THE MAHATMA GANDHI UNIVERSITY

Bachelor in Computer Applications (Honours)

SYLLABUS

MGU-BCA (Honours)

(2024 Admission Onwards)

Faculty: Technology and Applied Sciences

Expert Committee: Computer Application (UG)

Programme: Bachelor in Computer Applications (Honours)

Mahatma Gandhi University
Priyadarshini Hills
Kottayam – 686560, Kerala, India

CONTENTS

External Experts	
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2	**Prof. (Dr.) Sabu M K**, Professor, Department of Computer Applications, Cochin University of Science and Technology, Kochi
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2	**Dr. Ajitha R S,** Assistant Professor, Department of Computer Applications, NSS College, Rajakumari
3	**Mr. Bineesh Jose,** Assistant Professor, Department of Computer Applications, Pavanatma College, Murickassery
4	**Dr. Reji K Kollinal,** Assistant Professor, Department of Computer Applications, BPC College, Piravom
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7	**Ms. Bindhu Prabha,** Associate Professor, Department of Computer Applications, SAS SNDP Yogam College, Konni
8	**Dr. Leena C Sekhar,** Associate Professor, Department of Computer Applications, MES College, Marampally
9	**Dr. Juby George,** Assistant Professor, Department of Computer Applications, Marian College, Kuttikkanam
10	**Dr. Sowmya M R,** Assistant Professor, Department of Computer Science, Sree Sankara College, Kalady
11	**Mr. Biju Kumar S P,** Assistant Professor, Department of Computer Applications, NSS College Rajakumari, Idukki (Dist)

Third Semester								
Course Code	Course Type	Course Title	Hours / week	*L	*T	*P	*O	Credit
MG3CCRBCA200	CC	Quantitative Techniques	4	4	0	0	0	4
MG3CCRBCA201	CC	Database Management Systems	6	4	0	2	0	5
MG3CCRBCA202	CC	Software Engineering	3	3	0	0	0	3
MG3CCRBCA203	CC	Design and Analysis of Algorithms	3	3	0	0	0	3
MG3SECBCA200	SEC	Python Programming	5	3	0	2	0	4
	*DSE	**Professional Elective – I**	4	2	0	2	0	3
MG3DSEBCA200		Basics of Data Analytics using Spreadsheet (*Data Science specialization*)						
MG3DSEBCA201		Feature Engineering (*Artificial Intelligence & Machine Learning specialization*)						
MG3DSEBCA202		Web Programming -I (*Full Stack Development specialization*)						
		TOTAL	25	19	0	6	0	22
Fourth Semester								
MG4CCRBCA200	CC	Artificial Intelligence	6	4	0	2	0	5
MG4VACBCA200	#VAC	Entrepreneurship and Startup Ecosystem	2	2	0	0	0	2
MG4VACBCA201		IT and Environmental Sustainability						
MG4SECBCA200	SEC	Object Oriented Programming using Java	7	3	0	4	0	5
MG4SECBCA201	SEC	Probability Distributions and Statistical Inference	4	4	0	0	0	4
MG4SECBCA202	SEC	Design Thinking and Innovation	2	2	0	0	0	2
		Professional Elective – II						
MG4DSEBCA200	*DSE	Data Visualization (*Data Science Specialization*)	4	2	0	2	0	3
MG4DSEBCA201		Introduction to Machine Learning (*Artificial Intelligence & Machine Learning Specialization*)						
MG4DSEBCA202		Web Programming -I (*Full Stack Development Specialization*)						
		TOTAL	25	17	0	8	0	21

*L-Lecture; *T-Tutorial; *P-Practical/Practicum; *O- Others

*DSE- The Student can choose one from the available elective options

#VAC- The Student can choose one from the available options

	Mahatma Gandhi University **Kottayam**
Programme	**BCA (Honours)**
Course Name	**Quantitative Techniques**
Type of Course	**Core Course**
Course Code	MG3CCRBCA200
Course Level	NA
Course Summary	Students will learn statistical concepts, including measures of central tendency and dispersion. They will understand correlation, regression, and probability basics. Upon completion, students will apply statistical methods to analyze data and make informed decisions.

Semester	3	Credits			4	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		4	0	0	0	60
Pre-requisites, if any	NIL					

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains *	PO No
1	Describe *the fundamental concepts of statistics, including data types, collection methods, and representation techniques, to analyse and interpret data effectively for decision-making in various fields.*	U	1
2	C*ompute and interpret central tendency and dispersion measures to summarize datasets, assess variability, and make data-driven decisions.*	An	1,2
3	E*valuate relationships between variables using correlation coefficients, construct regression models for prediction, and interpret the association between correlation and regression.*	A	1,2

4	*Apply fundamental probability concepts to solve real-world problems involving uncertainty and decision-making.*	A	1,2
Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)			

COURSE CONTENT

Content for Classroom transactions (Units)

Module	Units	Course description	Hrs	CO No.
1		**Introduction to Statistics**		
	1.1	Origin, Definition, Functions, Applications and Limitations of Statistics	2	1
	1.2	Population and Sample, Qualitative and Quantitative data, Primary and Secondary data, Methods of collecting primary and secondary data, Drafting a Questionnaire	3	1
	1.3	Census and Sampling methods, Different types of sampling methods (Definitions only)	2	1
	1.4	Classification of data, Tabulation of data, Diagrammatic and Graphical representations- Bar diagrams, Pie diagram, Histogram, Frequency Polygon, Frequency curve, Ogives.	4	1
2		**Measures of Central Tendency and Dispersion**		
	2.1	Measures of Central Tendency-Arithmetic mean, Median and Mode, Empirical Relationship between mean, median and mode, Graphical location of Median and Mode	6	2
	2.2	Combined mean, Weighted mean, Partition Values-Quartiles, deciles and Percentiles	5	2
	2.3	Measures of Dispersion-Absolute & Relative Measures-Range, Quartile deviation, Mean deviation, Standard deviation	6	2
	2.4	Variance and Coefficient of Variation.	2	2
3		**Correlation and Regression**		

