Instructor: Jinny Rhee
Office Location: ENG 310K
Telephone: 408-924-3876
Email: Jinny.Rhee@sjsu.edu
Office Hours: TTh 10:30 – 11:30 AM
Class Days/Time: TTh 9:00 – 10:15 AM
Classroom: MacQuarrie Hall 520
Prerequisites: C- or better in (CE95 or CE99) AND (MATH32)

Canvas Resources
Copies of the course materials including the syllabus, lecture slides, link to online homeworks and quizzes, and recorded lectures may be found in the Canvas Learning Management System. Canvas resources are found here: http://www.sjsu.edu/at/ec/canvas/.

Course Description

Course Goals and Student Learning Objectives
The course goal is to teach the basic theory and mathematics describing fluid mechanics and their application to common and contemporary applications.

Course Content Learning Outcomes
Upon successful completion of this course, students will be able to:

Fluid Mechanics and Properties
- Describe fluid mechanics, and contrast gases and liquids by describing similarities and differences.
• Use primary dimensions to check equations for dimensional homogeneity.
• Define the various properties of fluids, such as density, specific weight, specific gravity, pressure, temperature, viscosity, and vapor pressure.

**Statics**
• Apply the hydrostatic equation and the manometer equations to predict pressure and the resulting forces on plane surfaces.

**Hydrodynamics – Bernoulli’s Equation**
• Apply the Bernoulli equation to pressure and velocity variations
• Calculate and interpret the pressure coefficient around ideal (fully attached) and real (separated) cylinders and blunt bodies.

**Hydrodynamics – Continuity**
• Calculate the volume and mass flow rates of applications such as draining tanks and variable-area ducts using the continuity equation.
• State the purpose of the Reynolds Transport Theorem
• Describe the idea underlying cavitation and predict its onset.

**Hydrodynamics – Momentum Equation**
• Interpret and apply the momentum equation to stationary and moving control volumes to calculate forces and moments on applications such as jets, vanes, nozzles and pipe sections.

**Hydrodynamics – Energy Equation**
• Apply the energy equation to predict pressure drop and head loss, or the power equation to find power required by a pump or power supplied by a turbine.
• Sketch and interpret an EGL or HGL for systems involving reservoirs, pipes, pumps, turbines, and nozzles, and identify locations of cavitation.

**Boundary Layers**
• Calculate boundary layer thickness and overall shear stress in laminar, combined laminar and turbulent, and turbulent boundary layer flows.

**Flow in Conduits – Internal Flows**
• Classify flow as laminar or turbulent, and developing or fully developed.
• Find values of the friction factor using the Moody diagram or equations
• Calculate pipe head loss, component head loss, and total head loss.
• Calculate minor losses (i.e., head losses in pipe inlets, outlets, valves, and other fittings).
• Select the right size pump for a given pipeline / system.

**Special Topics**
• Interpret and apply the drag coefficient to calculate drag force on a blunt body.
• Apply the Manning equation to predict velocity in an open channel flow.
• Determine and interpret the NPSH (Net Positive Suction Head) associated with the inlet of a centrifugal pump.

**Contemporary Problems Related to Fluid Mechanics**
• Demonstrate lifelong learning skills by using library databases and other reliable information sources to research a contemporary issue related to fluid mechanics with a regional, national, or global impact.
• Demonstrate an ability to identify, formulate, and solve engineering problems by articulating and testing a hypothesis to answer a question surrounding the
contemporary issue using theory discussed in class. Critically evaluate and draw conclusions based on evidence.

Required Texts/Readings

Textbook

*Engineering Fluid Mechanics*, by Elger et al., John Wiley and Sons, 10th ed., and the WileyPlus online homework system. ISBN 978111875477 (this is a custom paperback plus the WileyPlus homework system at a reduced price that you can purchase from the Spartan Bookstore.)

Classroom Protocol

Please arrive to class on time. Most recent updates are presented at the very beginning of each class. Even if tardy or absent, each student is personally responsible for staying up-to-date with all instructions and relevant announcements. An internet-enabled device, such as a laptop, will be required on the days that In-Class Problems are scheduled. All participation, including questions during lecture, volunteering solutions, and contributing in group activities, is highly encouraged. You must exhibit a respectful and professional attitude towards everyone in the classroom at all times.

Dropping and Adding

Students are responsible for understanding the policies and procedures about add/drop, grade forgiveness, etc. Refer to the current semester’s Catalog Policies section at http://info.sjsu.edu/static/catalog/policies.html. Add/drop deadlines can be found on the current academic year calendars document on the Academic Calendars webpage at http://www.sjsu.edu/provost/services/academic_calendars/. The Late Drop Policy is available at http://www.sjsu.edu/aars/policies/latedrops/policy/. Students should be aware of the current deadlines and penalties for dropping classes.

