Syllabus of 4 + 1 Year Integrated UG and PG Programme

w. e. f 2024-25 Academic Year

GRADUATE SCHOOL

Mahatma Gandhi University

P. D. Hills P O

Kottayam, Kerala

www.gs.mgu.ac.in

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Schools offering Majors

SL.No	School/Centre
1	School of Bio Sciences
2	School of Chemical Sciences
3	School of Computer Sciences
4	School of Environmental Sciences
5	School of Gandhian Thought and Development Studies
6	School of International Relations and Politics
7	School of Pure and Applied Physics
8	School of Social Sciences

Sl. No.	Major	Intake
SCIENCE		
1	Bio Sciences	6**
2	Chemistry	6
3	Computer Science	6
4	Environmental Science	6
5	Physics	6
SOCIAL SCIENCES		
1	Development Studies	5
2	Gandhian Studies	5
3	History	10
4	International Relations and Politics	10

Majors offered and Intake *1 seat shall be sanctioned over and above the intake in each major in the 3rd semester for students who opt for a change of major after two semesters.

**Progression to PG Shall be based on the specialization selected by students as Biochemistry (2 seats) Biotechnology (2 seats) and Microbiology (2 seats) based on merit.

Schools offering Minors/MDCs/AECs/VACs/SECs

SL.No	School/Centre
1	School of Artificial Intelligence And Robotics
2	School of Behavioural Sciences
3	School of Biosciences
4	School of Chemical Sciences
5	School of Computer Sciences
6	School of Data Analytics
7	School of Energy Materials
8	School of Environmental Sciences
9	School of Food Science And Technology
10	School of Gandhian Thought And Development Studies
11	School of Gender Studies
12	School of Indian Legal Thought
13	School of International Relations And Politics
14	School of Letters
15	School of Mathematics And Statistics
16	School of Nanoscience And Nano Technology
17	School of Pedagogical Sciences
18	School of Polymer Science And Technology
19	School of Pure And Applied Physics
20	School of Social Sciences
21	School of Tourism Studies
22	International and Inter University Centre for Nanoscience and Nanotechnology
23	K N Raj School of Economics

Scheme for 4 + 1 Integrated UG and PG Programme
Graduate School
Mahatma Gandhi University
School of Computer Sciences

Course Code	Title	Credits	Hours per Week		Level	Type
			Theory	Practicals		
SEMESTER I						
MG1DSCUCO101	Digital Fundamentals	4	4	0	Foundation (100-199)	Major
MG1DSCUCS121	Digital Fundamentals	4	4	0	"	Minor A
MG1DSCUCS141	Problem Solving and Fundamentals of Programming	4	2	4	"	Minor B
MG1MDCUCS101	Foundations of Data Organization	3	2	2	"	MDC
	AEC (Eng)	3			"	
	AEC (Mal)	3			"	
SEMESTER II						
MG2DSCUCO101	Problem Solving and Fundamentals of Programming	4	2	4	"	Major
MG2DSCUCS121	Object Oriented Programming using JAVA	4	2	4	"	Minor A
MG2DSCUCS141	Algorithms and Problem Solving	4	3	2	"	Minor B
MG2MDCUCS101	Data Processing Techniques	3	2	2	"	MDC

	AEC (Eng)	3			“	
	AEC (Mal)	3			“	
SEMESTER III						
MG3DSCUCO201	Computer Organization and Architecture	4	4	0	Intermediate (200-299)	Major
MG3DSCUCO202	Data Communication	4	4	0	“	Major
MG3DSCUCO203	Data Structures	4	2	4	“	Major
MG3DSCUCS221	Database Management Systems	4	2	4	“	Minor A
MG3MDCUCS201	Computational Intelligence - AI in Problem Solving	3	2	2	“	MDC
MG3VACUCS201	Security & Ethics in Cyber World	3	3	0	“	VAC
SEMESTER IV						
MG4DSCUCO201	Operating Systems	4	4	0	“	Major
MG4DSCUCO202	Object Oriented Programming using Java	4	2	4	“	Major
MG4DSCUCO203	Microprocessors	4	2	4	“	Major
MG4DSCUCS241	Software Engineering	4	4	0	“	Minor B

