MME 4475a – Advanced CAE: Computational Heat and Fluid Flow

COURSE OUTLINE – 2022-2023

CALENDAR DESCRIPTION:	The theory and application of numerical methods to solve heat transfer and fluid mechanics problems are studied, programmed, and applied using existing software.		
PREREQUISITES:	 MME 3303A – Fluid Mechanics II or equivalent MME 3307B – Heat Transfer II or equivalent 		
ACCREDITATION UNITS:	Engineering Science = 50%, Engineering Applications = 50%		
TOPICS COVERED:	 Governing equations of fluid mechanics and heat transfer Non-dimensionalization Discretization methods Errors, convergence and stability Pressure coupling and time stepping Meshing and pre-processing Boundary conditions Turbulence modeling Applications 		
LEARNING OUTCOMES:	 Upon successful completion of this course students will be able to: (1) Choose appropriate numerical methods for solving engineering heat transfer and fluid flow problems, (2) Write codes to numerically simulate very simple problems, (3) Setup, run, and analyse numerical simulations of more complex problems using existing software, (4) Understand the limitations of numerical methods. 		
CONTACT HOURS:	3 lecture hours and 2 lab hours per week; half course Lectures: Tuesday 5:30 – 6:20 pm, Wednesday 2:30 – 4:20 pm. Labs: Wednesday 8:30 am – 10:30 am in ACEB 1400.		
OPTIONAL REFERENCES:	 Fundamentals of Heat and Mass Transfer, Bergman and Levine (§ 4.4-4.5) Fluid Mechanics, White (§ 8.9) An Introduction to Computational Fluid Dynamics: The Finite Volume Method, Versteeg and Malalasekera 		
UNITS:	SI		
COMPUTING SKILLS:	Experience with Excel and/or Matlab is beneficial but not required.		
SOFTWARE:	Fluent and Excel and/or Matlab will be used during labs and projects.		
EVALUATION:	 The course grade will be based on an assignment, a project, lab assessments, participation, and an exam. The tentative schedule is as follows: Lab assessments 20% Grade based on best 5 of 6: Sept. 28, Oct. 19, Oct. 26, Nov. 9, Nov. 16, Nov. 30 Assigned and submitted during the specified lab session. Work will be done individually; discussion with classmates will usually 		
	be allowed; attendance is required.		

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	Assignment	16%	
	- Assigned Oct. 4, due October 18 at 5:30 pm	20/	
	Participation (based on labs during non-assessment weeks)	2%	
	 Assigned Nov. 16, due Dec. 6 at 5:30 pm Desist spill be seguedated in dividently. 	5270	
	Final examination (during exam period).	30%	
	 During exam period Individual work without collaboration or discussion wit Open book 	h others	
	- Only non-programmable calculators are allowed		
	If a minimum mark of 50% is not obtained on the final examination receive a final mark greater than 48%.	the student cannot	
	Late assessments will not be accepted, except at the discretion of th assessments are accepted, the penalty applied will be at the discretion	e professor; if late of the instructor.	
COURSE POLICIES:	URSE POLICIES: Access to a computer onto which Ansys Workbench student ec downloaded may be helpful (a recent version of Windows should su computer labs also provide access to this software.		
	If a student is excused from lab work, the absence will count as the If multiple lab assessments are missed with excused absences, th required to write a make-up assessment, the weighting may be do among the other lab assessments, or the weighting may be placed of decision of which occurs will be made on a case-by-case basis by academic consideration is approved by the undergraduate office for the extension equal to the length of the academic consideration (up to allowed. Extensions for longer periods of academic consideration is with the professor. If lab sessions that contribute to the participation due to excused absences, the grades will be redistributed to other coun- the discretion of the professor. Students are directed to the Policy of for Medical Illness (https://studentservices.uwo.ca/secure/index.cfm)	dropped lab mark. e student may be listributed equally onto the final. The v the instructor. If the assignment, an 48 hours) will be must be discussed a grade are missed urse components at n Accommodation	
	Attendance at lab sessions is required.		
ENGLISH:	In accordance with Senate and Faculty Policy, students may be penal the marks on all assignments, tests and exams for improper Additionally, poorly written work with the exception of final exam without grading. If resubmission of the work is permitted, it may be deducted for poor English and/or late submission.	lized up to 10% of use of English. s may be returned graded with marks	
INSTRUCTOR:	K. Ogden Room SEB 3091, e-mail: kogden3@uwo.ca		
CONSULTATION HOURS:	Office Hour: TBD (or by appointment)		
ATTENDANCE:	Any student who, in the opinion of the instructor, is absent too freque laboratory periods in any course, may be reported to the Dean (afte been given). On the recommendation of the Department concern permission of the Dean, the student will be debarred from ta examination in the course.	ently from class or r due warning has ned, and with the aking the regular	
CHEATING:	University policy states that cheating, including plagiarism is a scho commission of a scholastic offence is attended by academic pena include expulsion from the program. If you are caught cheating,	lastic offense. The lties which might there will be no	

second warning. Scholastic offences are taken seriously and students are directed to the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following Web site:

http://www.uwo.ca/univsec/handbook/appeals/scholastic discipline undergrad.pdf

Cheating will result in a grade of zero on the affected assessment, in addition to any penalties described above.

NOTES: This syllabus is tentative. The above topics and outline are subject to adjustments and changes as needed.

Students who have failed an Engineering course (ie.<50%) must repeat all components of the course. No special permissions will be granted enabling a student to retain laboratory, assignment or test marks from previous years. Previously completed assignments and laboratories cannot be resubmitted for grading by the student in subsequent years.

Masking Guidelines, Course Absences due to Daily COVID Screening Questionnaire, Contingency plan for an inperson class pivoting to 100% online learning: follow university policy.