

Howard University
College of Engineering and Architecture

B.S. Ch.E. Program Handbook

For students entering the chemical engineering program

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Overview

Chemical Engineering is the rigorous study of a broad range of systems involved in the transformation of materials and energy from one form to another. It focuses on the analysis of the chemical, physical and biological phenomena that form the basis of any process and culminates in process systems designs that are critically informed by consideration of relevant environmental, social and safety concerns.

The Department of Chemical Engineering offers an undergraduate program leading to the Bachelor of Science degree in Chemical Engineering and a graduate program of course work and research leading to the Master of Science in Chemical Engineering. The undergraduate program is accredited by the Engineering Accreditation Commission of ABET (<http://www.abet.org>). Chemical Engineering Department is one of five departments in the College of Engineering and Architecture at Howard University. Howard University is a private, coeducational institution located in the heart of the diverse, vibrant, multicultural metropolitan area that is home to the nation's capital, Washington, DC. The region offers an unsurpassed breadth of governmental, private, and academic resources for education and research.

Mission & Goals:

The mission of the Chemical Engineering Department is to produce outstanding chemical engineering graduates prepared to become technological, managerial and public service leaders with a keen sense of ethical and social responsibility and grounded in a holistic appreciation of technology. The faculty and staff are committed to providing a learning environment that instills creative and critical thinking, a solid technical foundation, competence and facility in information technology use, and a sensitivity to environmental and safety issues.

Program Educational Objectives (PEO's):

The educational objectives of the Chemical Engineering program, defined to be achieved by our graduates within a few years of their graduation, are to produce graduates, who are:

1. proficiently practicing chemical engineering in industry;
2. successfully entering and completing advanced degree programs;
3. leaders in their profession.

Student Outcomes (SO's)

Students successfully completing our program will have:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
 2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
 3. an ability to communicate effectively with a range of audiences
 4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
 5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
 6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
 7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.
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Academic Policies, Honors and Degree Requirements

This information has been prepared as a convenience for undergraduate Chemical Engineering students and their faculty advisors. **It is not intended to replace the Howard University Bulletin that is the official University publication on all matters concerning academic policy.** Students and their faculty advisors are encouraged to become familiar with information contained in the Howard University Bulletin and with information presented on the Howard University web site. Students are also encouraged to consult *The H-Book*, which is an official publication of the Office of Student Activities. The H-Book serves as a general resource for all Howard University Students.

Faculty Advisors

Students in the Department of Chemical Engineering are assigned a faculty advisor at the beginning of their first semester in residence. Students are required to consult with their faculty advisors on a regular basis on all academic matters and career objectives. During registration, each student's advisor is provided with an alternate PIN number which the student will need in order to register for their courses. This PIN will only be provided to the student by their advisor after consultation on, and approval of, courses they should register for in the following semester. Faculty advisors maintain an academic check sheet for their advisees in order to monitor student progress and adherence to all pre-requisite, co-requisite and program curricular requirements, and it is the students' responsibility to ensure that they are following the program.

Transfer students are also assigned an advisor when they are accepted into the program. It is the student's responsibility to ensure that all courses that have been taken at other institutions meet the department requirements and have been accepted by the advisor to be part of the student's academic record for graduation.

Transfer Credit

Transfer credits are awarded after review of official transcripts from all of the student's previous institutions by the Department of Chemical Engineering. Courses for which transfer credits are given must be equivalent to Howard University courses in content, prerequisites, co-requisites, and credit hours. No credit will be awarded for courses that do not meet the prerequisites of courses in the chemical engineering curriculum at Howard University. Only courses in which a grade of "C" or better was obtained at an accredited institution are transferable. Credits for some courses offered by the College of Arts and Sciences are transferable from international institutions if those courses have been evaluated by the University and are considered equivalent to courses offered at Howard University. The Department also transfers credit for Advanced Placement level courses if the score meets the requirements set by the department at Howard University that offers a similar course. To establish this, the student must provide official course descriptions and other supporting documentation, including a current University Catalog (or web-based course description) from all institutions in which transfer credit is requested.

