



# HOWARD UNIVERSITY

DEPARTMENT OF  
CIVIL AND ENVIRONMENTAL  
ENGINEERING

BACHELOR OF SCIENCE IN CIVIL  
ENGINEERING

REVISED MAY 2023

CURRICULUM HANDBOOK

**HOWARD UNIVERSITY**  
**Bachelor of Science in Civil Engineering Undergraduate Curriculum**

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# HOWARD UNIVERSITY

## Bachelor of Science in Civil Engineering Undergraduate Curriculum

Revised April 2023<sup>1</sup>

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### PROGRAM EDUCATIONAL OBJECTIVES

The undergraduate engineering program at Howard University leads to the Bachelor of Science in civil engineering degree. The undergraduate program will produce graduates:

- Who enter the civil engineering practice, working independently or as members and leaders of multi-disciplinary teams.
- Some of whom successfully complete graduate and professional studies or professional development opportunities, including the pursuit of professional registration.

The program offers instruction and undergraduate research opportunities in **environmental, geotechnical, structural, transportation, and water resources engineering**. The civil engineering undergraduate program is accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org>.

### STUDENT OUTCOMES

Student outcomes define what students are expected to know or be able to do by the time of graduation. The civil engineering program has adopted the student outcomes established by ABET requirements in Criterion 3. Achieving these outcomes establishes the foundation for achieving the program's educational objectives. The specific student outcomes are as follows.

Students completing the civil engineering program will be able to demonstrate:

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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<sup>1</sup> Note that students must follow either the curriculum in effect on their first date of enrollment at the University OR the most current curriculum. Students must declare the curriculum that they will use and submit the appropriate check-sheet for graduation.

## DEGREE REQUIREMENTS

To meet the requirements for graduation, a student must successfully complete the required 120 credits of coursework with a minimum overall cumulative grade point average (GPA) of 2.0 and a minimum GPA of 2.0 in civil engineering courses.

**Degree Requirements Overview**

<b>Subject Area</b>	<b>Total Credit Hours</b>
English	6
Math and Basic Science	35
Social Science/Humanities	6
African-American Studies	3
ROTC / Physical Education	1
Engineering	66
Free Elective	3
<b>Total Credit Hours</b>	<b>120</b>

**SPECIAL SERVICES FOR STUDENTS WITH DISABILITIES.** Howard University is committed to providing an educational environment that is accessible to all students. In accordance with this policy, students in need of accommodations due to a disability should contact the *Office of the Dean for Special Services* for verification and determination of reasonable accommodations as soon as possible after admission/registration to the University or at the beginning of each semester. The Dean of the Office of Special Services can be contacted at (202) 238-2420.

**CODE OF ETHICS OF ENGINEERS.** Engineers are expected to uphold and advance the integrity, honor, and dignity of the engineering profession by:

- Using their knowledge and skills for the enhancement of human welfare;
- Being honest and impartial and serving with fidelity the public, their employers, and clients;
- Striving to increase the competence and prestige of the engineering profession; and
- Supporting the professional technical societies of their disciplines.

### **The Fundamental Canons:**

1. Engineers shall hold paramount the safety, health, and welfare of the public in the performance of their professional duties.
2. Engineers shall perform services only in the areas of their competence.
3. Engineers shall issue public statements only in an objective and truthful manner.
4. Engineers shall act in professional manners for each employer or client as faithful agents or Trustees, and shall avoid conflicts of interest.
5. Engineers shall build their professional reputation on the merit of their services and shall not compete unfairly with others.
6. Engineers shall act in such a manner as to uphold and enhance the honor, integrity and dignity of the profession.
7. Engineers shall continue their professional development throughout their careers and shall provide opportunities for the professional development of those engineers under their supervision.



## TRANSFER CREDIT

Students desiring to transfer credits for courses taken prior to initial enrollment at Howard must submit official transcripts to the Office of the Registrar. Only courses with a grade of “C” or above are eligible for transfer. Grades do not transfer only credits earned. The Office of the Registrar reviews general education course transfers.

