ENGI 8673 Subsea Pipeline Engineering

Lecture 01 – Course Introduction
Course Learning Objectives

• Students will be able to:
  • Develop an understanding of fundamental engineering principles for the design, construction and operation of offshore energy pipeline transportation systems.
  • Conduct stress and strain based design procedures, focused on mechanical integrity, using international codes and standards.
  • Conduct pipeline/soil interaction analysis with application to standard design practice and examination of special topics.
Goals – Engineering Knowledge

• Overview Pipeline Engineering
  • Introduction to Pipeline Systems
  • Route selection, engineering surveys and subsea geotechnical engineering
  • Pipeline thermal and hydraulic analysis; Flow assurance
  • Linepipe fabrication; Materials selection
  • On-bottom stability and vortex induced vibrations
  • Bottom roughness
  • Installation and shore approach
  • Intervention and repairs
Goals – Engineering Design Practice

• Mechanical Design
  • Codes and standards
  • Stress based and limit states design approaches
  • Pressure containment and thermal expansion
  • Combined loads – Load and displacement control
  • Collapse and propagation buckling
Goals – Engineering Design Practice

• Pipeline/Soil Interaction Analysis
  • Thermal expansion, settlement, terrain roughness, upheaval and lateral buckling
  • Analytical methods including closed-form and approximate solutions
  • Structural and continuum finite element methods
Goals – Computational Methods

• Use of common engineering tools for communications and reporting
  • Word, Excel, PowerPoint

• Use of specialized engineering tools for analysis and design
  • Matlab
  • Finite element methods (e.g. ABAQUS)
Course Information

- Syllabus, Lecture Notes and Information
  - www.engr.mun.ca/~spkenny/Courses
- Office Hours
  - Mon., Tues, & Thu. 9am – 1pm
- Contact Information
  - www.engr.mun.ca/~spkenny/Contact
## Planned Course Outline

- **Introduction** [1 Lecture]
- **Pipeline Route Selection** [1 Lecture]
- **Flow Assurance** [1 Lecture]
- **Materials Selection** [3 Lectures]
- **Mechanical Design** [15 Lectures]
- **Pipeline/Soil Interaction** [5 Lectures]
- **Installation** [3 Lectures]
- **Intervention and Repair** [2 Lectures]
- **Special Topics** [3 Lectures]
# Course Evaluation

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Notes</th>
<th>Due Date</th>
<th>Grade (%)</th>
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<tr>
<td>Assignments</td>
<td>• 4 staggered over term</td>
<td>• Feb. 9</td>
<td>5</td>
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<td></td>
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<td>• Feb. 26</td>
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<td>• Mar. 16</td>
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<td>• Apr. 2</td>
<td>5</td>
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<tr>
<td>Term Project</td>
<td>• Proposal</td>
<td>• Feb. 5</td>
<td>5</td>
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<td></td>
<td>• Interim Status Report</td>
<td>• Mar. 5</td>
<td>5</td>
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<tr>
<td></td>
<td>• Final Report</td>
<td>• Apr. 6</td>
<td>20</td>
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<tr>
<td>Final Exam</td>
<td>• Open notes</td>
<td>• Date TBD</td>
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Course Perspective

• Lecture Notes
  • Complements available resources
  • Engage critical thinking and student learning
  • Taking additional notes recommended

• Educational and Professional Development
  • Facilitated by course material
  • Student ownership is fundamental
Resources

• Textbooks
Resources (cont.)

• Conferences
  • Offshore Technology Conference
  • International Society of Offshore and Polar Engineers
  • Offshore Mechanics and Arctic Engineering
  • International Pipeline Conference

• Journals
  • Offshore Mechanics and Arctic Engineering
  • Petroleum Technology
  • Pipeline Integrity
  • Pressure Vessel and Piping Technology
  • Transportation Engineering

• Available from QE II Library and CISTI Library
Resources (cont.)

- Industry Magazines
  - Oil and Gas Journal
  - Offshore
  - Offshore Engineer
    - http://www.offshore-engineer.com/
  - Pipeline and Gas Technology
    - http://www.pipelineandgastechnology.com/
  - World Pipelines
    - http://www.hydrocarbonengineering.com/Pipelines/WP_home.htm
Course Schedule

• Lectures
  • Day:  Mon., Tue. & Thu.
  • Time:  0100-0150
  • Room:  EN2050
Assignments

• Work Scope
  • 4 assignments
  • Available on course website
  • Due in class
  • Late assignments -50%

• Objectives
  • To advance critical thinking and problem solving skills
  • To demonstrate comprehension of course material by solving assigned problem sets
Term Project – Work Scope

• Work Scope
  • Desktop study
    • Topic of interest related to offshore pipeline systems
    • Topic and work scope must be approved by instructor

• Feedback and Learning
  • Proposal
  • Interim report
  • Final report
Term Project

• Objectives
  • Obtain improved technical knowledge and engineering skills on a topic of interest, within the course work scope, on offshore pipeline systems
  • Develop critical thinking skills
    • Synthesize and assess a topic of interest within current engineering practice
    • Not a simple compilation of literature
    • Not a graduate studies thesis
  • Demonstrate learning objectives have been achieved through submission of an engineering report