**Computational Problem Solving in Civil Engineering**

**Instructor:**

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Assistant Professor

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Office hour: visit anytime, or emails, or phones

**Prerequisites:**

Differential Equations and CSCE 150

CIVE 326 and CIVE 310

or instructor’s permission

**Textbook:**

Chapra, S.C. and Canale, R.P, Numerical Methods for Engineers, 6th ed., McGraw-Hill, New York, N.Y

Reference Book:

Anne Greenbaum & Timothy P. Chartier, , Numerical Methods: Design, Analysis, and Computer Implementation of Algorithms, Princeton University Press

**Course Description:**

Introduction to using numerical methods to solve engineering-oriented mathematical problems. Topics include mathematical modeling, round-off and truncation error, root location, linear algebraic equations, optimization, regression, interpolation, numerical differentiation and integration, and ordinary differential equation initial-value problems. Applications using software and programming languages.

**Course Objectives:**

* Introduce students to modeling by motivating every problem via problems in environmental and water resources engineering
* Solidify students’ mathematics
* Solidify students’ computing ability (including programming)
* Introduce students to a wide range of Numerical Methods
* Include key computing and numerical concepts (number representation, error analysis, order, condition, convergence, stability, efficiency, FLOPS, trade-offs, etc.)

**Grading:**

Final grades will be based on the following calculations:

Undergraduates (498): Graduates (898):

Homework: 50 % Homework: 30%

Midterm: 20 % Midterm: 20%

Final Exam: 30 % Final Exam: 30%

Project: 20%

**Class Attendance:**

Your ONTIME attendance in class is highly recommended. Some of the lectures and assignments will deal with materials that are not in the text. Please inform me if you intend to miss a lecture for personal reasons or for a religious holiday.

**Homework and Project:**

Students should do their own homework. Discussion of methods and solutions is permitted, but copying is unacceptable. All homework should be well organized, neat, and legible. Graphs should be done on graph paper, or using a computer, and should follow standard graphing procedures (labeled and numbered axes, graph title, etc.). The final solution to a problem should be boxed in. Measurement units (e.g. ft, cm, lb,) should be specified.

Due dates will be given on each assignment. Grades on late homework will be reduced by 10% of the total available points for that assignment, each day (24 - hour period) that the assignment is late for a maximum of 50% of the final grades. Homework turned in after solutions are posted will not receive any credit.

**Exams:**

There will be one midterm exam and one final exam. The midterm exam will be closed book, but you will be permitted to use one 8 ½” x 11” note sheet (front and back). The Final Exam is comprehensive, covering all materials presented in the course. The final exam will be open book and open notes. However, you need to finish them independently. No makeup exam will be provided, unless you notify me in ADVANCE that you have a scheduling conflict with the time of the Exam.

**Academic Ethics:**

Your ethics in this course are very serious:

1. If you are found cheating on an exam, you will receive an F in this course.

2. You can work in groups to do the homework, but you are responsible for your own work. Students that hand in identical homework will receive no credit.

**Tentative Course Outline:**

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| **Date** | **Topic** | **Reading** |
| 8/20/2011 | Instruction: Modeling and computing | Chapter 1 |
| 8/22/2011 | Matlab basics |  |
| 8/27/2011 | Roundoff and truncation errors | Chapters 3 and 4 |
| 8/29/2011 | Root of Equations:  Bracketing methods  Open methods | Chapter 5 |
| 9/3/2011 |  |
| 9/5/2011 | Chapter 6 |
| 9/10/2011 |  |
| 9/12/2011 |  |
| 9/17/2011 | Linear Algebraic equations :  Gauss Elimination  LU decomposition  Iterative methods | Chapter 9 |
| 9/19/2011 |  |
| 9/24/2011 | Chapter 10 |
| 9/26/2011 |  |
| 10/1/2011 | Chapter 11 |
| 10/3/2011 |  |
| 10/8/2011 |  |
| 10/10/2011 |  |
| 10/15/2011 | Fall break |  |
| 10/17/2011 | Curve fitting :  Regression  Interpolation |  |
| 10/22/2011 |  |
| 10/24/2011 (exam) | Chapter 17 |
| 10/29/2011 |  |
| 10/31/2011 | Chapter 18 |
| 11/5/2011 |  |
| 11/7/2011 | Numerical Integration and differentiation | Chapters 21, 22 ,23 |
| 11/12/2011 | Chapters 21, 22 ,23 |
| 11/14/2011 |  |  |
| 11/19/2011 | Ordinary differential equations  Partial differential equations | Chapter 25 |
| 11/21/2011 |  |
| 11/26/2011 | Chapters 29, 30 |
| 11/28/2011 |  |
| 12/3/2011 |  |
| 12/5/2011 | TBD |  |
|  | **3:30 to 5:30 p.m.  Tuesday, Dec. 11** |  |