MATH 4013/5013: Numerical Analysis/Fall 09

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Course: Completely online on MyWebCT.
Credit Hours: 3
Office Hours: Online available on Tuesday and Thursday: 3:15pm to 6:00pm.
Reference: Introduction to numerical analysis, Hildebrant, Dover edition, (Online)
Prerequisite: Math 2644, Calculus II.
Objective: This is a first course in numerical analysis. Students will learn the main concepts and ideas used in numerical methods as well as their pitfalls when analysis is missing. Topics include floating point representations; precision, accuracy, and the different errors; numerical solution techniques for various types of problems; root finding, fixed point methods, interpolation, numerical differentiation and integration. We shall cover in depth the first four chapters of the text.

Evaluation: There will be a test at the end of each chapter and counts 100 points each.
Homework: A weekly homework will mainly cover questions from the sections covered during that week. Each homework counts 20 points and the best 10 are counted towards your final grade.
W Deadline: March 3rd is the last day to withdraw with grade of W.
Evaluation: 5 Tests=5x100 points, Quizzes/Hw= 200 points,

Requirements
Hardware: You will also need access to a computer (XP windows) that is capable of running: WebCT & Maple (CAS) Computer Algebra System. A headset with noise cancelling can help you concentrate in a noisy environment. Also a web cam can be useful in the chat room. We also recommend a cup of coffee or tea in case you have a slow internet connection.

Software: You need to purchase Maple V12 as part of the Maple adoption course. Older/cheaper versions (4 and up) of the software can also be used. Shop around! The plotting commands, programming and computing precision in
Maple will save you time and give you a better understanding of the main ideas. Maple includes the latest technology in computing and symbolic manipulations.

**Homework:** Typing mathematical equations is always difficult. Scientific notebook/word is a software that helps write mathematics and save it on Pdf format. Student editions are available at a lower price. The alternative is to use the Word or the WebCT equation editor. The last resort is to write it by hand, scan it and upload it onto WebCT.

**Debugging:** I will help you with debugging codes written in Maple. You need to take the new user tour for Maple, to get used with the main commands. Understanding the output of a computer is part of understanding numerical analysis. Talking to and understanding its limit is part of the mastery of numerical analysis.

**Lecture notes:** For each unit I will post a summary of the method, main results, outlining the main points of the proof, the algorithm, and few worked examples on Maple. More details of the proofs can be found in the textbook.

**Review:** The review (Unit 1) contains the background of this course. It is the responsibility of the student to go back to refresh any concept already seen in Calculus I and II. The review chapter will set the language to be used throughout the course. For example derivatives, Mean value theorem, and Taylor expansions are used in proofs without any special mention.

**Student** As your instructor it is my responsibility to present you with the material, the way to do things, provide you with the instruction and tools necessary for learning. But as the saying goes "You can lead a horse to water but you can't make him drink". Your responsibility in this course is to learn the material presented. I provide you with the tools to learn but you must also do your part. Homworks are feedbacks! They tell me how much you have understood and what you have misunderstood, etc.... It is my learning sensor and works as TCS (Teaching Control System). **Cheating in homework means tampering with the TCS** and will certainly leads to disaster and unsafe learning....

**Homework:** Due by Monday Midnight.

**Test** The tests are online and will have two parts:
Analysis part is two hours (timed) while the numerical part is set for five hours. Before starting an exam, please read the instructions carefully....
Course Units/Schedule

1. **MATHEMATICAL PRELIMINARIES.** (3 weeks)

2. **SOLUTIONS OF EQUATIONS IN ONE VARIABLE.** (4 weeks)

3. **INTERPOLATION AND POLYNOMIAL APPROXIMATION.** (3 weeks)

4. **NUMERICAL DIFFERENTIATION.** (2 weeks)
   Numerical Differentiation: the 3pts & 5 pts formulae.

