Course Plan

(Fall 2018)

<table>
<tr><td>Course</td><td colspan="3">Fluid Mechanics</td><td>Dept</td><td colspan="2">Mechanical & Aerospace Eng (MAE)</td></tr>
<tr><td>Course #</td><td>M2794.001300</td><td>Section</td><td colspan="2">003</td><td>Credits</td><td>3</td></tr>
<tr><td>Instructor</td><td>Seung Jin SONG</td><td>e-mail</td><td colspan="2">sjsong@snu.ac.kr</td><td>Tel</td><td>880-1667</td></tr>
<tr><td>Homepage</td><td colspan="6">tml.snu.ac.kr</td></tr>
<tr><td>Intended for</td><td colspan="3">Second year students in MAE</td><td>Prerequisite</td><td colspan="2">Engineering Math I</td></tr>
<tr><td>Lectures</td><td colspan="3">Tues, Thurs 11:00-12:30</td><td>Classroom</td><td colspan="2">Not applicable</td></tr>
<tr><td>Teaching Assistant</td><td colspan="3">To Be Determined (TBD)</td><td>Office Hours</td><td colspan="2">TBD</td></tr>
<tr><td>Objectives</td><td colspan="6">This course introduces basic fluid dynamic concepts. Hydrostatics, integral and differential control volume analyses, and nondimensional analysis methods will be introduced. Then both internal and external viscous flow analysis techniques will be discussed. Application of such methods to designing various kinds of mechanical and aerospace vehicles will be covered as well.</td></tr>
<tr><td>Course Outline</td><td colspan="6">This course constitutes one of the fundamental mechanics courses in engineering and science. Focus will be on internal and external flows of water and air. After hydrostatics, the key concept of integral control volume analysis will be introduced, and governing equations will be derived using the Reynolds Transport Theorem. Furthermore, analysis based on differential control volume using the Navier-Stokes Equation will also be dealt with. Subsequently, experimental approaches using nondimensional analysis and Buckingham Pi Theorem will be covered. Scaled model testing and similarity concepts will be introduced. Also, viscous flows in pipes and over flat plates will be analyzed, and the concept of boundary layer will be introduced. If possible, applications of these concepts to solving various flow problems in nature and engineering systems will be given.</td></tr>
<tr><td rowspan="2">Text</td><td>Text</td><td colspan="5">F.M. White, Fluid Mechanics, McGraw Hill</td></tr>
<tr><td>Reference</td><td colspan="5"></td></tr>
<tr><td>Grading</td><td colspan="6">2 Midterm Exams (25% x 2 = 50%), Final (35%), Homework (15%)</td></tr>
<tr><td>Comments</td><td colspan="6">THIS COURSE IS TAUGHT ONLINE in ENGLISH. EXAMS WILL BE OFFLINE. CHECK ETL AS NEEDED.</td></tr>
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Course Syllabus		
Week	Contents	Comments
1	Fluid, Continuum, Types of flow, Dimensions and Units	
2	Pressure and its gradient, Forces on structures, Manometer design	
3	Surface tension, Buoyancy, Stability, Pressure Measurement	
4	Conservation Laws, Reynolds Transport Theorem and Applications	
5	Mass and momentum conservation	Midterm Exam
6	Bernoulli Equation, Energy Equation	
7	Differential Analysis – Continuity and Navier-Stokes Equations	
8	Boundary conditions, Rotationality, Streamfunction	
9	Principle of Dimensional Homogeneity, Nondimensional Parameters	
10	Pi Theorem, Models and Similarity, Design of Experiments	Midterm Exam
11	Internal Flow, Reynolds Number, Laminar vs. Turbulent Flows	
12	Flow Inside a Circular Pipe	
13	Noncircular Duct Flows, Additional Losses, Diffuser and Piping Designs	
14	Extermal Flow and Boundary Layer Theory	
15	Experiment and Drag Coefficient	Final Exam