Instructor:	Dr. Paul Kutler
Office Location:	Engineering 348
Telephone:	408.482.1028
Email:	pkutler@comcast.net
Office Hours:	Tuesday & Thursday, 3:15 - 4:15 PM
Class Days/Time:	Tuesday & Thursday, 4:30 - 5:45 PM
Classroom:	Engr. 303
Prerequisites:	Math 32 (Calculus III), CE 95 or 99 (Statics)

Faculty Web Page and MYSJSU Messaging

A copy of the Greensheet will be emailed to you before the first day of classes. You are responsible for regularly checking with the messaging system through MySJSU and your email account for updates to the Greensheet, messages and announcements.

Course Description

This course covers the study of fluid properties, and the statics and dynamics of fluids. It presents the continuity, linear and angular momentum and energy principles for describing the behavior of fluids. Both viscous and non-viscous flows are covered. Fluid flow systems including machines such as pumps and turbines are analyzed. The equations governing flow in pipes and around submerged obstacles are presented and used to analyze such systems

Course Goals and Student L

Alaskan pipeline. It is concerned with the forces on the 726 ft tall Hoover dam, which can hold over 32 million acre-feet of H_2O (enough to cover the entire state of New York to a depth of one foot). It is also concerned with the design of the Antonov 225 Mriya (the largest airplane in the world with a maximum gross weight of 1.3 million pounds). Fluid mechanics plays an essential part in many sports, such as golf (dimples on the balls), baseball, tennis, and ping-pong (spin on the ball), and all kinds of racing (windsurfing, skiing, auto-racing, etc.). But perhaps the most beautiful applications of fluid mechanics can be seen in nature from the descent of rain and snow, the powerful tornadoes and tsunamis to the airborne dispersal of seeds and fruits and the graceful flight of birds and insects.

This course will give you an understanding of:
1. Fluids in general and how they differ from solids.
2. The basic principles of fluid mechanics (continuity, momentum, energy).
3. Viscous flow over a surface and through a pipe.

This understanding will lead to appreciation of the phenomena, problems, and engineering applications mentioned above. In addition, the course will help you:
4. Develop and practice communication and team skills.

Course Content Learning Outcomes

Fluid Properties
1. Define a fluid and describe how it differs from a solid.
2. Describe the differences between liquids and gases and explain the origin of these differences.
3. Define the various properties of fluids, such as density, specific weight, specific gravity, pressure, temperature, viscosity, surface tension, and vapor pressure.
4. Distinguish between Newtonian and Non-Newtonian fluids.
5. Identify, formulate, and solve problems involving viscosity and vapor pressure.

Fluid Statics
6. Define and distinguish between absolute pressure, gage pressure, and vacuum.

17. Apply Bernoulli's equation in a variety of problems including flow velocity measurements and pressure calculations.
18. Predict cavitation in enclosed pipes or hydraulic machines.
19. Describe the differences between ideal (fully attached) and real (separated) flow over a circular cylinder.

Fluid Flow – Momentum Equation

20. Derive the momentum equation for a fluid, starting with Newton's 2nd law of motion.
21. Identify, formulate, and solve problems involving the momentum equation in a variety of applications including stationary and moving vanes, nozzles, pipes with bends, and propulsion systems.

Fluid Flow – Energy Equation

22. Derive Reynold's transport theorem (control volume equation).
23. Derive the integral form of the energy equation starting with Reynolds transport theorem.
24. Identify, formulate, and solve problems involving the energy equation in a variety of applications including reservoirs, pipes with minor losses, pumps, turbines, and nozzles.
25. Identify, formulate, and solve problems involving the simultaneous application of continuity, momentum, and energy equations.
26. Plot the hydraulic and energy grade lines for a variety of flow systems involving reservoirs, pipes of varying diameters, pumps, turbines, and nozzles.

Pipe Flow

27. Describe qualitatively and quantitatively both laminar and turbulent flow in a pipe and predict transition from laminar to turbulent flow.
28. Derive the equation for the shear stress distribution across a pipe section.
29. Derive the equation for the velocity distribution across a pipe section in laminar flow.
30. Use the Moody diagram in a variety of problems involving head losses in pipes, including the design of pipes for certain discharge with a given head loss per unit length.
31. Calculate minor losses (i.e., head loss) in pipe inlets, outlets, valves, and other fittings.
32. Select the right size pump for a given pipeline / system.

labs, clinical practica. Other course structures will have equivalent workload expec

Assignments and Grading Policy

In-class problems:

specified. If you would like to include your assignment or any material you have submitted, or plan to submit for another class, please note. SJSU's Academic Policy S07-2 requires approval of instructors.

