Syllabus - Spring 2012 -
EGGN493/593: Engineering Design Optimization
(TBD/TBD)

Lecture: TBD

Prerequisites:
Programming knowledge of C, C++ or Matlab
Senior or Graduate Standing or the Consent of the Instructor

Instructor:
Dr. Cameron J. Turner
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Office Hours: TBD

Course Summary:
Design is about finding the “best” solution amidst a plethora of design options and within a tangle of constraints. While many computational approaches for engineering design optimization have been proposed, actually optimizing designs requires expert knowledge of the capabilities of various algorithms with respect to different problem types. The goal of this course is to introduce students to optimization methods, challenges and pitfalls. A variety of problem types will be considered, including continuous, discontinuous and mixed variable problems, single and multiple objective problems, stochastic and network problems, the use of approximation models or metamodels, as well as a variety of solution methods using gradient and stochastic and heuristic methods.

Current Text:

References:
**Course Policies:**

**Homework Assignments:**

All homework assignments must be submitted at the beginning of class on the assigned due date. Though primarily graded on technical correctness, homework should be presented in a clear, neat and professional manner. And, all other things being equal, presentation counts. Written material (paragraphs, pages of discussion, etc) must be typed. Some assignments will be submitted electronically. Any student who submits a virus-infected assignment will receive a failing grade in the course.

**Collaboration:**

Discussion of assignments with other students is encouraged. All work submitted for credit, however, must be your own. **If you work on assignments with other students, you must indicate with whom you worked with on your assignments.** Any evidence of plagiarism or other forms of scholastic dishonesty will be grounds for a failing grade in the course.

**Student absences from class, labs, or exams:**

All students are advised to be familiar with CSM’s policy regarding the make-up of work missed due to excused absences. This policy may be found in the Bulletin. In all cases of unexcused absences the faculty member has the right to deny the student the opportunity to make-up all or part of the missed work. The make-up policy for missed work in this class follows:

*Work should be completed and submitted on time. If an absence prevents the timely submittal of homework, the student should complete and submit the homework as soon as possible and within the extension timeframe arranged with the professor. Assignments that are late beyond that timeframe may be assessed a penalty proportional to the lateness of the assignment and the required extra effort to grade the assignment, just like any other late assignment.*

**Attendance:**

I take class attendance seriously as it is a reflection of your professionalism to prepare for, attend and participate in technical meetings as requested by your supervisor. Therefore, class attendance is **expected and required.** Material not specifically covered in the text will be presented in lecture. Each student may miss two lectures without affecting their course grade. However, for each unexcused absence thereafter, 3% will be deducted. In the event a student must miss class, please contact the professor as soon as possible (in advance of the absence if possible) so that the situation can be addressed. Just like in the working world, where notifying your boss before missing work is expected, so it is in this class. A roll sheet may be distributed during each class to record attendance. Students late for class may receive a half absence or a full absence at the discretion of the professor.
Term Projects:
Grades for the project are assigned on a group basis, unless otherwise specified. Peer evaluations for each project are required. These peer evaluations, in addition to observations by the instructor, are used to assess individual participation within the projects and will influence each individual project grades. Late projects will be penalized 10% per day or portion thereof for which they are late.

Grading:
- Homework Assignments 24%
- Semester Project 35%
- Exams & Quizzes 36%
- Miscellaneous 5%

Initially, I assume each course will achieve a standard 10% bin for grades. (i.e. 90-100 = A, 80-89 = B, 70-79 = C, 60-69 = D, <60 = F) However, I reserve the right to adjust these values (by increasing the bin size) once final grades are evaluated. Undergraduate and graduate students may have independent final curves based on their peers.

Course Topics:
In any given semester, the content of the course may vary due to interests of the faculty and the students. However, the course generally follows the following topic areas. The course schedule provides additional detail.

- Week 1 – Optimization Overview and Challenges
- Weeks 2 & 3 – Unconstrained Optimization and Monotonicity
- Week 4 – Constrained Optimization
- Week 5 – Penalty Functions
- Week 6 – Lagrangians, KKT Conditions
- Week 7 – SLP, SQP and GRG
- Week 8 – Multiobjective Optimization and Mixed Integer Programming
- Weeks 9 & 10 – State Space Optimization
- Week 11 & 12 – Simulated Annealing, Genetic Algorithms and Tabu Searches
- Week 13 – Introduction to Metamodeling and Metamodel Optimization
- Week 14 – Introduction to Other OR fields
- Week 15 – Review and Project Presentations