

Courses in the EBF Curriculum Annotated Discussion

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This is an annotated listing of EBF classes, in order of listing on EBF checksheet.

There have been some revisions to the EBF curriculum, approved by the faculty senate in the spring of 2007. Summarizing, they are as follows:

- 1) An option in Geographic Information Systems has been added, leaving the default track as the "General Option."
- 2) Several more 400 level electives have been added.
- 3) Most complicated of all, three requirements have been changed:
 - A: PNG 489 replaces IST 110/MIS 204;
 - B: STAT 200 is deleted from the list of statistics classes
 - C: CMPSC 203 is deleted from the list of computer classes.

These requirement changes were made to address perceived deficiencies in problem solving among EBF students. However, they only affect students entering Penn State in Su07 and afterwards. For those of you who have not taken these classes, however, I would strongly recommend that you not take IST 110/MIS 204, STAT 200, or CMPSC 203.

Commentary here is not guaranteed to be accurate. Comments welcome.
Course descriptions from largely from the Penn State "Blue Book,"
<http://www.psu.edu/bulletins/bluebook/>

Required Core Classes

[ECON 002](#) (GS) **INTRODUCTORY MICROECONOMIC ANALYSIS AND POLICY** (3) Methods of economic analysis and their use; price determination; theory of the firm; distribution.

Students should take this as early as possible. It is offered in the summer at most PSU campuses, and equivalents are offered in the summer at most universities.

[ECON 302](#) (GS) **INTERMEDIATE MICROECONOMIC ANALYSIS** (3) Allocation of resources and distribution of income within various market structures, with emphasis on analytical tools. Prerequisite: [ECON 002](#)

This should be taken immediately after students take ECON 002, though not before sophomore year. It can be taken in the summer at the UP campuses, and equivalents can be taken at many universities.

EM SC 301 GLOBAL FINANCE FOR THE EARTH, ENERGY, AND MATERIALS INDUSTRIES (3) The aim of this course is to introduce fundamental concepts of financial management and illustrate their global applications.

This class is currently scheduled to be offered only in the fall.

EM SC 304 GLOBAL MANAGEMENT FOR THE EARTH, ENERGY, AND MATERIALS INDUSTRIES (3) This class is designed to introduce students to modern management and organization strategies for resource businesses. Prerequisite: [ECON 002](#)

The prerequisite is not needed. This class is offered only in the Spring in AY07-08. We expect to offer it both semesters beginning AY08-09, but one can never tell.

EM SC 401 STRATEGIC CORPORATE FINANCE FOR THE EARTH, ENERGY, AND MATERIALS INDUSTRIES (3) Financial decisions corporations in the earth science area make and the tools and analyses used to make these decisions. Prerequisite: [ENNEC 100](#) , [EM SC 301](#) , and junior or senior standing

This course is now offered both semesters.

ENNEC 100 (GS) INTRODUCTION TO ENERGY AND EARTH SCIENCES ECONOMICS (3) Resource use decisions and their effect on local, national, and global development.

This is the introductory course to the major, and should be taken as soon as possible. It is not offered in summers, or at any other campus or university.

ENNEC 473 RISK MANAGEMENT IN ENERGY INDUSTRIES (3) Analysis of strategies for mitigating business risk from market, atmospheric, geophysical uncertainties including the use of energy/mineral commodity futures/options, weather derivatives, and insurance. Prerequisite: [MSIS 200](#) or [STAT 200](#) or [ENNEC 472](#).

Any of the statistics classes below serve as the prerequisite. This is the most challenging, and most relevant to employment opportunities, course in the major. Students seeking a career in the financial services industry should take this class junior year. Less than fully motivated students taking this course senior year should beware – you can fail this class, if you work at it! Below are the grades for this class in S07.

A	A-	B+	B	B-	C+	C	D	F
6	2	1	4	3	1	4	5	4

Alternatives for this class are difficult to find. It may be helpful to take the new versions of EMSC 301 and EMSC 401 previously or concurrently.

[ENNEC 484W](#) **ENERGY ECONOMICS** (3) Economics of energy demand, production, storage, and pricing; advanced energy policy issues including regulation, climate change, new energy technology. Prerequisite: [ECON 002](#)

This class is now taught both terms, but seats are still limited

[IB 303](#) (IL) **INTERNATIONAL BUSINESS OPERATIONS** (3) A survey of the major aspects of international business environment and operations with an emphasis on the cultural dimension. Prerequisite: fifth-semester standing

This class does not appear to be taught at other PSU campuses or during the summer.

