Math 109
Spring Semester, 2008
Evelyn C. Bailey, Pierce 122

Text: Graphs and Their Uses by Oystein Ore and revised by Robin J. Wilson

Reader: The Education of T.C. MITS by Lillian R. Lieber

Goals: This course is an introduction to graphs and the field of graph theory. Student outcomes and opportunities:

The student should be able to: (Cognitive)

(1) identify several types of planar graphs; determine when a graph is planar;
(2) work several standard problems related to graph theory;
(3) discuss several well-known problems and theorems in graph theory;
(4) know several mathematicians and their contributions to graph theory;
(5) develop some problem solving skills needed to find patterns;
(6) begin to understand the role of proof in mathematics.

The student will have the opportunity: (Affective)

(1) to work several non-standard problems in graph theory and in related fields;
(2) to prepare a class project that explains "What is graph theory?";
(3) to work in smaller groups on two construction projects related to graph theory;
(4) to involve the class in a group presentation on a topic related to graph theory.

Grading: 3 tests @ 100 points	300
Notebook checks, homework problems@ 50	150
Notebook check on Reader	50
Class Project, contribution	100
Group Projects, constructions @50	100
Group Presentation	100
Final exam	200
TOTAL	1000

The number of points the student accumulates throughout the semester determines student grades in this course.

In general,

A, A-	900 points and up
B+, B, B-	800 - 899 points
C+, C, C-	700 - 799 points
D+, D	600 - 699 points
F	below 599 points

Each student has the following responsibilities:

1. Come prepared and on time to every class.
2. Complete all work on time with proper thought.
3. Consider that it is not always the fault of the instructor if the student doesn't understand the material
4. Treat the instructor and peers with respect.
5. Ask questions. Asking questions is a sign of maturity, not ignorance.
6. Understand that the instructor is not trying to "nit-pick" when grading and remember that grading is the responsibility of the instructor.

The instructor has the following responsibilities:

1. Come prepared to every class.
2. Design each so students can accomplish the cognitive objectives listed in the syllabus.
3. Provide appropriate tips for studying and study materials as seem appropriate.
4. Create a mutually respectful classroom environment.
5. Return tests in a timely manner so that students will know their grades.
6. Grading, as far as possible, to be consistent and impersonal even though students might not agree with the decisions concerning partial credit.

Some Policies:

Tests: It is the responsibility of the student to notify your instructor before the scheduled test if there is a conflict. If your conflict is legitimate, provisions will be made for you to take the test prior to the scheduled time. Emergencies will be handled on an individual basis. If special provisions are needed, it is the responsibility of the student to notify your instructor well in advance of the needed provision.

Attendance: Each student is responsible for work missed because of absences. There is no policy on class attendance; however, it is to the student's advantage to be in class and class attendance will be taken. Regular attendance will be taken into account for students who have total points on the borderline between two grades. If you are absent while the class is working on the class project, then 10 points per class will be deducted from your contribution on this project. Emergencies will be handled on an individual basis.

Outside help: There are no tutors for this course; however, students may come by during office hours and ask questions and/or work in the Math Center, outside the instructor's office.

ALL STUDENTS HAVE AGREED TO ABIDE BY THE HONOR CODE. ALL WORK SUBMITTED FOR CREDIT IS ASUMED TO BE THE WORK OF THE STUDENT.

Tests:

Tests are given during class time on the day designated in the attached daily schedule. Test dates are: **February 7**, **March 6**, and **April 15**. The final exam will be comprehensive and given according to the final exam schedule.

Homework:

Homework assignments are made at the end of class and put on the class conference, after each class. Students are to complete homework in a spiral notebook, dates and problem numbers clearly labeled.

Homework related to *T. C. Mits* needs to be in a special section in the back of the homework notebook. Assignments will be assigned throughout the semester and the student is to select one statement from each chapter assigned, write out the statement, and clearly write out why the particular statement was selected and how the statement is related to mathematics.

The homework notebook is to be turned in on the day of the test, for each test. The grade for each individual will be determined by checking a random selection of five problems from those assigned. For each problem selected: ten points are given to totally correct work, seven points are given for attempted work, and zero points are given for no work. The homework related to *T. C. Mits* is to be checked with test 3 problems. Five chapters will be randomly selected for this homework check.

An overall assessment of individual attention to homework is included at the end of the course for possible bonus points.

Class Project:

Each student will be involved in the class project and each student is expected to contribute to the result, a power point presentation on graph theory to answer, "What is graph theory?"

