TOUGH
Short Course

AGENDA

February 13~15, 2020

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Thursday, February 13, 2020

Morning Session

9:00 am *Welcome, Introduction , Safety*

9:15 am *Introduction*

- Modeling and Course objectives
- TOUGH history and applications

9:45 am *Computer Setup & Coffee Break*

10:00 am *Review of Multiphase Flow*

- Phases, components, phase transitions, governing equations, fluid and porous-medium properties, equation of state, non-isothermal and other processes

11:00 am *Break*

11:10 am *Continue: Review of Multiphase Flow*

12:00 pm *Working Lunch – Discussion of TOUGH in General*

Afternoon Session

1:00 pm *Numerical Methods in TOUGH*

- Integral finite difference method, space and time discretization, Newton-Raphson iterations, linear equation solvers, weighting schemes

2:00 pm *TOUGH Overview*

- Capabilities, code architecture, basic input and output concepts

2:30 pm *Break*

2:45 am *Building a TOUGH Model*

- Material properties (Problem 1a)
- Mesh generation (Problem 1b)

5:00 pm *Fractured Rocks*

5:30 pm *Adjourn*

6:00 pm *Working Dinner*

Friday, February 14, 2020

Morning Session

9:00 am *Continue – Building a TOUGH Model*

- Initial and boundary conditions (Problem 1c)
- Computational parameters (Problem 1d)
- Explore (e.g., Problem_OneElement, EOS 9 for problem 1, and comparison with EOS3)

(Coffee break between)

11:30 am *Examples of Tracer tests in Literature*

12:00 pm *Working Lunch – TOUGH3 features*

Afternoon Session

1:00 pm *Injection of CO_2 in a Saline Aquifer*

- Introduction to CO_2 sequestration related EOS
- Introduction to ECO2N
- Hands-on computer exercise (Problem ECO2N)
- Non-isothermal simulation
- Variable injection rate
- Permeability reduction due to salt precipitation
- Post-injection period: pressure recovery and phase redistribution
- Effect of relative permeability functions
- Introduction to hysteresis
- Hands-on computer exercises, including quick-and-dirty plotting with Excel

(Coffee break between)

5:30 pm *Adjourn*

Saturday, February 15, 2020

Morning Session

9:00 am *Model Tracer Tests in a Geothermal Reservoir*

- Introduction to EOS1 for modeling geothermal reservoir
- Hands-on computer exercise
- Problem variation

(Coffee break between)

11:30 am *Phase Change in a Non-isothermal Two-Phase, Two-Component System*

- Hands-on computer exercise (Problem PC)
- Primary variables, initialization, variable switching

12:30 pm *Working Lunch – General Discussion and Questions*