

# Department of Petroleum & Natural Gas Engineering

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E-mail: Statler-PNGE@mail.wvu.edu (samuel.ameri@mail.wvu.edu)

## Degree Offered

- Bachelor of Science in Petroleum and Natural Gas Engineering (B.S.P.N.G.E.)

## Nature of Program

Petroleum and Natural Gas Engineering is concerned with design and application aspects of the discovery, production, and transportation of oil and natural gas resources.

Professionals in this field must have a thorough understanding of the geological principles relating to the occurrence, discovery, and production of fluid hydrocarbons. The petroleum and natural gas engineer must know and be capable of applying both conventional engineering design principles as well as those pertaining specifically to the field of petroleum and natural gas engineering. These are developed in the petroleum and natural gas engineering courses in the curriculum. In addition, a strong foundation in mathematics and the sciences broadens the future engineer's professional capabilities. Because many engineers will be employed as supervisors or executives, managerial and social skills are also emphasized.

Students are offered the opportunity to enter all phases of the petroleum and natural gas industry in meaningful and important jobs, continue their education towards advanced degrees, or in some cases pursue a combination of professional employment and continued education. The petroleum and natural gas engineering program is accredited by the Engineering Accreditation Commission (EAC) of ABET, <http://www.abet.org>.

## Program Learning Objectives

- The graduates will be successful in their professional careers as petroleum engineers in the energy industry, government agencies, and/or post-graduate education.
- The graduates will continue to develop professionally and serve in leadership roles.
- The graduates will be successful in demonstrating their obligations to the profession, to their employer, and to society.

The foundation for achieving program objectives is established through a rigorous curriculum that provides the students with:

- An understanding of scientific and engineering principles and the application of these principles in solving petroleum and natural gas engineering problems using modern tools
- An integrated design experience leading to a capstone design course
- A balanced and rounded education to recognize the need for developing technical communication and teamwork skills, as well as understanding the engineer's professional, ethical, and societal obligations

## Student Outcomes

Upon graduation, all Bachelors of Science students in Petroleum and Natural Gas Engineering will have:

- A thorough understanding of scientific and engineering principles and their application to petroleum and natural gas engineering problems
- The ability to integrate their scientific and engineering knowledge to design and conduct experiments and interpret and analyze data
- The ability to apply scientific and engineering fundamentals to formulate solutions to petroleum and natural gas engineering problems
- The ability to use techniques, skills, and modern petroleum and natural gas engineering tools
- The ability to integrate their scientific and engineering knowledge to solve petroleum and natural gas engineering design problems
- The ability to communicate effectively
- The ability to function on multi-disciplinary teams
- Recognition of the professional and ethical responsibilities of a petroleum engineer
- An understanding of the impact of petroleum and natural gas engineering solutions in a societal and global context
- Recognition of the need to acquire the knowledge of contemporary issues
- Recognition of the need to engage in life-long learning

These outcomes are achieved by enrolling in rigorous individual courses in all basic areas of petroleum and natural gas engineering, basic science, mathematics, geology, and humanities and social sciences. The petroleum and natural gas engineering curriculum also contains significant laboratory components aimed at reinforcing the knowledge gained in the classroom. In the senior year, electives are offered in which the student may obtain additional depth of knowledge in specific areas of petroleum and natural gas engineering technology. Each student is individually assisted in course selection by an adviser who is a member of the petroleum and natural gas engineering faculty.

Students gain practical experience and first-hand knowledge of many aspects of petroleum and natural gas engineering through close proximity to the industry in West Virginia and surrounding states. Production sites, secondary and enhanced oil recovery projects, compressor stations, gas storage fields, and corporate offices all provide excellent opportunities for our students. Additional experience is provided through modern, well-equipped laboratories within the department and the University. Students are urged to gain field experience through summer employment in the industry.

