

with effect from: 2019-20

VASAVI COLLEGE OF ENGINEERING
(Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mathematics
DISCRETE STRUCTURES

SYLLABUS FOR B.E. III-SEMESTER

L:T:P (Hrs./week): 3:0:0	SEE Marks : 60	Course Code : U21PC350CS
Credits : 3	CIE Marks : 40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES <i>On completion of the course, students will be able to</i>
1. Understand the concepts of set theory, arithmetic logic and proof techniques 2. Build mathematical models to solve the real world problems by using appropriate methods	1. Construct compound statements using logical connectives and verify the validity of conclusion using inference rules 2. Compare types of relations and functions and also apply principle of inclusion and exclusion to solve counting problems 3. Solve types of recurrence relations to find the complexity of an algorithm 4. Develop crypto system using Ring and modular arithmetic

UNIT – I : Fundamentals of Logic

Basic Connectives and Truth Tables, Logical Equivalence, Logical Implication, Use of Quantifiers, Definitions and the Proof of Theorems.

Functions: Cartesian Product, One-to-one, Onto Functions, Special Functions, Pigeonhole Principle, Composition and Inverse Functions.

UNIT – II : Number Theory: Properties of the Integers

Prime Numbers, The division algorithms, The Greatest Common Divisor, The Integers modulo n Fermat's and Euler Theorems, The Fundamental theorem of arithmetic. Fermat's and Euler Theorems The Chinese Remainder Theorem(without proof)

UNIT – III : Relations

Partial Orders, Equivalence Relations and Partitions.

Principle of Inclusion and Exclusion: Principles of Inclusion and Exclusion, Generalizations of Principle, Derangements, Rook Polynomials, Arrangements with Forbidden Positions.

UNIT – IV : Generating Functions

Introductory Examples, Definition and Examples, Partitions of Integers, Exponential Generating Function, Summation Operator.

Recurrence Relations: First – Order Linear Recurrence Relation, Second – Order Linear Homogenous Recurrence Relation with Constant Coefficients, Non Homogenous Recurrence Relation.

UNIT – V : Algebraic Structures& Ring Theory

Algebraic System – General Properties, semi groups, Monoids, Homomorphism, Cosets and Lagrange's Theorem. The Ring structure: Definition and Examples, Ring Properties and Substructures, Ring Homomorphism and Isomorphism.

Learning Resources:

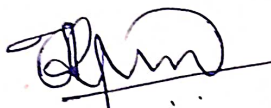
1. Ralph P. Grimaldi, Discrete and Combinatorial Mathematics, 4th Edition (2003), Pearson Education.
2. Kenneth H Rosen, Discrete mathematics and its applications, 5th Edition (2006), Tata McGraw-Hill Edition, New Delhi.
3. J.P. Tremblay, R. Manohar, Discrete Mathematical Structure with Applications to Computer Science, 4th Edition (1987), McGraw Hill, New Delhi.
4. Joe L. Mott, A. Kandel, T.P. Baker, Discrete Mathematics for Computer Scientists & Mathematicians, 2nd Edition (1986), Prentice Hall.
5. Thomas Koshy, Discrete Mathematics with Applications, 1st Edition (2004), Elsevier Inc.
6. <http://nptel.ac.in/courses/106106094/>
7. <https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-042j-mathematics-for-computer-science-fall-2010>

The break-up of CIE: Internal Test + Assignments + Quizzes

1	No. of Internal Test	2	Max. Marks for each Internal Test	30
2	No. of Assignments	3	Max. Marks for each Assignment	5
3	No. of Quizzes	3	Max. Marks for each Quiz Test	5

Duration of Internal Tests : 90 Minutes

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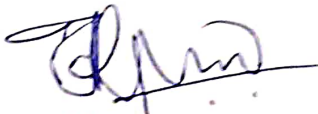
DEPARTMENT OF MATHEMATICS


Class	B.E.,III- Semester (2022-23)	Name of the Faculty	Mrs.CH.N.ANURADHA
Subject	Discrete Structures	Branch/Section	CSE- A

