

MA2271 GRAPH THEORY Term D15

Schedule: M, T, R, F: 9:00 -9:50 am, March 16 – May 5, 2015

Section D01, SH308

Instructor: Professor Peter R. Christopher (peterrc@wpi.edu) Office: SH 305B
Telephone: 508-831-5269
Office Hours: M 2:00-3:00pm, T: 10:00-11:00am F: 1:00-2:00pm

Section D02, FL320

Instructor: Professor Brigitte Servatius (bservat@wpi.edu) Office: SH 305C
Telephone: 508-831- 5361
Office Hours: M, T, R, F 8:00 – 8:50 am

Peer Learning Assistants:

Corre Steele (clsteele@wpi.edu)

Linan Zhang (lzhang2@wpi.edu)

Review Sessions: Corre, Wednesdays 11-12 in SH203; Linan, Thursdays 10-11 in AK232

Tutoring hours in MTC, SH002: Corre, Mondays 2-3; Linan. Thursdays 4-5.

Text: “A First Course in Graph Theory”, by Gary Chartrand and Ping Zhang, Dover Publications

COURSE GOALS:

1. To understand and be conversant in the language of graph theory.
2. To appreciate the rich diversity of applications and to recognize when and how graphs can be used as mathematical models.
3. To further increase mathematical skills including reading, questioning, conjecturing, researching, problem-solving and proving.
4. To experience the joy of mathematical discovery which is the reward for the labor that precedes it.

EVALUATION:

The following ingredients enter into the grading process:

Test 1	28%
Test 2	28%
Test 3	28%
Quizzes/Effort	6%
Assignments	<u>10%</u>
Total	100%

- Tests will be in-class with a possible take-home portion. Take-home test problems must be completed independently, without any form of communication with others except possibly with your instructor or assistant. You are expected to be familiar with the WPI Academic Honesty Policy.

(See <http://www.wpi.edu/Pubs/Policies/Honesty/policy.html>)

- Quizzes may be announced or unannounced.
- Assignments may be given on short notice. You are encouraged to work on these assignments in teams of two or three students.
- Effort is a measure of one's involvement in the course, which presupposes regular attendance.
- Scores of 70, 80, 90 percent will guarantee grades of C, B, A respectively.

Special Needs

If you have a disability or medical condition that may require special consideration, please let me know. Students in this situation should also contact the Office of Disability Services (ODS), 508-831-4908, email ODS@wpi.edu. ODS is located in Daniels Hall.

Resources

Your Professors and PLAs are eager to help you understand and appreciate (if not love) Graph Theory. Please feel free to call upon us. Gordon Library has a reasonable collection of graph theory texts. We have placed three graph theory texts by Gross & Yellen, Harary, and Marcus on reserve at the library circulation desk. Of course, there are plenty of Internet resources, including a text by Diestel: <http://www.esi2.us.es/~mbilbao/pdf/DiestelGT.pdf> (or just google diestel graph theory)

SYLLABUS:

The following list of exercises is designed to give you a solid foundation in graph theory. Some exercises are routine, but others may be rather challenging, hopefully leading to some interesting class discussion. Additional exercises and readings from other texts and journals may be assigned. This syllabus is a guide, and we will not necessarily follow the text page by page. Students have the responsibility of determining on a daily basis which materials to study and which exercises to review. Also students must keep aware of possible occurrences such as announcements of assignments or changes in test dates.

Chapter 1 Introduction

- 1.1 Graphs and Graph Models p.7 1, 3
- 1.2 Connected Graphs p.17 11, 12, 15, 17, 19
- 1.3 Common Classes of Graphs p.25 25, 27
- 1.4 Multigraphs and Digraphs p.28 29, 30, 33

Chapter 2 Degrees

- 2.1 The Degrees of a Vertex p.36 1, 3, 5, 7, 11, 13
- 2.2 Regular Graphs p.41 19, 21, 23, 25a, 27
- 2.3 Degree Sequences p.47 32, 34, 35
- 2.4 Excursion: Graphs and Matrices p.49 37, 39, 41

Chapter 3 Isomorphic Graphs

- 3.1 Definition of Isomorphism p.61 1, 3, 9, 11
- 3.2 Isomorphism as a Relation p.65 17, 18
- 3.3 Excursion: Graphs and Groups p.75 22, 23, 24

Chapter 4 Trees

- 4.1 Bridges p.87 1, 6
- 4.2 Trees p.92 7, 9, 11, 13, 15, 19, 23
- 4.3 The Minimum Spanning Tree Problem p.99 25, 27, 28
- 4.4 Excursion: The Number of Spanning Trees p.105 35, 37, 39

Test 1 – Monday, March 30

Chapter 5 Connectivity

- 5.1 Cut-Vertices p.110 1, 3, 5
- 5.2 Blocks p.114 9, 12
- 5.3 Connectivity p.122 21, 25, 28,d,e,f, 31

Chapter 6 Traversability

- 6.1 Eulerian Graphs p.139 1, 5, 6, 7
- 6.2 Hamiltonian Graphs p.150 11, 13, 16, 18

Chapter 8 Matchings and Factorization

- 8.4 Excursion: Instant Insanity p.219, 39
- 8.4 Excursion: The Petersen Graph

Chapter 9 Planarity

- 9.1 Planar Graphs p.238 1, 3, 5, 7, 9, 11, 13, 19
- 9.2 Embedding Graphs on Surfaces p.248 23, 24, 25, 26
- 9.3 Excursion: Graph Minors p.252 30, 32

Test 2 – Thursday, April 16

Chapter 10 Coloring

- 10.1 The Four Color Problem
- 10.2 Vertex Coloring p. 277 1, 3, 5, 7, 10, 11, 12
- 10.3 Edge Coloring p.287 17, 19
- 10.4 Excursion: The Heawood Map Coloring Theorem p.293, 21

Chapter 11 Ramsey Numbers

- 11.1 The Ramsey Number of Graphs p.306 3, 7, 9, 13
- 11.2 Turan's Theorem p.313 19, 21 b,c,e

Chapter 7 Digraphs

Chapter 8 Matchings and Factorization

Chapter 12 Distance

Test 3 - Tuesday, May 5