Continuing students may be granted approval to receive credits for courses taken at another institution. The continuing student must

- present the course syllabus for review and approval prior to enrolling in the course.
- document the accreditation status of the institution.
- document accreditation status of the engineering program for engineering courses
- document receipt of a grade of “C” or above via official transcript.

The Department reviews discipline-specific courses. The academic advisor, in consultation with the Howard instructor for the equivalent course, reviews the materials submitted. Recommended approval is presented to the department chair for the submission of Application for Advance Standing forms. The student will receive transfer credit, not a grade, for any approved course in which a grade of C or better was earned.

## THE CONSORTIUM

The University offers its qualified undergraduate and graduate students the opportunity to take courses at other universities with which Howard participates in a consortium agreement (<https://www.consortium.org/>). Grades earned in consortium courses appear on students’ transcripts in the same way that grades appear for courses taken at Howard. To participate in the Consortium, a Howard University student must:

1. Be a fully-admitted, degree-seeking student.
2. Be validated for the current semester.
3. Be registered and actively enrolled in courses at Howard University at the same time that the Consortium course is being taken.
4. Not exceed the number of credits they are registered for at Howard University.
5. Be in good academic standing (2.5 GPA for undergraduate students and 3.0 for graduate students).
6. Obtain the needed signatures of approval.

Information and applications are available from the Consortium Coordinator in the Administration Building, Office of Records, Room 105. Howard University participates in the Consortium with the following universities and colleges:

- |                                |  |
|--------------------------------|--|
| • American University          | • Mount Vernon College                   |
| • Catholic University          | • Southeastern University                |
| • Gallaudet University         | • Trinity College                        |
| • Georgetown University        | • University of the District of Columbia |
| • George Mason University      | • University of Maryland at College Park |
| • George Washington University |  |
| • Marymount College            |  |

Please note, courses pursued through the Consortium Program must be courses not available at Howard during the given semester and **are equivalent to the Howard University** courses. Further, CEE Graduating seniors are not permitted to take Consortium classes in their final semester.

## **TRACKING PROGRESS**

Students are encouraged to use this Undergraduate Curriculum Handbook to plan and track their progress during their period of study. At the beginning of the academic year of graduation, each student must also complete a curriculum check sheet (appended at the end of this document) that shows all the courses he or she has taken or transferred. Both the student and his/her academic advisor must review and sign the check sheet each semester.

## ACADEMIC ADVISEMENT

The role of the faculty advisor begins with providing assistance to students in selecting and scheduling classes. During general registration periods, all students are required to meet with their assigned faculty advisors to complete the registration requirements of the University and the Department. Student should bring a copy of their current transcript and the Registration Request Form with them to their advisory meeting. Students can meet with their advisor during office hours or schedule an appointment. The advisor and student will complete and sign the Registration Request Form based on the ***CEE Undergraduate Plan of Study***. The advisor's and the student's signatures are required on all Registration Request Forms. The signed, completed form serves as evidence of consultation with the advisor and approval of the selection of courses. Students who violate prerequisites/co-requisites or register for courses that were not approved by the advisor risk being dropped from those courses.

The scope of the advisor's responsibility also extends beyond course selection and may include any areas that affect or are related to student's academic success, such as goal setting, career planning, academic issues, personal concerns, and general guidance to facilitate personal growth. An advisor's assistance can be invaluable in helping students and students should inform their advisors of any difficulties, so they can be assisted with academic and personal challenges. All students should get to know their assigned advisors. Students can also arrange a meeting with the department chairperson to discuss any concerns or challenges.

## IMPORTANT

The prerequisite requirements will be strictly enforced. Students **MUST** have the prescribed prerequisites before registering for a course.

