MINOR IN ENERGY SYSTEMS

The Energy Systems Minor provides students a 15-hour multidisciplinary educational opportunity to study energy systems. The minor includes courses which provide depth in an area relevant to energy that is within the scope of the student's chosen program. Depth course options available to students may vary depending on the program. Appropriate courses are selected by program faculty to meet the needs of their students. The minor also includes requirements for courses which cut across disciplines. These courses are intended to add breadth of knowledge in areas outside the student's major but important to energy systems. A terminal "capstone" or project course provides an opportunity for students from multiple disciplines to work together in multidisciplinary teams on a significant project in the energy area. Appropriate projects are either solicited from industry or faculty experts.

The minor is open to all Georgia Tech undergraduate students whose majors have approved the minor. The breadth courses and the capstone project course, courses taken by all students completing the minor, require one or more pre-requisites; specifically, basic economics, mathematics, and lab science courses.

Minor Program of Study & Guidelines

The minor includes requirements for courses which cut across disciplines. These courses are intended to add breadth of knowledge in areas outside the student's major but important to energy systems. A terminal "capstone" or project course provides an opportunity for students from multiple disciplines to work together in multidisciplinary teams on a significant project in the energy area.

The breadth courses and the capstone project course, courses taken by all students completing the minor, require one or more prerequisites; specifically, basic economics, mathematics, and lab science courses. The minor must consist of at least 15 credit hours and all courses in the minor also must be 3000 level and above.

A multidisciplinary or other minor may contain courses in a student's major field of study. A maximum of 6 credit hours of such courses may be used to satisfy the course requirements for the minor, provided these courses are not also used to satisfy any course requirement in the student's major degree program.

All courses counting toward the minor must be taken on a letter-grade basis and completed with an overall grade-point average of at least 2.00.

All courses in the minor also must be 3000 level and above.

Program of Study - Track for Aerospace Engineering Students

Prerequisite Courses

Students ordinarily pursue the minor upon completion of the needed prerequisites. However, the

depth course requirements may be taken as soon as students have met the relevant prerequisites.

The prerequisites needed for one or more of the courses required for the minor (breadth courses and the capstone project course) are (all existing courses):

Code	Title	Credit Hours
Mathematics		
MATH 1551	Differential Calculus	2
MATH 1553	Introduction to Linear Algebra	2
or MATH 15	5Б і ́hear Algebra	
MATH 1552	Integral Calculus	4
MATH 2551	Multivariable Calculus	4
Physics		
PHYS 2211	Introductory Physics I	4
PHYS 2212	Introductory Physics II	4
Chemistry		
CHEM 1310	Principles of General Chemistry for Engineers	4
or CHEM 12	Chemical Principles I	
Economics		
Select one of t	the following:	3-6
ECON 2100	Economic Analysis and Policy Problems	
or ECON	2Th@1Global Economy	
ECON 2105 & ECON 210	Principles of Macroeconomics Cand Principles of Microeconomics	

Requirements

Code	Title	Credit Hours
Depth Course	s	
Select 6 credi	t hours related to energy systems: ¹	6
AE 4701	Wind Engineering	
AE 4370	Life Cycle Cost Analysis	
NRE 3208	Nuclear Reactor Phys I	
NRE 3301	Radiation Physics	
AE 4461	Introduction to Combustion	
Breadth Cours	ses	
Select two of	the following: ²	6
ECON 3300	Economics of International Energy Markets	
PUBP 3350) Energy Policy	
CHEM 370	The Science of Alternative Energy	
Capstone Cou	irse	
GT 4813	Project in Energy Systems ³	3
Total Credit H	ours	15

- The Depth Courses may have additional prerequisites; please check the current prerequisites.
- A list of acceptable courses which meet the depth requirement is provided by each major approving the minor. Depth courses may be taken in the student's major to ensure the depth in that major needed to peruse a multidisciplinary minor. All acceptable depth courses must be consistent with the goals of the minor. Examples of acceptable courses include engineering courses covering a specific energy technology like solar or relevant engineering science.
- Students should strive to complete the necessary prerequisites and the depth courses prior to enrolling in the breadth courses. However, depth courses may be taken concurrently with the courses taken to meet the breadth requirement.

- Breadth courses may ordinarily serve as technical or free electives in the student's program of study. However, courses required by name and number and/or used to satisfy Core IMPACTS cannot be used to satisfy the requirements of a minor.
- ³ Ordinarily, students must complete all minor requirements before they can register for the Project in Energy Systems course.

Program of Study - Track for Chemical and Biomolecular Engineering Students

Prerequisite Courses

Students ordinarily pursue the minor upon completion of the needed prerequisites. However, the depth course requirements may be taken as soon as students have met the relevant prerequisites.