5. **NUMERICAL INTEGRATION.** (2 weeks)

**Learning Outcomes:** The student will be able to:

- understand the different type of errors involved in computing. (L1)
- find the numerical solution of nonlinear equations \( f(x) = 0 \).
- interpolate and fit a curve. (L8)
- set a fixed point iteration to solve equations \( f(x) = 0 \).
- numerically differentiate a function. (L8)
- numerically integrate a function. (L8)
- apply numerical methods to solve real-life problems. (L9)
- write codes to implement a numerical method and algorithm. (L9)

**Discussions:** Questions that are of importance to everyone in the class may be posted to the appropriate discussion topic. Posting to the discussion boards allows all students in the class to see the answer.
Response Time: I will respond within 2 business days (M-F) to all email and discussion postings unless I inform you of any exceptions. I will expect the same response time from you! Please don't expect me to respond on weekends and holidays. I do like to get away from my computer occasionally. :-) 

The following ideas are available to help you fulfill your responsibilities in this course. They are ideas that will help you in any class you take even if it’s not online.

- Schedule time to study, do homework, and projects. Use a calendar to track these "appointments" with yourself. (The WebCT Vista calendar will allow you to add "appointments" for yourself.)
- Get acquainted with the course materials-- know how to use WebCT Vista, know the layout of your textbook, know when the due dates are, know your syllabus.
- Know yourself-- How do you learn best? Are you a visual learner? Are you a kinesthetic learner? Try out the Learning Styles Inventory: [http://library.cuesta.edu/distance/lrnstyle.htm](http://library.cuesta.edu/distance/lrnstyle.htm) to get an idea of how you learn best and what you can do to maximize your learning.

In addition to learning the material presented you are also expected to maintain a friendly atmosphere in the online classroom. "Flaming" and defamatory postings and email are not permitted in this environment. Following simple "netiquette" guidelines will help you to avoid creating a negative learning environment.

1. Don't type in ALL CAPS-- many people perceive this a yelling when online.
2. Remember that the written word can seem harsher than a spoken statement because visual clues are absent. For instance, if I verbally call you a "Knucklehead" while smiling and winking you are less likely to be offended than if I write that in an email with no visual clues as the to the fact that I am teasing you!
3. Try using emoticons such as :-) ;-) etc to let people know you are being light hearted. It seems silly but it helps to lighten the mood.
4. Always put something in the subject of email messages and discussion postings.
5. READ the syllabus, discussion postings, and email messages before asking a question. In many cases the question will have already been addressed.
6. Have fun, be patient and enjoy!

The schedule for starting each unit as well as your homework, discussions, projects, and exam due dates can be found on your WebCT Vista calendar. Please click the Calendar tool on the Vista course toolbar.
Attendance/Participation Policy
Students in an online course are expected to login a minimum of 3 times a week.

Academic Honesty
Please see the student handbook link for this policy. This class will use plagiarism detection software! http://www.westga.edu/assets/docs/studentHandbook-current.pdf .
You are encouraged to discuss mathematics, code writing with your friends. However homework and test are personal performance assessments. Submitting blind copies of others work will result in failing the course. No exceptions!

ADA: AMERICANS WITH DISABILITIES ACT STATEMENT
If you are a student who is disabled as defined under the Americans with Disabilities Act and requires assistance or support services, please seek assistance through the Center for Disability Services. A CDS Counselor will coordinate those services. See http://www.westga.edu/~dserve/

Affirmative Action Statement
University of West Georgia adheres to affirmative action policies to promote diversity and equal opportunity for all faculty and students.

Equal Opportunity Statement
No person shall, on the grounds of race, color, sex, religion, creed, national origin, age, or disability, be excluded from employment or participation in, be denied the benefits of, or otherwise be subjected to discrimination under any program or activity conducted by UWG.

Final Thoughts...
The TCS will control the speed on the learning highway. In case of icy/cold roads the TCS will slow down and adjust the pace. Likewise if it feels the class is ready to handle higher speeds, then we will make changes to the syllabus at any time. Please check it frequently for updates. You will be notified of any updates and/or changes to the syllabus via an Announcement in Vista.