Western University
Department of Mechanical & Materials Engineering

MME 2221b – Computational Methods for Mechanical Engineers

COURSE OUTLINE – 2025-2026

CALENDAR DESCRIPTION: The objective of this course is to introduce data organization and processing techniques using spreadsheet tools; and numerical methods, model formulation and programming using advanced mathematical software tools. Applications in applied mathematics and mechanical engineering will be considered throughout the course.

COURSE INFORMATION:

Instructor:	Dr. Elli Gkouti, PhD Email: egkouti@uwo.ca
Lectures:	See Draft My Schedule
Tutorials:	See Draft My Schedule

CONSULTATION HOURS: TBD

PREREQUISITES: ES1036A/B, NMM 1411A/B or the former Applied Mathematics 1411A/B, NMM 1414A/B or the former Applied Mathematics 1414A/B

COREQUISITES: NMM 2270A/B or NMM 2276A/B

ANTIREQUISITES: CEE 2219A/B, CBE 2291A/B, MSE 2221A/B

ACCREDITATION UNITS: Engineering Science = 40%, Math = 40%, Engineering Design = 20%

TOPICS:

Spreadsheet topics include:

- data sorting & plotting
- advanced formulae & conditional formatting
- Statistical analysis

Mathematical software topics include:

- numerical techniques for differentiation and integration
- the assessment of numerical error
- the solution of numerical roots problems
- linear and nonlinear algebraic equations
- curve fitting and the solution of ordinary differential equations

LEARNING OUTCOMES:

The Mechanical and Materials Engineering Program has been accredited by Canadian Engineering Accreditation Board (CEAB) of Engineers Canada. Accredited programs provide the academic requirements for licensure as a professional engineer in Canada. Western Engineering has defined indicators of the 12 Graduate Attributes (GAs) that the CEAB expects graduating engineering students to demonstrate. The connections between course learning outcomes and Western Engineering's GA Indicators are identified below.

1. Develop an advanced working knowledge of Microsoft Excel and MATLAB (KB3, KB4)
2. Organize, perform basic data analysis, and present data (ET1, ET2, IN2, CS3)
3. Ability to model and solve a variety of engineering problems using appropriate computational methods in MATLAB (PA1, PA2, ET1, ET2, ET3, D1)

CONTACT HOURS: 3 lecture hours, 2 tutorial hours per week, half course

TEXTBOOK: Chapra, Steven, 2023 Applied Numerical Methods with Matlab for Engineers and Scientists, 5th Edition (Required, Earlier editions or used copies can be used)

Nordell, Randy & Stewart, Kathleen, 2021, Microsoft Excel 365 Complete: In Practice, 2021 Edition, 1st Edition (Optional, Earlier editions or used copies can be used)

UNITS: SI units will be used.

EVALUATION: Evaluation will consist of eight in-tutorial assignments, two 2-hour quizzes administered in the tutorial sessions, and one 3-hour final exam. In-tutorial assignments are open book and performed in-class in groups. The quizzes are individual and closed book. For the final exam, students will be provided with an information sheet by the instructor if required; no other aid is allowed. A standard scientific calculator is permitted.
The final grade is computed as follows (Tentative Schedule):

Weekly In-Tutorial Assignments (8) **18%**
Best 6 out of 8 tutorial assignment grades are considered (6 best assignments x 3%). Specifically, Assignments 1-2 will be in Excel and Assignments 3-8 in MATLAB. The dates of each Assignment are fixed and will be announced in OWL Brightspace.

Quizzes (2) **42%**
Quiz 1: Week 5 (20%)
Quiz 2: Week 9 (22%) - *designated assessment*
The specific dates and locations will be announced within the first weeks.
Final Examination **40%**
The final exam will be scheduled during the final exam period.

If a minimum mark of 50% is not obtained on the final examination, the student cannot receive a final mark greater than 48%.

