Math 2441: Introduction to Mathematical Computation

Section 19605 - Fall 2015
MWF 11:00-11:50 am, MCS 212, Th 2:40-3:55 pm, MCS 214

Instructor: Clarence Burg
Office: MCS 225 Office Phone: 501-450-5654
email: clarenceb@uca.edu website: http://faculty.uca.edu/clarenceb
Final Exam: 2:00 – 4:00 pm, Monday, December 7, 2015
Office Hours: MWF 10:00-10:50 am, TTh 9:25-10:40

Required Text: Stewart, J., *Calculus: Early Transcendentals*, Sixth Edition, Thomson Brooks/Cole. We will rely on notes developed by the instructor.

Prerequisites: Math 1496 (Calculus II) with C or better

Course Description: This course focuses on the process of translating mathematical algorithms into an appropriate form for implementation within computational tools. Each week, the students will learn new mathematical content, complete homework problems to master these concepts, develop step-by-step algorithms for computing the numerical answers, implement these algorithms within appropriate software and compare the results from their implementations with known mathematical formula. This course is neither a programming course nor an introductory numerical methods course; rather, it is a mathematics course focused on the proper use of computational tools to aide with the mathematical investigations.

Student Learning Outcomes: Upon successful completion of this course, the student will be able to:

1) Translate mathematical processes into computational algorithms;
2) Use a variety of computational tools for mathematical investigations;
3) Write project reports that provide the mathematical concepts and detailed algorithms for the topic and computational evidence that the algorithm has been properly implemented and that the mathematical model adequately reflects the physical problem being investigated.

Grading

Grades will be based on the standard 10 point scale (A – 90-100%, B – 80-89%, C – 70-79%, D – 60-69%, F – below 60%). The final grade will be determined from homeworks, programming assignments, tests, and a final exam.

Homework Assignments	10%
Programming Lab Homeworks	5%
Programming Lab Reports	35%
Final Course Project	10%
Tests (2@10% each)	20%
Final Exam	20%
	100%

Course Structure: For each new mathematical concept, the material will be covered via a traditional lecture followed by a homework assignment, in order to give the student the opportunity to master the concept. We will then translate one or more algorithms used in that mathematical concept into pseudo-code and will implement the pseudo-code into a computational language during the lab time.

Homework Assignments: In order to master the mathematical concepts taught in the course, the students will complete a set of homework related to each concept. The goal is complete the homework prior to or alongside the programming assignments.

Programming Lab Assignments: Each Thursday, the students will engage in a programming lab, where the students will implement the pseudo-code representing the mathematical algorithms. The pseudo-code will be implemented within a variety of Mathematical software programs including Microsoft Excel, Mathematica, MatLab, and a programming language such as REXX or C++. Associated with each lab, the student will complete a set of homework questions using their codes, and the student will write a detailed lab report based on a specified lab format. Each lab will take at least two weeks to complete. Topics for the programming labs are

Lab 1 – Variability in Future and Present Value Annuities
Lab 2 – Sequences and iterations
Lab 3 – Applications of iterations
Lab 4 – Linear least squares regression
Lab 5 – Approximating functions with basis functions

Final Course Project: Students in a group of 2 or 3 will select a mathematical topic for their final course project, investigate the mathematical details more deeply than in class, translate the algorithm into pseudo-code and implement the pseudo-code within an appropriate mathematical software program. They will present their work to the class and write a paper based on their work. Each group of students will meet with the instructor at least three times during the semester to select the topic and obtain guidance and assistance in developing their implementation and project.

Tests: As a mathematics course, mastery of the mathematical content in the course is essential to a complete understanding of the process of translating the mathematical algorithm into a computational implementation. Hence, two tests will be administered to the students in order to assess their understanding and proficiency with the mathematical content.

Final Exam: The final exam will be comprehensive, covering all material taught in the course.

Grades: University regulations prohibit me from discussing your grades over the phone or communicating with you about your grades via email. I can communicate with you about your grade through your UCA cub account. If you need to discuss your grades, please come by my office.

University policy on Academic Integrity and Academic Misconduct: The University of Central Arkansas affirms its commitment to academic integrity and expects all members of the university community to accept shared responsibility for maintaining academic integrity. Students in this course are subject to the provisions of the university's Academic Integrity Policy, approved by the Board of Trustees as Board Policy No. 709 on February 10, 2010, and published in the *Student Handbook*. Penalties for academic misconduct in this course may include a failing grade on an assignment, a failing grade in the course, or any other course-related sanction the instructor determines to be appropriate. Continued enrollment in this course affirms a student's acceptance of this university policy.

Plagiarism: Plagiarism can be defined as the use of someone else's words without proper acknowledgement of that use. If you use someone else's words or the written words of the instructor in the assignment, you must put them in quotations and provide a reference for the source. Paraphrasing the words of others by only changing a few words is also considered plagiarism. For more information about plagiarism, please see UCA's statement on plagiarism at http://uca.edu/academicaffairs/files/2012/08/Plagiarism.pdf. Plagiarism is academic misconduct and will result in appropriate disciplinary action.

The Americans with Disabilities Act statement: The University of Central Arkansas adheres to the requirements of the Americans with Disabilities Act. If you need an accommodation under this Act due to a disability, please contact the UCA Disability Resource Center, 450-3613. If the instructor of this class needs to be informed of your disability in order to assist with any appropriate accommodations, please contact the instructor during the first week of classes.

Building Emergency Plan statement: An Emergency Procedures Summary (EPS) for the building in which this class is held will be discussed during the first week of this course. EPS documents for most buildings on campus are available at http://uca.edu/mysafety/bep. Every student should be familiar with emergency procedures for any campus building in which he/she spends time for classes or other purposes.

The Title IX disclosure: If a student discloses an act of sexual harassment, discrimination, assault, or other sexual misconduct to a faculty member (as it relates to "student-on-student" or "employee-on-student"), the faculty member cannot maintain complete confidentiality and is required to report the act and may be required to reveal the names of the parties involved. Any allegations made by a student may or may not trigger an investigation. Each situation differs and the obligation to conduct an investigation will depend on those specific set of circumstances. The determination to conduct an investigation will be made by the Title IX Coordinator. For further information, please visit: https://uca.edu/titleix. **Disclosure of sexual misconduct by a third party who is not a student and/or employee is also required if the misconduct occurs when the third party is a participant in a university-sponsored program, event, or activity.*

Departmental Policy: Use of cell phones (including texting), MP3 players, web browsers, ear buds/plugs is NOT ALLOWED during class time. Cell phones must be set to silent/vibrant mode while in class. Instructors may also disallow use of any other technology not relevant to the instruction. Use of any type of laptop during class time requires consent of the instructor.

Other Policies: Students should familiarize themselves with all policies listed in the UCA *Student Handbook*, such as the Sexual Harassment Policy and Academic Policies.