<u>Detailed Syllabus</u> Lecture-wise Breakup

Course Code	23B61CS121	Semester II (EVEN) (specify Odd/Even)		Session 2023-24 Month from Jan 2024 to June 2024		
Course Name	Data Structures					
Credits	3-1-0		Contact	Hours	4	

Faculty (Names)	Coordinator(s)	Dr. Niyati Aggrawal
	Teacher(s) (Alphabetically)	Dr. Manju, Dr. Niyati Aggrawal

COU	RSE OUTCOMES	COGNITIVE LEVELS
CO1	Explain the basics of data structures, their need and types viz. linear and non-linear, abstract data types.	Understand Level (Level 2)
CO2	Implement various linear data structures and their related operations.	Apply Level (Level 3)
CO3	Implement various non- linear data structures and their related operations.	Apply Level (Level 3)
CO4	Apply appropriate data structure to solve a given problem.	Analyze Level (Level 4)
CO5	Assess appropriate data structure for any given real-world problem.	Evaluate Level (Level 5)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module

1.	Introduction	Fundamentals of Linear and Non-Linear Data Structures, need of data structures, Memory Allocation – Static and dynamic, Introduction to Abstract Data Types.	3
2.	Linear Data Structures	Review of Arrays: One dimension, two-dimension, memory representation, address calculation, and related operations.	8
		Linked List: Singly, Doubly, Circular, and related operations like Creation, Insertion, Deletion, Modification, Searching,	
		Sorting, Reversing, and Merging.	
3.	Abstract data types	Stack: Static and dynamic implementation, operations, applications like conversion between polish and reverse polish notations.	5
		Queue: Static and dynamic implementation, operations, types: linear, circular, doubly ended.	
4.	Searching and Sorting	Searching – Review of Linear Search and Binary Search. Hashing – Hash Table, Chaining, Probing.	8
		Sorting – Merge, Quick, Radix, Bucket, and Count. Review of insertion, selection, bubble sort.	
5.	Non-Linear Data Structures	Trees: Notations & Terminologies, Memory Representation, Binary Trees Types- Complete, Full, Strict. Tree Traversals (Recursive and non-recursive), Binary Search Tree and Basic Operations, Threaded Binary Tree. Balanced BST: AVL Tree, B Tree. Priority Queue using Binary Heaps.	18
		Graphs: Notations and Terminologies, Memory Representation: Adjacency Matrix and List; Graph Traversal using DFS and BFS.	
		Total number of Lectures	42

Evaluation Criteria				
Components	Maximum Marks			
T1	20			
T2	20			
End Semester Examination	35			
ТА	25			
(Mini Project(10), Attendance(5), Assignment	ent/Quiz/Programming Contest(10))			
Total	100			

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

Text Book:

- 1 Dinesh P. Mehta and Sartaj Sahni, Handbook of Data Structures and Applications, 2nd Ed., Chapman and Hall/CRC Computer and Information Science Series, CRC Press
- ² Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, Introduction to rithms, MIT Press, 3rd Edition, 2009

3 Seymour Lipschutz, Data Structures with C, Schaum's Outline Series, McGraw Hill, 2010

⁴ Y. Langsam, M. J. Augenstein and A.M. Tanenebaum, "Data Structures using C and C++", Pearson Education India, Second Edition, 2015.

Reference Book

1

4

Alfred V. Aho, J.E. Hopcroft, Jeffrey D. Ullman, Data Structures and rithms, Addison-Wesley Series in Computer Science and Information Processing, 1983

- 2 Y. Kanetkar "Data Structures through C", BPB Publication, Third Edition, 2019.
- ³ R.F Gilberg, and B A Frouzan- "Data Structures: A Pseudocode Approach with C", Thomson Learning, Second Edition, 2004.

E. Horowitz and S. Sahni, "Fundamentals of Data Structures in C". Universities Press, Second edition, 2008.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
	1	1	1	1			1		1
C01	Analysis of problems to explain the need of different types of data structures	Analyse real time problems to suggest relevant Data structures	Understand to compare different solutions for a single problem in hand	Explore different offline/online tools available for implementing solutions			Understand the need for learning DS in real life		Understand the role of DS at software level to be embedded as appropriate solution for hardware to work
CO2	2	2	1	1			2		1

	Fundamentals of stack, queue, linked list	Analyse solution using stack, queue and lists	Using Linear DS design solution efficient than brute force	Use different offline/online tools available for implementing solutions using Linear DS			Apply linear DS and map them to different real-life scenarios to understand their impact on betterment of life	Develop solutions using Linear DS at software level to be embedded as appropriate solution for hardware to work
	2	2	1	1			2	1
CO3	Fundamentals of Multi list, tree and graphs	Analyse solution using Multi list, tree and graphs	Using Non- Linear DS design solution efficient than brute force	Use different offline/online tools available for implementing solutions using Non- Linear DS			Apply Non- Linear DS and map them to different real-life scenarios to understand their impact on betterment of life	Develop solutions using Non- Linear DS at software level to be embedded as appropriate solution for hardware to work
со	2	2	1	1	2	1	3	1
4	Mapping appropriate DS according to problem in hand	Identify which DS is suitable for the problem	Apply DS w.r.t. which a solution can be developed for a problem	Use different offline/online tools available for implementing solutions using various Data structures	Engineer solution to real time problems using appropriate DS/ that's of societal usage	PBL component to apply all learned DS to learn project management and team work	Develop solution to real life applications using combination of different DS	Develop solutions using various DS at software level to be embedded as appropriate solution for hardware to work
	3	3	2	1	3	1	3	1
CO 5	Assess different approaches on a single problem	Analyse at DS level using pseudo time/space calculation	Choose best DS w.r.t. which most efficient solution can be proposed	Use different offline/online tools available for implementing and analysing solutions using various Data structures	Engineer effective solution to real time problems using appropriate DS/ that's of societal usage	PBL component to develop the most efficient solution using all learned DS to learn project management and team work	Develop and analyse solution to real life applications using combination of different DS	Assess solutions using various DS at software level to be embedded as appropriate solution for hardware to work

<u>Detailed Syllabus</u> Lab-wise Breakup

Course Code	23B65CS124	Semester : II		Session Month	2023-24 from Jan 2024 to June 2024
Course Name	Data Structure Lab				
Credits	0-0-1		Contact H	Iours	2