## UNDERGRADUATE CLASSIFICATION

CLASSIFICATION	CREDIT HOURS	NOTES
Senior	90+ earned credit hours	Students must have taken and passed at least 4 of the 5 Core CEE Discipline Courses
Junior	60-89 earned credit hours	
Sophomore	30-59 earned credit hours	
Freshman	0-29 earned credit hours	



### Bachelor of Science in CIVIL ENGINEERING UNDERGRADUATE PLAN OF STUDY

FRESHMAN YEAR		Credit Hours		Prerequisites	Co-requisites
		Fall	Spring		
EGPP-101	Introduction to Engineering	2			
MATH-156	Calculus I	4			
ENGL-002	Freshman Composition I	3			
CHEM-003	General Chemistry Lecture I	4			
CHEM-005	General Chemistry Lab I	1			
CIEG-104	Civil Engineering Software & Design		3		
MATH-157	Calculus II		4	MATH-156	
ENGL-003	Freshman Composition II		3	ENGL-002	
PHYS-013	Physics/S&E Lecture I		3	MATH-156	PHYS-023
PHYS-023	Physics/S&E Lab I		1		PHYS-013
Electives	ROTC/Physical Education		1		
<b>FRESHMAN YEAR TOTAL</b>		<b>14</b>	<b>15</b>		
<b>SOPHOMORE YEAR</b>					
Electives	Basic Science Elective	3			
CIEG-202	Statics	3		MATH-157; PHYS-013	
MATH-158	Calculus III	4		MATH-157	
PHYS-014	Physics/S&E Lecture II	3		MATH-157; PHYS-013	PHYS-024
PHYS-024	Physics/S&E Lab II	1			PHYS-014
Electives	Humanities Elective		3		
CIEG-302	Dynamics		3	CIEG-202	MATH-159
CIEG-351	Probability & Statistics		3	MATH-158	
MATH-159	Differential Equations		4	MATH-157	
MEEG-209	Material Science		3	CHEM-003; PHYS 014; MATH-158	
<b>SOPHOMORE YEAR TOTAL</b>		<b>14</b>	<b>16</b>		
<b>JUNIOR YEAR</b>					
CIEG-207	Environmental Engineering I	3		CHEM-003	
CIEG-301	Mechanics of Materials Lecture	3		CIEG-202; MATH-159; MEEG-209	CIEG-303
CIEG-303	Mechanics of Materials Lab	1			CIEG-301
CIEG-311	Fluid Mechanics Lecture	3		CIEG-302; MATH-158; PHYS-013	CIEG-313
CIEG-313	Fluid Mechanics Lab	1		CIEG-302; MATH-158; PHYS-013	CIEG-311
Electives	Social Science Elective	3			
Electives	Free Elective	3			
CIEG-314	Basic Structural Analysis		3	CIEG-302; CIEG-301; CIEG-303	
CIEG-354	Engineering Economics		3	CIEG-351, CIEG-104	
CIEG-352	Water Resources Engineering		3	CIEG-351	
CIEG-416	Transportation Engineering		3	CIEG 104, 351; MATH 158, 159	CIEG-354
CIEG-434	Soil Mechanics Lecture		3	CIEG-301; CIEG 311	CIEG-438
CIEG-438	Soil Mechanics Lab		1		CIEG-434
<b>JUNIOR YEAR TOTAL</b>		<b>17</b>	<b>16</b>		
<b>SENIOR YEAR</b>					
CIEG-439	Senior Design I	2		CIEG 207, 314, 352, 416, and 434	
CIEG Electives	CIEG Discipline Elective 1	3			
CIEG Electives	CIEG Discipline Elective 2	3			
CIEG Electives	CIEG Discipline Elective 3	3			
CIEG-464	Engineering Project Management	3		CIEG 207, 314, 352, 354, 416, and 434	
CIEG-441	Senior Design II		2	CIEG-439	
CIEG Electives	CIEG Discipline Elective 4		3		
Electives	Technical Elective 1		3		
Electives	Technical Elective 2		3		
Electives	African American Elective		3		
<b>SENIOR YEAR TOTAL</b>		<b>14</b>	<b>14</b>		

## CURRICULUM POLICIES

**IMPORTANT** – To meet the requirements for graduation, a student must successfully complete the required **120 credit hours** of coursework with a minimum cumulative GPA of 2.0 and a minimum GPA of 2.0 in civil and environmental engineering courses. **All required courses must be taken in sequence.** Students are encouraged to take the Fundamentals of Engineering Exam (FE) in their senior year in the District of Columbia. Students must also adhere to the following curriculum policies.