	3.1	Correlation- Definition of different types of correlation, Scatter diagram, Measures—Karl Pearson's correlation coefficient.	3	3
	3.2	Degree of correlation, Spearman's rank correlation coefficient, Tie in ranks.	3	3
	3.3	Probable error, Interpretation of correlation coefficient on the basis of PE, Coefficient of determination.	3	3
	3.4	Regression: Definition of different types of Regression, Regression line, Simple linear Regression-Regression equation of y on x and x on y.	3	3
	3.5	Relationship between correlation coefficient and Regression coefficients, Identification of regression lines and properties, Comparison of correlation and regression.	4	3
4	**Basic Concepts of Probability**			
	4.1	Basic concepts of probability: Random experiment, Sample space, Different types of events, and operations with events.	4	4
	4.2	Definitions of Probability- Classical, Empirical and Axiomatic. Addition Theorem (up to 3 events).	4	4
	4.3	Conditional Probability, Independence of events, Multiplication theorem (up to 3 events), Bayes Theorem and its applications.	6	4

Teaching and Learning Approach	**Classroom Procedure (Mode of transaction)** • Brainstorming lectures • Explicit teaching • Active Cooperative learning
Assessment Types	**MODE OF ASSESSMENT** **A. Continuous Comprehensive Assessment (CCA)** **CCA for Theory: 30 Marks** • Quiz / MCQ • Assignments • Tests

	B. End Semester Examination (ESE) **ESE for Theory: Written Test (70 Marks, 2 Hrs)** (Use of a non-programmable calculator allowed) Part A: Answer any 5 questions out of 8. Each question carries 2 marks. (5 x 2 = 10 marks) Part B: Answer any 5 questions out of 8. Each question carries 6 marks. (5 x 6 = 30 marks). Part C: Answer any 2 questions out of 4. Each question carries 15 marks. (2 x 15 = 30 marks)

REFERENCES

1. S.P. Gupta: Statistical Methods (Sultan Chand & Sons Delhi).
2. S.C. Gupta and V.K. Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand and Sons.
3. B.L. Agarwal: Basic Statistics, New Age International (p) Ltd.
4. Parimal Mukhopadhya: Mathematical Statistics, New Central Book Agency (p) Ltd, Calcutta
5. Murthy M.N: Sampling Theory and Methods, Statistical Publishing Society, Calcutta.

Mahatma Gandhi University
Kottayam

Programme	**BCA (Honours)**					
Course Name	**Database Management Systems**					
Type of Course	**Core Course**					
Course Code	**MG3CCRBCA201**					
Course Level	**NA**					
Course Summary	The Database Management Systems (DBMS) course provides an in-depth understanding of the design, implementation, and management of databases, which are crucial for storing and retrieving structured data efficiently. This course covers theoretical concepts, practical techniques, and modern advancements in database technologies.					
Semester	3	Credits			5	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		4	0	1	0	90
Pre-requisites, if any	Basic knowledge of programming, data structures, algorithms, set theory, logical reasoning, and computer fundamentals					

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains *	PO No
1	Analyse the Basic Concept of DBMS	An	1
2	Proficiency in Database design and SQL	An	2
3	Understand Normalization and Transaction Management	An	2
4	Analyse MongoDB Database and Operations.	An	2
5	Implement SQL query, and administer MongoDB databases.	A	2

**Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)*

COURSE CONTENT

Content for Classroom transactions (Units)

Module	Units	Course description	Hrs	CO No.
1	1.1	**Introduction to Databases:** Definition of Data, Database, and DBMS, Overview of Database Applications, Advantages and Disadvantages of DBMS, Roles of Database Users and Administrators	4	1
	1.2	**Data Models:** Introduction to Data Models, Types of Data Models (Hierarchical, Network, Relational, Object-oriented), Importance of Data Models in DBMS.	5	1
	1.3	**Database Design:** Keys: Primary Key, Candidate Key, Super Key, Foreign Key, Composite Key, Alternate Key, Unique Key, Surrogate Key, Constraints in a table: Primary Key, Foreign Key, Unique Key, NOT NULL, CHECK	6	1
2	2.1	**Entity-Relationship (ER) Model**, Entities and Entity Sets, Attributes and Relationships, ER Diagrams, Key Constraints and Weak Entity Sets, Introduction to the Relational Model and Relational Schema	4	2
	2.2	**Relational Algebra and Calculus:** Introduction to Relational Algebra, Operations: Selection, Projection, Set Operations, Join Operations, Division, Tuple and Domain Relational Calculus.	5	2
	2.3	**Structured Query Language (SQL):** SQL Basics: DDL and DML, Aggregate Functions (Min(), Max(), Sum(), Avg(), Count()), Logical operators (AND, OR, NOT), Predicates (Like, Between, Alias, Distinct), Clauses(Group By, Having, Order by, top/limit), Inner Join, Natural Join, Full Outer Join, Left Outer Join, Right outer Join, Equi Join	6	2
3	3.1	**Normalization and Database Design:** Functional Dependencies: Armstrong's Axioms, Definition, Properties (Reflexivity, Augmentation, Transitivity), Types (Trivial, Non-Trivial, Partial and Full Functional Dependency), Closure of	5	3

		Functional Dependencies, Normal Forms (1NF, 2NF, 3NF, BCNF), Denormalization.		
	3.2	**Transaction Management:**ACID Properties, Transactions and Schedules, Concurrent Execution of Transactions, Lock-Based Concurrency Control, Performance of Locking,	5	3
	3.3	Transaction Support in SQL,Introduction to Crash Recovery, 2PL, Serializability, and Recoverability, Introduction to Lock Management, Dealing with Deadlocks	5	3
4	4.1	NoSQL Databases and Big Data: Introduction to NoSQL, Data Models: Document, Key value, Column family, Graph.	5	4
	4.2	Uses and Features of NO/SQL document databases. CAP theorem, BASE vs ACID, CRUD operations, MongoDB operators.	5	4
	4.3	Overview of Big Data Technologies: Hadoop, MongoDB, Cassandra	5	4
5	5.1	(Practical Session) Implement SQL query, and administer MongoDB databases. (List of Programs attached)	30	5
		List of Practicals: 1. Draw an ER Diagram of Registrar Office 2. Draw an ER Diagram of Hospital Management System 3. Reduce The ER diagram in question no 1 into tables 4. Reduce the ER diagram of question no 2 into tables Consider the following Schema Supplier(SID, Sname, branch, city, phone) Part(PID, Pname, color, price) Supplies(SID, PID, qty, date_supplied) **DDL Commands**		