The prerequisites needed for one or more of the courses required for the minor (breadth courses and the capstone project course) are (all existing courses):

Code	Title	Credit Hours
Mathematics		
MATH 1551	Differential Calculus	2
MATH 1553	Introduction to Linear Algebra	2
or MATH 1	ББи́hear Algebra	
MATH 1552	Integral Calculus	4
MATH 2551	Multivariable Calculus	4
Physics		
PHYS 2211	Introductory Physics I	4
PHYS 2212	Introductory Physics II	4
Chemistry		
CHEM 1310	Principles of General Chemistry for Engineers	4
or CHEM 12	2Chemical Principles I	
Economics		
Select one of	the following:	3-6
ECON 2100	Economic Analysis and Policy Problems	
or ECON	2Th@1Global Economy	
ECON 2105	Principles of Macroeconomics	
& ECON 210	Cand Principles of Microeconomics	
Requireme	nts	
Code	Title	Credit
		Hours
Depth Courses	6	
Select 6 credit	t hours related to energy systems: ¹	6
CHBE 4020	Chemical Engineering in Nanoscale Systems	
CHBE 4310	Bioprocess Engineering	
CHBE 4760	Biocatalysis and Metabolic Engineering	
CHBE 4803	Special Topics (Electrochemical Energy	
	Storage & Conversion)	
CHBE 6130	Electrochemical Engineering	
Breadth Cours	ses	
Select two of	the following: ²	6
ECON 3300	Economics of International Energy Markets	
PUBP 3350	Energy Policy	

CHEM 3700The Science of Alternative Energy Capstone Course GT 4813 Project in Energy Systems ³ 3 Total Credit Hours 15

- The Depth Courses may have additional prerequisites; please check the current prerequisites.
- A list of acceptable courses which meet the depth requirement is provided by each major approving the minor. Depth courses may be taken in the student's major to ensure the depth in that major needed to peruse a multidisciplinary minor. All acceptable depth courses must be consistent with the goals of the minor. Examples of acceptable courses include engineering courses covering a specific energy technology like solar or relevant engineering science.
- ² Students should strive to complete the necessary prerequisites and the depth courses prior to enrolling in the breadth courses. However, depth courses may be taken concurrently with the courses taken to meet the breadth requirement.
- ³ Ordinarily, students must complete all minor requirements before they can register for the Project in Energy Systems course.

Program of Study - Track for Civil and Environmental Engineering Students

Prerequisite Courses

Students ordinarily pursue the minor upon completion of the needed prerequisites. However, the

depth course requirements may be taken as soon as students have met the relevant prerequisites.

The prerequisites needed for one or more of the courses required for the minor (breadth courses and the capstone project course) are (all existing courses):

Code	Title	Credit Hours
Mathematics		
MATH 1551	Differential Calculus	2
MATH 1553	Introduction to Linear Algebra	2
or MATH 1	5Б і ́лear Algebra	
MATH 1552	Integral Calculus	4
MATH 2551	Multivariable Calculus	4
Physics		
PHYS 2211	Introductory Physics I	4
PHYS 2212	Introductory Physics II	4
Chemistry		
CHEM 1310	Principles of General Chemistry for Engineers	4
or CHEM 1	2Chemical Principles I	
Economics		
Select one of	the following:	3-6
ECON 210	0 Economic Analysis and Policy Problems	
or ECON	N 27h@1Global Economy	
ECON 210 & ECON 21	5 Principles of Macroeconomics Cand Principles of Microeconomics	

Requirements

Code	Title	Credit Hours
Depth Course	S	
Select 6 credi	t hours related to energy systems: ¹	6
AE 4370	Life Cycle Cost Analysis	3
CEE 4330	Air Pollution Engineering	3
CEE 4450	Introduction to Petroleum Geomechanics	3
CEE 4803	Marine and Hydrokinetic Renewable Energy	
EAS 3110	Energy, Environment, and Society	3
EAS 4410	Climate and Global Change	3
Breadth Cours	ses	
Select two of	the following: ²	6
ECON 3300) Economics of International Energy Markets	
PUBP 3350) Energy Policy	
CHEM 370	0The Science of Alternative Energy	
Capstone Cou	irse	
GT 4813	Project in Energy Systems ³	3
Total Credit H	ours	30
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- The Depth Courses may have additional prerequisites; please check the current prerequisites.
 - A list of acceptable courses which meet the depth requirement is provided by each major approving the minor. Depth courses may be taken in the student's major to ensure the depth in that major needed to peruse a multidisciplinary minor. All acceptable depth courses must be consistent with the goals of the minor. Examples of acceptable courses include engineering courses covering a specific energy technology like solar or relevant engineering science.
- Students should strive to complete the necessary prerequisites and the depth courses prior to enrolling in the breadth courses. However, depth courses may be taken concurrently with the courses taken to meet the breadth requirement.
 - Breadth courses may ordinarily serve as technical or free electives in the student's program of study. However, courses required by name and number and/or used to satisfy Core IMPACTS cannot be used to satisfy the requirements of a minor.
- ³ Ordinarily, students must complete all minor requirements before they can register for the Project in Energy Systems course.

Program of Study - Track for Electrical and Computer Engineering Students

Prerequisite Courses

Students ordinarily pursue the minor upon completion of the needed prerequisites. However, the depth course requirements may be taken as soon as students have met the relevant prerequisites.