**(1) Department Policy Regarding Pre/Co Requisites:** Each student must abide by the prerequisite and co-requisite stipulations in the Plan of Study. A prerequisite may be waived in extraordinary circumstances with the prerequisite in a previous semester at Howard University, is concurrently enrolled in the prerequisite, **and receives approval from the instructor of the course requiring the prerequisite.**

**(2) Department Policy Regarding Mathematics Placement Examination:** Every student taking mathematics courses at Howard University must adhere to Mathematics Placement Examination requirements to determine the appropriate mathematics course. Instructions for taking the exam are available at [www.mpe.howard.edu](http://www.mpe.howard.edu). Each student also must complete the minimum requirement of 16 mathematics credit hours, comprised of Calculus I, II, III and Differential Equations.

**(3) Department Policy Regarding Free Elective, African American Elective, Humanities and Social Sciences Elective Requirements:** The Free Elective is a three-credit course that is intended for students to explore a subject outside of, but related to, civil engineering; the Free Elective course selection must be approved by the Academic Advisor. Students must also complete a three-credit course in African American studies (per University requirement), a three-credit Humanities course, and a three-credit Social Sciences course. Tables 3 and 4 list the courses from which these elective selections must be made. *Any exception to the courses listed in Tables 3-4 must be requested, in writing, along with the course description, and submitted to the student's advisor for consideration and approval prior to enrollment in the course.*

**(4) Department Policy Regarding Discipline and Technical Electives:** Technical electives are intended to expand students' basic knowledge of the civil engineering disciplines. Table 2 lists the courses from which technical elective selections must be made. Students should select technical electives from the same areas of concentration as their CIEG Discipline Electives. Students also have an opportunity to take technical elective courses through the Consortium and other University departments, upon the approval of their advisor, the Department Chair and Discipline instructor. Students must complete four of the five CIEG Discipline Elective courses listed in Table 1.

**(5) Department Policy Regarding Basic Science Electives:** Each student must select one (1) of the following basic science courses to fulfill the basic science elective requirement. **Note: Students must register for the lecture and lab.** Students also have an opportunity to take basic science courses through the Consortium, upon the approval of their advisor and the Department Chair.

- COMP-001 Life Sciences Lecture & Lab (3 credits)
- COMP-002 Planetary Science Lecture & Lab (3 credits)
- BIOL-101 General Biology Lecture & Lab (4 credits)

(6) **Department Policy Regarding Civil Engineering Laboratory Courses:** Students are required to take the laboratory course simultaneously with the lecture for Mechanics of Materials, Fluid Mechanics, and Soil Mechanics. Only students who transfer credit for the lecture from another university may enroll in the laboratory course without concurrent enrollment in the lecture.

(7) **Department Policy Regarding Taking Courses from Other Institutions:** All courses taken at external institutions must be pre-approved by the Department if such courses are to become part of your undergraduate degree program requirements. Approval by the assigned advisor and Chairperson are required. Engineering courses taken from other institutions, including consortium institutions, will only be approved if the institution is ABET-accredited and the course is deemed to be of equal rigor and content as the course at Howard University. A student is only allowed to take engineering courses through the Consortium when the course has been unsuccessfully completed at Howard University or if the course is not offered at Howard in the semester that the student needs to complete it. Students should have a GPA of at least 2.5 to be eligible to take Courses in Other Institutions.

## DESCRIPTION OF COURSES

### Chemistry

**CHEM-003. General Chemistry & Recitation, 4 credits.** Deals with the fundamental principles of chemistry, the chemical and physical properties of the elements and their most common compounds, and methods of qualitative inorganic analysis. **Prereq:** Students required to take **CAR Math** have to satisfy that requirement before they are able to enroll in this course.

