

## **Insider's Guide to the EBF Option in Energy Land Management (ENLNM)**

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July 2017

Opened for students in August 2013, this option provides excellent employment opportunities for students in the natural gas industry. Students in this option take the required courses for all EBF students, as outlined in the Penn State Undergraduate Bulletin (See:

<http://www.bulletins.psu.edu/undergrad/programs/baccalaureate/E/EBF>), with some exceptions.

In particular, students in the ENLNM option are not required to take a minor, concurrent major, or term abroad program. Because the ENLNM option is accredited by the American Association of Professional Landmen, all courses must be approved by the option's Industry Advisory Board. This means that for some requirements for the major there are fewer choices in the ENLNM option than in the General Option.

Students wishing to pursue the ENLNM option have the same entrance-to-major requirements as students in the General Option. These entrance-to-major requirements depend on when you entered Penn State.

- Students entering Penn State prior to Summer 2017 must have a cumulative GPA of at least 2.0, at least 29.1 credits, and must have completed ECON 102 and MATH 140 with grades of C or higher in each.
- Students entering Penn State as freshmen in Summer 2017 or later can enter the EBF major (including the ENLNM Option) when they have attained between 40 and 70 Penn State credits. Entrance to major outside this credit window will not be approved. At the time they apply for the major, students must also have a cumulative GPA of at least 2.8 (Penn State courses only) and must have completed ECON 102, MATH 140 and MATH 141 with grades of C or higher in each of these courses. If a student applies for EBF while enrolled in their last entrance-to-major course(s) and meets the credit window and GPA requirements, the student will be conditionally accepted to the EBF major. The grade from the in-progress entrance-to-major course(s) will be checked at the end of the semester, and the student must have earned a C or above or otherwise will be removed from the major. The student's cumulative GPA must also still be a 2.8 or above at the end of the semester for the student to remain in the EBF major.
- Students entering Penn State as transfer students from another institution in Summer 2017 or later can enter the EBF major (including the ENLNM Option) under the following circumstances:
  - Students with no more than one year of attempted college coursework (approximately 30 credits) and who have completed 4 credits of calculus with analytic geometry can be admitted into pre-major status at a campus other than University Park. (Transfer students with more than one year of coursework at their previous institution are not eligible for the EBF major.)

- Transfer students must apply to officially enter the EBF major when they have completed between 14 and 35 Penn State credits. At the time that transfer students apply for the major, they must meet the following requirements:
  - Penn State cumulative GPA of at least 2.8.
  - Completion of Econ 102, Math 140, and Math 141 with a C or higher in each class (or transfer credit for direct equivalents of these courses). If a student applies for EBF while enrolled in their last entrance-to-major course(s) and meets the credit window and GPA requirements, the student will be conditionally accepted to the EBF major. The grade from the in-progress entrance-to-major course(s) will be checked at the end of the semester, and the student must have earned a C or above or otherwise will be removed from the major. The cumulative GPA must also still be a 2.8 or above at the end of the semester for the student to remain in the EBF major.

Since the ENLNM option was established, it has become clear how vital a role GIS plays in the land business in Appalachia and other places. Thus, we require three GIS courses for the option. It is advised that you take as many GIS courses as you can (though you can't substitute a GIS class for the other requirements). By taking three additional GIS courses, you can qualify for a GIS minor, which will be impressive to potential employers.

Classes are listed in the suggested order they should be taken for students starting this course of study during their freshman year. (See <https://rap.psu.edu/node/1304> for a slightly different ordering.)

### **Course Requirements:**

**GEOSC 1(3) Physical Geology.** Earth processes and their effects on the materials, structure, and morphology of the earth's crust. Practicum includes field work, study of rocks, minerals, dynamic models, and topographic maps. (This course includes from one to several field trips for which an additional charge will be made to cover transportation.) This course contains several field trips for which an additional charge will be made to cover transportation.

C required, offered every semester. Take this class your freshman year, if possible.

**PHYS 211 GN(4) General Physics: Mechanics** Calculus-based study of the basic concepts of mechanics: motion, force, Newton's laws, energy, collisions, and rotation.