COURSE PLAN

Unit	Topics	No. of Lectures
I	Fundamentals of Logic Basic Connectives and Truth Tables, Logical Equivalence, Logical Implication, Use of Quantifiers, Definitions and the Proof of Theorems. Functions: Cartesian Product, One-to-one, Onto Functions, Special Functions, Pigeonhole Principle, Composition and Inverse Functions.	11
II	Number Theory: Properties of the Integers Prime Numbers, The division algorithms, The Greatest Common Divisor, The Integers modulo n , Fermat's and Euler Theorems, The Fundamental theorem of arithmetic. Fermat's and Euler Theorems The Chinese Remainder Theorem(without proof)	09
III	Relations Partial Orders, Equivalence Relations and Partitions. Principle of Inclusion and Exclusion: Principles of Inclusion and Exclusion, Generalizations of Principle, Derangements, Rook Polynomials, Arrangements with Forbidden Positions.	10
IV	Generating Functions Introductory Examples, Definition and Examples, Partitions of Integers, Exponential Generating Function, Summation Operator. Recurrence Relations: First – Order Linear Recurrence Relation, Second – Order Linear Homogenous Recurrence Relation with Constant Coefficients, Non Homogenous Recurrence Relation.	10
V	Algebraic Structures& Ring Theory Algebraic System – General Properties, semi groups, Monoids, Homomorphism, Cosets and Lagrange's Theorem. The Ring structure: Definition and Examples, Ring Properties and Substructures, Ring Homomorphism and Isomorphism.	10
	Total Hours (Lectures+Tutorials)	50
	No. of Hours for Internal Examinations	06
	Total (Attendance) Hours	56
	No. of Hours Lost Due to Public Holidays	03
	Total	59

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DEPARTMENT OF MATHEMATICS

Class	B.E.,III- Semester (2022-23)	Name of the Faculty	Mrs. CH.N.ANURADHA
Subject	Discrete Structures	Branch/Section	CSE- A

LESSON PLAN

S.No	Date	Topic	No. Of Periods	Teaching Methodology	References	Cumulative Periods
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UNIT-I: FUNDAMENTALS OF LOGIC

01	27-10-22	Introduction -Logic -Basic Connectives	1	Lecture	1, 2	1
02	28-10-22	Truth tables on connectives	1	Lecture	1, 2	2
03	29-10-22	Problems on Translating English sentences into symbolic form and vice versa	1	Lecture	1, 2	3
04	01-11-22	Tutorial	1	Lecture	1, 2	4
05	03-11-22	Propositional Equivalences-problems- Tautologies-Contradiction - problems	1	Lecture	1, 2	5
06	04-11-22	Predicates and quantifiers - Nested quantifiers-Translating English sentences using quantifiers	1	Lecture	1, 2	6
07	05-11-22	Proof Strategy- Proofs of theorems	1	Lecture	1, 2	7
08	08-11-22	Karthika Pournima				
09	10-11-22	Tutorial	1	Lecture	1,2	8
10	11-11-22	Examples on various types of proofs	1	Lecture	1,2	9
11	12-11-22	Functions: Cartesian product, One-One functions, Onto functions, Special functions	1	Lecture	1, 2	10
12	15-11-22	Pigeonhole principle-Examples-Composite and Inverse Functions	1	video	7	11

UNIT-II: NUMBER THEORY


13	17-11-22	Prime Numbers-Divisibility - Division Algorithm-Theorems	1	Lecture	1, 2	12
14	18-11-22	GCD using Euclidean Algorithm- Examples	1	Lecture	1, 2	13
15	19-11-22	Modular Arithmetic- Theorems on Congruences	1	Lecture	1, 2	14
16	22-11-22	Tutorial	1	Lecture	1, 2	15
17	24-11-22	Finding inverse using GCD	1	Lecture	1, 2	16
18	25-11-22	Fundamental Theorem of Arithmetic-Proof	1	Lecture	1, 2	17
19	26-11-22	Fermat's Little Theorem- Proof	1	Video	1, 2	18
20	29-11-22	Tutorial	1	Lecture	1, 2	19
21	29-11-22	Euler's Theorem- Proof- Chinese Remainder theorem statement.	1	Lecture	1, 2	20