## FACULTY

### CHAIR

- Samuel Ameri - M.S.Pet.E., P.E. (West Virginia University)  
Formation Evaluation

### PROFESSORS

- Kashy Aminian - Ph.D. (University of Michigan)  
Graduate Coordinator. Natural Gas Engineering, Reservoir Engineering
- Shahab Mohaghegh - Ph.D. (Pennsylvania State University)  
Intelligent Systems

### ASSOCIATE PROFESSOR

- H. Ilkin Bilgesu - Ph.D., P.E. (Pennsylvania State University)  
Drilling Engineering

### ASSISTANT PROFESSOR

- Fatemeh Belyadi - Ph.D. (West Virginia University)  
Reservoir Engineering
- Ebrahim Fathi - Ph.D. (University of Oklahoma)  
Unconventional Gas Recovery
- Ali Takbiri Borujeni - Ph.D. (Louisiana State University)  
Enhanced Oil Recovery
- Ming Gu - Ph.D. (University of Texas)  
Rock Mechanics
- Mehrdad Zamirian - Ph.D. (West Virginia University)  
Reservoir Engineering

### ADJUNCT PROFESSORS

- Alan Brannon - Ph.D. (West Virginia University)  
Natural Gas Engineering
- Pramod Thakur - Ph.D. (Pennsylvania State University)  
Coalbed Methane

[Click here to view the Suggested Plan of Study \(p. 4\)](#)

## Curriculum in Petroleum and Natural Gas Engineering

### GENERAL EDUCATION FOUNDATIONS

Please use this link to view a list of courses that meet each GEF requirement. (<http://registrar.wvu.edu/gef>)

NOTE: Some major requirements will fulfill specific GEF requirements. Please see the curriculum requirements listed below for details on which GEFs you will need to select.

#### General Education Foundations

F1 - Composition & Rhetoric		3-6
ENGL 101 & ENGL 102 or ENGL 103	Introduction to Composition and Rhetoric and Composition, Rhetoric, and Research Accelerated Academic Writing	
F2A/F2B - Science & Technology		4-6
F3 - Math & Quantitative Skills		3-4
F4 - Society & Connections		3
F5 - Human Inquiry & the Past		3
F6 - The Arts & Creativity		3

F7 - Global Studies & Diversity	3
F8 - Focus (may be satisfied by completion of a minor, double major, or dual degree)	9
Total Hours	31-37

Please note that not all of the GEF courses are offered at all campuses. Students should consult with their advisor or academic department regarding the GEF course offerings available at their campus.

## Curriculum Requirements

To receive a degree of bachelor of science in petroleum and natural gas engineering, a student must meet the University's undergraduate degree requirements, take all of the courses indicated below, attain a grade point average of 2.25 or better in all petroleum and natural gas engineering courses and a grade of C- or better in all petroleum and natural gas engineering courses. If a petroleum and natural gas engineering course is repeated, only the last grade received is used to compute the major grade point average, and the course credit hours are counted only once. This requirement assures that the student has demonstrated overall competence in the major.

### Freshman Engineering Requirements

ENGR 101	Engineering Problem Solving 1	2
Engineering Problem Solving:		3
CHE 102	Introduction to Chemical Engineering	
ENGR 102	Engineering Problem-Solving 2	
ENGR 103	Introduction to Nanotechnology Design	
MAE 102	Introduction to Mechanical and Aerospace Engineering Design	
ENGR 199	Orientation to Engineering	1