Faculty (Names)	Coordinator(s)	Dr. Manju
	Teacher(s) (Alphabetically)	Dr. Manju, Dr. Niyati Aggrawal

COUR	SE OUTCOMES	COGNITIVE LEVELS
CO1	Demonstrate concepts of C programming language.	Apply Level (C3)
CO2	Apply various linear data structures and their related operations to solve the realworld problems.	Apply Level (C3)
CO3	Apply various non- linear data structures and their related operations to solve the real-world problems.	Analyze Level (C4)
CO4	Choose appropriate data structure to solve a given problem.	Evaluate Level (C5)
CO5	Create an application that utilizes the data structures to efficiently solve realworld problems	Create Level (C6)

Module No.	Title of the Module	Topics in the Module	No. of Labs for the module
1.	Introduction	Lab 1: Programs based on Memory Allocation – Static and dynamic, pointer arithmetic, structures	1

2.	Linear Data Structures	 Lab-2: Review of Arrays: One dimension, two-dimension, memory representation, address calculation, and related operations. Lab-3-4: Linked List: Singly, Doubly, Circular, and related operations like Creation, Insertion, Deletion, Modification, Searching, Sorting, Reversing, and Merging. 	3
3.	Abstract data types	 Lab-5: Stack: Static and dynamic implementation, operations, applications like conversion between polish and reverse polish notations. Lab 6: Queue: Static and dynamic implementation, operations, types: linear, circular, doubly ended. 	2
4.	Searching and Sorting	 Lab 7: Searching – Review of Linear Search and Binary Search. Hashing – Hash Table, Chaining, Probing. Lab 8: Sorting – Merge, Quick, Radix, Bucket, and Count. Review of insertion, selection, bubble sort. 	2
5.	Non-Linear Data Structures	 Lab 9-10: Trees: Notations & Terminologies, Memory Representation, Binary Trees Types- Complete, Full, Strict. Tree Traversals (Recursive and non-recursive), Binary Search Tree and Basic Operations, Threaded Binary Tree. Balanced BST: AVL Tree, B Tree. Priority Queue using Binary Heaps. Lab 11-12: Graphs: Notations and Terminologies, Memory Representation: Adjacency Matrix and List; Graph Traversal using DFS and BFS. 	4
Total num	ber of Labs		12
Evaluatio Compone Lab Test Lab Test Lab Eval Mini-Pro Lab Eval Attendan Total	on Criteria ents -1 -2 uation-1 ject uation-2 ce	Maximum Marks 20 20 10 20 15 15 15 100	

Project Based Learning: Each student in a group of 3-4 will develop one project using some data structures and explaining the real time usage of the developed application. The project is to be assessed based on the data structures involved and mapping it to real time problem. This course will help students grow their technical skills in terms of implementation and in turn will help in employability like web development, algorithms design and efficiency improvement.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1	Dinesh P. Mehta and Sartaj Sahni, Handbook of Data Structures and Applications, 2nd Ed., Chapman and Hall/CRC Computer and Information Science Series, CRC Press
2	R.F Gilberg, and B A Frouzan- "Data Structures: A Pseudocode Approach with C", Thomson Learning, Second Edition, 2004.
3	Alfred V. Aho, J.E. Hopcroft, Jeffrey D. Ullman, Data Structures and Algorithms, Addison-Wesley Series in Computer Science and Information Processing, 1983
4	Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, Introduction to Algorithms, MIT Press, 3rd Edition, 2009
5	E. Horowitz and S. Sahni, "Fundamentals of Data Structures in C". Universities Press, Second edition, 2008.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
	1	1	1	1			1		1
CO1	Analysis of problems to explain the need of different types of data structures	Analyse real time problems to suggest relevant Data structures	Understand to compare different solutions for a single problem in hand	Explore different offline/online tools available for implementing solutions			Understand the need for learning DS in real life		Understand the role of DS at software level to be embedded as appropriate solution for hardware to work
	2	2	1	1			2		1
CO2	Fundamentals of stack, queue, linked list	Analyse solution using stack, queue and lists	Using Linear DS design solution efficient than brute force	Use different offline/online tools available for implementing solutions using Linear DS			Apply linear DS and map them to different real-life scenarios to understand their impact on betterment of life		Develop solutions using Linear DS at software level to be embedded as appropriate solution for hardware to work
	2	2	1	1			2		1
CO3	Fundamentals of Multi list, tree and graphs	Analyse solution using Multi list, tree and graphs	Using Non- Linear DS design solution efficient than brute force	Use different offline/online tools available for implementing solutions using Non- Linear DS			Apply Non- Linear DS and map them to different real-life scenarios to understand their impact on betterment of life		Develop solutions using Non- Linear DS at software level to be embedded as appropriate solution for hardware to work
CO4	2	2	1	1	2	1	3		1

	Mapping appropriate DS according to problem in hand	Identify which DS is suitable for the problem	Apply DS w.r.t. which a solution can be developed for a problem	Use different offline/online tools available for implementing solutions using various Data structures	Engineer solution to real time problems using appropriate DS/ that's of societal usage	PBL component to apply all learned DS to learn project management and team work	Develop solution to real life applications using combination of different DS	Develop solutions using various DS at software level to be embedded as appropriate solution for hardware to work
	3	3	2	1	3	1	3	1
CO5	Assess different approaches on a single problem	Analyse at DS level using pseudo time/space calculation	Choose best DS w.r.t. which most efficient solution can be proposed	Use different offline/online tools available for implementing and analysing solutions using various Data structures	Engineer effective solution to real time problems using appropriate DS/ that's of societal usage	PBL component to develop the most efficient solution using all learned DS to learn project management and team work	Develop and analyse solution to real life applications using combination of different DS	Assess solutions using various DS at software level to be embedded as appropriate solution for hardware to work

<u>Detailed Syllabus</u> Lecture-wise Breakup

Course Code	23B61CS122	Semester: EVEN		Semester: II Session: 2023-24 Month from Jan 2024 to June 202				
Course Name	Database Manager	Database Management Systems						
Credits	3-1-0		Contact Hours		4			

Faculty (Names)	Coordinator(s)	Noor Mohammad
(ivanies)	Teacher(s) (Alphabetically)	Noor Mohammad, Neetu Singh

