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

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2	Scheme of First Semester BCA (Honours)
3	Semester 1 Course 1 **Fundamentals of Programming Using C**
4	Semester 1 Course 2 **Digital Fundamentals**
5	Semester 1 Course 3 **Software Lab in C**
6	Semester 1 Course 4 **Discrete Mathematics**
7	Semester 1 Course 5 **Cyber Laws and Security**

MGU-BCA (HONOURS)

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External Experts	
1	**Prof. (Dr.) Bindu V R**, Professor and Head, School of Computer Sciences, Mahatma Gandhi University, Kottayam
2	**Prof. (Dr.) Sabu M K**, Professor, Department of Computer Applications, Cochin University of Science and Technology, Kochi
Members of the Expert Committee in Computer Application (UG)	
1	**Dr. Rajimol A,** Associate Professor, Department of Computer Applications, Marian College Kuttikkanam (Autonomous), Kuttikkanam (Chairperson UG Board)
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
5	**Ms. Simi M,** Associate Professor, Department of Computer Applications, SAS SNDP Yogam College, Konni
6	**Ms. Ambili M S,** Assistant Professor, Department of Computer Science, Sree Sankara Vidyapeetom College, Valayanchirangara
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)

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First Semester								
Course Code	Title of the Course	Type of the Course .	Credit	Hours / week	Hour Distribution /week			
					L	T	P	O
MG1DSCBCA100	Fundamentals of Programming using C	DSC	4	4	4	0	0	0
MG1DSCBCA101	Digital Fundamentals	DSC	4	4	4	0	0	0
MG1DSCBCA102	Software lab in C	DSC	2	4	0	0	4	0
MG1DSCBCA103	Discrete Mathematics	DSC	4	4	4	0	0	0
MG1MDCBCA100	Cyber Laws and Online Safety	MDC	3	3	3	0	0	0
	AEC- ENGLISH	AEC 1	3	3	3	0	0	0
	AEC-OL	AEC 2	3	3	3	0	0	0

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Kottayam

Programme	**BCA (Honours)**					
Course Name	**Fundamentals of Programming Using C**					
Type of Course	**DSC**					
Course Code	MG1DSCBCA100					
Course Level	**100**					
Course Summary	This course covers fundamental concepts in computer programming, including algorithms, flowcharts, programming languages, control flow structures, arrays, and functions, emphasizing practical implementation through a series of hands-on exercises. Students will gain proficiency in solving problems using the C programming language.					
Semester	1	Credits			4	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		4	0	0	0	60
Pre-requisites, if any						

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains *	PO No
1	Demonstrate basic programming concepts.	U	1
2	Understand C Programming Basics such as Datatypes and Variables, Different types of operators.	U	2
3	Devise C programs using the concept of Decision statements and loop control statements.	An	2
4	Apply logic to use arrays and functions in C Programming Language.	A	1

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

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COURSE CONTENT

Content for Classroom transactions (Units)

Module	Units	Course description	Hrs	CO No.
1	1.1	Problem Solving Life Cycle – Understanding the Problem Statement, Analysing the problem, Planning Program design using Hierarchy charts, Top-down approach, Bottom-up approach. Understanding basic Problem-Solving Tools: Algorithms: Definition & its attributes, Flowchart: Definition & its attributes, symbols, Statements: Input-Output, Decision-Making &Looping, Module representation	6	1
	1.2	**Introduction to Programming:** Computer program. Classification of computer languages: machine, assembly and high-level languages, Language translators (Assembler, Compiler, Interpreter), Linker, Testing and debugging,	4	1
	1.3	Types of errors- Syntax errors, Logical errors and Runtime errors.	2	1
2	2.1	C Character Set, Delimiters, Types of Tokens, C Keywords, Identifiers, Constants, Variables, Rules for defining variables,	2	2
	2.2	Data types, C data types, Declaring and initialization of variables, Type modifiers, Type conversion, Operators and Expressions-	5	2
	2.3	Properties of operators, Priority of operators, Comma and conditional operator, Arithmetic operators, Relational operators,	3	2
	2.4	Assignment operators and expressions, Logical Operators, Bitwise operators.	4	2
3	3.1	Input and Output in C – Formatted functions, unformatted functions, commonly used library functions,	5	3
	3.2	Decision Statements If, if-else, nested if-else, if-else-if ladder, break, continue, goto, switch, nested switch, switch case and nested if.	6	3
	3.3	Loop control- for loops, nested for loops, while loops, do while loop.	6	3
4	4.1	Array, initialization, array terminology, characteristics of an array, one dimensional array and operations,	5	4

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	4.2	Two dimensional arrays and operations. Strings and standard functions, Introduction to pointers. Basics of a function, function definition, return statement,	6	4
	4.3	Types of functions, call by value and reference. Recursion - Rules for recursive function, Advantages and disadvantages of recursion. Storage class, Structure and union, Features of structures, Declaration and initialization of structures, typedef, enumerated data types, Union.	6	4

Teaching and Learning Approach	**Classroom Procedure (Mode of transaction)** • Use of ICT tools in conjunction with traditional classroom teaching methods • Interactive sessions • Class discussions
Assessment Types	**MODE OF ASSESSMENT** **A. Continuous Comprehensive Assessment (CCA)** **CCA for Theory: 30 Marks** 1. Written tests 2. Assignments 3. Quiz
	B. Semester End Examination **ESE for Theory: Written Test (70 Marks, 2 Hrs)** Part A: Very Short Answer Questions (Answer all) - (10*2=20 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*10=20 Marks)

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REFERENCES

1. Balagurusamy, E. (2019), “Programming in ANSI C” (8th ed.), Tata McGraw Hill.

2. Hanly J. R. and Koffman E. B. (2007), “Problem Solving and Program Design in C” (7th ed.), Pearson Education.

SUGGESTED READINGS

1. Gottfried, B. S. (2018). “Programming with C" (4th ed.). Schaum’s Outline Series, TMH.

2. Pradeep K. Sinha and Priti Sinha (2004), “Computer Fundamentals -Concepts, Systems & Applications”, 8th Edition, BPB Publications.

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	Mahatma Gandhi University **Kottayam**

Programme	BCA (Honours)					
Course Name	**Digital Fundamentals**					
Type of Course	DSC					
Course Code	MG1DSCBCA101					
Course Level	100					
Course Summary	This course covers the fundamentals of digital electronics, including number systems, Boolean algebra, logic gates, combinational logic circuits, and sequential logic circuits. Students gain a comprehensive understanding of digital logic design principles and their applications Through theoretical concepts and practical examples.					
Semester	1	Credits			4	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		4	0	0	0	60
Pre-requisites, if any						

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains *	PO No
1	Demonstrate comprehension of number systems.	U,A	2
2	Analyse working of logic gates, solve expressions using laws of Boolean algebra.	An,A	1,2
3	Illustrate the combinational logic circuits using multiplexers, demultiplexers and other circuits	U,An	1,3
4	Design sequential circuits using flip flops and registers	An,A	1,2

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

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COURSE CONTENT

Content for Classroom transactions (Units)

Module	Units	Course description	Hrs	CO No.
1	1.1	Number Systems, Introduction – Base or radix, Non-positional and Positional number system, Popular number systems (Decimal, Binary, Octal and Hexadecimal), Conversion-From one number system to another, Concept of binary addition and subtraction, 1's Complement, 2's complement.	8	1
	1.2	BCD numbers- concept and 8421 additions	2	1
2	2.1	Logic gates- AND, OR, NOT, NAND, NOR, XOR and XNOR. Truth tables and graphical representation.	5	2
	2.2	Basic laws of Boolean Algebra, Simplification of Expressions, DeMorgan's theorems,	5	2
	2.3	Dual expressions, Canonical expressions. Minterms and Maxterms, SOP and POS expressions	4	
	2.4	Simplification of expressions using K-MAP (up to 4 variables)	5	2
	2.5	Representation of simplified expressions using NAND/NOR Gates, Don't care conditions	4	2
3	3.1	Combinational Logic Circuits: Adders-Half adder, Full adder	7	3
	3.2	Encoders, Decoders (Diagram and working principle)	5	3
	3.3	Multiplexers, Demultiplexers (Diagram and working principle)	5	3
4	4.1	Sequential Logic Circuits: Flip flops- RS, JK, T, D, Triggering of flip flops, Concept of Registers	10	4

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Teaching and Learning Approach	**Classroom Procedure (Mode of transaction)** • ICT enabled Lectures • Interactive sessions • Class discussions
Assessment Types	**MODE OF ASSESSMENT** **A. Continuous Comprehensive Assessment (CCA)**

	CCA for Theory: 30 Marks 1. Written tests 2. Quiz 3. Assignments
	B. Semester End Examination **ESE for Theory: 70 Marks; Written Test (2 Hrs)** Part A: Very Short Answer Questions (Answer all) - (10*2=20 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*10=20 Marks)

REFERENCES

1. M Morris Mano. Digital Logic and Computer Design (4th Edition). Prentice Hall.
2. A. Anand Kumar (2018). Fundamentals of Digital Circuits (4th Edition). PHI Learning Pvt. Ltd.

SUGGESTED READINGS

1. Thomas C Bartee- Digital computer Fundamentals, Sixth Edition, TATA McGraw Hill Edition
2. Thomas L Floyd- Digital Fundamentals, Ninth edition, PEARSON Prentice Hall.
3. Malvino & Leach- Digital Principles and Applications, Sixth Edition, Tata McGraw Hill, 2006

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Mahatma Gandhi University
Kottayam

Programme	**BCA (Honours)**					
Course Name	**Software Lab in C**					
Type of Course	**DSC**					
Course Code	MG1DSCBCA102					
Course Level	**100**					
Course Summary	This course covers problem solving using C Programming, Practical Implementation of Problems using different types of C statements such as control flow structures, loop control structures, arrays, and functions. Students will gain proficiency in solving problems using the C programming language.					
Semester	First	Credits			2	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		0	0	4	0	60
Pre-requisites, if any						

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COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains *	PO No
1	Develop programs to solve various problems using different types of C statements such as control flow structures, loop control structures, arrays, and functions.	A	1

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

COURSE CONTENT

Content for Lab Sessions (Units)

Module	Units	Course description	Hrs	CO No.
1	1.1	Programs to understand the use of Datatypes and variables.	3	1
	1.2	Programs to use different Operators and Type Conversions	5	1
2	2.1	Programs to Apply Input and Output in C, understand Library functions	7	1
	2.2	Program to implement Control structures in C	10	1
	2.3	Programs to Implement Loop Control Structures in C	10	1
3	3.1	Programs to Implement Arrays: One-dimensional and Two-dimensional Arrays	10	1
4	4.1	Program to implement problems using Functions, Recursion and different parameter Passing Methods.	15	1

Teaching and Learning Approach	**Classroom Procedure (Mode of transaction)** • Practical Lab Sessions • Discussions
Assessment Types	**MODE OF ASSESSMENT** **A. Continuous Comprehensive Assessment (CCA)** **CCA for Practical: 30 Marks** 1. Written tests 2. Lab Assessment 3. Viva 4. Record
	B. Semester End Examination **ESE for Practical: 70 Marks (2.5 Hrs)**

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	Lab Examination Test: 70 Marks 1. First Program: 20 Marks 2. Second Program: 30 Marks 3. Viva Voce: 10 Marks 4. Record: 10 Marks

REFERENCES

1. Balagurusamy, E. (2019), “Programming in ANSI C” (8th ed.), Tata McGraw Hill.
2. Hanly J. R. and Koffman E. B. (2007), “Problem Solving and Program Design in C” (7th ed.), Pearson Education.

SUGGESTED READINGS

1. Gottfried, B. S. (2018). “Programming with C" (4th ed.). Schaum’s Outline Series, TMH.
2. Pradeep K. Sinha and Priti Sinha (2004), “Computer Fundamentals -Concepts, Systems & Applications”, 8th Edition, BPB Publications.

