North South University

Department of Civil and Environmental Engineering (DCEE)

CEE 211: Fluid Mechanics

Course Outline

1. BASIC INFORMATION

1.1 COURSE DESCRIPTION

This course presents fundamental concepts in fluid mechanics. Fluid mechanics topics include fluid properties, conservation laws, fluid kinematics, fluid flow concepts: continuity equations, energy and momentum equations, laminar and turbulent flow, incompressible flow, similitude and dimensional analysis, viscous flow in pipes, drag and lift and flow measurement in orifices, nozzles, venturimeter, weirs and pitot tubes. Civil engineering applications are emphasized.

1.2 COURSE CONTENTS

1. Fluid Statics, Dynamics and Kinematics
2. Control volume and Differential Analysis
3. Similitude, Dimensional Analysis and Modeling
4. Viscous flow in pipes
5. Flow Measurement

1.3 COURSE INFORMATION

1. Sophomore level undergraduate course
2. credit hours: 3 hours of classroom contact and 6 hours of self-study per week.
3. Two classes per week having 1.5 hours of duration
4. Tutorials moderated by teaching assistants
5. The course requires knowledge on Engineering Mechanics, Differential and Integral Calculus.

1.4 PREREQUISITE COURSES:

1. CEE 210: Engineering Mechanics

1.5 FACULTY

1. Name: Dr. Nazmun Nahar, P.Eng., Professor, DCEE, Initial: NMR
2. Room No: SAC 731/ADMN 625,
3. Phone: Office Ph: 8852000 ext. 1053
4. E-mail: nazmun.nahar@northsouth.edu
5. Consultation hours: Monday 3:00 pm – 4:00 pm., Tuesday 2:00 pm – 3:00 pm.

1.6 CLASS HOURS:

- Section 1: MW 9:40 am – 11:10 am (Room NAC 604)

1.7 TEXT BOOK:

Fundamentals of Fluid Mechanics by Munson, Young, Okiishi, Huebsch, Sixth Edition, Publisher: Wiley, ISBN-978-0470-26284-9

1.8 REFERENCE BOOKS:

1. Engineering Fluid Mechanics, by Crowe, Elger Williams, and Roberson, Ninth Edition, Publisher: Wiley, ISBN 978-0-470-25977-1

2. Fluid Mechanics with Engineering Applications, Franzini and Finnemore, most recent edition, Publisher: McGraw Hills, ISBN-13: 978-0072432022

2. COURSE OBJECTIVES AND OUTCOMES

1.9 COURSE OBJECTIVES:

1. To use governing principles of fluid mechanics such as conservation laws of mass, momentum and energy to solve fluid flow problems.
2. To determine the characteristics of kinematic fluid flow and to apply the principles of similitude and dimensional analysis to characterize and model fluid phenomena
3. To formulate and solve elementary problems involving forces on immersed bodies (pressure, buoyancy).
4. To demonstrate the understanding of fluid flow characteristics through building/assessing physical systems.

1.10 COURSE OUTCOMES (COs):

1.10.1 CO1: Apply knowledge of mathematics, science, and engineering.

1.10.2 CO2: Identify, formulate, and solve engineering problems.

1.10.3 CO3: Ability to design a system, component, or process to meet desired needs.

1.11 MAPPING OF COURSE OUTCOMES TO BSCEE PROGRAM OUTCOMES

L: Slightly maps (low); M: Moderately maps (medium); H: Substantially maps (high)

	PO - 1	PO - 2	PO - 3	PO - 4	PO - 5	PO - 6	PO - 7	PO - 8	PO - 9	PO - 10	PO - 11	PO - 12	PO - 13
CO1	H												
CO2		H											
CO3									H				

1.12 CO DELIVERY AND ASSESSMENT

Course outcomes	Bloom's taxonomy, domain/level *(C: Cognitive, P: Psychomotor A: Affective)*	Delivery methods and activities	Assessment tools
CO1	C2	Lecture, examples, exercises, hands-on practice, tutorials	Quiz, Assignment, In class assessment
CO2	C3	Lecture, video,	Midterm exam, Final exam
CO3	P2	Open discussion, suggestions	Class project

1.12.1 Cognitive domain (knowledge-based): C

1: Knowledge, 2: Comprehension, 3 Application, 4 Analysis, 5: Synthesis, 6: Evaluation

1.12.2 The affective domain (emotion-based): A

1: Receiving, .2: Responding, 3: Valuing, 4: Organizing, 5: Characterizing

1.12.3 The psychomotor domain (action-based): P

1: Perception, 2: Set, 3: Guided response, 4: Mechanism, 5: Complex overt response, 6: Adaptation, 7: Origination

BSCEE PROGRAM OUTCOMES (PO)

1.12.4 PO – 1: Engineering Knowledge

Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex civil engineering problems.

1.12.5 PO – 2: Problem analysis

Identify, formulate, research the literature and analyze complex civil engineering problems and reach substantiated conclusions using first principles of mathematics, the natural sciences and the engineering sciences.

1.12.6 PO – 3: Design/development of solutions

Design solutions for complex civil engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety as well as cultural, societal and environmental concerns.

