AEN 2107 FLUID MECHANICS (4 CU)

Lecturer: Mr. Collins Paul Sewanyana (B.Sc. Mech. Eng., M.Sc. Agric. Eng., PhD Candidate)

Course Type: CORE (B.Sc. Agric. Eng I)

Course Credits (CU): 4 CU i.e. 60 Contact Hours per semester

Course Duration: 15 weeks (45 hours) i.e. 45 LH, 30 PH

COURSE DESCRIPTION

- This course provides fundamental knowledge and understanding of the mechanics of fluid in equilibrium and in motion by describing and observing fluid phenomena and by developing and using the principles and laws for analyzing fluid interactions with natural and constructed systems.
- This course provides the basis for subsequent courses involving the analysis, design and/or operation of engineered systems in different media such as water and waste water treatment facilities; flooding, erosion and wave impacts on river, lake and coastal areas; containing, transport and mixing of chemicals and sediments; hydraulic and hydrostatic systems.
- Emphasis is placed on being able to formulate and solve typical problems of engineering importance

2. COURSE OBJECTIVES

The overall objective of this course is to be able identify the different properties of fluids and derive the pressures and forces existing in different static fluid systems by applying conservational equations of mass, momentum and energy and dimensional analysis to problems involving fluids motion, head losses and flows in different fluid flow regimes.

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The specific objectives are to:

- Introduce concepts, principles, laws, observations, and models of fluid static and dynamic systems
- Provide basis for understanding fluid behavior and for engineering design and control of fluid systems
- Develop competence with mass, energy and momentum balances for determining resultant interactions of flows and engineered and natural systems
- Develop basis for correlating experimental data, designing tests, and using scale models of fluid flows
- Learn nature of rotation, circulation, resistance(viscous, turbulent),boundary layers, and separation with applications to drag and lift on objects
- Learn methods for computing headlosses and flows in simple pipes and channels
- To discuss dimensional analysis

3. RECOMMENDED REFERENCES FOR READING

1. Massey B.S. (1998). Mechanics of Fluids 7th Ed. Nelson Thornes.
2. Shames, Irvin H (1989). Mechanics of Fluids. MacGraw-Hill
3. Fox and McDonald (1985). Introduction to Fluid Mechanics. John Willey &Sons .
4. Widden M. (1996). Fluid Mechanics. MacMillan
5. Douglas J.F. and Matthews R.D (1993). Solving problems in Fluid Mechanics Vol 1 3rd Ed. Longman

4. COURSE CONTENT, METHODS OF INSTRUCTION, TOOLS AND EQUIPMENT REQUIRED

TOPIC	CONTENT	METHOD OF INSTRUCTION / Time allocated	TOOLS / EQUIPMENT NEEDED
Chapter 1 . Basic definitions and Introduction	Introduction to Fluids and Properties of Fluids	Interactive lectures (9 hrs) Seminar (2 hrs)	Chalk / BB or Markers / Flip charts/LCD Projector/laptop
Chapter 2. Fluid statics	• Pressure • Forces • Instrumentation • Laboratories	Interactive lectures (12 hrs) Practical (5 hrs)	Chalk / BB or Markers / Flip charts/LCD Projector/laptop / graph paper/ rulers
Chapter 3. Fluid motion, mass, energy and Momentum conservation equations	• Laminar flow • Bernoulli equations • Continuity equation • Instrumentation (gates, notches, weirs, etc.) • Laboratories	Interactive lectures (12 hrs) Practical (5 hrs)	Chalk / BB or Markers / Flip charts/LCD Projector
Chapter 4. Application of Basic Principles	• Steady Flow in Pipes • Losses in Pipes and Fittings • Jets • Unsteady flow in closed conduits • Laboratories	Interactive lectures (12 hrs) Practical (5 hrs)	Chalk / BB or Markers / Flip charts/LCD Projector/laptop / graph paper/ rulers/ Computer lab
	• Evaluation	Tests (4 hrs)	Paper, printer, photocopier

5. SUMMARY OF TIME NEEDED

Interactive lectures covering theory	45 hrs
Class and computer-based practicals	15 hrs
Seminars	2 hrs
Evaluation	4 hrs

6. OVERALL COURSE EVALUATION

Continuous Assessment Test	20%
Class seminars and practicals	30%
Final examination	50%