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	Mahatma Gandhi University **Kottayam**
Programme	**BCA (Honours)**
Course Name	**Discrete Mathematics**
Type of Course	DSC
Course Code	MG1DSCBCA103
Course Level	**100**
Course Summary	This course introduces basic concepts of Set Theory, Logic, Relations, functions and Matrices. The Basic ideas of Sets and Propositional Logic are further expanded. Mathematical Significance of Relations and functions are explained. Various mathematical manipulations involved in Matrices are properly illustrated. Students acquire skills in applying concepts in Propositional Logic and Relations in different branches of computer science.

Semester	1	Credits			4	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		4	0	0	0	60
Pre-requisites, if any	Nil					

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COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains *	PO No
1	Understand Concepts of Set Theory	U	1
2	Evaluate problems on Set theory.	E	2
3	Understand Propositional Logic.	U	2
4	Identify and Apply Propositional Logic.	A	3
5	Evaluate problems using Truth tables and Logical operators.	E	3
6	Understand And Analyse different types and properties of Relations, functions and Equivalence Relations.	An	2
7	Understand concepts of Matrix and Matrix Operators.	U	2

8	Evaluate the Inverse of a Matrix and solution of a system of Non homogeneous Equations	E	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	Logic and Proofs			
	1.1	Propositional Logic (1.1 of Text 1)	5	3
	1.2	Propositional Equivalences (1.2 of Text 1)	5	4
	1.3	Rules of Inferences for Propositional Logic (Relevant portions of 1.5 of Text 1)	5	5
2	Set Theory			
	2.1	Sets (2. 1 of Text 1)	4	1
	2.2	Set operations. (2. 2 of Text 1)	4	2
	2.3	Functions (2. 3 of Text 1)	4	6
3	Relations			
	3. 1	Relations and their Properties (7. 1 of Text 1)	6	6
	3. 2	Representing relations (7.3 of Text 1)	6	6
	3. 3	Equivalence relations (7.5 of Text 1)	5	6
4	Matrices			
	4. 1	Definition and different types of Matrices, Symmetric and Skew Symmetric Matrices (2.5 of Text 2)	3	7
	4. 2	Matrix operations, Determinant, Matrix inverse (2.6 , Relevant portions of 2.7 of Text 2)	8	7 & 8
	4.3	Solution of a system of Non homogeneous equations by Matrix method and Cramer's rule (Relevant portions of 2.7, 2.10 of Text 2)	5	8

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<table>
<tr><td>Teaching and Learning Approach</td><td colspan="5">Classroom Procedure (Mode of transaction)
Brainstorming lectures, Explicit teaching, Active Cooperative learning</td></tr>
<tr><td rowspan="11">Assessment Types</td><td colspan="5">MODE OF ASSESSMENT</td></tr>
<tr><td>A</td><td colspan="4">Continuous Comprehensive Assessment (CCA) (30 marks)</td></tr>
<tr><td></td><td colspan="4">1. Quiz / MCQ
2. Assignment
3. Tests
4. Tutorial</td></tr>
<tr><td rowspan="7">B</td><td colspan="4">End Semester Evaluation (ESE) 70 marks</td></tr>
<tr><td colspan="4">Question Pattern
[Maximum Time 2 Hours, Maximum Marks 70]</td></tr>
<tr><td rowspan="2">Module</td><td>Part A</td><td>Part B</td><td>Part C</td><td rowspan="2">Total</td></tr>
<tr><td>2 Marks</td><td>6 Marks</td><td>10 Marks</td></tr>
<tr><td>I</td><td>2</td><td>2</td><td>2</td><td>6</td></tr>
<tr><td>II</td><td>2</td><td>2</td><td>1</td><td>5</td></tr>
<tr><td>III</td><td>2</td><td>2</td><td>1</td><td>5</td></tr>
<tr><td>IV</td><td>2</td><td>2</td><td>2</td><td>6</td></tr>
<tr><td></td><td>Total no of questions</td><td>8</td><td>8</td><td>6</td><td>22</td></tr>
<tr><td></td><td>Number of questions to be answered</td><td>5</td><td>5</td><td>3</td><td>13</td></tr>
<tr><td></td><td>Total Marks</td><td>10</td><td>30</td><td>30</td><td>70</td></tr>
</table>

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REFERENCES

1. Kenneth. H. Rosen - Discrete Mathematics and its applications, 6th edition
2. B.S Grewal - Higher Engineering Mathematics, 40th Edition, Khanna Publications

SUGGESTED READINGS

1. Erwin Kreyszig - Advanced Engineering Mathematics, Wiley, India.
2. S.S Sastry - Engineering Mathematics Volume 1, 4th edition PHI.

	Mahatma Gandhi University **Kottayam**
Programme	**BCA (Honours)**
Course Name	**Cyber Laws and Security**
Type of Course	MDC
Course Code	MG1MDCBCA100
Course Level	100
Course Summary	This comprehensive course on Cyber Laws and Security is designed to provide participants with a thorough understanding of cyber laws, including the IT Act, data protection, and regulations related to cybercrimes, cyberbullying, and harassment, along with internet security practices. It also provides a foundational understanding of cryptography, cyber forensics, and ethical hacking principles to enhance knowledge in securing digital information and systems.

Semester	1	Credits			3	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		3	0	0	0	45
Pre-requisites, if any						

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains *	PO No
1	Describe cyber laws, IT Act, data protection and various cybercrimes.	U	1
2	Analyze and apply security measures during online transactions and financial activities.	An	1
3	Illustrate basic cryptographic techniques and importance of cyber forensic.	U	2

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

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COURSE CONTENT

Content for Classroom transaction (Units)

Module	Units	Course description	Hrs	CO No.
1	Cyber Laws, IT Act and Cyber Crimes			
	1.1	Introduction to Cyber laws: Definition and Scope, Key legal concepts in cyberspace.	2	1
	1.2	IT Act: Overview of the IT Act 2000, Offenses and penalties under the IT Act, Amendments and evolving landscape.	4	1
	1.3	Data Protection and Privacy Laws : Principles of Data Protection, Privacy laws and regulations.	3	1
	1.4	Cyber Crimes: Types of Cybercrimes, Hacking and unauthorized access, Identity theft and cyber fraud.	4	1
	1.5	Cyber Bullying and Harassment: Definition and Forms of Cyber Bullying, Legal Perspective on Cyberbullying.	4	1
	1.6	Harassment Laws and social media, Reporting and preventing cyberbullying.	3	1
2	Online Security			
	2.1	Introduction to Internet Security: Overview of Internet Security, Importance of Online Safety.	2	2
	2.2	Passwords and Authentication: Importance of Strong Password, Multi Factor Authentication (MFA).	2	2
	2.3	Secure Browsing Practices: Recognizing and Avoiding phishing Attacks, Identifying Secure Websites (HTTPS).	3	2
	2.4	Social Media Security: Privacy settings on Social media platforms, Secure sharing information.	2	2
	2.5	Online Transaction and Financial Security: Secure online shopping, Banking and Financial Security, Payment Card safety.	2	2
3	Introduction to Cryptography and Cyber Forensics			
	3.1	Security Concepts: Introduction, The need for security, Principles of security, Types of Security attacks	3	3

	3.2	Cryptography Concepts and Techniques: Introduction, plain text and cipher text, substitution techniques, transposition techniques,	4	3
	3.3	Encryption and decryption, symmetric and asymmetric key cryptography	3	3
	3.4	Introduction to Cyber forensics - Definition and importance of cyber forensics, Types of cybercrime -hacking, phishing, identity theft, etc., The role of forensics in investigating cybercrime. Introduction to Ethical Hacking.	4	3

Teaching and Learning Approach	**Classroom Procedure (Mode of transaction)** Lectures, Discussions, Case Analysis
Assessment Types	**MODE OF ASSESSMENT** **A. Continuous Comprehensive Assessment (CCA)** **CCA for Theory: 25 Marks** 1. Written test 2. Assignments 3. MCQ
	B. Semester End Examination **ESE for Theory: 50 Marks (1.5 Hrs)** **Written Test (50 Marks)** Part A: Very Short Answer Questions (Answer all) - (10*2=20 Marks) Part B: Short Answer Questions (6 out of 8 Questions) - (6*5=30 Marks)

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REFERENCES:

1. Vakul Sharma, "Information Technology Law and Practice", 3rd ed. 2011, Universal Law Pub., New Delhi.

2. Adv. Prashant Mali, "Cyber Law & Cyber Crimes", Snow White Publications Pvt. Ltd, 2nd ed. 2015.

3. Michael Cross , "Social Media Security: Leveraging Social Networking While Mitigating Risk", Elsevier, 2014.

4. William Stallings & Lawrie Brown " Computer Security – Principles and Practice" 3rd ed., Pearson Pub., 2017.

5. William Stallings, Cryptography and Network Security Principles and Practice, 4/e,Pearson Ed.

6. Cyber Forensics - Concepts and Approaches, Ravi Kumar & B Jain,2006, icfai university press

SUGGESTED READINGS:

1. "Cyber Law in India" by Pavan Duggal
2. "Cyber Security: A Practitioner's Guide" by Eric Cole
3. "Principles of Intellectual Property" by Stephen M McJohn
4. "The Indian Cyber Law" by Sandeep Agrawal

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Syllabus

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

Sl.No	Title
1	External Experts & Expert Committee
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4	Semester 2 Course 2 **Data Structures**
5	Semester 2 Course 3 **Operating Systems**
6	Semester 2 Course 4 **Web Technologies**
7	Semester 2 Course 5 **Indian Constitution: Legal and Ethical Perspectives for IT**

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Syllabus

External Experts	
1	**Prof. (Dr.) Bindu V R**, Professor and Head, School of Computer Sciences, Mahatma Gandhi University, Kottayam
2	**Prof. (Dr.) Sabu M K**, Professor, Department of Computer Applications, Cochin University of Science and Technology, Kochi
Members of the Expert Committee in Computer Application (UG)	
1	**Dr. Rajimol A,** Associate Professor, Department of Computer Applications, Marian College Kuttikkanam (Autonomous), Kuttikkanam (Chairperson UG Board)
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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11	**Mr. Biju Kumar S P,** Assistant Professor, Department of Computer Applications, NSS College Rajakumari, Idukki (Dist)

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Second Semester							
Sl. No.	**Course Code**	**Course Type**	**Course Title**	**Hours per week**			**Credit**
				L	**T**	**P**	
1	MG2CCRBCA100	CC	Mathematics Foundations to Computer Science	4	0	0	4
2	MG2CCRBCA101	CC	Data Structures	4	0	2	5
3	MG2CCRBCA102	CC	Operating Systems	4	0	0	4
4	MG2SECBCA100	SEC	Web Technologies	1	0	2	2
5	MG2VACBCA100	VAC	Indian Constitution: Legal and Ethical Perspectives for IT	2	0	0	2
6		AEC	AEC -English	3	0	0	3
7		AEC-OL	AEC-Other Language	3	0	0	3
TOTAL				21	0	4	
				25			**23**

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	Mahatma Gandhi University **Kottayam**
Programme	**BCA (Honours)**
Course Name	**Mathematics Foundation to Computer Science**
Type of Course	**Core Course**
Course Code	MG2CCRBCA100
Course Level	NA
Course Summary	This course will introduce graph theory and mathematical techniques that form the foundation of advanced computational methods focusing on numerical methods and optimization. It enables students to comprehend and apply various problem-solving strategies to address both theoretical and practical challenges in computer science.

