

G E-GEOLOGICAL ENGINEERING

G E 2013 Introduction to Energy Resources 3 Credit Hours

Prerequisite: PHYS 2514; Co-requisite: PHYS 2524. Survey of energy sources including geothermal, fossil, solar, nuclear, wind, hydropower, and biomass. Addressing societal and environmental implications of different type of energy sources. (F, Sp)

G E 3212 Porous Media Characterization 2 Credit Hours

Prerequisite: MATH 2934, PHYS 2524, GEOL 1114, and P E 2113; Co-requisite G E 3221. Properties of porous media and the physical processes that controls and alters these properties. How to measure, analyze and interpret porous media properties. (F, Sp)

G E 3213 Porous Media Characterization 3 Credit Hours

Prerequisite: MATH 2934, PHYS 2524, GEOL 1114, and P E 2113; Co-Requisite: G E 3221. Properties of porous media and the physical processes that controls and alters these properties. How to measure, analyze and interpret porous media properties. (F, Sp)

G E 3220 GeoEnergy Engineering Internship 0 Credit Hours

Prerequisite: G E 2013. Full time Career-related work experience of at least eight weeks in the energy industry. The internship may also involve research with faculty members. (F, Su)

G E 3221 Porous Media Characterization Lab 1 Credit Hour

Prerequisite: None; Co-requisite: G E 3212. Laboratory experiments to understand and characterize porous media. (F, Sp)

G E 3313 Drilling and Well Construction 3 Credit Hours

Prerequisite: P E 3223 or concurrent enrollment, G E 3343, and P E 2153. Overview of well design and drilling engineering from surface to final depth, completion and abandonment for production and all six classes of injection wells. Topics include; casing design based on pore pressure and fracturing window, design cementing, selection of wellbore fluids for drilling and completion, and state of the art drilling equipment and processes. (F, Sp)

G E 3343 Applied Geomechanics 3 Credit Hours

Prerequisite: G E 3213, P E 2153, P E 3223, and GEOL 3003. Introduction to geomechanics. How to establish properties for rocks, subsurface stresses and pressures. Geomechanical analysis of subsurface energy applications. (F, Sp)

G E 3413 Production and Injection Systems 3 Credit Hours

Prerequisite: P E 3223, G E 3213, and P E 2153. Comprehension of well completion concepts leading to design for optimum well performance for injection and production wells. Applied understanding of the surface production systems and associated components. Included are flow assurance, surface facilities, separation, water and gas processing, pumps, compressors and flow meters. (F, Sp)

G E 3440 Mentored Research Experience 3 Credit Hours

0 to 3 hours. Prerequisites: ENGL 1113 or equivalent, and permission of instructor. May be repeated; maximum credit 12 hours. For the inquisitive student to apply the scholarly processes of the discipline to a research or creative project under the mentorship of a faculty member. Student and instructor should complete an Undergraduate Research & Creative Projects (URCP) Mentoring Agreement and file it with the URCP office. Not for honors credit. (F, Sp, Su)

G E 3513 Fluid Flow and Heat Transfer in Porous Media 3 Credit Hours

Prerequisite: G E 3213, P E 3223, and GEOL 3003. The course covers fluid flow and heat transfer in porous media including constitutive equations and modelling methods of transport processes through porous media. (F, Sp)

G E 3712 Energy Resource Economics 2 Credit Hours

Prerequisite: G E 2013. Application of engineering principles and economics to the evaluation/completion of energy projects, results of which to be used by regulatory agency and investors to value corporations. (F, Sp)

G E 3813 Formation Evaluation: Well Logs & Remote Sensing Methods 3 Credit Hours

Prerequisite: ENGR 2431, GEOL 3003, and G E 3213. Comprehension of various methods of formation evaluation. Application of logging tools, geophysical methods, and other sensing techniques to formation evaluation of sub-surface rocks. (F, Sp)

G E 3960 Honors Reading 1-3 Credit Hours

1 to 3 hours. Prerequisite: admission to Honors Program. May be repeated; maximum credit six hours. Consists of topics designated by the instructor in keeping with the student's major program. Covers materials not usually presented in the regular courses. (F, Sp)

G E 3970 Honors Seminar 1-3 Credit Hours

1 to 3 hours. Prerequisite: admission to Honors Program. May be repeated; maximum credit six hours. The projects covered will vary. Deals with concepts not usually presented in regular coursework. (Irreg.)

G E 3980 Honors Research 1-3 Credit Hours

1 to 3 hours. Prerequisite: admission to Honors Program. May be repeated; maximum credit six hours. Provides an opportunity for the gifted Honors candidate to work on a special project in the student's field. (F, Sp)

G E 3990 Independent Study 1-3 Credit Hours

1 to 3 hours. Prerequisite: permission of instructor and junior standing. May be repeated once with change of content. Independent study may be arranged to study a subject not available through regular course offerings. (F, Sp, Su)

G E 4553 GeoEnergy Capstone Design 3 Credit Hours

Prerequisite: G E 3513 and G E 3712 and G E 3813, or concurrent enrollment. Team based open ended capstone project in geoenery engineering. (F, Sp)

G E 4613 Carbon Capture, Utilization and Storage 3 Credit Hours

Prerequisite: G E 3513. CO₂ separation from syngas and flue gas for gasification and combustion processes. Transportation of CO₂ in pipelines and sequestration in deep underground geological formations or enhanced oil recovery. Comparison of options for geological sequestration in oil and gas reservoirs, deep unmineable coal beds, and saline aquifers. (F, Sp)

