

Course Code

PE08

Course Title

Geothermal Energy

Instructor

Dr. Serhat Akın



Professional Career

Dr. Serhat Akın is professor of Petroleum and Natural Gas Engineering at the Middle East Technical University (METU), Ankara, Turkey. He has served on the faculty since 1998. Prior to joining METU, Dr. Akın was a post-doctoral researcher and Blaustein Visiting Professor in Petroleum Engineering Department, Stanford University in 1996 - 1998 and 2006 respectively. He holds B.Sc., M.Sc. and PhD degrees from METU all in petroleum and natural gas engineering. His research interests include computerized tomography applications, image processing, EOR, reservoir and geothermal engineering. Dr. Akın received the Society of Petroleum Engineers Outstanding Technical Editor award three times in 2001, 2002 and 2004. He is an associate editor of the SPE Reservoir Evaluation and Engineering and an editorial board member in International Journal of Petroleum Science and Technology (IJPT), the Open Petroleum Engineering Journal and Turkish Oil and Gas Journal.

Course Objective and Description

This 5-day course provides a systematic approach for assessing the potential of geothermal energy. The course is structured around field case studies and background lectures in order to familiarize engineers with real life problems associated with the exploration, assesment and exploitation, optimal appraisal, development and operation of geothermal fields, and to provide a basis for management decisions. This course is designed for reservoir and production engineers working in the geothermal industry. Topics include:

- Types of Geothermal Systems
- Geological and Hydrological Considerations
- Geochemical Techniques
- Geophysical Techniques
- Assessment and Exploitation
- Case studies and histories

Who Should Attend

This course is designed for reservoir, production engineers and geologists working in the geothermal industry. It is anticipated that the participants would have at least a B.S. degree, or equivalent, in Petroleum Engineering. However many of the basic techniques used in geothermal studies will be described in sufficient detail for participants to obtain an understanding on the fundamentals behind the use of these techniques.

Prerequisite

Some basic engineering and geology would be useful but not essential.

Learning Level

Undergraduate to graduate level.

Duration

5 days

Course Material

The course material will consist of hard copies of the power point presentation plus and CD and copies of a number of important and relevant papers that will be discussed in the course.

Geothermal Energy

Course Outline

Day One

- Basic Concepts
 - o Heat transfer
 - Temperature, heat and Its storage
 - Heat Conduction
 - Fourier's Equation of Heat Conduction
 - Differential Equation of Heat Conduction
 - Heat Convection
 - Heat Radiation
 - Temperature Estimates in Some Simple Geological Situations
- Geothermal Systems and Resources
 - o Types of Geothermal Systems
 - Vapor-Dominated Geothermal Fields
 - Hot Water Geothermal Systems
 - Geopressed Geothermal Resources
 - Hot Dry Rock Geothermal Systems

Day Two

- Exploration Techniques
 - o Geological and Hydrological Considerations
 - Geothermal Resources Associated with Igneous Intrusions in the Upper Crust
 - Geothermal Regimes not Related to Young Intrusions
 - Choosing a Prospect Area
 - o Geochemical Techniques
 - Origin of Geothermal Fluids
 - Chemical Composition of Geothermal Fluids
 - Geothermometers
 - Na-K Geothermometers
 - Na-K-Ca Geothermometer
 - Silica Geothermometer
 - Mixing Models
 - Isotope Geothermometers
 - o Geophysical Techniques
 - Thermal Methods
 - Electrical Resistivity Methods
 - Electromagnetic Methods
 - Self-potential Method
 - Seismic Methods
 - Gravity Surveys
 - Magnetic Surveys
 - o Airborne Surveys
 - Aeromagnetic Investigations
 - Remote Sensing Techniques
 - Infrared Radiation and Atmospheric Transmission Windows
 - Infrared Aerial Surveys
 - Recent Remote Sensing Tools
 - Exploratory Drilling

Day Three

- Assessment and Exploitation
 - o Drilling Technology
 - Drilling with Mud
 - Drilling with Air
 - Well Spacing
 - Safety Measures
 - Repairing of Wells
 - Cyclic Production Behavior
 - Cutting Drilling Costs
 - o Reservoir Physics and Engineering
 - Subsurface Well and Reservoir Conditions
 - Temperature Measurements
 - Pressure Measurements
 - Flow Measurements
 - Pressure-Transient Analysis
 - Reservoir Modelling
 - Mathematical Modelling
 - Laboratory Modelling

Day Four

- Production Technology
 - o Wellhead Equipment
 - o Transmission of Hot Water
 - o Transmission of Steam
 - o Transmission of a Steam–Water Mixture
 - o Scale Deposition and Corrosion Control
 - o Scale Deposition Prevention Research
 - o Corrosion Control
- Environmental Aspects
 - o Physical Effects of Fluid Withdrawal
 - o Thermal Effects
 - o Chemical Pollution
 - o Biological Effects
 - o Noise

Day Five

- Case Study
 - o Geological and Tectonic Setting
 - o Surface Manifestations
 - o Geochemical Surveys
 - o Geophysical Measurements
 - Detection of Geothermal Anomaly
 - o Gravity and Magnetic Surveys
 - o Electrical Surveys
 - o Self-Potential Surveys
 - o Magnetotelluric Soundings
 - o Seismic Reflection Surveys
 - Hydrogeological Model
 - o Drilling
 - o Production
 - o Transportation of Steam
 - o The Power Plant
 - o Non-Electrical Uses
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Antalya, Turkey
24-28 May
US\$ 2,950

Istanbul, Turkey
22-26 Nov
US\$ 2,950
