

**Environmental Engineering**

**and Earth Sciences**

**EEES Department Seminar**

**Integrating Subsurface Modeling and Monitoring for**

**Sustainable Geoenergy Futures**

PRESENTED BY

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**Abstract:**

Achieving a sustainable geoenergy future requires the safe and efficient use of the subsurface for a variety of applications, including geothermal energy, hydrogen storage, and geological carbon sequestration (GCS). This requires a deep understanding of subsurface processes, predictive modeling, and real-time monitoring to ensure environmental safety and system reliability. Among these, GCS has emerged as a critical strategy for mitigating climate change by securely storing CO₂ in deep saline aquifers.

This seminar will explore how integrating subsurface fluid flow simulation, coupled fluid-geomechanical modeling, and advanced fiber optic sensing can address key challenges in GCS and contribute to broader geoenergy applications. It begins by establishing the fundamentals of subsurface fluid flow simulation, emphasizing numerical modeling approaches for geological reservoirs. The discussion extends to coupled fluid-geomechanical simulations, essential for estimating reservoir deformation and ensuring long-term storage integrity. An integral component of the seminar is the application of distributed fiber optic sensing (DFOS) to monitor potential fractures induced by CO₂ injection, a key factor in preventing leakage and induced seismicity. Additionally, the migration of CO₂ contaminants into underground drinking water is examined, highlighting simulation-based risk assessments for groundwater protection. By integrating computational modeling with real-time monitoring, this work advances not only secure, large-scale CO₂ sequestration but also builds a foundation for broader subsurface resources management.

**3:30 PM**

**Monday, March 13, 2025**

**Rich Lab Auditorium**

***Attendance is highly recommended and encouraged.***