[INS 301](#) **RISK AND INSURANCE** (3) Introduction to the principles and methods of handling business and personal risks; emphasis on insurance techniques. Prerequisite: fourth-semester standing.

This class does not appear to be taught at other PSU campuses or during the summer. With a new instructor in place for AY 2006-07, reviews for this class were positive.

Supporting Classes Required

[ACCTG 211](#) **FINANCIAL AND MANAGERIAL ACCOUNTING FOR DECISION MAKING** (4) Introduction to the role of accounting numbers in the process of managing a business and in investor decision making.

This is the standard accounting course, taught at every university in the country. The class is less crowded in the summer. Substitutes can be taken for this class at almost all universities.

[CMPSC 101](#) (GQ) **INTRODUCTION TO ALGORITHMIC PROCESSES** (3) Properties of algorithms, languages, and notations for describing algorithms, applications of a procedure-oriented language to problem solving. A student may receive credit for only one of the following courses: CMPSC 101, 201C, 201F, CSE 103. Prerequisite: 2 entrance units in mathematics

Or

[CMPSC 200](#) (GQ) **PROGRAMMING FOR ENGINEERS WITH MATLAB** (3) Effective Date: SP2008 Development and implementation of algorithms in a MATLAB environment, with emphasis on numerical methods for engineering problems. Students can receive credit for only one of the following: CMPSC 101, 201A, 201C, 201F or CSE 103. Prerequisite: [MATH 140](#) Concurrent: [MATH 141](#)

Or

[CMPSC 201](#) (GQ) **PROGRAMMING FOR ENGINEERS WITH C++** (3) Effective Date: SP2008 Development and implementation of algorithms in a procedure-oriented language, with emphasis on numerical methods for engineering problems. Students who have passed CMPSC 101, 201F, or CSE 103 may not schedule this course. Prerequisite: [MATH 140](#) Concurrent: [MATH 141](#)

Or (for pre-Su07 enrollees)

[CMPSC 203](#) (GQ) **PRINCIPLES OF PROGRAMMING WITH BUSINESS APPLICATIONS** (4) Programming in a high-level language; introduction to computers; packaged software: statistical packages and spreadsheets; designed for business students. Prerequisite: 2 entrance units in mathematics.

Somehow, CMPSC 101 is divided into two different classes, Visual Basic and C++ programming. Take the C++ programming class. (It should say which is which on the course schedule.) There seem to be several versions of CMSPC 201, any of which is fine.

CMSPC 203 is not addressing the needs of the program, and pre-Su07 enrollees are encouraged not to take the class.

[MATH 110](#) (GQ) **TECHNIQUES OF CALCULUS I** (4) Functions, graphs, derivatives, integrals, techniques of differentiation and integration, exponentials, improper integrals, applications. Students may take only one course for credit from MATH 110, 140, 140A, and 140B. Prerequisite: [MATH 022](#) or satisfactory performance on the mathematics proficiency examination

or

[MATH 140](#) (GQ) **CALCULUS WITH ANALYTIC GEOMETRY I** (4) Functions, limits; analytic geometry; derivatives, differentials, applications; integrals, applications. Students may only take one course for credit from MATH 110, 140, 140A, 140B, and 140H. Prerequisite: [MATH 022](#), [MATH 026](#); or [MATH 040](#) or [MATH 041](#) or satisfactory performance on the mathematics proficiency examination

These classes, or their equivalents, are offered in a large number of places and times. Anyone with an interest in engineering or meteorology should take MATH 140.

[B LAW 243](#) **LEGAL ENVIRONMENT OF BUSINESS** (3) Social control through law: courts, basic policies underlying individual and contractual rights in everyday society. May not be used to satisfy Smeal College baccalaureate degree requirements.

Or

[ERM 411](#) **LEGAL ASPECTS OF RESOURCE MANAGEMENT** (3) Legal systems and lawmaking processes; property rights in land, water, and wildlife resources; jurisdictional problems in planning resource use. Prerequisite: [ERM 151](#)

BLAW 243 is offered in the summer at various PSU campuses. There may be alternatives available in the summer at other universities. Do not worry about the prerequisite for ERM 411. This class is offered Fall term. You can take ERM 411 in place of BLAW 243 or a 400 level elective, but not both.

