

Whiting School of Engineering

Bachelor of Arts in General Engineering

For students entering in Fall 2023 or later

July 2023

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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 licensed, 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 licensed, professional engineer. This program is **not** accredited by the Accreditation Board for Engineering and Technology. Students desiring careers as licensed, 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:

Michael Falk, Vice Dean for Undergraduate Education and Professor of Materials Science & Engineering, Mechanical Engineering and Physics (ex officio chair)

Lilian Josephson, Lecturer, Chemical and Biomolecular Engineering

Steven Marra, Associate Professor of Mechanical Engineering

Kalina Hristova, Associate Professor of Materials Science and Engineering

Dan Naiman, Professor of Applied Mathematics and Statistics

Rachel Sangree, Lecturer, Civil Engineering

Sarah Preheim, Associate Professor of Environmental Health and Engineering

Scott Smith, Professor of Computer Science

Howard Weinert, Professor, Electrical and Computer Engineering

For information about and advising for the Bachelor of Arts in General Engineering please contact Professor Michael Falk, 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 mfalk@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 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 Catalogue.

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 14 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 33 credits).

- *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 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 or

110.106 Calculus I (Biology and Social Sciences).

110.109 Calculus II or

110.107 Calculus II (For Biological and Social Sciences) or

110.113 Honors Single Variable Calculus.

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.

5 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:

020.151 General Biology I or

030.101 Introductory Chemistry I

171.101 General Physics: Physical Science Major I or

171.103 General Physics I for Biological Science Majors or

171.105 Classical Mechanics I or

171.107 General Physics for Physical Sciences Majors.

Two terms of laboratory course with at least one course chosen from

020.153 General Biology Laboratory I or

030.105 Introductory Chemistry Laboratory I or

173.111 General Physics Laboratory I.

Two elective courses (area code N).

6 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.

6.1 AREA OF FOCUS

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

6.2 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.

7 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 satisfy this requirement are:

- 060.004.101 Reintroduction to Writing
- 220.105 Introduction to Fiction and Poetry
- 661.110 Professional Writing and Communication

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 may 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 may 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 may 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

070.267 Culture, Religion, and Politics in Iran

070.241 African Cities

100.122 or 123 Introduction to the History of Africa

100.234 The Making of the Muslim Middle East

100.251 West African History

100.282 Race & Power in Modern South Africa

100.387 Everyday Life in Medieval Middle East

100.409 Israel and Palestine from 1967 to the Present: a Current and Entangled History

100.421 Sex, Law, and Islam

100.430 Gender and Sexuality in African History

100.444 Migrants and Refugees in Africa

190.394 Comparative Politics of Middle East and North Africa

Asia

070.212 Minorities of South Asia

070.239 Hinduism and Ethics: The Epics

070.332 Reverberations of the Korean War

070.359 Korean War

070.389 Precarity in South Korea through TV and Film: Aesthetics and everyday life

100.243 China: Neolithic to Song

100.248 Japan in the World

100.340 Asian American Art and Activism: Third World, Feminist, and Queer Solidarities

100.347 Early Modern China

100.348 20th-Century China

100.422 Society & Social Change in 18th Century China

100.423 Multiethnic Japan

100.424 Women & Modern Chinese History

100.478 Japan from its Peripheries

100.482 Historiography of Modern China

190.341 Korean Politics

190.370 Chinese Politics

Europe

- 100.103 or 104 Early Modern Europe & the Wider World
- 100.216 Reformation and Counter Reformation Europe
- 100.233 History of Modern Germany
- 100.270 Europe since 1945
- 100.310 The French Revolution
- 100.314 The Enlightenment
- 100.326 From Blood Feud to Black Death: European Society in the High Middle Ages
- 190.440 Comparative European Politics

Latin and South America

- 070.324 Latin America in a Fracturing World
- 070.336 Ethnographic Perspectives on Brazil
- 100.115 Modern Latin America
- 100.154 Modern Mexico from the Alamo to El Chapo
- 100.394 Brazilian Paradoxes: Slavery, Race, and Inequality in Brazil

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

- 190.111 Introduction to Global Studies
- 190.108 Contemporary International Politics
- 190.220 Global Security Politics
- 190.226 Global Governance
- 190.245 The Politics of Global Development

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 (20-21 CREDITS REQUIRED)*Introduction to Engineering (one course)*

- 500.101 What is Engineering?
- 510.106 Foundations of Materials Science & Engineering
- 520.137 Introduction to Electrical and Computer Engineering
- 530.107 Mechanical Engineering Undergraduate Seminar I with
 - 530.108 Mechanical Engineering Undergraduate Seminar II and
 - 530.111 Introduction to Mechanical Engineering Design and CAD
- 560.100 Civilization Engineered
- 570.108 Introduction to Environmental Engineering and Design

Computer Language (one course)

- 500.112 or 113 or 114 Gateway Computing or
- 601.220 Intermediate Programming

Fundamentals of Engineering Science (four courses)

(Student must choose at least one course from each of the following four groups.)