Consortium Courses

Howard University offers its qualified undergraduate and graduate degree students the opportunity to enroll in courses in the Washington Metropolitan Area Consortium of Universities (WMACU), including Catholic University, Georgetown University, George Washington University, Trinity College, the University of Maryland, George Mason University and the University of the District of Columbia. Courses to be pursued through the Consortium must be courses that are not available at Howard University during the given semester or year. Details concerning enrollment in consortium courses are contained in the Howard University Student Reference Manual and Directory of Classes available on the Web each semester.

Dean's Honor Roll

Students with a grade point average of at least 3.0 based on a minimum load of 14 credits for the semester will have their names placed on the Dean's Honor Roll.

Attendance Regulations

All students are expected to attend classes regularly and promptly. Students who are absent from classes or laboratory periods are responsible for the entire work of the course. Members of the faculty may hold students responsible for regular and prompt class attendance. Individual faculty may also include attendance and class participation as a component of the grade received for the course.

Any student who does not take a scheduled mid-term or final examination must provide medical or official athletic reasons in writing in order to obtain the approval of his or her instructor to take a substitute examination. A student who does not secure such approval will receive a grade of zero for the examination missed.

Faculty members are responsible for reporting to the Director of Undergraduate Studies of the College of Engineering and Architecture the names of students whose repeated absences or tardiness are, in their opinion, impairing the student's work. In such cases, the Assistant Dean will take appropriate action, which may include withdrawing the student from the course.

Academic Suspension and Readmission

The Department of Chemical Engineering adheres to the policy published by the University. Details concerning academic probation, suspension and readmission after suspension are published in the *Howard University Bulletin* and in the *Student Reference Manual* and *Directory of Classes*.

Graduation

Students must be recommended for graduation by the faculty of the College of Engineering and Architecture. Formal applications for graduation are required. Application forms may be obtained from the Office of the Assistant Dean, Room 1114 LKD Hall. Application should be made approximately seven months in advance of the anticipated date of graduation. A copy of this application must be submitted to the Chemical Engineering Department Office for filing. If a student does not graduate when expected, the student must reapply for graduation.

All students should consult with their advisors or with the Chair of the Department of Chemical Engineering prior to the published deadline to add courses for the fall semester of the academic year in which they plan to graduate. This is imperative in order to assure that their proposed program of study will allow them to meet all academic requirements for graduation in that academic year.

Disclaimer: Individual departments reserve the right to make any changes which supersede the information listed here. Please consult with each department for the latest information.

Requirements Regarding Course Prerequisites

Students enrolled in the Chemical Engineering Program must follow the curriculum published by the department. The student's advisor and the Chair of the department must approve any deviation from the published curriculum. Students should also be aware that the following procedures will be followed to enforce and ensure compliance with current pre-requisite and co-requisite requirements:

- Following General Mandatory Registration, the course schedule of each student will be reviewed by his/her department. Students will be "withdrawn" from classes for which they do not have the proper pre-requisites or co-requisites.
- At the beginning of each semester, instructors in CEA will require each student to complete a pre-requisite/co-requisite survey for his/her class. Students who do not complete and sign the survey or do not have the required pre- and co-requisites will be "withdrawn" from the class.

Social Science, Humanities and Afro-American Studies Requirements

In the interest of making engineers fully aware of their social responsibilities and better able to consider related factors in decision-making processes and to be broadly educated, course work in the humanities, social sciences and Afro-American studies is required as an integral part of the chemical engineering program. Students must include courses at both a lower level and an advanced level and may not limit selections to unrelated introductory humanities and social science courses. ***Therefore, all students should consult closely with their faculty advisors to be certain that these requirements are met.***

Afro-American studies, Social science and humanities electives are offered primarily through the College of Arts and Sciences, although some electives may be selected from course offerings of the Schools of Education and Business. It is important to remember that ***all social science and humanities elective sequences require the approval of the student's major department.***

Each student must complete at least 9 credits in the social science/humanities areas as follows:

- Complete three credit hours (one course) per the University requirements in Afro-American studies. Examples are provided in Table 1 and each semester the Schedule of Classes includes a listing of courses that will satisfy this University requirement.
- Choose either the "Literature" or Non-Literature" area from the Humanities elective in Table 2 and select three credits (one courses) from that area.
- Select an option consisting of three credit hours (one courses) from the Social Science Options listed in Table 3.