Campus Policy in Compliance with the American Disabilities Act

If you need course adaptations or accommodations because of a disability, or if you need to make special arrangements in case the building must be evacuated, please make an appointment with me as soon as possible, or see me during office hours. Presidential Directive 97-03 requires that students with disabilities requesting accommodations must register with the Disability Resource Center (DRC) at http://www.drc.sjsu.edu/ to establish a record of their disability.

Student Technology Resources

Computer labs for student use are available in the Academic Success Center located on the 1st floor of Clark Hall and on the 2nd floor of the Student Union. Additional computer labs may be available in your department/college. Computers are also available in the Martin Luther King Library.

Learning Assistance Resource Center

The Learning Assistance Resource Center (LARC) is located in Room 600 in the Student Services Center. It is designed to assist students in the development of their full academic potential and to motivate them to become self-directed learners. The center provides support services, such as skills assessment, individual or group tutorials, subject tutoring, learning assistance, summer academic preparation and basic skills development. The LARC website is located at http:/www.sjsu.edu/larc/.

SJSU Writing Center

The SJSU Writing Center is located in Room 126 in Clark Hall. It is staffed by professional instructors and upper-division or graduate-level writing specialists from each of the seven SJSU colleges. Our writing specialists have met a rigorous GPA requirement, and they are well trained to assist students of all levels and abilities in developing

ME 111 Fluid Mechanics, Spring 2020, Course Schedule

Table 1 Course Schedule

Week	Date	Topics, Readings, Assignments, Deadlines
1	1/23	Greensheet; Introduction & Basic Concepts, Chapter 1 (1-1 – 1-10): Homework; 1-21, 1-24, 1-27, 1-30, 1-32, 1-40; Due 1/30
2	1/28 & 1/30	Properties of Fluids, Chapter 2 (2-2 – 2-4 & 2-6 – 2-7): Homework; 2-11, 2-25, 2.75, 2.76, 2-79, 2-85, 2-95, 2-97; Due 2/6, Video on Cavitation, http://web.mit.edu/hml/ncfmf.html
3	2/4 & 2/6	Pressure & Fluid Statics, Chapter 3 (3-3 – 3-7): Homework; 3-8, 3-10. 3-17, 3-37, 3-70, 3-76, 3-98, 3-113, 3-135; Due 2/13, Quiz 1 (2/6, 15 minutes, Chapter 1 & 2)
4	2/11 & 2/13	Fluid Kinematics, Chapter 4 (4-1 – 4-6): Homework; 4-4, 4-19, 4-59, 4-79, 4-86; Due 2/20:
5	2/18 & 2/20	Bernoulli & Energy Equations, Chapter 5 (5-1 – 5-4): Quiz 2 (2/20, 15 minutes, Chapter 3 & 4),
6		

Week	Date	Topics, Readings, Assignments, Deadlines
15	4/28 & 4/30	Turbomachinery, Chapter 14 (14-1 to 14-4): Homework: 14-34, 14-35E, 14-39 14-77, 14-84E; Due 5/7,

Research Paper Guidance

Suggested Process

- Determine group members
- Select leader
- Assign responsibilities, for example
  - Lead
  - Scribe
  - Web searcher
  - Library searcher
  - Paper writer
  - Slide design
  - Figure design
- Design criteria for selecting research topic, for example
  - Liquid or gases
  - Civil/ Mechanical/ Aerospace Engineering Related
  - Level of technical detail
  - Uses theory presented in class
  - Is of contemporary interest (e.g., environmental, energy)
- Brainstorm ideas for research topic
- Identify specific topic using criteria
- Each member performs a search for papers on topic selected
- Compose written paper on research/experiment performed using outline below
- Compose oral presentation using outline below
- Rehearse oral presentation

Suggested Written Paper Outline

I. Title/Authors/Affiliation (i.e., Civil, Mechanical, Aerospace Engineering)
II. Abstract
III. Introduction
IV. Approach
V. Analysis
VI. 0 Tw 24 >>Bw 10cej /TT2 1 Tf 2.034.4T0 1 Tf 0 Tc 0 Tw 0.97 0 Td ( )Tj 3

IV. Results
V. Conclusions

- Powerpoint slides using the classroom computer system should be used
- Each group member should perform part of the presentation