COURSE	OUTCOMES	COGNITIVE LEVELS
CO1	Explain the basic concepts of database management system and their application in system design.	Understand (Level 2)
CO2	Identify the data models for relevant problems and explain the basics of relational model.	Understand (Level 2)
CO3	Model the real world systems using Entity Relationship Diagrams and convert the ER model into a relational logical schema using various mapping algorithms.	Apply (Level 3)
CO4	Demonstrate the use of SQL commands and relational algebraic expressions for query processing.	Apply (Level 3)
CO5	Simplify databases using normalization process based on identified keys and functional dependencies	Analyse (Level 4)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction to Databases	Overview of data, database, database management system DBMS Architecture, Data Independence, Three Schema architecture, File system vs DBMS, Data models, Schema, Instances, Database states, Role of database administrator, Designers and end users.	4

2.	Relational database And ER Model	Entity and its types, Entity set, Notations for ER Diagram Attributes, Keys, Relationships and its types, Mapping Constraints, Enhanced ER Diagram, Specialization and generalization. ER to relational mapping: Steps to map ER diagram to relational schema	5
3.	Relational Model	<i>Relational Data Models</i> : Relational model terminology domains, Attributes, Tuples, Relations, characteristics of relations, relational constraints domain constraints, key	5
		constraints and constraints on null, Relational DB schema. Codd's Rules. <i>Relational algebra:</i> Basic operations selection and projection. Set Theoretic operations: Union, Intersection, set difference and division (Order, Relational calculus: Domain, Tuple, Well Formed Formula, specification, quantifiers). <i>Join</i> <i>operations:</i> Inner, Outer, Left outer, Right outer, and full outer join.	
5.	Database Design	Functional Dependencies, Armstrong's inference rule, Normalization, First Normal form, Second Normal form, Third Normal Form, BCNF,	6
6.	Structured Query Language	Overview, Characteristics, Advantage of SQL- DDL, DML, DCL, SQL data type, specifying constraints, Basic SQL queries. Logical operators: BETWEEN, IN, AND, OR, NOT, ANY, ALL. Set Comparison operators, Group by and Having Clauses, Nested queries, Joins	9
7.	Procedural Language	PL/SQL: Data types, Stored Procedures, Functions, Exceptions, Cursors and triggers.	5
9.	Transaction and Concurrency Control	Definition of Transactions, ACID properties, Schedules, Serializability, Concurrency Control, Lock-based protocols, Time-stamp based protocols.	6
10.	Database Recovery	System Failure, Backup and recovery Technique, checkpoints, rollback, Deadlock	2
		Total number of Lectures	42
Evaluatio	n Criteria		
Compone T1 T2 End Seme TA Test/Quiz/ Total	ents ster Examination /Tutorial):15	Maximum Marks 20 20 35 25(Attendance:10, Assignments/Min-Project/Class 100	

Project Based Learning: Each student in a group of 3-4 will choose a real-life application area. To make a project, the students will analyze and define the need of database systems in terms of functional requirements. Each group will design the Entity Relationship diagram to understand the organizational structure of the application area and implement the database in MySQL. Each group will identify 15-20 typical queries and execute them. For handling the multiple record, they will implement cursors ad triggers. Student will design the webpage of the application area and connect with the database.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	Henry F Korth, Abraham Silberschatz, S. Sudurshan, Database system concepts, 6 th Edition, McGraw-Hill,2010
2.	RamezElmasri, Shamkant B. Navathe, Fundamentals of Database Systems, 6th Edition, Pearson
	Education, 2011.
3.	Ramakrishnan, Gehrke, Database Management Systems, Mcgraw-Hill, 3 rd Edition, AddisonWesley, 2006.
4.	Thomas Connolly, Carolyn Begg, Database Systems-A Practical Approach to design, Implementation and Management, 6 th Edition, Pearson Education,2015.
7.	"An introduction to database systems" by Bipin C. Desai, West Publishing Company, College & School Division, 1990 - Computers - 820 pages
8.	Christopher J. Date, Database Design and Relational Theory: Normal Forms and All That Jazz, 2012.
9.	Rajiv Chopra, Database Management System (DBMS): A Practical Approach, 5th Edition, 2016, 682 pages.

	CO-PO-PSO Mapping										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2		
C01	1	1	2				1				
	It focuses on understanding database management system.	It may not directly involve problem analysis.	Understanding database is necessary for designing systems.				It slightly contributes to lifelong learning.				
CO2	2	1	1				1		1		
	It aligns with understanding basic knowledge of data models to identify suitable data model for any problem.	It slightly helps in problem analysis.	It slightly contributes to designing applications that involve data models.				It aligns with lifelong learning.		Slightly, it contributes to database development for web and mobile applications.		
CO3	2	2	2	1	1		1		1		

	It directly aligns with the basic knowledge to model real world systems	Modelling involves problem analysis to address challenges related to data.	It involves designing ER model.	It aligns with modern tool usage to create designs.	ER model aligns with data information.	It aligns with lifelong learning.	It contributes to database development for web and mobile applications.
CO4	2	2		2		1	1
	It directly aligns with the basic knowledge of SQL for query processing	It involves problem analysis.		It uses modern tool for query processing.		It aligns with lifelong learning,	It contributes to database development for web and mobile applications.
CO5	2	2					2
	It directly aligns with the basic knowledge of normalization.	It involves problem analysis to normalize data.					It contributes to database development for web and mobile applications.
Avg.	1.8	1.6	1.67	1.5	1	1	1.25

Detailed Syllabus

Lab-wise Breakup

Course Code	23B65CS125	Semester: EVEN		Semester: II Session : 2023-24 Month from Jan 2024 to June 2024		
Course Name	Database Manager	ement Systems Lab				
Credits	0-0-1		Contact		2	

Faculty (Names)	Coordinator(s)	Noor Mohammad
(Ivallies)	Teacher(s) (Alphabetically)	Dhanalakshmi G , Indu Chawla, Noor Mohammad ,Neetu Singh

	COURSE OUTCOMES				
CO1	Discuss the basic concepts of MySQL commands.	Understand (Level II)			

CO2	Execute simple and complex queries using DDL, DML, DCL and TCL.	Apply (Level III)
CO3	Implement SQL Joins, Clauses, and Subqueries.	Apply (Level III)
CO4	Programming PL/SQL including stored procedures, stored functions, cursors, Triggers.	Apply (Level III)

