STATE UNIVERSITY OF NEW YORK
COLLEGE OF TECHNOLOGY
CANTON, NEW YORK

MASTER SYLLABUS

CIVL 321– Fluid Mechanics and Hydraulics

CIP Code: 14.0805

Created by: Adrienne C. Rygel
Updated by:

School: Canino School of Technology
Department: Civil and Construction Technology
Implementation Semester/Year: Fall 2026

A. TITLE: Fluid Mechanics and Hydraulics

B. COURSE NUMBER: CIVL 321

C. CREDIT HOURS (Hours of Lecture, Laboratory, Recitation, Tutorial, Activity):

# Credit Hours per Week	**4**
# Lecture Hours per Week	**3**
# Lab Hours per Week	**3**
Other per Week	

D. WRITING INTENSIVE COURSE:

Yes	
No	x

E. GER CATEGORY:

Does course satisfy a GER category(ies)? If so, please select all that apply.

[1-2] Communication	
[3] Diversity: Equity, Inclusion & Social Justice	
[4] Mathematics & Quantitative Reasoning	
[5] Natural Science & Scientific Reasoning	
[6] Humanities	
[7] Social Sciences	
[8] Arts	
[9] US History & Civic Engagement	
[10] World History & Global Awareness	
[11] World Languages	

F. SEMESTER(S) OFFERED:

Fall	
Spring	x
Fall and Spring	

G. COURSE DESCRIPTION:

Concepts and theory of fluid mechanics and their application to civil engineering and design are presented. The course focuses on water as the fluid, fluid mechanics theory and concepts that relate to civil engineering, and civil engineering hydraulics. Fluid mechanics, hydrostatics, and hydrodynamics related topics include: fluid properties, buoyancy, hydrostatic pressure, resultant force and center of pressure on submerged surfaces, motion of water and types of flow, energy head and conservation laws, measuring flow and hydraulic devices. Fundamental concepts and theory of hydraulics include open channel flow, application of continuity

equation to flow in a closed conduit, use of Manning's equation for determining channel, pipe, and stream flow, examination of varied flow and determination of backwater profiles, use of rational method in determination of peak discharge, and determination of drainage area and time of concentration. Students will learn theory and concepts of hydraulic design in order to design culverts, storm sewers, and stormwater detention systems.

H. PRE-REQUISITES: ENGS 201 Statics, or permission of the instructor
CO-REQUISITES:

I. STUDENT LEARNING OUTCOMES:

Course Student Learning Outcome [SLO]	Program Student Learning Outcome [PSLO]	GER	ISLO & Subsets
a. calculate pressure as a function of depth and the resultant force from water pressure and its point of application on fully and partially submerged surfaces.	SO1		ISLO 5
b. solve problems related to buoyancy.	SO1 and SO6		ISLO 5
c. analyze data from pressure or flow devises	SO1 and SO6		ISLO2 (PS) and ISLO 5
d. solve for discharge, velocity, and/or pressure in a closed piping system with friction losses by applying the continuity equations.	SO1		ISLO 5
e. interpret hydraulic and energy grade lines for a hydraulic system.	SO7		ISLO 5
f. calculate flow through hydraulic devices such as venturis, orifices, and weirs; and calculate discharge in open channels.	SO1 and SO6		ISLO 5
g. design a culvert.	SO2		ISLO2 (PS) and ISLO 5
h. design a sanitary or storm sewer system for a small residential development, and a storm water detention system.	SO2		ISLO2 (PS) and ISLO 5

KEY	Institutional Student Learning Outcomes [ISLO 1 – 5]
ISLO #	ISLO & Subsets
1	**Communication Skills** Oral [O], Written [W]
2	**Critical Thinking** *Critical Analysis [CA], Inquiry & Analysis [IA] , Problem Solving [PS]*
3	**Foundational Skills** *Information Management [IM], Quantitative Lit, /Reasoning [QTR]*
4	**Social Responsibility** *Ethical Reasoning [ER], Global Learning [GL],* *Intercultural Knowledge [IK], Teamwork [T]*
5	**Industry, Professional, Discipline Specific Knowledge and Skills**

J. APPLIED LEARNING COMPONENT:

Yes	x
No	

If yes, select [X] one or more of the following categories:

Classroom / Lab	x	Community Service	
Internship		Civic Engagement	
Clinical Practicum		Creative Works/Senior Project	
Practicum		Research	
Service Learning		Entrepreneurship [program, class, project]	

K. TEXTS:

Jayawardena, A.W. (2021) Fluid Mechanics, Hydraulics, Hydrology and Water Resources for Civil Engineer2, 1st edition, CRC Press, ISBN 9780429423116.

L. REFERENCES:

Gribbin, J. E. (2007). *Introduction to Hydraulics and Hydrology, 4th Edition*. Clifton Park, NY: Thomson Delmar Learning. ISBN: 978-1-133-69183-9.

M. EQUIPMENT:

computer, calculator, engineering scale. Laboratory testing equipment will include venturi meter device, pressure gauges, dead load tester, center of pressure apparatus, model flume/culvert system, weir bench-scale system, permeameter, horizontal pipe flow apparatus with manometers/piezometers, and testing equipment related to fluid properties.

N. GRADING METHOD: A-F

O. SUGGESTED MEASUREMENT CRITERIA/METHODS:

Exams
Homework Assignments
Laboratory Assignments

P. DETAILED COURSE OUTLINE:

I. Fluid Mechanics and Fundamental Hydrostatics and Hydrodynamics
   A. Fluid Mechanics
      i. Fundamental concepts and theory
      ii. Specific weight and density
      iii. Viscosity
   B. Hydrostatics
      i. Hydrostatic pressure
      ii. Pressure on plane surfaces and curved surfaces
      iii. Measuring pressure
      iv. Buoyancy
   C. Hydrodynamics
      i. Motion of water and types of flow
      ii. Energy head and conservation laws
      iii. Measuring flow
   D. Hydraulic Devices
      i. Orifices
      ii. Weirs
      iii. Gates and siphons

II. Hydraulics
   A. Fundamental concepts and theory of open channel flow and types of channels
      i. Normal and critical depth
      ii. Uniform flow
         1. Manning's equation
         2. Channel flow
         3. Pipe flow
         4. Stream flow
      iii. Varied flow
         1. Backwater profile
         2. Entrance to a channel
         3. Hydraulic jump
   B. Culverts
      i. Types of culverts and culvert flow
      ii. Inlet and outlet control
      iii. Culvert design
   C. Fundamental Hydrology
      i. Drainage area and time of concentration
      ii. Rainfall and runoff
         1. Rational method
   D. Storm Sewers and Stormwater Detention
      i. Design of storm sewers
         1. Design considerations and investigations
         2. System layout and design
      ii. Design of Stormwater Detention Systems
         1. Impoundments
         2. Outlet structures and spillways

Q. LABORATORY OUTLINE:

1. Density of Liquids
2. Calibration of a pressure gauge
3. Resultant force from pressure on a vertical and inclined planar surface
4. Piezometers and manometers
5. Archimedes' principal and buoyancy
6. Calibration of an orifice and Venturi meter
7. Friction losses in pipes
8. Calibration of sharp-crested weirs
9. Design of a water supply system
10. Culvert control
11. Culvert Design
12. HEC RAS Corps of Engineers
13. Design of a storm sewer