**CHEM-005. General Chemistry Laboratory, 1 credit.** Designed to teach some of the techniques of chemical experimentation, and illustrate some of the principles of chemical substances.

### Civil and Environmental Engineering

**EGPP-101. Introduction to Engineering, 2 credits.** Provides information on engineering education, the engineering profession, and basic concepts and tools. Introduces the engineering design process and provides the opportunity for students to complete engineering design projects. Introduces the civil engineering discipline, including the concentration areas of transportation, environmental, water resources, structural, and geotechnical engineering.

**CIEG-104. Civil Engineering Software & Design, 3 credits.** This course is designed to provide students with an introduction to programming with MATLAB, data analysis with MS Excel, and drawing 2D and 3D objects using AutoCAD. It also teaches students to prepare professional project reports using MS Word and presentations using MS PowerPoint. It is aimed at helping students to develop technical writing and communication competencies appropriate for civil engineering practice.

**CIEG-202. Statics, 3 credits.** Introduction to vectors, pseudo-graphical and analytical micro-computer aided resolution and composition of forces; equilibrium of collinear, concurrent, and non-concurrent two and three-dimensional force systems, as applied to particles and rigid bodies. Coulomb friction; Hooke's law; introductory application of equilibrium, compatibility, and constitutive relations in the determination of forces moments, displacements and rotations of simple deformable bodies and biomechanical systems, using simple computer aids. **Prereq.: MATH-157, PHYS-013.**

**CIEG-207. Introduction to Environmental Engineering, 3 credits.** Introduces concepts in water supply, water and wastewater treatment, air quality, solid and hazardous waste management, and social and ethical considerations. Provides a brief history and background of environmental engineering. **Prereq.: CHEM-003.**

**CIEG-301. Mechanics of Materials Lecture, 3 credits.** Introductory analysis of tension, compression and shear; analysis of stress and strain; ties, shafts, beams and columns; related laboratory experiments and computer applications; introduction to structural analysis and design. **Prereq.: MATH-159, CIEG-202, MEEG-209.**

**CIEG-302. Dynamics, 3 credits.** Study of motions of particles; particle systems, rigid bodies and simple deformable mass system; rectilinear and curvilinear kinematics; Newton's laws of motion and gravitation; work energy and impulse-momentum principles; conservation laws for energy and momentum; introduction to vibrations; computer-aided applications. **Prereq.: CIEG-202; Coreq.: MATH-159.**

**CIEG-303. Mechanics of Materials Lab, 1 credit.** This laboratory course accompanies the Mechanics of Materials lecture. **Coreq.: CIEG-301 or approval of instructor**

**CIEG-311. Fluid Mechanics Lecture, 3 credits.** Theoretical and laboratory studies of fluid properties, hydrostatics, kinematics, and dynamics of fluid; continuity equation; energy and Bernoulli equation; momentum equation; dimensional analysis and flow resistance. **Prereq.: MATH-158, CIEG-302; PHYS-013; Coreq.: CIEG-313**

**CIEG-313. Fluid Mechanics Lab, 1 credit.** This laboratory course accompanies the Fluid Mechanics lecture. CIEG 311. **Prereq.: MATH-158, CIEG-302; PHYS-013; Coreq.: CIEG-311 or approval of instructor**

**CIEG 314. Basic Structural Analysis, 3 credits.** An introduction to the elastic behavior of structural elements, statically determinate structures; and reactions, shears, moments, and deflections in beams, trusses, and frames and definition of standard structural design loads. **Prereq.: CIEG-302, CIEG-301, CIEG-303.**

**CIEG-328. Unit Operations in Environmental Engineering, 3 credits.** Analysis and basic design of treatment facilities for the remediation of water pollution. Advanced design of facilities for water and wastewater treatment including design ranges, regulations, economics and ethics of environmental design. **Prereq.: CIEG-207.**