Module	Title of the	List of Experiments	СО
No.	Module		
1.	Introduction to MySQL commands.	MySQL Create command, Data Types, Constraints, Alter, Drop, Rename Statements.	
2.	SQL-DML	Select database, show and describe tables. DML Commands- Select, Insert, Update, Delete.	
3.	Conditions and Logical Operators	Specifying conditions with Where keyword, AND, OR, NOT, BETWEEN, IN, NOT IN etc.	
4.	SQL Aggregate Functions	Date and Time functions, Numeric, String, Conversion functions like Count, Min, Max, Avg, Sum etc.	
5.	SQL Joins	Cross Join, Natural Join, Inner Join, Outer Join.	
6.	SQL Clauses	Sorting Results (ORDER BY Clause), Grouping Results (GROUP BY Clause), ANY and ALL, Combining Result Tables (UNION, INTERSECT, EXCEPT).	
7.	Subqueries	Basic Subqueries, multiple column subqueries, subqueries with Having and group by clause.	
8.	Procedural Language	 Write PL/SQL program for storing data using procedures. Write PL/SQL program for storing data using stored functions. Write PL/SQL program for storing data using cursors and Triggers 	
Evaluatio Compone Lab Test Lab Test Day-to-E	on Criteria ents :-1 :-2 Day	Maximum Marks 20 20 60	
(Project, Total	Lab Assessment, Atten	idance) 100	

Reco book	commended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text ks, Reference Books, Journals, Reports, Websites etc. in the IEEE format)
1.	Henry F Korth, Abraham Silberschatz, S. Sudurshan, Database system concepts, 7 th Edition, McGraw-Hill,2019
2.	Ramez Elmasri , Shamkant B. Navathe , Fundamentals of Database Systems, 5 th Edition, Pearson Education, 2015.
3.	Ramakrishnan, Gehrke, Database Management Systems, Mcgraw-Hill, 3 rd Edition, AddisonWesley, 2014.
4.	Thomas Connolly, Carolyn Begg, Database Systems-A Practical Approach to design, Implementation and Management, 6 rd Edition, Addison-Wesley,2015.

	CO-PO-PSO Mapping									
	PO1 PO2 PO3 PO4 PO5 PO6 PO7 PS01 PS02									
C01	1		1				1			
	It focuses on understanding MySQL basics.		Understanding database language is necessary for designing database.				It slightly contributes to lifelong learning.			
CO2	2	2	1	2			1		1	

	It aligns with executing queries.	It involves problem analysis to execute complex queries.	It slightly contributes to designing applications that involve database.	It aligns with database managem ent software		It aligns with lifelong learning.		It contributes to database development for web and mobile applications.
CO3	2	2	1	2		1		1
	It aligns with executing queries	It involves problem analysis to execute complex queries.	It slightly contributes to designing applications that involve database	It aligns with database managem ent software		It aligns with lifelong learning		It contributes to database development for web and mobile applications.
CO4	2	2	2	2		1		2
	It align with applying basic knowledge.	It involves problem analysis.	It contributes to designing applications that involve database	It uses modern tool for designing database.		It aligns with lifelong learning	•	It contributes to database development for web and mobile applications.
Avg.	1.75	2	1.25	2		1		1.33

<u>Detailed Syllabus</u> Lecture-wise Breakup

Subject Code	23B61CS123	Semester: (specify Odd/Even): Even	Semester: 2 nd Session: 2023-24 Month: Jan2024 to June 2024
Subject Name	Python 1		
Credits	2-0-0	Contact Hours	2

Faculty (Names)	Coordinator(s)	Neetu Singh
	Teacher(s) (Alphabetically)	Neetu Singh, Preeti Mittal

COURSE	OUTCOMES	COGNITIVE LEVELS
CO1	List reasons why Python is a useful scripting language for developers	Knowledge (level 1)
CO2	Illustrate solution of practical problems using variables, assignment statements, control statements, functions and Sequences	Apply (level 3)
CO3	Solve practical problems using Dictionaries and Sets	Apply (level 3)
CO4	Demonstrate Array Oriented Programming with NumPy and String Handling methods to write scripts	Apply (level 3)
CO5	Practice solving practical problems by writing scripts using file and exception handling and creating data visualization using Matplotlib	Apply (level 3)

Module	Subtitle of the	Topics in the Module	No. of Lectures
No.	Module		for the module
1	Introduction to Python	Language features	1
		Current applications of Python	
		Reasons for increasing popularity	
2	Variables and	Variables and assignment statements	2
	Assignment Statements	Arithmetic	
		Function print and introduction to single and double quoted	
		Strings	
		Triple quoted strings	
		Getting input from user	
		Objects and dynamic typing	
3	Control Statements	if, else, ifelseif, else statements	3
		while statement	
		for statement	
		Iterables, list and Iterators	
		Built in range function	
		Augmented Assignments	
		Sequence controlled Iteration	
		Formatted Strings	
		Built in function range: A deeper look	
		Using type Decimal for monetary amounts	
		break and continue Statements	

Boolean Operators and, or and not	
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4	Functions	Defining functions	4
1		Random Number	
		Python Standard Library math	
		Module Functions Default	
		Parameter Values	
		Keyword Arguments	
		Arbitrary Argument Lists	
		Methods: Functions That Belong to Objects Scope	
		Rules	
		import: A Deeper Look	
		Passing Arguments to Functions: A Deeper Look	
		Recursion	
		Functional-Style Programming	
		Main module, built-in, custom modules	
		Namespaces and scopes in Python	
5	Sequences: Arrays, Lists	Arrays and basic operations on Arrays	4
5	and Tuples	Matrix	1
	and rupies	Tiete	
		Tunlee	
		Unnacking Sequences	
		Sequence Slicing del	
		Statement	
		Passing Lists to Functions	
		Sorting Lists	
		Searching Sequences	
		Other List Methods	
		Simulating Stacks with Lists	
		List Comprehensions	
		Generator Expressions	
		Filter Man and Reduce	
		Other Sequence Processing Functions	
		Two-Dimensional Lists	
6	Distionaries and Sets	Introduction to Dictionarias	л
0	Dictionalies and Sets	Creating a Dictionary	4
		Iterating a Dictionary	
		Regia Dictionery Operations	
		Distingery Methods have and values	
		Dictionary Methods keys and values	
		Dictionary Comparisons	
		Dictionary Method update	
		Liter Luciente Set	
		Introduction to Sets	
		Comparing Sets	
		Mathematical Set Operations	
		Mutable Set Operators and Methods	
		Set Comprehensions	
7	Array-Oriented	Creating arrays from Existing Data array	3
	Programming with	Attributes	
	NumPy	Filling arrays with Specific Values	
		Creating arrays from Ranges	
		List vs. array Performance: Introducing %timeit array	
		Operators Num Dy Coloulation Mathada	
		NumPy Calculation Methods	
		Universal Functions	
		Midexing and Shellow Comies	
		views: Shahow Copies	
	1	Deep Copies	

