

# Whiting School of Engineering

## Bachelor of Arts in General Engineering

For students entering in Fall 2009

*August 2009*

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## 1 INTRODUCTION

Our time has already seen the rapid development of a broad range of technological, scientific and engineering innovations which shape the way in which contemporary society functions. The pace of these developments will become even faster and more global in this century. The Bachelor of Arts in General Engineering is designed to provide students with the fundamental engineering principles needed to understand the basics of, and to work with, modern technology, innovations and engineering practices.

The B.A. degree with a major in General Engineering is intended for undergraduate students who desire a background in engineering and technology yet have neither the desire nor the intention to become professional engineers. These students may, for example, plan to pursue graduate or professional study in architecture, business, law (e.g. intellectual property, patent law) or medicine. They may wish to work in areas which relate to engineering and technology such as public policy or to thrive in the global industrial economy. The Bachelor of Arts in General Engineering is a true liberal arts degree with a concentration in engineering.

The distinctive features of the Bachelor of Arts in General Engineering include:

*Breadth.* Course requirements for the Bachelor of Arts in General Engineering encourage breadth. Approximately 17% of required credits are in mathematics or statistics, 12% in the natural sciences, 20% in humanities and/or social sciences, 8% in international studies (language or other) and 30% in engineering, with the rest being free electives.

*Flexibility.* This program is designed to allow students, in consultation with their advisor, the flexibility to choose a program of study which develops their interests. The engineering concentration and the humanities and social science requirements may be departmentally based or may follow a creative theme designed by the student and his/her advisor. Students are encouraged to minor in any area of their choosing.

*Interdisciplinary Study.* The distribution requirements are ideal for students who seek to understand areas at the interface between technical fields (such as robotics, nanotechnology and biomaterials) or the connections between a technical area and a discipline in the humanities or social sciences (for example environment issues and international trade or ethics and biotechnology).

*International Dimensions of Engineering.* Students are required to develop some knowledge of the international dimensions of engineering. They can do this by studying abroad or by taking a combination of language and other classes which develop an understanding of the culture, technology or society in a foreign country.

This degree is not an engineering degree, and is not suitable for employment as a professional engineer. This program is **not** accredited by the Accreditation Board for Engineering and Technology. Students desiring careers as professional engineers should complete a B.S. degree in one of the engineering disciplines offered by the Whiting School.

## 2 FACULTY

The faculty committee which oversees the BA in General Engineering consists of:

Edward Scheinerman, Vice Dean for Education and Professor of applied Mathematics and Statistics (ex officio chair)

Andrew Douglas, Vice Dean for Faculty and Professor of Mechanical Engineering

Kalina Hristova, Associate Professor of Materials Science and Engineering

Dan Naiman, Professor of Applied Mathematics and Statistics

Erica Schoenberger, Professor of Geography and Environmental Engineering

Ben Schafer, Associate Professor and Department Chair, Civil Engineering

David Yarowsky, Professor of Computer Science

For information about and advising for the Bachelor of Arts in General Engineering please contact Professor Edward Scheinerman, Vice Dean for Education, Whiting School of Engineering, Johns Hopkins University, 3400 N. Charles Street, Baltimore, MD 21218-2681, Tel. (410) 516-7395 or e-mail at [ers@jhu.edu](mailto:ers@jhu.edu).

## 3 GENERAL REGULATIONS

All undergraduate students majoring in the Bachelor of Arts in General Engineering must follow a program approved by their advisor. Your advisor can be any member of the faculty committee who oversee the BA in General Engineering (see above), or any faculty member approved by them.

Candidates for the Bachelor of Arts in with major in General Engineering must fulfill the overall requirements for the Bachelor of Arts degrees as described in the University Catalog. These include the University writing requirement, distribution requirement and 120-credit minimum. Details of these requirements are also provided in the Undergraduate Academic Manual.

