

ME 407: Computational Fluid Dynamics

<i>Course description:</i>	Basic concepts and applications of computational fluid dynamics to the analysis and design of fluid systems and components.
<i>Number of credits:</i>	3
<i>Course Coordinator:</i>	P. Dutta
<i>Prerequisites by course:</i>	ME 303
<i>Prerequisites by topic:</i>	<ol style="list-style-type: none">1. Conservation of mass, momentum, and energy2. Fluid statics3. Dimensional analysis4. Flow in conduits5. Applied numerical methods6. Finite difference methods
<i>Postrequisites:</i>	None
<i>Textbooks/other required materials:</i>	Versteeg. <i>Introduction to Computational Fluid Dynamics</i> . Pearson Prentice Hall, 2007, 2/e.
<i>Course objectives:</i>	<ol style="list-style-type: none">1. To develop skills in computational fluid dynamics to address engineering problems.2. To understand the basic structure and capabilities of current commercial CFD codes.3. To apply CFD codes in the design of fluid systems and components.
<i>Topics covered:</i>	<ol style="list-style-type: none">1. Review of control volume formulation of fluid flow analysis.2. Finite difference formulation of flow system equations.3. Numerical methods to solve systems of algebraic equations.4. Upwind differencing and staggered grids for stability and introduction of numerical viscosity.5. Pressure formulation of continuity equation.6. Flow diagrams for code structure.7. Features of currently available commercial codes.8. Design and theory and methodology.9. Design optimization.10. Application of a commercial code to the design of a fluid system or component.
<i>Expected learning outcomes:</i>	<ol style="list-style-type: none">1. Be familiar with the general principles of computational fluid mechanics and the capabilities of commercial software for design of engineering fluid systems.
<i>Class schedule:</i>	Three 50-minute lecture sessions per week, for one semester.
<i>Laboratory schedule:</i>	None.

Contribution to meeting the professional component: Engineering Topics

Relationship of course to student outcomes:
 3 strongly supported; 2 supported; 1 minimally supported

Student Outcomes Pre-Fall 2018
 (ABET EC2000)

a	b	c	d	e	f	g	h	i	j	k
3								1		

Student Outcomes Fall 2018 forward
 (ABET EC2019)

1	2	3	4	5	6	7
3					1	1

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