

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
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)

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
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)

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



MGU-BCA (HONOURS)

Syllabus

	<h2 style="text-align: center;">Mahatma Gandhi University Kottayam</h2>				
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
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others
		4	0	0	0
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
<i>*Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)</i>			

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

	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) <ul style="list-style-type: none"> • 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 <ol style="list-style-type: none"> 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)

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.



MGU-BCA (HONOURS)

Syllabus

	<h2 style="text-align: center;">Mahatma Gandhi University</h2> <h3 style="text-align: center;">Kottayam</h3>				
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			Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	
		4	0	0	0
Pre-requisites, if any					

COURSE OUTCOMES (CO)

MGU-BCA (HONOURS)

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)			

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

Teaching and Learning Approach	Classroom Procedure (Mode of transaction) <ul style="list-style-type: none"> • ICT enabled Lectures • Interactive sessions • Class discussions
Assessment Types	MODE OF ASSESSMENT A. Continuous Comprehensive Assessment (CCA)

	CCA for Theory: 30 Marks <ol style="list-style-type: none"> 1. Written tests 2. Quiz 3. Assignments
	B. Semester End Examination <p>ESE for Theory: 70 Marks; Written Test (2 Hrs)</p> <p>Part A: Very Short Answer Questions (Answer all) - (10*2=20 Marks)</p> <p>Part B: Short Answer Questions (5 out of 7 Questions) - (5*6=30 Marks)</p> <p>Part C: Essay Questions (2 out of 3 Questions) - (2*10=20 Marks)</p>

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



MGU-BCA (HONOURS)

Syllabus

	<h2 style="text-align: center;">Mahatma Gandhi University Kottayam</h2>				
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	
		0	0	4	60
Pre-requisites, if any					

COURSE OUTCOMES (CO) MGU-BCA (HONOURS)

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) <ul style="list-style-type: none"> Practical Lab Sessions Discussions
Assessment Types	MODE OF ASSESSMENT A. Continuous Comprehensive Assessment (CCA) CCA for Practical: 30 Marks <ol style="list-style-type: none"> Written tests Lab Assessment Viva Record
	B. Semester End Examination ESE for Practical: 70 Marks (2.5 Hrs)

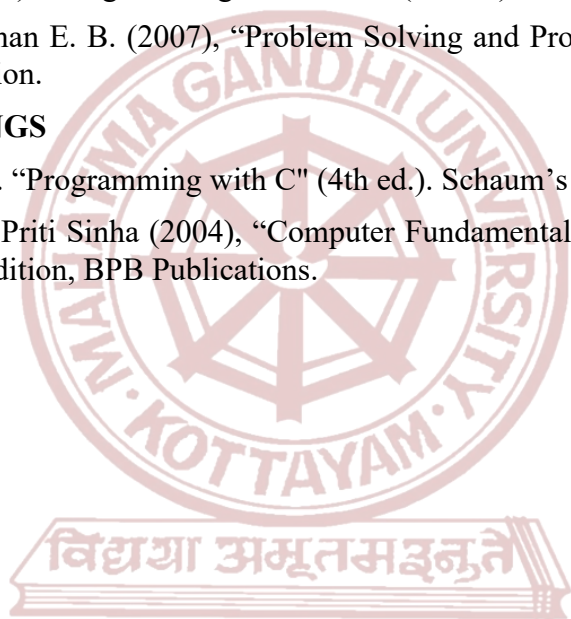
	<p>Lab Examination Test: 70 Marks</p> <ol style="list-style-type: none"> 1. First Program: 20 Marks 2. Second Program: 30 Marks 3. Viva Voce: 10 Marks 4. Record: 10 Marks
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REFERENCES

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.


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MGU-BCA (HONOURS)

Syllabus

	<div>Mahatma Gandhi University</div> <div>Kottayam</div>					
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	60
		4	0	0	0	
Pre-requisites, if any	Nil					

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


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) (30 marks)			
		1. Quiz / MCQ 2. Assignment 3. Tests 4. Tutorial			
	B	End Semester Evaluation (ESE) 70 marks			
		Question Pattern [Maximum Time 2 Hours, Maximum Marks 70]			
		Module	Part A	Part B	Part C
			2 Marks	6 Marks	10 Marks
		Total			
		I	2	2	2
		II	2	2	1
		III	2	2	1
		IV	2	2	2
		Total no of questions	8	8	6
		Number of questions to be answered	5	5	3
		Total Marks	10	30	30

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.

