CIV ENG 2E03 Course Outline

1. COURSE INFORMATION

Session Offered	Fall 2018	
Course Name	Computer Applications in Civil Engineering	
Course Code	Civ Eng 2E03	
Calendar Description	Number systems and errors; solutions to nonlinear equations; interpolation by polynomials; matrices and systems of linear equations; differentiation and integration; differential equations; applications to mechanical systems.	
Instructor(s)	Cameron Churchill	Phone: x23179 E-Mail: church@mcmaster.ca Office Hours & Location: JHE A214/B

2. COURSE SPECIFICS

Course Description	Learn the basic principles of modelling mathematical problems that occur in engineering; understand the main tools available in numerical analysis; write Matlab programs that use numerical methods to solve engineering problems; numerical techniques including error analysis, root finding, linear algebraic equations, curve fitting, integration and differentiation, ordinary differential equations; sensitivity analysis; civil engineering applications.		
Instruction Type	**Code**	**Type**	**Hours per term**
	C	Classroom instruction	25
	L	Laboratory, workshop or fieldwork	11
	T	Tutorial	22
	DE	Distance education	
		Total Hours	**58**
Resources	**ISBN**	**Textbook Title & Edition**	**Author & Publisher**
	978-0073397924	Numerical Methods for Engineers, 7th Edition	Chapra & Canale – McGraw-Hill
	Other Supplies	**Source**	
Course Specific Policies	- Late assignments will not be accepted - Term tests and Final Exams will be closed-book. - One **FORMULA ONLY** crib sheet will be allowed for each test - Only the use of the McMaster Standard Calculator will be allowed on the test and final exam		

3. SUB TOPIC(S)

Week 1	Introduction, Modelling and Computers;	Chapters 1 and 2
Week 2	Number Representation and Errors Root Finding: Bracketing Methods • Graphical • Bisection Method • False Position	Chapter 3
Week 3	Root Finding: Open Methods • Newton-Raphson • Secant Method	Chapter 3
Week 4	Root Finding: Open Methods • Muller's Method	Chapter 7 Chapter 9

	• Bairstow	
Week 5	Systems of Linear Equations • Gauss Elimination • Gauss-Jordan	Chapter 10 Chapter 11
Week 6	Systems of Linear Equations • LU Decomposition • Gauss-eidel Least Squares Regression • Linear Regression	Chapter 17
Week 7	Least Squares Regression • Polynomial Regression • Multiple Linear Regression Polynomial Interpolation • Lagrange Interpolating Polynomials	Chapter 18
Week 8	Polynomial Interpolation • Lagrange Interpolating Polynomials Spline Functions • First Degree Splines • Second Degree Splines • Cubic Splines	Chapter 18
Week 9	Numerical Integration • Trapezoidal Rule • Romberg Algorithm	Chapter 21
Week 10	Numerical Integration • Simpson's Rule • Gauss Quadrature	Chapter 22
Week 11	Numerical Differentiation • First Derivative via Taylor Series • Second Derivative via Taylor Series • Richardson Extraplolation	Chapter 23
Week 12	First Order ODE • Taylor Series Method • Runge-Kutta Methods	Chapter 25
Week 13	Systems of First Order ODE; Higher Order ODE • Runge-Kutta Methods • Review	Chapter 25
Final Examination	Scheduled during the regular University Final Examination period established by the Registrar's Office.	
Note that this structure represents a plan and is subject to adjustment term by term. The instructor and the University reserve the right to modify elements of the course during the term.		

4. ASSESSMENT OF LEARNING	**Weight**
Quizzes and Assignments	20%
Term Tests (two 2-hour tests, each worth 15%)	30%
Final Exam	50%
TOTAL	**100%**

Term Tests: The term tests will occur on **October 23rd and, November 20th**. Both tests are from 8:30-10:20.

Course results determined on a percentage scale will be converted to an official letter grade, as indicated in the Undergraduate Calendar. The results of all courses attempted will appear on your transcript as letter grades.

5. LEARNING OUTCOMES

1. Perform error analyses and determine if the solutions are acceptable. [CEAB Indicator(s): 1.1, 2.1, 2.3, 3.1, 3.3, 5.1]
2. Understand the limitations of the numerical techniques covered. [CEAB Indicator(s): 1.1, **2.2**, 2.3, 3.2, 5.1]
3. Distinguish between and select the most applicable of available numerical techniques for an engineering analysis task. [CEAB Indicator(s): 1.1, **2.2**, 3.2, 5.1]
4. Use Matlab to compute numerical solutions. [CEAB Indicator(s): 1.4, 5.1, 5.2, 5.3, **12.1**]

6. POLICIES

Anti-Discrimination

The Faculty of Engineering is concerned with ensuring an environment that is free of all discrimination. If there is a problem, individuals are reminded that they should contact the Department Chair, the Sexual Harassment Officer or the Human Rights Consultant, as soon as possible.

Academic Integrity

You are expected to exhibit honesty and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity. Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. This behaviour can result in serious consequences, e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: "Grade of F assigned for academic dishonesty"), and/or suspension or expulsion from the university. It is your responsibility to understand what constitutes academic dishonesty. For information on the various types of academic dishonesty please refer to the Academic Integrity Policy, located at www.mcmaster.ca/academicintegrity. The following illustrates only three forms of academic dishonesty:

- Plagiarism, e.g. the submission of work that is not one's own or for which other credit has been obtained.
- Improper collaboration in group work.
- Copying or using unauthorized aids in tests and examinations.

Academic Accommodation of Students with Disabilities Policy

Students with disabilities who require academic accommodation must contact Student Accessibility Services (SAS) to make arrangements with a Program Coordinator. Student Accessibility Services can be contacted by phone 905-525-9140 ext. 28652 or e-mail sas@mcmaster.ca. For further information, consult McMaster University's Academic Accommodation of Students with Disabilities policy.

Requests For Relief For Missed Academic Term Work

In the event of an absence for medical or other reasons, students should review and follow the Academic Regulation in the Undergraduate Calendar "Requests for Relief for Missed Academic Term Work".

Academic Accommodation For Religious, Indigenous Or Spiritual Observances (RISO)

Students requiring academic accommodation based on religious, indigenous or spiritual observances should follow the procedures set out in the RISO policy. Students requiring a RISO accommodation should submit their request to their Faculty Office normally within 10 working days of the beginning of term in which they anticipate a need for accommodation or to the Registrar's Office prior to their examinations. Students should also contact their instructors as soon as possible to make alternative arrangements for classes, assignments, and tests.

Extreme Circumstances

The University reserves the right to change the dates and deadlines for any or all courses in extreme circumstances (e.g., severe weather, labour disruptions, etc.). Changes will be communicated through regular McMaster communication channels, such as McMaster Daily News, A2L and/or McMaster email.