The prerequisites needed for one or more of the courses required for the minor (breadth courses and the capstone project course) are (all existing courses):

Code	Title	Credit Hours
Mathematics		
MATH 1551	Differential Calculus	2
MATH 1553	Introduction to Linear Algebra	2
or MATH 1	5Б і ́hear Algebra	
MATH 1552	Integral Calculus	4
MATH 2551	Multivariable Calculus	4
Physics		
PHYS 2211	Introductory Physics I	4
PHYS 2212	Introductory Physics II	4
Chemistry		
CHEM 1310	Principles of General Chemistry for Engineers	4
or CHEM 1	2Chemical Principles I	
Economics		
Select one of	the following:	3-6
ECON 210	0 Economic Analysis and Policy Problems	
or ECO	N 27h@1Global Economy	
ECON 210	5 Principles of Macroeconomics	
& ECON 21	Cand Principles of Microeconomics	

Requirements

Code	Title	Credit Hours
Depth Course	S	
Select 6 credi systems: ¹	t hours of depth courses related to energy	6
ECE 3070	Electromechanical and Electromagnetic Energy Conversion ²	
ECE 3071	Modern Electric Energy Systems ²	
ECE 4320	Power System Analysis and Control	
ECE 4321	Power System Engineering	
ECE 4325	Electric Power Quality	
ECE 4330	Power Electronics	
ECE 4335	Electric Machinery Analysis	
NRE 3208	Nuclear Reactor Phys I	
NRE 3301	Radiation Physics	
Breadth Cours	ses	
Select two of	the following: ³	6
ECON 3300) Economics of International Energy Markets	
PUBP 3350) Energy Policy	
CHEM 370	0The Science of Alternative Energy	
Capstone Cou	irse	
GT 4813	Project in Energy Systems ⁴	3
Total Credit H	ours	15

- The Depth Courses may have additional prerequisites; please check the current prerequisites.
- A list of acceptable courses which meet the depth requirement is provided by each major approving the minor. Depth courses may be taken in the student's major to ensure the depth in that major needed to peruse a multidisciplinary minor. All acceptable depth courses must be consistent with the goals of the minor. Examples of acceptable courses include engineering courses covering

a specific energy technology like solar or relevant engineering science.

- Any course on this list that is taken for ECE elective, engineering elective, or approved elective credit can count for this minor.
- ² If used for EE Breadth credit, ECE 3070 and ECE 3071 cannot be used for this minor.
- Students should strive to complete the necessary prerequisites and the depth courses prior to enrolling in the breadth courses. However, depth courses may be taken concurrently with the courses taken to meet the breadth requirement.
 - Breadth courses may ordinarily serve as technical or free electives in the student's program of study. However, courses required by name and number and/or used to satisfy Core IMPACTS cannot be used to satisfy the requirements of a minor.
- ⁴ Ordinarily, students must complete all minor requirements before they can register for the Project in Energy Systems course.

Program of Study - Track for Industrial and Systems Engineering Students

Prerequisite Courses

Students ordinarily pursue the minor upon completion of the needed prerequisites. However, the depth course requirements may be taken as soon as students have met the relevant prerequisites.

The prerequisites needed for one or more of the courses required for the minor (breadth courses and the capstone project course) are (all existing courses):

Code	Title	Credit Hours
Mathematics		
MATH 1551	Differential Calculus	2
MATH 1553	Introduction to Linear Algebra	2
or MATH 1	5Би́hear Algebra	
MATH 1552	Integral Calculus	4
MATH 2551	Multivariable Calculus	4
Physics		
PHYS 2211	Introductory Physics I	4
PHYS 2212	Introductory Physics II	4
Chemistry		
CHEM 1310	Principles of General Chemistry for Engineers	4
or CHEM 1	2Chemical Principles I	
Economics		
Select one of	the following:	3-6
ECON 210	0 Economic Analysis and Policy Problems	
or ECON	I 27h@1Global Economy	
ECON 210	5 Principles of Macroeconomics	
& ECON 21	Cand Principles of Microeconomics	

Requirements

Code	Title	Credit Hours
Depth Course	s	
Select 6 credi systems: ¹	t hours of depth courses related to energy	6
AE/ME 4701	Wind Engineering	
ECE 3072	Electrical Energy Systems	
ISYE 4803	Special Topics (Energy and Environment)	
ME 4011	Internal Combustion Engines	
ME 4325	Introduction to Fuel Cell Systems	
ME 4823	Special Topics (Mechatronic sys in Hybrid- electric power trains)	
ME 4171	Environmentally Conscious Design and Manufacturing	
ME 4172	Designing Sustainable Engineering Systems	
ME 4803	Special Topics in Mechanical Engineering (Thermal Systems Engineering)	
NRE 4610	Introduction to Plasma Physics and Fusion Engineering	
Breadth Cours	ses	
Select two of	the following: ²	6
CHEM 370	0The Science of Alternative Energy	
EAS 4410	Climate and Global Change	
EAS 3110	Energy, Environment, and Society	
ECON 3300) Economics of International Energy Markets	
PUBP 3315	5 Environmental Policy and Politics	
PUBP 3350) Energy Policy	
PUBP 3600) Sustainability, Technology, and Policy	
PUBP 4440) Science, Technology, and Regulation	
PHIL 4176	Environmental Ethics	
Capstone Cou	irse	
GT 4813	Project in Energy Systems ³	3
Total Credit H	ours	15

 The Depth Courses may have additional prerequisites; please check the current prerequisites.

