

| Faculty Name :  |   |               | Academic Year: 2024-25 (EVEN SEMESTER)     |               |   |   |                        |
|---|---|---------------|--|---------------|---|---|------------------------|
| Department: Mathematics   |   |               |  |               |   |   |                        |
| Course Code   | Course Title  | Core/Elective | Prerequisite                               | Contact Hours |   |   | Total Hrs/<br>Sessions |
|   |   |               |  | L             | T | P |                        |
| BCS405A   | DISCRETE MATHEMATICS  | Core          | Logics, Relations, functions, Group Theory | 2             | 2 | - | 40                     |
| Objectives  | 1 To help students to understand discrete and continuous mathematical structures.<br>2. To impart basics of relations and functions.<br>3. To facilitate students in applying principles of Recurrence Relations to find the general terms of sequences and solve the Recurrence relations.<br>4. To have the knowledge of groups and their properties to understand the importance of groups and their properties relative to various number systems |               |  |               |   |   |                        |
| Topics Covered as per Syllabus  |   |               |  |               |   |   |                        |
| <b>MODULE-I</b><br><b>Fundamentals of Logic:</b> Basic Connectives and Truth Tables, Logical Equivalence – The Laws of Logic, Logical Implication – Rules of Inference. Fundamentals of Logic contd.: The Use of Quantifiers, Quantifiers, Definitions, and the Proofs of Theorems.<br><b>Self-study:</b> Problems on Logical equivalence.  |   |               |  |               |   |   |                        |
| <b>MODULE-2:</b><br><b>PROPERTIES OF THE INTEGERS:</b><br>Mathematical Induction, The Well Ordering Principle – Mathematical Induction, Recursive Definitions.<br><b>Fundamental Principles of Counting:</b> The Rules of Sum and Product, Permutations, Combinations – The Binomial Theorem, Combinations with Repetition  |   |               |  |               |   |   |                        |
| <b>MODULE-III</b><br><b>RELATIONS AND FUNCTIONS :</b><br>Cartesian Products and Relations, Functions – Plain and One-to-One, Onto Functions. The Pigeon-hole Principle, Function Composition and Inverse Functions. <b>Properties of Relations</b> , Computer Recognition – Zero-One Matrices and Directed Graphs, Partial Orders – Hasse Diagrams, Equivalence Relations and Partitions. |   |               |  |               |   |   |                        |
| <b>MODULE-IV</b><br><b>THE PRINCIPLE OF INCLUSION AND EXCLUSION:</b><br>The Principle of Inclusion and Exclusion, Generalizations of the Principle, Derangements – Nothing is in its Right Place, Rook Polynomials.<br><b>Recurrence Relations:</b> First Order Linear Recurrence Relation, The Second Order Linear   |   |               |  |               |   |   |                        |

## MODULE-V

### INTRODUCTION TO GROUPS THEORY:

Definitions and Examples of Particular Groups Klein 4-group, Additive group of Integers modulo  $n$ , Multiplicative group of Integers modulo- $p$  and permutation groups, Properties of groups, Subgroups, cyclic groups, Cosets, Lagrange's Theorem.

#### List of Text Books

1. Ralph P. Grimaldi, B V Ramana: "Discrete Mathematical Structures an Applied Introduction", 5th Edition, Pearson Education, 2004.
2. Ralph P. Grimaldi: "Discrete and Combinatorial Mathematics", 5th Edition, Pearson Education. 2004.

#### List of Reference Books

1. Basavaraj S Anami and Venakanna S Madalli: "Discrete Mathematics – A Concept-based approach", Universities Press, 2016
2. Kenneth H. Rosen: "Discrete Mathematics and its Applications", 6th Edition, McGraw Hill, 2007.
3. Jayant Ganguly: "A Treatise on Discrete Mathematical Structures", Sanguine-Pearson, 2010.
4. D.S. Malik and M.K. Sen: "Discrete Mathematical Structures Theory and Applications, Latest Edition, Thomson, 2004.
5. Thomas Koshy: "Discrete Mathematics with Applications", Elsevier, 2005, Reprint 2008.

#### List of URLs, Text Books, Notes, Multimedia Content, etc

<http://nptel.ac.in/courses.php?disciplineID=111>  
 • [http://www.class-central.com/subject/math\(MOOCs\)](http://www.class-central.com/subject/math(MOOCs))  
 • <http://academicearth.org/>  
 • VTU e-Shikshana Program  
 • VTU EDUSAT Program.  
 • <http://www.themathpage.com/>  
 • <http://www.abstractmath.org/>  
 • <http://www.ocw.mit.edu/courses/mathematics/>

|                        |   |
|------------------------|---|
| <b>Course Outcomes</b> | <b>Course Outcomes:</b><br>At the end of the course, the student will be able to: <ol style="list-style-type: none"> <li>1. Apply concepts of logical reasoning and mathematical proof techniques in proving the statements.</li> <li>2. Demonstrate the application of discrete structures in different fields of computer science.</li> <li>3. Apply the basic concepts of relations, functions and partially ordered sets for computer representations.</li> <li>4. Solve problems involving recurrence relations and generating functions.</li> <li>5. Illustrate the fundamental principles of Algebraic structures with the problems related to science &amp; engineering.</li> </ol> |
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**Internal Assessment Marks:** 50 (3 Session Tests are conducted during the semester, each IA for 25 marks and Each assignment shall be conducted for 25 marks. (If two assignments are conducted then the sum of the two assignments shall be scaled down to 25 marks)

The final CIE marks of the course out of 50 will be the sum of the scale-down marks of tests and assignment/s marks. .Total 100M is scaled down to 50M).

### The Correlation of Course Outcomes (CO's) and Program Outcomes (PO's)

| Subject Code:                 | BCS405A          | TITLE :DISCRETE MATHEMATICS |     |     |     |     |     |     | Faculty Name: |      |      |      |       |   |
|-------------------------------|------------------|-----------------------------|-----|-----|-----|-----|-----|-----|---------------|------|------|------|-------|---|
| List of Course Outcomes (RBT) | Program Outcomes |                             |     |     |     |     |     |     |               |      |      |      | Total |   |
|                               | PO1              | PO2                         | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9           | PO10 | PO11 | PO12 |       |   |
|                               | CO-1(L3)         | 3                           | 2   |     | -   |     |     |     |               |      |      | 2    |       | 7 |
|                               | CO-2(L3)         | 3                           | 2   |     | -   |     |     |     |               |      |      | -    |       | 5 |
|                               | CO-3(L3)         | 2                           | 2   |     | -   |     |     |     |               |      |      | 2    |       | 6 |
|                               | CO-4(L3)         | 2                           | 2   |     | —   |     |     |     |               |      |      | 2    |       | 6 |
|                               | CO-5(L3)         | 2                           | 2   |     | -   |     |     |     |               |      |      | -    |       | 4 |
|                               |                  |                             |     |     |     |     |     |     |               |      |      |      |       |   |
|                               |                  |                             |     |     |     |     |     |     |               |      |      |      |       |   |

**Note:** 3 = Strong Contribution    2 = Average Contribution    1 = Weak Contribution