

SYLLABUS

Code/Name	MCE 313.2/ Computational Fluid Dynamics
Type	Technical Elective
Credit/ECTS	3/6
Hour per Week	4 (2+2+0)
Level/Year	Undergraduate/3
Semester	Fall
Classroom	L208
Content	Basic aspects of Computational Fluid Dynamics (CFD) and Governing equations of fluid dynamics. Discretization techniques and solution algorithms. Concepts of Initial and boundary value problems, classification of partial differential equations, Finite difference formulations. Application on fluid mechanics and heat transfer problems. Using appropriate software in solving CFD problems.
Prerequisites	MCE 204 Fluid Mechanics I, MCE 303 Fluid Mechanics II, MCE 208 Numerical Methods
Textbooks	<i>Primary</i> Klaus A. Hoffman, Steve T. Chiang, "Computational Fluid Dynamics for Engineers", Vol. I. Wichita, Kansas, Engineering Education System, 1993 Steven C. Chapra, Raymond P. Canale, 'Numerical Methods For Engineers', Sixth Edition, McGraw-Hill, International Edition 2010.
Objectives	<ul style="list-style-type: none"> • Introducing Computational Fluid Dynamics methods • Enabling students to solve fluid mechanics problems with these methods
Course Outcomes	In this course students will be able to: CO1 Understanding of the governing equations in fluid dynamics and their physical aspects CO2 An ability to distinct between initial and boundary value problems and their occurrences in physical systems CO3 Apply finite difference methods to solve the boundary value problems CO4 Apply Runge-Kutta Methods to numerically solve the initial boundary problems CO5 Application of CFD to engineering problems

Weekly Schedule of Topics

W	Topic
1	Introduction to CFD
2	Basic aspects of CFD
3	Numerical solution of initial boundary value problems
4	Application of CFD to engineering problems
5	Numerical solution of boundary value problems
6	Application of CFD to engineering problems
7	Classification of partial differential equations
8	Application of CFD to engineering problems
9	Finite difference formulations and applications
10	Application of CFD to engineering problems
11	Parabolic partial differential equations
12	Application of CFD to engineering problems
14	Elliptic partial differential equations

Professional ContributionAbility to understand, analyze, improve and manage heat transfer mechanisms

Contribution to Program Outcomes*

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	4	5	2	3	1	3	5	2	3	5	1
CO2	5	5	2	3	1	2	3	2	2	5	1
CO3	5	5	2	3	1	2	3	2	2	5	1
CO4	5	5	2	3	1	2	3	2	2	5	1
CO5	5	5	2	3	1	2	3	2	2	5	1

* Contribution Level | 0: None | 1: Very Low | 2: Low | 3: Medium | 4: High | 5: Very High

Special Conditions • Students work in groups for project and presentations.

Requirements

Evaluation	Midterm Project	40%
	Presentation	10%
	Final Project	50%
	Total	100%

Rubric

Course Policy

1. Students are required to attend at least 80% of the theoretical and 80% of lab/application sessions including add-drop period. Otherwise, you will receive a grade of DZ. Health reports and other official or nonofficial excuses are not accepted.
2. Late attendance is not accepted.
3. English should always be used to communicate with one another.
4. The mobile phone should be switched off and put away during the class.
5. Illegal copies of the textbooks and other course materials cannot be used for the classwork and exams.

Cheating & Plagiarism

- Copying or letting someone to copy your work on exams, assignments, or reports is cheating.
- Cutting and pasting text, figures, and tables from web sources or any other electronic source is plagiarism.
- A consequence of academic dishonesty is to receive a grade of FF for the course.

Instructor

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Room	216	Office Hours	

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