

# **CIVE 571 Pipeline Engineering and Hydraulics**

**Spring Semester 2018: MWF 1:00 pm, Engineering Room B4**

America's infrastructure includes millions of miles of buried pipelines to convey water, wastewater, oil and gas, and other industrial fluids. The engineering and management challenges posed by this extensive infrastructure provide job opportunities across several industries. The course prepares students for these jobs by an integrated presentation about pipeline hydraulics, water quality, planning, engineering and life-cycle management. Source material is drawn from research into the principles of closed conduit hydraulics, network models, water quality in closed systems, internal and external corrosion of buried pipelines, and management systems. The major focus is water supply pipelines, with added topics from oil and gas and other pipeline sectors. Students in hydraulics, environmental, civil infrastructure, energy, geotechnical, and structures fields may benefit from the course and be qualified to work in consulting firms, utilities, regulatory agencies, and supplier firms for pipe systems and equipment.

## **Topics**

- Types of pipe and their functions
- Pipe system engineering (structural, construction, jointing)
- Flow and hydraulic principles of closed conduit hydraulics
- Network models for water flow and quality
- Hydraulic machinery and controls
- Hydroelectric energy systems
- Flow perturbations: water hammer, air pockets, intrusions, cross connections, I&I
- Chemistry and biology of fluid flows: emphasis on potable water
- Corrosion of pipelines: internal and external corrosion
- Asset management systems
- Monitoring and optimization of distribution system operations
- Assessment of pipe condition and performance
- Maintenance, renewal and repair, in-situ and trenchless technologies
- Failure modes and diagnosis
- Emergency management
- Aging, deterioration, and tuberculation
- Economics and planning of pipe systems
- Pipe industry organization
- Case studies and policy issues

**Instructor:** Neil S. Grigg, Department of Civil and Environmental Engineering.  
Textbook material will be drawn from instructor notes and recent research papers and web-based material from pipeline industries and research organizations.

## **Course materials and information on textbook**

You are not required to buy any textbooks. Rather than a standard textbook, the class draws from many sources and topics, which are integrated on the powerpoint presentations, along with posting of up-to-date documents and references to websites. Text material will be drawn from instructor notes and recent research papers and web-based materials from the pipeline industry. I have hundreds of the latest reports to draw from on many different topics.

**Pipeline engineering and management.** I consider this topic to include a wide span of topics on both engineering and management. For example, pipeline network layout and design are mainly engineering topics, but asset management to provide maximum life cycles is a management topic. I published a book on the management topics, entitled: “Water, Wastewater, and Stormwater Infrastructure Management, Second Edition 2nd Edition.” Sometimes students purchase books like this through Amazon for their libraries, but you will receive all of the material digitally and there is no need to buy the book.

**Pipeline hydraulics.** The hydraulics portion of the course is like a mini-course on closed conduct hydraulics, as opposed to open channel hydraulics. There are some good books on pipeline hydraulics and one I draw from extensively is “Hydraulic Engineering, 2nd Edition” by John A. Roberson, John J. Cassidy, and M. Hanif Chaudhry. This book is dated but it is still very good. You do not need to purchase it, but sometimes students want to have a book like this their libraries.

I'll be adding much more material to these, and if you would like more detail on any of these let me know.

## Course procedures

This is a 500-level course of the Department of Civil and Environmental Engineering, open to graduate and advanced undergraduate students. Because civil engineers and public administrators deal with many infrastructure management issues, this course has broad coverage rather than depth in a single technical area. Because of its emphasis on real situations, case studies are used along with new lecture material. In addition to cases presented by the instructor, students prepare and present cases to the class.

Rather than having a standard textbook, the class draws from many sources and topics, which are integrated on the powerpoint presentations, along with posting of up-to-date documents and references to websites. Canvas will be used to post all lecture material, assignments, and other information. I will try to post each day's lecture by noon of the day of class.

Distance students view each day's lecture and complete all assignments. The only difference between distance and in-class students is actual attendance in the classroom.

### ***Grading procedures***

Grading weights are:

50%	Hour exams (3 mid-terms)
30%	Homework, including class paper (25% of homework grade)
20%	Final exam

I give a tentative grade on the last day of class (based on exams at 62.5% and homework/paper at 37.5%). Students can accept the grade or take the option of taking the final exam to try to improve it.

Students are expected to perform as professionals in the class. This means they should attend, express interest, ask questions, and behave as they would in a business environment.

### **Academic Integrity**

Colorado State University takes academic integrity seriously and requires that no one will use another's work as their own. Of course, academic integrity means more than just avoiding plagiarism. It also involves doing your own reading and studying. It includes regular class attendance, careful consideration of all class materials, and engagement with the class and your fellow students. Any violation of academic integrity will be addressed according to university procedures.