- A list of acceptable courses which meet the depth requirement is provided by each major approving the minor. Depth courses may be taken in the student's major to ensure the depth in that major needed to peruse a multidisciplinary minor. All acceptable depth courses must be consistent with the goals of the minor. Examples of acceptable courses include engineering courses covering a specific energy technology like solar or relevant engineering science.
- ² Students should strive to complete the necessary prerequisites and the depth courses prior to enrolling in the breadth courses. However, depth courses may be taken concurrently with the courses taken to meet the breadth requirement.
- ³ Ordinarily, students must complete all minor requirements before they can register for the Project in Energy Systems course.

Program of Study - Track for Mechanical Engineering Students

Prerequisite Courses

Students ordinarily pursue the minor upon completion of the needed prerequisites. However, the depth course requirements may be taken as soon as students have met the relevant prerequisites.

The prerequisites needed for one or more of the courses required for the minor (breadth courses and the capstone project course) are (all existing courses):

Code	Title	Credit Hours
Mathematics		
MATH 1551	Differential Calculus	2
MATH 1553	Introduction to Linear Algebra	2
or MATH 1	5Би́hear Algebra	
MATH 1552	Integral Calculus	4
MATH 2551	Multivariable Calculus	4
Physics		
PHYS 2211	Introductory Physics I	4
PHYS 2212	Introductory Physics II	4
Chemistry		
CHEM 1310	Principles of General Chemistry for Engineers	4
or CHEM 1	2Chemical Principles I	
Economics		
Select one of	the following:	3-6
ECON 2100) Economic Analysis and Policy Problems	
or ECON	l 27h@1Global Economy	
ECON 2105 & ECON 21	5 Principles of Macroeconomics Cand Principles of Microeconomics	

Requirements

Code	Title	Credit
		Hours

Depth Courses

Select 6 credi	t hours related to energy systems: ¹	6
ME 4011	Internal Combustion Engines	
ME 4315	Energy Systems Analysis and Design	
ME 4325	Introduction to Fuel Cell Systems	
ME 4321	Refrigeration and Air Conditioning	
ME 4823	Special Topics (Mechatronic Systems in Hybrid-Electric Powertrains)	
ME 4823	Special Topics (Renewable Energy Systems)	
ME 4171	Environmentally Conscious Design and Manufacturing	
ME 4172	Designing Sustainable Engineering Systems	
ME 4701	Wind Engineering	
ECE 3071	Modern Electric Energy Systems	
NRE 3208	Nuclear Reactor Phys I	
NRE 4214	Reactor Engineering	
NRE 4610	Introduction to Plasma Physics and Fusion Engineering	
Breadth Cours	ses ²	6
ME 4823 ME 4171 ME 4172 ME 4701 ECE 3071 NRE 3208 NRE 4214 NRE 4610 Breadth Cours	Special Topics (Renewable Energy Systems) Environmentally Conscious Design and Manufacturing Designing Sustainable Engineering Systems Wind Engineering Modern Electric Energy Systems Nuclear Reactor Phys I Reactor Engineering Introduction to Plasma Physics and Fusion Engineering ses ²	6

Total Credit Hours		15
GT 4813	Project in Energy Systems ³	3
Capstone Co	ourse	
PUBP 33	50 Energy Policy	
ECON 33	00 Economics of International Energy Markets	
CHEM 37	00The Science of Alternative Energy	

¹ The Depth Courses may have additional prerequisites; please check the current prerequisites.

- A list of acceptable courses which meet the depth requirement is provided by each major approving the minor. Depth courses may be taken in the student's major to ensure the depth in that major needed to peruse a multidisciplinary minor. All acceptable depth courses must be consistent with the goals of the minor. Examples of acceptable courses include engineering courses covering a specific energy technology like solar or relevant engineering science.
- Students should strive to complete the necessary prerequisites and the depth courses prior to enrolling in the breadth courses. However, depth courses may be taken concurrently with the courses taken to meet the breadth requirement.
- Breadth courses may ordinarily serve as technical or free electives in the student's program of study. However, courses required by name and number and/or used to satisfy Core IMPACTS cannot be used to satisfy the requirements of a minor. All courses in the minor also must be 3000 level and above.
- ³ Ordinarily, students must complete all minor requirements before they can register for the Project in Energy Systems course.

Program of Study - Track for Economics (including EIA, and GEML) Students Prerequisite Courses

Students ordinarily pursue the minor upon completion of the needed prerequisites. However, the depth course requirements may be taken as soon as students have met the relevant prerequisites.

