Approved Program of Study for Undergraduate Minors
Georgia Institute of Technology
Office of the Registrar
2013-2014
Minor in Energy Systems

Please type or print in ink:

Name (first/last):  
GT Student ID Number: 

GT Email Address:  
Daytime Phone: 

Major:  
Anticipated Graduation Date: 

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In addition to the guidelines listed below, you are responsible for reviewing and following the general guidelines for minors: http://www.catalog.gatech.edu/academics/minorguide.php

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 pre-requisites; specifically, basic economics, mathematics, and lab science courses. List of required prerequisites and curriculum requirements and options for this minor are on the following pages. All courses in the minor also must be 3000 level and above.

It is the major advisor’s responsibility to verify that students are not using any courses required by name and number for their major, 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. Free electives and technical electives may be used towards minors.

List the courses completed for the requested minor:

<table>
<thead>
<tr>
<th>Course and Section</th>
<th>Course Title</th>
<th>Credit Hours</th>
<th>Grade</th>
<th>Semester Completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>GT 4813</td>
<td>Project in Energy Systems</td>
<td>3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Student Signature:

Major School Signature:

Minor School Signature (Management):
Partnering Colleges and Schools:

**College of Engineering**
- The Daniel Guggenheim School of Aerospace Engineering
- School of Electrical and Computer Engineering
- The George W. Woodruff School of Mechanical Engineering

**Ivan Allen College**
- School of Economics
- School of Public Policy

**College of Sciences**
- School of Biology
- School of Chemistry and Biochemistry
- School of Earth and Atmospheric Sciences

**Prerequisite Courses**
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):

a) Mathematics (MATH 1501, 1502, 2401 through Calculus III)
b) Physics (PHYS 2211, 2212)
c) Chemistry (CHEM 1310 or 1211)
d) Economics ECON 2100 or 2101 or (2105 and 2106)

Students ordinarily pursue the minor upon completion of the needed prerequisites. However, the depth course requirements (see below) may be taken as soon as students have met the relevant prerequisites. Students pursuing the minor are expected to remain in good academic standing while pursuing the minor. There is no specific GPA requirement nor are there any required grades in specific courses.

**Depth Courses**
The minor requires **six hours of depth courses** related to energy systems. 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 pursue a multidisciplinary minor. All acceptable depth courses must be consistent with the goals of the minor. Examples of acceptable courses include:

a) Engineering courses covering a specific energy technology like solar or relevant engineering science
b) Science courses which cover energy science like biomass or other relevant basic science
c) Public Policy courses which cover policy analysis or methodology
d) Economics courses covering economic analysis of complex systems
e) Relevant CoA or CoM courses

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

**Menus of Depth Courses by Program**
The Depth Courses below may have additional prerequisites; please check [http://www.catalog.gatech.edu/courses/index.php](http://www.catalog.gatech.edu/courses/index.php) to view the current prerequisites.

### Aerospace Engineering
- AE 4701 Wind Engineering
- AE 4370 Life Cycle Cost Analysis
- NRE 3208 Fundamentals of Nuclear and Radiological Engineering
- NRE 3301 Radiation Physics
- AE 4461 Intro to Combustion

### Biology
- BIOL 4221 Biological Oceanography
- BIOL 4410 Microbial Ecology
- BIOL 4418 Microbial Physiology
- BIOL 4440 Plant Physiology
- CHEM 3511 Survey of Biochemistry
- CHEM 4511 Biochemistry I
- CHEM 4512 Biochemistry II
- EAS 4410 Climate and Global Change
- EAS 3110 Energy, the Environment, and Society

### Mechanical Engineering
- ME 4011 Internal Combustion Engines
- ME 4315 Energy Systems Analysis and Design (if not used as Design Elective)
- ME 4325 Fuel Cells
- ME 4321 Refrigeration and Air Conditioning
- ME 4823 Mechatronic Systems in Hybrid-Electric Powertrains
- ME 4823 Renewable Energy Systems
- ME 4171 Environmental Design and Manufacturing
- ME 4172 Sustainable Energy Systems Design
- ME 4701 Wind Engineering
- ECE 3071 Modern Electric Energy Systems
- NRE 3208 Nuclear Reactor Physics I
- NRE 4214 Reactor Engineering
- NRE 4610 Intro to Plasma Physics and Fusion Engineering

### Electrical and Computer Engineering
- ECE 3070 Electromechanical and Electromagnetic Energy Conversion*
- ECE 3071 Modern Electric Energy Systems*
- 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  Fundamentals of Nuclear and Radiological Engineering  
NRE 3301  Radiation Physics  

*Note: If used for EE Breadth credit, ECE 3070 and ECE 3071 cannot be used for this minor. Any course on this list that is taken for ECE elective, engineering elective, or approved elective credit can count for this minor.
Public Policy
PUBP 3315  Environmental Policy and Politics
PUBP 3600  Sustainability, Technology & Policy
PHIL 4176  Environmental Ethics
PUBP 4420  Science, Technology, and Regulation

Economics
ECON 4440  Environmental Economics
ECON 4340  Industrial Organization

Chemistry and Biochemistry
CHEM 3511  Survey of Biochemistry
CHEM 4XXX/6284  Environmental Analytical Chemistry
CHEM 4XXX/6483  Chemistry of Electronic Materials

Earth and Atmospheric Sciences
EAS 4410  Climate and Global Change
EAS 3110  Energy, Environment, and Society

Breadth Courses
The minor requires **six hours of breadth courses** (two courses). 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. All students pursuing the minor choose either a) or d) and either b) or c) from the list below. Their choices depend on their majors (see notes below). While restrictions apply as to which courses can be used by various majors to fulfill the minor requirements (see Notes a – d), breadth courses may, with permission of the student’s major, be taken for credit outside the minor.

- ME 3700  Introduction to Energy Systems Engineering  (See note a)
- ECON 3300  Economics of International Energy Markets  (See note b)
- PUBP 3350  Energy Policy  (See note c)
- CHEM 3700  The Science of Alternative Energy  (See note d)

Notes:
  a) Cannot be used to complete the minor by COE students.
  b) Cannot be used to complete the minor by ECON students.
  c) Cannot be used to complete the minor by PUBP students.
  d) Cannot be used to complete the minor by COS students.

Capstone Course
GT 4813  Project in Energy Systems

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