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| B TECH SECOND YEAR | | | | | | | | |
| **Course code** | | | | **Discrete Structures** | L T P | | credits | |
| **Course title** | | | | **20CS304** | 3 0 0 | | 3 | |
| **Course objective:** | | | | | | | | |
| 1 | | | | The subject enhances one’s ability to develop logical thinking and ability to problem solving. | | | | |
| 2 | | | | The objective of discrete structure is to enables students to formulate problems precisely, solve the problems, apply formal proofs techniques and explain their reasoning clearly. | | | | |
| **Pre-requisites:**   1. Basic Understanding of mathematics 2. Basic knowledge algebra. 3. Basic knowledge of mathematical notations | | | | | | | | |
| **Course Contents / Syllabus** | | | | | | | | |
| **UNIT-I** | | | **Set Theory**, **Relation, Function** | | | **8 hours** | | |
| **Set Theory**: Introduction to Sets and Elements, Types of sets, Venn Diagrams, Set Operations, Multisets, Ordered pairs. Proofs of some general identities on sets.  **Relations:** Definition, Operations on relations, Pictorial Representatives of Relations, Properties of relations, Composite Relations, Recursive definition of relation, Order of relations.  **Functions:** Definition, Classification of functions, Operations on functions, Growth of Functions.  **Recurrence Relation & Generating function**: Recursively definition of functions, Recursive algorithms, Method of solving recurrences.  **Combinatorics:** Introduction, basic counting Techniques, Pigeonhole Principle.  **Proof and techniques** | | | | | | | | |
| **UNIT-II** | | | **Algebraic Structures** | | | **8 hours** | | |
| **Algebraic Structures:**Definition, Operation, Groups, Subgroups and order, Cyclic Groups, Cosets, Lagrange's theorem, Normal Subgroups, Permutation and Symmetric groups, Group Homomorphisms, Rings, Internal Domains, and Fields. | | | | | | | | |
| **UNIT-III** | | | **Lattices** | | | **8 hours** | | |
| Ordered set, Posets, Hasse Diagram of partially ordered set, Lattices: Introduction, isomorphic ordered set, well ordered set, properties of Lattices, bounded and complemented lattices, Distributive Lattices.  **Boolean Algebra**: Introduction, Axioms and Theorems of Boolean algebra, Algebraic manipulation of Boolean expressions. Simplification of Boolean Functions | | | | | | | | |
| **UNIT-IV** | | | **Propositional Logic** | | | **8 hours** | | |
| **Propositional Logic:** Introduction, Propositions and Compound Statements, Basic Logical Operations, well formed formula, Truth tables, Tautology, Satisfiability, Contradiction, Algebra of proposition, Theory of Inference.  **Predicate Logic:** First order predicate, well formed formula of predicate, quantifiers, Inference theory of predicate logic. | | | | | | | | |
| **UNIT-V** | | | **Tree and Graph** | | | **8 hours** | | |
| **Trees:** Definition, Binary tree, Complete and Extended Binary Trees, Binary tree traversal, Binary search tree.  **Graphs:** Definition and terminology, Representation of graphs, Various types of Graph, connectivity, Isomorphism and Homeomorphism of graphs, Euler and Hamiltonian paths, Graph coloring | | | | | | | | |
| **Course outcome: After completion of this course students will be able to** | | | | | | | | |
| **CO 1** | | Apply the basic principles of sets, relations & functions in computer science & engineering related problems and to solve counting problem using recursive function theory. | | | | | | K1,K3,K2 |
| **CO 2** | | Define the algebraic structure of a system and use these concepts such as coding theory, cryptographic algorithms etc. | | | | | | K1,K2 |
| **CO 3** | | Apply basics of lattices in mathematical modeling | | | | | | K2,K3 |
| **CO 4** | | Infer the validity of statements and construct proofs using predicate logic formulas. | | | | | | K3,K4 |
