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

MASTER SYLLABUS

COURSE NUMBER – COURSE NAME
MECH 341 – INTERMEDIATE FLUID MECHANICS

Created by: Dr. Lucas Craig

Updated by:

Canino School of Engineering Technology

Department: MET !

Semester/Year: Spring 2019

A. **TITLE**: Intermediate Fluid Mechanics

B. **COURSE NUMBER:** MECH 341

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

 # Credit Hours: 3
 # Lecture Hours: 3 **per week**
 # Lab Hours: **per week**
Other: **per week**

Course Length: 15 **Weeks**

D. **WRITING INTENSIVE COURSE**: Yes ☐ No ☒

E. **GER CATEGORY: None:** ☒ **Yes:** GER
If course satisfies more than one: GER

F. **SEMESTER(S) OFFERED: Fall** ☒ **Spring** ☐ **Fall & Spring** ☐

G. **COURSE DESCRIPTION:**

This course is an intermediate step in students understanding of fluid mechanics. Topics include fluid kinematics, Bernoulli's equation, mass, energy, and momentum analysis of flow systems, internal flow, external flow, compressible flow, and differential analysis of fluid flows. The continuity, stream function, and Navier-Stokes equations are development for 2-D and 3-D flows. The introduction of similitude and dimensional analysis is also included.

H. **PRE-REQUISITES: None** ☒ **Yes** ☒ **If yes, list below:**

MECH 241 and junior level status or permission of the instructor

CO-REQUISITES: None ☒ **Yes** ☐ **If yes, list below:**

I. **STUDENT LEARNING OUTCOMES**: (*see key below*)

By the end of this course, the student will be able to:

Course Student Learning Outcome [SLO]	***Program Student Learning Outcome [PSLO]***	***GER*** *[If Applicable]*	***ISLO & SUBSETS***	
Distinguish between streamlines, streaklines, pathlines, and timelines.	6		2-Crit Think ISLO ISLO	PS Subsets Subsets Subsets
Develop and understanding of the Bernoulli equation and its applications along with conservation of mass	1,6		2-Crit Think ISLO ISLO	PS Subsets Subsets Subsets
Determine the forces acting on a control volume and apply them to Newton's 2nd law.	6		2-Crit Think ISLO ISLO	PS Subsets Subsets Subsets
Apply Reynolds and other non-dimensional numbers in the solution of fluid problems.	6		2-Crit Think ISLO ISLO	PS Subsets Subsets Subsets
Discriminate when to simplify the Navier-Stokes equations and demonstrate its proper use.	6		2-Crit Think ISLO ISLO	PS Subsets Subsets Subsets
Develop the stream functions necessary to solve 2-D problems.	1,6		2-Crit Think ISLO ISLO	PS Subsets Subsets Subsets

Analyze fluid flow in different situations such as annulus flow, rotating disc, and round tubes	6		2-Crit Think ISLO ISLO	PS Subsets Subsets Subsets
Explain the different types of drag associated with external flow and calculate drag and the point of flow separation.	6		2-Crit Think ISLO ISLO	PS Subsets Subsets Subsets
Comprehend the fundamental concept of compressible flow and the development of shock waves.	6		2-Crit Think ISLO ISLO	PS Subsets Subsets Subsets
Produce flow calculations around objects using a CFD package.	2		2-Crit Think ISLO ISLO	PS Subsets Subsets Subsets

KEY	<u>**Institutional Student Learning Outcomes [ISLO 1 – 5]**</u>
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**

*Include program objectives if applicable. Please consult with Program Coordinator

J. APPLIED LEARNING COMPONENT: Yes ☒ No ☐

If YES, select one or more of the following categories:

☒ Classroom/Lab
☐ Internship
☐ Clinical Placement
☐ Practicum
☐ Service Learning
☐ Community Service
☐ Civic Engagement
☐ Creative Works/Senior Project
☐ Research
☐ Entrepreneurship (program, class, project)

K. TEXTS:

Cengel, Yunus A. and Cimbala, John M., Fluid Mechanics 3e , McGraw-Hill 2014., ISBN: 9780073380322.

Or

Mott, R. Applied Fluid Mechanics (7th Edition). New York: Prentice Hall, 2014.

L. REFERENCES:

N/A

M. EQUIPMENT: None ☒ Needed:

N. GRADING METHOD: A-F

O. SUGGESTED MEASUREMENT CRITERIA/METHODS:

Homework	**25%**
Exams (3)	**60%**
Final Exam / Project	**15%**

P. DETAILED COURSE OUTLINE:

I. Intro to Fluid Mechanics
- **A. Fluid as a liquid or gas**
- **B. Power vs. Transportation systems**
- **C. Pascal's, Bernoulli's law (introduced)**

II. Properties of Fluids
- **A. Weight, Density, and Specific Gravity**
- **B. Force, Pressure, and Head**
- **C. Pascal's Law**
- **D. Bulk Modulus**
- **E. Viscosity**

III. Energy and Forces
- **A. Review Mechanics**

B. Pressures in liquids at rest
C. Atmospheric Pressure
D. Manometers
E. Forces on plane surfaces
F. Forces on inclined surfaces
G. Buoyancy
H. Bernoulli's Equations applications

IV. Sizing pipes and ducts
A. Flow Rate
B. Laminar flow and Turbulent flow
C. Losses due to valves and fittings
D. Compressible and Incompressible Flow

V. Pump Sizing
A. Pumps
B. Motors
C. Horsepower and Efficiency
D. Sizing Hydraulic Cylinders

VI. Air Handling Systems
A. Sizing Fans
B. Velocity and Pressure Measurement

Q. <u>LABORATORY OUTLINE</u>: None ☒ Yes ☐