

**DE LA SALLE UNIVERSITY – MANILA**  
**MATHEMATICS DEPARTMENT**  
**SYLLABUS**

**COURSE CODE / TITLE** : MTH671M/D (Graph Theory)  
**PREREQUISITE TO** : \_\_\_\_\_  
**TYPE OF COURSE** : \_\_\_\_\_  
**NAME OF FACULTY** : \_\_\_\_\_  
**TERM/ TIME/ROOM** : \_\_\_\_\_

**COURSE DESCRIPTION:** A study of graphs, subgraphs, graph operations, colorings, and digraphs.

**COURSE OBJECTIVES:**

1. To make the students aware that graphs are mathematical models for some real-life situations.
2. To give the students knowledge of basic concepts which will enable them to appreciate both the theory and applications of graph theory.
3. To demonstrate to the students that many problems-theoretical or real-life, can be analyzed and solved by using graphs.
4. To developed the skill of translating problems to graph-theoretic problems and translating the solutions to the real-life problems.

**VALUE AIMS :**

1. To realize that it helps to look at some problems in a general or abstract way in order to find solutions.
2. To develop the skill of solving problems, both mathematical and real-life, by applying known facts and results.
3. To appreciate the importance of interaction and cooperation in problem solving through problem sets assigned to students.

**TEXTBOOK :** *Theory of Graphs* by Frank Harary  
**REFERENCES:** *Modern Graph Theory* by Bollobas  
*Graphs and Digraphs* by Chartrand and Lesniak  
*Graph Theory With Applications* by Bondy and Murty

---

**COURSE OUTLINE**

---

1. **UNDIRECTED GRAPHS**
  - 1.1 Simple Graph, Multigraph
  - 1.2 Walk, Path, Cycle
  - 1.3 Subgraphs
  - 1.4 Some Special Classes of Graphs
  - 1.5 Connected Graph, Components of a Graph
  - 1.6 Adjacency Matrix
  - 1.7 Degree Sequences
2. **GRAPH OPERATIONS AND GRAPH VALUED FUNCTIONS**
  - 2.1 Graph Isomorphisms
  - 2.2 Some Operations on Graphs
  - 2.3 Graph Valued Functions
3. **OTHER SPECIAL CLASSES OF GRAPHS**
  - 3.1 Trees and Forests
  - 3.2 Eulerian Graphs
  - 3.3 Hamiltonian Graphs
  - 3.4 Planar Graphs
4. **CONNECTIVITY**
  - 4.1 Cutpoints, Bridges and Blocks
  - 4.2 Vertex Connectivity
  - 4.3 Edge Connectivity
  - 4.4 Menger's Theorem
5. **SOME GRAPH INVARIANTS**
  - 5.1 Independence Number and Dominance Number
  - 5.2 Graph Coloring
    - 5.2.1 The Four Color Theorem
    - 5.2.2 Vertex and Edge Colorings
    - 5.2.3 Chromatic Number
6. **DIGRAPHS**
  - 6.1 Strong Digraphs
  - 6.2 Tournaments