[ECON 004](#) (GS) **INTRODUCTORY MACROECONOMIC ANALYSIS AND POLICY** (3) National income measurement; aggregate economic models; money and income; policy problems.

Or

[GEOG 126](#) (GS;US;IL) **ECONOMIC GEOGRAPHY** (3) The location of economic activity at both macro- and micro-regional levels on the earth's surface.

If you are in the GIS option, you are required to take GEOG 126. If you are in the General option, you can take either, though you need a signed exemption sheet if you want to take GEOG 126.

I have a small preference for ECON 004 over GEOG 126. Some students, however, prefer the smaller class size of GEOG 126. ECON 004, however, is part of the minor in economics, which many EBF students take. ECON 004 not a prerequisite to anything in the EBF curriculum, and so there is no need to take it at a particular time. ECON 004 is offered in the summer at most PSU campuses, and equivalents are offered in the summer at most universities.

[ENNEC 472](#) **QUANTITATIVE ANALYSIS IN EARTH SCIENCES** (3) Quantitative analysis of decision making in atmospheric/geophysical sciences: exploratory data analysis, quantification of uncertainty, parametric/non- parametric testing, forecasting, time series analysis. Prerequisite: [MATH 110](#) or [MATH 140](#)

Or

[STAT 301](#) (GQ) **STATISTICAL ANALYSIS I** (3) Probability concepts; nature of statistical methods; elementary distribution and sampling theory; fundamental ideas relative to estimation and testing hypotheses. Prerequisite: 3 credits of calculus

Or

[STAT 401](#) **EXPERIMENTAL METHODS** (3) Random variables; probability density functions; estimation; statistical tests, t-tests; correlation; simple linear regression; one-way analysis of variance; randomized blocks. Prerequisite: [MATH 111](#) or [MATH 141](#) (for pre-Su 07 enrollees)

or

(for pre-Su 07 enrollees)

[SCM 200](#) **INTRODUCTION TO STATISTICS FOR BUSINESS** (4) Introduction to business statistics including topics in probability theory, sampling, inference, quality assurance, regression, forecasting, and simulation. Prerequisite: [MATH 018](#), [MATH 110](#), or [MATH 140](#)

Or

(for pre-Su 07 enrollees)

[STAT 200](#) (GQ) **ELEMENTARY STATISTICS** (4) Descriptive statistics, frequency distributions, probability, binomial and normal distributions, statistical inference, linear regression, and correlation. Prerequisite: 2 units in algebra

ENNEC 472 is the better course, but is not offered AY07-07. SCM 200 and STAT 200 were simply not supplying EBF students with what they need. A variety of options for summer courses at other universities may be available.

(for pre-Su 07 enrollees)

[IST 110](#) (GS) **INFORMATION, PEOPLE AND TECHNOLOGY** (3) The use, analysis and design of information systems and technologies to organize, coordinate, and inform human enterprises.

or

(for pre-Su 07 enrollees)

[MIS 204](#) **INTRODUCTION TO BUSINESS INFORMATION SYSTEMS** (2) Introduction to the use of information systems in business organizations.

This courses do not appear particularly useful. Pre-Su 07 enrollees are encouraged to take PNG 489 instead.

[PNG 489](#) **ENGINEERING EVALUATION OF OIL AND GAS PROPERTIES** (3) Application of present worth and rate-of-return analysis; reserve calculations; decline curve analysis; uncertainty and risk analysis to engineering project design and evaluation. Prerequisite: ECON 002.

IE 302 is a potential substitute for this class, but talk to the instructor first.

Introductory EMS Electives

There are a large number of potential classes here, not all of whom are listed on the checksheet. Below I discuss a few classes most relevant to the major.

[EGEE 101](#) (GN) (MATSC) **ENERGY AND THE ENVIRONMENT** (3) Energy utilization and technological development, energy resources, conversion and consequences on the local and global environment, and future energy alternatives.

This is an excellent introduction to energy engineering issues, and is taught by popular instructors.

[EGEE 102](#) (GN) **ENERGY CONSERVATION FOR ENVIRONMENTAL PROTECTION** (3) Exposure to energy efficiency in day-to-day life to save money and energy, and thereby protect the environment.

This is an excellent introduction to energy conservation issues, and is again taught by popular instructors.

