MATH 3411 (Ng/Fall 2009)
Course Project
September 1, 2009
Report **Due by 10am in my office on Friday December 4, 2009.**

The purpose of this project assignment is for MATH 3411 students to be familiar with real-world applications of the modeling and analysis approaches we study in the course.

Your main goal is to discuss an application of **discrete or combinatorial mathematics** or of any one of the specific topics covered in class this semester. (Look ahead in the syllabus for the topics). The application can be in **any fields or areas of your interest**. You are required to write a report **and** give an oral presentation on this topic.

First, choose **one** or **two** other persons you would like to work with on this project.

Second, your group has to decide on a particular topic or application of Discrete & Combinatorial Math that you would like to discuss. I suggest that you look ahead in the syllabus for upcoming topics as well as browse through any books related to discrete mathematics, combinatorial mathematics or combinatorics, graph theory, applications of discrete math in electronics, or discrete structures in computer science in the **Briggs** library.

You **must** have your working partner(s) and your topic selected by **Monday, September 21**. To avoid duplication of projects on the same topic, I need to know what you are planning to do and who the members of your group are, by that date.

Your Project's Grade: Your project consists of two parts, namely, a written report and an oral presentation in class, each of which is graded on a basis of *50 points*.

Your Written Report: Of the total of *50 points*, 10 points will be for neatness and organization of your written presentation, with the rest for substance of content especially on the quality (discrete) mathematical level of the project.

Your report **MUST** have the following outline structure with **sections and subsections numbered and titled** (with your choice of the titles). (Otherwise, you will lose most credits for organization.)

- Description of the problem, including some motivation as to why the problem is worth looking at (according to you or others).
- Connections between the project and the contents of the course.
- The approach to solving the problem.
- Results and analysis.
- Conclusions.
- Bibliography or references.

Format: Your report should consist of several (*approx*12) neat pages, with text typed. You may hand write mathematical formulations, tables and figures if they are neat. (Note: the 12−pages is just a guideline for you; I value **quality** more than **quantity**.

If applicable, attach a xerox copy of the article or the source of the problem reviewed to your report when you submit it. If you wish to retain a copy of your report, make one before you turn it in. All reports become the property of the Math Discipline, and only a "Scoring and Comments" sheet will be returned.

Bibliography or references **must** be used and they can be in any format as long as they are well-documented with authors, dates and the source. (WWW URLs alone is **NOT** sufficient.)

Oral Presentation: You and your group members will be responsible for preparing a 15 ± 1 minutes talk in class about your project. This talk is intended to give you a chance to present some complicated ideas in such a way that your audience (who may or may not be knowledgeable in this area) will at least be able to grasp the big picture of the topic you worked on.

Your oral presentation should be prepared with the following attributes and outline in mind:

- Introduction
- Description of Problem/Project
- Substance & quality of (discrete) mathematics level used, and connections between the project and the contents of the course.
- Organization & Clarity
- Enthusiasm
- Communication

Examples of titles from previous projects:

1. Evacuation of the Student Center at UMM: an application of maximum flow.
2. Finding convex hull of a set of points.
3. Finding the shortest route from Minneapolis to Los Angeles and the best tour routes in a few intermediate cities.
4. Vertex Coloring: The Four Color Problem.
5. Predator-Prey Problem: a Discrete Time Model.
6. Phasing Traffic Lights as an application of discrete math
7. Games, Gambling and Counting Process
8. Logic circuits in electronics
9. Tour of UMM campus via shortest paths
10. The Death-Star Maximum Flow Problem
11. Using the Cobweb Model to evaluate field of study selection process at the undergraduate level
12. Using Difference Equations as an approximation method for solving ordinary differential equations
13. Streamlining Local Area Network (LAN) at UMM using graph theory
14. The Huffman Code
15. A Traveling Salesman Problem for the 48 contiguous states of USA and a dynamic insertion algorithm to solve it.
16. Designing efficient snow plow routes via euler tours
17. Using CPM-PERT to design the critical path for a sequence of of projects.
18. Applications of combinatorics in molecular chemistry and genetics
19. Class scheduling via minimum vertex coloring
20. etc....