MG4SECUCS201	Web Technologies	3	2	2	“	SEC
MG4VACUCS201	Green Computing	3	3	0	“	VAC
MG4INTUCO200	Internship/Fieldwork	2	0	4		
SEMESTER V						
MG5DSCUCO301	Database Management Systems	4	2	4	Higher (300-399)	Major
MG5DSCUCO302	Design and Analysis of Algorithms	4	3	2	“	Major
MG5DSCUCO303	Computer Networks	4	4	0	“	Major
MG5DSCUCO304	Machine Learning	4			“	Major
MG5SECUCS301	Search Engine Optimization	3	2	2	“	SEC
MG5VACUCS301	Publication Ethics	3	3	0	“	VAC
SEMESTER VI						
MG6DSCUCO301	Software Engineering	4	4	0	“	Major
MG6DSCUCO302	Advanced Java	4	2	4	“	Major

	Programming					
MG6DSCUCO303	Theory of Computation	4	4	0	“	Major
MG6DSEUCO304 MG6DSEUCO305 MG6DSEUCO306	1. Data Mining 2. IoT and Robotics 3. Introduction to Data Science	4	2	4	“	Major (E)
MG6DSEUCO307 MG6DSEUCO308 MG6DSEUCO309	1. Mobile Development Technologies 2. Big Data Analytics 3. Cloud Computing	4	2	4	“	Major (E)
MG6SECUCS301	Software Project Management: Case Study	3	1	4	“	SEC
Total Credits		**133**				

SEMESTER VII						
MG7DSCUCO401	Deep Learning	4	2	4	Advanced (400-499)	Major
MG7DSEUCO402 MG7DSEUCO403	1 Digital Image Processing 2 Advanced Computer Architecture and Parallel Programming	4	2	4	“	Major (E)

MG7DSEUCO404	3 Artificial Intelligence					
MG7DSEUCO405 MG7DSEUCO406 MG7DSEUCO407	1 Advanced Data Structures 2 Cyber Security and Cyber Laws 3 Graphics and Visualization	4	2	4	"	Major (E)
MG7DSCUCS421	Research Methodology & Ethics	4	4	0	"	Minor A
MG7DSEUCS422 MG7DSEUCS423 MG7DSEUCS424	1 Explainable AI 2 Digital Forensics 3 Cryptography	4	3	2	"	Minor A(E)
MG7DSEUCS441 MG7DSEUCS442 MG7DSEUCS443	1 Compiler Design 2 Data Analytics using R 3 Blockchain Technologies	4	3	2	"	Minor B(E)
SEMESTER VIII						
MG8DSCUCO401	Research Methodology & Ethics	4	4	0	"	Major
MG8DSEUCO402 MG8DSEUCO403	1 Algorithms and Complexity 2 Cyber Physical Systems 3 Operating Systems and Virtualization	4	3	2	"	Major (E)

MG8DSEUCO404						
MG8RPHUCO400	Research Project I	12	0	24	“	Research Project
Total Credits		**44**				
SEMESTER IX						
MG09DSCUCO501	Computer Vision	4	2	4	PG Level (500-599)	Major
MG09DSCUCO502	Wireless Communication and Sensor Networks	4	4	0	“	Major
MG09DSCUCO503	Natural Language Processing	4	2	4	“	Major
MG09DSEUCO504 MG09DSEUCO505 MG09DSEUCO506	1 Data Science 2 Fuzzy Logic and Nature Inspired Computing 3 Digital Signal Processing and Speech Technologies	4	2	4	“	Major (E)
MG09DSEUCO507 MG09DSEUCO508 MG09DSEUCO509	1 Generative AI 2 Bioinformatics 3 Blockchain Technologies	4	3	2	“	Major (E)
SEMESTER X						
MG10RPHUCO500	Research Project	20	0	40	“	
	Major**	4			“	
	Major**	4			“	

	Major**	4			“	
	Major**	4			“	
	Major**	4			“	
Total Credits		**40**				

**Only for students who opt for theory courses instead of Research Project

Note: General foundations courses shall be offered by different schools. Students can flexibly choose the courses across disciplines.

Level	Foundation (100-199)	Intermediate (200-299)	Higher (300-399)	Advanced (400-499)	PG Level (500-599)

Type	Major	Minor	MDC	SEC	VAC	AEC

	MAHATMA GANDHI UNIVERSITY **Graduate School**
	4 + 1 Integrated UG and PG Programme

School	School of Computer Sciences		
Programme	4 + 1 Integrated UG and PG Programme		
Course Title	Digital Fundamentals		
Course Type	Major		
Course Level	100-199		
Course Code	MG1DSCUCO101		
Course Overview	This course provides the basic concepts of number systems, Boolean algebra and digital systems. It covers the design of simple combinational and sequential logic circuits which in turn are helpful in understanding organization & design of a computer system.		
Semester	I	**Credit**	4
Total Student Learning Time	**Instructional hours for theory**	**Instructional hours for practical/lab work/field work**	
	60		
Pre-requisite	Basic knowledge of electronics and number systems at plus two level.		