Semester	2	Credits			4	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		4	0	0	0	60
Pre-requisites, if any	NIL					

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Syllabus

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains *	PO No
1	Apply Concepts of Graph Theory to solve real-life problems.	A	1
2	Apply numerical methods to approximate solutions to mathematical problems.	A	1,2
3	Understand the concepts of Linear programming and Operations Research, and Apply them using graphical and simplex methods.	A	1,2
4	Formulate and solve transportation problems	C	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		**Elementary Graph Theory**		
	1.1	Basic terminologies of graphs, connected and disconnected graphs, subgraphs, paths and cycles, complete graphs, digraphs, weighted graphs, Planar graphs. (Section 3.1 of REF. 1)	4	1
	1.2	Basic concepts of Euler graphs. Characterisation of Euler graphs. (Section 3.1 of REF. 1)	4	1
	1.3	Basic concepts of Trees and Spanning trees. Properties of trees. (Section 3.2 of REF. 1)	5	1
2		**Numerical Methods**		
	2.1	Roots of Nonlinear equations: Bisection method and Newton-Raphson methods. (Section 6.1, 6.6, 6,8 of REF. 2) *Only formula and problem-solving for all the topics mentioned above.*	6	2
	2.2	Numerical Interpolation: Newton's Forward and Backward Interpolation Formula. (Section 9.1,9.7 of REF. 2) *Only formula and problem-solving for all the topics mentioned above.*	5	2
	2.3	Numerical Integration: Trapezoidal rule and Simpson's 1/3 rule. (Section 12.1- 12.4 of REF. 2) *Only formula and problem-solving for all the topics mentioned above.*	6	2
3		**Linear Programming Problem**		
	3.1	Linear programming: Introduction, Formulation of LPP. (REF. 3)	5	3
	3.2	Graphical method for solving LPP with two variables, Special cases in graphical methods.	5	3

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		(REF. 3)		
	3.3	Simplex method, Artificial variable techniques, Big M method. (REF. 3)	6	3
4		**Transportation**		
	4.1	Transportation problem: Definition, Linear form, North-west corner method, Least cost method, Vogel's approximation method for finding a feasible solution. (REF. 3)	4	4
	4.2	MODI method for finding the optimum solution. Degeneracy (REF. 3)	6	4
	4.3	Unbalanced Transportation Problem, Maximisation in transportation problem. (REF. 3)	4	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 • Assignment • Tests
	B. Semester End Examination **ESE for Theory: Written Test (70 Marks, 2 Hrs)** 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)

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REFERENCES

1. Robert J McEliece, Robert B Ash, Carol Ash - Introduction to Discrete Mathematics, McGraw Hill.
2. E Balagurusamy - Numerical Methods, Tata McGraw Hill.
3. V K Kapoor - Operations Research- Concepts, Problems & Solutions, Sultan Chand & Sons

SUGGESTED READINGS

1. Narsingh Deo - Graph Theory with applications to Engineering and Computer Science.
2. P Kandasamy, K Thilagavathy, K Gunavathi - Numerical Methods.
3. Belly E Gillet - Introduction to Operations Research (A Computer Oriented Arithmetic Approach), Tata Mc Graw Hill.

MGU-BCA (HONOURS)

Syllabus

Mahatma Gandhi University

Kottayam

Programme	**BCA (Honours)**
Course Name	**Data Structures**
Type of Course	**Core Course**
Course Code	**MG2CCRBCA101**
Course Level	NA
Course Summary	This course module offers a comprehensive introduction to data structures and its applications. It covers foundational topics such as algorithms, arrays, stacks, queues, recursion, and linked lists. It also covers advanced concepts like hashing, graphs, and tree structures, including AVL trees.

Semester	2	Credits			5	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		4	0	1	0	90

Pre-requisites, if any	1. **Programming Fundamentals:** Understanding the basic syntax and semantics of the C programming language. 2. **Problem-Solving Skills:** Ability to break down a problem into smaller steps, devise a step-by-step solution and be familiar with simple algorithms.

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains *	PO No
1	Understand the fundamental concepts of Data Structures, the Representation of single and two-dimensional arrays and the implementation of various operations on them	An	1
2	Analyse the representation of stacks and queues using arrays, operations on them and application of these data structures in problem-solving.	An	1,2
3	Demonstrate the ability to implement and manipulate various types of linked lists (singly, doubly, and circular)	An	1,2
4	Illustrate the basic concepts of Graphs and Trees and the operations on Binary search trees.	An	1,2

5	Implement Data Structures using C programming language	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 and Overview: Definition, Classification and Operations of Data Structures. Algorithms: Complexity, Time-Space Trade off.	2	1
	1.2	Arrays: Definition and Classification of Arrays, Representation of Linear Arrays in Memory, Operations on Linear Arrays: Traversing, Inserting, Deleting, Searching, Sorting and Merging.	4	1
	1.3	Searching: Linear Search and Binary Search, Comparison of Methods.	3	1
	1.4	Sorting: Bubble Sort, Selection Sort, and Insertion Sort.	4	1
	1.5	Two-Dimensional Arrays, Representation of Two-Dimensional Arrays in Memory, Matrices	2	1
2	2.1	Stacks: Definition, Representation of Stacks using Arrays, Operations on Stacks using Arrays	3	2
	2.2	Application of Stacks: Arithmetic Expressions, Polish Notation, Conversion of Infix Expression to Postfix Expression, Evaluation of Postfix Expression.	5	2
	2.3	Queues: Definition, Representation of Queues using arrays, Types of Queue: Simple Queue, Circular Queue, Double-Ended Queue, Priority Queue,	4	2
	2.4	Operations on Simple Queues and Circular Queues using Array, Applications of Queues.	5	2
3	3.1	Linked Lists: Definition, Comparison with Arrays, Representation, Types of Linked lists	3	3
	3.2	Traversing, Inserting, Deleting and Searching in Singly Linked List. Doubly Linked List and Circular Linked List. Applications of Linked Lists.	7	3
	3.3	Introduction to Hashing, Hash Tables	2	3
	3.4	Recursion: Definition, Runtime Stack, Applications of Recursion: Factorial of Number, Fibonacci Series	5	3
4	4.1	Graphs: Definition, Terminology.	2	4

	4.2	Trees: Definition, Terminology, Binary Trees, Traversal of Binary Tree, Binary Search Tree, Inserting and Searching in Binary Search Tree	5	4
	4.3	Height Balanced Trees: AVL Trees- Introduction	4	4
5	5.1	(Practical Session) Lab Programs: 1. Write a program for insertion and deletion operations in an array. 2. Write a program to search for an element in an array using Linear Search and Binary Search. 3. Write a program to sort an array using Bubble Sort, Selection Sort and Insertion Sort. 4. Write a program to merge two arrays. 5. Write a program to add and subtract two matrices. 6. Write a program to multiply two matrices. 7. Write a program to insert an element into a Singly Linked List: (a) At the beginning (b) At the end (c) At a specified position 8. Write a program to delete an element from a Singly Linked List: (a) At the beginning (b) At the end (c) A specified element 9. Write a program to perform the following operations in a Doubly Linked List: (a) Create (b) Search for an element 10. Write a program to perform the following operations in a Circular Linked List: (a) Create (b) Search an element 11. Write a program to implement stack operations using an array. 12. Write a program to evaluate a postfix expression using a stack. 13. Write a program to perform the following using recursion: (a) Find the factorial of a number (b)Generate Fibonacci Series 14. Write a program to implement simple queue operations using an array. 15. Write a program to implement circular queue operations using an array.	30	5

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		16. Write a program to perform the following operations on a binary search tree. (a) Preorder Traversal (b) Inorder Traversal (c) Postorder Traversal 17. Write a program to perform an insertion operation in a binary search tree.		

Teaching and Learning Approach	**Classroom Procedure (Mode of transaction)** • ICT enabled Lectures • Interactive sessions • Class discussions
Assessment Types	**MODE OF ASSESSMENT** **B. Continuous Comprehensive Assessment (CCA)** **CCA for Theory: 30 Marks** • Written tests • Quiz • Assignments **CCA for Practical: 15 Marks** • Practical assignments • Lab Record • Observation of practical skills • Viva
	C. Semester End Examination **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 Mark

REFERENCES

1. G.S Baluja (2004). Data Structures Through C (A Practical Approach) (2nd Edition). Danapat Rai & Co.

2. Ellis Horowitz and Sartaj Sahni. Fundamentals of Data Structures (2nd Edition). Galgotia Publications.

SUGGESTED READINGS

1. Seymour Lipschutz, Theory and Problems of Data Structures, Schaums Outline Series,2006, McGraw Hill.
2. Yedidyah Langsam, Moshe Augustein, Aaron M Tenenbaum- Data structures using C and C++, Second Edition, Prentice Hall.

MGU-BCA (HONOURS)
Syllabus

Mahatma Gandhi University
Kottayam

Programme	**BCA (Honours)**					
Course Name	**Operating Systems**					
Type of Course	**Core Course**					
Course Code	**MG2CCRBCA102**					
Course Level	NA					
Course Summary	This course provides a comprehensive understanding of operating systems (OS), focusing on their design, functionality, and core components. Students will explore fundamental concepts, including process management, scheduling, synchronization, memory management, and strategies to handle deadlocks and virtual memory.					
Semester	2	Credits			4	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		4	0	0	0	60
Pre-requisites, if any						

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains *	PO No
1	Describe the structure, types, services of operating system.	U	1
2	Analyse the performance of various process scheduling algorithms.	An	2
3	Appraise various techniques for process synchronization and deadlock handling.	An	2
4	Analyse the method employed for memory management in computer systems.	An	2

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

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COURSE CONTENT

Content for Classroom transactions (Units)

Module	Units	Course description	Hrs	CO No.
1	1.1	Operating Systems Overview: Definition. Functions, Structure- Simple, Layered, Microkernels, Modules.	6	1
	1.2	Operating systems Operation-Dual-Mode operation and Timer. Operating System services, User Operating System Interface, System Calls, Types of system calls.	6	1
2	2.1	Process Management: Process Definition, Process states, Process State transitions, Process Scheduling, Process Control Block, Threads, Concept of multithreads.	5	2
	2.2	Process Scheduling: Definition, Scheduling Criteria, CPU scheduling- Preemptive and Non-preemptive. Scheduling algorithms (FCFS, SJF and RR), Performance evaluation of the scheduling Algorithms.	9	2
3	3.1	Process Synchronization: Introduction, Inter-process Communication, Race Conditions. Critical Section Problem, Mutual Exclusion, Semaphores, Monitors.	8	3
	3.2	Deadlocks: System model, deadlock characterization, deadlock prevention, avoidance, Banker's algorithm, Deadlock detection, and recovery from deadlocks.	10	3
4	4.1	**Memory Management**: Logical and Physical address map, Swapping, Contiguous Memory allocation- Internal and External fragmentation and Compaction, Paging, Segmentation.	8	4
	4.2	**Virtual Memory**: Demand paging, Page Replacement algorithms- FIFO, LRU, Optimal. Allocation of frames, thrashing.	8	4

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Teaching and Learning Approach	**Classroom Procedure (Mode of transaction)** • Use of ICT tools in conjunction with traditional classroom teaching methods • Interactive sessions • Class discussions
Assessment Types	**MODE OF ASSESSMENT** **A. Continuous Comprehensive Assessment (CCA)** **CCA for Theory: 30 Marks** • Written tests • Assignments • Quiz • Seminar
	B. Semester End Examination **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)

REFERENCES

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne (2006), Operating System Principles, 7th edition. Wiley India Private Limited, New Delhi.
2. William Stallings (2006), Operating Systems, Internals and Design Principles, 5th edition, Pearson Education, India.

SUGGESTED READINGS

1. Andrew S Tanenbaum, Modern Operating Systems, Third Edition, Prentice Hall India.

MGU BCA (HONOURS) Syllabus

	Mahatma Gandhi University **Kottayam**
Programme	**BCA (Honours)**
Course Name	**Web Technologies**
Type of Course	**SEC**
Course Code	**MG2SECBCA100**
Course Level	NA
Course Summary	This course introduces the fundamental concepts of web development, focusing on HTML, CSS, and JavaScript to build interactive and responsive web pages. Students will also explore server management, web hosting, and modern techniques like AJAX to enhance web application performance.