The class will elect a chairperson and secretary. The chairperson will conduct those classes for which time is allotted to work on the class project. The secretary will keep a dated log in a bound notebook outlining what was decided and done as the project evolves. The class project will be viewed in class on **April 17** for "proofreading" and then the class will view the final completed project on **April 24.**

At the completion of the class project, each student will provide a comprehensive listing of his/her individual contributions, listed and dated. This individual contribution sheet, the completed power point presentation, comments/work in progress provided on the class conference, and the secretary's log account of the project's progress will determine grades. The individual contribution sheet and the secretary's log are due on **April 24**.

Group Projects:

In groups of two or three, students will complete a construction project. These constructions will begin in class, to be completed a week later. Each student needs to have a concrete model as the result of this project but will be able to work with other students on the construction. Each construction project will have related questions for the group to answer providing one set of answers per group.

Individual grades are determined by the quality of the construction and the responses to the questions. Each student will show his/her constructed project to the rest of the class on the due date. There are two group projects. The first group project is assigned on **February 12** and due on **February 19**; the second is assigned on **March 18** and due on **March 25**.

Group Presentations:

There will be six presentations, paced throughout the semester. In groups of two or three, students will prepare a short (10-20 minutes) presentation after which the group will have some type of demonstration that will involve the class in an activity related to the presentation. Total time for the group presentation is between 30 and 45 minutes or half the class period (or more if needed). Class members should learn something important about each of the topics below plus each class member needs to participate in a related activity, designed by the group presenting, such as working a problem, constructing something, coloring or drawing something, measuring or comparing things, or writing something.

Students are responsible for the content from these classes so the group might choose to have notes available and/or posted on the class conference. The group presenting may request that the class students bring supplies on these days, such as scissors, crayons, etc.

Topics are assigned on a first come basis. Your instructor will work with each group as needed during the planning stages. It is advisable to send a summary via e-mail or make an appointment to come by the office at least one week prior to the presentation. Topics and dates for these presentations are:

2/5 Tessellations, tilling, Escher drawings (summary by 1/29)

2/12 Mobius strip, Kline bottle (summary by 2/5)

2/28 Chinese Tangrams (history, puzzles) (summary by 2/21)

3/18 Platonic Solids (summary by 3/4)

4/17 Four Color Conjecture (see chapter 9) (summary by 4/10)

4/24 Fibonacci Sequence and the Golden Ratio (summary by 4/17)

Topics by days:

1/17	Introduction, "What is a graph?"	text sections 1.1 - 1.3
1/22	Planar Graphs - Introduction *T. C. Mits* Introduction, chapters I - IV	text sections 1.4 - 1.6
1/24	Interval Graphs, Jordan Curve Theorem, Sprouts, Bridge Problem	text section 1.7
1/29	Connected graphs, Hamiltonian Cycles, Article on Graph Theory Elect chairperson and secretary, discuss class project	text sections 2.1 - 2.4, 2.5
1/31	Ferryman problems, Garbage Truck problems, Review for test *T. C. Mits* chapters V - VIII Write out: What is Graph Theory?	
2/5	Presentation: Tessellations, tiling, Escher drawings Discuss class project	
2/7	**Test 1** Notebook due	
2/12	Presentation: Mobius Strip, Kline Bottle **Begin Group Project**, due 2/19	
2/14	Trees Discuss class project	text sections 3.1 - 3.2
2/19	Alkanes, economy tree, shortest route **Group Project due**, class time *T. C. Mits* chapters IX - XI	text 3.3
2/21, 2/26	Directed graphs, Tournaments, phone calls	text - parts of chapter 5
2/28	Presentation: Chinese Tangrams Discuss class project *T. C. Mits* chapters XII - XV	
3/4	Review for test Discuss class project	
3/6	**Test 2** Notebook due	

3/18	Presentation: Platonic Solids **Begin Second Group Project**, due 3/25	
3/20	Games and puzzles, pouring problems, NIM, "-aminos"	text - parts of chapter 6
3/25, 3/27	Proof, Induction proof Article on proof *T. C. Mits* chapters XVI - XVIII **Second Group Project due** on 3/25	
4/1	Planar Graphs, Euler's Formula Discuss class project	text - parts of chapter 8
4/3, 4/8	Spanning Trees, More about proofs *T. C. Mits* chapters XIX - The Moral	
4/10	Discuss *T.C. Mits* Review for test 3	
4/15	**Test 3** Notebook due, last check, includes *T. C. Mits* discussions	
4/17	Presentation: Four Color Problem Discuss Class Project	text - parts of chapter 9
4/22	Presentation: Fibonacci Sequence and Golden Ratio "Proof" the class project power point Receive course evaluations	
4/24	**Class Project due**, watch final version **Contribution sheet** for class project due Review for final exam	
4/29	**Course Evaluations due** Review for final exam	