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome *Upon completion of this course, students will be able to;*	Learning Domains	PSO No.
1	Perform operations and conversions among different number systems.	R, U	1, 2
2	Apply the basic concepts of Boolean algebra for the simplification and implementation of logic functions using suitable gates.	U, A	1, 2
3	Design simple combinational circuits.	A, E, C	1, 2, 3, 4
4	Design sequential circuits.	A, E, C	1, 2, 3, 4
5	Implement PLDs for the given logical problem.	A, An, C	1, 2, 3, 5, 6

*(Learning Domains: Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E) , Create (C), Skill (S))

COURSE CONTENT

Module 1	Hours	CO No.
Number Systems: Number Systems- Basic Concepts, Conversions and Operations, Representation of Negative Numbers- Complements and their Applications, BCD Numbers- Concept and Addition, Other Binary Codes, Error Detection Codes.	13	1
Module 2	**Hours**	
Logic Gates and Boolean Algebra: Logic Gates- Basic and Universal Gates, Truth Table, Graphical	15	2

Representation, Basic Theorems and Properties of Boolean Algebra, Boolean Functions - Canonical and Standard Forms, Simplification of Boolean Functions - SOP and POS Minimization, Karnaugh Map Simplification.		
Module 3	**Hours**	
Sequential and Combinational Logic Circuits: Binary Adder and Subtractor, Magnitude Comparator, Decoder, Encoder, Code Converters, Demultiplexer, Multiplexer, Parity Generator and Checker. Flip-flops- Latch, Clocked, RS, JK, T, D and Master Slave.	15	3, 4
Module 4	**Hours**	
Registers and Counters: Register, Shift Registers, Asynchronous Counters- Binary and BCD Ripple Counters, Synchronous Counters- Binary Counter, Binary Up- Down Counter, BCD Counter, Johnson Counter. **Memory and Programmable Logic Devices:** RAM, ROM, Programmable Logic Arrays (PLA), Programmable Array Logic (PAL).	17	4, 5

Mode of Transaction	**Classroom activities:** Direct Instruction: Brain storming lecture, Explicit Teaching, E-learning, Interactive Instruction: Active co-operative learning, Seminar, Group Assignments Authentic learning: Library work and Group discussion, Presentation by individual student/ Group representative. **Field activities:** Understand the working principles of computer hardware
Mode of Assessment	**A. Continuous Internal Assessment (CIA)** ● Internal Tests – Minimum Two (Extended answers / Practical) ● Seminar ● Assignment – Written, Practical, Oral Presentation and Viva

	● Case study/ Mini project **B. Semester End Examination**

Learning Resources

1. M. Morris Mano, Digital Logic and Computer Design, 6/e, Pearson Education India, 2023.

2. Thomas L Floyd, Digital Fundamentals, 11/e, Pearson Education, 2017.

3. M. Morris Mano, Computer System Architecture, 3/e, Pearson Education, 2017.

Relevance of Learning the Course/ Employability of the Course
Digital electronics is foundational to modern computing, providing essential insights into how computers process and store information. It explains how software instructions are executed by underlying hardware. This knowledge is vital for embedded systems, designing CPUs, memory, and I/O systems. Furthermore, studying digital electronics is crucial for hardware related applications in computer science and technology-driven industries.

	MAHATMA GANDHI UNIVERSITY **Graduate School**
	4 + 1 Integrated UG and PG Programme

School	School of Computer Sciences		
Programme	4 + 1 Integrated UG and PG Programme		
Course Title	Digital Fundamentals		
Course Type	Minor		
Course Level	100-199		
Course Code	MG1DSCUCS121		
Course Overview	This course provides the basic concepts of number systems, Boolean algebra and digital systems. It covers the design of simple combinational and sequential logic circuits which in turn are helpful in understanding organization & design of a computer system.		
Semester	I	**Credit**	4
Total Student Learning Time	**Instructional hours for theory**	**Instructional hours for practical/lab work/field work**	
	60		
Pre-requisite	Basic knowledge of electronics and number systems at plus two level.		

