

ENERGY BUSINESS AND FINANCE (EBF)

EBF 200: Introduction to Energy and Earth Sciences Economics

3 Credits

Resource use decisions and their effect on local, national, and global development. EBF 200 Introduction to Energy and Earth Sciences Economics (3) (GS)(BA) This course meets the Bachelor of Arts degree requirements. Facing the challenge of ever-increasing demand for energy, and limited energy resources to meet those demands, will be one of the great problems/opportunities of the 21st century. This class will help students understand and discuss the current event items you hear about every day, and help to prepare many of you to work to address this challenge. This class introduces the economic method of analysis to the environmental and resource questions facing society. It introduces a "paradigm," a way of thinking, that has four elements: What advantages can be gained by using market forces? What are the drawbacks of the market ("market failures") that may lead to a rationale for government intervention? What are the drawbacks of using government intervention ("government failure")? How do you apply these three concepts to real-world situations? Examples are drawn from both the United States economy and from the worldwide community. Both analytical and quantitative methods are used to understand the environmental and resource challenges faced by modern society.

Enforced Prerequisite at Enrollment: ECON 102 and (MATH 22 or MATH 26 or MATH 41 or MATH 110 or MATH 140 or satisfactory performance on the mathematics placement examination)
 Bachelor of Arts: Social and Behavioral Sciences
 General Education: Social and Behavioral Science (GS)
 GenEd Learning Objective: Crit and Analytical Think
 GenEd Learning Objective: Key Literacies

EBF 301: Global Finance for the Earth, Energy, and Materials Industries

3 Credits

The aim of this course is to introduce fundamental concepts of financial management and illustrate their global applications.

EBF 304W: Global Management for the Earth, Energy, and Materials Industries

3 Credits

The real world is often complex and unstructured. A major goal of this course is to teach you how to structure "real-world" environmental and energy problems that involve business decisions in the face of uncertainty. The focus of this course is problems in environmental and resource management, but rather than teaching you specific facts, the goal of this course is to teach you how to think systematically about problems at the interface between business, society, and the environment. The course develops a number of tools for analyzing decision problems where impacts on the environment or human health and safety are important components. These tools include benefit-cost analysis, technological and environmental risk assessment, decision-making under uncertainty (perfect and imperfect information), and Monte Carlo analysis. Students will then use these models in the homework

assignments and projects to solve a number of different decision problems.

Enforced Prerequisite at Enrollment: EBF 200 and EME 460 and (STAT 401 or EBF 472 or ECON 306)
 Writing Across the Curriculum

EBF 401: Strategic Corporate Finance for the Earth, Energy, and Materials Industries

3 Credits

The objective of this course is to give students a working knowledge of the major tools used by financial managers for making investment and financing decisions. Topics include, but are not limited to: time value of money, trade-off between risk and expected return, Capital Asset Pricing Model, valuation and role of debt and equity, capital budgeting/project evaluation techniques, cost of capital, cash flow estimation, real and financial options, company valuation, and capital structure decisions. As an illustration of the theory, we will discuss examples and cases, with a focus on the energy industry. Students will learn the fundamentals of capital budgeting and structure analysis; how capital structure decisions affect the value of the firm; and how to develop financial statements for energy projects.

Enforced Prerequisite at Enrollment: EBF 200 and EBF 301 and EME 460 and (EBF 472 or STAT 200 or STAT 401 or ECON 106 or SCM 200)

EBF 402: Energy Law and Contracts

3 Credits

An examination of the law that applies to acquiring the property rights for exploration and drilling of energy sources. This course examines the area of energy law and contracts, which is crucial to successful drilling in natural gas and oil properties. The course begins with a description of ownership and rights in the mineral estate, and how those rights have evolved over time. Students will be instructed in the how different types of land affect legal rights, and the details of the law of capture. They will also review the Statute of Frauds and examine how it applies to land drilling contracts. The second part of the course presents the basic tenets of real estate law, examining the seminal cases in this area. It will review the standard oil and gas lease used in the United States. Issues reviewed will include the nature of lease clauses and implied covenants, as well as farmout and joint operating agreements. It will also examine how royalty payments can be structured. Environmental regulation is a critical component of energy exploration. To address this topic, students will be introduced to the regulatory process. They will study regulatory compliance and how to deal with government officials. They will also be instructed in corporate liability for property clean up and pollution, and in strategies for minimizing both that liability and harm to the environment. In addition, the course will review topics of environmental due diligence and the joint and several nature of environmental liability.

Enforced Prerequisite at Enrollment: BLAW 243 or BA 242 or BA 243

EBF 404W: The Great Energy Transition: Law, Economics, and New Frontiers

3 Credits

The U.S. energy sector is in the process of a great transformation. This Writing Across the Curriculum course examines how evolving federal, state, and local policies; regulatory efforts toward electricity market deregulation; and the technical innovations driving shale gas

development and renewable energy generation have changed markets for energy and electricity in the United States. This all occurs in the context of a movement towards lower carbon emissions. The Great Energy Transition explores these energy topics from a law, policy, and economics perspective. It analyzes energy topics such as natural gas development and renewable energy by asking how law, policy, and economics are driving changes in these types of sectors, how these changes impact society, and how these changes present both opportunities and challenges in their design and implementation. Successful completion of the course will enable students to productively engage with prospective employers, energy experts, policymakers, and administrative professionals on a broad range of modern energy topics. The Writing Across the Curriculum aspects of this course will hone students' skills at outlining and structuring their writing, identifying sources, incorporating feedback, and making their writing more concise.

