PETE 7241 - Geomechanics with applications in Petroleum Engineering Problems

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Office Hours: TH 4:00-6:00, T 4:00-5:00
Class:
Midterm exam:

Course Description

The first part of the course deals with the fundamentals of rock mechanics. This includes theories of elasticity and failure mechanics, borehole stresses, and acoustic wave propagation. Fundamentals of the theory of poroelasticity will be explained. After that we will talk about methods for obtaining parameters that are relevant for rock mechanics field application, ranging from laboratory tests to borehole logs. In the last part of the course, we will discuss applications of rock mechanics in borehole stability, sand production, hydraulic fracturing and reservoir compaction/ reservoir subsidence.

Course References

[F] Petroleum Related Rock Mechanics by Erling Fjaer, Rune M. Holt, Per Horsrud, and Arne M. Raaen (Hardcover - Jan 1, 1992)
[BCZ] Bourbie, Coussy and Zinszner, Acoustics of porous media.
Outlines

Elasticity
- Strain
- Stress
- Constitutive Equations
- Elastic moduli

Poroelasticity
- Biot’s poroelastic theory for static properties
- The effective stress concepts

Failure Mechanics
- Basic concepts
- Compressive strength criteria
- Shear failure – Mohr-Coulomb criterion
- Failure criteria which depends on the intermediate stress

Some geological aspects of rock mechanics
- In-situ stresses
- Rock mechanical properties

Stresses around borehole, and borehole failure criteria
- Stresses around a borehole – general linear elastic solution
- Stresses around a borehole in a poroelastic formation
- Borehole failure criteria

Reservoir Compaction: Subsidence and well problems
- Elastic Modelling
  - Compaction of the reservoir
  - Stress changes in depleting reservoirs
- Consolidation Theory

(Optional) Sand Prediction
- What is sand production?
- Mechanisms for sand production
- Modelling for sand production

(Optional) Acoustic wave propagation in rocks
- The wave equation
- P- and S- waves
- Sound velocities in rock

Disability Services
If you have a disability that may have some impact on your work in this class and for which you may require accommodations, please see an advisor in the office of Disability
Services (112 Johnston Hall) so that necessary accommodations may be arranged. After you receive accommodation letters, please see the instructor as soon as possible to discuss the provisions of those accommodations.

**Misconduct/Dishonesty**
Any kind of misconduct and dishonesty will be reported to the department chair, the Dean of Engineering, and/or the Dean of students in writing. Then the case will be investigated by the university (Not by the instructor) and the students have the right to appeal to the university.