Semester	2	Credits			2	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		1	0	1	0	45
Pre-requisites, if any						

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains *	PO No
1	Apply HTML and CSS to design and develop interactive web pages, incorporating forms, tables, multimedia, and navigation components.	A	1
2	Implement JavaScript for dynamic web page behavior, including DOM manipulation, form validation, and event handling, while integrating AJAX for asynchronous web applications.	A	2
3	Design and develop fully functional, responsive, and interactive web applications using HTML, CSS, JavaScript and AJAX	A	2

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

MGU-BCA (HONOURS) Syllabus

COURSE CONTENT

Content for Classroom transactions (Units)

Module	Units	Course description	Hrs	CO No.
1	1.1	Introduction to HTML, history of HTML, Objective, basic Structures of HTML, Header Tags, body tags, Paragraph tags.	2	1
	1.2	Tags for FORM Creation, TABLE, FORM, TEXTAREA, SELECT, IMG, IFRAME FIELDSET, ANCHOR.	2	1
	1.3	Lists in HTML, Introduction to DIV tag, NAVBAR Design. Introduction to CSS, types, Selectors, and Responsiveness of a web page.	2	1
	1.4	Introduction to www, Protocols and Programs, Applications and development tools, web browsers, DNS, Web hosting Provider, Setting up of Windows/Linux/Unix web servers, Web hosting in cloud, Types of Web Hosting.	2	1
2	2.1	Introduction to JavaScript: Functions and Events, Document Object model traversing using JavaScript. Output System in JavaScript i.e. Alert, throughput, Input box, Console. Variables and Arrays in JavaScript. Date and String handling in JavaScript.	3	2
	2.2	Manipulating CSS through JavaScript: Form Validation like Required validator, length validator, Pattern validator. Advanced JavaScript, Combining HTML, CSS and JavaScript events and buttons, controlling your browser.	2	2
	2.3	Introduction to AJAX, Purpose, advantages and disadvantages, AJAX based Web applications and alternatives of AJAX.	2	2
3	3.1	**Practical Session** 1. Create your class time table using table tag. 2. Design a Webpage for your college containing description of courses, department, faculties, library etc. using list tags, href tags, and anchor tags. 3. Create web page using Frame with rows and columns where we will have header frame, left frame, right frame,	30	3

		and status bar frame. On clicking in the left frame, information should be displayed in right frame. 4. Create Your Resume using HTML, use text, link, size, color and lists. 5. Create a Web Page of a super market using (internal CSS) 6. Use Inline CSS to format your resume that you have created. 7. Use External CSS to format your time table created. 8. Use all the CSS (inline, internal and external) to format college web page that you have created. 9. Write a HTML Program to create your college website using for mobile device. 10. Write an HTML/JavaScript page to create login page with validations. 11. Develop a Simple calculator for addiction, subtraction, multiplication and division operation using JavaScript. 12. Use Regular Expressions for validations in Login Page using JavaScript. 13. Write a Program to retrieve date from a text file and displaying it using AJAX.		

Teaching and Learning Approach	**Classroom Procedure (Mode of transaction)** • ICT enabled Lectures • Interactive sessions • Class discussions
Assessment Types	**MODE OF ASSESSMENT** **A. Continuous Comprehensive Assessment (CCA)** **CCA for Theory: 15 Marks** • Written tests • Quiz • Assignments **CCA for Practical: 15 Marks** • Lab Involvement • Creativity • Lab Record

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	• Viva
	B. Semester End Examination **ESE for Theory: Written Test(35 Marks, 1 Hr)** Part A: Short Answer Questions (4 out of 6 Questions) - (4*5=20 Marks) Part **B**: Essay Question (1 out of 2 Questions) - (1*15=15 Marks) **ESE for Practical: 35 Marks (1.5 Hrs)** • Design & Development - 20 Marks • Viva- 10 Marks • Record - 5 Mark

REFERENCES:

1. Laura Lemay, Mastering HTML, CSS & Java Script Web Publishing, BPB Publications, 2016

2. Thomas A. Powell, The Complete Reference HTML & CSS, Fifth Edition, 2017

SUGGESTED READINGS:

1. Silvio Moreto, Bootstrap 4 By Example, ebook, 2016.

2. Tanweer Alam, Web Technologies, Khanna Book Publishing, 2011.

MGU-BCA (HONOURS)

Syllabus

Mahatma Gandhi University
Kottayam

Programme	**BCA (Honours)**					
Course Name	**Indian Constitution: Legal and Ethical Perspectives for IT**					
Type of Course	**VAC**					
Course Code	**MG2VACBCA100**					
Course Level	NA					
Course Summary	This course provides an interdisciplinary exploration of the Indian Constitution and its intersection with Information Technology (IT). Spanning three modules, the course examines the foundational principles of the Constitution, emphasizing their relevance in the digital era. Students will delve into governance frameworks, IT laws, and cybersecurity, gaining insights into e-Governance and digital transparency. The course also addresses the ethical implications of emerging technologies, highlighting constitutional perspectives on privacy, data protection, and accountability.					
Semester	2	Credits			2	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		2	0	0	0	30
Pre-requisites, if any	NIL					

MGU-BCA (HONOURS)

COURSE OUTCOMES (CO)

Syllabus

CO No.	Expected Course Outcome	Learning Domains *	PO No
1	Understand the fundamental principles of the Indian Constitution	U	6
2	Explain the legal framework governing IT and cybersecurity in India, and evaluate the role of e-Governance in promoting transparency and accountability.	An	1
3	Analyze the ethical and constitutional implications of emerging technologies.	An	7

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

COURSE CONTENT

Content for Classroom transaction (Units)

Module	Units	Course description	Hrs	CO No.
1	**Foundations of the Indian Constitution**			
	1.1	**Introduction to the Indian Constitution:** Historical background and evolution of the Constitution, Salient features and the Preamble	2	1
	1.2	**Fundamental Rights and Duties:** Fundamental Rights (Articles 12–35), including Right to Privacy in the digital age, Fundamental Duties in the context of digital citizenship and cyber ethics	2	1
	1.3	**Directive Principles of State Policy:** Overview and their impact on governance, Relevance to IT policies and development	3	1
	1.4	**Constitutional Amendments:** Process of amendments, Key amendments impacting IT and technology policies	3	1
2	**Governance, IT Laws, and Cybersecurity**			
	2.1	**Separation of Powers and IT in Governance:** Legislature, Executive, and Judiciary roles in IT policy-making, e-Governance initiatives and digital transformation	2	2
	2.2	**Legal Framework for IT and Cybersecurity:** Overview of the IT Act, 2000 and its amendments, Cybercrime laws, digital signatures, and electronic records	2	2
	2.3	**Right to Information Act and Digital Transparency:** Promoting transparency through RTI, Role of IT in ensuring public accountability and access to information	3	2
	2.4	**Data Protection and Privacy:** Legal provisions on data protection, Emerging challenges with digital data and cybersecurity	3	2
3	**Ethics, Emerging Trends, and IT Applications**			
	3.1	**Digital Ethics and Accountability:** Cyber ethics, misinformation, and online behaviour, Combating challenges like cyberbullying and the digital divide	3	3
	3.2	**Constitutional Perspective on Emerging Technologies:** Legal and ethical implications of AI, blockchain, and IoT, Data sovereignty and balancing innovation with privacy	2	3

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	3.3	**IT for Governance and Policy Implementation:** Role of IT in improving public service delivery, Case studies on successful digital governance initiatives in India.	3	3
	3.4	**Future Directions and Challenges:** Technological advancements and constitutional implications, Evolving role of the judiciary in IT disputes and digital rights	2	3

Teaching and Learning Approach	**Classroom Procedure (Mode of transaction)** Lectures, Discussions, Case Analysis
Assessment Types	**MODE OF ASSESSMENT** **A. Continuous Comprehensive Assessment (CCA)** **CCA for Theory: 15 Marks** • Written test • Assignments • MCQ
	B. Semester End Examination **ESE for Theory: Written Test (35 Marks, 1 Hr)** Part A: Short Answer Questions (7 out of 10 Questions) - (7*5=35 Marks)

REFERENCES:

1. "Introduction to the Constitution of India" by D.D. Basu (Module 1)
2. "Cyber Law in India" by Farooq Ahmad, 6th Edition, New Era Law Publications. (Module 2)
3. "Ethics and Technology: Controversies, Questions, and Strategies for Ethical Computing" by Herman T. Tavani (Module 3)

SUGGESTED READINGS:

1. "The Constitution of India: A Contextual Analysis" by Arun K. Thiruvengadam
2. "Legal Dimensions of Cyber Space" by S.K. Verma and Raman Mittal
3. "Information Technology Law and Practice" by Vakul Sharma
4. "Artificial Intelligence and Law" by Thomas E. Arnold and Michael D. Kirby
5. "E-Governance: Concepts and Case Studies" by C.S.R. Prabhu.
6. The Constitution of India by B.L. Fadia Sahitya Bhawan; New edition (2017).

MGU-BCA (HONOURS) Syllabus

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

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7	Semester 3 Course 5 **Python Programming**
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18	Semester 4 Course 8 **Introduction to Machine Learning** (*Professional Elective 2- Artificial Intelligence & Machine Learning Specialization)*
19	Semester 4 Course 9 **Web Programming -II** (*Professional Elective 2 - Full Stack Development Specialization*)

MGU-BCA (HONOURS)

External Experts	
1	**Prof. (Dr.) Bindu V R**, Professor and Head, School of Computer Sciences, Mahatma Gandhi University, Kottayam
2	**Prof. (Dr.) Sabu M K**, Professor, Department of Computer Applications, Cochin University of Science and Technology, Kochi
Members of the Expert Committee in Computer Application (UG)	
1	**Dr. Rajimol A,** Associate Professor, Department of Computer Applications, Marian College Kuttikkanam (Autonomous), Kuttikkanam (Chairperson UG Board)
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
5	**Ms. Simi M,** Associate Professor, Department of Computer Applications, SAS SNDP Yogam College, Konni
6	**Ms. Ambili M S,** Assistant Professor, Department of Computer Science, Sree Sankara Vidyapeetom College, Valayanchirangara
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)

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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**		

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	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

विद्यया अमृतमश्नुते
MGU-BCA (HONOURS)
Syllabus

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.

MGU-BCA (HONOURS)

Syllabus

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					

MGU-BCA (HONOURS)

COURSE OUTCOMES (CO)

Syllabus

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

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		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**		

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		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		

MGU BCA (HONOURS) Syllabus

		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		

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		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		

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		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.		

MGU-BCA (HONOURS) Syllabus

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

MGU-BCA (HONOURS) Syllabus

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 ·
विद्यया अमृतमश्नुते
MGU-BCA (HONOURS)
Syllabus

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.					

MGU-BCA (HONOURS)

COURSE OUTCOMES (CO)

Syllabus

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

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	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

MGU-BCA (HONOURS) Syllabus

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.					

MGU-BCA (HONOURS)

COURSE OUTCOMES (CO)

Syllabus

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

MGU-BCA (HONOURS)

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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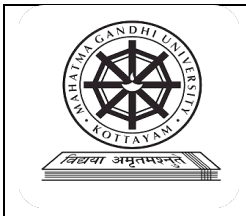
<tr><td>  </td><td colspan="6">Mahatma Gandhi University
Kottayam</td></tr>
<tr><td>Programme</td><td colspan="6">BCA (Honours)</td></tr>
<tr><td>Course Name</td><td colspan="6">Python Programming</td></tr>
<tr><td>Type of Course</td><td colspan="6">SEC</td></tr>
<tr><td>Course Code</td><td colspan="6">MG3SECBCA200</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)

MGU-BCA (HONOURS) Syllabus

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

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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/

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Syllabus

<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>

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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.