Enforced Prerequisite at Enrollment: ECON 302
Writing Across the Curriculum

EBF 410: Petroleum and Natural Gas Operations

3 Credits

The course is designed to instruct energy land management option students of the EBF major in the drilling of petroleum and natural gas wells and the challenges in that process. EBF 410 Petroleum and Natural Gas Operations (3) Energy landmen graduating from the energy land management option (ELMO) will work directly with natural gas and petroleum engineers on drilling projects. This course will present the basics of natural gas and petroleum operations, so that EBF graduates will be able to assist engineering and other personnel in solving drilling operating problems. After taking this course, EBF students will have the background to move to a production company and start their training in assisting at a well site. The challenges students will be introduced to include (i) being able to develop plans for oil and gas field drilling, as well as for product recovery and treatment, (ii) coordinating the installation, maintenance, and operation of mining and oil field equipment, (iii) assessing costs and estimating production capabilities and economic value of oil and gas wells, (iv) evaluating the economic viability of potential drilling sites, and (v) participating in the completion and evaluation of wells, well testing, or well surveys. Students will also have an understanding of several other important facets of drilling operations, including (i) maintaining records of drilling and production operations, (ii) writing reports on the success or lack thereof of particular wells, and (iii) becoming aware of the challenges involved in the removal of drilling equipment, the removal of any waste, and the safe return of land to structural stability when wells are exhausted.

Enforced Prerequisite at Enrollment: (PHYS 211 or PHYS 250) and GEOSC 1

EBF 411: Petroleum and Natural Gas Geology for Land Professionals

3 Credits

This course provides energy land students with a knowledge base, as well as a set of notes and references, that they can draw on during a career in the petroleum industry. EBF 411 Petroleum and Natural Gas Geology for Land Professionals (3) The aim of this course is to provide students with a knowledge base, as well as a set of notes and references, that they can draw on during a career in the petroleum industry. This course will cover most aspects of geology and petroleum geology that students are likely to encounter in their professional endeavors. Open note examinations will encourage students to take well organized and thorough notes that

can be used as a future reference. Two class projects are designed to reinforce the petroleum systems concept, which is probably the single most important concept in this course. Throughout the course, key concepts will be illustrated with examples from the Pennsylvania portion of the Appalachian Basin. This is an active petroleum province, and many oil and gas companies in the Pittsburgh area are involved in exploration and production in this field setting. This course does not cover petroleum engineering. The course begins with an overview of the geologic subdisciplines that are most pertinent to petroleum geology. In the second part of the course, the petroleum system is reviewed. The third part of the course is designed to introduce students to the various roles that geologists play at petroleum companies. Finally, the concept of the petroleum system is extended to unconventional plays, which will play an increasingly large role in the petroleum industry in the coming decades. Depending on time constraints, the course may include some discussion of the world's remaining petroleum reserves.

Enforced Prerequisite at Enrollment: GEOSC 1

EBF 472: Quantitative Analysis in Earth Sciences

3 Credits

Quantitative analysis of decision making in atmospheric/geophysical sciences: exploratory data analysis, quantification of uncertainty, parametric/non-parametric testing, forecasting, time series analysis.

Enforced Prerequisite at Enrollment: MATH 110 or MATH 140

EBF 473: Risk Management in Energy Industries

3 Credits

All major firms engage in financial risk management. In this course, we will learn quantitative techniques for describing how firms can use financial instruments to manage their financial risk. In particular, we will focus on risk management with respect to threats to financial viability from the weather. The course takes a highly statistical approach to the valuation and analysis of financial derivatives such as futures and options. Specific topics to be covered include the structure and pricing of options, the theory of arbitrage, financial statistics and the use of options to hedge financial risk. Students will gain experience using the Black-Scholes equation to value financial options, and will also learn strategies for hedging financial exposure to large commodity price variations. The techniques discussed in this class will be primarily illustrated using weather and energy commodity derivatives, but can be applied to a large variety of different commodity markets.

Enforced Prerequisite at Enrollment: EBF 200 and (MATH 111 or MATH 141) and (EBF 472 or STAT 200 or STAT 401 or ECON 106 or SCM 200)

EBF 483: Introduction to Electricity Markets

3 Credits

This course is designed to teach students about the structure of the electricity industry, the regulatory institutions that oversee the industry, and the new market institutions that have been put into place since electricity restructuring. Much of the focus will be on the U.S. electricity industry. Since Pennsylvania has been a national leader in electricity restructuring, we will place particular emphasis on events in the Mid-Atlantic region, but will also discuss other market structures in the U.S. and in other countries. Specific topics covered will include cost models for power generation, transmission and distribution; rate of return

regulation for electric utilities; the process of electricity restructuring and creation of electricity markets; Locational Marginal Pricing of electric energy; financial risk management in electric power; and detecting and mitigating market power.

Enforced Prerequisite at Enrollment: EBF 200 and MATH 140 and EBF 301 and (EBF 472 or STAT 200 or STAT 401 or ECON 106 or SCM 200)

EBF 484: Energy Economics

3 Credits

What is the role of energy in the economic system? What are the implications of the energy transformation on economic welfare? How can we efficiently meet new demand while also addressing the myriad social, environmental, and regulatory challenges related to the energy system? This course will examine these questions from an intermediate microeconomics perspective. The course covers topics in the organization and conduct of firms operating in energy markets, measuring and detecting the manipulation of energy markets, and regulating the environmental impacts of energy production, delivery and consumption.

Enforced Prerequisite at Enrollment: (MATH 110 or MATH 140) and EBF 200 and EBF 301 and (ECON 302 or MATH 250 or MATH 251)

EBF 497: Special Topics

1-9 Credits/Maximum of 9

Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.

EBF 499: Foreign Study

1-15 Credits/Maximum of 15

This course is designed to enable students to study in EBF study abroad programs.

International Cultures (IL)