CMSC 420/MATH 420: Graph Theory (3 credits)
Spring 2013

Instructor: Robert Marmorstein, 395-2185, marmorsteinrm@longwood.edu
Lecture: 9:30am-10:45am TR, Ruffner 352
Office Hours: 1:00pm-2:00pm MWF, 3:00pm-4:00pm TR, Ruffner 329 or by appointment
Course Web Site: http://marmorstein.org/~robert/Spring2013/cs420.html

Course Description:
An introduction to topics in graph theory, focusing on analysis of specific applications and proofs of important theorems in the discipline. Topics include graphs, paths, and cycles; directed graphs, trees, and applications of graph theory in real world contexts.

Prerequisite:
CMSC 160 and either MATH 300 or CMSC 300.

Course Objectives:
The student will learn to:

* Represent complex systems using graphs
* Identify properties of graphs (such as planarity and girth)
* Implement simple graph algorithms by hand
* Implement graph algorithms in a high level programming language such as C++

Textbook:
The textbook for this course is “Graph Theory and its Applications” by Jonathan Gross and Jay Yellen, 2nd edition, Chapman and Hall, ISBN: 978-1584885054

Course Requirements:
Your grade in this course will be determined by your scores on the homework and lab assignments (60%), quizzes (10%), midterm exam (15%), and final exam (15%).

Grading Policy:
Late work will not be accepted unless you have a medical condition or family emergency which prevents you from completing the assignment on time. However, I allot three slip days at the beginning of the semester which you may use to extend the due date of one or more homework or lab assignments.

In the event of a medical or family emergency, you do not need a doctor's note, but you must contact me by e-mail as soon as possible to arrange an extension. In such cases, I may, at my option, extend the due date on the project or grant you additional slip days.

Grading Scale:
Letter grades will be assigned using the following scale. Note that there is no grade of D- in this class:

	A: 91-99	A-: 90
B+: 89	B: 81-88	B-: 80
C+: 79	C: 71-78	C-: 70
D+: 69	D: 64-68	F: Below 64

Attendance:
I expect you to attend class unless you are sick or engaged in a school sponsored sports event or extra-curricular activity. In accordance with Longwood policy, missing more than 10% of scheduled class time to unexcused absences may result in loss of one letter grade. Missing more than 25% of class (whether excused or unexcused absences) may, at my discretion, result in a failing grade.

Food and Drink:
I prefer that you do not eat in class (it distracts me and the other students). You may bring water or other non-alcoholic beverages to class. I occasionally make exceptions to this rule for students who would otherwise miss a meal or who have medical needs. If you feel that you need such an exception, you MUST make arrangements with me before you bring food to class. Violations of this policy will be considered an unexcused absence.

Cell Phones and Laptops:
Cell phones and laptops must be turned off and put away during lecture, unless specifically noted at the beginning of class. Violations of this policy will be considered an unexcused absence. I will tell you in advance (usually by e-mail) if you need your laptop in class.

Honor Code:
I take the honor code seriously in my classes. Students suspected of an honor code violation will be taken before the honor board. A student convicted of an honor offense will receive an F in the course in addition to any penalties imposed by the honor council.

All work in this class should be considered pledged, whether or not you have written the pledge on it. Tests and quizzes must be completed entirely on your own and will be taken closed-book and closed-notes. You *may* discuss homework problems and laboratory projects with other students subject to the following restrictions:

1. You must acknowledge any help you receive, including any discussion of the homework problems, by leaving a short note at the top of the assignment, or in the case of a project, placing appropriate comments in the code.

2. Your submitted work must consist entirely of *your own answers in your own words* which you have typed or written yourself. You may discuss assignments verbally with other students, but do not share code or answers electronically.

3. Do not simply copy answers from other students. You can discuss the general approach to an assignment and you can help other students find syntax errors in their code, but any block of code longer than three lines should be entirely your own work.

4. Use the Internet only as a general reference. There are web sites which contain solutions to the problems in our book. DO NOT USE THEM. However, if you find a web page which outlines the general algorithm or proof you need, you may use it as long as you cite it appropriately (make sure to give at least the complete URL) and don't simply copy and paste code off the web site. The three-line rule is a good guideline here, too.

Tentative Course Schedule:

Week 1: January 15-17	Directed and Undirected Graphs, Kinds of Graphs, Graph Representations, Paths and Cycles, Graph Properties **Read Sections 1.1 – 1.6 (p. 1-51)**
Add/Drop Ends Monday, January 22 (5pm)	
Week 2: January 22-24	Isomorphisms and Automorphisms Subgraphs, Isomorphism Tests **Read Sections 2.1-2.5 (p. 57-95)**
Week 3: January 29-31	Matrix and List Representation of Graphs Graph Operations **Read Sections 2.6-2.7 (p. 95-107)**
January 31	**Midterm Exam**
Week 4: February 5-7	Trees, Tree Properties, Decsision Trees, Binary Trees, Tree Traversals **Read Sections 3.1-3.4 (p. 115-141)**
Week 5: February 12-14	Huffman and Priority Trees, Cayley's Formula, Counting Binary Trees **Read Sections 3.5-3.8 (p. 141-157)**
Pass/Fail Deadline: February 18	
Week 6: February 19-21	Spanning Trees and Graph Searches DFS, BFS, and Prim's Algorithm **Read Sections 4.1-4.4 (p. 163-189)**
Week 7: February 26-28	Shortest Paths, Cycles, Edge Cuts, Matroids and Kruskal's Algorithm **Read Sections 4.5-4.7 (p. 190-211)**
Spring Break March 4-8	**HOLIDAY: No Classes**
Deadline to Withdraw Wednesday, March 13 (5pm)	
Week 8: March 12-14	Vertex and Edge Connectivity, Max-Min Duality, Networks **Read Sections 5.1-5.4 (p. 217-243)**
Week 9: March 19-21	Graph Decompositions, Euler Cycles, Postman Problem **Read Sections 6.1-6.2 (p. 247-265)**

Week 10: March 26-28	Hamiltonian Paths and Cycles, Traveling Salesman Problem **Read Sections 6.3-6.4 (p. 267-282)**
Week 11: April 2-4	Planar Graphs, Planar Graph Operations **Read Sections 7.1-7.3 (p. 285-302)**
Week 12: April 9-11	Tests for Planarity, Planarity Algorithms **Read Sections 7.4-7.7 (p. 304-331)**
Week 13: April 16-18	Graph Coloring and Factorization **Read Sections 9.1-9.4 (p. 371-411)**
Week 14: April 23-25	**Catchup and Review**

Final Exam

May 2 (Thursday), 11:30am-2pm