



AGENDA

April 11 ~ April 15, 2022

**Energy Geosciences Division
Lawrence Berkeley National Laboratory
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Instructors
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*Times are Pacific time, with potential to be adjusted based on the major of the participants region.

Monday, April 11, 2022

1:00 pm Welcome, Introduction, Safety

1:15 pm Introduction

- Modeling and Course objectives
- TOUGH history and applications

1:45 pm Computer Setup & Coffee Break

2:00 pm Review of Multiphase Flow

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

3:00 pm Break

3:10 pm Continue: Review of Multiphase Flow

4:00 pm Numerical Methods in TOUGH

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

5:00 pm Adjourn

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Tuesday, April 12, 2022

1:00 pm *TOUGH Overview*

- Capabilities, code architecture, basic input and output concepts

1:30 pm *Building a TOUGH Model*

- Material properties (Problem 1a)
 - Mesh generation (Problem 1b)
 - Initial and boundary conditions (Problem 1c)
- (Coffee break between)

5:00 pm *Adjourn*

Wednesday, April 13, 2022

1:00 pm *Continue – Building a TOUGH Model*

- Computational parameters (Problem 1d)
- Explore (e.g., Problem_OneElement, EOS 9 for problem 1, and comparison with EOS3)
- Q/A

3:00 pm *Fractured Rocks*

3:30 pm *Break*

3:45 pm *TOUGH3 features*

4:00 pm *Phase Change in a Non-isothermal Two-Phase, Two-Component System*

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

5:00 pm *Adjourn*

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Thursday, April 14, 2022

1:00 pm Injection of CO₂ in a Saline Aquifer

- Introduction to CO₂ 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)

5:00 pm Adjourn

Friday, April 15, 2022

1:00 pm Model Tracer Tests in a Geothermal Reservoir

- Introduction to EOS1 for modeling geothermal reservoir
 - Hands-on computer exercise
 - Problem variation
- (Coffee break between)

4:00 pm Q/A

6:00 pm Adjourn

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