COURSE OUTLINE: MCH506 - ADVANCED FLUID MECH

Prepared: Kevin Sloss
Approved: Corey Meunier, Dean, Technology, Trades, and Apprenticeship

Course Code: Title	MCH506: ADVANCED FLUID MECHANICS
Program Number: Name	4043: MECH ENG. TECHNOLOGY
Department:	MECHANICAL TECHNIQUES PS
Academic Year:	2024-2025
Course Description:	In this course students learn about fundamentals and advanced topics of fluid mechanics. Topics include the nature of fluids and the study of fluid mechanics, viscosity of fluids, pressure measurement, forces due to static fluids, buoyancy, flow of fluids, general energy equation, Reynolds number and energy losses due to friction, minor losses, series pipeline systems, pump selection and application, flow measurement, forces due to fluids in motion and drag and lift.
Total Credits:	3
Hours/Week:	3
Total Hours:	42
Prerequisites:	MCH125
Corequisites:	There are no co-requisites for this course.
Substitutes:	MCH225
Vocational Learning Outcomes (VLO's) addressed in this course: **Please refer to program web page for a complete listing of program outcomes where applicable.**	**4043 - MECH ENG. TECHNOLOGY** VLO 5 Use current and emerging technologies to implement mechanical engineering projects. VLO 6 Analyze and solve complex mechanical problems by applying mathematics and fundamentals of mechanical engineering. VLO 7 Prepare, analyze, evaluate and modify mechanical engineering drawings and other related technical documents. VLO 8 Design and analyze mechanical components, processes and systems by applying fundamentals of mechanical engineering. VLO 10 Establish and verify the specifications of materials, processes and operations for the design and production of mechanical components.
Essential Employability Skills (EES) addressed in this course:	EES 1 Communicate clearly, concisely and correctly in the written, spoken, and visual form that fulfills the purpose and meets the needs of the audience. EES 2 Respond to written, spoken, or visual messages in a manner that ensures effective communication. EES 3 Execute mathematical operations accurately. EES 4 Apply a systematic approach to solve problems. EES 5 Use a variety of thinking skills to anticipate and solve problems.

	EES 6 Locate, select, organize, and document information using appropriate technology and information systems. EES 7 Analyze, evaluate, and apply relevant information from a variety of sources. EES 8 Show respect for the diverse opinions, values, belief systems, and contributions of others. EES 10 Manage the use of time and other resources to complete projects. EES 11 Take responsibility for ones own actions, decisions, and consequences.
Course Evaluation:	Passing Grade: 50%, A minimum program GPA of 2.0 or higher where program specific standards exist is required for graduation.
Other Course Evaluation & Assessment Requirements:	Grade Definition Grade Point Equivalent A+ 90 - 100% 4.00 A 80 - 89% B 70 - 79% 3.00 C 60 - 69% 2.00 D 50 - 59% 1.00 F (Fail) 49% and below 0.00 CR (Credit) Credit for diploma requirements has been awarded. S Satisfactory achievement in field /clinical placement or non-graded subject area. U Unsatisfactory achievement in field/clinical placement or non-graded subject area. X A temporary grade limited to situations with extenuating circumstances giving a student additional time to complete the requirements for a course. NR Grade not reported to Registrar`s office. W Student has withdrawn from the course without academic penalty.
Books and Required Resources:	Applied Fluid Mechanics by Robert Mott and Joseph A Untener Publisher: Pearson Edition: 7th ISBN: 9780132558921

Course Outcomes and Learning Objectives:

Course Outcome 1	Learning Objectives for Course Outcome 1
1. Examine velocity profiles for circular sections and flow in noncircular sections	1.1 Describe the velocity profile for laminar and turbulent flow in circular cross sections. 1.2 Describe the laminar boundary layer as it occurs in turbulent flow. 1.3 Compute the local velocity of flow at any given position in a circular cross section. 1.4 Compute average flow velocity in non-circular cross sections. 1.5 Compute the Reynolds number for flow in noncircular cross sections using the hydraulic radius to characterize the size of the cross section. 1.6 Determine the energy loss for the flow of a fluid in a noncircular cross section, considering special forms for the

	relative roughness and Darcy`s equation.
Course Outcome 2	**Learning Objectives for Course Outcome 2**
2. Calculate minor losses in fluid systems	2.1 Recognize sources of minor losses. 2.2 Define the resistance coefficient. 2.3 Determine the energy loss for flow through: sudden enlargements, pipe to reservoirs exits, gradual enlargements, sudden contractions, gradual contractions, and tank to pipe entrance losses. 2.4 Define and use the equivalent length technique for determining energy losses in system components. 2.5 Demonstrate how to use the flow coefficient Cv to evaluate energy losses.
Course Outcome 3	**Learning Objectives for Course Outcome 3**
3. Perform Calculations on series pipeline systems	3.1 Understand and identify a series pipeline system. 3.2 Determine the class of the series pipeline system. 3.3 Determine the sources of energy losses in a series system and determine what the losses are.
Course Outcome 4	**Learning Objectives for Course Outcome 4**
4. Perform calculations on parallel and branching pipeline systems	4.1 Understand the difference between parallel and series pipeline systems. 4.2 State the general relationships for flow rates and head losses for parallel pipeline systems. 4.3 Compute flow in each branch of a parallel pipeline system 4.4 Use the Cross technique to compute the flow rates in all branches of a network having three or more branches.
Course Outcome 5	**Learning Objectives for Course Outcome 5**
5. Demonstrate pump selection for specific applications	5.1 List the parameters required for pump selection. 5.2 Describe and understand the applications and limitations for each of the basic pump classifications. 5.3 Understand the differences between positive and variable displacement pumps 5.4 Demonstrate reading of pump curves and understand the relationship to pump performance for each style of pump. 5.5 Describe how the operating point of a pump is related to system resistance information 5.6 Define net positive suction head for a pump and discuss its significance to pump performance 5.7 Identify and define optimal system designs for pump installations.
Course Outcome 6	**Learning Objectives for Course Outcome 6**
6. Open Channel Flow	6.1 Calculate the hydraulic radius for open channel flow. 6.2 Describe uniform and varied flow. 6.3 Apply Manning`s equation to analyze uniform flow. 6.4 Calculate flow and depth parameters for open channels. 6.5 Define the Froude number. 6.6 Describe critical flow, sub-critical flow, and supercritical flow.

	6.7 Determine the energy in the flow of an open channel. 6.8 Explain hydraulic jump. 6.9 Describe weirs and flumes and how they are used for measuring flow in open channels.

Evaluation Process and Grading System:

Evaluation Type	Evaluation Weight
Assignments	25%
Test #1	25%
Test #2	25%
Test #3	25%

Date: November 12, 2024

Addendum: Please refer to the course outline addendum on the Learning Management System for further information.