**CIEG-354 Engineering Economics, 3 credits.** Examines principles of accounting, time value of money, depreciation, taxes, retirement, and economic analysis of alternatives for use in personal finances and engineering projects. **Prereq.: CIEG-351, CIEG-104.**

**CIEG-351. Probability and Statistics, 3 credits.** Stochastic and deterministic statistical modeling: probability and statistics for univariate analysis including probability density functions, confidence intervals and hypothesis testing. Probability and statistics for multivariate analysis including regression analysis, confidence intervals and hypothesis testing; PCA, ANOVA, and risk-based design concepts. **Prereq: MATH-158.**

**CIEG-352. Water Resources Engineering I, 3 credits.** Classical and statistical hydrology: hydrologic cycle, hydrologic processes, physical watershed characteristics, hydrologic modeling, collect analyze and interpret meteorological and hydrologic data using statistical analysis for design of hydrologic and hydraulic structures. Remote sensing data in hydrology. **Prereq.: CIEG-351.**

**CIEG 407. Intelligent Transportation Systems, 3 credits.** Command, controls and communications in modern multimodal transportation; infrastructure/highway and vehicle automation, advanced traffic management, vehicle control and safety systems; information data, and sensory requirements; practical application. **Prereq: CIEG 416, 465.**

**CIEG-416. Transportation Engineering, 3 credits.** Involves planning and design of highways. Students work in teams during the preparation of the required design plans, cost estimates and project reports. **Prereq.: CIEG-104, 351; MATH 158; Co-req.: CIEG-354.**

**CIEG-420. Matrix Structural Analysis, 3 credits.** Continuation of analysis of statically indeterminate structures; moment distribution; introduction to matrix formulation of the direct

stiffness method (emphasized) and the flexibility method (for reference); elementary finite element analysis techniques; introduction to nonlinear (plastic) analysis; structural stability; and structural dynamics.. **Prereq.: CIEG-314.**

**CIEG-422. Steel Design, 3 credits.** Principles of structural design, loads, types of steels, tension members, columns, non-composite and composite beams, beam-columns, column base plates, and simple bolted and welded connections. The use of the AISC LRFD specification is emphasized and a comprehensive group design project is assigned. **Prereq.: CIEG-314.** (Available at the Consortium at Catholic University in the spring semester at George Washington University in the fall semester)

**CIEG-433. Foundations, 3 credits.** Based on the principles of soil mechanics, fluid mechanics, and solid mechanics, covers the bearing capacity and settlement analysis of shallow and mat foundations, an introduction to deep foundations, and design of earth retaining structures. Analytical, empirical, and computational methods are used. **Prereq.: CIEG-434.**

**CIEG-434. Soil Mechanics Lecture, 3 credits.** Provides for appreciation and understanding of the engineering properties of soils and how they relate to design and construction, including soil identification and classification. **Prereq.: CIEG-301, CIEG-311; Coreq.: CIEG-438**

**CIEG-435. Reinforced Concrete, 3 credits.** Theory and design of reinforced concrete structural members and entire structural systems according to the ACI Building Code Requirements. The students will apply fundamentals and basic design procedures to reinforced concrete members (beams, slabs, columns and footings). **Prereq.: CIEG-314.**

**CIEG-438. Soil Mechanics Lab, 1 credit.** This laboratory course accompanies the Soil Mechanics lecture. Exposure to grain size analysis, permeability, consolidation and strength tests. **Coreq.: CIEG-434 or approval of instructor**

**CIEG-439. Senior Design I, 2 credits.** This course is concerned with the planning, management, teaming and the development of the concept documents of the capstone design project. **Prereq: CIEG-104, 207; CIEG-314; CIEG-352; CIEG-416; CIEG-434.**

**CIEG-440. Water and Wastewater Treatment, 3 credits.** Advanced design of facilities for water and wastewater treatment including design ranges, regulations, economics and ethics of environmental design. Introduces the concepts of green design and sustainability. **Prereq.: CIEG-328.**

