COURSE OUTLINE

Course Number	Course Title	Credits
CIV223	**Fluid Mechanics**	**4**
Hours: Lecture/Lab/Other	**Co- or Pre-requisite**	**Implementation Semester & Year**
3/3/0	**MAT115**	**Fall 2022**

Catalog description:
Introduction to the field of fluid mechanics. Topics include the properties of fluids, buoyancy, basic fluid power, closed pipe flow, open channel flow, forces due to fluids in motion, flow measuring devices, and the energy balances of fluid systems. Lab experiments (requiring written reports) on non-compressible fluids illustrate the theoretical concepts.

General Education Category:
Not GenEd

Course coordinator:
James Maccariella, 609-570-3462, maccarij@mccc.edu

Required texts & Other materials:

Applied Fluid Mechanics, 6th edition
Mott
Prentice Hall
ISBN13: 9780131146808

Course Student Learning Outcomes (SLO):

Upon successful completion of this course the student will be able to:

1. Demonstrate the basic terminology of fluid mechanics. [Supports ILG 1, 2, 11; PLO 1]
2. Solve basic flow problems and evaluate the flow potential of given systems. [Supports ILG 1, 2, 11; PLO 1]
3. Measure fluid flow and predict a flow system's capacity. [Supports ILG 1, 2, 11; PLO 1]
4. Perform various fluid mechanics experiments. [Supports ILG 1, 2, 11; PLO 1]
5. Solve problems in a well-organized and logical manner. [Supports ILG 1, 2, 11; PLO 1]

Course-specific Institutional Learning Goals (ILG):

Institutional Learning Goal 1. Written and Oral Communication in English. Students will communicate effectively in both speech and writing.
Institutional Learning Goal 2. Mathematics. Students will use appropriate mathematical and statistical concepts and operations to interpret data and to solve problems.
Institutional Learning Goal 4. Technology. Students will use computer systems or other appropriate forms of technology to achieve educational and personal goals.
Institutional Learning Goal 11. Critical Thinking: Students will use critical thinking skills understand, analyze, or apply information or solve problems.

Program Learning Outcomes for Civil Engineering Technology (PLO)

1. Prepare designs for highways, buildings, and bridges.
2. Perform route/construction surveys using survey equipment and methods.
3. Test and analyze various construction materials.
4. Prepare design drawings.

Units of study in detail – Unit Student Learning Outcomes:

Unit I **Fluid Statics [Supports Course SLO #1, 2, 3, 4, 5]**

Learning Objectives
The student will be able to:

- Define weight, head, pressure and force as it may be used in the measurement of a fluid.
- Calculate specific gravity, specific weight, and density of both solids and liquids.
- Understand fluid mechanics charts and graphs.
- Convert pressures from absolute to gage and back.
- Demonstrate the theory of manometers and be able to work problems involving instruments.
- Determine a point force on a submerged body.
- Determine the center of pressure on a submerged regular area.

Unit II **Flow and Energy [Supports Course SLO #1, 2, 3, 4, 5]**

Learning Objectives
The student will be able to:

- Analyze problems involving volume flow rates, and mass flow rates.
- Use the conservation of energy as related to fluid flow.
- Solve flow problems involving potential, kinetic and pressure energies.
- Use Bernoulli's equation to solve flow problems dealing with energy and losses.

Unit III **Fluid Energy Losses [Supports Course SLO #1, 2, 3, 4, 5]**

Learning Objectives
The student will be able to:

- Understand viscosity and be able to predict flow results which will correspond to specific viscosity changes.
- Use both dynamic and kinematic viscosity data in solving problems.
- Determine the viscosity of a fluid.
- Identify whether a flow is laminar or turbulent.
- Use the Darcy equation to determine the friction factor for flow in pipelines.
- Determine the roughness factor of a commercially available material which could be made into a pipe.

Unit IV **Open Channel Flow [Supports Course SLO #1, 2, 3, 4, 5]**

Learning Objectives
The student will be able to:

- Calculate the hydraulic radius of any given flow channel.
- Define uniform steady state of flow.

- Use the Manning equation to calculate factors such as flow rate, slope, and roughness.
- Determine whether a flow is above, at, or below its critical velocity.
- Calculate when and how high a hydraulic jump may occur.
- Calculate flow channel dimensions needed for field drainage problems, including culverts, canals, flumes, and catch basins.

Evaluation of student learning:

Course student learning outcomes will be assessed by the following activities:

Tests (3)	30%
Quizzes and Homework	20%
Lab Reports	30%
Final Exam	20%