Briefly, the requirements are as follows:

- *Mathematics*: five courses; two in calculus, one in statistics, one 200-level or above and one elective (minimum of 20 credits).
  - *Natural Sciences*: four courses (of which at least one must be physics) and two terms of laboratory (minimum of 15 credits).
  - *Humanities and/or Social Sciences*: one course in English writing or composition, at least **four** related courses which form a core (two of which are at the advanced level) and three additional courses coded H or S (minimum of 24 credits).
  - *International Dimensions of Engineering*: Either a semester abroad or three courses which provide expertise in international issues (these may count towards the Humanities or Social Science requirement above).
  - *Engineering*: one course which is an introduction to an engineering discipline, one course in a computer language, three fundamental engineering science courses, and six courses in an engineering concentration which are related thematically or departmentally (at least three of which must be at the advanced level) (minimum of 35 credits).
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- *Free Electives*: a minimum of five full courses (at least 3 credits each). The number of credits required to reach the minimum of 120 will depend on how the International Dimensions requirement is satisfied and on the courses chosen in other areas.

Students are required to have a minimum cumulative GPA of 2.0 to graduate. Further, a maximum of 12 D credits may be counted towards degree requirements and no more than 12 credits completed prior to matriculation or in summer sessions at other accredited colleges or universities may be accepted.

Transfer students are not subject to 12 credits of transfer credit restriction; they must obtain credit for courses they wish to transfer during their first year at Hopkins. University regulations require a minimum of four consecutive full-time semesters and 60 credits earned at JHU for a Hopkins degree.

#### **4 MINORS**

All undergraduate students majoring in the Bachelor of Arts in General Engineering are encouraged to minor in an area offered by any department in the School of Engineering or the School of Arts and Sciences. Students wishing to pursue a minor should confer with the department through which the minor is offered to ascertain the exact requirements.

#### **5 MATHEMATICS REQUIREMENTS**

Mathematics and statistics are at the very core of modern science and technology and a solid foundation is required to understand how contemporary engineering problems are solved. Students are required to take five courses (a minimum of 20 credits) including:

110.108 Calculus I.

110.109 Calculus II.

One course in statistics.

One course at the 200-level or above in either mathematics or statistics.

One mathematics or statistics elective.

Students are strongly advised to take a calculus based statistics course.

#### **6 NATURAL SCIENCE REQUIREMENTS**

The natural sciences, particularly physics and chemistry, form the foundation for most engineering disciplines. In more recent times, biology has become an increasingly important component of modern technology. Students must therefore be familiar with these areas and be trained in fundamental laboratory techniques. Students are required to take four courses and two laboratory courses (a minimum of 15 credits) including:

171.101 General Physics I and at least one course chosen from

030.101 Introductory Chemistry,

510.101 Introduction to Materials Chemistry, or

020.151 General Biology,

two terms of laboratory course; and

two elective courses (area code N).

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## 7 HUMANITIES AND SOCIAL SCIENCE REQUIREMENTS

The Humanities and Social Sciences play a particularly important role in the education of an individual in the Bachelor of Arts in General Engineering. Students are strongly encouraged to include at least one course in economics and one in the history of science and technology.

### 7.1 WRITING REQUIREMENT

Students must complete at least four (minimum of 12 credits) writing intensive courses (catalog code W). Since competence in written communication is essential for the B.A. in General Engineering graduate, at least one of these courses must specifically develop writing skills. Although this course must be designated as a writing intensive course, this designation is not sufficient to guarantee the desirable level of intensity in writing instruction. Three courses that do satisfy this requirement are:

- 661.110 Technical Communication
- 060.113-114 Expository Writing and
- 220.105 Introduction to Fiction and Poetry: Telling it Straight.

(The writing course for non-native writers, 060.100 Basic Expository Writing, may be used by non-native English speakers to fulfill elective requirements, but cannot be used to fulfill the designated writing intensive course requirement.) A student wishing to use any other course to satisfy this writing requirement must have written permission from his/her advisor.

### 7.2 AREA OF CONCENTRATION

The Humanities and Social Science portion of the program is of great importance in broadening the student's education and in stimulating the development of a critical and inquisitive mind as well as incisive analytical skills. In order to best attain these objectives, Humanities and Social Science courses must be chosen as a coherent group in one area of concentration. A minimum of four courses (12 credits) must be taken, of which two are at the advanced (300+) level.

Examples of areas are listed below.