		5. Create the above tables 6. Add a new attribute state in supplier table 7. Remove attribute city from supplier table 8. Modify the data type of phone attribute 9. Change the name of attribute city to address 10. Change a table's name, supplier to sup 11. Use truncate to delete the contents of supplies table 12. Remove the part table from database **DML Commands** 1. Insert at least 10 records in tables supplier, part and supplies 2. Show the contents in tables supplier, part and supplies 3. Find the name and city of all suppliers 4. Find the name and phoneno of all suppliers who stay in 'Delhi' 5. Find all distinct branches of suppliers 6. Delete the record of the supplier whose SID is 204001 7. Delete all records of supplier table 8. Delete all records of suppliers whose city starts with capital A. 9. Find the supplier names which have 'lk' in any position 10. Find the supplier name where 'R' is in the second position 11. Find the name of supplier whose name starts with 'V' and ends with 'A' 12. Change the city of all suppliers to 'BOMBAY' 13. Change the city of supplier 'Vandana' to 'Goa' **Queries with Constraints** 1. Create the supplier table with Primary Key Constraint		

		2. Create supplies table with Foreign key Constraint 3. Create a part table with UNIQUE Constraint 4. Create supplier Table with Check Constraints 5. Create Supplier table with Default Constraint **Queries on TCL** 1. Create Savepoints 2. Rollback to SavePoints 3. Use Commit to save on **Aggregate Functions:** 1. Find the minimum, maximum, average and sum of costs of parts 2. Count the total number of parts present 3. Retrieve the average cost of all parts supplied by 'Mike' **Queries on GROUP BY, HAVING AND ORDER BY Clauses** 1. Display total price of parts of each color 2. Find the branch and the number of suppliers in that branch for branches which have more than 2 suppliers 3. Find all parts sorted by pname in ascending order and cost in descending order 4. Find the branch and the number of suppliers in that branch **Queries on Analytical, Hierarchical and Recursive nature.** 1. Find out the 5th highest earning employee details. 2. Which department has the highest number of employees with a salary above $80,000, and what percentage of employees in that department have a salary above $80,000 3. Retrieve employee table details using the hierarchy query and display that hierarchy path		

		starting from the top level indicating if it is a leaf and there exists a cycle. 4. What is the average salary for employees in the top 2 departments with the highest average salary, and what is the hierarchy of departments and sub-departments for these top 2 departments? 5. Use recursion to retrieve the employee table and display the result in breadth first and depth first order. 6. Write a recursive query to show the equivalent of level, connect_by_root and connect_by_path 7. Use recursion to retrieve the employee table and display the result in depth first order showing id, parent_id, level, root_id, path and leaf. **Queries on Operators** 1. Find the pname, phoneno and cost of parts which have cost equal to or greater than 200 and less than or equal to 600. 2. Find the sname , SID and branch of suppliers who are in 'local' branch or 'global' branch 3. Find the pname, phoneno and cost of parts for which cost is between 200 and 600 4. Find the pname and color of parts , which has the word 'NET' anywhere in its pname. 5. Find the PID and pname of parts with pname either 'NUT' or 'BOLT' 6. List the suppliers who supplied parts on '1st may2000', '12 JAN 2021' ,'17 dec 2000' ,'10 Jan 2021' 7. Find all the distinct costs of parts **Join Operators** 1. Perform Inner join on two tables 2. Perform Natural Join on two tables 3. Perform Left Outer Join on tables 4. Perform Right Outer join on tables		

		5. Perform Full Outer Join on tables **Set Theory Operators** 1. Show the use of UNION operator with union compatibility 2. Show the use of intersect operator with union compatibility 3. Show the use of minus operator with union compatibility 4. Find the cartesian product of two tables **Queries on Set Theory Operators** 1. List all parts except 'NUT' and 'BOLT' in ascending order of costs 2. display all parts that have not been supplied so far 3. To display the supplier names who have supplied 'green' part with cost 500 Rupees AND 'red' part with cost 400 Rupees. 4. To Display the name of suppliers who have supplied all parts that are 'red' in color. **PL/SQL Programs** 1. Write a PL/SQL Code to add two numbers 2. Write a PL/SQL code for Fibonacci series 3. Write a PL/SQL Code for greatest of 3 numbers 4. Write a PL/SQL code for area and circumference of a circle **PL/SQL Programs on Cursors** 1. Write a Program using CURSOR to display SID and city of 1st record of supplier 2. Write a program using cursors to display the SID and City of all suppliers and then print the count of suppliers. **PL/SQL Programs on Triggers, Procedures and Functions** 1. Write a Program using TRIGGER on UPDATE		

		2. Write a command to See the effect of trigger 3. Write a Program using PROCEDURE to increase the cost by Rs.1000 for part whose PID is passed as an argument. 4. Write a procedure to update the city of an supplier whose SID and city are passed as arguments and the procedure returns the name of supplier whose city is updated. 5. Write a function to return the total number of suppliers 6. Write a function to return the PID of part, for which the part name is passed 7. Write a function to find the sum total of costs of all parts. **PL/SQL Programs on Implicit Cursors** 1. Insert a record using %ROWTYPE 2. Write a code using %NOTFOUND, %FOUND, %ROWCOUNT 3. Write a code using %TYPE **MongoDB Queries** 1. Create a collection and insert documents into it using insertOne() and insertMany() 2. Select all documents in collection 3. Find the count of all suppliers 4. Find all records that have city = 'Delhi' 5. Retrieve all documents that have color equal to 'red' or 'green' 6. Retrieve all documents where part_name is 'P1' or price is less than 200. 7. Update the record of 'Geeta' ,set city = 'Bombay' and phoneno = '11223344' 8. Delete all records where price is greater than 5000 9. Display only the name and city of the supplier 10. Sort all suppliers on city and display only the first two records.		