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome *Upon completion of this course, students will be able to;*	Learning Domains	PSO No.
1	Perform operations and conversions among different number systems.	R, U	1, 2
2	Apply the basic concepts of Boolean algebra for the simplification and implementation of logic functions using suitable gates.	U, A	1, 2
3	Design simple combinational circuits.	A, E, C	1, 2, 3, 4
4	Design sequential circuits.	A, E, C	1, 2, 3, 4
5	Implement PLDs for the given logical problem.	A, An, C	1, 2, 3, 5, 6

*(Learning Domains: Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E) , Create (C), Skill (S))

COURSE CONTENT

Module 1	Hours	CO No.
Number Systems: Number Systems- Basic Concepts, Conversions and Operations, Representation of Negative Numbers- Complements and their Applications, BCD Numbers- Concept and Addition, Other Binary Codes, Error Detection Codes.	13	1
Module 2	**Hours**	
Logic Gates and Boolean Algebra: Logic Gates- Basic and Universal Gates, Truth Table, Graphical	15	2

Representation, Basic Theorems and Properties of Boolean Algebra, Boolean Functions - Canonical and Standard Forms, Simplification of Boolean Functions - SOP and POS Minimization, Karnaugh Map Simplification.		
Module 3	**Hours**	
Sequential and Combinational Logic Circuits: Binary Adder and Subtractor, Magnitude Comparator, Decoder, Encoder, Code Converters, Demultiplexer, Multiplexer, Parity Generator and Checker. Flip-flops- Latch, Clocked, RS, JK, T, D and Master Slave.	15	3, 4
Module 4	**Hours**	
Registers and Counters: Register, Shift Registers, Asynchronous Counters- Binary and BCD Ripple Counters, Synchronous Counters- Binary Counter, Binary Up- Down Counter, BCD Counter, Johnson Counter. **Memory and Programmable Logic Devices:** RAM, ROM, Programmable Logic Arrays (PLA), Programmable Array Logic (PAL).	17	4, 5

Mode of Transaction	**Classroom activities:** Direct Instruction: Brain storming lecture, Explicit Teaching, E-learning, Interactive Instruction: Active co-operative learning, Seminar, Group Assignments Authentic learning: Library work and Group discussion, Presentation by individual student/ Group representative. **Field activities:** Understand the working principles of computer hardware
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	● Case study/ Mini project **B. Semester End Examination**

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	MAHATMA GANDHI UNIVERSITY **Graduate School**
	4 + 1 Integrated UG and PG Programme

School	School of Computer Sciences		
Programme	4 + 1 Integrated UG and PG Programme		
Course Title	Problem Solving and Fundamentals of Programming		
Course Type	Minor		
Course Level	100-199		
Course Code	MG1DSCUCS141		
Course Overview	This course covers programming concepts including pointers, dynamic memory allocation, linked lists, and file handling using the C language, with a focus on efficient, low-level programming techniques. It also explores best practices in code organization, modular programming, and software development. Mastery of C provides a solid foundation for learning other programming languages and deepens understanding of core computer science principles.		
Semester	I	**Credit**	4
Total Student Learning Time	**Instructional hours for theory**	**Instructional hours for practical/lab work/field work**	
	40	40	
Pre-requisite	Basic knowledge about the Computers		

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome *Upon completion of this course, students will be able to;*	Learning Domains	PSO No.
1	Analyse computational problems and develop algorithms/flowcharts to find the solutions.	A, An	1
2	Develop C programs using functions.	S, C	1,2
3	Implement C programs with arrays, strings, structure or union.	A, C	3,4
4	Develop C programs using pointers and files.	A, C, S	1,5,6
5	Handle system level programming in C.	A, S	2,6

*(Learning Domains: Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S))

COURSE CONTENT

Module 1	**Hours**	**CO No**
Introduction to programming: Problem Solving Techniques, Types of Programming Languages and Translators, Introduction to C Programming, Operators and Expressions, Control Flow Statements, Looping Statements.	8	1
Module 2	**Hours**	
Functions: Predefined Functions, Programmer-defined Function, Functions with Default Arguments, Call-By-Value and Call-By-Reference Parameters, Recursion	16	2
Module 3	**Hours**	
Arrays: Single and Multi-Dimensional Arrays, Arrays as Function Parameters,	16	3

