ME I4600/ME 59913 COMPUTATIONAL FLUID MECHANICS
Spring 2022

INSTRUCTOR: Associate Professor Taehun Lee
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PREREQUISITE: **I1500 INTRODUCTION TO NUMERICAL METHODS OR EQUIVALENT**

OFFICE HOURS: 3:00pm-5:00pm Tuesday; 4:00pm-5:00pm Thursday

DESCRIPTION: Governing equation and models of fluid flow and heat transfer; basic numerical techniques for solution; estimation of accuracy and stability of the numerical approximations; boundary conditions; grid generation; structure and performance of commercial software for applications in analysis and design of thermo-fluid systems

SCHEDULE: **LECTURE** TIME & LOCATION: 5:00PM – 7:45PM THUR; MARSHAK 408
LAB TIME & LOCATION: 5:00PM – 7:45PM THUR; MARSHAK 408

(please refer to the course schedule for the dates for computer lab)

TEXT: Lecture note

LEARNING OBJECTIVES:
1. The student will have an understanding of fundamental governing equations of computational fluid flow and heat transfer.
2. The student will learn about basic computational techniques for the solution of fluid flow and heat transfer.
3. The student will become familiar with commonly used open-source software package for computational fluid dynamics and heat transfer.
4. The student will utilize a computer software tool to learn about design aspects of fluid and thermal engineering.

COURSE OUTLINES:
1. Governing Equations
2. Mathematical Behavior of Partial Differential Equations and Its Impact on Computational Fluid Dynamics and Heat Transfer
3. Basic Aspects of Finite Element & Spectral Element Discretizations, Numerical Errors and Stability
4. Grid Generation
5. Some Simple Techniques for Computational Fluid Dynamics and Heat Transfer
6. Open Source Codes: NEK5000
7. Final Project

REFERENCES

1. https://nek5000.mcs.anl.gov/
2. Computational Fluid Dynamics, John D. Anderson, JR., 1995
3. Computational Methods for Fluid Dynamics, Joel H. Ferziger and Milovan Peric, Springer, 2002.
4. Numerical Methods for Engineering Application, Joel H. Ferziger, Wiley Interscience. 1997.
5. Numerical Computation of Internal and External Flows, Volumes I and II, C. Hirsch, Wiley, 1988.

EVALUATION:		
	Homework	20%
	2 Midterm Exams, counted as 20% each	40%
	Oral Presentation/proposal	10%
	Final Project	30%
	Total	100%