Teaching and Learning Approach	**Classroom Procedure (Mode of transaction)** • Lecture • Demonstration • Practical sessions
Assessment Types	**MODE OF ASSESSMENT** **A. Continuous Comprehensive Assessment (CCA)** **CCA for Theory: 30 Marks** • Written test • Assignments • Viva • MCQ, etc. **CCA for Practical: 15 Marks** • Practical assignments • Lab Record • Observation of practical skills • Viva etc.
	C. End Semester Examination (ESE) **ESE for Theory: Written Test (70 Marks, 2 Hrs.)** Part A: Very Short Answer Questions (Answer all) - (5*2=10 Marks) Part B: Short Answer Questions (5 out of 7 Questions) - (5*6=30 Marks) Part C: Essay Questions (2 out of 3 Questions) - (2*15=30 Marks) **ESE for Practical: (35 Marks, 1.5 Hrs.)** • Logic - 10 Marks • Successful Compilation - 5 Marks • Output - 5 Marks • Viva - 10 Marks • Record - 5 Marks

REFERENCES:

1. Ramez Elmasri and Shamkant B. Navathe - Database Systems, Seventh Edition, Pearson Education. (Module 1,2,3)
2. Kristina Chodorow, MongoDB: The Definitive Guide, Second Edition, O'Reilly Media. (Module 4)

SUGGESTED READINGS:

1. Reghu Ramakrishnan and Johannes Gehrke- Database Management Systems, Third edition, Mc Graw Hill International Edition.
2. Benjamin Rosenzweig, Elena Rakhimov, "Oracle PL/SQL by Example", fifth edition, Prentice Hall, 2015
3. Brad Dayley, "NoSQL with MongoDB in 24 Hours", 1st edition, Sams Publishing, 2024
4. Andreas Meier, Michael Kaufmann, - SQL & NoSQL Databases-Models, Languages, Consistency, Options and Architectures for Big Data Management.

WEB RESOURCES:

1. https://oracle-base.com/articles
2. https://forums.oracle.com/ords/apexds/domain/devcommunity/category/sql_and_pl_sql
3. https://www.mongodb.com/docs/manual/MongoDB-manual.pdf

Mahatma Gandhi University
Kottayam

Programme	**BCA(Honours)**					
Course Name	**Software Engineering**					
Type of Course	**Core Course**					
Course Code	**MG3CCRBCA202**					
Course Level	**NA**					
Course Summary	This course provides a comprehensive understanding of the software development lifecycle (SDLC) and equips students with the skills to manage, design, develop, and test robust software solutions. Emphasizing contemporary practices and strategic decision-making, it prepares students to excel in project management and deliver efficient, maintainable software systems.					
Semester	3	Credits			3	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		3	0	0	0	45
Pre-requisites, if any	Basic understanding of software, applications, and programming fundamentals.					

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains *	PO No
Upon completion of this course, the students will be able to:			
1	Illustrate the software development lifecycle and its application in contemporary software engineering practices.	An	1
2	Analyse project management methodologies and strategic decision making for successful software project execution.	An	1,2
3	Analyse software design, development, and testing processes to produce robust and efficient software solutions.	An	1,2

*Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)

COURSE CONTENT

Content for Classroom transactions (Units)

Module	Units	Course description	Hrs.	CO No.
1	1.1	The evolving role of software, changing nature of software, layered technology, a process framework	5	1
	1.2	Process models: The waterfall model, incremental process models, evolutionary process models, the unified process.	5	1
	1.3	Agile software development: Agility Principles, Agile methods, Plan-driven and agile development, Extreme programming, Scrum, A Tool Set for the Agile Process.	5	1
2	2.1	Software Requirements Engineering: Functional and non-functional requirements, the software requirements document, Requirements specification, Requirements engineering processes, Requirements elicitation and analysis, Requirements validation, Requirement management.	5	2
	2.2	Risk management: Reactive Vs proactive risk strategies, software risks, risk identification, risk projection, risk refinement, RMMM, RMMM plan.	5	2
	2.3	Project planning- Software pricing, Plan-driven development, Project scheduling, Agile planning, Estimation techniques.	5	2
3	3.1	Design: Design process and design quality, design concepts, the design model, software architecture, data design, architectural design, Basic structural modeling, class diagrams, sequence diagrams, collaboration diagrams, use case diagrams, component diagrams.	5	3
	3.2	Testing Strategies: A strategic approach to software testing, test strategies for conventional software, black-box and white-box testing, validation testing, system testing, the art of debugging.	5	3

	3.3	Product metrics: Software quality, metrics for analysis model, metrics for design model, metrics for source code, metrics for testing, metrics for maintenance.	5	3

Teaching and Learning Approach	**Classroom Procedure (Mode of transaction)** Lecturing, Demonstration through ICT tools
Assessment Types	**MODE OF ASSESSMENT** **A. Continuous Comprehensive Assessment (CCA)** **CCA for Theory: 25 Marks** • Written test • Assignment • MCQ/Quiz
	D. End Semester Examination (ESE) **ESE for Theory: Written test (50 Marks, 1.5 Hrs)** Part A: Very Short Answer Questions (Answer all) - (10*2=20 Marks) Part B: Short Answer Questions (3 out of 5 Questions)- (3*5=15 Marks) Part C: Essay Questions (1 out of 2 Questions) - (1*15=15 Marks)

REFERENCES

1. Software Engineering A practitioner's Approach, 8th edition, Roger S Pressman, Bruce R. Maxim. McGraw Hill Education, 2015.
2. Software Engineering, Ian Somerville, 9th edition, Pearson education
3. Software Engineering, N.S. Gill, Khanna Publishing House, 2023

SUGGESTED READINGS

1. Stephen Schach, Software Engineering 7th ed, McGraw-Hill, 2007
2. Software Engineering: Principles and Practice Hans van Vliet

Mahatma Gandhi University
Kottayam

Programme	**BCA (Honours)**					
Course Name	**Design and Analysis of Algorithms**					
Type of Course	**Core Course**					
Course Code	**MG3CCRBCA203**					
Course Level	**NA**					
Course Summary	The course provides a comprehensive understanding of fundamental algorithm design techniques and emphasizes the analysis of algorithm efficiency through time and space complexity. Students will gain the skills to design and implement efficient algorithms to solve practical problems in various domains.					
Semester	3	Credits			3	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		3	0	0	0	45
Pre-requisites, if any	Thorough understanding of Data Structures and algorithms.					

