|  |  |
| --- | --- |
| MONO | **DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING**  **NATIONAL INSTITUTE OF TECHNOLOGY PATNA**  Ashok Raj Path, PATNA 800 005 (Bihar), India |
| Phone No.: 0612 – 2372715, 2370419, 2370843, 2371929, 2371930, 2371715 Fax – 0612- 2670631 Website: [www.nitp.ac.in](http://www.nitp.ac.in/) |

***CS3402 Discrete Mathematics and Graph Theory***

**L-T-P-Cr: 3-1-0-4**

**Pre-requisites:** High school mathematics.

**Objectives/Overview:**

* To know the classical notions of logic, set theory, main formulas in combinatories, main definitions and some classical theorems on graphs and apply graphs in concrete situations.
* The purpose of the course is to provide the students with several concepts and methods of the number theory, graph theory and their applications in engineering and computer science.

**Course Outcomes:**

At the end of the course, a student should:

|  |  |  |
| --- | --- | --- |
| **Sl. No.** | **Outcome** | **Mapping to POs** |
|  | Analyse mathematical arguments using logical connectives and quantifiers. | PO-1 |
|  | Illustrate proofs using direct proof, proof by contradiction, proof by contrapositive, and proof by cases, or mathematical induction. | PO-1 |
|  | Apply methods of counting methods in problem solving. | PO-2 |
|  | Use relations and function and their properties. | PO-2 |
|  | Examine problems in computer science using graphs and trees. | PO-4 |
|  | Examine Boolean algebra and combinatorial circuits. | PO-2 |

**UNIT I: Logic Lectures: 5**

Propositional Logic, Arguments , Methods of Proofs.

**UNIT II: Fundamentals Lectures: 5**

Sets and Operations, Proofs of Set Identities , Properties of the Integers, Matrices, Mathematical Structures.

**UNIT III: Relations and Functions Lectures: 8**

Equivalence Relations, Functions , Operations on Functions

**UNIT IV: Graphs Lectures: 14**

paths, cycles, walk; Trees and their characterization, diameter, center, degree sequences and realizability, Eulerian trails, Hamiltonian cycles---sufficient conditions, connectivity—cut points, bridges, block, Whitney’s theorem, Planarity, colourability, Coverings and independence, digraphs, tournaments, orientability, Matrix representation of graphs, External problems. Permutation, Combination of multisets, Pegionhole principle, Formal power series, and recurrence relation, Stirling numbers, Mobius inversion, Posets, Sperner’s lemma, Dilworth’s theorem, Systems of distinct representatives, Principle of inclusion-exclusion.

**Text/Reference Books**

1. *Discrete Mathematics For Computer Scientists And Mathematicians* 2Nd Ed by Mott Kandel & Baker, PHI
2. *Discrete Mathematics.* K. A. Ross, Ch. R. B. Wright, Prentice Hall Inc., 1992
3. *Graph Theory & its application.* Narsingh Deo, TMH
4. *Discrete Mathematical structures and applications to Computer Science.* by Trembly & Manohar, TMH.