Information about the latest changes and news is available at the Advising Hub at http://www.sjsu.edu/advising/.

Assignments and Grading Policy

*Academic Policy S12-3* at http://www.sjsu.edu/senate/S12-3.htm has defined expected student workload as follows:

“Success in this course is based on the expectation that students will spend, for each unit of credit, a minimum of forty-five hours over the length of the course (normally 3 hours per unit per week with 1 of the hours used for lecture) for instruction or preparation/studying or course related activities including but not limited to internships, labs, clinical practica. Other course structures will have equivalent workload expectations as described in the syllabus.”
Graded Work and Weight Distribution

<table>
<thead>
<tr>
<th>Work Type</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homework</td>
<td>10%</td>
</tr>
<tr>
<td>In-class Problems</td>
<td>15%</td>
</tr>
<tr>
<td>Midterm Exams</td>
<td>30% (2 at 15% each)</td>
</tr>
<tr>
<td>Research Paper</td>
<td>15%</td>
</tr>
<tr>
<td>Final Exam</td>
<td>30%</td>
</tr>
</tbody>
</table>

Grading Scale

A+ = 99-100 | A = 92-98 | A- = 90-91 | B+ = 88-89 | B = 82-87 | B- = 80-81
C+ = 78-79 | C = 72-77 | C- = 70-71 | D+ = 68-69 | D = 62-67 | D- = 60-61 | F < 60

Homework

Homework will be administered on WileyPlus. Homework is to be completed and submitted individually, unless explicitly pre-approved otherwise for a given assignment. Students are allowed and encouraged to discuss homework strategies with classmates, but are still expected to prepare and submit individual solutions.

The first five weeks of the course will be in flipped format. During this time, the homework will consist of completing assigned Canvas modules consisting of pre-recorded lecture content and conceptual questions.

In-class Problems

In-class problems are intended to be exercises based on recently covered material. They may be administered in WileyPlus, or in hardcopy. Please see tentative schedule for expected topics for in-class exercises.

Research Paper

This assignment involves an examination of modern topics in fluid mechanics, based on contemporary literature research. You will work in groups of 3 students. It is an open-ended opportunity to delve actively into published literature on a fluid mechanics topic that is of interest to you (e.g. biotechnology, sustainable energy, advanced propulsion, sports performance, etc.). The deliverables will be a written paper. More details will be provided by separate documentation in class.

Exam Policy

All students are expected to complete exams in class as scheduled. There are no make-up exams or quizzes. Alternative accommodations or extended time will be considered only in partnership with the Disability Resource Center (http://www.drc.sjsu.edu/).
Exception Handling

Any grading exceptions or appeals must be resolved in writing. Late homework and missed quizzes or exams will be recorded with zero credit in the grade roster. Special consideration of truly unavoidable and extenuating circumstances will depend on expeditious timing and supporting documentation (e.g. doctor's note, jury summons, military orders). In fairness to classmates who have more fully met requirements, any retroactive credit will be evaluated at the very end of the semester, in context with one's overall class performance and in relative comparison to all other cases class-wide.

University Policies

Academic integrity

Your commitment as a student to learning is evidenced by your enrollment at San Jose State University. The University’s Academic Integrity policy S07-2, located at http://www.sjsu.edu/senate/S07-2.htm, requires you to be honest in all your academic course work. Faculty members are required to report all infractions to the office of Student Conduct and Ethical Development. The Student Conduct and Ethical Development website is available at http://www.sjsu.edu/studentconduct/.

Instances of academic dishonesty will not be tolerated. Cheating on exams or plagiarism (presenting the work of another as your own, or the use of another person’s ideas without giving proper credit) will result in a failing grade and sanctions by the University. For this class, all assignments are to be completed by the individual student unless otherwise specified. If you would like to include your assignment or any material you have submitted, or plan to submit for another class, please note that SJSU’s Academic Integrity 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 at http://www.sjsu.edu/president/docs/directives/PD_1997-03.pdf 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 at http://www.sjsu.edu/at/asc/ located on the 1st floor of Clark Hall and in the Associated Students Lab on the 2nd floor of the Student Union. Additional computer labs are available in the ME department in E213/215. Computers are also available in the Martin Luther King Library.
# ME111 / Fluid Mechanics, Fall 2013, Course Schedule