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains *	PO No
Upon completion of this course, the students will be able to:			
1	Illustrate basic algorithm designing paradigms and analyse the performance of algorithms	An	1
2	Analyse the design approaches- Divide and Conquer and the greedy method and apply them in real-life problems	An	2
3	Synthesize algorithms using Dynamic Programming, Backtracking approaches and apply to common real-life problems.	An	2

**Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)*

COURSE CONTENT

Content for Classroom transactions (Units)

Module	Units	Course description	Hrs.	CO No.
1	1.1	Algorithm: Introduction, Definition of Algorithm, Algorithm design techniques.	3	1
	1.2	Performance Analysis :Space complexity, Time Complexity, Asymptotic notations :(O, Ω, θ) to measure growth of a function and application to measure	3	1
	1.3	Recursion: Basic concept. Analysis of recursive algorithms.	3	1
2	2.1	Divide & Conquer Design Technique: The general concept. Binary search, finding the maximum and minimum, merge sort, quick sort. Best and worst case analysis for the mentioned algorithms. Strassen's matrix multiplication.	10	2
	2.2	The Greedy Design Technique: The general concept. Applications to general Knapsack problem.	4	2
	2.3	Spanning trees: Prim's and Kruskal's algorithms, Dijkstra's Algorithm for finding single source shortest paths problem.	5	2
3	3.1	The Dynamic Programming Design Technique: The general concept, All pair of shortest paths problem (Floyd-Warshall's algorithm)	5	3
	3.2	Algorithms on Graphs: Breadth First Search, Depth First Search, finding connected components, depth-first search of a directed graph	7	3
	3.3	Backtracking Method: concept, N-Queen problem; Sum of subsets problem, Hamiltonian circuit problem	5	3

Teaching and Learning Approach	**Classroom Procedure (Mode of transaction)** Lecturing, ICT enabled Sessions, Discussions
Assessment Types	**MODE OF ASSESSMENT** **A. Continuous Comprehensive Assessment (CCA)** **CCA for Theory: 25 Marks** ● Written test ● Assignments ● MCQ
	E. End Semester Examination (ESE) **ESE for Theory: Written Test (50 Marks, 1.5 Hrs)** Part A: Very Short Answer Questions (Answer all) - (10*2=20 Marks) Part B: Short Answer Questions (3 out of 5 Questions) - (3*5=15 Marks) Part C: Essay Questions (1 out of 2 Questions) - (1*15=15 Marks)

REFERENCES

1. Horowitz Ellis, Sahni Sartaj and Rajasekaran Sanguthevar, Fundamentals of Computer Algorithms, University Press (I) Pvt. Ltd., 2012.

2. Gajendra Sharma, Design and Analysis of Algorithms, Khanna Publishing House

3. Cormen Thomas H., Leiserson Charles E., Rivest Ronald L. and Stein Cliffo Introduction to Algorithms, PHI publication, 3rd Edition, 2009

SUGGESTED READINGS

1. Aho Alfred V., Hopcroft John E. & Ullman Jeffrey D., The Design & Analysis of Computer Algorithms, Addison Wesley Publications, Boston, 1983.

2. Kleinberg Jon & Tardos Eva, Algorithm Design, Pearson Education, 2006. Web Resources.

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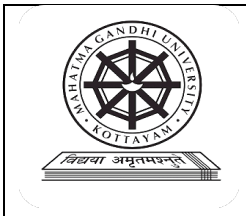
<tr><td>  </td><td colspan="6">Mahatma Gandhi University
Kottayam</td></tr>
<tr><td>Programme</td><td colspan="6">BCA (Honours)</td></tr>
<tr><td>Course Name</td><td colspan="6">Python Programming</td></tr>
<tr><td>Type of Course</td><td colspan="6">SEC</td></tr>
<tr><td>Course Code</td><td colspan="6">MG3SECBCA200</td></tr>
<tr><td>Course Level</td><td colspan="6">NA</td></tr>
<tr><td>Course Summary</td><td colspan="6">This course is designed to teach students how to analyze different types of data using Python. Students will learn how to prepare data for analysis, perform simple statistical analysis, create meaningful data visualizations and predict future trends from data.</td></tr>
<tr><td>Semester</td><td>3</td><td colspan="3">Credits</td><td>4</td><td rowspan="2">Total Hours</td></tr>
<tr><td rowspan="2">Course Details</td><td rowspan="2">Learning Approach</td><td>Lecture</td><td>Tutorial</td><td>Practical</td><td>Others</td></tr>
<tr><td>3</td><td></td><td>1</td><td></td><td>75</td></tr>
<tr><td>Pre-requisites, if any</td><td colspan="6">Understanding of Problem-solving techniques using a programming language and basic data structures.</td></tr>
</table>

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains *	PO No
1	Analyse Python programming concepts.	An	1
2	Apply suitable Python programming constructs, built-in data structures using Python libraries to solve problems.	An	2
3	Analyse basic Data visualization and File handling in Python.	An	2
4	Solve problems using Python Programming.	A	2

**Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)*

COURSE CONTENT

Content for Classroom transactions (Units)

Module	Units	Course description	Hrs.	CO No.
1	1.1	**Introduction:** History and Application areas of Python; Structure of Python Program; Identifiers and Keywords; Operators and Precedence; Basic Data Types and type conversion; Statements and expressions; Input/Output statements.	5	1
	1.2	**Strings:** Creating and Storing Strings, Built-in functions for strings; string operators, String slicing and joining; Formatting Strings.	5	1
	1.3	**Control Flow Statements:** Conditional Flow statements; Loop Control Statements; Nested control Flow; continue and break statements, continue, Pass and exit.	5	1
2	2.1	**Functions:** Built-In Functions, Function Definition and call; Scope and Lifetime of Variables, Default Parameters, Command Line Arguments; Lambda Functions; Assert statement; Importing User defined module;	5	2
	2.2	**Mutable and Immutable objects:** Lists, Tuples and Dictionaries; Commonly used Functions on Lists, Tuples and Dictionaries. Passing Lists, tuples and Dictionaries as arguments to functions. Using Math and Numpy module for list of integers and arrays.	10	2
3	3.1	**Files:** Types of Files; Creating, Reading and writing on Text and Binary Files;The Pickle Module, Reading and Writing CSV Files. Reading and writing of csv and JSON files.	5	3
	3.2	**Exception Handling:** Try-except-else-finally block, raise statement, hierarchy of exceptions, adding exceptions.	5	3
	3.3	**Data visualization:** Plotting various 2D and 3D graphics; Histogram; Pi charts; Sine and cosine curves.	5	3
4	4.1	**Practical List:** 1. Write a program to find whether a number is a prime number. 2. Write a program to print m raise to power n, where m and n are read from the user.	30	4

