

Resource and Energy Engineering (REE)

COURSES

REE 1301. INTRODUCTION TO RESOURCE & ENERGY ENGINEERING. 3 Hours.

Provides a review and discussion of the history of energy usage, the relation between energy usage and quality of life, the societal impact of energy use, and the environmental constraints on energy usage. Emphasis is placed on the role that engineering disciplines play in solving energy problem. The full impact that the various energy alternatives have on economic and environmental issues will be reviewed in order to provide a rational basis for energy choices now and in the future.

REE 1306. THE CHEMISTRY OF FUELS. 3 Hours.

Design of energy systems including generation, delivery, conversion and efficiency. Topics include efficiencies of both new and established energy generation and conversion methods; electricity generation by fossil fuels, nuclear, solar, wind and hydropower; and alternative energy technologies. Energy systems are evaluated quantitatively by modeling and by introducing the principles of fluid mechanics, thermodynamics and heat transfer. Prerequisite: CHEM 1465.

REE 2301. THERMAL ENGINEERING. 3 Hours.

Basic concepts and definitions, properties of pure substances, work and heat, first law of thermodynamics, second law of thermodynamics, entropy, and introduction to conductive, convective, and radiative transfer. Prerequisite: CHEM 1465 (or concurrent enrollment) or CHEM 1441 and CHEM 1442 (or concurrent enrollment); MATH 2425 (or HONR-SC 2425) and PHYS 1444; or student group.

REE 3301. PRINCIPLES OF ENERGY ENGINEERING. 3 Hours.

Design of energy systems including generation, delivery, conversion and efficiency. Topics include efficiencies of both new and established energy generation and conversion methods; electricity generation by fossil fuels, nuclear, solar, wind and hydropower; and alternative energy technologies. Energy systems are evaluated quantitatively by modeling and by introducing the principles of fluid mechanics, thermodynamics and heat transfer.

REE 3302. SUSTAINABLE ENERGY SYSTEMS. 3 Hours.

This course presents the production and consumption of energy from a systems perspective. Sustainability is examined by studying global and regional environmental impacts, economics, energy efficiency, consumption patterns and energy policy. First, the physics of energy and energy accounting methods are introduced. Next, the current energy system that encompasses resource extraction, conversion processes and end-uses are covered. Responses to current challenges such as declining fossil fuels and climate change are then explored.

REE 3303. PETROLEUM & GAS ENGINEERING. 3 Hours.

The course provides the student with a basic knowledge and understanding of the oil and gas engineering and industry, including its history, technical aspects, business model, and impact on society and the environment. The primary emphasis is on operations in exploration, production, transportation, refining, and marketing. At the end of the course, the student should be able to speak in a general way on all aspects of the industry and be familiar with common industry terminology. Prerequisite: PHYS 1443, PHYS 1444, GEOL 3340.

REE 4301. ENERGY SYSTEMS MODELING. 3 Hours.

Mathematical methods to model and optimize effective management of dynamic energy systems. Topics include concepts in probability and statistics, spatial statistics (geo-statistics and machine learning), Monte Carlo simulations, global and local sensitivity analyses, surrogate models, and computational alternatives to Monte Carlo simulates. Prerequisite: IE 3301.

REE 4302. SMART GRID. 3 Hours.

Fundamentals of smart electric power grid including definition, design criteria, and technology. Application of data collection, processing, and communications to the power grid. Seeks to motivate development of the smart grid, evaluating options for adding sensing, communications, computation, intelligence, control, and automation to various parts of the electric system. Topics include automation in existing power systems; generation; transmission; distribution; and smart grid definition. Prerequisite: EE 2204.

REE 4303. MANAGEMENT OF ENERGY PROJECTS. 3 Hours.

This project course is intended to provide students with an industry-relevant experience. Students will apply their engineering knowledge and skills to solve problems in the production, processing, storage, distribution, and utilization of energy. A faculty member will follow the progress and serve as an advisor to the project. Each project must have a clearly defined problem or need; must show a solution methodology; and must be value-added to the sponsor. Prerequisite: Must be a senior in the REE Professional Program.

REE 4304. ENERGY STORAGE TECHNOLOGIES. 3 Hours.

Explores the various energy storage technologies, their working, and their practical applications. Focuses on the state-of-the-art review of current and most recent technologies. Offers students an opportunity to explore various innovations in the field of energy storage that can be helpful for fulfilling our current energy storage needs. Covers many different energy storage systems such as mechanical, chemical, electrochemical, thermal, and thermochemical. Prerequisite: REE 2301, EE 2240, MSE 3300.

REE 4305. ENERGY GOVERNANCE. 3 Hours.

Introduces contemporary energy markets, government policies, and regulations. Explores energy as a strategic resource influenced by economics, market conditions and environmental constraints. Explores the relationship between nonrenewable and renewable energy sources and how different regions adapt and address local needs and concerns. Evaluates the impact of government policies on energy usage and alternative energy development efforts. Prerequisite: IE 2308.

REE 4310. CAPSTONE DESIGN. 3 Hours.

Students will apply knowledge gained in the program to an application oriented capstone project. Activities will demonstrate technical skills in energy system knowledge, identifying opportunities, analysis for quantifiable savings, engineering economics, report writing, and presentation. Prerequisite: Must be a senior in the REE Professional Program.