Graph Theory – MT3001

General Information:

Course:
Credit Hours: 3-0
Prerequisite: None

Instructor:
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Course Description:

This course is aimed to introduce properties and applications of graphs. It will cover graph-theoretic concepts such as paths, Eulerian circuits, trees, distance, matchings, connectivity, network flows, colorings, planarity, and spanning cycles. Famous applications include the Minimum Connector Problem (building roads at minimum cost), the Assignment Problem (filling n jobs in the best way), the Committee Scheduling Problem (using the fewest time slots), the Four Color Problem (coloring maps with four colors so that adjacent regions have different colors), and the Traveling Salesman Problem (visiting n cities with minimum cost).

Course Learning Outcomes (Tentative):

At the end of the course the students will be able to:

1. Introduce the fundamental concepts of Graph Theory
2. Understand and prove central theorems about trees, matching, connectivity, colouring and planar graphs
3. Understand Eulerian and Hamitonian graphs
4. Integrate core theoretical knowledge of graph theory to solve problems.

Books:
Textbook:

Graph Theory & Applications (1st Edition) by Fournier. Published by Wiley-ISTE, 2011.

Reference Books:

1. Applied Algorithmic Graph Theory (1st Edition) by Chartrand. Published by college, 1995.

2. Handbook of Graph Theory (Series Edition) by Jonathan Published by CRC Press, 2004.

Course Policies:

Grading: Absolute (Tentative)
Plagiarism: Zero-tolerance (Use of anti plagiarism softwares like Turnitin and MOSS)
Attendance: Strict 80% and above

Grade Distribution:

Evaluation	**Frequency**	**Weightage (%)**
Quizzes	Weekly	14
Assignments (Handwritten + soft copy)	3	6
Sessionals	2	30
Finals	1	50

Course Outline:

Week 1: Introduction to Graph Theory, Basic definitions

Week 2: Computer representations and properties of Graph, Data structure for representing Graphs

Week 3: Fundamental theorem of Graph Theory, Isomorphic and Special Graphs

Week 4: Properties of Trees and Forests, Binary tree, Balanced Binary Tree

Week 5: Directed and Undirected rooted tree

Week 6: Minimum Spanning Tree algorithms and implementation

Week 7: Path and Distance in graphs, Shortest path algorithms and implementation

Week 8: Cycle and distance in weighted graph and digraphs

Week 9: Distance algorithms and implementation

Week 10: Eulerian graphs and Hamiltonians graphs with applications

Week 11: Flow networks, Max-flow Min-cut Theorem

Week 12: Graph coloring, Edge coloring,

Week 13: Planar graphs, Four color theorem

Week 14: Deadlock of computer system, Matching Algorithms

Week 15: Dominance & Ramsey theory