		3. Write a program having a parameterised function that returns True or False depending on whether the parameter passed is even or odd. 4. Write a program to print the summation of the following series upto n terms:1-2+3-4+5 6+7 - - - - - - - -n 5. Write a menu driven program to perform the following operations on strings using string built in functions. a. Find the frequency of a character in a string. b. Replace a character by another character in a string. c. Remove the first occurrence of a character from a string. d. Remove all occurrences of a character from a string. 6. Write a program that accepts two strings and returns the indices of all the occurrences of the second string in the first string as a list. If the second string is not present in the first string, then it should return -1 7. Using Numpy module write menu driven program to do following a. Create an array filled with 1's. b. Find maximum and minimum values from an array c. Dot product of 2 arrays. d. Reshape a 1-D array to 2-D array. 8. Write a function that takes a sentence as input from the user and calculates the frequency of each letter. Use a variable of dictionary type to maintain the count. 9. Consider a tuple t1=(1,2,5,7,9,2,4,6,8,10). Write a program to perform following operations: a. Print contents of t1 in 2 separate lines such that half values come on one line and other half in the next line. b. Print all even values of t1 as another tuple t2. c. Concatenate a tuple t2=(11,13,15) witht1. d. Return maximum and minimum value from t1.. 10. Write a function that reads a file file1 and copies only alternative lines to another file file2. Alternative lines copied should be the odd numbered lines. 11. Write a Python program to handle a ZeroDivisionError exception when dividing a number by zero. 12. Write a program that reads a list of integers from the user and throws an exception if any numbers are duplicates. 13. Write a program that makes use of a function to display sine, cosine, polynomial and exponential curves. 14. Take as input in the months and profits made by a company ABC over a year. Represent this data using a line plot. Generated line plot must include X axis label		

		name = Month Number and Y axis label name = Total profit.		

Teaching and Learning Approach	**Classroom Procedure (Mode of transaction)** ● Lecture ● Demonstration ● Lab Practicals
Assessment Types	**MODE OF ASSESSMENT** **A. Continuous Comprehensive Assessment (CCA)** **CCA for Theory: 25 Marks** ● Written test ● Assignments etc. **CCA for Practical: 15 Marks** ● Practical assignments ● Lab Record ● Observation of practical skills ● Viva etc.
	F. End Semester Examination (ESE) **ESE for Theory: Written Test (50 Marks, 1.5 Hrs)** Part A: Very Short Answer Questions (Answer all) - (10*2=20 Marks) Part B: Short Answer Questions (3 out of 5 Questions) - (3*5=15 Marks) Part C: Essay Questions (1out of 2 Questions) - (1*15=15 Marks) **ESE for Practical: 35 Marks (1.5 Hrs)** • Logic - 10 Marks • Successful Compilation - 5 Marks • Output - 5 Marks • Viva - 10 Marks • Record - 5 Marks

REFERENCES

1. Fabio Nelli, "Python Data Analytics Data Analysis and Science Using Pandas, Matplotlib, and the Python Programming Language", Edition 1, 2015, Apress.
2. Wes Mckinney ,"Python for Data Analysis: Data Wrangling with pandas, NumPy, and Jupyter" 3rd Edition, O'Reilly, 2022.

SUGGESTED READINGS

1. Think Python, by Allen Downey, 2 nd edition, 2015, O'Reilly.
2. An introduction to Python for absolute beginners, by Bob Dowling, Cambridge Univ.
3. Introduction to Computation and Programming using Python, by John Guttag, 2 nd edition, 2016, PHI India.

Web Resources:

1. https://www.learnpython.org/
2. https://www.w3schools.com/python/default.asp
3. https://wesmckinney.com/book/

<table>
<tr><td>  </td><td colspan="5">Mahatma Gandhi University
Kottayam</td></tr>
<tr><td>Programme</td><td colspan="5">BCA (Honours)</td></tr>
<tr><td>Course Name</td><td colspan="5">Basics of Data Analytics using Spreadsheet</td></tr>
<tr><td>Type of Course</td><td colspan="5">DSE</td></tr>
<tr><td>Course Code</td><td colspan="5">MG3DSEBCA200</td></tr>
<tr><td>Course Level</td><td colspan="5">NA</td></tr>
<tr><td>Course Summary</td><td colspan="5">This course introduces the fundamentals of data analytics and its practical applications, focusing on building a strong foundation in data manipulation and analysis. Students will develop proficiency in using spreadsheet software to create and analyze data models, enabling effective decision-making. The course also emphasizes communicating data insights clearly, equipping students with the skills needed for real-world problem-solving and business analytics.</td></tr>
<tr><td>Semester</td><td>3</td><td colspan="2">Credits</td><td>3</td><td rowspan="2">Total Hours</td></tr>
<tr><td>Course Details</td><td rowspan="2">Learning Approach</td><td>Lecture</td><td>Tutorial</td><td>Practical</td><td>Others</td></tr>
<tr><td></td><td>2</td><td>0</td><td>1</td><td>0</td><td>60</td></tr>
<tr><td>Pre-requisites, if any</td><td colspan="5">Knowledge of the basics of mathematical & Statistical concepts such as arithmetic, percentages, averages, and basic algebra.</td></tr>
</table>

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains *	PO No
Upon completion of this course, the students will be able to:			
1	Understand the basics of data analytics and its applications.	U	1
2	Develop proficiency in using spreadsheet software for data manipulation and analysis.	A	2
3	Build and use spreadsheet models for decision making & Communicate data insights effectively	A	2

Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)

COURSE CONTENT

Content for Classroom transactions (Units)

