



Syllabus for ENGR120: Fluid Mechanics

Spring 2018

Designation:	Fluid Mechanics
Instructor:	Tao Ren, tren@ucmerced.edu, AOA148
Office Hours:	Wednesday 2-4pm, AOA148
Teaching Assistant 1:	Maria Alejandra Lozano Rodriguez, mlozanorodriguez@ucmerced.edu
Teaching Assistant 2:	Alireza Karimaghhaloo, akarimaghhaloo@ucmerced.edu
Teaching Assistant 3:	Mrittunjoy Sarker, msarker@ucmerced.edu
Office Hours for TAs:	TBA
Catalog Description:	Introduction to fluid properties, fluid statics, conservation of mass, energy and momentum, and internal and external flow. Topics include hydrostatic pressure, hydraulic head, friction losses, laminar and turbulent flow, pipe flow, open-channel flow, and dimensional analysis.
Text Books and Other Required Materials:	Frank M. White, "Fluid Mechanics", 8th edition, 2016. <i>Note that only Chapters 1-7 are relevant to this course. If you want to save money, there is also an international edition that you can buy online. The international edition will have the same content but is black/white.</i>
Course Outline	<ul style="list-style-type: none">• 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 stream function; vorticity and irrotationality.• Dimensional Analysis and Similarity: Buckingham's π 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; at plate boundary layer; boundary layers with pressure gradient.
Prerequisites by Topic	ENGR 57 Dynamics, MATH 24 Linear Algebra and Differential Equations

Academic Dishonesty Statement:

- 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.
- 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 email 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.
- 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.

Class Schedule:

M W, 04:30 Pm-05:45 pm CLSSRM 120;

laboratory Schedule:

SE2 150

R 10:30 am-01:20 pm

R 01:30 pm-04:20 pm

W 08:00 am-10:50 am

F 01:30 pm-04:20 pm

W 11:00 am-01:50 pm

F 10:30 am-01:20 pm

Assessment

Midterm: 25%; Final: 35%; Homeworks: 20%; Lab reports: 20%.

- Homeworks are typically assigned on Wednesday (check CatCourses) and will be due (in class) on the date indicated (typically after one week).
- Late homeworks will be accepted till the following day (basically a 24-hour extension) but for a reduced credit of 75%.
- To reiterate, feel free to discuss among yourselves to complete the homework problems, but reproducing another person's work is not acceptable.
- Details of exams will be provided as the course progresses. The final exam will be comprehensive but with a higher weightage for topics covered in the second half.
- Lab reports will be due the next time you come to lab. Even though you work as a group in the lab, individual lab reports must be submitted. The tentative schedule of labs is provided in the table below. Students registered for a particular lab session will be divided into groups of six. Specific instructions will be provided by the TAs during the lab session.

- Note that attendance in labs is mandatory and will be assigned 25 points. The instructor reserves the right to change the grading policy and syllabus depending on the overall course progress but any change will be communicated in advance to the students.

**Midterm/Final Exam
Schedule:**

TBA

Tentative Lab Schedule:

Week of	Lab schedule	Lab topics and report due dates
Jan. 15	No Lab	No lab
Jan. 22	Lab 1	Basic experimental error analysis
Jan. 29	No Lab	Report 1 due
Feb. 05	Lab 2	Buoyancy and Archimedes' Principle
Feb. 12	No Lab	Report 2 due
Feb. 19	No Lab	No Report due
Feb. 26	Lab 3	Introduction to wind tunnel and pitot-static tube
Mar. 05	No Lab	Report 3 due
Mar. 12	Lab 4	Measurements of flow pass a cylinder
Mar. 19	No Lab	Report 4 due
Mar. 26	Spring break	Spring break
Apr. 02	Lab 5	Non-invasive flow measurements: Vibrations and pipe flow
Apr. 09	No Lab	Report 5 due
Apr. 16	Lab 6	Characterization and design of a siphon weir
Apr. 23	No Lab	Report 6 due
Apr. 30	No Lab	Makeup week, if required