



National University of Engineering (UNI)

School of Civil Engineering

Syllabus 2027-I

1. COURSE

CE3H9. Hydraulic and Hydrology Engineering Workshop (Mandatory)

2. GENERAL INFORMATION

2.1 Course	:	CE3H9. Hydraulic and Hydrology Engineering Workshop
2.2 Semester	:	10 th Semester.
2.3 Credits	:	3
2.4 Hours	:	
2.5 Duration of the period	:	16 weeks
2.6 Type of course	:	Mandatory
2.7 Learning modality	:	Face to face
2.8 Prerequisites	:	CE3H2. General Hydrology. (7 th Sem)

3. PROFESSORS

Meetings after coordination with the professor

4. INTRODUCTION TO THE COURSE

Hydraulic and Hydrological Engineering Workshop is an applied course on dam design: it begins with hydraulic planning (water availability and demand, reservoir sizing methods) and then covers the engineering and structural design of gravity concrete dams, hollow gravity dams, earthfill dams, and rockfill dams, including stability and seepage analysis, and the design of associated intake, diversion, and control structures.

5. GOALS

- Estimate water availability and demand for reservoir planning.
- Size reservoir capacity using simulation methods and stochastic analysis (Ripple, range, Markov chains).
- Design concrete dams (gravity and hollow gravity) and earthfill and rockfill dams, including stability and seepage analysis.
- Design the associated intake, diversion, and control structures for a dam project.

6. COMPETENCES

ABET-1) An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics. (Usage)

ABET-2) An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors. (Usage)

7. TOPICS

Unit 1: Hydrologic Cycle and Water Balance (5 hours)	
Competences Expected: ABET-1	
Topics	Learning Outcomes
• Hydrologic cycle and water balance concepts • Precipitation measurement and analysis • Evaporation and evapotranspiration estimation • Infiltration theory and rainfall-runoff processes	• Explain the hydrologic cycle and quantify water balance components [Familiarity] • Analyze precipitation data and develop depth-area-duration relationships [Assessment] • Estimate evaporation and evapotranspiration using empirical methods [Usage] • Apply infiltration models to estimate runoff from rainfall events [Assessment]
Readings : [ChowMaidmentMays1988], [Loucks2017]	

Unit 2: Surface Hydrology and Watershed Modeling (4 hours)	
Competences Expected: ABET-1	
Topics	Learning Outcomes
• Hydrograph analysis and unit hydrograph method • Watershed modeling and hydrologic simulation • Streamflow measurement and gauging techniques	• Derive unit hydrographs and synthesize runoff hydrographs [Usage] • Develop watershed models using software tools for hydrologic simulation [Usage] • Conduct streamflow measurements and interpret flow duration curves [Assessment]
Readings : [ChowMaidmentMays1988], [Loucks2017]	

Unit 3: Flood Frequency Analysis and Climate Change (3 hours)	
Competences Expected: ABET-1	
Topics	Learning Outcomes
• Flood frequency analysis and design storms • Hydrologic routing methods for channels and reservoirs • Climate change impacts on hydrologic systems	• Perform flood frequency analysis using statistical methods [Assessment] • Route flood hydrographs through channels and reservoirs [Usage] • Evaluate climate change impacts on watershed hydrology and design implications [Assessment]
Readings : [ChowMaidmentMays1988], [Loucks2017]	

Unit 4: Design of Hydraulic Structures (66 hours)	
Competences Expected: ABET-2	
Topics	Learning Outcomes
• Dam types and selection criteria • Spillway hydraulics and design • Weir and gate flow equations • Energy dissipation and stilling basin design • Culvert hydraulics and design • Dam safety analysis and risk assessment • Outlet works and control structures • Fish passage facilities and environmental hydraulics • Cavitation analysis and prevention • Physical hydraulic modeling and scale effects	• Classify dam types and select appropriate configurations for site conditions [Familiarity] • Design spillways for flood discharge capacity [Assessment] • Calculate discharge over weirs and through gates [Usage] • Proportion energy dissipation structures and stilling basins [Assessment] • Analyze culvert hydraulics for inlet and outlet control [Usage] • Perform dam safety evaluations and hazard classification [Assessment] • Design outlet works including intake structures and conduits [Usage] • Incorporate fish passage requirements in hydraulic structure design [Assessment] • Evaluate cavitation potential and design preventive measures [Usage] • Interpret physical model results and apply scale corrections [Assessment]
Readings : [Novak2007], [USBR1987]	

8. WORKPLAN

8.1 Methodology

Individual and team participation is encouraged to present their ideas, motivating them with additional points in the different stages of the course evaluation.

8.2 Theory Sessions

The theory sessions are held in master classes with activities including active learning and roleplay to allow students to internalize the concepts.

8.3 Practical Sessions

The practical sessions are held in class where a series of exercises and/or practical concepts are developed through problem solving, problem solving, specific exercises and/or in application contexts.

9. EVALUATION SYSTEM

***** EVALUATION MISSING *****

10. BASIC BIBLIOGRAPHY