*Schedule is subject to change with fair notice via in-class announcements or email. Assignments to be completed at home are indicated in parentheses. Due date is the next class period unless otherwise specified.*

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Topics, Readings, Assignments, Deadlines</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>8/22</td>
<td>Greensheet, Introduction Ch. 1 – Liquids/gases, dimensions/units; (Text: read Ch1, Canvas: Module 1, due 8/27)</td>
</tr>
</tbody>
</table>
| 2    | 8/27, 8/29 | WileyPlus: Ch1 In-class problems; (Text: read Ch 2.1-2.7,2.9, Canvas: Module 2 Fluid Properties)  
WileyPlus: Ch2 In-class problems; (Text: read Ch 3.1-3.3, Canvas: Module 3a Hydrostatics) |
| 3    | 9/3, 9/5 | WileyPlus: Ch3a In-class problems; (Text: read Ch 3.4, Canvas: Module 3b Forces on Submerged Planes)  
WileyPlus: Ch3b In-class problems; (Text: read 3.5-3.6, Canvas: Module 3c Forces on Submerged Curves and Buoyancy) |
| 4    | 9/10, 9/12 | WileyPlus: Ch 3c In-class problems; (Text: read 4.1, 4.5-4.6, Canvas: Module 4a Bernoulli’s Equation)  
WileyPlus: Ch 4a In-class problems; (Text: 4.7, Canvas: Module 4b Velocity Measurement with Pitot-static Tube) |
| 5    | 9/17, 9/19 | WileyPlus: Ch 4b In-class problems; (Text: 4.9-4.10, Canvas: Module 4c Pressure Coefficient)  
WileyPlus: Ch 4c In-class problems |
| 6    | 9/24, 9/26 | Review Chapters 1-4  
EXAM 1: Chapters 1-4 |
| 7    | 10/1, 10/3 | (Text: read 5.1 – 5.2) Rate of flow, control volume, Reynolds transport theorem (Text: read 5.3-5.4) Continuity; (WileyPlus: Ch 5 HW assigned, due 10/10 ) |
| 8    | 10/8, 10/10 | (Text: read 5.5) Cavitation video: [http://web.mit.edu/hml/ncfmf.html](http://web.mit.edu/hml/ncfmf.html); (Text: read 6.1-6.2) Momentum equation, Ch 5 HW due, Ch 5 In-class problem |
| 9    | 10/15, 10/17 | (Text: read 6.3) Applications of momentum equation; (WileyPlus: Ch 6 HW assigned, due 10/22; Canvas: Research Project assigned, groups and topics due 11/5, paper due 12/5)  
(Text: read 6.4-6.5) Momentum applications cont. |
| 10   | 10/22, 10/24 | (Text: read 7.1 – 7.3) Energy, energy equation; Ch 6 HW due, Ch 6 In-class problem  
(Text: read 7.4-7.5) Pipe flow, Power equation, Efficiency; (WileyPlus: Ch 7 HW assigned, due 10/31) |
<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Topics, Readings, Assignments, Deadlines</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>10/29, 10/31</td>
<td>(Text: read 7.7 – 7.8) Transitions, HGL/EGL; Review Chapters 5-7; Ch 7 HW due, Ch 7 In-class problem</td>
</tr>
<tr>
<td>12</td>
<td>11/5, 11/7</td>
<td>EXAM 2: Chapters 5-7 (Text: read 9.1 – 9.4) Laminar boundary layer and transition (WileyPlus: Ch 9 HW assigned, due 11/14)</td>
</tr>
<tr>
<td>13</td>
<td>11/12, 11/14</td>
<td>(Text: read 9.5) Turbulent boundary layer; (10.1 – 10.3) Pipe sizes and pipe head loss, Ch 9 HW due, Ch 9 In-class problem (WileyPlus: Ch 10 HW assigned, due 11/21)</td>
</tr>
<tr>
<td>14</td>
<td>11/19, 11/21</td>
<td>(10.5 – 10.8) Head loss and minor losses; (11.3) Drag coefficient; Ch 10 HW due, Ch 10 In-class problem; (WileyPlus: Ch 11 HW assigned/Special topics HW assigned, due 12/3)</td>
</tr>
<tr>
<td>15</td>
<td>11/26</td>
<td>In-class Research Project Day</td>
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<tr>
<td>16</td>
<td>12/3, 12/5</td>
<td>Ch 11 HW due, Special Topics HW due Review for Final Exam; Research project due</td>
</tr>
<tr>
<td>Final Exam</td>
<td>12/12</td>
<td>Thursday, 7:15 – 9:30 AM</td>
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