8	Strings: A Deeper Look	Formatting Strings	3
		Presentation Types	
		Field Widths and Alignment	
		Numeric Formatting	
		String's format Method	
		Concatenating and Repeating Strings	
		Stripping Whitespace from Strings	
		Changing Character Case	
		Comparison Operators for Strings	
		Searching for Substrings	
		Replacing Substrings	
		Splitting and Joining Strings	
		Characters and Character-Testing Miethous	
		Kaw Strings	
		Introduction to Regular Expressions	
		Replacing Substrings and Splitting Strings	
		Other Search Functions: Accessing Matches	
0	Files and Exceptions	Writing to a Text File: Introducing the with Statement	Λ
フ	Thes and Exceptions	Reading Data from a Text File	1
		Undating Text Files	
		Serialization with JSON	
		Additional Notes Regarding Files	
		Handling Exceptions	
		Division by Zero and Invalid Input try	
		Statements	
		Catching Multiple Exceptions in One except Clause	
		What Exceptions Does a Function or Method Raise?	
		What Code Should Be Placed in a try Suite?	
		finally Clause	
		Explicitly Kaising an Exception Stack Unwinding and Tracebacks	
10		Stack Unwinding and Tracebacks	-
10	Data Visualization	Introduction to Matplotlib	2
		Introduction to data visualization	
		Types of charts	
			20
		Total number of Lectures	30
Evaluatio	n Criteria		
Components		Maximum Marks	
Mid Term (T2)		30	
End Seme	stor Examination	40	
	Ster Examination	40 20 (Attendance (5) Assignment/Mini Project/Tutorial/	
Ouiz (25))	50 (Altendance (5), Assignmente mini i rojece i utoriale	
Total		100	
Iotai		100	

Project based learning: Create a Python application either individually or in groups of maximum 4 students each, to illustrate the concepts covered in class.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

er Series,

1	Paul Barry: Head First Python, 3rd Edition, O'Reilly, 2023.
2	Erric Matthes: Python Crash Course, 3rd Edition, No Starch Press, 2023.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	-	-	-	-	-	-	1	-	-
							Engage in life long learning on new areas where knowledge of Python can be applied	_	
CO2	3	2	2	1	-	-	1	-	1
	Strongly apply fundamental knowledge of variables, assignment statements, control statements, functions and sequences to provide solutions to problems using Python	Conduct a moderate level of analysis of problems and solve them using Python based variables, assignment statements, control statements, functions and sequences	Be able to create and demonstrate Python based applications using variables, assignment statements, control statements, functions and sequences that help resolve various needs of the society at moderate level	Slightly understand the constraints of variables, assignment statements, control statements, functions and sequences in developing applications using Python and apply them where appropriate			Able to engage in lifelong learning of new features introduced with respect to variables, assignment statements, control statements, functions and sequences in Python independently to a slight extent		Slightly acquire programming skills by learning usage of variables, assignment statements, control statements, functions and sequences in Python
CO3	2	2	2	1	-	-	1	-	1
	Apply knowledge of Dictionaries and Sets to provide solutions to problems using Python at moderate level	Solve application development use cases by applying the knowledge of Dictionaries and Sets at moderate level	Be able to create and demonstrate Python based applications using Dictionaries and Sets that help resolve various needs of the society at moderate level	Slightly understand the constraints of Dictionaries and Sets in developing applications using Python and apply them where appropriate			Able to engage in lifelong learning of new features introduced with respect to Dictionaries and Sets in Python independently to a slight extent	-	Slightly acquire programming skills by learning usage of Dictionaries and Sets in Python
CO4	2	2	2	1	-	-	1	-	1
	Apply knowledge of Array Oriented Programming with NumPy and String Handling methods to provide solutions to problems using Python at moderate	Solve application development use cases by applying the knowledge of Array Oriented Programming with NumPy and String Handling methods at moderate	Be able to create and demonstrate Python based applications using Array Oriented Programming with NumPy and String Handling methods that	Slightly understand the constraints of Array Oriented Programming with NumPy and String Handling methods in developing applications using Python			Able to engage in lifelong learning of new features introduced with respect to Array Oriented Programming with NumPy and String		Slightly acquire programming skills by learning usage of Array Oriented Programming with NumPy and String Handling methods in

			help resolve various needs				Handling methods in		
	level	level	of the society at moderate level	and apply them where appropriate			Python independently to a slight extent		Python
CO5	2	2	2	1	1	-	1	-	2
Average	Apply knowledge of File and Exception handling and data visualization using Matplotlib to provide solutions to problems using Python at moderate level	Solve application development use cases by applying the knowledge of File and Exception handling and data visualization using Matplotlib at moderate level	Be able to create and demonstrate Python based applications using File and Exception handling and data visualization using Matplotlib that help resolve various needs of the society at moderate level	Slightly understand the constraints of File and Exception handling methods and data visualization using Matplotlib in developing applications using Python and apply them where appropriate	Slightly communicate effective reports, design documents and presentations explaining the use of File and Exception handling and data visualization using Matplotlib via Project Based Learning		Able to engage in lifelong learning of new features introduced with respect to File and Exception handling and data visualization using Matplotlib in Python independently to a slight extent	-	Acquire programming skills by learning usage of File and Exception handling and data visualization using Matplotlib in Python at moderate level
Average									
	1.8	1.6	1.6	0.7	0.2	0	1	0	1

<u>Detailed Syllabus</u> Lab-wise Breakup

Subject Code	23B65CS126	Semester: (Specify Odd/Even): Even	Semester: 2 nd Session: 2023-24 Month: Jan2024 to June 2024
Subject Name	Python 1		
Credits	0-0-1	Contact Hours	2

Faculty (Names)	Coordinator(s)	Kirti Jain
(i tulines)	Teacher(s) (Alphabetically)	Ankita Verma, Kirti Jain, Neetu Singh, Preeti Mittal