	Date	Topic	No. Of Periods	Teaching Methodology	References	Cumulative Periods
UNIT-III: RELATIONS						
22	01-12-22	Relations – Properties	1	Lecture	2, 4	21
23	02-12-22	Representing relations – Closures	1	Lecture	2, 4	22
24	03-12-22	Equivalence Relations - Examples	1	Lecture	2, 4	23
25	06-12-22	<i>I-Internal test</i>	1			24
26	08-12-22	<i>I-Internal test</i>	1			25
27	09-12-22	Partial Ordering- Poset- Examples- Partitions	1	Lecture	2, 4	26
28	10-12-22	Principle of Inclusion-Exclusion- Generalization- Examples	1	Lecture	2, 4	27
29	13-12-22	Derangements - Examples	1	Lecture	1, 2	28
30	15-12-22	Tutorial	1	Lecture	1, 2	29
31	16-12-22	Rook polynomials	1	Lecture	1, 2	30
32	17-12-22	Arrangements with Forbidden positions	1	Video	1, 2	31
33	20-12-22	Some more problems	1	Lecture	1, 2	32
UNIT-IV: GENERATING FUNCTIONS						
34	22-12-22	Introduction- Definition- Examples	1	MOOC	7	33
35	23-12-22	Partition of Integers - Examples	1	Lecture	2, 4	34
36	24-12-22	Exponential generating function	1	Lecture	2, 4	35
37	27-12-22	Tutorial	1	Lecture	1, 2	36
38	29-12-22	Summation operator	1	Lecture	2, 4	37
39	30-12-22	Recurrence relations- Definitions	1	Peer-learning	2, 4	38
40	31-12-22	Homogeneous linear Recurrence relations with constant coefficients - Examples	1	Peer learning	2, 4	39
41	03-01-23	Tutorial	1	Lecture	1, 2	40
42	05-01-23	Non-Homogeneous Linear Recurrence relations- Examples	1	Lecture	2, 4	41
43	06-01-23	Some more examples on Non-Homogeneous Linear Recurrence relations	1	Project Assignment	2, 4	42
UNIT-V: ALGEBRAIC STRUCTURES AND RING THEORY						
44	07-01-23	Algebraic system – General properties	1	Lecture	1,4	43
45	10-01-23	Semi groups-Monoids- Groups- Examples	1	Lecture	1,4	44
46	12-01-23	Theorems on sub groups and Groups		Lecture	1,4	45
47	13-01-23	Tutorial	1	Lecture	1, 2	46
48	14-01-23	Pongal				

S.No	Date	Topic	No. Of Periods	Teaching Methodology	References	Cumulative Periods
49	17-01-23	Homomorphism- Cosets	1	Lecture	1,4	47
50	20-01-23	Lagrange's Theorem	1	Lecture	1,4	48
51	21-01-23	Definition of a Ring - Examples	1	Lecture	1,4	49
52	24-01-23	Properties of a Ring- Substructures	1	Lecture	1,4	50
53	26-01-23	Republic Day				
54	27-01-23	Ring Homomorphism- Examples	1	Lecture	1,4	51
55	28-01-23	Isomorphism of Rings- Examples	1	Student Seminar	1,4	52
56	31-01-23	II-Internal test	1	Lecture	1,4	53
57	02-02-23	II-Internal test	1			54
58	03-02-23	II-Internal test	1			55
59	04-02-23	II-Internal test	1			56
Total No. of Periods					50 + 6 = 56	

Ref. No.	Book Title / Reference
1	Ralph P. Grimaldi, Discrete and Combinatorial Mathematics, 4 th Edition (2003), Pearson Education.
2	Kenneth H Rosen, Discrete mathematics and its applications, 5 th Edition (2006), Tata McGraw-Hill Edition, New Delhi.
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6	http://nptel.ac.in/courses/106106094/
7	https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-042j-mathematics-for-computer-science-fall-2010

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