Module	Units	Course description	Hrs	CO No.
1	1.1	Understanding data and its types (structured, unstructured, semi-structured)-What is Data Analytics- Types of data Analytics	5	1
	1.2	Importance of Data Analytics- Applications of Data Analytics.	5	1
2	2.1	Data Collection Methods - Different Data Sources & format - Data Cleaning and Transformation - Handling Missing Data and Outliers.	8	2
	2.2	Ethical considerations in data analytics	4	2
	2.3	Real-world Applications of Data Analytics- Industry-specific applications (finance, marketing, operations) - Case Study Note: Case study is for discussion not to be considered for evaluation.	8	2
3	**Lab Practice**			
	3.1	Introduction to Spreadsheet tool- Basic Functions, Data importing and pre-processing	5	3
	3.2	Descriptive Statistics Using Spreadsheet, Advanced Spreadsheet functions	10	3
	3.3	Data visualization techniques, Dashboard creation	15	3

Teaching and Learning Approach	**Classroom Procedure (Mode of transaction)** Lecture, Practical, Demonstration through ICT tools
Assessment Types	**MODE OF ASSESSMENT** **Continuous Comprehensive Assessment (CCA)**

	CCA for Theory: 15 Marks • Written test • Assignment • MCQ/Quiz **CCA for Practical: 15 Marks** • Practical assignments • Lab Record • Observation of practical skills • Viva
	G. End Semester Examination (ESE) **ESE for Theory: Written test (35 Marks, 1 Hr)** Part A: Short Answer Questions (7 out of 10 Questions) - (7*5=35 Marks) **ESE for Practical: (35 Marks, 1.5 Hr.)** • Procedure - 10 Marks • Output – 10 Marks • Viva - 10 Marks • Record - 5 Marks

REFERENCES

1. "Data Analytics" by V.K. Jain, Khanna Book Publishing Company, 2024.
2. "Excel Data Analysis For Dummies" by Stephen L. Nelson and E. C. Nelson, John Wiley & Sons; 3rd edition, 2016
3. "Data Analysis Using Microsoft Excel" by Michael R. Middleton, Thomson, Brooks/Cole, 3rd edition, 2004

SUGGESTED READINGS

1. "Excel 2019 Bible" by Michael Alexander, Richard Kusleika, and John Walkenbach, John Wiley & Sons, 25 Sept 2018
2. "Spreadsheet Modeling and Decision Analysis: A Practical Introduction to Business Analytics" by Cliff T Ragsdale, Cegage learning asia pet. 2015
3. "Mastering Excel" by WebTech Solutions, Khanna Publishing House, 2024.

Mahatma Gandhi University
Kottayam

Programme	**BCA (Honours)**
Course Name	**Feature Engineering**
Type of Course	**DSE**
Course Code	**MG3DSEBCA201**
Course Level	**NA**
Course Summary	This course covers the essential concepts of feature engineering and preprocessing techniques in machine learning. It explores the importance of features, differentiating between structured and unstructured data, and various feature types such as categorical, numerical, text, and date-time. Students will learn how to handle missing data, clean datasets, and apply scaling and normalization. The course also delves into advanced techniques like binning, polynomial features, log transformation, one-hot encoding, label encoding, and feature selection methods, including filter and wrapper methods, while emphasizing the application of Principal Component Analysis (PCA) for dimensionality reduction.

Semester	3	Credits			3	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		2	0	1	0	60
Pre-requisites, if any	Basic knowledge of data analytics/machine learning and familiarity with any programming language					

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains *	PO No
Upon completion of this course, the students will be able to:			
1	Understand the importance of features in machine learning and differentiate between various types of data and features.	U	1
2	Apply basic feature preprocessing techniques such as handling missing data, data cleaning, and feature scaling and normalization	A	2

3	Implement feature engineering techniques for numerical data, including binning, discretization, polynomial and interaction features, and log transformation.	A	2
4	Utilize categorical data techniques, such as one-hot encoding and label encoding, and understand feature selection methods, including filter and wrapper methods.	A	2
5	Perform feature transformation using techniques like Principal Component Analysis (PCA) and understand its application in machine learning.	An	2
Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)			

COURSE CONTENT

Content for Classroom transactions (Units)

Module	Units	Course description	Hrs	CO No.
1	1.1	Introduction to Feature Engineering: Introduction to Data and Features, Importance of Features in Machine Learning.	4	1
	1.2	Data types and features: Numerical, Categorical, Ordinal, Discrete, Continuous, Interval and Ratio.	4	1
	1.3	Basic Feature Preprocessing: Handling Missing Data, Data Cleaning, Feature Scaling, Normalization, and Transformation.	6	2
2	2.1	Techniques for Numerical Data: Binning and Discretization, Polynomial and Interaction Features.	6	3
	2.2	Categorical Data Techniques: One Hot Encoding, Label Encoding.	4	4
	2.3	Feature extraction vs. feature selection, Steps in feature selection. Feature Selection Methods: Filter, Wrapper, and Hybrid. Feature Reduction: Introduction and application of Principal Components Analysis.	6	4
3	**Lab Practice**			
	3.1	Introduction to Python relevant libraries such as numpy, pandas, sklearn, nltk, matplotlib, and seaborn. Kaggle.	10	2

		Dataset access and preprocesing: Handling Missing Data (Mean, Median, Mode Imputation), Data Cleaning		
	3.2	Exploratory Data Analysis (EDA): Histograms and Boxplots, Correlation Matrix Computation and Visualization. Binning and Discretization of Numerical Data,	10	3,4
	3.3	Polynomial and Interaction Feature Creation, Logarithmic Transformation for Skewed Data. Text Data Preprocessing, Principal Component Analysis.	10	2,3,5

Teaching and Learning Approach	**Classroom Procedure (Mode of transaction)** Lecture, Practical, Demonstration through ICT tools, Discussion
Assessment Types	**A. Continuous Comprehensive Assessment (CCA)** **CCA for Theory: 15 Marks** ● Written test ● Assignment ● MCQ/Quiz **CCA for Practical: 15 Marks** ● Practical assignments ● Lab Record ● Observation of practical skills ● Viva
	B. End Semester Examination (ESE) **ESE for Theory: Written test (35 Marks, 1 Hr)** Part A : Very Short Answer Questions(Answer all) - (10*2=20 Marks) Part B : Short answer questions (3 out of 5 questions) - (3*5=15 Marks) **ESE for Practical: (35 Marks, 1 Hr.)** 1. Design and Development - 20 Marks 2. Viva - 10 Marks 3. Record - 5 Marks

