

Subsurface Energy Engineering (SEE)

SEE 398R Master's Report 3 Hours

Prepare a report to fulfill the requirement for the master's degree under the report option.

SEE 380 Topics in Subsurface Energy Engineering 3 Hours

SEE 381K Subsurface Water Management 3 Hours

Examine methods for treating, utilizing and disposing of water produced from the subsurface. Discuss the chemistry and engineering principles involved in water treatment and reinjection.

SEE 381L Nuclear Waste Storage 3 Hours

Introduction to engineering and science of nuclear waste storage and disposal with emphasis on geological methods. Review current methods and new solutions to safely dispose of radioactive waste resulting from nuclear energy generation.

SEE 381M Advanced Well Integrity 3 Hours

Focus on the unique challenges in the construction and integrity of special purpose wells, such as geothermal wells, carbon capture and underground storage (CCUS) wells, and nuclear storage and waste injection wells. Consider the entire lifecycle of these wells, from initial drilling and well construction all the way to their long-term plugging and abandonment. Explore how to maintain well integrity to prevent premature failure of geothermal wells, CO₂ leakage in CCUS wells, and nuclear and other waste leakage in waste injection/storage wells for an indefinite period.

SEE 382 Subsurface Energy Storage 3 Hours

Introduction to hydrogen, compressed air, and carbon storage in geological formations as well as review of ongoing projects and their relations to net-zero greenhouse emission targets. Discuss flow, transport, and geochemical interactions of different gases with site minerals. Gain insights and quantify storage capacity, deliverability, dissolution, trapping, and other loss mechanisms, using hands-on numerical simulation training and exercises.

SEE 382K Global Carbon Monitoring Systems 3 Hours

Introduction to the myriad of ways we measure global greenhouse gas emissions, from ubiquitous ground sensors to low-earth orbit satellites. Explore how new technologies are revolutionizing our ability to monitor global energy flows, track progress on emissions reduction goals, and enable new policy approaches to addressing climate change.

SEE 388 Data Analytics and Geostatistics 3 Hours

Examine fundamental probability and statistics to derive and demonstrate the fundamental deterministic and stochastic spatial modeling paradigms, including kriging, sequential Gaussian simulation, indicator methods, object-based processes, multiple point simulation and generative AI. Discuss uncertainty modeling, model diagnostics and checking, and decision making in the presence of uncertainty.

SEE 388K Applied Reservoir Simulation for Low-Carbon Energy Projects 3 Hours

Introduction to geothermal, hydrogen, and carbon capture-storage-utilization (CCUS) projects. Review the key physics, mathematics, and engineering for each process, such as thermal modeling, equation of state for gas projects, and storage and recovery mechanisms for CCUS. Focus on how to build a numerical model with geological description and proper gridding, fluid models based on the fluid types, and energy production mechanisms, followed by uncertainty analysis.

SEE 389 Legal and Technical Issues in Subsurface Trespass 3 Hours

Examine legal and technical issues related to subsurface trespass on state and federal lands. Discuss how courts define actionable subsurface trespass and explore the implications of fluid injections that cross property boundaries.

SEE 698 Thesis 6 Hours