Any exceptions to the above must be requested in writing to the Chair of the Department for consideration and must be approved prior to enrollment in the course(s).

1. Afro-American Studies Requirement (One Course Required)

Table 1: Examples of Afro-American Studies Options

- HIST-005 or HIST-006 Intro to the Black Diaspora
- ENGL-150 Afro-American Lit I
- ENGL-151 Afro-American Lit II
- AFRO-005 Intro to Afro-American Studies I
- AFRO-006 Intro to Afro-American Studies II
- POLS-168 Pan-Africanism
- MUTP-100 Blacks in the Art

2. Humanities Requirements (One Courses Required, Lower and Upper Level, With Either Literature or Non- Literature Emphasis)

Table 2A: Examples of Humanities Literature Emphasis Options

Humanities Literature Emphasis Lower Level Course Elective Options

- CLAS-101 Greek Literature in English
- CLAS-102 Roman Literature in English
- CLAS-108 Greek Drama
- CLAS-109 Classical Mythology
- CLAS-113 Women in the Ancient World
- ENGL-050 Introduction to Poetry
- ENGL-151 Intro to Prose Fiction
- ENGL-142 Major English and American Writers
- ENGL-143 Intro to General Literature
- ENGL-054 Afro-American Literature I
- ENGL-055 Afro-American Literature II
- FREN-100 Francophone Literature in English
- RUSS-100 Russian Short Stories
- RUSS-101 Literature of Revolution
- SPAN-100 Hispanic Literature in English
- CLAS-016 Literature of the Ancient World
- HUMA-015 Literature of the Modern World

Humanities Literature Emphasis Upper Level Course Elective Options

- CLAS-114 Lyrics Poetry in Classical Antiquity
- ENGL-053 Highlights in Afro-American Literature
- ENGL-107 Women in Literature
- GREM-101 Literature of Love
- ENGL-168 Modern Caribbean Literature
- CLAS-014 Introduction to Humanities I
- CLAS-015 Introduction to Humanities II
- ENGL-014 Introduction to Humanities I
- ENGL-015 Introduction to Humanities II

Table 2B: Examples of Humanities Non-Literature Emphasis Options

- GERM-100 Individual and Society
- GERM-109 Northern Myths and Legends
- GERM-111 Classics Films in English
- GERM-109 Slavic Mythology
- CLAS-103 Classical Art
- CLAS-111 Satire and Comedy in the World
- ENGL-052 Introduction to Drama
- MUSC-100 Intro to Music
- MUTP-100 Blacks in the Arts
- ARTH-161 Art Appreciation
- THAC-010 Introduction to the Theatre
- FREN-106 Francophone Film

3. Social Science Requirements (One Courses Required)

Table 3: Examples of Social Science Lower/Upper Level Sequence Options

- CLAS-104 Greek Civilization
- CLAS-105 Roman Civilization
- HIST-001 Introduction to Civilization I
- HIST-002 Introduction to Civilization II
- HIST-005 Black Diaspora I
- HIST-006 Black Diaspora II
- SOSC-011 Social Science I
- SOSC-012 Social Science II
- HIST-101 World Geography
- HIST-102 Economic Geography
- RUSS-145 Russian Culture I
- RUSS-146 Politics of Culture
- AFRO-005 Afro-American Studies I
- AFRO-006 Afro-American Studies II
- HIST-003 Europe and the Wider World I
- HIST-004 Europe and the Wider World II
- HIST-030 Intro to African History I
- HIST-031 Intro to African History II
- HIST-040 Intro to the History of Latin America and the Caribbean I
- HIST-041 Intro to the History of Latin America and the Caribbean II
- HIST-050 Intro to Europe History I
- HIST-051 Intro to Europe History II
- ANTH-001 Anthropology
- ANTH-160 Intro to Cultural Anthropology
- SOCI-001 Intro to Sociology
- SOCI-160 Sociology of African Americans
- POLS-001 Intro to Political Science
- POLS-006 Pan-Africanism
- ECON-001 Principles of Economics I
- ECON-002 Principles of Economics II

Please note that the approved courses in the African-American Studies Cluster are always listed in the STUDENT REFERENCE MANUAL and DIRECTORY OF CLASSES.