The prerequisites needed for one or more of the courses required for the minor (breadth courses and the capstone project course) are (all existing courses):

Code	Title	Credit Hours
Mathematics		
MATH 1551	Differential Calculus	2
MATH 1553	Introduction to Linear Algebra	2
or MATH 1	5Би́hear Algebra	
MATH 1552	Integral Calculus	4
MATH 2551	Multivariable Calculus	4
Physics		
PHYS 2211	Introductory Physics I	4
PHYS 2212	Introductory Physics II	4
Chemistry		
CHEM 1310	Principles of General Chemistry for Engineers	4
or CHEM 1	2Chemical Principles I	

Economics

Select one of the following:	3-6
ECON 2100 Economic Analysis and Policy Problems	
or ECON 27h@1Global Economy	
ECON 2105 Principles of Macroeconomics	
& ECON 21C and Principles of Microeconomics	

Requirements

Code	Title	Credit
		Hours

Depth Courses¹

1

Total Credit Hours		
GT 4813	Project in Energy Systems ³	3
Capstone Course		
CHEM 3700The Science of Alternative Energy		
PUBP 3350 Energy Policy		
ME 3700	Introduction to Energy Systems Engineering	
Select 6 credi	t hours from the following: ²	6
Breadth Courses		
ECON 4340	Economics of Industrial Competition	3
ECON 4440	Economics of Natural Resources and the Environment	3

- The Depth Courses may have additional prerequisites; please check the current prerequisites.
- A list of acceptable courses which meet the depth requirement is provided by each major approving the minor. Depth courses may be taken in the student's major to ensure the depth in that major needed to peruse a multidisciplinary minor. All acceptable depth courses must be consistent with the goals of the minor. Examples of acceptable courses include economics courses covering economic analysis of complex systems.
- ² Students should strive to complete the necessary prerequisites and the depth courses prior to enrolling in the breadth courses. However, depth courses may be taken concurrently with the courses taken to meet the breadth requirement.
- ³ Ordinarily, students must complete all minor requirements before they can register for the Project in Energy Systems course.

Program of Study - Track for Public Policy Students

Prerequisite Courses

Students ordinarily pursue the minor upon completion of the needed prerequisites. However, the depth course requirements may be taken as soon as students have met the relevant prerequisites.

The prerequisites needed for one or more of the courses required for the minor (breadth courses and the capstone project course) are (all existing courses):

Code Mathematic	Title	Credit Hours
MATH 1551	Differential Calculus	2
MATH 1553	Introduction to Linear Algebra	2

MATTINUUT	Differential Galeulus		
MATH 1553	Introduction to Linear Algebra		
or MATH 15 5i hear Algebra			

MATH 1552	Integral Calculus	4		
MATH 2551	Multivariable Calculus	4		
Physics				
PHYS 2211	Introductory Physics I	4		
PHYS 2212	Introductory Physics II	4		
Chemistry				
CHEM 1310	Principles of General Chemistry for Engineers	4		
or CHEM 12Chemical Principles I				
Economics				
Select one of	the following:	3-6		
ECON 2100 Economic Analysis and Policy Problems				
or ECON 27h@1Global Economy				
ECON 2105 Principles of Macroeconomics				
& ECON 21	Cand Principles of Microeconomics			

Requirements

Code	Title	Credit Hours
Depth Course	S	
Select 6 credi systems: ¹	t hours of depth courses related to energy	6
PUBP 3315	Environmental Policy and Politics	
PUBP 3600) Sustainability, Technology, and Policy	
PHIL 4176	Environmental Ethics	
PUBP 4440) Science, Technology, and Regulation	
Breadth Cours	ses	
Select 6 credi	t hours from the following: ²	6
ME 3700	Introduction to Energy Systems Engineering	
ECON 3300	Economics of International Energy Markets	
CHEM 370	OThe Science of Alternative Energy	
Capstone Cou	irse	
GT 4813	Project in Energy Systems ³	3
Total Credit H	ours	15

- ¹ The Depth Courses may have additional prerequisites; please check the current prerequisites.
 - A list of acceptable courses which meet the depth requirement is provided by each major approving the minor. Depth courses may be taken in the student's major to ensure the depth in that major needed to peruse a multidisciplinary minor. All acceptable depth courses must be consistent with the goals of the minor. Examples of acceptable courses include economics courses covering economic analysis of complex systems.
 - Students should strive to complete the necessary prerequisites and the depth courses prior to enrolling in the breadth courses. However, depth courses may be taken concurrently with the courses taken to meet the breadth requirement.
 - Breadth courses may ordinarily serve as technical or free electives in the student's program of study. However, courses required by name and number and/or used to satisfy Core IMPACTS cannot be used to satisfy the requirements of a minor.
- ³ Ordinarily, students must complete all minor requirements before they can register for the Project in Energy Systems course.

Program of Study - Track for Biology Students

Prerequisite Courses

Students ordinarily pursue the minor upon completion of the needed prerequisites. However, the depth course requirements may be taken as soon as students have met the relevant prerequisites.