Structures: Member Accessing, Pointers to Structures, Arrays of Structures, Unions. **Strings:** Arrays of Strings, String and Function, Strings and Structure, Standard String Library Functions**.**		
Module 4	**Hours**	
Pointers: Array Access using Pointers, Pass by Reference Effect, Strings and Pointers **Files:** File Operations, Read, Write, Append Contents to a File, Sequential and Random Search of Contents, Merging and Copying Files, Dynamic Memory Allocation and Linked Lists, Low-level Programming.	20	4, 5

Mode of Transaction	**Classroom activities** • Lecturing, Discussions, Writing Programs **Field activities** **Lab based activities** • Implement programs
Mode of Assessment	A. Continuous Internal Assessment (CIA) • Internal Tests – Minimum Two • Seminar • Assignment – Written, Practical, Oral Presentation and Viva B. Semester End Examination

Learning Resources

1. *Brian W Kernighan & Dennis Ritchie, "The C programming language", 2nd Edition, Prentice Hall*

2. *Stephen Prata, C Primer Plus, 6th Edition, Addison-Wesley Professional.*

3. *Jens Gustedt, Modern C, Manning Publications.*

Relevance of Learning the Course/ Employability of the Course
C programming language holds immense importance in the software development industry. Its simplicity, efficiency, and versatility make it a powerful tool for developing a wide range of applications. C is utilized across various domains, from operating systems to embedded systems. Learning C opens up a world of possibilities for aspiring programmers and enables them to contribute to the

ever-evolving field of technology.

	MAHATMA GANDHI UNIVERSITY **Graduate School**
	4 + 1 Integrated UG and PG Programme

School	School of Computer Sciences		
Programme	4 + 1 Integrated UG and PG Programme		
Course Title	Foundations of Data Organization		
Course Type	MDC		
Course Level	100-199		
Course Code	MG1MDCUCS101		
Course Overview	Proper data organization is crucial for effective data processing, retrieval, analysis, and decision-making. This course covers key concepts and techniques in data organization which includes methods and processes used to structure, store, manage, and utilize data efficiently.		
Semester	1	**Credit**	3
Total Student Learning Time	**Instructional hours for theory**	**Instructional hours for practical/lab work/field work**	
	35	20	
Pre-requisite	General understanding of computers.		

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome *Upon completion of this course, students will be able to;*	Learning Domains	PSO No.
1	Understand various data organizations and models which use different data representations and illustrate data management, storage efficiency and storage capacities.	R, U	1
2	Apply master data indexing, partitioning, normalization, denormalization, cataloging, archiving, security, and backup/recovery for data organization process.	A	2
3	Illustrate big data fundamentals, manipulate data using Hadoop, implement data security techniques and analyse emerging data organization trends.	U, An, S	4,5
4	Design and develop data organization mechanisms to represent real world data.	E, C	3,6

*(Learning Domains: Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E) , Create (C), Skill (S))

COURSE CONTENT

Module 1	Hours	CO No
Introduction: Data Organization, Data Structuring, Hierarchical Organization, Network Model, Relational Model, Data Storage, Databases, Data Warehouses, Data Lakes.	**15**	**1**

Module 2	**Hours**	
Data Management: Data Indexing, Data Partitioning, Data Normalization, Data Denormalization, Data Cataloging, Data Archiving, Data Security, Data Backup and Recovery.	**20**	**2**
Module 3	**Hours**	
Big Data Fundamentals: Hadoop, Data Security and Privacy, Data Encryption, Review of Modern Data Organization Tools, Emerging Trends in Data Organization.	**20**	**3, 4**

Mode of Transaction	**Classroom activities:** Lecture and Tutorial **Field activities:** Collect Primary data from the source **Lab based activities:** Data Management Activities and Tools
Mode of Assessment	A. Continuous Internal Assessment (CIA) • Internal Tests – Minimum Two • Seminar • Assignment – Written, Practical, Oral Presentation and Viva B. End Semester Examination

Learning Resources

1. Jiawei Han, Jian Pei, and Hanghang Tong. Data Mining: Concepts and Techniques. Fourth Edition, Elsevier, 2024.
2. Narasimha Karumanchi. Data Structures and Algorithms Made Easy. CareerMonk Publications, 6th Edition, 2022.
3. Silberschatz, Korth, and Sudarshan. Database System Concepts. McGraw-Hill Education, 7th Edition, 2020.
4. Tom White. Hadoop: The Definitive Guide. Fourth Edition, O'Reilly Media, 2015.