[EGEE 120](#) (GS;US;IL) **OIL: INTERNATIONAL EVOLUTION** (3) Survey of the commercial development of the world petroleum industry from various international, historical, business, and cultural perspectives.

This course investigates historical issues relevant to the major, and is therefore a good choice for GS, US, and IL requirements.

Students are required to take 9 credits of EMS introductory electives. However, you can use 3 credits (but no more than 3) of either a “hard science” class (say Physics 211) or a science general education class from another college to count toward this requirement.

In addition, the Meteorology Department is creating METEO 004, Business and Meteorology, which can serve as an introductory EMS elective. (This class may, or may not, be listed at METEO 297A for S08.)

Advanced EMS Electives

There are a number of choices here, and I will only discuss a few. I note that if students desire to concentrate in areas relevant to the major with courses not listed here, I am open to discussions.

[ECON 428](#) **ENVIRONMENTAL ECONOMICS** (3) Environmental pollution, the market economy, and optimal resource allocation; alternative control procedures; levels of environmental protection and public policy. Prerequisite: [ECON 302](#) or [ECON 323](#)

This is a well-regarded 400 level electives taught both semesters.

[EM SC 420](#) (SOC;S T S) **ENERGY AND MODERN SOCIETY** (3) Technology and economics of energy resources, production, and consumption; environmental factors, exhaustion, new technology

This is a well-received class. It is also offered as STS 420, so if the EMSC 420 version is filled, try the STS version.

[GEOSC 454](#) **GEOLGY OF OIL AND GAS** (3) Properties, origin, migration, and occurrence of oil and gas. This course has one or more required field trips for which a fee is charged to the student. Prerequisite: [GEOSC 001](#)

This is a challenging, yet highly relevant class. Speak to the instructor before you sign up for it.

[METEO 473](#) **APPLICATION OF COMPUTERS TO METEOROLOGY** (3)
Application of statistical and numerical methods to practical problems in meteorology. Prerequisite: [CMPSC 101](#), [CMPSC 201C](#), or [CMPSC 201F](#)

This is a challenging class. If you are not also meteorology major or minor, speak with the instructor before signing up.

The Geography Department has changed the numbering of most of its classes, starting Spring term 2007. So I will list the possible electives here, with their new numbers, and their old numbers in parentheses.

[GEOG 430 \(406\)](#) **HUMAN USE OF ENVIRONMENT** (3) The human use of resources and ecosystems and social causes and consequences of environmental degradation in different parts of the world; development of environmental policy and management strategies. Prerequisite: [GEOG 030](#)

[GEOG 424 \(470\)](#) (US;IL) **GEOGRAPHY OF THE GLOBAL ECONOMY** (3) Focus on industrial location theory, factors in industrial location, studies of selected industries and problems of industrial development. Prerequisite: [ECON 002](#), [ECON 004](#), GEOG 100 .

The instructor tells me you only need 2 of the 3 listed prerequisites.

[GEOG 431 \(410\)](#) **GEOGRAPHY OF WATER RESOURCES** (3) Perspectives on water as a resource and hazard for human society; water resource issues in environmental and regional planning. Prerequisite: 6 credits in geography or natural sciences

[GEOG 444 \(444\)](#) **AFRICAN RESOURCES AND DEVELOPMENT** (3) Ecological and cultural factors in the geography of Africa; natural resources and development. Prerequisite: [GEOG 010](#), [GEOG 020](#), [GEOG 030](#), or [GEOG 124](#)

[GEOG 493C \(497-A\)](#) **COMMUNITY ENERGY SERVICE LEARNING** is a course designed to appeal to students who have an interest in studying the principles of energy supply, use, and transformation in a real-world context, with a particular focus on the relationship of local energy consumption patterns and community socioeconomic

consequences. The course will analyze the efficiency of energy use in Centre County as a platform for building a place-based sustainable economy, establish a benchmark data-base, and develop the initial field projects to be implemented as part of the seminar's on-going, long-term goal of materially upgrading the community's energy efficiency.

This class has 10 seats per term, so you will want to sign up as soon as possible, if you are interested.

In addition

[B A 427](#) **RISK AND DECISIONS** (3) Conceptualizing decisions involving risk, analyzing choices, estimating the risk, and communicating the analysis. Prerequisite: [MATH 110](#) or [MATH 140](#) and either [MS&IS 200](#) or [STAT 200](#).