	<h1>Mahatma Gandhi University</h1> <h2>Kottayam</h2>					
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	
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)			

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) MGU-BCA (HONOURS) 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)

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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Bachelor in Computer Applications (Honours)

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1	External Experts & Expert Committee
2	Scheme of Second Semester BCA (Honours)
3	Semester 2 Course 1 Mathematics Foundations to Computer Science
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



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
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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



MGU-BCA (HONOURS)

Syllabus

	<div>Mahatma Gandhi University</div> <div>Kottayam</div>					
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	
Pre-requisites, if any	NIL					

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

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) <i>Only formula and problem-solving for all the topics mentioned above.</i>	6	2
	2.2	Numerical Interpolation: Newton's Forward and Backward Interpolation Formula. (Section 9.1, 9.7 of REF. 2) <i>Only formula and problem-solving for all the topics mentioned above.</i>	5	2
	2.3	Numerical Integration: Trapezoidal rule and Simpson's 1/3 rule. (Section 12.1- 12.4 of REF. 2) <i>Only formula and problem-solving for all the topics mentioned above.</i>	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

		(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

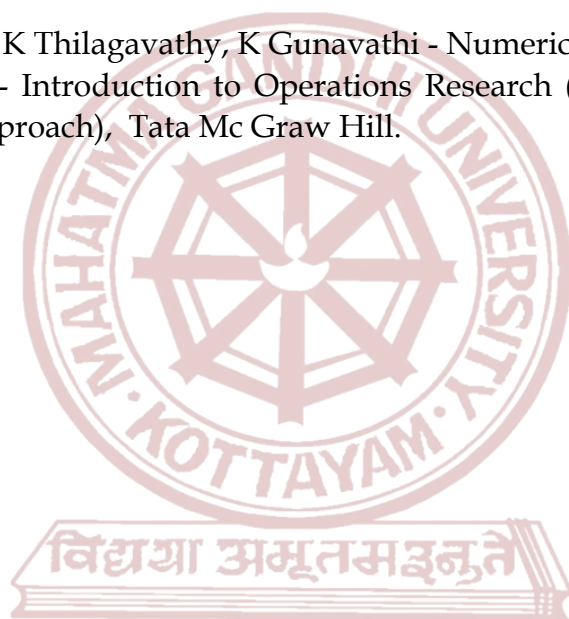
Teaching and Learning Approach	Classroom Procedure (Mode of transaction) <ul style="list-style-type: none"> • Brainstorming lectures • Explicit teaching • Active Cooperative learning
Assessment Types	MODE OF ASSESSMENT A. Continuous Comprehensive Assessment (CCA) CCA for Theory: 30 Marks <ul style="list-style-type: none"> • 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)

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	MG2CCRBACA101				
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
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others
		4	0	1	0
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
<i>*Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)</i>			

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	<p>(Practical Session)</p> <p>Lab Programs:</p> <ol style="list-style-type: none"> 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: <ol style="list-style-type: none"> (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: <ol style="list-style-type: none"> (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: <ol style="list-style-type: none"> (a) Create (b) Search for an element 10. Write a program to perform the following operations in a Circular Linked List: <ol style="list-style-type: none"> (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: <ol style="list-style-type: none"> (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

		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.		
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Teaching and Learning Approach	Classroom Procedure (Mode of transaction) <ul style="list-style-type: none"> • ICT enabled Lectures • Interactive sessions • Class discussions
Assessment Types	MODE OF ASSESSMENT B. Continuous Comprehensive Assessment (CCA) CCA for Theory: 30 Marks <ul style="list-style-type: none"> • Written tests • Quiz • Assignments CCA for Practical: 15 Marks <ul style="list-style-type: none"> • 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) <ul style="list-style-type: none"> • 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 Lannsam, 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) - BCA (HONOURS)

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)			

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

Teaching and Learning Approach	Classroom Procedure (Mode of transaction) <ul style="list-style-type: none"> • 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 <ul style="list-style-type: none"> • 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.



Mahatma Gandhi University Kottayam

Programme	BCA (Honours)					
Course Name	Web Technologies					
Type of Course	SEC					
Course Code	MG2SECBKA100					
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)			

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

	<p>and status bar frame. On clicking in the left frame, information should be displayed in right frame.</p> <p>4. Create Your Resume using HTML, use text, link, size, color and lists.</p> <p>5. Create a Web Page of a super market using (internal CSS)</p> <p>6. Use Inline CSS to format your resume that you have created.</p> <p>7. Use External CSS to format your time table created.</p> <p>8. Use all the CSS (inline, internal and external) to format college web page that you have created.</p> <p>9. Write a HTML Program to create your college website using for mobile device.</p> <p>10. Write an HTML/JavaScript page to create login page with validations.</p> <p>11. Develop a Simple calculator for addition, subtraction, multiplication and division operation using JavaScript.</p> <p>12. Use Regular Expressions for validations in Login Page using JavaScript.</p> <p>13. Write a Program to retrieve date from a text file and displaying it using AJAX.</p>		
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Teaching and Learning Approach	Classroom Procedure (Mode of transaction) <ul style="list-style-type: none"> • ICT enabled Lectures • Interactive sessions • Class discussions
Assessment Types	MODE OF ASSESSMENT A. Continuous Comprehensive Assessment (CCA) CCA for Theory: 15 Marks <ul style="list-style-type: none"> • Written tests • Quiz • Assignments CCA for Practical: 15 Marks <ul style="list-style-type: none"> • Lab Involvement • Creativity • Lab Record

	<ul style="list-style-type: none"> • Viva
	<p>B. Semester End Examination</p> <p>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)</p> <p>ESE for Practical: 35 Marks (1.5 Hrs)</p> <ul style="list-style-type: none"> • 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

	<div>Mahatma Gandhi University</div> <div>Kottayam</div>					
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	
Pre-requisites, if any	NIL					

COURSE OUTCOMES (CO)

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

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

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 <ul style="list-style-type: none"> • 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).