Physical Education Requirements

Undergraduate students are required to complete one activity-based course in Physical Education.

If in doubt about any information contained herein, students should consult the Howard University Bulletin and/or their Advisor. **The final responsibility for the fulfillment of all requirements for the degree lies with the student.** Academic clearances for the degree BSChE will be issued by the Department of Chemical Engineering if and only if the candidate for graduation has satisfied all published requirements for the degree. The Department of Chemical Engineering will not consider exceptions to these requirements.

The Chemical Engineering Curriculum contained in this Handbook is designed for students to complete the program in four years. It is a recommended schedule and may be adjusted in consultation with the advisor to accommodate longer time frame for completion of B.S. degree.

Chemical Engineering Curriculum

FRESHMAN YEAR

Fall Semester

Discipline/Field	Credit Hours
EGPP-101 Introduction to Engineering	2
MATH-156 Calculus	4
CHEM-003 General Chemistry Lecture I	4
CHEM-005 General Chemistry Lab	1
ENGW-101/102 OR 104 Critical Writing, Expository Writing or Writing, Literacy and Discourse	3
Elective (Humanities/Social Sciences/African American Studies)	3
Total Credit Hours	17

Spring Semester

Discipline/Field	Credit Hours
CHEG-102 Introduction to Chemical Engineering	3
MATH-157 Calculus II	4
CHEM-004 General Chemistry Lecture II	4
ENGW-103 or 105 Persuasive Writing or Reflective Writing Portfolio	3
Elective (Humanities/Social Sciences/African American Studies)	3
Total Credit Hours	17

SOPHOMORE YEAR**Fall Semester**

Discipline/Field	Credit Hours
CHEG-201 ChE Material Balance	3
CSCI-165 Sci. Computing for Engineers	3
MATH-158 Calculus III	4
CHEM-141 Organic Chemistry Lecture	3
PHYS-013 Physics I Lecture	3
PHYS-023 Physics I Laboratory	1
Total Credit Hours	17

Spring Semester

Discipline/Field	Credit Hours
CHEG-202 Energy Balance	3
MATH-159 Differential Equations	4
CHEM-142 Organic Chemistry Lecture	3
CHEM-145 Organic Chemistry Lab	3
PHYS-014 Physics II Lecture	3
Total Credit Hours	16

JUNIOR YEAR**Fall Semester**

Discipline/Field	Credit Hours
CHEG-301 Fluid Mechanics	3
CHEG-303 ChE Thermodynamics	3
CHEM-171 Physical Chemistry Lecture I	3
CHEM-173 Physical Chemistry Laboratory	2
EECE -310 Principles of Electronics	2
Physical Education	1
Total Credit Hours	14

Spring Semester

Discipline/Field	Credit Hours
CHEG-302 Heat Transfer	3
CHEG-306 ChE Analysis	3
CHEM-172 Physical Chemistry Lecture II	3
Elective (Humanities/Social Sciences/African American Studies)	3
Technical Elective (STEM)	3
Total Credit Hours	15

SENIOR YEAR**Fall Semester**

Discipline/Field	Credit Hours
CHEG-401 Mass Transfer /Separation Processes	3
CHEG-403 Chemical Reaction Engineering (Kinetics)	3
CHEG-405 Ch.E. Laboratory	3
CHEG-407 Process Design I	3
Total Credit Hours	12

Spring Semester

Discipline/Field	Credit Hours
CHEG-402 Process Control	3
CHEG-414 Process Design II	3
CHEG-xxx Chemical Engineering Elective	3
Technical Elective (Chemical Engineering)	3
Total Credit Hours	12

TOTAL CREDITS REQUIRED FOR BSCHE**120**

PREREQUISITES AND CO-REQUISITES

NOTE: The following prerequisites/co-requisites listing represents the information available during AY 2017-18. For courses outside chemical engineering department, this may represent only partial listing of prerequisites/co-requisite courses. Please consult the brochure and website for each individual department for up to date information.