G E 4623 Energy Conversion and Storage 3 Credit Hours

Prerequisite: G E 2013 and P E 2213. Overview of thermal, mechanical, and hybrid chemical energy storage systems. Surface and subsurface storage technologies are addressed. (F, Sp)

G E 4633 Hydrogen Energy Systems 3 Credit Hours

Prerequisite: G E 2013, P E 2213, and P E 3223. Production of hydrogen from natural, hydrocarbon and renewable energy sources. Transportation, storage and utilization of hydrogen. (F, Sp)

G E 4713 Overview of Geothermal Energy 3 Credit Hours

Prerequisite: G E 2013, P E 2213, P E 3223, and GEOL 3003. Geothermal exploration, surface and downhole geothermal facilities. Overview of geothermal systems such as direct use and enhanced geothermal systems. (F, Sp)

- G E 4960 Directed Readings** **1-4 Credit Hours**
1 to 4 hours. Prerequisite: good standing in University; permission of instructor and dean. May be repeated; maximum credit four hours. Designed for upper-division students who need opportunity to study a specific problem in greater depth than formal course content permits. (Irreg.)
- G E 4970 Special Topics/Seminar** **1-3 Credit Hours**
1 to 3 hours. Prerequisite: Senior standing or permission of instructor. May be repeated; maximum credit nine hours. Special topics or seminar course for content not currently offered in regularly scheduled courses. May include library and/or laboratory research and field projects. (Irreg.)
- G E 4990 Independent Study** **1-3 Credit Hours**
1 to 3 hours. Prerequisite: Senior standing and permission of instructor. May be repeated; maximum credit nine hours. Contracted independent study for a topic not currently offered in regularly scheduled courses. Independent study may include library and/or laboratory research and field projects. (Irreg.)
- G E 5233 Geothermal Technologies** **3 Credit Hours**
(Crosslisted with P E 5233) Prerequisite: Graduate standing or permission of instructor. This course provides an overview of geothermal resources, applications, systems, surface facilities, wellbore design and completion in geothermal wells, fracture design for EGS systems, drilling challenges of deep geothermal application, well construction challenges in geothermal, and new advancements in numerical and experimental investigation of geothermal. Risk and failure analysis and economic analysis of geothermal systems are incorporated. (F)
- G E 5443 Formation Damage** **3 Credit Hours**
(Crosslisted with P E and GEOL 5443) Prerequisite: Graduate standing or permission of instructor. This course presents an overview of main mechanisms of formation damage (mechanical, chemical, thermal, and biological) occurring during subsurface applications, including but not limited to primary and enhanced hydrocarbon production, CO₂ storage, and geothermal processes. Existing theories explaining the process and methods to mitigate the formation damage will be discussed. (Irreg.)
- G E 5960 Directed Readings** **1-3 Credit Hours**
1 to 3 hours. Prerequisite: graduate standing and permission of department. May be repeated; maximum credit twelve hours. Directed readings and/or literature reviews under the direction of a faculty member. (F, Sp, Su)
- G E 5970 Special Topics/Seminar** **1-3 Credit Hours**
1 to 3 hours. Prerequisite: Graduate standing or permission of instructor. May be repeated; maximum credit nine hours. Special topics or seminar course for content not currently offered in regularly scheduled courses. May include library and/or laboratory research and field projects. (Irreg.)
- G E 5980 Research for Master's Thesis** **2-9 Credit Hours**
Variable enrollment, 2 to 9 hours; maximum credit applicable toward degree, four hours. (F, Sp, Su)
- G E 5990 Special Studies** **1-4 Credit Hours**
1 to 4 hours. Prerequisite: graduate standing in Geological Engineering. May be repeated with change of topic; maximum credit four hours. Supervised individual study or specialized research in geological engineering. (F, Sp)
- G E 6273 Advanced Rock Mechanics II** **3 Credit Hours**
(Crosslisted with P E 6273) Prerequisite: Graduate standing and instructor permission. Advanced topics related to petroleum and geothermal reservoir rock properties, constitutive models, rock fracture, and coupled processes in rocks and rock masses. Influence of stress, fluid pressure, temperature, and chemistry on rock properties and deformation in the context of drilling, reservoir stimulation, and induced seismicity. (Irreg.)
- G E 6960 Directed Readings** **1-3 Credit Hours**
1 to 3 hours. Prerequisite: graduate standing or permission of instructor. May be repeated; maximum credit six hours. Directed readings and/or literature review under the direction of a faculty member. (Irreg.)
- G E 6970 Special Topics/Seminar** **1-3 Credit Hours**
1 to 3 hours. Prerequisite: graduate standing or permission of instructor. May be repeated; maximum credit 12 hours. Special topics or seminar course for content not currently offered in regularly scheduled courses. May include library and/or research and field projects. (Irreg.)
- G E 6980 Research for Doctoral Dissertation** **2-16 Credit Hours**
2 to 16 hours. Prerequisite: Graduate standing and permission of instructor; may be repeated. Directed research culminating in the completion of the doctoral dissertation. (F, Sp, Su)
- G E 6990 Independent Study** **1-3 Credit Hours**
1 to 3 hours. Prerequisite: Graduate standing and permission of instructor. May be repeated; maximum credit nine hours. Contracted independent study for a topic not currently offered in regularly scheduled courses. Independent study may include library and/or laboratory research and field projects. (Irreg.)