The prerequisites needed for one or more of the courses required for the minor (breadth courses and the capstone project course) are (all existing courses):

Code	Title	Credit Hours	
Mathematics			
MATH 1551	Differential Calculus	2	
MATH 1553	Introduction to Linear Algebra	2	
or MATH 1	5Би́hear Algebra		
MATH 1552	Integral Calculus	4	
MATH 2551	Multivariable Calculus	4	
Physics			
PHYS 2211	Introductory Physics I	4	
PHYS 2212	Introductory Physics II	4	
Chemistry			
CHEM 1310 or CHEM 12	Principles of General Chemistry for Engineers 2Chemical Principles I	4	
Economics			
Select one of	the following:	3-6	
ECON 2100) Economic Analysis and Policy Problems		
or ECON	2Th@1Global Economy		
ECON 2105	Principles of Macroeconomics		
& ECON 21	Cand Principles of Microeconomics		
Requireme	nts		
Code	Title	Credit	
oode	nie	Hours	
Depth Course	S		
Select 6 credi	t hours of depth courses related to energy	6	
systems: ¹			
BIOS 4221	Biological Oceanography		
BIOS 4410	Microbial Ecology		
BIOS 4418	Microbial Physiology		
BIOS 4440	Human Pathology		
CHEM 351	1 Survey of Biochemistry		
CHEM 451	1 Biochemistry I		
CHEM 4512	2Biochemistry II		
EAS 4410	Climate and Global Change		
EAS 3110	Energy, Environment, and Society		
Breadth Cours	ses		
Select 6 credi	t hours from the following: ²	6	
ME 3700	Introduction to Energy Systems Engineering		
ECON 3300	Economics of International Energy Markets		
PUBP 3350) Energy Policy		
Capstone Course			

Total Credit H	ours	15
GT 4813	Project in Energy Systems ³	3

- The Depth Courses may have additional prerequisites; please check the current prerequisites.
 - A list of acceptable courses which meet the depth requirement is provided by each major approving the minor. Depth courses may be taken in the student's major to ensure the depth in that major needed to peruse a multidisciplinary minor. All acceptable depth courses must be consistent with the goals of the minor. Examples of acceptable courses include science courses which cover energy science like biomass or other relevant basic science.
- ² Students should strive to complete the necessary prerequisites and the depth courses prior to enrolling in the breadth courses. However, depth courses may be taken concurrently with the courses taken to meet the breadth requirement.
- ³ Ordinarily, students must complete all minor requirements before they can register for the Project in Energy Systems course.

Program of Study - Track for Chemistry and Biochemistry Students

- 1. Courses at the 1000 level may NOT be used toward the minor.
- A maximum of 3 credit hours of Special Topics (in biochemistry) courses may be included in the minimum 15 credit hours of a minor program.
- 3. A maximum of 3 credit hours of CHEM 4699 may be used toward the minor.
- 4. All courses counting toward the minor must be completed with an overall average GPA of at least 2.0.
- 5. All courses counting toward the minor must be completed with on a letter grade basis.
- 6. A maximum of 3 credit hours of transfer credit may be used to satisfy the course requirements for a minor. This includes courses taken at another institution or credit earned through the AP or IB program, assuming the scores meet Georgia Tech minimum standards.
- 7. It is the **major advisor's responsibility** to verify that students are using only courses from the designated block(s) from the student's major field of study that are allowed to satisfy a minor program, that they are not using any Core Area A-E courses (including humanities and social sciences), and that they are not using any courses for more than one minor or certificate. Any free elective course used to satisfy the course requirements of the student's major degree program may also be used to satisfy the course requirements for a minor.

Prerequisite Courses

Students ordinarily pursue the minor upon completion of the needed prerequisites. However, the depth course requirements may be taken as soon as students have met the relevant prerequisites.

The prerequisites needed for one or more of the courses required for the minor (breadth courses and the capstone project course) are (all existing courses):

Code	Title	Credit
Mathematic	s	Hours
MATH 1551	Differential Calculus	2

MATH 1553	Introduction to Linear Algebra	2	
or MATH 155#hear Algebra			
MATH 1552	Integral Calculus	4	
MATH 2551	Multivariable Calculus	4	
Physics			
PHYS 2211	Introductory Physics I	4	
PHYS 2212	Introductory Physics II	4	
Chemistry			
CHEM 1310	Principles of General Chemistry for Engineers	4	
or CHEM 12Chemical Principles I			
Economics			
Select one of the following:			
ECON 2100 Economic Analysis and Policy Problems			
or ECON 21h@1 Global Economy			
ECON 2105 Principles of Macroeconomics			
& ECON 21	Cand Principles of Microeconomics		
Requireme	nts		