- Africana Studies
- Anthropology
- Asian Studies
- Economics
- Geography
- History and Philosophy of Science
- Ancient, Classical, Medieval and Renaissance studies
- International Relations
- Latin American Studies
- Moral and Political Philosophy
- Political Institutions
- Psychology
- Sociology
- Eighteenth, Nineteenth, and Twentieth Century studies

### 7.3 H/S ELECTIVE

Students must add three additional full courses (minimum 9 credits) in either the humanities or social sciences. These electives are typically used to take courses in economics and the history of science and technology, depending on the courses chosen to fulfill the concentration requirements detailed above.

## 8 INTERNATIONAL DIMENSIONS OF ENGINEERING REQUIREMENTS

Because of the importance of the globalization of technology, all students completing the B.A. in General Engineering are required to demonstrate competence in being able to address technical issues within the context of another society. This can be done in three different ways.

1. Students are encouraged to study abroad for a minimum of one fall or one spring semester in any foreign country (except Canada). In that country, they must take the equivalent of a minimum of 12 credits which are transferred to their Hopkins transcript. In this case, these credits can satisfy any degree requirements (Humanities or Social Sciences, Engineering Concentration, Mathematics, Free Electives, etc.). Additional Free Electives must be taken to ensure that the student graduates with a minimum of 120 credits.
2. Students can complete the equivalent of two semesters of the same foreign language (students may not use language courses in their native language to satisfy this requirement) and one additional course which relates to the culture, economy, social structure or politics of a country which uses this foreign language (minimum of 9 credits).
3. Students can demonstrate proficiency in a foreign language by taking an intermediate course in a foreign language (this can include their native tongue) and two additional courses which relate to the culture, economy, social structure or politics of a country which uses this foreign language (see the list below for examples; minimum of 9 credits).

### *Africa and the Middle East*

070.301 Envisioning African Diaspora

070.334 Urban Africa

100.121 History of Africa

190.311 Middle East Politics

360.375 Parks, Products and People: Debating Environmental Change in Africa

### *Asia*

070.339 Introduction to Indian History and Civilization

070.341 The Other Japan

100.131 History of East Asia

100.219 The Chinese Cultural revolution

140.324 Electronic Identities in Japan: Consumer Culture and Business

190.336 Chinese Foreign Policy

### *Europe*

070.308 Recasting Europe

100.104 History of Occidental Civilization: Modern Europe

### *Latin and South America*

070.313 Community and Governance in Latin America

100.115 History of Latin America

100.243 Brazil for Beginners

*All Regions (no more than one can count toward International Dimensions)*

190.209 Contemporary International Politics

190.316 An Introduction to Globalization

190.323 Introduction to International Law

## **9 ENGINEERING REQUIREMENTS**

The program requires a core of fundamental courses in the engineering sciences as well as a coherent group of related courses planned in consultation with the student's faculty advisor.

### **9.1 CORE REQUIREMENTS**

*Introduction to Engineering (one course)*

500.101 What is Engineering?

500.111 Energy and the Environment

500.141 Perspectives on the Evolution of Structures

510.102 From the Stone Age to the Age of Silicon: Materials and Their Influence on Technology

520.137 Introduction to Electrical and Computer Engineering

570.108 Introduction to Environmental Engineering

530.101 Freshman Experiences in Mechanical Engineering

*Computer Language (one course)*

600.107 Introduction to Programming in Java

500.200 Computing for Engineers and Scientists

(Note that 600.101 Computer Fluency does not meet this requirement.)

*Fundamentals of Engineering Science (three courses)*

(Student must choose no more than one course from the following four groups.)

1. 520.213 Circuits,

2. 530.201 Statics and Mechanics of Materials,

3. either

510.301 Introduction to Engineering Materials OR

510.311 Structure of Materials, or

4. either

530.231 Mechanical Engineering Thermodynamics OR

540.203 Engineering Thermodynamics.

## 9.2 *ENGINEERING CONCENTRATION REQUIREMENTS*

The concentration in engineering must consist of at least six courses (minimum of 20 credits) which are related thematically or departmentally to an engineering discipline; at least three (3) of which must be at the advanced level (300 or above). While the selection of courses must be approved by the faculty advisor, students can be guided by the “E” area designator on courses in their selection of appropriate courses.

