ME 465 – Computational Fluid Dynamics

Hour: Lecture: 2 Hrs.   Tutorial: 2 Hrs.   Credit: 3.

Coordinator: Sameh Shabaan

Text Book:
- Computational Fluid Dynamics Lecture notes

Reference Books:
- Ferziger J.H. & Peric M. "Computational Methods for fluid Dynamics", Springer Verlag, 1999.
- Versteeg H. & Malalasekera W. "An introduction to computational fluid dynamics (The finite volume method) ", McGraw Hill, 1995.
- Mathews J.H. & Fink K.D. "Numerical methods using MATLAB" , Prentice Hall, 1999.

Specific course information
a. Introduction – The finite difference method (FDM) – Solution of fluid flow problems using FDM with MATLAB – The finite element method (FEM) -   Solution of fluid flow problems using FEM with MATLAB (PDE Tool) – The finite volume method (FVM) - Solution of fluid flow problems using FVM with MATLAB – Thermofluid problems using the FVM with FLUENT software.

b. Prerequisite: ME 461 / ME 431

c. Designation: Required

Specific goals for the course:
- An ability to identify, formulate, and solve engineering problems,
- An ability to use the techniques, skills, and modern engineering tools necessary for Mechanical engineering practice

Course instruction outcomes:
- The students will be able to understand the computational fluid dynamic techniques using the finite difference, finite element and finite volume methods and to assure familiarity with modern computer software.

Student outcomes:
E, K

Topics Covered:
- Introduction to Computational Fluid Dynamics

- The Finite Difference Method (FDM)
- Solution of inviscid flow problems using the FDM with MATLAB
- The Finite Element Method (FEM)
- Solution of fluid flow problems using the FEM with MATLAB (PDE Tool)
- The Finite Volume Method (FVM)
- Solution of fluid flow problems using the FVM with MATLAB
- Thermofluid problems using the software FLUENT
- Mesh Generation using the Software Gambit
- Examples using the FLUENT solver

Course / credit hours	Math & Basic Sciences	Engineering Topics	General Education
Computational Fluid Dynamics(ME 465)/3		3	