

## ANNOUNCEMENTS

### A SHORT COURSE

on

### AN INTRODUCTION TO APPLIED NONLINEAR DYNAMICS—BIFURCATIONS, FRACTALS AND CHAOS IN HEAT TRANSFER AND FLUID FLOW

*Hosted by*

Swiss Federal Institute of Technology (ETH), Zurich, Switzerland

*10–11 March 1994*

The intention of this course is to give practising engineers a working knowledge of recent advances in nonlinear dynamics, including: static and dynamic bifurcations, fractals and chaos theory. While the theory of nonlinear dynamics is generic and has many practical applications, the examples to be given will stress heat transfer and fluid flow technology.

This course does not assume that the participants have any prior knowledge of nonlinear dynamics. It will be taught by Professors R. T. Lahey Jr (Rensselaer Polytechnic Institute) and J. J. Dorning (University of Virginia) who are specialists in the field.

For further information contact:

**Professor G. Yadigaroglu**  
ETH-Zentrum/CLT  
8092 Zurich  
Switzerland  
*Tel.* +41-1-632.4615  
*Fax:* +41-1-262.2158

---

## SHORT COURSES

on

### MULTIPHASE FLOW AND HEAT TRANSFER: BASES, MODELING AND APPLICATIONS IN (A) THE NUCLEAR POWER INDUSTRY AND (B) THE PROCESS INDUSTRIES

*Hosted by*

Swiss Federal Institute of Technology (ETH), Zurich, Switzerland

*14–18 March 1994*

These modular courses feature coordinated, comprehensive series of lectures by experts and are of interest to practising engineers and to researchers who wish to obtain a condensed and critical view of present basic knowledge, modeling and numerical techniques (Part I). Information on the state-of-the-art regarding applications in specialized industries is provided in Parts IIA and IIB.

The courses aim at an interdisciplinary transfer of knowledge. Applications cover nuclear and chemical plant safety (with an emphasis on severe accidents), advanced light water reactors, pipelines etc.

*The lecturers*

**S. Banerjee**, Professor at the Department of Chemical and Nuclear Engineering, University of California, Santa Barbara, U.S.A.

**M. L. Corradini**, Professor of Nuclear Engineering and Engineering Physics at the University of Wisconsin, Madison, U.S.A.

**G. Hetsroni**, Danciger Professor of Engineering at Technion—Israel Institute of Technology, Haifa, Israel.

**G. F. Hewitt**, Professor of Chemical Engineering at Imperial College, London, England.

**R. T. Lahey Jr**, Edward E. Hood Jr Professor of Engineering at Rensselaer Polytechnic Institute, Troy, NY and Director of the Center for Multiphase Research at RPI.

**G. Yadigaroglu**, Professor of Nuclear Engineering at the Swiss Federal Institute of Technology in Zurich (ETHZ) and Head of the Thermal-Hydraulics Laboratory at the Paul-Scherrer Institute, Switzerland.

*Contents of lectures***Part I. Bases** (3 days)

1. Introduction and basics
2. Basic equations
3. Flow regimes, pressure drop and void fraction
4. Phenomenological modeling: continuous flow
5. Phenomenological modeling: intermittent flow
6. Closure relationships
7. Two-phase heat transfer
8. Post-dryout heat transfer and rewetting
9. Numerical methods
10. The prediction of phase distribution and separation phenomena
11. Computer codes
12. Instabilities in two-phase flow

**Part IIA. Water Reactor Applications** (1½ days)

- 13A. LOCA phenomena
- 14A. Severe accidents
- 15A. Codes for transient and accident analysis
- 16A. Multiphase containment phenomena in advanced LWRs
- 17A. Steam generators
- 18A. Vapor explosions

**Part IIB. Process and Petroleum Industry Applications** (1½ days)

- 13B. Multicomponent evaporation and boiling
- 14B. Two-phase flow in pipelines
- 15B. Emergency relief system vent sizing
- 16B. Oil/water/gas flows: characteristics and measurement
- 17B. Dense gas and mist dispersions
- 18B. Vapor-cloud explosions

For further information contact:

**Professor G. Yadigaroglu**  
ETH-Zentrum/CLT  
8092 Zurich  
Switzerland  
*Tel.:* +41-1-632.4615  
*Fax:* +41-1-262.2158