1. 520.230 Mastering Electronics taken at the same time with
520.231 Mastering Electronics Laboratory AND
2. 560.201 Statics and Mechanics of Materials AND
3. either
510.311 Structure of Materials, OR
530.352 Materials Selection AND
4. either
510.312 Thermodynamics/Materials, OR
530.231 Mechanical Engineering Thermodynamics, OR
540.203 Engineering Thermodynamics.

9.2 ENGINEERING FOCUS AREAS

The focus area 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) courses 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 focus areas are provided below, students are encouraged to develop their own focus area in consultation with their faculty advisor.

Sample Focus Areas**Biotechnology**

510.316 Biomaterials I
510.407 Biomaterials II
580.221 Biochemistry and Molecular Engineering
540.437 Application of Molecular Evolution to Biotechnology
580.441 Cellular Engineering
580.442 Tissue Engineering
580.444 Biomedical Applications of Glycoengineering
580.452 Cell and Tissue Engineering Lab (fall semester)

Imaging

520.214 Signals and Systems
520.344 Digital Signal Processing
520.432 Medical Imaging Systems
520.483 Biophotonics
553.361 Optimization I
601.226 Data Structures
601.457 Computer Graphics
601.461 Computer Vision

Computer Technology

520.142 Digital System Fundamentals
520.214 Signals and Systems
520.344 Introduction to Digital Signal Processing
520.349 Microprocessor Lab.
601.229 Computer System Fundamentals
601.414 Computer Networks

Nanotechnology & Electro-Mechanical Devices

510.106 Foundations of Materials Science & Engineering
510.311 Structure of Materials
540.440 Micro/Nanotechnology: The Science and Engineering of Small Structures
520.142 Digital System Fundamentals
520.214 Signals and Systems
530.420 Robot Actuators and Sensors
530.421 Mechatronics
601.226 Data Structures

Engineering Science

510.106 Foundations of Materials Science & Engineering
 520.214 Signals and Systems
 520.219 Introduction to Electromagnetics
 530.327 Intro. to Fluid Mechanics
 530.405 Mechanics of Advanced Engineering Structures
 560.255 Dynamical Systems

Structural Mechanics

510.106 Foundations of Materials Science & Engineering
 530.405 Mechanics of Advanced Engineering Structures
 530.418 Aerospace Structures

560.255 Dynamical Systems
 560.330 Foundation Design
 553.310 Probability & Statistics for the Physical Sciences & Engineering
 560.445 Advanced Structural Analysis

Environmental Engineering

570.239 Environmental Engineering Chemistry: Current and Emerging Topics
 570.303 Environmental Engineering Principles and Applications
 570.304 Environmental Engineering Laboratory
 570.351 Introduction to Fluid Mechanics
 570.353 Hydrology
 570.420 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 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.

12 Bachelor of Arts in General Engineering Checkout Sheet

Student: _____

Class of: _____

		Cred	Grde	Sem			Cred	Grde	Sem
Natural Sciences (min 15 credits)					Engineering Core (min 14)				
171.101	Physics I	4				Intro Engineering	2-4		
	NS1(Intro Chem or Bio)	3				Computing	3-4		
	NS2	3				EC1	3-4		
	NS3	3				EC2	3-4		
	Lab	1				EC3	3-4		
	Lab	1							
Mathematics (min 20)					Engineering Focus Area (min 18)				
110.108	Calculus I	4				Eng1	3-4		
110.109	Calculus II	4				Eng2	3-4		
____.2__	Math/Stat 1	4				Eng3	3-4		
	Stat	4			____.3__	Eng4	3-4		
	Math/Stat 2	4			____.3__	Eng5	3-4		
					____.3__	Eng6	3-4		
Humanities or Social Sciences (min 21)					Free Electives				
		W*					W*		
	HSC1		3						
	HSC2		3			FE1			
____.3__	HSC3		3			FE2			
____.3__	HSC4		3			FE3			
	HSE1		3			FE4			
	HSE2		3			FE5			
	HSE3		3			FE6			
						FE7			
						FE8			
International Dimensions (Study Abroad or min 9)						FE9			
		W*				D credits (max 12)			
	ID1		3			Transfer Credits			
	ID2		3			Total Credits			
	ID3		3						

***Writing-Intensive Requirement:**

Students must complete 4 writing-intensive courses, minimum of 3 credits each. One course must specifically develop writing skills (see Section 7). The writing-intensive courses may be applied to any of the requirement areas above. When completing the checkout sheet, check off the writing-intensive courses in the “W” column.