WASHINGTON STATE UNIVERSITY
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School of Engineering and Computer Science

MECH 439: Foundations of Aerodynamics

Catalog Data:		**439 Foundations of Aerodynamics** 3 Course Prerequisite: MATH 315; MECH 303. Governing equations of fluid mechanics, potential flow, introduction to aerodynamics, thin airfoil theory, compressible flow, viscous effects. Typically offered Fall.
Class Schedule:		Three 50-minute lectures per week, for one semester
Laboratory Schedule:		None
Prerequisites by Course:		MECH 303, MATH 315
Prerequisites by Topic:		1. Undergraduate fluid mechanics 2. Good understanding of calculus 3. Basic understanding of differential equations
Textbook:		John D. Anderson, *Fundamentals of Aerodynamics*, 5th Edition, McGraw-Hill, 2011.
Course Coordinator:		Dr. Stephen Solovitz
Course Objectives:		1. Develop conservation equations for aerodynamic analysis. 2. Use potential flow solutions to examine motion around streamlined shapes. 3. Analyze lift for thin airfoils and finite wings. 4. Examine compressibility effects on internal flow and supersonic airfoils. 5. Understand how viscosity generates frictional and pressure drag. 6. Experimentally study an aerodynamic design in the laboratory.
Topics Covered:		1. Conservation equations 2. Potential flow 3. Aerodynamics 4. Thin airfoils 5. Compressible flow 6. Viscous effects
Lab Experiments and Activities:		This course will not hold regular laboratory activities, but some laboratory equipment will be used for design project evaluation.
Course Outcomes:	Students will be able to:	
	Assessed for Student Outcomes	1-d. Apply the fundamental flow equations (continuity, momentum, and energy), analytical techniques, and computational methods toward solving aerodynamics problems of varying complexity. 2-b. Apply the engineering design process, including modeling and analysis, to satisfy project requirements for an aerodynamic design. 2-c. Analyze an aerodynamic design within realistic constraints, such as economic, environmental, and manufacturability. 3-a. Produce a well-written report on an aerodynamic design project for an informed audience of peers using appropriate formatting and grammar.
	Other	2-d. Produce an aerodynamic device that meets specified needs. 6-b. Use the wind tunnel and data acquisition equipment for experimentation in the thermal/fluids laboratory.
Required or Elective Course:		Elective
Relationship of Course to Program:		Meets: Educational Objectives 1, 2, 4 Student Outcomes 1 ,2 ,3, 6

Prepared by:	Stephen Solovitz	Date:	March 16, 2018 (4.6.18 mb)
Approved by USC:	4/16/2018		