

Course Syllabus

Course Information - Spring 2016

[MECH 4320.001](#)

APPLICATIONS OF COMPUTATIONAL TOOLS IN THERMAL FLUID SCIENCE

Room: [ECSN 2.126](#)

Time: MW 4:00pm-5:15pm

Final: TBA

Professor Contact Information

Prof. Stefano Leonardi

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Office Hours:

W 9.00-10.30am

Or by appointment (please use email to set this up)

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Course Pre-requisites, Co-requisites, and/or Other Restrictions

Prerequisites: MECH 3320 or equivalent

Course Description

MECH 6372 Turbulent Flows (3 semester credit hours)

Introduction to the methods used to simulate fluid flow and heat transfer, with an emphasis on the selection and use of commercial analysis packages. This course covers basic numerical analysis and the application of these techniques to the solution of the relevant transport equations in thermal-fluid science. Discussion of how engineering problems can be formulated and solved using various commercial software packages.

Student Learning Objectives/Outcomes

Assuming you will fulfill your responsibility (e.g., attend most classes, be attentive, read the assigned materials and complete homework on time), you should be able to achieve the following goals by the end of the semester:

1. Conduct transient and steady state analyses for typical mixed-mode heat transfer processes.
2. Perform basic transient conduction analysis.
3. Characterize free convection processes and analyze mixed-mode heat transfer processes that combine free convection with other heat transfer modes such as forced convection and radiation.

Required Textbooks and Materials

1. Primary: Reading assignments and other homework will come from this book.

“An Introduction to Computational Fluid Dynamics: The Finite Volume Method”, 2nd Ed., by H. Versteeg, W. Malalasekera, Pearson. ISBN-13: 978-0131274983

2. Secondary:

- My lecture note, which will be posted on eLearning

Assignments & Academic Calendar

(Topics, Reading Assignments, Due Dates, Exam Dates; numbers in parentheses are the chapters in Fox's book)

Week 1 Introduction "What is CFD"

Week 2 Review of governing equations

Workshop (Matlab): heat conduction

Week 3 Classification of PDEs

Week 4 Initial and Boundary conditions

Workshop (commercial software) Fluid Flow and Heat Transfer in a Mixing Tee

Week 5-6 Turbulence

Week 7 Finite volume method for diffusion

Intermediate exam

Week 8-9 Finite volume method for convection-diffusion

Workshop (commercial software) trajectories of particles

Week 10-11 SIMPLE algorithm coupling velocity pressure

Workshop (commercial software) Fluid Flow around an airfoil

Week 12-13 Finite volume method for Unsteady flows

Workshop (commercial software) Turbulent Flow Past a Backward Facing Step

Week 14 Methods for dealing with complex geometries

Week 15 Calculation of radiative heat transfer

Workshop (commercial software) Electronics Cooling with Natural Convection and Radiation

Final exam

Grading Policy

Midterm 1 (Thru)	20%
Final (Comprehensive)	30%
Projects	50%

* *Projects must be submitted on line on e-learning.*

* *Plagiarism may be punished by failure of the assignment, exam, or the entire course.*

Course & Instructor Policies

(make-up exams, extra credit, late work, special assignments, class attendance, classroom citizenship, etc.)

Off-campus Instruction and Course Activities

Below is a description of any travel and/or risk-related activity associated with this course.

Policies and Procedures for Students

The University of Texas at Dallas provides a number of policies and procedures designed to provide students with a safe and supportive learning environment. Brief summaries of the policies and procedures are provided for you at <http://provost.utdallas.edu/home/index.php/syllabus-policies-and-procedures-text> and include information about technical support, field trip policies, off-campus activities, student conduct and discipline, academic integrity, copyright infringement, email use, withdrawal from class, student grievance procedures, incomplete grades, access to Disability Services, and religious holy days. You may also seek further information at these websites:

- http://www.utdallas.edu/BusinessAffairs/Travel_Risk_Activities.htm
- <http://www.utdallas.edu/judicialaffairs/UTDJudicialAffairs-HOPV.html>
- <http://www.utsystem.edu/ogc/intellectualproperty/copypol2.htm>
- <http://www.utdallas.edu/disability/documentation/index.html>

These descriptions and timelines are subject to change at the discretion of the Professor.