Code Title Credit Hours **Depth Courses** Select 6 credit hours of depth courses related to energy systems: 1 CHEM 3700The Science of Alternative Energy CHEM 4113 Applications of Inorganic Chemistry in Current **Energy Research** CHEM 4759 Electrochemical Energy Storage and Conversion CHEM 4760 Biocatalysis and Metabolic Engineering CHEM 4785Nanoscale Science and Technology CHEM 4803 Special Topics (with approval of the director of US studies of Chemistry and Biochemistry) CHEM 6571 Enzymology and Metabolism CHEM 6760 Biocatalysis and Metabolic Engineering CHEM 6785Nanoscale Science and Technology Breadth Courses Select 6 credit hours from the following: ² EAS 3110 Energy, Environment, and Society EAS 4410 Climate and Global Change ME 3700 Introduction to Energy Systems Engineering ECON 3300 Economics of International Energy Markets PUBP 3315 Environmental Policy and Politics PUBP 3350 Energy Policy **Capstone Course** Project in Energy Systems ³ GT 4813 15 **Total Credit Hours**

· The Depth Courses may have additional prerequisites; please check the current prerequisites.

· A list of acceptable courses which meet the depth requirement is provided by each major approving the minor. Depth courses may be taken in the student's major to ensure the depth in that major needed to peruse a multidisciplinary minor. All acceptable depth courses must be consistent with the goals of the minor. Examples

- of acceptable courses include science courses which cover energy science like biomass or other relevant basic science.
- 2 · Students should strive to complete the necessary prerequisites and the depth courses prior to enrolling in the breadth courses. However, depth courses may be taken concurrently with the courses taken to meet the breadth requirement.
 - Breadth courses may ordinarily serve as technical or free electives in the student's program of study. However, courses required by name and number and/or used to satisfy Core IMPACTS cannot be used to satisfy the requirements of a minor.
- ³ Ordinarily, students must complete all minor requirements before they can register for the Project in Energy Systems course.

Program of Study - Track for Earth and **Atmospheric Sciences Students Prerequisite Courses**

Students ordinarily pursue the minor upon completion of the needed prerequisites. However, the depth course requirements may be taken as soon as students have met the relevant prerequisites.

The prerequisites needed for one or more of the courses required for the minor (breadth courses and the capstone project course) are (all existing courses):

Code	Title	Credit Hours
Mathematics		
MATH 1551	Differential Calculus	2
MATH 1553	Introduction to Linear Algebra	2
or MATH 1	5Би́hear Algebra	
MATH 1552	Integral Calculus	4
MATH 2551	Multivariable Calculus	4
Physics		
PHYS 2211	Introductory Physics I	4
PHYS 2212	Introductory Physics II	4
Chemistry		
CHEM 1310	Principles of General Chemistry for Engineers	4
or CHEM 1	2Chemical Principles I	
Economics		
Select one of	the following:	3-6
ECON 2100) Economic Analysis and Policy Problems	
or ECON	I 27h@1Global Economy	
ECON 210	5 Principles of Macroeconomics	
& ECON 21	Cand Principles of Microeconomics	

Requirements

3

Code	Title	Credit Hours
Depth Cours	es	
EAS 4410	Climate and Global Change ¹	3
EAS 3110	Energy, Environment, and Society ¹	3
Breadth Cou	rses	
Select 6 cred	lit hours from the following: ²	6
ME 3700	Introduction to Energy Systems Engineering	

ECON 3300 Economics of International Energy Markets

GT 4813	Project in Energy Systems ³	3
Total Credit Hours		1!

The Depth Courses may have additional prerequisites; please check the current prerequisites.

- A list of acceptable courses which meet the depth requirement is provided by each major approving the minor. Depth courses may be taken in the student's major to ensure the depth in that major needed to peruse a multidisciplinary minor. All acceptable depth courses must be consistent with the goals of the minor. Examples of acceptable courses include science courses which cover energy science like biomass or other relevant basic science.
- Students should strive to complete the necessary prerequisites and the depth courses prior to enrolling in the breadth courses. However, depth courses may be taken concurrently with the courses taken to meet the breadth requirement.
 - Breadth courses may ordinarily serve as technical or free electives in the student's program of study. However, courses required by name and number and/or used to satisfy Core IMPACTS cannot be used to satisfy the requirements of a minor. All courses in the minor also must be 3000 level and above.
- ³ Ordinarily, students must complete all minor requirements before they can register for the Project in Energy Systems course.

Program of Study - Track for Physics and Applied Physics Students

Prerequisite Courses

Students ordinarily pursue the minor upon completion of the needed prerequisites. However, the depth course requirements may be taken as soon as students have met the relevant prerequisites.

