

## **ME 3F04 COURSE OUTLINES – Fall 2019:**

### **Instructor:**

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### **Teaching (Marking) Assistants are:**

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### **Lectures/Tutorial will take place on:**

Monday 11:30 AM - 12:20 PM (KTH B135)  
Wednesday 11:30 AM - 12:20 PM (KTH B135)  
Friday 1:30 AM - 2:20 PM (KTH B135)  
Friday 3:30 AM - 4:20 PM (ITB AB102)

### **COURSE TOPICS:**

1. Introduction to modelling and error analysis
2. Roots of equations
3. Linear and non-linear algebraic equations
4. Optimization
5. Curve Fitting
6. Numerical differentiation and integration
7. Ordinary Differential equations
8. Partial Differential Equations

**LEARNING OUTCOMES:** Upon successful completion of the course the students are expected to be able to:

1. Solve systems of linear equations using direct and iterative methods based on properties of the matrix while understanding the significance of matrix parameters (condition number) on accuracy
2. Solve nonlinear equations and systems of non-linear equations using a variety of methods, understanding differences in the methods in terms of convergence and speed

3. Perform one- and multi-dimensional unconstrained optimizations using a variety of methods, understanding differences in the methods in terms of convergence and speed
4. Perform polynomial and spline Interpolations while understanding the limitations/benefits of the various approaches
5. Perform regressions on data sets using least-squares methods including linearization of non-linear data sets.
6. Calculate numerical derivatives of discrete data and be able to assess their accuracy
7. Solve ordinary differential equations (sets of first-order equations) as initial value problems using Euler's and Runge Kutta methods with an understanding of their solution accuracy
8. Solve boundary value problems using finite difference methods and solving the resulting linear equation set.

## **REFERENCES:**

The main textbook for the course:

Chandra & Canale, Numerical Methods for Engineers (Note: 4th and later editions are all essentially the same).

Other References

- Numerical Recipes
- Numerical Methods, Gilat & Subramaniam
- Numerical Mathematics, Grasselli & Pelinovsky
- [Matlab site: www.mathworks.com](http://www.mathworks.com)

## **SOFTWARE:**

Note that this is **NOT** a course on how to use a particular bit of software - it is more fundamental and deals with the algorithms, errors and other issues of the numerical methods examined. However, guidance and extra materials will be provided to help you get a better handle of using MatLab/Octave and MS Excel (will be added shortly to the course contents).

MatLab will be primarily used to apply methods learned in class. It is commonly used in industry for solving engineering problems numerically (it is probably the most common software package used for these applications). MatLab is available on the MechEng computers in JHE 219, and a student version is available

[online. Octave](#) is an open-source program very similar to MatLab and can be used as well.

**LECTURE NOTES:** Notes are posted regularly after corresponding lectures on A2L.

**COURSE MARKS:**

- 5 Assignments (4% each)
- 2 Midterms (15% each)
- Final Exam (50%)

**ASSIGNMENTS:** There will be a total of 5 assignments accounting for 20% of the total mark of the course

- Assignments will be dropped at 3F04 dropbox in JHE-307.
- Note <2 day-late assignments will be marked out of 50% (you must contact the TA directly to submit it to them - Please do not hand in late assignments to the dropbox). Assignments later than 2 days will not be accepted. The weight of all MSAF'd assignments (or midterms) will be transferred to the final exam.

**POLICY REMINDER:**

The Faculty of Engineering is concerned with ensuring an environment that is free of all discrimination. If there is a problem that cannot be resolved by discussion among the persons concerned, individuals are reminded that they should contact the Department Chair, the Sexual Harassment Officer or the Human Rights Consultant, as the problem occurs.

**McMaster University Statement on Academic Dishonesty**

You are expected to exhibit honesty and use ethical behavior 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 behavior 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](http://www.mcmaster.ca/academicintegrity).

The following illustrates only three forms of academic dishonesty:

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

#### Academic accommodation of students with disabilities

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](mailto:sas@mcmaster.ca). For further information, consult McMaster University’s Academic Accommodation of Students with Disabilities policy.

#### Requests for relief for missed academic work - McMaster Student Absence Form (MSAF)

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 the 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, labor disruptions, etc.). Changes will be communicated through regular McMaster communication channels, such as McMaster Daily News, A2L and/or McMaster email. Changes to this course will be provided through this A2L portal.