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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

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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.

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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

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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.

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Programme	**BCA (Honours)**					
Course Name	**Artificial Intelligence**					
Type of Course	**Core Course**					
Course Code	**MG4CCRBCA200**					
Course Level	**NA**					
Course Summary	The course introduces the fundamental concepts of Artificial Intelligence (AI). It covers AI problem-solving search techniques, including both uninformed and informed search methods. The role of logic and reasoning in AI is explored, along with essential inference techniques. Various domains and applications of AI are examined, such as Machine Learning, Computer Vision, Robotics, Natural Language Processing, and Deep Neural Networks. The course also examines the architecture and role of expert systems through case studies. Additionally, it addresses the legal and ethical issues related to AI, discussing privacy, bias, and societal impacts.					
Semester	4	Credits			5	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		4	0	1	0	90
Pre-requisites, if any	Basic understanding of computer science concepts, including data structures and algorithms. Proficiency in any one programming language, such as Python.					

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains *	PO No
1	Describe the characteristics of rational agents and gain insights about problem-solving agents.	An	1,2
2	Analyse Uninformed and informed search techniques.	An	1, 2

3	Apply knowledge representation using Propositional logic and Predicate calculus for inference/reasoning and handling uncertainty through probabilistic reasoning and fuzzy sets	An	1, 2, 3
4	Illustrate AI domains and their applications and examine the legal and ethical issues of AI	An	2
5	Apply search strategies, solve constraint-based problems, build rule-based systems, evaluate optimization methods, and use basic NLP techniques in intelligent systems.	E	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	Introduction to Al What is AI? Intelligent Agents: Agents and environment, the concept of Rationality, the nature of environment, the structure of Agents	5	1
	2	Knowledge-Based Agents: Introduction to Knowledge-Based Agents, The Wumpus World as an Example World.	5	1
	3	Problem-solving: Problem-solving agents	5	1
2	1	Advanced Search Techniques Uninformed Search: DFS, BFS.	3	2
	2	Informed Search: Best First Search, A* search, AO* search.	4	2
	3	Constraints and Constraint Satisfaction Problems (CSPs), Backtracking search for CSP. Adversarial Search & Games: Two-player zero-sum games, Minimax Search, Alpha-Beta pruning.	4	2
	4	Evolutionary Search Techniques: Introduction to evolutionary algorithms, Genetic algorithms, Applications of evolutionary search in AI.	4	2
	1	Logical Reasoning and Uncertainty Logic: Propositional logic, First-order predicate logic, Propositional versus first-order inference, Unification and lifting.	5	3

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3	2	First Order Inference: Forward chaining, Backward chaining, Resolution, Truth maintenance systems.	5	3
	3	Handling Uncertainties:, Probabilistic reasoning, Introduction to Fuzzy set theory	5	3
4	1	Domains and Applications of AI: Introduction to Machine Learning, Computer Vision, Robotics, Natural Language Processing, Neural Networks.	6	4
	2	Expert Systems: The architecture and role of expert systems (include two case studies).	6	4
	3	Legal and Ethical Issues: Concerns related to AI	3	4
	Case Studies of each module of the syllabus, providing real-world relevance and practical insights		30	5

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5	Group – 1	**Case Study 1**: **AI in Customer Service (Intelligent Agents)** • **Scenario**: A leading e-commerce platform implements AI-powered chatbots to handle customer queries efficiently. • **Details**: Discuss how intelligent agents operate in dynamic environments, adapt to user inputs, and learn over time. Focus on concepts like rationality, agent structure, and agent-environment interaction. **Case Study 2**: **The Wumpus World** • **Scenario**: The classic Wumpus World problem illustrates knowledge-based agents navigating an environment with uncertainty. • **Details**: Extend the problem to real-world examples, such as robot navigation in unknown terrains or automated cleaning robots in dynamic home environments. **Case Study 3**: **Google Maps and Navigation Systems (Search Techniques)** • **Scenario**: Explore how Google Maps uses A* search for route optimization and heuristic-based problem-solving. • **Details**: Discuss the trade-offs between uninformed (DFS, BFS) and informed searches like A*, and their real-world implications for user experience. **Case Study 4**: **Chess and Adversarial Search** • **Scenario**: AI systems like Deep Blue playing chess against world champions. • **Details**: Analyze how the Minimax algorithm and Alpha-Beta pruning were used to evaluate game states, optimize moves, and win against human players.

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	Group - 2	**Case Study 1: Solving the 4-Queens Problem** • **Objective**: Demonstrate CSP techniques like backtracking and constraint propagation. • **Scenario**: The 4-Queens Problem requires placing four queens on a chessboard such that no two queens threaten each other. • **Details**: Formulate the problem as a CSP where variables represent columns, and domains represent rows. Use backtracking to place queens, ensuring constraints (no same row, column, or diagonal placement) are satisfied. Explore improvements with forward checking and arc consistency. **Case Study 2: Solving a Sudoku Puzzle** • **Objective**: Apply constraint propagation and backtracking to a classic problem. • **Scenario**: A partially filled Sudoku grid must be completed so that each row, column, and subgrid contains unique digits. • **Details**: Represent rows, columns, and grids as variables. Apply initial constraint propagation to reduce possible values for each cell. Use backtracking to fill cells while maintaining consistency. **Case Study 3: Scheduling Problem (Timetable Generation)** • **Objective**: Analyze constraints and use CSP techniques for optimization. • **Scenario**: A university needs to generate a timetable for courses, ensuring no instructor or student group has overlapping schedules. • **Details**: Variables: Time slots for courses. Domains: Available time slots. Constraints: Instructors and classrooms must not overlap, and prerequisites must be scheduled in sequence. Use constraint propagation to eliminate invalid slots and backtracking to finalize the schedule. **Case Study 4: Cryptarithmetic Problem**

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		• **Objective**: Solve a CSP involving digits and arithmetic operations. • **Scenario**: Solve a problem like SEND + MORE = MONEY, where each letter represents a unique digit. • **Details**: Variables: Letters (S, E, N, D, M, O, R, Y). Domains: Digits 0-9. Constraints: Each letter must have a unique digit, and the arithmetic sum must be valid. Apply constraint propagation and backtracking to identify valid digit assignments. **Case Study 5: Resource Allocation for a Project** • **Objective**: Optimize resource allocation using CSP techniques. • **Scenario**: Assign tasks to team members while ensuring deadlines are met and workloads are balanced. • **Details**: Variables: Tasks. Domains: Available team members. Constraints: Skillset match, task dependencies, and workload distribution. Use constraint propagation to filter infeasible assignments and backtracking for optimal allocation.
	Group - 3	**Case Study 1**: **Expert Systems for Medical Diagnosis** • **Scenario**: Implementation of an expert system for diagnosing diseases based on patient symptoms and history. • **Details**: Discuss the use of propositional logic and first-order predicate logic in building rule-based systems for accurate diagnosis. **Case Study 2**: **Handling Uncertainty in Weather Forecasting** • **Scenario**: Probabilistic reasoning and Bayesian networks used in weather prediction systems. • **Details**: Explore how these systems manage incomplete or uncertain data to provide accurate forecasts.

	Group - 4	**Case Study 1: Loan Approval System** • **Objective**: Design a rule-based system for automating loan approval processes in banks. • **Scenario**: A system evaluates loan applications based on predefined criteria like credit score, income, and existing debt. • **Details**: **Knowledge Base**: Rules like IF credit_score > 700 AND income > 50000 THEN approve_loan. **Inference Mechanism**: Backward chaining to verify whether a specific loan can be approved, tracing required conditions. **Outcome**: Faster decision-making and reduced manual intervention in loan processing. **Case Study 2: Smart Home Automation** • **Objective**: Implement a rule-based system for automating home appliances. • **Scenario**: A smart home system adjusts lighting, temperature, and security based on user preferences and external conditions. • **Details**: **Knowledge Base**: Rules like IF time = night AND motion_detected = true THEN turn on the lights. **Inference Mechanism**: Forward chaining to trigger actions based on sensor inputs. **Outcome**: Enhanced user convenience and energy efficiency. **Case Study 3: Rule-Based Chatbot** • **Objective**: Create a chatbot for answering customer queries using predefined rules. • **Scenario**: A rule-based chatbot helps users with common issues like order tracking or account settings. • **Details**: **Knowledge Base**: Rules like IF user_query = "Where is my order?" THEN respond = "Please provide your order ID." **Inference Mechanism**: Forward chaining to determine the appropriate response based on input queries. **Outcome**: Seamless user interaction and improved customer support.

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	Group - 5	**Case Study 1**: **AI in Autonomous Vehicles** • **Scenario**: Self-driving cars developed by companies like Tesla and Waymo. • **Details**: Discuss the integration of computer vision, machine learning, and robotics to enable vehicles to navigate safely. **Case Study 2**: **AI in Natural Language Processing (NLP)** • **Scenario**: Language translation systems like Google Translate or voice assistants like Alexa. • **Details**: Examine the challenges of context understanding, ambiguity resolution, and real-time processing in NLP. **Case Study 3**: **Legal and Ethical Issues in AI** • **Scenario**: Controversy around AI bias in hiring systems and facial recognition technologies. **Details**: Discuss ethical considerations, data privacy issues, and the importance of fairness and accountability in AI systems.
Students must prepare a report based on at least one case study analysis from each group of Module 5.		

Teaching and Learning Approach	**Classroom Procedure (Mode of transaction)** • Use of ICT tools in conjunction with traditional classroom teaching methods • Interactive sessions • Class discussions • Practical sessions
Assessment Types	**MODE OF ASSESSMENT** **A. Continuous Comprehensive Assessment (CCA)** **CCA for Theory : 30 Marks** • Written Exam • Oral Presentations • Assignments **CCA for Practical : 15 Marks** • Evaluation of Case Study Assignments/report based on Module 5 • Report must include at least one case study from each of the five groups.
	B. End Semester Examination **ESE for Theory: Written test (70 Marks, 2 Hours)** Part A: Very Short Answer Questions (Answer all) - (5*2=10 Marks)

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	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 Component: 35 Marks** Lab Record : 15 Marks Viva : 20 Marks • Viva Voce based on the submitted report. • No Practical Examination.

