Syllabus for ENGR120-01: Fluid Mechanics

Spring 2019
Instructor: Venkattraman Ayyaswamy

Designation:	Upper division undergraduate
Catalog Description:	This course will introduce engineers to the mechanics of fluids in natural and engineered systems.
Text Books and Other Required Materials:	Frank M. White, "Fluid Mechanics", 8th edition, 2016.
Course Objectives/ Student Learning Outcomes:	Upon successful completion of this course, students will be able to analyze internal and external flows as well as perform design of flow systems.
Program Learning Outcomes:	
Prerequisites by Topic:	ENGR 057; MATH 024
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:	

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	Introduction: Concept of a fluid; fluid as a continuum; thermodynamic properties of a fluid; viscosity; streamlines, streaklines and pathlines
	Pressure and related concepts: Equilibrium of a fluid element; hydrostatic pressure distributions; manometry; buoyancy and stability; pressure measurement.
	Integral relations: Basic physical laws; conservation of mass, momentum and energy equation; Bernoulli's equation; angular momentum conservation.
	Differential relations: Differential equations for conservation of mass, momentum and energy; boundary conditions; concept of streamfunction; vorticity and irrotationality; exact solutions to Navier-Stokes equations.
	Dimensional Analysis and Similarity: Buckingham's pi theorem; non-dimensionalization; modeling and similarity
	Viscous flows in ducts: Reynolds number regimes; internal versus external viscous flows; Head loss - the friction factor; laminar fully-developed pipe flow; flow in non-circular ducts; losses in pipe systems; multiple-pipe systems
	Flow past immersed bodies: Reynolds number and geometry effects; momentum integral estimates; boundary layer equations; flat plate boundary layer; boundary layers with pressure gradient.
Class/laboratory Schedule:	MW 4:30 - 5:45 pm (lecture) and 6 lab sessions
Midterm/Final Exam Schedule:	TBA
Course Calendar:	
Professional Component:	
Assessment/Grading Policy:	Homeworks: 15% Mid-term Exam 1: 20% Mid-term Exam 2: 20% Final Exam: 30% Lab reports: 15%
Coordinator:	Prof. Venkattraman Ayyaswamy
Contact Information:	Office: SE2 278 Email: vayyaswamy@ucmerced.edu Phone: 209 228 2359
Office Hours:	TBA