REFERENCES

1. M.C. Trivedi, Data Science and Data Analytics Using Python Programming, Khanna Publishing House, 2024.

2. Han, Jiawei, Kamber, Micheline, & Pei, Jian. (2011). Data mining: Concepts and techniques (3rd ed.). Morgan Kaufmann Publishers. ISBN 978-0123814791.
3. Zheng, Alice, & Casari, Amanda. (2018). Feature engineering for machine learning: Principles and techniques for data scientists. O'Reilly Media, Inc.
4. Kalita, J. K., Bhattacharyya, D. K., & Roy, S. (2023). Fundamentals of Data Science: Theory and Practice. Elsevier. ISBN-13: 9780323917780

SUGGESTED READINGS:

1. Duda, R. O., Hart, P. E., Stork, D (2007). Pattern classification (2Ed), John Wiley &Sons, ISBN-13: 978-8126511167.
2. N. Bhaskar, Vasundhara, Machine Learning, Khanna Publishing House, 2024.
3. M.C. Trivedi, Deep Learning and Neural Network_MC Trivedi, Khanna Publishing House, 2024.
4. Ng, Andrew. (2018). Machine learning yearning (Draft, MIT Licensed). GitHub. ISBN10: 199957950X, ISBN-13: 978-1999579500.
5. Tan, Pang-Ning, Steinbach, Michael, Karpatne, Anuj, & Kumar, Vipin. (2021). Introduction to data mining (2nd ed.). Pearson. ISBN 978-9354491047.
6. Provost, Foster, & Fawcett, Tom. (2013). Data science for business: What you need to know about data mining and data-analytic thinking. O'Reilly Media, Inc.
7. Galli, Soledad. (2020). Python feature engineering cookbook: Over 70 recipes for creating, engineering, and transforming features to build machine learning models. Packt Publishing, Limited.
8. Nielsen, Aileen. (2019). Practical time series analysis: Prediction with statistics and machine learning. O'Reilly Media.
9. Rajiv Chopra, Deep Learning, Khanna Publishing House, 2024.
10. Jeeva Jose, Machine Learning, Khanna Publishing House, 2024.
11. Chollet, François. (2017). Deep learning with Python. Manning Publications. ISBN 9781617294433.

Mahatma Gandhi University
Kottayam

Programme	**BCA(Honours)**
Course Name	**Web Programming-I**
Type of Course	**DSE**
Course Code	**MG3DSEBCA202**
Course Level	**NA**
Course Summary	This course covers the essential concepts of feature engineering and preprocessing techniques in machine learning. It explores the importance of features, differentiating between structured and unstructured data, and various feature types such as categorical, numerical, text, and date-time. Students will learn how to handle missing data, clean datasets, and apply scaling and normalization. The course also delves into advanced techniques like binning, polynomial features, log transformation, one-hot encoding, label encoding, and feature selection methods, including filter and wrapper methods, while emphasizing the application of Principal Component Analysis (PCA) for dimensionality reduction.

Semester	3	Credits			3	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		2	0	1	0	60
Pre-requisites, if any	Basic Understanding of HTML					

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains *	PO No
Upon completion of this course, the students will be able to:			
1	Understand the fundamental concepts and components of web development.	U	1
2	Apply intermediate-level web development techniques and develop PHP Programming Skills:	A	2
3	Integrate PHP with Databases	A	2

**Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)*

COURSE CONTENT

Content for Classroom transactions (Units)

Module	Units	Course description	Hrs	CO No.
1	1.1	Introduction to web, WWW architecture .Introduction to PHP, Server-side scripting, XAmPP, Role of web server software, PHP comments, variables, echo and print, PHP operators, data types.	3	1
	1.2	PHP branching statements and loping statements, arrays in PHP-numeric array, associative array, multidimensional array, array functions in PHP.	6	1,2
	1.3	Multidimensional array, array functions in PHP push, pop, shift, unshift, array_search, in_array, sort(), rsort, asort, arsort, ksort, krsort.	6	1,2
2	2.1	PHP form:$_GET,$_POST,$_SERVER, $_REQUEST, $_GLOBALS, include and require function	6	2
	2.2	Basic MYSQL commands CRUD	4	2,3
	2.3	PHP- MYSQL database connectivity using procedure oriented methods-mysqli_connect, mysqli_clos	3	2,3
	2.4	ysqli_query, mysqli_fetch_row, mysqli_fetch_assoc, ysqli_fetch_array	2	2,3
3	**Lab Practice**			
	3.1	Using PHP, create dynamic websites, form handling applications	10	1,2
	3.2	CRUD (Create, Read, Update, Delete) applications, arrays and data manipulation programs	10	2
	3.3	Dynamic content display and PHP-MySQL database connectivity applications.	10	3

Teaching and Learning Approach	**Classroom Procedure (Mode of transaction)** Lecture,, Demonstration through ICT tools
Assessment Types	**A. Continuous Comprehensive Assessment (CCA)** **CCA for Theory: 15 Marks** ● Written test ● Assignment ● MCQ/Quiz **CCA for Practical: 15 Marks** ● Practical assignments ● Lab Record ● Observation of practical skills ● Viva
	B. End Semester Examination (ESE) **ESE for Theory: Written test (35 Marks, 1 Hr)** Part A: Very Short Answer Questions (Answer all) - 10 X2 = 20 Marks Part B: Short answer questions (3 out of 5 questions) - 3X5 = 15 Marks **ESE for Practical: (35 Marks, 1 Hr.)** 1. Design and Development - 20 Marks 2. Viva - 10 Marks 3. Record - 5 Marks

REFERENCES:

1. Dave W Mercer, Allan Kent, Steven D Nowicki, David Mercer, Dan Squier, Wankyu Choi- "Beginning PHP5", Wiley Publishing, Inc.
2. Adrian W. West, Steve Prettyman, Practical PHP 7, MySQL 8, and MariaDB Website Databases, A Simplified Approach to Developing Database-Driven Websites, Second Edition, Apress

SUGGESTED READINGS:

1. Mike O'Kane, Essential Algorithms, Syntax, and Control Structures Using PHP, HTML, and MariaDB/MySQL, Carolina Academic Press, Fourth Edition.
2. Julie C. Meloni, Teach Yourself PHP, MySQL® and Apache All in One, Fifth Edition.