I. COURSE INFORMATION

Instructor: Dr. Pablo Tarazaga
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E-mail: pablo.tarazaga@tamucc.edu
Office: CI 316
Office Hours: MW 9:00 to 11:30

Meeting Time and Place: MW 5:30 – 6:45 BH 201

II. COURSE DESCRIPTION

This course will cover basic concepts of optimization (maximization and minimization). This includes, convexity, unconstrained optimization, necessary and sufficient conditions for optimality, a brief introduction to constrained optimization and numerical methods and algorithms to solve problems.

III. PREREQUISITES

Math 4301 and Math 3311

IV. TEXT AND OTHER SUPPLIES REQUIRED


V. STUDENTS LEARNING OUTCOMES

- At the end of the course students will be able to:
  - Identify and classify different optimization problems.
  - Identify applications that require optimization techniques.
• Select through an adequate analysis of the characteristics of the problem, the appropriate necessary and sufficient optimality conditions for different classes of unconstrained optimization problems.

• Describe, evaluate and use the different components of line search techniques and trust region methods to generate descent direction algorithms.

• Evaluate the advantages and disadvantages of the numerical methods and algorithms for unconstrained problems (including steepest descent, Newton and Quasi-Newton, conjugate gradient, etc.) to solve different classes of unconstrained optimization problems.

• Identify different constrained optimization problems. Their advantages and disadvantages.

• Describe adequate necessary and sufficient optimality conditions for some constrained optimization problems.

• Describe and apply numerical methods for simple constrained optimization problems.

VI. INSTRUCTIONAL METHODS AND ACTIVITIES.

The class uses lecture format encouraging student participation and discussion. The general lectures introduce ideas methods and algorithms and provide proofs of the fundamental results. Assignments will contain problems from the book and other resources. Students will do presentations on alternative methods and algorithms to those presented in class. Students will write code for optimization algorithms and they will also use well established code to solve problems. They will use Matlab as the computing environment.

VII. EVALUATIONS AND GRADE ASSIGNMENTS

The grade is calculated as follows
Assignment  40%
Midterm  30%
Final exam  30%

Tests will include problems and proofs and exercises that require an elaborate answer. This includes identify the problem, find the appropriate tool and solve it.

Assignments as well as tests will include problems related to the material covered in the lectures. These problems will include: regular problems from the book, additional properties, proofs, variation of algorithms, etc. Student presentations will require doing a bibliography search to look for the assigned method/algorithm. Implementation of algorithms and algorithms comparison will also be part of assignments.
Your final grade will be determined using the following scale:
A: 90%-100%  B: 80%-89%  C: 70%-79%  D: 60%-69%  F: 0%-59

VIII. TENTATIVE COURSE SCHEDULE

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<tr>
<th>Week</th>
<th>Topics</th>
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<tbody>
<tr>
<td>8/29</td>
<td>Review of calculus optimization</td>
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<tr>
<td>9/5-9/12</td>
<td>Convexity: properties</td>
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<tr>
<td>9/19</td>
<td>Convex functions, properties</td>
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<td>9/26</td>
<td>The Newton method</td>
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<tr>
<td>10/3</td>
<td>Necessary and sufficient conditions</td>
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<td>10/10</td>
<td>Overview of algorithms</td>
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<td>10/17</td>
<td>Line searches, step length, descent directions</td>
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<td>10/24</td>
<td>Midterm Rate of convergence. Modifications of Newton method</td>
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<tr>
<td>10/31</td>
<td>Trust region methods. Cauchy point algorithms</td>
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<td>11/7</td>
<td>Local and global convergence.</td>
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<td>11/14</td>
<td>Conjugate gradient method.</td>
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<td>11/21</td>
<td>Nonlinear conjugate gradient.</td>
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<tr>
<td>11/28-12/5</td>
<td>Basic of constrained optimization</td>
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<td>Dec. 12</td>
<td>FINAL EXAM (4:300-7:00)</td>
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IX. CLASS POLICIES

- Attendance: It will not be part of your grade, it is required. Exceptions are sickness and emergencies.

- I do expect that you come to each class ready to learn and to participate. Also you have to be prepared to do any required work. You are expected to devote for each hour of class between two and three hours outside the class working in the subject (some people need more time than others).

- If you are missing a deadline, a quiz or a test, you have to tell me beforehand by any mean, examples: e-mail or phone.

- Grades: After you receive your grades you have up to a week to dispute it. I am the person you can dispute your grade with.
● If at any point during the course you are considering dropping the class, talk to me before you do it. I am here to help you in your learning experience and to help you to succeed in your college career.

● PLEASE TURN YOUR CELLULAR PHONES OFF. DO NOT DISTURB THE CLASS WITH THEM.

**Academic Honesty:** University students are expected to conduct themselves in accordance with the highest standards of academic honesty. Academic misconduct for which a student is subject to penalty includes all forms of cheating, such as illicit possession of examinations or examination materials, forgery or plagiarism.

**Grade Appeal Process:** As stated in University Rule 13.02.99.C2, Student Grade Appeals, a student who believes that he or she has not been held to appropriate academic standards as outlined in the class syllabus, equitable evaluation procedures, or appropriate grading, may appeal the final grade given in the course. The burden of proof is upon the student to demonstrate the appropriateness of the appeal. A student with a complaint about a grade is encouraged to first discuss the matter with the instructor. For complete details, including the responsibilities of the parties involved in the process and the number of days allowed for completing the steps in the process, see University Rule13.02.99.C2, Student Grade Appeals, and University Procedure 13.02.99.C2.01, Student Grade Appeal Procedures. These documents are accessible through the University Rules.

**Dropping a Class:** I hope that you never find it necessary to drop this or any other class. However, events can sometimes occur that make dropping a course necessary or wise. Please consult with me before you decide to drop to be sure it is the best thing to do. Should dropping the course be the best course of action, you must initiate the process to drop the course by going to the Student Services Center and filling out a course drop form. Just stopping attendance and participation WILL NOT automatically result in your being dropped from the class. November 5, 2010 is the last day to drop a class with an automatic grade of “W” this term.

**Disabilities Accommodations:** The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please call or visit Disability Services at (361) 825-5816 in Driftwood 101.
If you are a returning veteran and are experiencing cognitive and/or physical access issues in the classroom or on campus, please contact the Disability Services office for assistance at (361) 825-5816.