Relevance of Learning the Course/ Employability of the Course
Learning data organization enhances employability by equipping students with skills in data processing, retrieval and analysis. These skills are essential for roles in data analysis and management across diverse IT industries.

	MAHATMA GANDHI UNIVERSITY **Graduate School**
	4 + 1 Integrated UG and PG Programme

School	School of Computer Sciences		
Programme	4 + 1 Integrated UG and PG Programme		
Course Title	Problem Solving and Fundamentals of Programming		
Course Type	Major		
Course Level	100-199		
Course Code	MG2DSCUCO101		
Course Overview	This course covers programming concepts including pointers, dynamic memory allocation, linked lists, and file handling using the C language, with a focus on efficient, low-level programming techniques. It also explores best practices in code organization, modular programming, and software development. Mastery of C provides a solid foundation for learning other programming languages and deepens understanding of core computer science principles.		
Semester	I	**Credit**	4
Total Student Learning Time	**Instructional hours for theory**	**Instructional hours for practical/lab work/field work**	
	40	40	
Pre-requisite	Basic knowledge about the Computers		

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome *Upon completion of this course, students will be able to;*	Learning Domains	PSO No.
1	Analyse computational problems and develop algorithms/flowcharts to find the solutions.	A, An	1
2	Develop C programs using functions.	S, C	1,2
3	Implement C programs with arrays, strings, structure or union.	A, C	3,4
4	Develop C programs using pointers and files.	A, C, S	1,5,6
5	Handle system level programming in C.	A, S	2,6

*(Learning Domains: Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S))

COURSE CONTENT

Module 1	**Hours**	**CO No**
Introduction to programming: Problem Solving Techniques, Types of Programming Languages and Translators, Introduction to C Programming, Operators and Expressions, Control Flow Statements, Looping Statements.	8	1
Module 2	**Hours**	
Functions: Predefined Functions, Programmer-defined Function, Functions with Default Arguments, Call-By-Value and Call-By-Reference Parameters, Recursion	16	2
Module 3	**Hours**	
Arrays: Single and Multi-Dimensional Arrays, Arrays as Function Parameters,	16	3

Structures: Member Accessing, Pointers to Structures, Arrays of Structures, Unions. **Strings:** Arrays of Strings, String and Function, Strings and Structure, Standard String Library Functions**.**		
Module 4	**Hours**	
Pointers: Array Access using Pointers, Pass by Reference Effect, Strings and Pointers **Files:** File Operations, Read, Write, Append Contents to a File, Sequential and Random Search of Contents, Merging and Copying Files, Dynamic Memory Allocation and Linked Lists, Low-level Programming.	20	4, 5

Mode of Transaction	**Classroom activities** • Lecturing, Discussions, Writing Programs **Field activities** **Lab based activities** • Implement programs
Mode of Assessment	A. Continuous Internal Assessment (CIA) • Internal Tests – Minimum Two • Seminar • Assignment – Written, Practical, Oral Presentation and Viva B. Semester End Examination

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ever-evolving field of technology.

	MAHATMA GANDHI UNIVERSITY **Graduate School**
	4 + 1 Integrated UG and PG Programme

School	School of Computer Sciences		
Programme	4 + 1 Integrated UG and PG Programme		
Course Title	Object Oriented Programming using JAVA		
Course Type	Minor		
Course Level	100-199		
Course Code	MG2DSCUCS121		
Course Overview	This course helps to create in-depth knowledge in object oriented programming concepts and to develop programming language skills. The students are exposed to the core and advanced features available in Java, such as file handling, interfaces, packages and GUI programming. Mastery of Java ensures a solid foundation for modern software development.		
Semester	II	**Credit**	4
Total Student Learning Time	**Instructional hours for theory**	**Instructional hours for practical/lab work/field work**	
	40	40	
Pre-requisite	Basic programming knowledge.		

