Jordan University of Science and Technology

Faculty of Engineering

Mechanical Engineering Department

ME742 Advanced Fluid Mechanics - JNQF Level: 9
First Semester 2024-2025

Course Catalog
3 Credit Hours. Fluid properties. Basic laws for a control volume. Kinematics of fluid flow. Dynamics of frictionless incompressible flow and basic hydrodynamics. Equations of motion for viscous flow, viscous flow applications, boundary-layer theory. Dimensional analysis.
Teaching Method: On Campus

Text Book	
Title	Viscous Fluid Flow
Author(s)	Frank M. White
Edition	4th Edition
Short Name	Text Book
Other Information	

Course References

Short name	Book name	Author(s)	Edition	Other Information
Text Book	Viscous Fluid Flow,	Tasos C. Papanastasiou, Georgios C. Georgiou, Andreas N. Alexandrou	3rd Edition	
Text Book	Incompressible flow	Ronald L. Panton	4th Edition	

Class Schedule & Room

Tentative List of Topics Covered		
Weeks	**Topic**	**References**

Weeks 1, 2	Introduction, Fluid properties and other preliminary concepts, Vector& Tensor Calculus.	From **Text Book**
Weeks 3, 4	Basic laws for a control volume	From **Text Book**
Week 5	Kinematics of fluid flow	From **Text Book**
Weeks 6, 7	Dynamics of frictionless and incompressible flow	From **Text Book**, From **Text Book**
Weeks 8, 9	Basic hydrodynamics and equations of motion of viscous flow	From **Text Book**
Week 10	Dimensional analysis	From **Text Book**
Weeks 11, 12	Boundary-layer theory	From **Text Book**
Weeks 13, 14, 15, 16	Exact solutions of viscous-flow equations and their applications	From **Text Book**, From **Text Book**, From **Text Book**

Mapping of Course Outcomes to Program Outcomes and NQF Outcomes	**Course Outcome Weight (Out of 100%)**	**Assessment method**
Define and look up fluid properties and other preliminary concepts [10SO1] [10L9K1]	10%	
State basic laws for a control volume in different coordinate systems [10SO1] [5L9K1, 5L9K2]	10%	
Derive the kinematics of fluid flow in problem solving [10SO1] [2L9K1, 3L9K2, 5L9S1]	10%	
Derive the basic equations of motion of viscous flows. [5SO1, 5SO7] [2L9K1, 3L9K3, 5L9S1]	10%	
Find standard exact solutions of viscous-flow equations and apply them [10SO1, 10SO7] [5L9K1, 5L9K3, 10L9S2]	20%	
Derive and solve some basic equations of boundary-layer theory [10SO1] [10L9K1]	10%	
Understand concepts of incompressible turbulent flows and wall turbulence [10SO1] [10L9K1]	10%	
Apply dimensional analysis [10SO1] [10L9K1]	10%	
Derive the equations for frictionless and incompressible flows [5SO1, 5SO7] [10L9K2]	10%	

Relationship to Program Student Outcomes (Out of 100%)						
SO1	SO2	SO3	SO4	SO5	SO6	SO7
80						20

Relationship to NQF Outcomes (Out of 100%)				
L9K1	L9K2	L9K3	L9S1	L9S2
54	18	8	10	10

Evaluation	
Assessment Tool	**Weight**
First Exam	15%
Second Exam	20%
Final Exam	50%
Student work and activity	15%

Date Printed: 2024-11-10