### Non-Petroleum & Natural Gas Engineering Core

CHEM 115	Fundamentals of Chemistry (GEF 2B)	4
CHEM 116	Fundamentals of Chemistry (GEF 8)	4
ECON 201	Principles of Microeconomics (GEF 4)	3
ECON 202	Principles of Macroeconomics	3
GEOL 101	Planet Earth	3
GEOL 373	Introduction to Petroleum Geology	3
Calculus I (GEF 3):		4
MATH 155	Calculus 1 (Minimum grade of C- is required)	
MATH 153 & MATH 154	Calculus 1a with Precalculus and Calculus 1b with Precalculus (Minimum grade of C- is required)	
MATH 156	Calculus 2 (GEF 8 - Minimum grade of C- is required)	4
MATH 251	Multivariable Calculus (Minimum grade of C- is required)	4
MATH 261	Elementary Differential Equations	4
PHYS 111	General Physics (GEF 8)	4
PHYS 112	General Physics	4
STAT 215	Introduction to Probability and Statistics	3
or IENG 213	Engineering Statistics	
EE 221	Introduction to Electrical Engineering	3
MAE 241	Statics	3
MAE 243	Mechanics of Materials	3
MAE 320	Thermodynamics	3
MAE 331	Fluid Mechanics	3

### Petroleum & Natural Gas Engineering Core Requirements (Minimum grade of C- required)

Minimum GPA of 2.25 required in all petroleum and natural gas courses

PNGE 200	Introduction to Petroleum Engineering	3
PNGE 310	Drilling Engineering	4
PNGE 312	Drilling Fluids Laboratory	1
PNGE 332	Petroleum Properties and Phase Behavior (Fulfills Writing and Communications Skills Requirement)	3
PNGE 333	Basic Reservoir Engineering	3
PNGE 400	Petroleum Engineering Ethics	1
PNGE 405	Multidisciplinary Team Project	1

PNGE 420	Production Engineering	3
PNGE 432	Petroleum Reservoir Engineering Laboratory	1
PNGE 434	Applied Reservoir Engineering	3
PNGE 441	Oil and Gas Property Evaluation	3
PNGE 450	Formation Evaluation	3
PNGE 470	Natural Gas Engineering	4
PNGE 480	Petroleum Engineering Design	3
Professional Elective - select two of the following:		6
PNGE 415	Well Control	
PNGE 460	Well Stimulation Design	
PNGE 471	Natural Gas Production and Storage	
PNGE 501	Petroleum Engineering Problems	
PNGE 532	Introduction to Reservoir Simulation	
Additional GEF Elective (2-7)		3
GEF Electives 1, 5, 6, 7		15
Total Hours		128

## Suggested Plan of Study

It is important for students to take courses in the order specified as much as possible; all prerequisites and concurrent requirements must be observed. A typical B.S.P.N.G.E. degree program that completes degree requirements in four years is as follows.

### First Year

Fall	Hours Spring	Hours
MATH 155 (GEF 3)	4 MATH 156 (GEF 8)	4
ENGR 101	2 ENGR 102	3
ENGR 199	1 PHYS 111 (GEF 8)	4
CHEM 115 (GEF 2B)	4 CHEM 116 (GEF 8)	4
ENGL 101 (GEF 1)	3 GEF Elective 6	3
GEF Elective 5	3	
	17	18

### Second Year

Fall	Hours Spring	Hours
PHYS 112	4 MATH 261	4
MATH 251	4 MAE 243	3
MAE 241	3 MAE 331	3
ENGL 102 (GEF 1)	3 IENG 213 or STAT 215	3
GEOL 101	3 PNGE 200	3
	17	16

### Third Year

Fall	Hours Spring	Hours
PNGE 332	3 PNGE 310	4
EE 221	3 PNGE 312	1
ECON 201 (GEF 4)	3 PNGE 333	3
MAE 320	3 ECON 202	3
GEF Elective 7	3 GEOL 373	3
	Additional GEF Course	3
	15	17

### Fourth Year

Fall	Hours Spring	Hours
PNGE 420	3 PNGE 400	1
PNGE 434	3 PNGE 405	1
PNGE 441	3 PNGE 432	1

PNGE 450	3 PNGE 480	3
PNGE 470	4 Two Professional Electives	6
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	16	12

Total credit hours: 128

## Major Learning Goals

### PETROLEUM & NATURAL GAS ENGINEERING

Upon graduation, all Bachelors of Science students in Petroleum and Natural Gas Engineering will have:

- A thorough understanding of scientific and engineering principles and their application to petroleum and natural gas engineering problems
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