COURSE	OUTCOMES	COGNITIVE LEVELS
CO1	Practice writing Python programs using variables, operators, control statements, functions and sequences	Apply (level 3)
CO2	Solve problems using Dictionaries, Sets, String operations and array-oriented programming with NumPy using Python scripts	Apply (level 3)
CO3	Illustrate usage of File and Exception handling and data visualization using Matplotlib to solve problems using Python scripts	Apply (level 3)
CO4	Experiment creating solutions for practical problems using various python concepts	Analyze (level 4)

Module No.	Subtitle of the Module	Topics in the Module	No. of Labs for the module
1	Variables and	Writing your first 'Hello World' Program	1
	assignment statements	Python Indentation	
		Python Comments	
		Variables	
		Operators	

2	Control Statements	Getting input from user Control Statements - if, else, while, for range function break and continue and, or,	2
		not operators	
3	Functions	Recursion Functional-Style Programming	1
4	Sequences: Arrays, Lists	Arrays	3
	and Tuples	Matrix	
		Lists	
		Tuples	
		I wo-Dimensional Lists Sequence Processing Functions	
	Dictionaries and Sets	Creating a Dictionary	2
5	Dictionaries and Sets	Iterating through a Dictionary	2
		Basic Dictionary Operations	
		Dictionary Methods keys and values	
		Dictionary Comparisons	
		Dictionary Method update	
		Comparing Sets	
		Mathematical Set Operations	
		Mutable Set Operators and Methods	
6	Strings: A Deeper Look	Formatting Strings	1
		Stripping Whitespace from Strings	
		Changing Character Case	
		Comparison Operators for Strings	
		Searching for Substrings	
		Replacing Substrings	
		Splitting and Joining Strings	
		Regular Expressions	
		Replacing Substrings and Splitting Strings	
		Other Search Functions	
	Amore Oriented	Accessing Matches	1
7	Array-Oriented Programming with	Attributes	
	NumPy	Filling arrays with Specific Values	
	i tuini y	Creating arrays from Ranges	
		List vs. array Performance: Introducing %timeit array	
		Operators	
		NumPy Calculation Methods	
		Indexing and Slicing	
0	Files and Exceptions	Writing to a Text File	2
0	Thes and Exceptions	Reading Data from a Text File	2
		Updating Text Files	
		Serialization with JSON	
		Additional Notes Regarding Files	
		Handling Exceptions	
		Division by Zero and Invalid Input try	
		Catching Multiple Exceptions in One except Clause	
		What Exceptions Does a Function or Method Raise?	
		What Code Should Be Placed in a try Suite?	
		finally Clause	
		Explicitly Raising an Exception Stack Unwinding and Tracebooks	
11	1	Suck Onwinding and Hacebacks	ll l

9	Data Visualization	Creating Data Visualization using Matplotlib	1
		Total number of Lectures	16
Evaluation	Criteria		
Component	s Maxir	num Marks	
Eval 1	15		
Eval 2	15		
Lab Test 1	20		
Lab Test 2	20		
PBL	20 (S	tudents will submit the mini project in a group of 3-4	
members)			
Attendance	10		
Total	100		

Project based learning: Create a Python application either individually or in groups of maximum 4 students each, to illustrate the concepts covered in class.

Reco Refe	mmended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, rence Books, Journals, Reports, Websites etc. in the IEEE format)
	Text Books
1	Paul Deitel and Harvey Deitel: <i>Python for Programmers</i> , 1 st Edition, Deitel Developer Series, 2020.
2	Allen Downey: <i>Think Python</i> , 2 nd Edition, O'Reilly, 2015.
	Reference Books
1	Paul Barry: Head First Python, 3rd Edition, O'Reilly, 2023.
2	Erric Matthes: Python Crash Course, 3rd Edition, No Starch Press, 2023.

<u>CO-PO and CO-PSO Mapping:</u>

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	2	2	2	1	-	1	1	-	2
	Moderately apply fundamental knowledge of variables, operators, control statements, functions and sequences to develop Python based applications at a moderate level.	Moderately conduct the analysis of problems and solve them using Python variables, operators, control statements, functions and sequences	Be able to create and demonstrate Python based applications using variables, operators, control statements, functions and sequences that help resolve various needs of the society at moderate level	Slightly understand the constraints of variables, operators, control statements, functions and sequences in developing applications using Python and apply them where appropriate		Slightly apply project management principles and act as leader and team member via Project Based Learning	Able to engage in lifelong learning of new features introduced with respect to variables, operators, control statements, functions and sequences in Python independently to a slight extent		Acquire programming skills by learning usage of variables, operators, control statements, functions and sequences in Python at moderate level
CO2	2	2	2	1	-	1	1	-	2
	Moderately apply fundamental knowledge of Dictionaries, Sets and String operations, arrayoriented programming with NumPy to develop Python based applications at a moderate level.	Moderately conduct the analysis of problems and solve them using Python Dictionaries, Sets and String operations, arrayoriented programming with NumPy	Be able to create and demonstrate Python based applications using Dictionaries, Sets and String operations, arrayoriented programming with NumPy that help resolve various needs of the society at moderate level	Slightly understand the constraints of Dictionaries, Sets and String operations, arrayoriented programming with NumPy in developing applications using Python and apply them where appropriate		Slightly apply project management principles and act as leader and team member	Able to engage in lifelong learning of new features introduced with respect to Dictionaries, Sets and String operations, array-oriented programming with NumPy in Python independently to a slight extent	_	Acquire programming skills by learning usage of Dictionaries, Sets and String operations, arrayoriented programming with NumPy in Python at moderate level
CO3	2	2	2	1	1	2	1	-	2

	Moderately apply fundamental knowledge of File and Exception handling and data visualization using Matplotlib to develop Python based applications at a moderate level.	Moderately conduct the analysis of problems and solve them using Python File and Exception handling and data visualization using Matplotlib	Be able to create and demonstrate Python based applications using File and Exception handling and data visualization using Matplotlib that help resolve various needs of the society at moderate level	Slightly understand the constraints of File and Exception handling and data visualization using Matplotlib in developing applications using Python and apply them where appropriate	Slightly communicate effective reports, design documents and presentations explaining the use of File and Exception handling and data visualization using Matplotlib via Project Based Learning	Moderately apply project management principles and act as leader and team member via Project Based Learning	Able to engage in lifelong learning of new features introduced with respect to File and Exception handling and data visualization using Matplotlib in Python independently to a slight extent	-	Acquire programming skills by learning usage of File and Exception handling and data visualization using Matplotlib in Python at moderate level
CO4	2	2	2	2	2	2	1	-	2
	Moderately apply knowledge of Python concepts to provide solution to problems	Moderately identify and analyze problems and solve them using Python concepts	Design computer applications that meet the various needs of society at moderate level using Python	Moderately understand the constraints of developing applications using Python and apply them where appropriate	Moderately communicate effective reports, design documents and presentations via Project Based Learning using Python concepts	Moderately apply project management principles and act as leader and team member via Project Based Learning using Python concepts	Able to engage in independent and lifelong learning of new features introduced in Python to a slight extent	-	Acquire programming skills using Python at moderate level
Average									
	2	2	2	1.25	0.75	1.5	1	0	2

