The intent of this Course is to provide the student with a comprehensive overview of the many and varied activities that are involved in developing and maintaining a pipeline infrastructure to transport hydrocarbons in a cost effective manner. The lecture material will be presented in a logical sequence of several blocks covering elements of design, hydraulics, mechanical and geotechnical design, construction and operation and maintenance. While the subject matter is wide ranging, the learning objectives will be to provide a sound understanding of the underlying engineering principles in each area and, illustrate how they are linked to produce a total life cycle approach to system design and operation. Hence most of the major engineering disciplines will be touched upon during the course. The topics to be covered are listed below.

**Elements of Design**
- Function and types of Pipeline Systems for Liquid/Gas/Multi-phase flows; Gathering, Transmission, and Distribution systems.
Hydraulics

- Pipeline packing; Heat transfer to surroundings; Pressure Drop calculations for single and looped lines.
- Types of compressors, Thermodynamics of polytropic compression, gas cooling, Centrifugal compressor performance curves.
- Hydraulic gradient, Types of pump, Fan laws, NPSH, Cavitation. Entry and exit losses
- Internal coating, drag reduction additives, cost comparisons.

Mechanical/Geotechnical Design

- Material Selection, HDPE, Aluminum, low carbon steels. Sour Service considerations, low temperature toughness requirements, fracture resistance calculations, weldability.
- High Strength steels, significance of Y/T, post yield behaviour, constructability considerations. Weld strength over/under matching.
- Pipe manufacturing techniques, Seamless, ERW, Spiral, UOE. Common material testing
- Codes and Standards
  Pressure, thermal and combined loads, Pipe design methods (1) Working stress design, (2) Strain Based design, (3) Limit States Design.
- Above and below ground design considerations, Pig launchers and receivers
  Buoyancy calculations, Wheel loads, Road and rail crossings. Casing design, pull through loads for directional drilling.
- Slope stability, surface drainage and ground movement monitoring.
- External coatings selection. Cathodic Protection and design of ground beds.

Construction

- The construction sequence for large pipe, clearing grading, trenching, stringing, welding etc; and for smaller pipe ploughing, joining techniques for HDPE and Aluminum pipe reels, explosive joining etc; Right of way calculations, salvage.
- Automatic welding techniques single and dual tandem,
- Ultrasonic and radiographic inspection, records keeping. As built drawings and Alignment sheets. Hydrostatic testing, purging and commissioning of equipment. Ground bed Installation.

Operating and Maintenance

- Planned Maintenance Strategies, Reliability Centred Maintenance, Supply Chain management, Life cycle calculations including abandonment.
  Pipeline pigging. Repair methods.

FORMAT and DELIVERY
The lecture material would be supplemented by the use of Videos and PC based computer programs. The course is offered over three days (16- 18 hours of teaching). The course can be taken for ½ graduate class credit providing assignments and exams are completed over a one month duration after the lectures have been completed.

TEXTBOOK:
The text for this course is “Pipeline Design and Construction – A Practical Approach”, 2nd edition ASME Press 2003. Notes will also be supplied covering the lectures.
**Registration form:** (fee in full must accompany this form)

**Course:** Fundamentals of Pipeline Design, Construction and Operation

**Date & Time:** Wednesday- Friday, June 15-17, 2005  8:30 to 16:30

**Location:** HAMILTON ROOM, BOW VALLEY SQUARE, CONFERENCE CENTRE, 3RD FLOOR, North Central Location on 3rd level Mezzanine, 240-4th Avenue, Calgary, Alberta

Individual Name: ________________________________________________

Company Affiliation: _____________________________________________

Preferred Mailing Address: ________________________________________

________________________________________________________________

Phone: ___________ Fax:_____________ E-Mail: ________________

Registration fee (includes textbook, lunch and 7% GST) =  $ 1640.00

Method of Payment (please circle):  
  - [ ] Cash  
  - [ ] Cheque  
  - [ ] VISA  
  - [ ] MC

Make checks payable to: Pipeline Engineering Center, Univ of Calgary

Card Number: __________________________  Expiry Date: _________
Card Holder Signature: __________________________
Card Holder Name: __________________________

Mail to:
Pipeline Engineering Center,
Department of Mechanical & Manufacturing Engineering University of Calgary, Calgary AB T2N 1N4

or

FAX Registration to: (403) 210-3440 (cover sheet not required)

For further information call (403) 220-5801 or email: wjshaw@ucalgary.ca

**Cancellation Policy** : PEC must be advised 7 days prior to start of class in order to obtain a full refund