

CIVE 514 – HYDRAULIC STRUCTURES

Spring 2018

Tuesdays & Thursdays, 11:00am – 12:15pm; Engineering B105

SYLLABUS



[Illustrated is flow in two of the three spillways of Guri Hydroelectric Project, Caroni River, Venezuela. The spillways have aeration ramps and flip buckets. This photo shows the resulting free-jet profile and the associated plunging jet. Note the use of concrete gravity and earthfill portions of the overall dam.]

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OFFICE HOURS: Tuesday & Thursday: 10:00am –11:00am

DESCRIPTION: Hydraulic structures can be defined broadly as structures designed to handle water in any way – retention, conveyance, control, regulation, mixing and energy dissipation. Such structures are required in all facets of water engineering; the principal facets being water quantity management (flood control, water supply, hydropower, irrigation and drainage, navigation, environmental and recreation use), water-quality management, thermal-power generation, and aspects of road and rail transportation. To ensure that a hydraulic structure functions as required entails the design application of equations based on continuity, momentum and energy principles coupled with useful notions about the mechanical behavior of construction materials, notably concrete, various metals and soils.

OBJECTIVE: This course seeks to present design considerations and procedures regarding the form and function of many types of hydraulic structure. The application of basic principles is intended to be sufficiently rigorous and practical that students will gain a working knowledge of the basic procedures used in the design of hydraulic structures. While this course examines the “how” aspect of hydraulic structures, it emphasizes the “why” aspect; e.g., in the design of multi-purpose reservoirs and bridge waterways. It is only through this insightful approach that the engineer can properly determine the merits of a proposed design for a specific application.

TEXTBOOK: In addition to using various freely available on-line articles, this course will use *Hydraulic Structures*, by P. Novak et al., pub'd by Taylor & Francis, 2007. Additional reading resources will be provided during the course.

CONTENT: Techniques, methodologies and guidelines used by engineers designing hydraulic structures for various water-engineering purposes.

Specific topics include:

1. Our “water planet,” infrastructure development in watersheds and coastal regions
2. Powerful basic hydraulic engineering principles
3. Design for water-quantity management
 - Flood control
 - Water demand
 - Hydropower
 - Environment
4. Selection of dam type
5. Spillways and energy dissipation
6. Outlet works
7. Tunnels and large-diameter pipes
8. Levees and by-pass channels
9. Bridge waterways
10. Pump stations
11. Design for water-quality management
 - Diffuser manifolds
 - Marine outfall systems
12. Cooling towers
13. Inland navigation
14. Hydraulic modeling (laboratory and numerical)

HOME WORK: Homework will be assigned throughout the course. Every assigned problem will be graded. Homework submissions are to be individual or specified group depending on assignment.

GRADING:	Homework	40%
	Mid-semester test	25%
	Participation	10%
	Final Exam:	<u>25%</u>
	TOTAL	100%