COURSE POLICIES: *Tutorial Exercises:*

- Tutorial exercises will be carried out in the tutorial rooms where students will collect in their pre-determined groups.
- The tutorial exercises will consist of problems to be solved in a group format.
- Teams will receive problem-solving assistance from the TA and instructor, who will be in the tutorial/zoom room. However, prior knowledge on problems assigned (like the ones solved by the instructor in the preceding week) will be highly beneficial.
- Tutorial exercises will be open-book.
- Communication is encouraged during the tutorial exercises, but blatant copying of another team's work will be considered a scholastic offence.
- Only the 6 highest-scoring assignments out of the 8 tutorial assignments given during the course will be accounted toward the final grade. Each of these top 6 assignments will contribute 3% to the overall course grade, for a maximum of 18% (6 assignments x 3% each).
- No make-up tutorial exercises will be offered regardless of the reason missed.
- Since flexibility in attendance is provided by basing the tutorial grade on only the best 6 of 8 total tutorials, any requests for academic consideration for missed tutorials will be denied.
- Tutorial Exercises are due at the end of the tutorial session in which they are assigned. No late submissions will be accepted.
- The default assumption is that everyone contributes equally to the in-tutorial assignment team effort, and hence, everyone should receive the same mark for the common team submission.

Quizzes:

- Quizzes will be carried out in the Engineering computer labs TEB 454, ACEB 2415 and ACEB 1400 and will consist of problems to be solved individually in a closed-book format.
- Communication is not permitted.
- No make-up quizzes will be offered regardless of the reason missed.
- Quiz 2 is considered a *designated assessment*, and therefore, undocumented absences will not be given academic consideration.
- Missing a quiz with academic consideration will shift the weight of the missed quiz to the final exam.
- Quizzes are due at the end of the tutorial session in which they are assigned. No late submissions will be accepted.
- Students are required to contact the course instructor for any other circumstances that appear not to be covered by the non-exhaustive list above.

Term Work:

- If a minimum of 50% is not obtained on term work, the student will fail the course irrespective of the mark obtained in the final examination.

Final Examination:

- The exam will take place during the April examination period.
- The exam will be closed-book.
- If a minimum of 50% is not obtained on the final examination, the student cannot receive a final mark greater than 48%.
- If technical issues will prevent a student from successfully completing and submitting the final exam, the official guidelines from the Associate Dean's Office, Undergraduate Affairs will be followed. Options to be considered will include but without being limited to oral examination or make-up examination in the special examination period.
- If cheating during the final examination is suspected, the student will be required to participate in a one-on-one oral examination with the instructor. The mark obtained in the oral examination will supersede the one obtained during the written exam. If the student refuses their participation in the oral examination, the final exam will be automatically graded with zero, and further academic penalties for scholastic offences will be applied.

- Students are required to contact the instructor of the course for any other circumstances that appear to not be covered by the non-exhaustive list above.

Computer Requirements:

- It is highly recommended that all students install Microsoft Excel and MATLAB on their personal computers and that they bring their laptops to the in-person tutorial sessions. This software is all available at no cost as part of the UWO software site license. If a student does not have a working laptop, one of the tutorial rooms has computers in it, and they can attend that room.

Course Content:

- Lecture notes and online lecture videos are copyrighted to the instructor, and hence, they are legally protected.
- As such, the unauthorized posting and sharing of the copyrighted course content could be subjected to legal actions.

ASSIGNMENTS: Homework may be assigned, and solutions will be provided. These will not be graded but will prepare the students for the graded tutorial exercises.

USE OF AI: The use of generative artificial intelligence is prohibited in this course, unless it is used as a teaching and training tool. Specifically, it is acceptable for learning purposes, such as gaining skills in Excel/MATLAB. Additionally, if AI is used to produce any materials submitted for grading in this course, its use must be fully disclosed. This includes the use of AI tools for tasks like text generation, editing and refinement. However, using generative artificial intelligence is strictly prohibited when generating the requested solutions for the Assignments (e.g., writing code or programming in Excel or MATLAB).

General Faculty / University Policies

The Faculty of Engineering and Western University have overarching policies that prescribe how undergraduate courses should run. The course-specific policies described above should be considered *in addition to* those overarching policies, or as course-specific interpretations of them. In the event of contradictions or confusion between course-specific policies above and general Faculty / University policies, please contact your course instructor for clarification.

Western Engineering's undergraduate polices can be found by navigating to:
https://www.eng.uwo.ca/undergraduate/academic-support-and-accommodations/policies.html

and then clicking the "*Engineering Undergraduate Policies framework*" link.