# ME 422

## TENTATIVE LECTURE OUTLINE—Spring, 2014

| Date | Lecture Topic | Reading Due | Assignments Due |
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| **Week 1:** | | | |
| Jan. 14 (T.) | Course Introduction; scope of fluid mechanics, dimensions and units-I | FMP; Ch. 1 | |
| Jan. 16 (R.) | Dimensions and units-II, Fluid as a continuum | FMP; Ch. 1, Ch. 2.1 | |
| **Week 2:** | | | |
| Jan. 21 (T.) | Fluid as a continuum, velocity field, time-, path-, streak-, and stream-lines | FMP; Ch. 2.1-2.2 | HW 1 Assigned |
| Jan. 23 (R.) | Stress field-II | FMP; Ch. 2.1-2.3 | |
| **Week 3:** | | | |
| Jan. 28 (T.) | Viscosity, Newtonian and non-Newtonian fluids, Surface tension | FMP; Ch. 2.4-2.5 | HW 2 Assigned HW 1 Due |
| Jan. 30 (R.) | Description and classification of fluid dynamics, The basic equations of fluid statics-I | FMP; Ch. 2.5-2.6, Ch. 3.1 | |
| **Week 4:** | | | |
| Feb. 4 (T.) | The basic equations of fluid statics-II Pressure variation in a static fluid-I | FMP; Ch. 3.1-3.2 | HW 3 Assigned HW 2 Due |
| Feb. 6 (R.) | Pressure variation in a static fluid-II, Hydrostatic force on submerged surfaces-I | FMP; Ch. 3.2-3.5 | |

| Week 5: | | | |
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| Feb. 11 (T.) | Hydrostatic force on submerged surfaces-II, | FMP; Ch. 3.4-3.5 | HW 4 Assigned HW 3 Due |
| Feb. 13 (R.) | Hydrostatic force on submerged surfaces-III, Basic equations of fluid motion in integral form for a stationary control volume –I | FMP; Ch. 3.4-3.5 Ch. 4.1 | |
| Week 6: | | | |
| Feb. 18 (T.) | Basic equations of fluid motion in integral form for a stationary  C.V.-I I, Mass conservation equation in integral form-I | FMP; Ch. 4.1-4.3 | HW 5 Assigned HW 4 Due |
| Feb. 20 (R.) | **In-Class  Exam-I** | | |
| Week 7: | | | |
| Feb. 25 (T.) | Mass conservation equation in integral form-II, Momentum equation in integral form-I | FMP; Ch. 4.3-4.4 | HW 6 Assigned HW 5 Due |
| Feb. 27 (R.) | Momentum equation in integral form-II | FMP; Ch. 4.4 | |
| Week 8: | | | |
| Mar 4 (T.) | Basic equations of fluid motion in integral form for a control volume moving with constant rectilinear acceleration-I | FMP; Ch. 4.5 | HW 7 Assigned HW 6 Due |
| Mar. 6 (R.) | Basic equations of fluid motion in integral form for a control volume moving with constant rectilinear acceleration-II, Mass conservation equation in differential form-I | FMP; Ch. 5.1 | |

| Week 9: | | | |
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| Mar 11 (T.) | **Spring Break** | | |
| Mar 13 (R.) | **Spring Break** | | |
| **Week 10:** | | | |
| Mar 18 (T.) | Mass conservation equation in differential form-II, Stream function for two-dimensional incompressible flow-I | FMP; Ch. 5.1-5.2 | HW 8 Assigned HW 7 Due |
| Mar 20 (R.) | Stream function for two-dimensional incompressible flow-II, Fluid kinematics-I | FMP; Ch. 5.2-5.3 | |
| **Week 11:** | | | |
| Mar 25 (T.) | Fluid kinematics-II | FMP; Ch. 5.3 | HW 9 Assigned HW 8 Due |
| Mar 27 (R.) | Fluid kinematics-III, Fluid Rotation; vorticity and circulation-I | FMP; Ch. 5.3 | |
| **Week 12:** | | | |
| April 1 (T.) | Fluid Rotation; vorticity and circulation-II, Momentum equation in differential form-I | FMP; Ch. 5.3-5.4 | HW 10 Assigned HW 9 Due |
| April 3 (R.) | **In-Class Exam-II** | IDBL; Ch. 8.5 | |
| **Week 13:** | | | |
| April 8 (T.) | Momentum equation in differential form-II, Euler equations-I | FMP; Ch. 5.4-6.1 | HW 11 Assigned HW 10 Due |
| April 10 (R.) | Euler equations-II, Bernoulli equations-I | FMP; Ch. 6.1-6.3 & 4.4 | |

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| **Week 14:** | | | |
| April 15 (T.) | Bernoulli equations-II, Static, stagnation and dynamic Pressures-I | FMP; Ch. 6.1-6.3& 4.4 | HW 12 Assigned HW 11 Due |
| April 17 (R.) | Static, stagnation, and dynamic Pressures-II, Dimensional analysis and similitude-I | FMP; Ch. 6.3 Ch. 7.1-7.2 | |
| **Week 15:** | | | |
| April 22 (T.) | Dimensional analysis and similitude-II, Buckingham PI theorem and Determining the PI groups-I | FMP; Ch. 7.2-7.4 | HW 13 Assigned HW 12 Due |
| April 24 (R.) | Buckingham PI theorem and Determining the PI groups-II | FMP; Ch. 7.3-7.4 | |
| **Week 16:** | | | |
| April 29 (T.) | Significant dimensionless groups in Fluid mechanics, Flow similarity and model studies | FMP; Ch. 7.5-7.7 | HW 14 Assigned HW 13 Due |
| May 1 (R.) | Review & catch up | | |

**Final Exam: Thursday, May 8, 10:10am-1:10 pm**

**Disclaimer:**

Emergency Procedures: Southern Illinois University Carbondale is committed to providing a safe and healthy environment for study and work. Because some health and safety circumstances are beyond our control, we ask that you become familiar with the SIUC Emergency Response Plan and Building Emergency Response Team (BERT) program. Emergency response information is available on posters in buildings on campus, available on BERT's website at www.bert.siu.edu, Department of Safety's website www.dps.siu.edu (disaster drop down) and in Emergency Response Guideline pamphlet. Know how to respond to each type of emergency. Instructors will provide guidance and direction to students in the classroom in the event of an emergency affecting your location. **It is important that you follow these instructions and stay with your instructor during an evacuation or sheltering emergency.** The Building Emergency Response Team will provide assistance to your instructor in evacuating the building or sheltering within the facility.