semester.

3.5 Students failing the Mid-Term Review (less than 50% progress) shall be placed under academic probation and must resubmit within two weeks.

4. Documentation and Report Standards

4.1 The final project report must be prepared using LaTeX and compiled to PDF.

4.2 The report shall follow the standard chapter structure:

4.2.1 Title Page

4.2.2 Certificate of Originality (signed by student and supervisor)

4.2.3 Abstract (150–300 words)

4.2.4 Table of Contents, List of Figures, List of Tables

4.2.5 Chapter 1: Introduction

4.2.6 Chapter 2: Literature Review

4.2.7 Chapter 3: System Design and Methodology

4.2.8 Chapter 4: Implementation

4.2.9 Chapter 5: Testing, Results, and Evaluation

4.2.10 Chapter 6: Conclusion and Future Scope

4.2.11 References / Bibliography

4.2.12 Appendices (if any)

4.3 Formatting specifications:

4.3.1 Font: Computer Modern or Times New Roman, 12 pt

4.3.2 Line spacing: 1.5 lines

4.3.3 Margins: 2.5 cm on left side and 1.5 on all sides

4.3.4 Heading should be in Bold, max size should not exceed 14 pt

4.3.5 Page size: A4

4.3.6 Citation style: IEEE or ACM format

4.3.7 All figures and tables must be numbered, captioned, and referenced in the text

4.4 The report must be submitted in the following manner:

4.4.1 Two hardbound copies (black cover, golden lettering) to the Department

4.4.2 One soft copy (PDF)

5. Plagiarism and Academic Integrity

5.1 The final report must be submitted to the institutional plagiarism detection tool (e.g., ***Turnitin, iThenticate, Drillbit).***

5.2 The maximum permissible similarity index is 15% for the entire report and 7% from any single source.

5.3 Code plagiarism is strictly prohibited. The source code shall be checked using automated plagiarism detection tools.

5.4 Any violation of academic integrity shall result in:

5.4.1 First offense: Zero marks for the project; mandatory resubmission in the next academic term

5.4.2 Second offense: Cancellation of the project and disciplinary action by the Academic Council

6. Submission Deadlines

6.1 Synopsis Submission: Week 2 of the semester

6.2 Mid-Term Report: Week 8 of the semester

6.3 Final Report Submission: Week 16 of the semester (strict deadline)

6.4 Late submissions shall attract a penalty of 10% of total marks per day of delay, up to a maximum of five days. Submissions beyond five days shall not be accepted.

7. Evaluation and Assessment

7.1 The project shall be evaluated out of a total of [100 / 200 / 500] marks, distributed as follows:

7.1.1 Mid-Term Review: 20%

7.1.2 Final Report (Documentation): 30%

7.1.3 Implementation and Code Quality: 25%

7.1.4 Final Viva-Voce and Presentation: 25%

7.2 The Final Viva-Voce shall be conducted by a panel comprising:

7.2.1 Internal Supervisor

7.2.2 One Internal Examiner (other than supervisor)

7.2.3 One External Examiner (from academia or industry)

7.3 The presentation shall be 15–20 minutes followed by a 10–15 minute question-and-answer session.

7.4 A live demonstration of the working system is mandatory during the viva.

7.5 To pass, a student must secure a minimum of 40% in each component and 50% in aggregate.

8. Deliverables Checklist

8.1 At the time of final submission, the student must provide:

8.1.1 Final Project Report (2 hardbound and soft copy)

8.1.2 Plagiarism Report (original and within limit)

8.1.3 Source Code (with README and setup instructions)

8.1.4 Presentation Slides (PPT/PDF)

8.1.5 Demonstration Video (5–10 minutes, optional but recommended)

9. Code and Repository Standards

9.1 Source code must be well-commented and follow consistent naming conventions.

9.2 A README.md file must include:

9.2.1 Project title and brief description

9.2.2 Technology stack and dependencies

9.2.3 Installation and execution instructions

9.2.4 Screenshots or demo links

9.2.5 Contribution notes (if group project)

9.3 If the project involves a database, a schema diagram and sample dataset must be included.

9.4 All third-party libraries, APIs, or datasets used must be properly attributed.

10. General Conduct

10.1 Students must maintain professional conduct during all project-related activities.

10.2 Any dispute between group members must be reported to the supervisor and HoD in writing within 48 hours.

10.3 The Department reserves the right to reallocate topics or supervisors under exceptional circumstances.

10.4 All decisions of the Departmental Project Committee shall be final and binding.

IARD	MAJOR RESEACRH PROJECT / DISSERTATION

IARD-MAJOR RESEACRH PROJECT / DISSERTATION as assigned and advised by teacher(s).