Syllabus for ME136-01: Aerodynamics

Fall 2014
Instructor: Venkattraman Ayyaswamy

Designation:	Assistant Professor
Catalog Description:	
Text Books and Other Required Materials:	
Course Objectives/ Student Learning Outcomes:	This course builds on the student's background in Fluid Mechanics to deal primarily with internal and external flows (low-speed and high speed) relevant to aerospace applications. Students are expected to be able to analyse flows past airfoils, wings as well as nozzles and diffusers which form the basic building blocks of an airplane.
Prerequisites by Topic:	ENGR 120; MATH 032
Course Policies:	
Academic Dishonesty Statement:	a. Each student in this course is expected to abide by the University of California, Merced's Academic Honesty Policy. Any work submitted by a student in this course for academic credit will be the student's own work. b. You are encouraged to study together and to discuss information and concepts covered in lecture and the sections with other students. You can give "consulting" help to or receive "consulting" help from such students. However, this permissible cooperation should never involve one student having possession of a copy of all or part of work done by someone else, in the form of an e mail, an e mail attachment file, a diskette, or a hard copy. Should copying occur, both the student who copied work from another student and the student who gave material to be copied will both automatically receive a zero for the assignment. Penalty for violation of this Policy can also be extended to include failure of the course and University disciplinary action. c. During examinations, you must do your own work. Talking or discussion is not permitted during the examinations, nor may you compare papers, copy from others, or collaborate in any way. Any collaborative behavior during the examinations will result in failure of the exam, and may lead to failure of the course and University disciplinary action.
Disability Statement:	Accommodations for Students with Disabilities: The University of California Merced is committed to ensuring equal academic opportunities and inclusion for students with disabilities based on the principles of independent living, accessible universal design and diversity. I am available to discuss appropriate academic accommodations that may be required for student with disabilities.

	Requests for academic accommodations are to be made during the first three weeks of the semester, except for unusual circumstances. Students are encouraged to register with Disability Services Center to verify their eligibility for appropriate accommodations.
Topics:	1. Introduction: Lift, drag, moment and related coefficients; Vector operations (review); conservation equations (mass, momentum and energy); Streamlines, streaklines and pathlines; Velocity potential and stream function 2. Inviscid, Incompressible flow: Bernoulli's equation, low-speed wind tunnel flows; Governing equations and boundary conditions; Elementary flows (uniform, sources, sinks and vortex); ideal lifting flow past a circular cylinder, Kutta-Joukowski theorem and lift generation; source panel method for non-lifting flows; d' Alembert's paradox. 3. Incompressible flow over airfoils: Introduction; Kutta Condition; Thin airfoil theory (symmetric, cambered); Aerodynamic center; vortex panel method for lifting flows; qualitative picture of viscous flow. 4. Finite Wing Theory: Introduction; Downwash and induced drag; Biot-Savart Law and Helmholtz's Theorems; Prandtl's lifting line theory; Numerical lifting-line method; Some ractical aspects. 5. Introduction to Compressible flows (Inviscid): Thermodynamics review; Governing equations; Compressibility. 6. Normal Shock, Oblique Shock and Expansion Waves: Basic relations; flow over wedges and cones; shock interactions; blunt body flow; Prandtl-Meyer expansion waves; qualitative pitcute of shock wave-boundary layer interaction; quasi-one-dimensional flow through nozzles and diffusers. 7. Linearized Theory for Subsonic and Supersonic Flows: Introduction; Velocity potential equation and linearized form; Prandtl-Glauert correction; Improved corrections; Critical Mach number; Drag divergence; Supercritical airfoils and area rule. 8. Some aspects of hypersonic flows (if time permits)
Class/laboratory Schedule:	TR 4:30 - 5:45 pm (Lecture); R (6 - 8:50 pm) and F (1:00 - 3:50 pm) lab sections (two individual)
Midterm/Final Exam Schedule:	
Course Calendar:	
Professional Component:	
Assessment/Grading Policy:	Homework: 30 Mid-term Exam: 30 Final Exam: 40
Coordinator:	
Contact Information:	vayyaswamy@ucmerced.edu
Office Hours:	TR 3:30 - 4:30 pm at SE2 278