This class is taught fall only, and is generally difficult to get into. At this writing, however, there are seats for F07.

[E RRE 404](#) (AG EC) **METHODS IN NATURAL RESOURCE AND ENVIRONMENTAL ECONOMICS** (3) Students will learn empirical research methodology in the areas of environmental and natural resource economics. Prerequisite: [AG EC 201](#) or [ECON 302](#), [ECON 428](#)

[E RRE 429](#) (AG EC) **NATURAL RESOURCE ECONOMICS** (3) Optimal management of resources; roles of markets and other institutions; resources and economic development; public policy. Prerequisite: [ECON 302](#)

[E RRE 431W](#) (AG EC) **ECONOMIC ANALYSIS OF ENVIRONMENTAL AND RESOURCE POLICIES** (3) Economic analysis of environmental and natural resource policies, benefit-cost analysis, non-market valuation techniques; resource damage assessment. Prerequisite: [ECON 302](#)

[PL SC 420](#) **POLICY MAKING AND EVALUATION** (3) Advanced analysis of public policy, emphasizing policy evaluation and the factors that determine policy success and failure. Prerequisite: [PL SC 001](#) or [PL SC 002](#)

[ECON 490](#) **INTRODUCTION TO ECONOMETRICS** (3) Use of simple and multiple regression models in measuring and testing economic relationships. Problems including multicollinearity, hetroskedasticity, and serial correlation. Prerequisite: MATH 110, [ECON 390](#) (or ENNEC 472 or STAT 301 or STAT 401).

Courses in the GIS Option

Below are the courses required for the GIS option.

PRESCRIBED COURSES

GEOG 126 (discussed above)

[GEOG 160](#) (GS) **MAPPING OUR CHANGING WORLD** (3) Fundamental concepts of GIS, cartography, remote sensing, and GPS in the context of environmental and social problems.

[GEOG 363](#) **GEOGRAPHIC INFORMATION SYSTEMS** (3) Principles and use of geographic information; emphasis is on data acquisition and techniques for computer-aided analysis. Prerequisite: [GEOG 160](#)

ADDITIONAL COURSES (12 credits)

[GEOG 361](#) **CARTOGRAPHY--MAPS AND MAP CONSTRUCTION** (3) The art and science of creating small-scale maps as a medium for communication and research. Prerequisite: [GEOG 160](#)

Or

[GEOG 362](#) **IMAGE ANALYSIS** (3) Introduction to the basic principles of remote sensing, and the analysis of aerial and satellite data. Prerequisite: [GEOG 160](#)

Or

[GEOG 464](#) **ANALYSIS AND GIS** (3) Normative and probabilistic models of spatial behavior; adaptive systems in geographic space; interaction and system stability. Prerequisite: [GEOG 364](#)

Select 9 credits from GEOG 485(3), GEOG 461W(3), GEOG 467(3), GEOG 463(3), GEOG 468(3), GEOG 464(3) [if not taken for requirement above].

[GEOG 485](#) **GIS PROGRAMMING AND CUSTOMIZATION** (3) Customizing GIS software to extend its built-in functionality and to automate repetitive tasks. Prerequisite: [GEOG 484](#) or equivalent experience

[GEOG 461W](#) **DYNAMIC CARTOGRAPHIC REPRESENTATION** (3) Theory and practice of mapping and geo-representation in a hypermedia context. Applications in science, policy, travel, and education. Prerequisite: [GEOG 361](#), [GEOG 330](#), [GEOG 362](#), [GEOG 356](#), or [GEOG 363](#)

[GEOG 467](#) **APPLIED CARTOGRAPHIC DESIGN** (3) Applied computer-assisted map production methods with emphasis on geographic information design and color use for multiple presentation media. Prerequisite: [GEOG 361](#)

[GEOG 463](#) **GEOSPATIAL INFORMATION MANAGEMENT (3)** This course examines geospatial data representations and algorithmic techniques that apply to spatially-organized data in digital form. Prerequisite: any earth science computer application course; familiarization with databases and information systems.

[GEOG 468](#) **GEOGRAPHIC INFORMATION SYSTEMS DESIGN AND EVALUATION (3)** Design and evaluation of Geographic Information Systems and other forms of integrated spatial data systems. Prerequisite: [GEOG 363](#)