1.12.7 PO – 4: Investigation

Conduct investigations of complex problems, considering design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.

1.12.8 PO – 5: Modern tool usage

Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to complex civil engineering activities with an understanding of the limitations.

1.12.9 PO – 6: The engineer and society

Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional civil engineering practice.

1.12.10 PO – 7: Environment and sustainability

Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate the knowledge of, and need for sustainable development.

1.12.11 PO – 8: Ethics

Apply ethical principles and commit to professional ethics, responsibilities and the norms of the civil engineering practice.

1.12.12 PO – 9: Individual work and teamwork

Function effectively as an individual and as a member or leader of diverse teams as well as in multidisciplinary settings.

1.12.13 PO – 10: Communication

Communicate effectively about complex engineering activities with the engineering community and with society at large. Be able to comprehend and write effective reports, design documentation, make effective presentations and give and receive clear instructions.

1.12.14 PO – 11: Project management and finance

Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work as a member or a leader of a team to manage projects in multidisciplinary environments.

1.12.15 PO – 12: Life-long learning

Recognize the need for and have the preparation and ability to engage in independent, life-long learning in the broadest context of technological change.

1.12.16 PO – 13: Contemporary Issues

Demonstrate sound knowledge on global and local contemporary civil engineering issues.

COURSE ASSESSMENT

1.13 TEACHING/LEARNING STRATEGIES

1.13.1 Lectures

- Attend all classes punctually
- Follow worked examples taught in the class and provided in the textbook
- Solve exercises from the textbook and innovative problems in the assignments

1.13.2 Tutorials & Group work

- Contact teaching assistant whenever required
- Come to the tutorial sessions
- Work with peers to solve problems, discuss with friends

1.13.3 Private study

- Review lecture material and textbook
- Practice the worked out examples provided in the class/google classroom

1.14 ASSESSMENT

- Frequent assessments may be conducted to check if you are following the lectures attentively to check the basic knowledge
- In-class exams of duration around 15 minutes will be taken to check your ability in solving a problem following a certain method
- Midterm exam and final exam will contain comprehensive problems to assess complete understanding
- Class project will be given to assess your capability in applying theory in practice, your performance in team setting and time management.

1.15 EVALUATION:

Distribution of numerical scores		
Class attendance	5%	Over 70% -5%, below 40%- 0, in between obtained attendance % will be calculated in 5%
Assignment	5%	One per chapter
In-Class Assessment	15%	Declared in the same class
Exam I	15%	One and half hour
Exam II	15%	One and half hour
Final Exam	30%	Two hours
Project	15%	3 weeks

1.16 GRADING POLICY:

Generally, NSU grading policy will be followed. However, minor deviation is still possible depending on the situation.

1.17 EXAM POLICY:

No makeup for quiz and in-class exam is possible. MAKE UP for MID-TERM OR FINAL EXAM WILL BE ARRANGED UNLESS AN ABSOLUTELY UNAVOIDABLE VALID REASON FOR ABSENCE IS FOUND. For such unavoidable circumstances, written explanation of the situation

must be submitted before the exam. If any class test or mid-term exam cannot be held on the due date, the exam will be automatically shifted to the very next available class, unless otherwise announced.

LECTURE SCHEDULE

* One Day = 1.5 lecture hours, Total 22 lectures = 33 lecture hours

LECTURE SCHEDULE

COURSE CONTENT	# of week		Reference	Assessment type
Fluid Properties	Week 1	Sept 25, 30	Ch 1	
		Oct 2nd		Guest lecture by Dr Mamun Molla
Fluid Statics	Week 2	Oct 2,7	Ch 2	In class assessment 1
	Week 3	Oct 9,14	Ch 2	
	Week 4	Oct 16,21	Ch 2	In class assessment 2
				EXAM 1
Fluid Dynamics	Week 5	Oct 23,28, 30	Ch 3	
	Week 6	Nov 4,6	Ch 3	In class assessment 3
Fluid Kinematics	Week 7	Nov 11,13	Ch 4	
Finite Control Volume Analysis	Week 8	Nov 18,20	Ch 5	In class assessment 4
				EXAM 2
Differential Analysis	Week 9	Nov 25,27	Ch 6	
				Field Trip
				PROJECT ASSIGNED
Similitude, Dimensional Analysis and Modelling	Week 10	Dec 2,4	Ch 7	In class assessment 5
Viscous flow in pipes	Week 11	Dec 9,11	Ch 8	
	Week 12	Dec 16,18	Ch 8	In class assessment 6
Flow over immersed bodies (Lift and Drag)	Week 12	Dec 18	Ch 9	PROJECT DUE
				FINAL EXAM

CODE OF CONDUCT

- It is highly requested to maintain discipline in the class like not to be late, refrain from making noise during lecture time, not to leave the class early.
- Adopting unfair means in the exams will be considered as a serious crime and the student shall be placed to the university disciplinary committee.
- All materials should be neat and clear, and demonstrate professionalism
- Direct duplication of the work of another is a big offense
- Paraphrasing another person's work with very minor changes keeping the meaning is also plagiarism