MECH 6930 - Advanced Fluid Mechanics and Heat Transfer

Spring 2026 Syllabus, Section 01, CRN 24574,

Credit hours: 3

Instructor

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Professional Qualifications:
Doctor of Philosophy in Mechanical Engineering, The University of Akron
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Course Description

6930. Advanced Fluid Mechanics and Heat Transfer. Viscous and inviscid flows, Navier-Stokes equations, Euler equations, and complex variables methods. Analytic solutions to advanced heat transfer problems, advanced boundary-value problems. Prereq.: MECH 3725 Heat Transfer I or equivalent. 3 s.h.

Course Readings

Group	Title	Author	ISBN
Required	Pdf handouts	Stefan Moldovan	
Optional	Web-accessible ANSYS/FLUENT manual and online tutorials	ANSYS	
Optional	Introduction to Fluid Mechanics	Fox and McDonald	
Optional	Heat and Mass Transfer	Yunus Cengel	
Optional	Modern Developments in Fluid Dynamics, Vol. I & II	Goldstein	
Optional	Computational Fluid Mechanics and Heat Transfer, 2nd Ed	Tannehill, et al	

The course readings are subject to change in the event of extenuating circumstances, research developments, current events, and/or to ensure better learning.

Schedule of Topics and Assignments

Day	Date	Reading(s)	Proposed Topic	Due/To Prepare for Class
Mon	1/5	Handout 1	Eulerian and Lagrangian Coordinates	
Wed	1/7	Handout 1	Reynolds Transport Theorem RTT	
Mon	1/12	Handout 1	Reynolds Transport Theorem RTT	
Wed	1/14	Handout 1	Conservation of mass	
Mon	1/19	Handout 1	Bernoulli Equation	
Wed	1/21	Handout 1	Basic Equations of Mass, Momentum, and Energy	
Mon	1/26	Handout 1	Boundary Layer Equations	
Wed	1/28	Handout 1	Solution for the Prandtl Boundary Layer Equations	

Mon	2/2	Handout 1	Blasius Solution
Wed	2/4	Handout 1	Numerical Solution
Mon	2/9	Handout 1	Finite difference scheme
Wed	2/11	Handout 1	Skin friction
Mon	2/16	Handout 1	Drag
Wed	2/18	Handout 1	Integral Scheme
Mon	2/23	Handout 1	Integral Scheme
Wed	2/25	Handout 1	Momentum Equation of the Boundary Layer using the Integral approach
Mon	3/2	Handout 1	Momentum Equation of the Boundary Layer using the Integral approach
Wed	3/4	Handout 1	Solution for flow over a flat plate
Mon	3/9	Handout 1	Some applications
Wed	3/11	Handout 1	Some applications
Mon	3/16	Handout 1	Some applications
Wed	3/18	Handout 1	Closed form solution for the Navier-Stokes Equations
Mon	3/23	Handout 1	Closed form solution for the Navier-Stokes Equations
Wed	3/25	Handout 1	Closed form solution for the Navier-Stokes Equations
Mon	3/30	Handout 1	Closed form solution for the Navier-Stokes Equations
Wed	4/1	Handout 1	Closed form solution for the Navier-Stokes Equations
Mon	4/6	Handout 1	Closed form solution for the Navier-Stokes Equations
Wed	4/8	Handout 1	Closed form solution for the Navier-Stokes Equations
Mon	4/13	Handout 1	Closed form solution for the Navier-Stokes Equations
Wed	4/15	Handout 1	Closed form solution for the Navier-Stokes Equations
Mon	4/20	Handout 1	Closed form solution for the Navier-Stokes Equations
Wed	4/22	Handout 1	Closed form solution for the Navier-Stokes Equations
Mon	4/27	Handout 1	Closed form solution for the Navier-Stokes Equations
Wed	4/29	Handout 1	Closed form solution for the Navier-Stokes Equations

The course schedule, policies, procedures, and assignments in this course are subject to change in the event of extenuating circumstances, by mutual agreement, and/or to ensure better learning.