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains	PSO No.
	Upon completion of this course, students will be able to;		

1	Understand object oriented programming concepts for implementing classes, objects and the relationships among them using Java.	R,U	1, 2
2	Implement efficient programs in Java by applying object oriented features.	A,S	1, 2, 3
3	Analyse common abstract user interface components and design GUI using Applet & AWT along with response to events.	An, C, S	1, 2, 4
4	Evaluate the connection of interface and database with the help of JDBC.	E,S	1, 5
5	Design and develop complex Graphical user interfaces.	C,S	5, 6

*(Learning Domains: Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E) , Create (C), Skill (S))

COURSE CONTENT

Module 1	**Hours**	**CO No**
Introduction: Object Oriented Programming, Comparison between Procedural and Object Oriented Programming, Basic Principles of Object Orientation, Introduction to Java: Java Virtual Machine, Java Program Language Components.	10	1
Module 2	**Hours**	
I/O, Threads and Exception Handling: Introduction to Classes and Methods, Input and Output, File Class, **Threads:** Threads vs. Processes, Creating Threads, Synchronization. **Exceptions:** Exception Handling, Developing User Defined Exception Classes.	10	2
Module 3	**Hours**	
Database Connectivity & GUI: Introduction to JDBC : The JDBC Connectivity Model, Database Programming, Connecting to the Database, Creating a SQL Query. **Introduction to GUI Applications** - Applets - Types of Applet, Applet Skeleton, HTML Applet Tag and Passing Parameter to Applet.	10	3, 4
Module 4	**Hours**	
Events and GUI Applications: Event Handling: The	10	5

Delegation Event Model, Event Classes, Event Listener Interfaces, Adapter Classes. Java Desktop Applications, Introduction to the AWT, Containers, Components, Canvas, Frame Working Attributes, Simple Graphics, Controls.		

Mode of Transaction	**Classroom activities:** ● Lecturing, Discussions, Writing Programs ● Seminar and Assignment **Field activities:** **Lab based activities:** • Implement each topic in lab to learn the logic behind it.
Mode of Assessment	• Continuous Internal Assessment (CIA) • Internal Tests – Minimum Two • Seminar • Assignment – Written, Practical, Oral Presentation and Viva • Semester End Examination

Learning Resources

1. Schildt, H. (2023). Java: The Complete Reference. 13th edition. McGraw-Hill Education.

2. Balaguruswamy E. (2023). Programming with JAVA. 7th edition. India: McGraw Hill Education

3. Horstmann, C. S. (2017). Core Java - Vol. I – Fundamentals (Vol. 10). Pearson Education

4. Mark Reed(2020) Java : The ultimate beginners guide to effectively learn java programming step-by-step, Publishing Factory LLC.

Relevance of Learning the Course/ Employability of the Course

Learning Object Oriented Programming in Java is crucial as it forms the foundation for advanced Java technologies and frameworks, enhancing employability in the software development industry. Core Java skills are in high

demand due to the widespread use of Java in enterprise applications, Android development, and web services. Proficiency in Java improves job prospects, enabling roles such as software engineer, backend developer, and systems architect.

	MAHATMA GANDHI UNIVERSITY **Graduate School**
	4 + 1 Integrated UG and PG Programme

School	School of Computer Sciences		
Programme	4 + 1 Integrated UG and PG Programme		
Course Title	Algorithms and Problem Solving		
Course Type	Minor		
Course Level	100-199		
Course Code	MG2DSCUCS141		
Course Overview	This course will introduce students to the fundamental concepts of algorithms and problem-solving techniques. Students will learn to design, analyze, and implement algorithms to solve real-world problems efficiently.		
Semester	II	**Credit**	4
Total Student Learning Time	**Instructional hours for theory**	**Instructional hours for practical/lab work/field work**	
	50	20	
Prerequisite	Basic Problem solving skill and mathematical foundation.		

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains	PSO No.
	Upon completion of this course, students will be able to;		
1	Recall fundamental concepts of algorithms and data structures.	R	1
2	Explain the importance and applications of algorithms in problem-solving.	U	2
3	Apply basic data structures and efficient design strategies to implement algorithms and solve problems.	A	3,5
4	Design efficient algorithms to solve real-world problems and evaluate the efficiency and correctness of the solutions.	C, E	4,6

*(Learning Domains: Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E) , Create (C), Skill (S))

COURSE CONTENT

Module 1	**Hours**	**CO No.**
Introduction: Algorithms, Importance of Algorithms in Problem Solving, Basic Algorithmic Concepts, Performance Analysis	**15**	**1**
Module 2	**Hours**	
Problem Solving Strategies: Understanding Problem Constraints, Breaking Down Problems, Problem-Solving Patterns.	**15**	**2**
Module 3	**Hours**	
Basic Data Structures and Algorithm Design Strategies: Arrays and Lists, Stacks and Queues, Linked Lists. **Introduction to Algorithm Design Strategies**: Divide and Conquer, Greedy, Dynamic Programming, Backtracking.	**20**	**3**
Module 4	**Hours**	
Searching and Sorting Algorithms: Linear Search,	**20**	**4**

Binary Search, Search Efficiency, Depth-First Search (DFS), Breadth-First Search (BFS), **Sorting Algorithms:** Bubble Sort, Selection Sort, Insertion Sort, Merge Sort and Quick Sort.		