REFERENCES:

1. Russell, S. and Norvig, P., "Artificial Intelligence - A Modern Approach", 3rd edition, Prentice Hall
2. Dan W Patterson, Introduction to Artificial Intelligence & Expert Systems, PHI Learning 2010.
3. Lavika Goel, Artificial Intelligence: Concepts and Applications, Wiley, 2021

Suggested Reading:

1. Elaine Rich and Kevin Knight, "Artificial Intelligence" Second Edition, Tata McGraw-Hill Edition.
2. Nilsson Nils J, Artificial Intelligence: A new Synthesis, Morgan Kaufmann Publishers Inc. San Francisco, CA, ISBN: 978-1-55-860467-4.
3. Rajiv Chopra, Data Science with Artificial Intelligence, Machine Learning and Deep Learning, Khanna Book Publishing Company, 2024.
4. M.C. Trivedi, Introduction to AI and Machine Learning, Khanna Book Publishing Company, 2024.
5. Van Hirtum, A. & Kolski, C. (2020). Constraint Satisfaction Problems: Algorithms and Applications. Springer
6. Rajiv Chopra, Machine Learning and Machine Intelligence, Khanna Book Publishing Company, 2024

Syllabus

Mahatma Gandhi University
Kottayam

Programme	**BCA (Honours)**					
Course Name	**Entrepreneurship and Startup Ecosystem**					
Type of Course	**VAC**					
Course Code	**MG4VACBCA200**					
Course Level	**NA**					
Course Summary	This course provides a comprehensive introduction to Design Thinking, a human-centered approach to innovation that integrates the needs of people, the possibilities of technology, and the requirements for business success. Students will explore creative thinking processes, problem-solving approaches, and the importance of customer-centricity in the modern business landscape.					
Semester	4	Credits			2	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		2	0	0	0	30
Pre-requisites, if any	Nil					

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COURSE OUTCOMES (CO)

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CO No.	Expected Course Outcome	Learning Domains *	PO No
1	Understand the legacy of family businesses and key differentiations from entrepreneurship. Be able to identify a business opportunity and translate it into a viable business model.	An	1,3
2	Understand the basic building blocks of creating a venture. Identify the elements of the Indian entrepreneurship ecosystem and leverage the relevant benefits from its constituents.	An	1,3

**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 Entrepreneurship & Family Business : Definition and Concept of entrepreneurship, Entrepreneur Characteristics, Classification of Entrepreneurs,	2	1
	1.2	Role of Entrepreneurship in Economic Development –Start-ups,	2	1
	1.3	Knowing the characteristics of Family business with discussion on few Indian cases of Family Business like Murugappa, Dabur, Wadia, Godrej, Kirloskar etc.	3	1
	1.4	Evaluating Business opportunity: Sources of business ideas and opportunity recognition, Guesstimating the market potential of a business idea,	4	1
	1.5	Feasibility analysis of the idea, Industry, competition and environment analysis.	4	1
2	2.1	Building Blocks of starting ventures, Low cost Marketing using digital technologies,	2	2
	2.2	Team building from scratch, Venture Funding, Establishing the value-chain and managing operations,	3	2
	2.3	Legal aspects like IPR and compliances.	2	2
	2.4	Start-up Ecosystem: Know the components of the start-up ecosystem including Incubators, Accelerators, Venture Capital Funds, Angel Investors etc.,	4	2
	2.5	Know various govt. schemes like Start-up India, Digital India, MSME etc., Sources of Venture Funding available in India, Source of Technology, Intellectual Property management.	4	2

Teaching and Learning Approach	**Classroom Procedure (Mode of transaction)** • Use of ICT tools in conjunction with traditional classroom teaching methods • Interactive sessions

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	• Class discussions
Assessment Types	**MODE OF ASSESSMENT** **Continuous Comprehensive Assessment (CCA)** **CCA for Theory : 15 Marks** • Oral Presentations • Assignments • Written Exam
	B. End Semester Examination **ESE for Theory: 35 Marks (1 Hour)** Part A: Very Short Answer Questions (5 out of 7 Questions) - (5*3=15 Marks) Part B: Short Answer Questions (4 out of 6 Questions) - (4*5=20 Marks)

REFERENCES:

1. Startup India Learning Program by Start Up India available at www.startupindia.gov.in
2. Entrepreneurship, Rajeev Roy, Oxford University Press
3. Entrepreneurship: Successfully Launching New Ventures by R. Duane Ireland Bruce R. Barringer, Pearson Publishing
4. Family Business Management by Rajiv Agarwal, Sage Publishing Anish Tiwari (2003), "Mapping the Startup Ecosystem in India", Economic & Political Weekly
5. Ramachandran, K, Indian Family Businesses: Their survival beyond three generations, ISB Working Paper Series

विद्यया अमृतमश्नुते

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	Mahatma Gandhi University **Kottayam**
Programme	**BCA (Honours)**
Course Name	**IT and Environmental Sustainability**
Type of Course	**VAC**
Course Code	**MG4VACBCA201**
Course Level	NA
Course Summary	This course aims to familiarize students with fundamental environmental concepts and their relevance to IT and business operations, preparing them to address forthcoming sustainability challenges. It is designed to equip students with the knowledge and skills needed to make decisions that account for environmental consequences, fostering environmentally sensitive and responsible future managers.

Semester	4	Credits			2	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		2	0	0	0	30
Pre-requisites, if any	NIL					

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains *	PO No
1	Describe the components of the environment, natural resources, and ecosystems, and explain sustainable practices for their conservation.	U	1,3
2	Identify types of pollution and waste, explain sustainable development goals, and summarize key environmental laws and their impact on society and businesses.	An	1,3, 6
3	Explain key social issues, environmental laws, and the role of population dynamics in promoting sustainable development.	An	1,6, 7,8

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

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COURSE CONTENT

Content for Classroom transaction (Units)

Module	Units	Course description	Hrs	CO No.
1	**Understanding Environment, Natural Resources, and Sustainability**:			
	1.1	Components and segments of the environment, the man-environment relationship, Concept of sustainability; Classification of natural resources, issues related to their overutilization, and strategies for their conservation.	2	1
	1.2	sustainable practices in managing resources, including deforestation, water conservation, energy security, and food security issues. importance of public awareness and education.	3	1
	Ecosystems, Biodiversity, and Sustainable Practices:			
	1.3	Various natural ecosystems, learning about their structure, functions, and ecological characteristics.	2	1
	1.4	The importance of biodiversity, the threats it faces, and the methods used for its conservation.	2	1
	1.5	Need for sustainable ecosystem management, Significance of India as a mega diverse nation.	2	1
2	**Environmental Pollution, Waste Management, and Sustainable Development:**			
	2.1	Various types of environmental pollution, including air, water, noise, soil, marine pollution, E-waste, and their impacts on businesses and communities. Causes of pollution, such as global climate change, ozone layer depletion, the greenhouse effect, and acid rain, with a particular focus on pollution episodes in India.	2	2
	2.2	Classification of waste: solid, liquid, hazardous, and electronic waste. Principles of waste management: 3Rs – Reduce, Reuse, Recycle.	2	2
	2.3	Methods of waste disposal: landfilling, composting, incineration, recycling. E-waste management: Challenges and best practices. Role of IT in efficient waste management (smart bins, waste tracking apps).	3	2
	2.4	Concept and need for sustainability. Principles of sustainable development: Economic growth, Environmental protection, Social inclusion.	2	2
	2.5	UN Sustainable Development Goals (SDGs) with a focus on environmental goals. Green technologies and innovations: Renewable	2	2

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		energy, Green computing, Eco-friendly products. Role of individuals and technology professionals in promoting sustainability.		
3	**Social Issues and Legislation:**			
	3.1	Dynamic interactions between society and the environment, with a focus on sustainable development and environmental ethics.	3	3
	3.2	Overview of key environmental legislation and the judiciary's role in environmental protection, including the Water (Prevention and Control of Pollution) Act of 1974, the Environment (Protection) Act of 1986, and the Air (Prevention and Control of Pollution) Act of 1981.	2	3
	3.3	Environmental justice, environmental refugees, and the resettlement and rehabilitation of affected populations; Ecological economics, human population growth, and demographic changes in India.	3	3

Teaching and Learning Approach	**Classroom Procedure (Mode of transaction)** Lectures, Discussions, Case Analysis
Assessment Types	**MODE OF ASSESSMENT** **A. Continuous Comprehensive Assessment (CCA)** **CCA for Theory: 15 Marks** • Written test • Assignments • MCQ
	B. 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)

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REFERENCES:

1. Text Book of Environmental Studies by Bharucha, E., 3rd Edition, Orient Blackswan Private Ltd.
2. Environmental Studies, 3rd ed., Poonia, M.P. Khanna Book Publishing Co.
3. Sustainable Development: Environment, Energy and Water Resources. Roy, M. G., Ane Books.
4. Fundamentals of environmental studies, Basu, M., & Xavier Savarimuthu, S. J., Cambridge University Press.
5. Text Book of Environmental Studies, Dave, D., & Katewa, S. S Cengage Learning India Pvt Ltd.

6. Rajagopalan, R. *Environmental studies: from crisis to cure* (4th ed.). Oxford University Press.

SUGGESTED READINGS:

Web links:

- https://www.ourplanet.com
- https://www.undp.org/content/undp/en/home/sustainable-development-goals.html
- www.myfootprint.org
- https://www.globalchange.umich.edu/globalchange1/current/lectures/kling/ecosystem/ecosystem.html

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Mahatma Gandhi University
Kottayam

Programme	**BCA (Honours)**					
Course Name	**Object Oriented Programming using Java**					
Type of Course	**SEC**					
Course Code	**MG4SECBCA200**					
Course Level	**NA**					
Course Summary	This course covers basic object-oriented programming concepts, swing and database connectivity.					
Semester	4	Credits			5	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		3	0	2	0	105
Pre-requisites, if any	Knowledge about programming logic					

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains *	PO No
CO1:	Understand the fundamental concepts of object-oriented programming using Java.	U	2
CO2:	Utilize arrays, String, Vectors, Wrapper Classes and inheritance in Java programming	An	2
CO3:	Utilize packages, Exceptions and Threads in Java programming	An	2
CO4:	Apply basic java Programming concepts, Multithreading Exceptions, and packages for problem solving.	An	2
CO5:	Understand basic GUI and JDBC architecture, and develop Java GUI applications to communicate with databases using JDBC.	A	2

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

COURSE CONTENT

Theory Content for Classroom transaction (Units)

Module	Units	Course description	Hrs	CO No.
1	1.1	Concepts of Object-Oriented Programming, Benefits of OOP, Features of Java, Java Environment, defining a class, fields declaration, method declaration, creating object, accessing class members	6	1
	1.2	Decision Making, Branching & Looping: Decision Making with Control Statements, Looping statements, Jump in loops, Labelled loops.	2	1
	1.3	method overloading, constructors, constructor overloading, command line arguments, super keyword, static members	7	1
2	2.1	Arrays-one dimensional arrays, declaration, creation, initialization of arrays, two dimensional arrays.	5	2
	2.2	String class, Vectors, Wrapper Classes, Enumerated Types.	4	2
	2.3	Inheritance, overriding methods, dynamic method despatch, final (variables, methods and classes), abstract methods and classes, interfaces, visibility control	6	2
3	3.1	Packages: -Java API packages overview (lang, util, io, swing, applet), Creating and accessing packages, creating user defined packages, Adding class to a package.	5	3
	3.2	Exception Handling: Using the main keywords of exception handling: try, catch, throw, throws and finally; Nested try, Multiple catch statements, Creating user defined exceptions	4	3
	3.3	Multithreading-creation of multithreaded program-Thread class –Runnable interface-thread life cycle.	6	3
4	4.1	**Simple Java Programs:** 1. Read numeric data from user and output results.(Fibonacci series & Factorial etc.) 2. Numeric and String data as Command line arguments.	4	4
	4.2	1. Simple Programs using arrays: Sorting, searching, matrix operations, palindrome etc. 2. Programs to Utilize String Methods	6	4

	4.3	Programs to implement 1. Method Overloading, Constructor Overloading 2. Inheritance, Method overriding, Dynamic Method Despatch. 3.super, this, final and static keywords 4.Abstract class, interface, Package 5. Exception handling. 6.Multithreading	20	4
5	5.1	**Using NetBeans IDE Implement Simple Programs for Swing :** GUI programming using Swing-Window(Jframe, Jdialog), Containers(Jpanel, JtabbedPane, JscrollPane, JdesktopPane) Controls (Jlabel, JtextField, JtextArea, Jbutton, JcheckBox, JradioButton, Jlist, JcomboBox, Jtable), Layout managers (FlowLayout, BorderLayout, GridLayout, GridBagLayout, CardLayout, Null Layout)	20	5
	5.2	**Programs for Database Connectivity** JDBC – The Structured Query Language, The Connection Interface, The Prepared Statement Interface, ResultSets.	10	5

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Teaching and Learning Approach	**Classroom Procedure (Mode of Transaction)** ICT Enabled lectures, Practical Sessions
Assessment Types	**MODE OF ASSESSMENT** **A. Continuous Comprehensive Assessment (CCA) : 40 Marks** **CCA for Theory : 25 Marks** • Written Exam • Oral Presentations • Assignments **CCA for Practical : 15 Marks** • Lab assignments Based on Module 4.
	B. End Semester Examination **ESE for Theory: Written Test (50 Marks, 1.5 Hrs)** Part A: Very Short Answer Questions (Answer all) - (5*3=15 Marks) Part B: Short Answer Questions (4 out of 5 Questions) - (4*5=20 Marks) Part C: Essay Questions (1 out of 2 Questions) - (1*15=15 Marks) **ESE for Practical: 35 Marks (2 Hrs)** Question 1- (From Module 4): 10 Marks. Question 2- (From Module 5): 15 Marks. ***(Use NetBeans IDE for implementing the programs)*** Record: 5 Marks. Viva: 5 Marks.

