

Announcing the 42nd offering of

FLUID FLOW PROJECTS

"TWO-PHASE FLOW IN PIPES"

Instructors

Dr. Cem Sarica
Dr. Eduardo Pereyra



THE UNIVERSITY of
TULSA
*Continuing Education for
Science & Engineering*

A STATE-OF-THE-ART

SHORT COURSE

May 15-19, 2017

TULSA, OKLAHOMA

Doubletree Hotel, 6110 S. Yale, 918-495-1000

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.

Off-shore activity for the petroleum industry emphasizes subsea completions with full wellstream flow in much longer flowlines than in other areas. Therefore, an improved understanding of multiphase flow in wells, flowlines, and risers is of vital importance to engineers and industry professionals. **This short course focuses on the fundamentals of two-phase flow in piping systems encountered in the production and transportation of oil and gas.** The completed and current research projects conducted at the **Tulsa University Fluid Flow Project (TUFPF)** permits teaching the latest techniques for designing multiphase flow systems.

ABOUT THE INSTRUCTORS

DR. CEM SARICA, F.H. "Mick" Merelli/Cimarex Energy 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. 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 (TUFPF), 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 TUFPF, Tulsa University Paraffin Deposition Projects (TUPDP) and Tulsa University Horizontal Well Artificial Lift Projects (TUHWALP). He is the recipient of the 2010 SPE International Production and Operations Award, recognized as a Distinguished Member of SPE in 2012. Cem received the SPE John Franklin Carll Award and SPE Cedric K. Feguson Certificate in 2015.

DR. EDUARDO PEREYRA, Assistant Professor of Petroleum Engineering and Associate Director of Fluid Flow and Horizontal Wells Artificial Lift Projects at The University of Tulsa. He also has worked as a research scientist intern at Chevron's advanced production technology / subsea technology unit focusing conventional separators performance. During that time, Dr. Pereyra worked on multiphase systems integration which involved consulting on multiphase transport, facilities design and multiphase flow metering systems. His research interests are multiphase flow systems and transport, flow assurance, and separation technologies. He received his Ph.D. and Master's degree in petroleum engineering from The University of Tulsa and two BS degrees (Mechanical and Systems Engineering) from The University of Los Andes, Merida Venezuela.

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

PVT PROPERTIES

- Mass Transfer Models
 - Black oil model
 - Compositional model
- Density of Oil, Water, Gas
- Viscosity of Oil, Water, Gas, Emulsions
- Surface Tension

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

UNIFIED MODELING

- Model Development
- Model Evaluation

FLOW ASSURANCE

- Wax Deposition
 - Deposition Modeling
 - Prevention and Remediation
- Severe Slugging
 - Phenomena
 - Mechanisms
 - Elimination Methods

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 at the end of class;
- Tour TU's North Campus Multiphase Flow and Flow Assurance Experimental Test Facilities;
- A scientific calculator will be provided.

This course is designed for . . .

Systems Engineers, Process Engineers, Operations Engineers, Facilities Engineers, Reservoir Engineers, Production Engineers, Petroleum Engineers, Flow Assurance Engineers, Technical Consultants, Chemical & Mechanical Engineers, and anyone who handles multiphase flow systems.

Course Pre-Requisites

No experience in two-phase flow is required. Participants should be familiar with basic fluid mechanics and properties; along with hydrocarbon systems vapor-liquid equilibrium and computer programming.

WHAT THEY SAY ABOUT US

"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. Sutton, Sr. Technical Consultant, Marathon Oil

"I gained many useful tools and insights about multiphase flow from this course that will be beneficial to me in my job."

— R. Russell, Sr. Project Engineer, Baker Hughes, Inc.

"The course is very well organized and I now have a much deeper understanding of multiphase flow. The course clarifies the theories behind software interface."

— S. Cai, SGS Upstream Services

WHAT IS TUFFP ?

The **Tulsa University Fluid Flow Projects (TUFFP)** is a cooperative industry-university research group supported by oil and gas production, service companies and government agencies. TUFFP conducts applied research on fluid flow problems encountered by the member firms. Most of the current research projects involve experimental studies of multiphase flow in pipes. This short course 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 both member and nonmember firms.

Doubletree Hotel, 6110 S. Yale, 918-495-1000

HOTEL RESERVATIONS: A block of sleeping rooms has been reserved at the hotel for participants attending this course needing overnight accommodations. Contact the hotel directly at 1-800-801-1317, and specify you are with TU Flow in Pipes Short course. To receive the discounted group rate of \$97, reservations must be made before April 17, 2017.



FLUID FLOW PROJECTS

SHORT COURSE "TWO-PHASE FLOW IN PIPES"

Yes! Please enroll the following in the **May 15-19, 2017**, Tulsa, Oklahoma offering of **FLUID FLOW PROJECTS: "TWO-PHASE FLOW IN PIPES" Short Course**

FIRST NAME	LAST NAME		
<input type="text"/>	<input type="text"/>		
JOB TITLE			
<input type="text"/>			
ORGANIZATION / COMPANY NAME			
<input type="text"/>			
ADDRESS			
<input type="text"/>			
CITY	STATE	ZIP	COUNTRY
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PARTICIPANTS PHONE			
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PARTICIPANTS EMAIL			
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COURSE FEE SCHEDULE

Online Registration available at www.cese.utulsa.edu (credit card payments only)

SELECT ONE — fees listed are per person and in net US Dollars:

TUFFP & TUPDP Member Company per person fees:

- \$2,595.00** ... **GROUP DISCOUNT** (available to 3 or more from the same company)
- \$2,595.00** ... **EARLY REGISTRATION DISCOUNT** (expires April 17, 2017)
- \$2,795.00** ... **REGISTRATION FEE AFTER APRIL 17, 2017**

Non-Member Company per person fees:

- \$2,995.00** ... **GROUP DISCOUNT** (available to 3 or more from the same company)
- \$2,995.00** ... **EARLY REGISTRATION DISCOUNT** (expires April 17, 2017)
- \$3,295.00** ... **REGISTRATION FEE AFTER APRIL 17, 2017**

PAYMENT METHOD

- CHECK ENCLOSED** Make payable to The University of Tulsa, CESE
- VISA** **MasterCard** **Discover** **American Express**

CREDIT CARD NUMBER	EXP. DATE (MO./YR.)	CVC CODE	
<input type="text"/>	<input type="text"/>	<input type="text"/>	
NAME ON CARD			
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BILLING ADDRESS			
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CITY	STATE	ZIP	COUNTRY
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To enroll, complete and return the enrollment form with payment to:

The University of Tulsa – CESE

800 S. Tucker Dr., Tulsa, OK 74104-3189

Fax: 918.631.2154

Phone: 918.631.3088

Email: cese@utulsa.edu

Online registration: cese.utulsa.edu

(credit cards only)

SEMINAR FEE

The seminar fee covers the cost of all sessions, handout materials, textbook, electronic workshop manual, guided tour of TU's experimental facilities, 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

Group discounts are available to groups of two or more attending from the same company location.

EARLY ENROLLMENT

Sign-up for the short course before April 17, 2017 to receive the discounted rate.

"Sarica's knowledge in multiphase flow is unsurpassed."

— D. Dimattia, Process Eng. Advisor, ExxonMobil

"An excellent short course on problem solving techniques to resolve your multiphase flow issues and understand the limits of the solutions."

— K. Leigh, Sr. Process Engineer, Chevron

"This course shows the pros and cons of many different models used in two-phase flow calculations."

— J. B. Huff, Engineer I, EOG Resources



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