| **CO 5** | | Design and use the non-linear data structure like tree and graph for circuit and network designing | | | | | | K2,K6 |
| **Text books** | | | | | | | | |
| 1. B. Kolman, R.C. Busby, and S.C. Ross, Discrete Mathematical Structures, 5/e, Prentice Hall, 2004 | | | | | | | | |
| 1. E.R. Scheinerman, Mathematics: A Discrete Introduction, Brooks/Cole, 2000. | | | | | | | | |
| 1. Liptschutz, Seymour, “ Discrete Mathematics”, McGraw Hill. | | | | | | | | |
| 1. Trembley, J.P & R. Manohar, “Discrete Mathematical Structure with Application to Computer Science”, McGraw Hill. | | | | | | | | |
| 1. Liu and Mohapatra, “Elements of Distcrete Mathematics”, McGraw Hill | | | | | | | | |
| **Reference Books** | | | | | | | | |
| 1. Deo & Narsingh, “Graph Theory With application to Engineering and Computer Science.”, PHI. | | | | | | | | |
| 1. Krishnamurthy, V., “Combinatorics Theory & Application”, East-West Press Pvt. Ltd., New Delh | | | | | | | | |
| 1. Koshy, Discrete Structures, Elsevier Pub. 2008 Kenneth H. Rosen, Discrete Mathematics and Its Applications, 6/e,McGraw-Hill, 2006 | | | | | | | | |
| **NPTEL/ Youtube/ Faculty Video Link:** | | | | | | | | |
| **Unit 1** | 1. <https://www.youtube.com/watch?v=hGtOLG3SsjI&list=PLwdnzlV3ogoVxVxCTlI45pDVM1aoYoMHf&index=9> 2. <https://www.youtube.com/watch?v=rGcTcGFx9_s&list=PLwdnzlV3ogoVxVxCTlI45pDVM1aoYoMHf&index=10> 3. <https://www.youtube.com/watch?v=oU60TuGHxe0&list=PL0862D1A947252D20&index=11> | | | | | | | |
| **Unit 2** | 1. <https://www.youtube.com/watch?v=M8nh83bFJAA&list=PLwdnzlV3ogoVxVxCTlI45pDVM1aoYoMHf&index=38> 2. <https://www.youtube.com/watch?v=CjmWE-f3vEc&list=PLwdnzlV3ogoVxVxCTlI45pDVM1aoYoMHf&index=41> | | | | | | | |
| **Unit 3** | 1. <https://www.youtube.com/watch?v=c6ARWh6lVgc&list=PLwdnzlV3ogoVxVxCTlI45pDVM1aoYoMHf&index=24> 2. <https://www.youtube.com/watch?v=QKP6sOnu1vg&list=PLwdnzlV3ogoVxVxCTlI45pDVM1aoYoMHf&index=22> | | | | | | | |
| **Unit 4** | 1. <https://www.youtube.com/watch?v=hklHg9oMkGA&list=PLwdnzlV3ogoVxVxCTlI45pDVM1aoYoMHf&index=3> 2. <https://www.youtube.com/watch?v=ASDaXWCExzo&list=PLwdnzlV3ogoVxVxCTlI45pDVM1aoYoMHf&index=4> | | | | | | | |
| **Unit 5** | 1. <https://www.youtube.com/watch?v=AtDgXyluW-Y&list=PLwdnzlV3ogoVxVxCTlI45pDVM1aoYoMHf&index=12> 2. <https://www.youtube.com/watch?v=cwbZUjfz_I0&list=PLwdnzlV3ogoVxVxCTlI45pDVM1aoYoMHf&index=13> | | | | | | | |

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| **Sl. No.** | **Subject**  **Codes** | **Subject** | **Periods** | | | **Evaluation Schemes** | | | | **End**  **Semester** | | **Total** | **Credit** |
| **L** | **T** | **P** | **CT** | **TA** | **TOTAL** | **PS** | **TE** | **PE** |
| 1 |  | Mathematics III | 3 | 1 | 0 | 30 | 20 | 50 |  | 100 |  | 150 | 4 |
| 2 |  | Digital Circuit & Logic Design | 3 | 0 | 0 | 30 | 20 | 50 |  | 100 |  | 150 | 3 |
| 3 |  | Data Structures | 3 | 1 | 0 | 30 | 20 | 50 |  | 100 |  | 150 | 4 |
| 4 |  | Introduction to Cloud Computing | 3 | 0 | 0 | 30 | 20 | 50 |  | 100 |  | 150 | 3 |
| 5 |  | Discrete Structures | 3 | 0 | 0 | 30 | 20 | 50 |  | 100 |  | 150 | 3 |
| 6 |  | ComputerOrganizationandArchitecture | 3 | 0 | 0 | 30 | 20 | 50 |  | 100 |  | 150 | 3 |
| 7 |  | Digital Circuit & Logic Design Lab | 0 | 0 | 2 |  |  |  | 25 |  | 25 | 50 | 1 |
| 8 |  | Data Structures Lab | 0 | 0 | 2 |  |  |  | 25 |  | 25 | 50 | 1 |
| 9 |  | Cloud Computing lab | 0 | 0 | 2 |  |  |  | 25 |  | 25 | 50 | 1 |
| 10 |  | Internship Assessment / Mini Project | 0 | 0 | 2 |  |  |  | 50 |  | 50 | 50 | 1 |
| 11 |  | Computer System Security | 2 | 0 | 0 |  |  |  |  |  |  |  | 0 |
| 12 |  | MOOCs (For B.Tech. Hons. Degree) |  |  |  |  |  |  |  |  |  |  | 0 |
|  |  | **TOTAL** |  |  |  |  |  |  |  |  |  | **1100** | **24** |