While examples of concentrations are provided below, students are encouraged to develop their own concentrations in consultation with their faculty advisor.

### Sample Concentrations

#### **Biotechnology**

510.104 Introductory lectures in biomaterials  
520.214 Signals and Systems  
540.431 Biochemical Eng/Biotechnology  
510.431 Biocompatibility  
510.316 Biomaterials I  
510.407 Biomaterials II  
580.441 Cell Engineering  
580.442 Tissue Engineering

#### **Imaging**

520.214 Signals and Systems  
520.432 Medical Imaging Systems  
600.226 Data Structures  
600.410 Sensory Engineering  
600.357 Computer Graphics  
600.461 Computer Vision

#### **Computer Technology**

520.142 Digital System Fundamentals  
520.214 Signals and Systems  
520.349 Microprocessor Lab.  
520.372 Programmable Device Lab.  
600.333 Computer System Fundamentals  
600.344 Computer Networks

#### **Nanotechnology**

510.201 Introduction to Engineering Materials  
510.311 Structure of Materials  
540.440 Chem. Eng. for Micro and Nanotech.  
540.438 Interfacial Phenomena in Nanotech.  
530.487 Introduction to MEMS  
510.404 Micro and Nanostructured Materials

#### **Electro-Mechanical Devices**

520.142 Digital System Fundamentals  
520.214 Signals and Systems  
520.345 ECE Lab.  
520.372 Programmable Device Lab.  
530.420 Robot Actuators and Sensors  
530.421 MechatronicsRobotics  
520.142 Digital System Fundamentals  
520.214 Signals and Systems  
600.226 Data Structures  
520.372 Programmable Device Lab.  
530.420 Robot Actuators and Sensors  
530.421 Mechatronics

#### **Engineering Science**

520.214 Signals and Systems  
560.202 Dynamics  
530.327 Intro. to Fluid Mechanics  
510.301 Intro. to Engineering Materials  
530.405 Mechanics of Solids and Structures  
520.219 Fields, Matter and Waves

#### **Structural Mechanics**

560.202 Dynamics  
560.206 Solid Mech. and Theory of Structures  
510.301 Intro. to Eng. Materials  
560.320 Steel Structures  
560.435 Probability and Statistics in CE  
560.445 Advanced Structural Analysis

#### **Environmental Engineering**

570.239 Current and Emerging Env. Issues

570.301 Env. Engineering I: Fundamentals

570.353 Hydrology

530.328 Fluid Mechanics II

570.432 Sediment Transport and River  
Mech.

570.424 Air Pollution

**10 FREE ELECTIVES**

The Bachelor of Arts with a major in engineering requires students to take between five and nine courses in any area such that the total number of credits earned is at least 120. Typically, students who have studied abroad will have more free electives than those who have met the International Dimensions requirement through coursework.

Students must select these courses in consultation with their advisor. These free electives are designed to allow students to develop a curriculum of study uniquely suited to their interests.

## 11 Sample Program with a Semester Abroad

(EC=Engineering Core, Eng=Engineering Concentration, ID=International Dimensions, HSC=Humanities or Social Science Concentration, HSE=Humanities or Social Science Elective, FE=Free Elective, Math/Stat=Mathematics or Statistics, Computing=Computer Language, IE= Introductory Engineering course)

<b><i>Freshman year</i></b>			
110.108 Calculus I	4	110.109 Calculus II	4
510.101 Intro to Materials Chemistry	3	171.101 General Physics I	4
030.105 Introductory Chemistry Lab.	1	173.111 General Physics I Lab.	1
IE	3	Computing	3
FE1	3	FE2	3
<b>Total credits</b>	<b>14</b>	<b>Total credits</b>	<b>15</b>
<b><i>Sophomore year</i></b>			
550.111 Statistical Analysis I	4	550.112 Statistical Analysis II	4
EC1	3	EC2	3
NS2	3	NS3	3
HSC1	3	HSC2	3
HSE1	3	Writing	3
<b>Total credits</b>	<b>16</b>	<b>Total credits</b>	<b>16</b>
<b><i>Junior year</i></b>		<b><i>Semester Abroad</i></b>	
Math/Stat Elective	4	<i>Eng2</i>	3
EC3	3	<i>Eng3</i>	3
Eng1	4	<i>FE4</i>	3
HSE2	3	<i>FE5</i>	3
FE3	3		
<b>Total credits</b>	<b>17</b>	<b>Total credits</b>	<b>12</b>
<b><i>Senior year</i></b>			
Eng4	4	Eng6	3
Eng5	3	HSC4	3
HSC3	3	FE7	3
HSE3	3	FE8	3
FE6	3	FE9	3
<b>Total credits</b>	<b>16</b>	<b>Total credits</b>	<b>15</b>