The prerequisites needed for one or more of the courses required for the minor (breadth courses and the capstone project course) are (all existing courses):

Code	Title	Credit Hours
Mathematics		
MATH 1551	Differential Calculus	2
MATH 1553	Introduction to Linear Algebra	2
or MATH 1	5Би́hear Algebra	
MATH 1552	Integral Calculus	4
MATH 2551	Multivariable Calculus	4
Physics		
PHYS 2211	Introductory Physics I	4
PHYS 2212	Introductory Physics II	4
Chemistry		
CHEM 1310	Principles of General Chemistry for Engineers	4
or CHEM 12Chemical Principles I		
Economics		
Select one of the following:		3-6

ECON 2100 Econ	omic Analysis and	Policy Problems
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Total Credit H	ours	15
GT 4813	Project in Energy Systems ³	3
Capstone Cou	rse	
CHEM 3700	The Science of Alternative Energy	
PUBP 3350	Energy Policy	
ECON 3300	Economics of International Energy Markets	
Select two of	the following: ²	6
Breadth Cours	ses	
PHYS 4263	Nuclei, Particles, and Fields	
PHYS 4262	Solid-state Physics	
PHYS 4251	Biophysics	
PHYS 3232	Optics I	
PHYS 3141	Thermodynamics	
Select 6 credit	hours related to energy systems: ¹	6
Depth Courses	5	
Code	Title	Credit Hours
Requireme	nts	
& ECON 21	and Principles of Microeconomics	
ECON 2105	Principles of Macroeconomics	
or ECON	The IGlobal Economy	

- The Depth Courses may have additional prerequisites; please check the current prerequisites.
- A list of acceptable courses which meet the depth requirement is provided by each major approving the minor. Depth courses may be taken in the student's major to ensure the depth in that major needed to peruse a multidisciplinary minor. All acceptable depth courses must be consistent with the goals of the minor. Examples of acceptable courses include engineering courses covering a specific energy technology like solar or relevant engineering science.
- Students should strive to complete the necessary prerequisites and the depth courses prior to enrolling in the breadth courses. However, depth courses may be taken concurrently with the courses taken to meet the breadth requirement.
 - Breadth courses may ordinarily serve as technical or free electives in the student's program of study. However, courses required by name and number and/or used to satisfy Core Areas A through E cannot be used to satisfy the requirements of a minor.

³ Ordinarily, students must complete all minor requirements before they can register for the Project in Energy Systems course.

Program of Study - Track for Materials Science and Engineering Students

Prerequisite Courses

Students ordinarily pursue the minor upon completion of the needed prerequisites. However, the depth course requirements may be taken as soon as students have met the relevant prerequisites.

The prerequisites needed for one or more of the courses required for the minor (breadth courses and the capstone project course) are (all existing courses):

Code	Title	Credit Hours
Mathematics		
MATH 1551	Differential Calculus	2
MATH 1553	Introduction to Linear Algebra	2
or MATH 1	5Бihear Algebra	
MATH 1552	Integral Calculus	4
MATH 2551	Multivariable Calculus	4
Physics		
PHYS 2211	Introductory Physics I	4
PHYS 2212	Introductory Physics II	4
Chemistry		
CHEM 1310	Principles of General Chemistry for Engineers	4
or CHEM 1	2Chemical Principles I	
Economics		
Select one of	the following:	3-6
ECON 2100) Economic Analysis and Policy Problems	
or ECON	I 21h@IGlobal Economy	
ECON 2105 & ECON 21	5 Principles of Macroeconomics Cand Principles of Microeconomics	
Requireme	nts	
Code	Title	Credit Hours
Depth Course	s	
Select 6 credi	t hours related to energy systems: '	6
MSE 4330	Fundamentals of Nanomaterials and Nanostructures	
Breadth Cours	ses	
Select 3 credi	t hours from the following:	3
Select 3 credi	t hours from the following:	3
Capstone Cou	Irse	
GT 4813	Project in Energy Systems ³	3
Total Credit H	lours	15

 The Depth Courses may have additional prerequisites; please check the current prerequisites.

 A list of acceptable courses which meet the depth requirement is provided by each major approving the minor. Depth courses may be taken in the student's major to ensure the depth in that major needed to peruse a multidisciplinary minor. All acceptable depth courses must be consistent with the goals of the minor. Examples of acceptable courses include engineering courses covering a specific energy technology like solar or relevant engineering science.

- Students should strive to complete the necessary prerequisites and the depth courses prior to enrolling in the breadth courses. However, depth courses may be taken concurrently with the courses taken to meet the breadth requirement.
 - Breadth courses may ordinarily serve as technical or free electives in the student's program of study. However, courses required by name and number and/or used to satisfy Core IMPACTS cannot be used to satisfy the requirements of a minor.

³ Ordinarily, students must complete all minor requirements before they can register for the Project in Energy Systems course.

Additional Guidelines

- A maximum of 6 credit hours of Special Topics courses may be included in a minor program or the student may complete 3 credit hours of Special Topics and 3 credit hours of either Special Problems or Undergraduate Research.
- A maximum of 3 credit hours of transfer credit may be used to satisfy the course requirements for a minor. This includes courses taken at another institution or credit earned through the AP or IB program, assuming the scores meet Georgia Tech minimum standards.
- It is the major advisor's responsibility to verify that students are using only courses from the designated block(s) from the student's major field of study that are allowed to satisfy a minor program, that they are not using any Core IMPACTS courses (including humanities and social sciences), and that they are not using any courses for more than one minor or certificate. Any free elective course used to satisfy the course requirements of the student's major degree program may also be used to satisfy the course requirements for a minor.