It has been predicted that future offshore activity for the petroleum industry will emphasize subsea completion with full wellstream flow in much longer flowlines. Thus, an improved understanding of multiphase flow in wells, flowlines, and risers is of vital importance. **This course gives you that understanding!**

Fundamentals of two-phase flow in piping systems encountered in the production and transportation of oil and gas is the course’s focus. The completed and current research projects conducted at the Tulsa University Fluid Flow Project (TUFFP) permits teaching the latest techniques for designing multiphase flow systems.

**This course features . . .**

- An appropriate balance will be maintained between lectures and problem solving, and between theory and application.
- Problem-solving sessions are dispersed throughout the course to enhance the understanding of variables unique to two-phase flow.
- Computer algorithms are presented so that you will be able to develop your own programs upon completion of the course.
- You will receive the SPE monograph on “Multiphase Flow in Wells” and an extensive workshop manual.
- A “get acquainted” reception will be held Monday evening.
- A scientific calculator will be provided.

**This course if designed for . . .**


A familiarity with basic fluid mechanics and fluid properties is necessary. You should also be familiar with hydrocarbon systems vapor-liquid equilibrium and computer programming. No previous experience in two-phase flow is required.

**Date, Time and Location**

May 17-21, 2010 • Tulsa, Oklahoma

The University of Tulsa Campus

The short course is scheduled from 8:30 a.m. to 5:00 p.m. Monday-Thursday and from 8:30 a.m. to noon on Friday.

**HOTEL RESERVATIONS:** A list of hotels honoring a special rate for The University of Tulsa will be provided with your confirmation letter. Please make your reservations at the hotel of your choice as early as possible to ensure space & rate availability.

**Instructors**

**Dr. Cem Sarica,** Professor of Petroleum Engineering at The University of Tulsa (TU) holds a Ph.D. in Petroleum Engineering from TU. His current research interests are multiphase flow in pipes, oil and gas production, and flow assurance. He has authored several publications on these subjects. Since receiving his Ph.D. degree, he has worked for Istanbul Technical University (ITU) as an Assistant Professor of Petroleum Engineering, TU as the Associate Director of Tulsa University Fluid Flow Projects (TUFFP), and The Pennsylvania State University (PSU) as Associate Professor of Petroleum and Natural Gas Engineering in the Energy and Geo-Environmental Engineering Department. He is currently serving as the director of TUFFP and Tulsa University Paraffin Deposition Projects (TUPDP). He has taught several courses in multiphase flow in pipes, and oil and gas production at ITU, PSU, and TU.

**Dr. James P. Brill,** Professor Emeritus and Research Professor of Petroleum Engineering at The University of Tulsa (TU), is a recognized authority on behavior prediction and applications for multiphase flow in pipes and paraffin deposition. Since receiving a Ph.D. degree in Petroleum Engineering from the University of Texas, he has worked for Chevron Oilfield Research Company and Amoco Production Company’s Research Center, in addition to TU. He has numerous publications on multiphase flow and other areas of Petroleum Engineering and is co-author of the SPE Monograph on *Multiphase Flow in Wells* that serves as the primary text for the short course. At TU, he has been actively engaged in teaching, research, and consulting in multiphase flow, and is the founder and director emeritus of TUFFP.

**Enrollment Information**

To enroll, complete and return the attached enrollment form with your payment to: The University of Tulsa, Continuing Engineering Education, 800 South Tucker Drive, Tulsa, OK, 74104-3189, USA

**or fax to:** 918-631-2154

**or call:** 918-631-3088

**or Email:** cese@utulsa.edu

**or Online:** www.cese.utulsa.edu

Confirmation of enrollment will be sent to you by mail or FAX prior to the course.

**SEMINAR FEE:** The seminar fee covers the cost of all sessions, handout materials, textbook, workshop manual, TU Campus Visitor Parking Permit, reception and daily refreshments. The fee is to be paid in net U.S. dollars.

**MEMBER COMPANY DISCOUNT:** Available to those companies enrolled in TUFFP (Tulsa University Fluid Flow Projects) and TUPDP (Tulsa University Paraffin Deposition Projects).