Soft Skills-1 (23B31HS112)

Course Description								
Course C	ode	23B31HS11	2	Semester Even	1	Semeste	er II Sessio from Ian 2024	n 2023-24 4 to June 2024
Course N	ame	Soft Skills -	1			Month	110111 Jan 202.	+ to June 2024
Credits		2	_		Contact]	Hours	2_0_0	
Faculty (N	Vamos)	2 Coordinate	or(c)	Dr. Nibba Sinh		liours	2-0-0	
	vanics)	Too oh or (a)	JI (3)		a			
		(Alphabetic	ally)					
COURSE	OUTC	COMES: Aft	er the s	uccessful comple	etion of th	his cours	e, the student	COGNITIVE
will be abl	le to			_				LEVELS
CO1	To une person	derstand varionality	ous aspe	ects of soft skills	and learn	n ways to	develop	Understand Level (C2)
CO2	To app profes	oly stress and sional	time m	anagement skills	s to perfo	rm as a b	etter	Apply Level (C3)
CO3	Analy: life	ze leadership	skills a	nd styles to surv	ive and e	xcel in p	rofessional	Analyze Level (C4)
CO4	Creati Learn,	ng a Decision Unlearn, and	ı makin l relearı	g, negotiation, ar 1 approach	nd capaci	ty-buildi	ng using	Create Level (C6)
Module	Title o	of the	Topic	s in the Module				No. of
No.	Modu	le	2					Lectures
1.	Introd	uction to Soft	Introd	uction, Personali	ity Devel	opment:	Knowing	5
	Skills		Yours	elf, Positive Thin	nking, En	notional	Intelligence,	
			Component of Emotional Intelligence, Skills to					
			Devel	op Emotional Int	telligence	, SWOT	Analysis	
2.	Stress	and Time	Stress	, Sources of Stre	ss, Ways	to Cope	with Stress,	4
	Manag	gement	Time	Management,	Smart	Goal	setting and	
			priorit	ization, Short-te	erm and	long-ter	m goals, and	
			Implei	menting Goals.				
3.	Decisi	on Making	Introd	uction to De	ecision	Making	Steps for	7
	and N	egotiation	Decisi	onMaking, D	Decision-N	Making	Techniques,	
		-	Negot	iation		C	• ·	
			Funda	mentals, Nego	otiation	Styles,	and Major	
			Negot	iation Concepts				
4.	Leade	rship and	Leade	r and Leadershi	ip, Leade	ership Ti	aits, Culture	5
	Team	Building	and Le	eadership, Leade	ership Sty	les and T	Frends, Team	
			Buildi	ng, Types of Tea	ums			

5	Capacity Building: Learn,	Capacity Building, Elements of Capacity Building, Zones of Learning, Ideas for Learning, Strategies for	7			
		Capacity Building				
	Unlearn and					
	Relearn	Tetel much on of Loctoria	29			
Evol	lustion Critoria	1 otal number of Lectures	28			
Con	iponents	Maximum Marks				
Mid	Term	30 (Project)				
End	Semester Examination	40				
TA		30 (Quiz, Assignments, Project, Class Attendance &	Participation)			
Tota	Total 100					
PBL repo	Component: The projec rt related to various skills	t is to be done in a group of 4-6 students. They will be implementation in their workplace.	asked to write a			
Reco book	ommended Reading mate	erial: Author(s), Title, Edition, Publisher, Year of Public mals, Reports, Websites, etc)	ation, etc. (Text			
1.	Harold R. Wallace et. al, 2006	Personality Development, Cengage Learning India Pvt.	Ltd, New Delhi			
2.	Barun K. Mitra, Personality Development & Soft Skills, Oxford University Press, New Delhi, 2012.					
3.	 L.U.B. Pandey, Practical Communication, A.I.T.B.S. Publications India Ltd.; Krishan Nagar, 2013, Delhi 					
4.	4. Sangeeta Sharma et. al, Communication Skills for Engineers and Scientists, THI Learning Pvt Ltd, New Delhi, 2011					
5.	William S. Pfeiffer, Publ	ic Speaking, Pearson, Delhi, 2012				

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1					2	1	3		3
CO2					2	1	3		3
CO3					3	3	3		3
CO4					3	3	3		3

Avg 2.5 2 3 3	
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<u>Detailed syllabus</u> Lecture-wise Breakup

Subject Code	23B36HS111	Semester: E	VEN	Semester 2 nd Month from Jan to June	Session 2023-24 2024	
Subject Name	EVERYDAY PSYCHOLOGY					
Credits	2	Contact Hou	rs	2-0-0		
Faculty (Names)	Coordinator(s)	ator(s) Dr Yogita Naruka				
(1,11110)	Teacher(s) (Alphabetically)	Dr Yogita Naruk	a			

COURSE	OUTCOMES	COGNITIVE LEVELS
CO1	Understand human behavior and components that constitute self and social relationships	Understanding Level (C2)
CO2	Apply psychological concepts to understand challenges at the level of self and inter-personal relationships	Applying Level (C3)
CO3	Evaluate the role of social norms and perceptions in shaping our behaviors and thinking	Evaluating Level (C5)
CO4	Understand and analyze the role of various psychological and lifestyle related strategies for promoting living with peace and balance	Analyse Level (C4)

Module No.	Subtitle of the Module	Topics in the module	No. of Lectures for the module
1.	Introduction to Everyday Psychology	Use and Purpose of psychology in everyday life, Understanding behavior	3
3.	Understanding Self	Basic Human Emotions, Self-esteem Core – Self Evaluation	3
3.	Identity	Identity and its formation, Identity conflict	2
4.	Personality	Personality, types of Personality, Proactive Personality	3
5.	Morality	Development of Moral Reasoning and Moral Dilemmas	2
6.	Social context of Development	Socio-cultural theory, Context of Development – Family, Peers and Schooling, Media	4
7.	Relationships	Family Relationships Relationship Struggles	2
8.	Mental Health	Concept of mental health, taboos around mental issues, mental health concerns - Body Image, Loneliness, Anxiety, Sadness vs Depression, Abuse	5

