Course on

Reservoir Simulation: Mathematical techniques in oil and gas recovery

(18-29 July 2016)

Indian Institute of Technology Guwahati
Guwahati 781039

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About the Course

Reservoir simulation has become a necessary tool for the petroleum engineers, geologists, and subsurface modelers to understand the recovery of hydrocarbon (or other fluids) in an efficient manner. With the advances in computing capabilities and the numerical methods, the complex geological systems and mixtures of fluids can be tracked and visualized using the scientific computations. Insights from these simulations are expected to help in managing the reservoir assets and making reliable predictions about production rates.

In this course the fundamental governing equations as well as the numerical techniques to discretize them will be covered. Simple linear algebra solvers will also be presented to enable building a simulator that can provide the hands-on implementation of ideas in reservoir management.

The course is organized in two modules that should be taken together. In the first module the fundamentals of reservoir simulation, discretization of governing equations and their solution techniques using linear algebra solvers will be presented. The single phase subsurface solver and well modeling will also be described. The second module will focus on reservoir simulation involving multiphase flow in porous media. Black oil, Compositional, non-isothermal reservoir simulations and upscaling in reservoir simulation will be taught in this module. For basic understanding of the reservoir simulation various problems will be taken up during problem solving sessions.

Modules	**A: Basics of Numerical Reservoir Simulation : July 18 - July 22, 2016** **B: Application of Reservoir Simulation and Advanced features : July 25 - July 29, 2016** **Number of participants for the course will be limited to fifty.**
You Should Attend If…	▪ you are an executive, engineer, researcher working in oil and gas industry and government organizations including R&D laboratories. ▪ you are geologist or geophysicist interested in learning the reservoir simulation methods. ▪ you are a student or faculty in chemical, petroleum, mechanical or civil engineering from academic institution interested in learning how to carry out petroleum reservoir simulation.
Fees	The participation fees for taking the course is as follows: **Participants from abroad : US $500** **Industry/ Research Organizations: Rs. 20000 for any of two modules; Rs. 30000 for both the modules** **Academic Institutions:** **Students: Rs. 1000 (Refundable, subjected to joining the course)** **Faculty : Rs. 10000** The above fee include all instructional materials, computer use for tutorials and assignments, laboratory equipment usage charges, 24 hr free internet facility. The participants will be provided with accommodation on payment basis.

Course schedule

Course duration (18-29 July 2016) - 28 hours contact time.

Module A: 18-22 July - 10 lectures + 2 tutorials (14 hours)
Module B: 25-29 July - 10 lectures + 2 tutorial (14 hours)
July 23rd and 29th : Course evaluation / examination

Course Outine

- Overview of petroleum engineering
- Introduction to reservoir simulation
- Single phase fluid flow equations
- Fundamentals of numerical discretization methods
- Discretization of flow equations in multidimensions
- Linear Algebra Solvers
- Single Phase Subsurface Flow Solver
- Grid generation and boundary conditions
- Well Modeling
- Fundamentals of Multiphase Flow through Porous Media
- Multiphase Flow Models
- Blackoil Reservoir Simulator
- Well modeling and treatment of boundary conditions
- Fundamentals of Compositional and non-Isothermal Reservoir Simulation
- Advanced Topics : Upscaling/Streamline Simulations/Near Wellbore Flow Physics
- Introduction to naturally-fractured reservoir modeling
- Introduction to discrete fracture network modeling
- Overview of unconventional reservoir engineering
- Overview of offshore petroleum reservoir geology and engineering concepts

The Faculty

Dr. Mayank Tyagi is designated Associate Professor at the Craft & Hawkins Department of Petroleum Engineering, Louisiana State University (LSU), Baton Rouge, USA. He also holds a joint appointment at the Center for Computation & Technology (CCT), LSU. Prof. Tyagi obtained his B.Tech. degree in mechanical engineering from IIT Kanpur and MS and PhD degrees in mechanical engineering from LSU, USA. His teaching interests are Reservoir Simulation, Numerical Methods, Well Design, Petroleum Fluid Properties, and Flow and Heat Transfer around Wellbores. His research interests include geothermal reservoir engineering, HPC applications for petroleum engineering systems, computational fluid dynamics (CFD), and quantitative risk assessment (QRA).

Dr. Anugrah Singh is Professor at the Chemical Engineering Department of IIT Guwahati. He received B.Tech. and M.Tech. degrees in Petroleum Engineering from the Indian School of Mines, Dhanbad and PhD in Chemical Engineering from the Indian Institute of Science, Bangalore. His teaching interests are Reservoir Engineering, Fluid Mechanics and Computational Fluid Dynamics. His research interests include computational and experimental fluid dynamics of multiphase systems.

Accommodation

Accommodation based on nominal charges (per day) will be available to all participants at IIT Guwahati campus. Student participants will be accommodated in boys / girls hostels. Participants from academic, R & D institutes and industry will be accommodated in IIT Guwahati guest house. Participants need to bear their own accommodation and food expenses. At hostels all arrangements such as bed, mattress, toiletries will be made available. For more information please contact the course coordinator.

Course Venue:

Centre for Educational Technology
Indian Institute of Technology Guwahati
Guwahati 781039

Important Information for Students

This is a 2 credit course but may also be taken as audit course. The students will obtain academic credits for this course based on the evaluation and grading process. The host Institute will only provide information on the grading system, subject syllabus and the academic policy. The home/sponsoring University/Institute of the student will be mainly responsible for transferring academic credits.

Participants will be provided registration kit and course material covering the entire course.

After successful completion of the course, all participants will get participation certificates along with grades and credits as per Institute norms. The students not opting for credit/audit will get only the participation certificate.

No TA, DA will be provided to the participants.

Course Co-ordinator

Prof. Anugrah Singh
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For course registration please visit
http://www.gian.iitkgp.ac.in/GREGN