Concurrent: MATH 140

or

**PHYS 250 GN(4) Introductory Physics I (4)** Selected topics in mechanics, heat, and sound.

Prerequisite: MATH 22, MATH 26 ; or MATH 40 ; or MATH 41 or satisfactory performance on

the mathematics proficiency examination. (If you have gotten at least a C in MATH 140, you are fine.)

C required, offered every semester. You should take one of these classes your freshman year. Former engineering majors will likely have taken PHYS 211, but PHYS 250 is fine for the ELM option.

**GEOG 160 GS(3) Mapping Our Changing World** Fundamental concepts of GIS, cartography, remote sensing, and GPS in the context of environmental and social problems.

C required. Take this class your freshman year.

**GEOG 363(3) (Sem: 5). Geographic Information Systems.** Principles and use of geographic information; emphasis is on data acquisition and techniques for computer-aided analysis.  
Prerequisite: GEOG 160

This is the basic GIS class. In Spring 2017 we offered an EBF 497 section specializing in natural gas GIS that substituted for this class. We may offer this again in Spring 2018.

Either

**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 (but you'll also want to take GEOG 363 first).

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 (but you'll also want to take GEOG 363 first).

or

**GEOG 364(3) Spatial Analysis** Geographic measurement, scaling, and classification; analysis of spatial pattern and structure; geographic covariation and autocorrelation.

Prerequisite: STAT 200 and 6 credits in social science (but you'll want to take GEOG 363 and STAT 301/401/EBF 472 first, and not take STAT 200).

or

**GEOG 463(3) Geospatial Information Management (3)** This course examines geospatial data representations and algorithmic techniques that apply to spatially-organized data in digital form.

Prerequisite: GEOG 363

A C is required for each of these classes. (Sem: 6-7)

**EBF 410(3) Petroleum and Natural Gas Operations** 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.

Prerequisite: PHYS 211 or PHYS 250, GEO SC 1

Or

**PNG 405(3) Rock and Fluid Properties** Reservoir rock properties, rock and fluid properties (interaction between rock and fluids), flow behavior in reservoir, and fluid properties.

Prerequisite: PHYS 211. Don't take this class if you only took PHYS 250; take EBF 410 instead.

PNG 405 is listed for students who are also majoring or minoring in Petroleum and Natural Gas Engineering. Otherwise, you will want to take EBF 410. These courses are offered fall term only, so I suggest you take one of these courses Semester 7. We expect that the Petroleum and Natural Gas Engineering program will offer PNG 301 (on-line) in the spring or fall of 2018. PNG 301 can substitute for the EBF 410/PNG 405 requirement once the class becomes available.

**EBF 411(3) Petroleum and Natural Gas Geology for Land Professionals** 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.

Prerequisite: GEO SC 1

or

**GEO SC 454(3) Geology 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: GEO SC 1

GEO SC 454 is listed for students who are also majoring or minoring in Petroleum Engineering or Geosciences. Otherwise, you will want to take EBF 411. These courses are offered spring term only, so you will want to take them Semester 8.

EBF 402(3) (Sem: 6 or 8) **Energy Law and Contracts.** An examination of the law that applies to acquiring the property rights for exploration and drilling of energy sources.

Prerequisite: BLAW 243 (or whatever business law class you have taken)

This course is only offered spring term. If you plan to get an internship, this class can be extremely helpful. So you might want to take it during your sixth semester.

We are once again offering a course in Energy Land Contracts in Fall 2017 as an EBF 497 class. This course is about contracts in general, and energy land contracts in particular. Almost all industries have contracts, and it is important for a successful business career to have a strong understanding of contracts. It will count for your “W” course for graduation requirements.

The class will have three parts. The first will focus on the economics of contracts, using the focus of the field of law and economics. The second will examine negotiation and leadership strategies. The third will review the ethical issues that arise in contracting. This class has numerous guest speakers from the energy land industry and uses materials prepared for land professionals by the American Association of Professional Landmen.