CHEMICAL ENGINEERING MAJOR COURSES

Course No.	Course Title	Cr.	Prerequisite	Co-Requisite
EGPP-101	Intro to Engineering	2		
CHEG-102	Intro to Ch.E. Design	3		CHEM 003
CHEG-201	Ch.E. Material Balances	3	MATH 156, CHEM 003	
CHEG 202	Ch.E. Energy Balances	3	CHEG 201, MATH 157	
CHEG-301	Fluid Mechanics	3	CHEG 202, PHYS 013	
CHEG-302	Heat Transfer	3	MATH 159	CHEG 301
CHEG-303	Ch.E. Thermodynamics	3	CHEG 202, PHYS 013	
CHEG-306	Ch.E. Analysis	3	CHEG 301, MATH 159	SYCS 165
CHEG-401	Mass Transfer/Separation Processes	3	CHEG 301, 302, 303, CHEM 171/*PoI	
CHEG 402	Process Control	3	CHEG 302, CHEG 306/*PoI	
CHEG-403	Chemical Reaction Engineering	3	CHEG 301, 303, CHEM 141/*PoI, MATH 159	
CHEG 405	Ch.E. Laboratory	3	CHEM 173 OR CHEM 145	CHEG 401,403
CHEG-407	Process Design I	3	CHEG 303, CHEM 171/*PoI	CHEG 302, 401
CHEG 414	Process Design II	3	CHEG 306, 401, 403, 407, CHEM 142, CHEM 172/*PoI	
CHEG-xxx	Ch.E. Tech Elective	3	Variable Pre-req.; perm. of instructor	
SUB-TOTAL		44		

PoI- Permission of Instructor

REQUIRED ENGINEERING COURSES (FOR CHE)

Course No.	Course Title	Cr.	Prerequisite	Co-Requisite
CSCI 165	Sci. Computing for Engineers	3		
EECE 310	Prin. of Electronics	2	PHYS 014	
xxxx-xxx	Engineering Elective	3	Variable Pre-req.; perm. of instructor	
xxxx-xxx	Eng./Tech Elective	3	Variable Pre-req.; perm. of instructor	
SUB-TOTAL		11		

Course No.	Course Title	Cr.	Prerequisite	Co-Requisite
CHEM 003	General Chem Lecture I	4	-----	
CHEM 004	General Chem Lecture II	4	CHEM 003	
CHEM 005	General Chem Lab I	1	-----	
CHEM 141	Organic Chem Lecture I	3	CHEM 004	
CHEM 142	Organic Chem Lecture II	3	CHEM 141	
CHEM 145	Organic Chem Lab	3	-----	CHEM 141 OR 142
CHEM 171	Physical Chem Lecture I	3	CHEM 004; MATH 159	
CHEM 172	Physical Chem Lecture II	3	CHEM 171	
CHEM 173	Physical Chem Lab I	2	-----	CHEM 171
MATH 156	Calculus I	4	Acceptable Math Placement Exam	
MATH 157	Calculus II	4	MATH 156	
MATH 158	Calculus III	4	MATH 157	
MATH 159	Differential Equations	4	MATH 157	
PHYS 013	Physics I Lecture	3	-----	
PHYS 014	Physics II Lecture 3	3	PHYS 013	

PHYS 023	Physics I Laboratory	1	-----
SUB-TOTAL		49	

REQUIRED ENGLISH, HUMANTIES AND SOCIAL SCIENCE COURSES

Course No.	Course Title	Cr.	Prerequisite
ENGW	English	6	ENGW 101, 102, 104 is Prerequisite for ENGW 103 and 105
xxxx xxx	African American Studies	3	(See Table 1) Variable Prerequisites
xxxx xxx	Humanities	3	(See Table 2A and 2B) Variable Prerequisites
xxxx xxx	Social Science	3	(See Table 3) Variable Prerequisites
SUB-TOTAL		15	

REQUIRED PHYSICAL EDUCATION COURSES

Course No.	Course Title	Cr.	Prerequisite
PHED xxx	PE 1	1	
SUB-TOTAL		1	

GRAND TOTAL 120

