TEXAS A&M UNIVERSITY-CORPUS CHRISTI
DEPARTMENT OF MATHEMATICS AND STATISTICS

MATH 5339.001
NUMERICAL ANALYSIS
Fall 2012

I. COURSE INFORMATION

Instructor: Dr. Pablo Tarazaga
Office Phone: 825-3187
Office Address: CI 316
E-Mail Address: pablo.tarazaga@tamucc.edu
Office hours: MW 9:00 to 11:30

Meting Time and Place: Math 5339.001 MW 5:30-6:45 CS-114

II. COURSE DESCRIPTION

This course will deal with the basic concepts of Numerical Analysis and the foundations of numerical algorithms. We will cover some of the main topics of Numerical Analysis like: computer arithmetic, solutions of nonlinear equations, solutions of linear equations, approximation of functions, numerical differentiation and integration and numerical solutions of differential equations. The student will use the computing environment Matlab to run teaching codes and their own codes to see how these algorithms perform. They will also compare these codes with professional codes.
III. PREREQUISITES

MATH 3311, MATH 3470, MATH 3315 and COSC 1435 or COSC 5311

IV. TEXT AND OTHER SUPPLIES REQUIRED


V. COURSE LEARNING OUTCOMES

- Students will be able to:
  - Use the floating point arithmetic in the computers
  - Recognize the different problems studied in Numerical analysis.
  - Distinguish among different methods used to solve a particular problem determining advantages and disadvantages
  - Write codes for several of the numerical methods introduced in the class.
  - Use the codes for solving typical problems
  - Interpret the solutions computed by the algorithms.
  - Solve problems in the following areas: nonlinear equation, interpolation of functions, numerical differentiation, integration and ordinary differential equations.
Students will also learn to use Matlab computational environment to numerically:

- Solve nonlinear equations
- Interpolate function using polynomials
- Interpolate function using splines.
- Compute accurate numerical derivatives.
- Solve ordinary differential equation using a variety of methods.

VI. INSTRUCTIONAL METHODS AND ACTIVITIES.

The class uses lecture format encouraging student participation and discussion. Using the computing environment provided by Matlab, student will develop their own codes for some algorithms and they will compare the performance with Matlab and other codes.
VII. EVALUATIONS AND GRADE ASSIGNMENTS

- All the work done in the class will be part of your final grade (quizzes, assignments, tests and final exam). I will evaluate very carefully the learning objectives.

- There will be two kinds of assignments:
  - First, problems from each section of the book that we cover during the course, they will not be collected (problem in quizzes and some in the tests will be similar to them).
  - A second class of assignment will consist in writing Matlab codes for the methods we describe in class, this assignments will be collected and graded.

- The table below shows the weight of each of the items considered to determine your grade.

- All tests and quizzes and the final will contain a part on techniques and a part on understanding and basic proofs.

- Final exam will be comprehensive.

Assignments and Quizzes: 40%
Test (2) 30%
Final exam: 30%

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
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<tr>
<th>Week</th>
<th>Topics</th>
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<tbody>
<tr>
<td>8/20</td>
<td>Preliminaries and review of key mathematical concepts.</td>
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<tr>
<td>8/27</td>
<td>Floating point arithmetic.</td>
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<tr>
<td>9/10</td>
<td>Basic methods for nonlinear equations.</td>
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<tr>
<td>9/17</td>
<td>Fixed points and functional iteration. Roots of polynomials.</td>
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<tr>
<td>9/24</td>
<td>Interpolation and Polynomial interpolation.</td>
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<tr>
<td>10/1</td>
<td>Basic methods, Divided defferences and Hermite Interpolation.</td>
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<tr>
<td>10/8</td>
<td>Spline interpolation.</td>
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<tr>
<td>10/15</td>
<td>Numerical differentiation based in interpolation.</td>
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<tr>
<td>10/22</td>
<td>Gauss quadrature, Romberg integration.</td>
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<tr>
<td>10/29</td>
<td>Adaptive methods in Integration.</td>
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<tr>
<td>11/5</td>
<td>Euler and Taylor methods for initial value problems.</td>
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<td>11/12</td>
<td>Runge-Kutta methods.</td>
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<td>11/19</td>
<td>Additional methods.</td>
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<tr>
<td>11/26</td>
<td>Multistep methods.</td>
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<td>12/3</td>
<td>FINAL EXAM (4:30-7:00)</td>
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IX. CLASS POLICIES

- Attendance: It will not be part of your grade, but 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).

- Late work: In general, I accept homework up to a week after the deadline, there will be a 10% late penalty.

- 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 in the semester you are considering to drop 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 Rule 13.02.99.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.