

MME 4437A – Advanced CAE: Simulation

COURSE OUTLINE – 2026-2027

CALENDAR DESCRIPTION:	Nonlinear structural analysis, vibration of discrete and distributed systems, kinematic and dynamic analysis, flexible mechanism analysis, nonlinear thermal analysis, fluid flow analysis, thermal fluids, multi-physics simulation, interfacing between structural, thermal and mechanism analyses.
COURSE INFORMATION:	Instructor: Ben Hamilton, PhD Email: ben.hamilton@uwo.ca Lectures/tutorials/labs: See Draft My Schedule
CONSULTATION HOURS:	By appointment
PREREQUISITES:	MME3307A/B, MME3360A/B, MME3380A/B Unless you have either the requisites for this course or written special permission from your Dean to enroll in it, you will be removed from this course and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped from a course for failing to have the necessary prerequisites.
ANTIREQUISITES:	None
ACCREDITATION UNITS:	Engineering Science = 75%, Engineering Design = 25%
TOPICS:	Selected advanced topics of Computer Aided Engineering (CAE) 1. Nonlinear structural problems 2. Nonlinear material models 3. Linear and nonlinear vibration of discrete and distributed systems 4. Kinematics and dynamics of flexible mechanisms 5. Computational Fluid Dynamics 6. Thermal fluid problems 7. Topology Optimization
LEARNING OUTCOMES:	Upon successful completion of this course, students will be able to: 1. Formulate and solve advanced engineering analysis problems not covered in introductory courses. (KB3, PA2, D4) 2. Interface between different computer aided engineering tools. (ET2) 3. Use different computer aided engineering tools to analyze complex system behavior analysis tools. (KB3, PA2)

4. Perform advanced types of finite element analysis, finite volume analysis and topology optimization. (KB4, CS3, LL2)
5. Specify the latest engineering tools. (ET2)
6. Use latest local and cloud computing analysis tools. (ET2)

The terms in parentheses following each learning outcome refer to Graduate Attributes (GAs) established by the Canadian Engineering Accreditation Board (CEAB) of Engineers Canada. These attributes are used in the accreditation process to ensure that accredited engineering programs are providing the academic requirements for licensure as a professional engineer in Canada. Information on Graduate Attributes and Indicators can be found at [GA Indicators](#). The table below indicates which specific attributes are measured in this course and the level at which it is measured, wherein I=*Introduced*, D=*Developed* and A=*Advanced/Applied*

CEAB Graduate Attribute Learning Levels for this course:

Knowledge Base	A	Engineering Tools	A	Impact on Society	
Problem Analysis	A	Individual & Teamwork		Ethics and Equity	
Investigation		Communication	A	Economics & Project Mgmt.	
Design	A	Professionalism		Life-Long Learning	A

CONTACT HOURS: 3 lecture hours, 2 hours of supervised lab time per week for assignment/project help, half course

TEXTBOOK: The following textbooks are recommended:

“Thermal Analysis with SolidWorks Simulation 2026 and Flow Simulation 2026”, P. Kurowski, SDC Publications, ISBN: 978-1-63057-796-4.

<https://www.sdcpublications.com/Textbooks/Thermal-Analysis-SOLIDWORKS-Simulation-2026/ISBN/978-1-63057-796-4/>

“Vibration Analysis with SolidWorks Simulation 2022”, P. Kurowski, SDC Publications, ISBN: 978-1-63057-488-8.

<https://www.sdcpublications.com/Textbooks/Vibration-Analysis-SOLIDWORKS-Simulation-2022/ISBN/978-1-63057-488-8/>

“Engineering Analysis with SolidWorks Simulation 2025”, P. Kurowski, SDC Publications, ISBN: 978-1-63057-702-5.

<https://www.sdcpublications.com/Textbooks/Engineering-Analysis-SOLIDWORKS-Simulation-2025/ISBN/978-1-63057-702-5/>

Other references will be provided during lectures.

UNITS: SI will be used; however, English units may be introduced through examples as required.

EVALUATION:

Assessment Type	Assigned	Due Date	Weight	CEAB GAs Assessed
Assignment 1 – FEA	Sep. 16	Oct. 2	8%	KB3
Assignment 2 – CFD	Oct. 28	Nov. 13	8%	
CSWP-S Exam (closed book)	N/A	Oct. 7	4%	KB3, KB4, LL2, PA2
CSWP-Flow Exam (closed book)	N/A	Nov. 18	4%	ET2
Project	Sept. 11	Dec. 4	26%	LL2
Final Exam (closed book)	During the examination period		50%	CS3, ET2, PA2

COURSE POLICIES: If deadlines for assignments are not met, a three-day grace period will be allowed without penalty. A delay of more than three days will result in a mark of zero. Because the submission deadline for these assignments already includes flexibility in the form of a 72-hour submission window, the instructor reserves the right to deny academic consideration for assignments which are submitted following the end of the period of flexibility.

Attendance: Attendance at lectures is not mandatory; however, regular attendance is strongly encouraged, as lectures frequently include demonstrations, modeling strategies, and guidance that extend beyond the posted notes. All material presented or discussed during lectures may be assessed. **Mandatory attendance:** Students are required to attend the first scheduled laboratory session for each assignment (September 16 and October 28). During these sessions, assignment problems will be discussed, and demonstrations will be provided illustrating the methods and workflows used to solve each problem.

Students who do not attend the first scheduled laboratory session for an assignment, without an approved absence or academic consideration, will receive a **maximum grade of 75% for that assignment**. Students remain responsible for all material covered during laboratory sessions they do not attend.

CSW Exams: If technical issues prevent a student from successfully completing or submitting a CSW exam, the instructor will decide whether a second attempt is permitted. If approved, a makeup exam will be scheduled at a later date.

Final Examination: If technical issues prevent a student from successfully completing and submitting the final examination, the official guidelines from the Associate Dean's Office, Undergraduate Affairs will be followed. Options to be considered will include, but are not limited to, an oral examination or a makeup examination in the special examination period.

Designated Assessment: The Project is considered to be central to the learning

objectives for this course. Accordingly, students seeking academic consideration for the Project will be required to provide formal supporting documentation.

Generative AI: The use of generative artificial intelligence (AI) tools (i.e., ChatGPT, Google Gemini, Microsoft Copilot, image or code generation tools, etc.) is not permitted for any assessed work in this course, including exams, assignments, and projects. All submitted work must be produced by the student without the aid of generative AI technologies.

If you are unsure whether a particular tool or approach is permitted, please consult the instructor before using it.

If a student is suspected of cheating on a course assessment, the student will be notified, and an investigation will be completed by the Associate Chair - Undergraduate (MME). If it is determined that a scholastic offence has taken place, the Associate Chair - Undergraduate may apply a grade penalty, up to and including course failure. Further disciplinary actions may be imposed by the Associate Dean for Undergraduate Studies (Engineering).

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.

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 policies 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.

The policy covers:

- Absence/Late Accommodation Policy
- Religious Accommodation
- Academic Integrity
- Academic Offences
- Faculty of Engineering AI Policy
- Accessibility
- Inclusivity, Diversity, and Respect
- Health and Well-being
- Gender-Based and Sexual Violence