Course Syllabus
Math 4420/6420---Spring 2009

Instructor: Dr. Neal Smith
Phone: 729-2283
Office: Allgood N329
Office Hours: How about 800-900 MWF, 200-300 TU and by appointment. It is the responsibility of each student to seek help when necessary.

Text: Introductory Graph Theory, by Gary Chartrand. Please note that this text is not quite a tome of graph theory and thus many lectures will be supplemented with material not included in this textbook.

Grading: Your grade will be determined by your performance on 2 'mid-term' exams, homework*, class participation** and a final exam; each mid-term will count for 30% of your grade, the final 30%, and homework and class participation will count for the remaining 10%.

If your final percentage is in the interval...	**Your course grade is...**
[80%, 100%]	A
[70%, 80%)	B
[60%, 70%)	C
[40%, 60%)	D
[0%, 40%)	F

*---Homework will probably include a few problems a week to be turned in. See the list of problems that was distributed.

**---Each student will be expected to present the solution to at least four homework problems to the class over the course of the term. Details will follow with the first homework assignment.

Graduate credit: Students taking the course for graduate credit (as Math 6420) will be asked to do '6420-only' problems on exams, be asked to do extra presentations of homework exercises, and will have their graded work subjected to somewhat greater scrutiny than those taking the course for undergraduate credit.

Other Policies:

Attendance: In the world of upper-division courses, frivolous absence is a very bad thing. You never know if you might want someone to write you a recommendation letter someday. If you are going to be absent on a given day for a legitimate purpose, you should notify me in advance.

Make-ups: I do not like to do make-ups. If you know you're going to be gone at some point (for a non-frivolous reason) when exam-time nears, let me know well in advance, so I can schedule the exam appropriately.

Grading philosophy: This is a theorem-proof course, and you should be getting advanced enough as a student to write clear, well-written, and coherent mathematical arguments. Homework and exams will be graded with this in mind; thus you should make things as clear, neat, and well-written as possible to ensure that you receive the proper credit for your work.

Grading philosophy, mark II: On homework and exams, problems will typically be evaluated with the following rubric in mind.
5-The problem is completely correct, beyond any reproach.
4-The problem is 'basically correct', but there may be some problems with a minor detail, the proof may be not as well written as it should be, etc.
3- The key idea is there, but there may be a serious error. Or, the problem is correct but the solution is very poorly written.
2-Some headway has been made on the problem, but there is not a complete solution on the paper.
1-The problem reflects that the writer knows what the problem is asking for, and the writer seems to have some clue as to how to proceed, but little to no actual progress has been made towards a solution.
0-Speaks for itself. What is written down is of no value with regards to a solution to the problem.

Honor Statement: Each student is responsible for maintaining academic honesty as specified in the ASU catalog. You are free to work with others on homework assignments, but homework handed in should be your own and not simply a 'bad photocopy' of someone else's work. On any assignment which is designated as a 'take-home exam' or portion thereof, there shall be **no collaboration of any kind** between students.

Etiquette: Please be punctual and make sure your cell phone is turned off before coming to class.

Miscellany: If you decide for your own inscrutable reasons to drop the course you have the responsibility of making sure you have filled out the necessary forms and collected the necessary signatures by the withdrawal deadline. Extended non-attendance will not necessarily cause me to drop you from the class roll.

Advice: You will probably find that we will not be able to spend as much time in class answering questions as anyone (myself included) would like. Please take advantage of my office hours. Get to know your classmates; the semester will probably be more productive (and more fun) if you get to know some people that you can work with. When the exam rolls around, see if you can explain stuff to the people in your study group!

Course Outline:
(*---denotes topics where some of the content will come from outside the textbook)

I. Introduction

a. The definition of a graph
b. Some mathematical problems which are 'graph-theoretic' in nature

II. Basic graph-theoretic concepts

a. Isomorphic graphs
b. Connected vs. non-connected graphs
*c. Distance in graphs
d. Cut-vertices and bridges of a graph
*e. Hamiltonian and Eulerian graphs
*f. Algorithms for finding Euler/Hamilton cycles

Insert Exam 1 somewhere around here.

III. More advanced graph-theoretic concepts

*a. Trees, spanning trees, weighted graphs, and Kruskal's algorithm
b. Matchings and bipartite graphs
c. Planar graphs, Euler's Formula, and Kuratowski's Theorem
d. Graph colorings
e. The Four- and Five-Color Theorems

Insert Exam 2 somewhere around here.

IV. Algebraic techniques in graph theory

*a. The chromatic polynomial of a graph
*b. A Linear Algebra refresher/crash-course: matrix algebra, matrix operations, eigenvalues, and eigenvectors
*c. The adjacency matrix of a graph and the characteristic polynomial of a graph
*d. What information can the adjacency matrix and its eigenvalues tell you about a graph?

V. Maybe we'll get to these topics
a. Directed graphs and tournaments
b. Applications of directed graphs and tournaments (voting problems)
c. An introduction to Ramsey theory

Final Exam

Other sources: A more complete (but also more advanced) Graph Theory text is:

West, Douglas. Introduction to Graph Theory (2nd ed.), Prentice Hall, ISBN 0130144002

Math 4420/6420 Homework

How to write up homework problems to turn in:

0. Write up exactly one problem per page, using only one side of the paper.
1. Write the statement of the problem.
2. Write up the solution to the problem. If the problem is computational, you should include enough detail so that a third party with a comparable level of knowledge of the subject could pick up the problem and be able to follow what you are doing. If the problem is a proof, you should use proper English grammar.

Section	**Problems**
2.1	4, 7, 10d, 11
2.2	14, 15, 16, 19, 21, 22, 26
2.3	32, 36, 37, 39, 40, 41, 44
2.4	45, 46, 48, 49, 50, 53, 54, 55, 58, 59, 60
3.1	1, 3, 6, 7, 8, 10, 15
3.2	16, 18, 19, 21, 27, 31

Exam 1 should happen around this time.

4.1	1, 4, 6, 9, 10, 12, 14, 17
5.2	17, 18, 19, 20, 21, 24, 27
9.1	2, 6, 9, 10, 11, 12, 13
9.2	15, 16, 19, 20, 21
9.3	25, 27

Exam 2 should happen around this time.

10.1	1, 2, 4, 9
Chromatic Polys.	Problems will be given on handouts
Algebraic Graph Theory	Problems will be given on handouts