Course Objective:

This course provides a complete review of all aspects of waterflood schemes being the most proven, lowest cost, and applicable to various types of reservoirs. The various steps of waterflood implementation include cursory screening of candidate fields, scheme planning, project design (including pilot design), and the estimation of the expected incremental oil recovery and production performance, using the most common analytical and numerical methods in the industry.

The different techniques used to monitor/evaluate the performance of waterflood projects and to optimize oil recovery, will be discussed. Numerous interesting case studies will be reviewed to illustrate the performance monitoring and optimization of waterflood projects from different parts of the world. Add-on schemes to improve oil recovery including, polymer and gas injection will be discussed. Class problems will be offered to the course attendees to emphasize the technical concepts. A detailed course hand-out in full colours; which is an excellent reference, will be provided.

Who Should Attend:

This course is aimed at reservoir, petroleum and exploitation engineers/technologists, and geologists who are involved in the area of Waterflooding and EOR schemes.

Course Instructor:

Mr. Saad Ibrahim, P. Eng, president of Petro Management Group Ltd. with over 30 years of diversified experience in the oil and gas industry. He is a worldwide highly recognized engineering consultant and a distinguished instructor (Please see his professional profile). Mr. Ibrahim is a member of APEGA and SPE.
Course Agenda:

Reservoir Characterization:

- A review the factors that can affect waterflood performance from worldwide projects
- Selective criteria to choose suitable candidate fields for EOR application
- Reservoir facies and heterogeneity (case study)

Reservoir Drive Mechanisms:

- Primary, secondary, and tertiary recovery schemes (case study)
- Performance characteristics of different reservoir drive mechanisms
- The use of reservoir drive indices to assess water injection requirement

Reserves Determination:

- Volumetric, material balance, and probabilistic methods (class problem)
- Decline analysis
- Empirical method (Russian method!)

Design and Planning of Waterflood Schemes:

- Review and screening of EOR schemes
- Timing start of waterflood projects
- Water injection requirement and control methods of injection volumes
- Waterflood displacement mechanism (fractional flow, Buckley Leverett)
- Scheme planning and design; including pilot design (case study)
- Application of Multi-stage frac Horizontal Wells (MFHW) in waterflooding of tight formations
- Factors that impact oil recovery
- Prediction of recovery efficiency, using Dykstra and Parsons, Stiles method and other empirical techniques
Add-on schemes including, polymer and gas injection (case study)
Illustration of “friendly-user” reservoir modeling/simulation to predict performance of waterflood projects.

Performance Monitoring Waterflood Schemes:

- Monitoring of pressure and VRR
- Bubble maps and various production/injection performance diagnostic graphs
- Use of PLT tools and tracer surveys (case studies)
- Well testing and the Hall Plot (class problem)
- Monitoring of the water quality and injectivity
- Water filter size determination

Economics:

- Production forecast
- Operating and capital costs
- Profitability Indices