REFERENCES:

1. Patrick Naughton – Java 2, The Complete Reference, Seventh Edition.

SUGGESTED READINGS::

1. Advanced Java Programming - Uttam K Roy, Oxford University Press; UK ed. Edition
2. E. Balagurusamy-Programming with Java, Third edition, McGraw Hill Publishers.
3. Cay S. Horstmann & Gary Cornell – Core Java Volume 1 – Fundamentals, Eighth edition.
4. K. Somasundaram – Programming in Java 2 , First edition, Jaico Publishing House.

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	Mahatma Gandhi University **Kottayam**
Programme	**BCA (Honours)**
Course Name	**Probability Distributions and Statistical Inference**
Type of Course	**SEC**
Course Code	MG4SECBCA201
Course Level	NA
Course Summary	This course covers statistical concepts like data analysis, distributions, and hypothesis testing, enabling students to apply statistical methods to real-world problems.

Semester	4	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	Analyse random variables, probability distributions, and statistical moments to model uncertainty, compute key metrics, and solve practical problems in data science and decision-making.	An	1
2	Apply key theoretical distributions to model real-world data, compute statistical properties, and solve probability problems—equipping them with essential tools for data analysis and predictive modelling.	A	1,2
3	Describe commonly used sampling distributions and their interrelationships.	U	1,2

4	Illustrate hypothesis testing, including types of hypotheses and errors, critical concepts like p-value and power, tests based on t, z, and chi-square distributions.	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		**Random Variables**		
	1.1	Random Variables: Definition of discrete and continuous random variables.	2	1
	1.2	Probability density(mass) function and distribution function (discrete case) with properties (without Proof),	4	1
	1.3	Expectation, variance and Moment generating function of a discrete random variable with properties (without proof), Related problems.	4	1
2		**Standard Probability Distributions**		
	2.1	Theoretical distributions: Discrete Distribution-Bernoulli, Binomial and Poisson-mean, variance, moment generating functions (without proof) and fitting of data, Problems based on the distributions.	9	2
	2.2	Problems based on the distributions, Continuous Distribution-Normal distribution, Important properties (without proof) of the distribution (mean, variance, moments, MGF, M.D. and Q.D, etc. fitting excluded).	5	2
	2.3	Area under the normal curve related problems.	4	2
3		**Sampling Distributions**		
	3.1	Sampling distribution, Statistic, Parameter, Standard Error.	2	3

	3.2	Sampling Distributions of Mean of the sample from Normal population and distribution of Variance (without derivation).	3	3
	3.3	Statement of the form of the distributions Z, t, Chi-square and F (form alone), properties (without derivation) and uses, Inter relationships.	8	3
4	**Testing of Hypothesis**			
	4.1	Statistical inference definition, Testing of hypotheses procedure, Statistical hypotheses, Simple and composite hypotheses, Null and Alternate hypothesis, Parametric and Non-parametric hypotheses.	2	4
	4.2	Type-1 and Type-II errors, Critical Region, One-tailed and Two-tailed tests, Size of the test, Significance level, P value, Power.	2	4
	4.3	Tests based on t and Z- Testing of Population mean (One sample and two samples).	4	4
	4.4	Testing of Population Proportion (One sample and Two samples), Paired sample t-test.	6	4
	4.5	Chi-square test of goodness of fit, Chi-square test of independence.	5	4

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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 non-programmable calculator and statistical tables 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.C. Gupta and V.K. Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand and Sons
2. S.P. Gupta: Statistical Methods (Sultan Chand & Sons Delhi)
3. V.K. Rohatgi: An Introduction to Probability Theory and Mathematical Statistics, Wiley Eastern.
4. B.L. Agarwal: Basic Statistics, New Age International (p) Ltd.

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Syllabus

Mahatma Gandhi University
Kottayam

Programme	**BCA (Honours)**					
Course Name	**Design Thinking and Innovation**					
Type of Course	**SEC**					
Course Code	**MG4SECBCA202**					
Course Level	NA					
Course Summary	This course provides a comprehensive introduction to Design Thinking, a human-centered approach to innovation that integrates the needs of people, the possibilities of technology, and the requirements for business success. Students will explore creative thinking processes, problem-solving approaches, and the importance of customer-centricity in the modern business landscape.					
Semester	4	Credits			2	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		2	0	0	-	30
Pre-requisites, if any	Basic awareness of problem solving.					

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COURSE OUTCOMES(CO)

CO No.	Expected Course Outcome	Learning Domains *	PO No
CO1:	Propose real-time innovative product designs and Choose appropriate frameworks, strategies, techniques during prototype development	An	1,3
CO2:	Know wicked problems and how to frame them in a consensus manner that is agreeable to all stakeholders using appropriate frameworks, strategies, techniques during prototype development.	An	1

CO3:	Analyze emotional experience and Inspect emotional expressions to better understand users while designing innovative products.	An	1,3
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	Basics of Design Thinking: Understand the concept of innovation and its significance in business. Understanding creative thinking process and problem solving approaches. Know Design Thinking approach and its objective.	2	1
	2	Design Thinking and customer centricity – real world examples of customer challenges, use of Design Thinking to Enhance Customer Experience, Parameters of Product Experience, Alignment of Customer Expectations with Product.	4	1
	3	Discussion of a few global success stories like AirBnB, Apple, IDEO, Netflix etc. Explain the four stages of Design Thinking Process – Empathize, Define, Ideate, Prototype, Implement	4	1
2	1	Learning to Empathize and Define the Problem : Know the importance of empathy in innovation process – how can students develop empathy using design tools Observing and assimilating information	2	2
	2	Individual differences & Uniqueness Group Discussion and Activities to encourage the understanding, acceptance and appreciation of individual differences.	3	2
	3	What are wicked problems? Identifying wicked problems around us and the potential impact of their solution	3	2
	4	Know the various templates of ideation like brainstorming, systems thinking Concept of	2	2

		brainstorming – how to reach consensus on wicked problems		
3	1	Ideate, Prototype and Implement: Mapping customer experience for ideation. Know the methods of prototyping, purpose of rapid prototyping. Implementation	4	3
	2	Feedback, Re-Design & Re-Create: Feedback loop, focus on User Experience, address ergonomic challenges, user focused design	3	3
	3	Final concept testing, Final Presentation – Solving Problems through innovative design concepts & creative solution	3	3

Teaching and Learning Approach	**Classroom Procedure (Mode of transaction)** • Use of ICT tools in conjunction with traditional classroom teaching methods • Interactive sessions • Class discussions
Assessment Types	**MODE OF ASSESSMENT** **A: Continuous Comprehensive Assessment (CCA)** **CCA for Theory : 15 Marks** ○ Written test ○ Assignments ○ Oral Presentations
	B. End Semester Examination **ESE for Theory : Written Test (35 Marks, 1 Hour)** **Part A: Short Answer Questions (7 out of 10 Questions) – (7*5=35 Marks)**

REFERENCES:

1. E Balaguruswamy (2023), Developing Thinking Skills (The way to Success), Khanna Book Publishing Company .

2. Tim Brown, (2008), "Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation", Harvard Business Review.

3. 8 steps to Innovation by R T Krishnan & V Dabholkar, Collins Publishing.

SUGGESTED READINGS:

1. Design Thinking by Nigel Cross, Bloomsbury.

	Mahatma Gandhi University Kottayam
Programme	**BCA (Honours)**
Course Name	**Data Visualization**
Type of Course	**DSE**
Course Code	**MG4DSEBCA200**
Course Level	NA
Course Summary	This course provides a comprehensive introduction to data visualization, covering various types of data and the entire data visualization process. The course also addresses the challenges and limitations of data visualization and offers an overview of popular visualization tools and data storytelling principles. Additionally, it introduces the Power BI interface, data transformations and preparations, data models and visualizations, and the process of publishing and sharing reports.

Semester	4	Credits			3	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		2	0	1	-	60
Pre-requisites, if any	Familiarity with using a computer, including file management and basic software navigation. Basic knowledge of data structures, such as tables and databases. Basic understanding of data analysis concepts and familiarity with data types.					

COURSE OUTCOME

CO No.	Expected Course Outcome	Learning Domains *	PO No
CO1:	Analyze the fundamentals of data visualization and its importance.	An	1
CO2:	Compare and contrast different types of visualizations and their appropriate uses.	An	2,3
CO3:	Use Power BI to create and customize various types of visualizations	A	2,3

**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	Introduction to Data Visualization Definition and importance of data visualization-Role of data visualization in decision making, Types of data (numerical, categorical, temporal, geographical)-	2	1
	2	Data visualization process (data collection, exploration, analysis, visualization, interpretation)	4	1
	3	Challenges and limitations of data visualization	4	1
2	1	Visualization tools & Data Storytelling Overview of Visualization Tools (e.g., Excel, Tableau, Power BI, Python)- Comparing and contrasting features and Use Cases among these tools.	5	2
	2	Principles of Data Storytelling: Narrative and Context-Best Practices for Dashboard Layout and Interactivity.	5	2
	3	Designing Effective Visualizations Principles of Good Visualization Design.	3	2
	4	Understanding and Using Color in Visualizations	3	2
	5	Importance of Data Modelling in Visualization.	4	2
Practical Component: Lab Programs for Data Visualization Using Power BI				
3	1	**Introduction to Power BI Interface and Basics** 1. Installation and interface overview 2. Exploring the Power BI workspace: Ribbon, panes, and canvas. 3. Importing data from Excel and CSV files. 4. Introduction to multiple data sources 5. Basic report creation: Adding visuals and saving a report.	6	3
	2	**Data Transformation and Preparation** 1. Using Power Query Editor	6	3

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		2. Cleaning data: Removing duplicates, handling missing values. 3. Transforming data: Splitting columns, changing data types, renaming columns. 4. Merging and appending queries. 5. Creating custom columns and calculated columns		
	3	**Data Modelling** 1. Creating relationships between tables 2. Identifying and resolving data inconsistencies 3. Creating calculated columns and measures	6	3
	4	**Creating Basic Visualizations** 1. Creating various chart types (bar, column, line, pie, area, etc.,) 2. Formatting and customizing visualizations	6	3
	5	**Publishing and Sharing Reports** 1. Publishing a report to Power BI Service. 2. Sharing reports and dashboards with team members. 3. Setting up data refresh schedules and managing permissions	6	3

Teaching and Learning Approach	**Classroom Procedure (Mode of transaction)** • Use of ICT tools in conjunction with traditional classroom teaching methods • Interactive sessions • Class discussions
Assessment Types	**MODE OF ASSESSMENT** **Continuous Comprehensive Assessment (CCA)** **CCA for Theory : 15 Marks** • Written Exam • Oral Presentations • Assignments **CCA for Practical : 15 Marks** • Lab assignments
	B. End Semester Examination **ESE for Theory: Written Test (35 Marks, 1 Hr)** Part A: Very Short Answer Questions (5 out of 7) - (5*3=15 Marks) Part B: Short Answer Questions (4 out of 6 Questions) - (4*5=20 Marks)

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	ESE for Practical: 35 Marks • Implementation: 15 Marks. • Record : 10 Marks • Viva : 10 Marks

REFERENCES:

1. "Storytelling with Data: A Data Visualization Guide for Business Professionals" Cole Nussbaumer Knaflic, Wiley; 1st edition, 2015.

