

**ME4J03-Introduction to Computational Fluid Dynamics and Heat Transfer
January 2020**

Instructor: Prof. M. S. Hamed
Tel: 905-525-9140 ext. 26113
Email : hamedm@mcmaster.ca
<http://mech.mcmaster.ca/~hamedm/index.htm>

Textbooks

- 1) Computational Fluid Dynamics - A Practical Approach, J. Tu, G.H. Yeoh, and C. Liu, Elsevier Inc.
- 2) Computational Fluid Dynamics for Engineers, T. Cebeci, J.P. Shao, F. Kafyeke, E. Laurendeau, Horizons Publishing, 2005, ISBN 0-9766545-0-4.
- 3) "Introduction to Heat Transfer", 4th Edition, Frank P. Incropera and David P. DeWitt, Wiley, 2002.

Course Website: <http://mech.mcmaster.ca/~hamedm/Personal/courses.htm>

Important

Announcements: Important announcements will be posted on course website. It is the student's responsibility to check the "Important Announcement" section on course website at least once a week.

Lectures: Wednesdays 8:30 AM-11:20 AM in UH-102.

Tutorials: Mondays 8:30 AM-10:20 AM in JHE-219A

Assessment: The following distribution of marks will be used, unless there is a valid and compelling reason to use an alternative weighting scheme. Missed work (e.g., assignments, projects, and tests) will have a grade of zero entered without legitimate and documented reason.

Assignments	15%
Two Projects	30% (15% each)
Mid-term	15%
Final exam	40%

Downloads: Lecture notes and other material will be posted on the course website in a password protected section. All material is copyright protected and should not be shared with and/or distributed to others.

Late Penalty: A 10% per day late penalty will be applied on late assignments and/or projects.

Laptops, Tablets and Cell Phone Use: Not allowed during lectures, tutorials, and exams.

Course Description: This course is an introductory course in Computational Methods for Fluid Mechanics and Heat Transfer covering: concepts of modeling and numerical analysis, governing equations of thermo-fluid problems, finite-difference and finite-volume

discretization methods, and introduction of the use of ANSYS-CFX CFD software package in solving Thermal Engineering problems.

Course Objectives:

- Introduce Computational Methods for Fluid Mechanics and Heat Transfer.
- Introduce the use of the computational commercial software package ANSYS-CFX in solving Thermal Engineering problems.

Course Topics:

- | | |
|--|--|
| 1. CFD Solution Procedure. | 4. CFD Solution Analysis and Practical Guidelines. |
| 2. Governing Equations for CFD. | 5. Applications of CFD. |
| 3. CDF Techniques - Basics of Finite-Difference and Finite-Volume Methods. | |

Learning Outcomes: Upon successful completion of the course the student will be expected to have demonstrated the ability to:

1. Learn and use one of the most advanced and powerful computational tools (ANSYS CFX) to solve and analyze fluid dynamics and heat transfer problems.
2. Understand how to make physically justified assumptions to simplify and carry out feasible analysis of real-life fluid flow and heat transfer problems.
3. Utilize scaling analysis to evaluate the order of magnitude of physical mechanisms in a problem, simplify governing equations and identify important scales (e.g., length, velocity, and time) and dimensionless quantities.

Graduate Attributes: This course provides the students opportunity to develop the following measures of graduate attributes:

Graduate Attributes	Learning Outcomes where it is measured
Problem Analysis (Indicators 1,2, & 3)	1,2,3
Investigation (Indicators 2, 3)	2,3
Use of Engineering Tools (Indicator 2)	1

Policy Reminders:

1. Academic Integrity

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](https://www.mcmaster.ca/policy/Students-AcademicStudies/AcademicIntegrity.pdf) (<https://www.mcmaster.ca/policy/Students-AcademicStudies/AcademicIntegrity.pdf>), 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.

2. 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”.

The weight of any missed work properly reported using MSAF will be automatically added to the weight of the final examination.

3. 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.

4. 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. For further information, consult McMaster University’s [Academic Accommodation of Students with Disabilities](#) policy.

5. 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.