Minimum Credits for the Bachelor of Arts in General Engineering – 120

## 12 Sample Program without a Semester Abroad

(EC=Engineering Core, Eng=Engineering Concentration, ID=International Dimensions, HSC=Humanities or Social Science Concentration, HSE=Humanities or Social Science Elective, FE=Free Elective, Math/Stat=Mathematics or Statistics, Computing=Computer Language, IE= Introductory Engineering course)

<b><i>Freshman year</i></b>			
110.108 Calculus I	4	110.109 Calculus II	4
510.101 Intro to Materials Chemistry	3	171.101 General Physics I	4
030.105 Introductory Chemistry Lab.	1	173.111 General Physics I Lab.	1
IE	3	Computing	3
FE1	3	FE2	3
<b>Total credits</b>	<b>14</b>	<b>Total credits</b>	<b>15</b>
<b><i>Sophomore year</i></b>			
550.111 Statistical Analysis I	4	550.112 Statistical Analysis I	4
EC1	3	EC2	3
NS2	3	NS3	3
HSC1	3	Writing	3
HSE1	3	HSC2	3
<b>Total credits</b>	<b>16</b>	<b>Total credits</b>	<b>16</b>
<b><i>Junior year</i></b>			
Math/Stat Elective	4	Eng2	4
EC3	3	Eng3	4
Eng1	3	FE3	3
ID1	3	ID2	3
HSE2	3		
<b>Total credits</b>	<b>16</b>	<b>Total credits</b>	<b>14</b>
<b><i>Senior year</i></b>			
Eng4	3	Eng6	3
Eng5	3	HSC4	3
HSC3	3	FE5	3
HSE3	3	FE6	3
FE4	3	ID3	3
<b>Total credits</b>	<b>15</b>	<b>Total credits</b>	<b>15</b>

Total Credits for the Bachelor of Arts in General Engineering – **120**

**13 Bachelor of Arts in General Engineering Checkout Sheet (2009-2010)**

**Student:** \_\_\_\_\_

**Class of:** \_\_\_\_\_

		Cred	Grde	Sem		Cred	Grde	Sem	
<b>Natural Sciences (min 15 credits)</b>					<b>Engineering Core (min 15)</b>				
171.101	Physics I	4			Intro Engineering	3			
	NS1	3			Computing	3			
	NS2	3			EC1	3			
	NS3	3			EC2	3			
	Lab	1			EC3	3			
	Lab	1							
<b>Mathematics (min 20)</b>					<b>Engineering Concentration (min 20)</b>				
110.108	Calculus I	4			Eng1	4			
110.109	Calculus II	4			Eng2	4			
____.2__	Math/Stat 1	4			Eng3	3			
	Stat	4			____.3__ Eng4	3			
	Math/Stat 2	4			____.3__ Eng5	3			
		<b>20</b>			____.3__ Eng6	3			
<b>Humanities or Social Sciences (min 24)</b>									
	Writing	3							
	HSC1	3			<b>Free Electives</b>				
	HSC2	3			FE1	3			
____.3__	HSC3	3			FE2	3			
____.3__	HSC4	3			FE3	3			
	HSE1	3			FE4	3			
	HSE2	3			FE5	3			
	HSE3	3			FE6	3			
					FE7				
					FE8				
<b>International Dimensions (Study Abroad or min 9)</b>					FE9				
	ID1	3							
	ID2	3							
	ID3	3							
					D credits (max 12)				
					Transfer Credits				
					Total Credits				