2. “The Visual Display of Quantitative Information” by Edward Tufte, Graphics Press USA; 2nd edition, 2001.

SUGGESTED READINGS:

1. "Data Visualization: A Practical Introduction" Kieran Healy, Princeton University Press, 2018.

2. "Analyzing Data with Power BI and Power Pivot for Excel", Alberto Ferrari and Marco Russo, Microsoft Press; 1st edition, 2017.

3. "Microsoft Power BI Complete Reference", Devin Knight, Brian Knight, Mitchell Pearson, and Manuel Quintana, Packt Publishing; 1st edition, 2018.

WEB RESOURCES:

1. https://learn.microsoft.com/en-us/power-bi/

2. https://www.storytellingwithdata.com/

3.https://jpsm.umd.edu/sites/jpsm.umd.edu/files/syllabi/Syllabus_Introduction%20to%20 Data%20Visualization_Spring%202024.pd

MGU-BCA (HONOURS)
Syllabus

	Mahatma Gandhi University Kottayam
Programme	**BCA (Honours)**
Course Name	**Introduction to Machine Learning**
Type of Course	**DSE**
Course Code	**MG4DSEBCA201**
Course Level	NA
Course Summary	This course provides a comprehensive overview of machine learning, covering both theoretical concepts and practical applications, preparing students to apply ML techniques in various domains.

Semester	4	Credits			3	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		2	0	1	-	60
Pre-requisites, if any	Basic knowledge of statistics and probability. Familiarity with fundamental programming concepts and proficiency in Python. With libraries such as NumPy, pandas, Scikit-Learn, NLTK, Matplotlib, and Seaborn					

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COURSE OUTCOMES(CO)

Syllabus

CO No.	Expected Course Outcome	Learning Domains *	PO No
CO1:	Define and explain machine learning concepts, types, and basic metrics.	An	1
CO2:	Understand supervised and unsupervised learning techniques	An	1
CO3:	Implement and evaluate supervised learning techniques, including K-Nearest Neighbors, linear regression, and logistic regression, and measure model performance using accuracy, precision, recall, and F1 score.	A	1
CO4:	Apply and visualize clustering algorithms such as K-Means, hierarchical clustering, and DBSCAN on	A	2,3

	datasets. This practical application helps you understand their real world use.		
CO5:	Perform dimensionality reduction using Principal Component Analysis (PCA) and interpret the results.	A	2,3
CO6:	Develop and assess classification models using random forests, support vector machines, and neural networks	A	2,3
CO7	Demonstrate ensemble learning concepts through bagging with random forests and boosting with the AdaBoost algorithm	A	2,3
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	Introduction to Machine Learning Introduction: Definition, History and Application of Machine Learning,	2	1
	2	Types of Machine Learning: Supervised, Unsupervised, Semi-Supervised, and Reinforcement Learning. Labeled and Unlabelled Dataset. Supervised Learning Tasks: Regression vs. Classification,	5	1
	3	Learning Framework: Training, Validation and Testing of ML models. Performance Evaluation Parameters: Confusion matrix, Accuracy, Precision, Recall, F1 Score, and AUC	8	1
2	1	Supervised Learning and Unsupervised Learning Regression: Linear and non-linear Regression, Logistic Regression. Classification: Naïve Bayes, K-Nearest Neighbors, Decision Trees.	3	2
	2	Linear model: Introduction to Artificial Neural Networks, Perceptron Learning Algorithm, Single Layer Perceptron, Introduction to Support Vector Machine for linearly separable data.	6	2
	3	Clustering: K-Means, Hierarchical Clustering, DBSCAN, Clustering Validation Measures. ML Applications: Ethical Considerations in Machine Learning, Case study and Real-world Applications	6	2

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Introduction to Machine Learning Lab				
3	1	1.Implement linear regression on a dataset and visualize the regression line. 2. Implement logistic regression on a binary classification dataset and plot the decision boundary.3 Implement and evaluate the performance of Decision tree ID3/Cart classifier for any given dataset. 4.Implement and evaluate the performance of the Naive Bayes Classifier on a given dataset.	5	3
	2	1.Implement K-Means clustering on a point dataset and visualize and evaluate the clusters. 2. Implement hierarchical clustering on a dataset and plot the dendrogram. 3. Implement DBSCAN clustering on a dataset and visualize and evaluate the clusters.	5	4
	3	1. Perform Principal Components Analysis (PCA) and apply any one or more classifiers to show the performance variation with or without feature reduction.	5	5
	4	1. Build and evaluate a random forest classifier using a numerical dataset. 2. Implement a support vector machine for linearly separable classes and visualize the margins and decision boundary	8	6
	5	1.Build a single layer perceptron model to classify AND, OR, and XOR problems (may use TensorFlow/Keras) and visualize their decision boundaries. Also evaluate its performance. 2. Demonstrate the concept of boosting using the AdaBoost algorithm	7	7

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Teaching and Learning Approach	**Classroom Procedure (Mode of transaction)** • Use of ICT tools in conjunction with traditional classroom teaching methods • Interactive sessions • Class discussions
Assessment Types	**MODE OF ASSESSMENT** **A. Continuous Comprehensive Assessment (CCA) : 30 Marks** **CCA for Theory : 15 Marks** • Written Exam • Oral Presentations • Assignments **CCA for Practical : 15 Marks** • Lab assignments Based on Module 3.

	B. End Semester Examination **ESE for Theory: 35 Marks (1 Hour)** **Written Examination for Modules 1 and 2.** Part A: Very Short Answer Questions (5 out of 7) - (5*3=15 Marks) Part B: Short Answer Questions (4 out of 6 Questions) - (4*5=20 Marks) **ESE for Practical Component: 35 Marks** Lab Record : 10 Marks Viva : 25 Marks (5 Marks for each CO in Module 3, 5*5= 25 Marks) **(No Practical Examination)**

REFERENCES:

1.Rajiv Chopra (2024), Machine Learning and Machine Intelligence, Khanna Publishing House.

2. Jeeva Jose (2023), Introduction to Machine Learning, Khanna Publishing House.

3. Mitchell T. (1997). Machine Learning, First Edition, McGraw-Hill.

4. Kalita, J. K., Bhattacharyya, D. K., & Roy, S. (2023). Fundamentals of Data Science: Theory and Practice. Elsevier. ISBN9780323917780

SUGGESTED READINGS:

1.Flach, P. A. (2012). Machine Learning: The Art and Science of Algorithms that Make Sense of Data. Cambridge University Press. ISBN: 9781107422223, 2012.

2. Duda, R. O., Hart, P. E., Stork, D (2007). Pattern classification (2Ed), John Wiley & Sons, ISBN-13: 978-8126511167.

3. Haykin S. (2009). Neural Networks and Learning Machines, Third Edition, PHI Learning.

4. Chollet, F. (2018). Deep Learning with Python. Manning Publications.

5. Bishop, C. M. (2006). Pattern Recognition and Machine Learning. Springer.

6. Goodfellow, I., Bengio, Y., & Courville, A. (2016). Deep Learning. MIT Press.

7. Géron, A. (2017). Hands-On Machine Learning with Scikit-Learn and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems* (1st ed.). O'Reilly Media

MGU-BCA (HONOURS)

Mahatma Gandhi University
Kottayam

Programme	**BCA (Honours)**					
Course Name	**Web Programming –II**					
Type of Course	**DSE**					
Course Code	**MG4DSEBCA202**					
Course Level	NA					
Course Summary	This course covers the Node.js environment, the REPL terminal, Node.js modules, Node Package Manager (NPM), file management, event handling, database operations, and an introduction to the Express framework.					
Semester	4	Credits			3	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		2	0	1	0	60
Pre-requisites, if any	Basic Knowledge of JavaScript and OOPS					

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 Node JS and REPL terminal and Experiment with Node JS Modules and Node Package Manager	U	1
2	Make use of Web Server to manage files.	U	1
3	Understand event handling and database operations	A	1,2
4	Develop applications in Node JS and Express	A	1,2
****Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)***			

COURSE CONTENT

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Content for Classroom transaction (Units)

Module	Units	Course description	Hrs	CO No.
1	1.1	Features and advantages of Node JS, Traditional Web Server Model, Node.js Process Model, Asynchronous programming with Node.js, Types of applications that can be developed using Node.js	2	1
	1.2	Primitive Types, Object Literal, Functions, NODE.JS MODULES: Module, Module Types: Core Modules, Local Modules, Third Party Modules, Module Exports. Using Modules in a Node.js File, Using the Built in HTTP, URL.	5	1
	1.3	Node Package Manager: NPM, Installing Packages Locally, Adding dependency in package.json, Installing packages globally, Updating packages.	3	1
2	2.1	Handling HTTP requests, Sending requests.	2	2
	2.2	File System-Reading, Writing a File, Writing a file asynchronously, Opening a file, deleting a file, Other IO Operations: Append, Rename, Truncate. File System Module with URL Module Create, Read, Remove a Directory.	5	2
3	3.1	EventEmitter class, Methods and Events of EvenEmitter Class, returning event emitter, Extend EventEmitter Class, Passing Arguments and 'this' to listeners, Asynchronous and Synchronous call, Handle Events only Once, Error Events	3	3
	3.2	Database Connectivity-Connection string, Configuring, working with insert, select command, updating records, delete records, drop tables, Ordered Result Set	4	3
	3.3	Express And Node Js-Introduction to Express Framework, Express Server Request-Response Routes, Route Parameters, Multiple Route Callback/Handler Functions, Methods of Response Object, Chaining Route Handlers, Send Static Files, Accept User Input, Send file as a response, Templates and Express.	6	3

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4	4.1	Explore the Node.js REPL, Use Core Modules, Create and Import Custom Modules, Install and Use a Third-Party Module, Install a local package (e.g., chalk for colorful console output), Add dependencies in package.json and update them, Install a global package (e.g., nodemon) and use it to run a server, Create file and perform read and write operations, Perform asynchronous file operations like appending and renaming,Create a directory, add files, and remove the directory.	10	4
	4.2	Create and Send HTTP requests using the http module, Create an EventEmitter instance (Handle a custom event with a listener, Pass arguments to the listener function.), Implement an EventEmitter that triggers events based on asynchronous tasks (e.g., file read completion), Handle error events, Set up a connection to a database (e.g., MySQL or MongoDB) and Perform basic CRUD operations.	10	4
	4.3	Build an Express server (Handles GET and POST routes, Sends JSON and HTML responses.), Implement route parameters and query string handling, send static files using Express, Accept and validate user input through forms, implement file upload functionality, use a template engine like Pug to render dynamic views.	10	4

Teaching and Learning Approach	**Classroom Procedure (Mode of Transaction)** Lecture & Lab Sessions
Assessment Types	**MODE OF ASSESSMENT** **Continuous Comprehensive Assessment (CCA)** **CCA for Theory : 15 Marks** • Written Exam • Oral Presentations • Assignments **CCA for Practical : 15 Marks** • Lab assignments
	B. End Semester Examination **ESE for Theory: Written Test (35 Marks, 1 Hour)** **Written Examination for Modules 1, 2 and 3.**

	Part A: Very Short Answer Questions (5 out of 7) - (5*3=15 Marks) Part B: Short Answer Questions (4 out of 6 Questions) - (4*5=20 Marks) **ESE for Practical: (35 Marks, 2 Hrs)** 1. Design & Development - 20 Marks 2. Viva- 10 Marks 3. Record - 5 Mark

REFERENCES:

1. Dhruti Shah, "Node.JS Guidebook", BPB Publications, 2018.

SUGGESTED READINGS:

1. Basarat Ali Syed, Beginning Node.js, A press, 2014,

WEB REFERENCES:

1. https://nodejs.org/en/docs/
2. https://www.tutorialsteacher.com/nodejs

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