Mode of Transaction	**Classroom activities** • Lecturing, Discussions, Writing Programs **Field activities** **Lab based activities:** Problem solving activities
Mode of Assessment	A. Continuous Internal Assessment (CIA) • Internal Tests – Minimum Two • Seminar • Assignment – Written, Practical, Oral Presentation and Viva B. Semester End Examination

Learning Resources

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein. Introduction to Algorithms. (MIT Press, 3rd Edition, 2009)
2. Robert Sedgewick and Kevin Wayne. Algorithms. (Addison-Wesley Professional, 4th Edition, 2011)
3. Steven S. Skiena. The Algorithm Design Manual. (Springer, 2nd Edition, 2008)

Relevance of Learning the Course/ Employability of the Course
Learning algorithms and problem-solving is crucial for a career in software development, data science, and computer engineering. This course equips students with essential skills to analyze complex problems, design efficient algorithms, and implement effective solutions.

	MAHATMA GANDHI UNIVERSITY **Graduate School**
	4 + 1 Integrated UG and PG Programme

School	School of Computer Sciences		
Programme	Computer Science		
Course Title	Data Processing Techniques		
Course Type	MDC		
Course Level	100-199		
Course Code	MG2MDCUCS101		
Course Overview	This course covers essential data processing techniques, including data collection, cleaning, transformation, aggregation, and integration. Students will gain hands-on experience with descriptive and inferential statistical methods, and apply best practices in real-world scenarios.		
Semester	II	**Credit**	3
Total Student Learning Time	**Instructional hours for theory**	**Instructional hours for practical/lab work/field work**	
	35	20	
Prerequisite	Basic computing skills and fundamental statistics.		

COURSE OUTCOMES (CO)

CO	Expected Course Outcome	Learning	PSO

No.	*Upon completion of this course, students will be able to;*	Domains	No.
1	Classify various data types, storage, retrieval, modeling, and security of data.	R, U	1
2	Create quality data using advanced techniques.	An, C	2, 3
3	Formulate various data models using EDA techniques, descriptive and inferential statistics, and data visualization methods.	U, An	4, 5
4	Design and assess various data models.	C, E	2, 6

*(Learning Domains: Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E) , Create (C), Skill (S))

COURSE CONTENT

Module 1	**Hours**	**CO No**
Introduction: Data, Types of Data, Characteristics of Data, Data Storage and Retrieval, Data Modeling, Data Security, Data Collection, Data Sampling, Sampling Techniques, Sampling Design, Data Filtering, Data Management.	**15**	**1**
Module 2	**Hours**	
Data Processing Techniques: Data Cleaning, Handling Missing Values, Data Integration, Data Transformation, Data Normalization, Data Reduction- Dimensionality Reduction Methods.	**20**	**2**
Module 3	**Hours**	
Data Analysis Techniques: Introduction to Exploratory Data Analysis (EDA), Descriptive Statistics, Inferential Statistics, Data Visualization Techniques.	**20**	**3, 4**

Mode of Transaction	**Classroom activities:** Lecture and Tutorial **Field activities:** Collect Primary data from the source **Lab based activities:** Data processing activities
Mode of Assessment	A. Continuous Internal Assessment (CIA) • Internal Tests – Minimum Two • Seminar • Assignment – Written, Practical, Oral Presentation and Viva

	B. End Semester Examination

Learning Resources

1. **Salvador García, et al.** Data Preprocessing in Data Mining. Springer International Publishing, Germany, 2014.
2. **Foster Provost and Tom Fawcett.** Data Science for Business. O'Reilly Media, 2013.
3. **C.R. Kothari.** Research Methodology: Methods and Techniques. New Age International, 2nd Edition, 2004.
4. **Jiawei Han, Jian Pei, and Hanghang Tong.** Data Mining: Concepts and Techniques. Fourth Edition, Elsevier, 2024.

Relevance of Learning the Course/ Employability of the Course
Mastering data processing techniques is crucial for careers in data science, analytics, and information technology. This course equips students with skills in data processing essentially required in data-driven industries.