**GROUP DISCOUNT:** Available to groups of two or more attending from the same company location.

All paid seminar fees will be refunded in the unlikely event the course is canceled. Those who cancel ten working days or less prior to the seminar will receive a refund less an administrative fee of $125. Refunds will not be granted after class has begun or for nonattendance. Substitutions are permitted at any time.

**Course Outline**

**Principles of Two-Phase Flow**

- Single-Phase Flow Review
  - Conservation laws
  - Mechanical energy balance equation
  - Heat balance equation
  - Evaluation of friction losses
- Two-Phase Flow Introduction
  - Definition of basic variables
  - Two-phase flow pressure gradient equation
  - Flow patterns
  - Computing algorithms

**Flow in Wells**

- Flow Pattern Prediction Modeling
- Pressure Loss and Holdup Prediction – Models and Correlations
- Evaluation of Pressure Loss Methods

**Flow in Pipelines**

- Flow Pattern Prediction Modeling
- Pressure Loss and Holdup Prediction – Models and Correlations
- Evaluation of Methods
- Effects of Hilly Terrain
- Slug Flow Modeling

**Flow Through Restrictions**

- Basic Equations
- Critical vs. Subcritical Flow
- Critical Flow Correlations
- Subcritical Flow Correlations

**Flow Assurance**

- Wax Deposition
  - Deposition Modeling
  - Prevention of Remediation
- Severe Slugging
  - Phenomena
  - Mechanisms
  - Elimination Methods
**Registration Form**

Please enroll the following in the May 17-21, 2010 • Tulsa, Oklahoma offering of FLUID FLOW PROJECTS: "TWO-PHASE FLOW IN PIPES" Short Course.

Name ______________________________________________________
Title ________________________________________________________
Company ___________________________________________________
Address _____________________________________________________
City___________________________________State_________________
Zip______________________ Country ___________________________
Phone (___________) _______________________________________
Fax (___________) ____________________________________________
Email _______________________________________________________

**TUFFP & TUPDP Member Company Fee Schedule:**
- $2,495 per person - regular tuition (net U.S. dollars)
- $2,295 per person - group discount (net U.S. dollars)

**Non-Member Company Seminar Fee Schedule:**
- $2,895 per person - regular tuition (net U.S. dollars)
- $2,695 per person - group discount (net U.S. dollars)

**Method of Payment:**
- Check enclosed. Make payable to The University of Tulsa, CESE
- Charge my credit card.
  - VISA
  - MasterCard
  - Discover
  - Am. Exp.

Card Number ______________________________________________
Expiration Date ____________________________________________

**Complete and send to:**
The University of Tulsa, CESE
800 South Tucker Drive, Tulsa, OK  74104-3189 USA
or FAX to: 918-631-2154 or CALL: 918-631-3088
or EMAIL: cese@utulsa.edu
Enroll on-line! www.cese.utulsa.edu

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**What is TUFFP?**
The Tulsa University Fluid Flow Projects (TUFFP) is a cooperative industry-university research group supported by more than 15 oil and gas production, service companies and government agencies from 10 countries. The group was formed January 1, 1973, to conduct applied research on fluid flow problems encountered by the member firms. Research is supported by $800,000 annual membership fees. Most of the current research projects involve experimental studies of multiphase flow in pipes. Short courses on the design of two-phase flow in piping systems for oil and gas production and transportation are among the services offered by TUFFP to member and nonmember firms.

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**Instructors:**
- Dr. Cem Sarica
- Dr. James P. Brill

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"This was a very informative, extensive and enriching course that has already given me ways to improve my work." - R. Lehigh, Senior Operations Engineer, Williams Exploration & Production

"An excellent short course providing the background to problem solving techniques to use state-of-the-art models to resolve your multiphase flow issues and understand the limits of the solutions." - K. Lehigh, Senior Process Engineer, ExxonMobil

"This course offers the attendee a unique opportunity to learn the fundamentals of multiphase flow technology from the industry experts who develop the technology." - R. Sacco, Technical Consultant, Marathon Oil

"Opens the two phase blackbox to fully understanding the phenomena involved." - E. Solano, SIMSCI Tech Support, Invensys Process Systems