9.	Coping with Mental health issues	Coping Strategies, Role of counselling, Self-Regulation	4		
Total number of Hours					
JIIT University, Noida					

Evaluation Criteria Compone	ents Maximum Marks
Τ1	20
T2	20
End Semester Examination	35
ТА	25 (Project, Assignment/Quiz)
Total	100

Project based learning: Based on core-self-evaluation you have done for yourself and types of personalities you have studied, analyze your personality type and list out specific steps that you need to work for achieving a proactive personality in future. Be detailed, reflective about your personal experiences and support you answer from personal life anecdotes that you would like to share.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)					
1.	W. Weiten, and M. A. Lloyd, Psychology Applied to Modern Life: Adjustment in the 21 st Century, Wadsworth Publishing, 2007				
2.	R. Harington, Stress, Health and well-being: Thriving in the 21 st century, Wadsworth Publishing, 2013.				
3.	Tavris, C., & Aronson, E. (2007). Mistakes were made (but not by me): Why we justify foolish beliefs, bad decisions, and hurtful acts. Harcourt.				
4.	Aronson, E. (1994). The social animal (7 th ed.). W H Freeman/Times Books/ Henry Holt & Co.				
5.	Myers, D. G. (1999). Social psychology (6th ed.). McGraw-Hill.				

JIIT University, Noida

Discrete Mathematics (23B31MA112)

Relations, Equivalence Relations, Partial Ordered Set, Hasse Diagram, Lattice, Functions, Recursively Defined Functions, Generating functions, Z-Transforms, Propositions, Basic Logical Operators, Truth tables, Tautologies and Contradictions. Valid arguments and Fallacy, Propositional Functions and Quantifiers, Graphs, Subgraphs, Eulerian Graph and Konigsberg problem, Hamiltonian graph, Labelled and Weighted graphs. Tree Graphs-Minimum Spanning Tree (Prim's algorithm), Graph Colourings. Four Colour Problem, Trees, Digraphs, Rooted trees, Binary trees, Sequential representation, Adjacency Matrix, Path Matrix, Shortest Path.

Course Description

Course	23B31MA112	Semester : Even	Semester -						
Code			II Session 2023-						
			24						
			Month from Jan-						
~			June 2024						
Course	Discrete Mathematics								
Name			a a a						
Credits	3	Contact Hours	3-0-0						
Faculty	Coordinator(s)	Dr. Shashank Goel							
(Names)	Teacher(s) (Alphabetically)	Dr. Aradhana Narang, Dr. Shashank Go	el						
COURSE	OUTCOMES: Afte	r the successful completion of this course,	COGNITIVE						
the student	will be able to		LEVELS						
CO1	recall basics of set t	heory, functions and relations.	Remembering (C1)						
CO2	explain lattices, g algebraic structure a	Understanding (C2)							
CO3	solve the problems and algebraic struct	Applying (C3)							
CO4	analyse different graph theoretic algorithms for solving related Analyzing (C4)								
Module	Title of the	Topics in the Module	No. of Lectures for						
No.	Module		the module						
1.	Relations and	Relations and their composition. Pictorial							
	Lattices	representation, matrix and graphical							
		representations. Equivalence relations and							
		partitions. Transitive closure and	10						
		Warshall's algorithm, Partial ordered							
		relations and Hasse diagram. Lattices,							
		Boolean algebra.							
2.	Functions	Functions and recursively defined							
		functions, generating functions, solution of							
		recurrence relations by generating	10						
1	1	\downarrow unrefere equations by \angle transform.	1						

3.	Propositional	Propositions- simple and compound. Basic					
	Calculus						
		tables. Tautologies and contradictions.	5				
		Valid arguments and fallacy.					
4.	Graphs	Graphs Graphs and related definitions, subgraphs,					
		isomorphism, paths and connectivity.					
		Hamiltonian graph Labellad and weighted	7				
		graphs. Tree Graphs-Minimum spanning	1				
		Four color problem.					
5.	Directed Graphs	Trees, Digraphs and related definitions.					
		Rooted trees. Binary trees, Sequential	5				
		representation. Adjacency matrix. Path	5				
		matrix. Shortest path.					
6.	Algebraic						
	Structures	elements, subgroup, condition for	5				
		subgroups, Rings, integral domains and	5				
		Fields- definition and examples.					
Total num	ber of Lectures		42				
Evaluation	n Criteria						
Componen	nts	Maximum Marks					
		20					
T2	· - · ·	20					
End Semes	ster Examination	35 25 (Ouiz Assistments Tutorials DDI) 7					
IA		25 (Quiz, Assignments, Tutoriais, PBL) 1	lotal				
Drojact has	ad loarning: A group	n of 4 to 5 students will be formed. Each are	up will be assigned a				
nrohlem re	lated to the diversifie	p of 4 to 5 students will be formed. Each group wi	Il submit a report of 67				
problem re pages.		a upplications of graph theory. Each group wi	in subline a report of 07				
Recomme	nded Reading Mate	rial:					
	Lipschutz, S. and	Lipson, M., Discrete Mathematics, 2 nd Editio	on, Tata McGraw-Hill,				
1.	1997.						
2	Rosen, K. H., Discrete Mathematics and its Application, 7 th Edition, Tata McGrawHill,						
2.	2011.						
3.	Liu, C. L., Elements of Discrete Mathematics, 2 nd Edition, Tata McGraw-Hill, 1998.						
4.Kolman, B., Busby, R. C. and Ross, S., Discrete Mathematical Structures, 6th Edition, Prentice Hall, 2018.							
							5.
6	Grimaldi, R.P., Discrete and Combinatorial Mathematics, 5 th Edition, Pearson						
U.		Discrete and Comonatorial Mathematics,	2 Edition, Tourson				

<u>CO-PO and CO-PSO Mapping:</u>

СО	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	2	1	1				2		

CO2	2	2	1			2	1	
CO3	3	3	1		1	2	1	
CO4	3	3	1		2	2	1	
Avg	2.5	2.25	1		1.5	2	1	