**CIEG-441. Senior Design II, 2 credits.** This course integrates the many sub-disciplines of civil engineering into a major design experience based on knowledge and skills acquired in preparatory civil engineering courses. This course requires students to use multiple constraints and engineering standards for a project that will prepare students for engineering practice. **Prereq.: CIEG-439.**

**CIEG-442. Advanced Foundations, 3 credits.** Design of deep foundations and braced excavations. Concepts of factors of safety, margin of safety, reliability and load and resistance factor design (LRFD). Analysis of slope stability and foundation design in difficult soils. **Prereq.: CIEG-433.**

**CIEG-445. Undergraduate Research, 3 credits.** Requires a student to conduct research under the directives of an instructor. Students must seek and receive the approval of the instructor prior to enrollment in this course. The selected research topic must broaden the student's understanding of one of the five emphasis areas. **Prereq.: Approval of instructor .**

**CIEG-457. Advanced Hydrology, 3 credits.** Modeling of the hydrologic cycle and hydrologic processes; learn and apply hydrologic models such as those hosted by the Watershed Modeling System (WMS) software, including the US Army Corps of Engineers HEC-1 model and the SCS TR-20 and TR-55 models; learn and apply GIS software, Arc GIS. **Prereq.: CIEG-352.**

**CIEG-463. Water Resources Planning, 3 credits.** Presents basic concepts in the planning of water resources development systems; analytical techniques, basic information required for planning; and examples for planning flood control, wastewater management, and water supply systems. **(Senior Status)**

**CIEG-464. Engineering Project Management, 3 credits.** Involves planning performing and controlling of engineering projects; introduces management roles, project scheduling, principles and procedures, as well as emphasis on engineering project proposal preparation in one of the civil engineering sub-disciplines. Students will also be introduced to Earned Value Management analysis.. **Prereq.: CIEG 207, 314, 352, 354, 416, 434 or equivalent core courses if student is from another Department.**

**CIEG-465. Traffic Engineering I, 3 credits.** Involves the collection and use of traffic engineering data and introduces students to traffic operations and safety. Students use software for capacity analysis and signal optimization. Students are required to prepare reports. **Prereq.: CIEG-351; CIEG-416.**

**CIEG-466. Traffic Engineering II, 3 credits.** Involves the introduction to traffic impact analysis, and use of traffic simulation models for evaluating traffic operation on highway networks, including traffic impact studies and signal warrant analyses. . **Prereq.: CIEG-465.**

**CIEG-467: Construction Project Management, 3 credits.** This course covers elements of management related to construction projects; responsibilities of construction managers, on-site representatives, engineers and inspectors; concept of developing the project team approach. The student will gain knowledge of the roles and responsibilities of a project manager, including technical and management skills and an overview of the phases in a construction project. The student will develop knowledge and skills in safety, interpersonal communication, negotiation and conflict resolution, construction documents, construction planning, estimating and cost control, scheduling, resource control, quality control and continuous improvement. Students will also be introduced to construction project management software program(s) used in the industry. **Prereq.: CIEG-354, CIEG 351 or approval of instructor.**

**CIEG 470. Biological Processes. 3 credits.** Design of biological treatment processes with a focus on removing organic and inorganic pollutants and recovering resources (i.e., energy, water,



nutrients, and other useful products). Aerobic and anaerobic as well as suspended and attached growth technologies are emphasized. Computational models to facilitate design are introduced.

**Prereq: CIEG 328**

**CIEG-474. Special Topics in Structural Eng. 3 credits.** Presentation of material is not normally available in regular structural engineering course offerings of new courses on a trial basis. Content determined by a faculty member in consultation with the Department Chair. **Prereq.: CIEG-314.**

**CIEG-476 Intro to Structural Protection Systems. 3 credits.** An introductory course about applying emerging technologies for protecting civil engineering structures and basic concepts for analysis and design. **Prereq.: CIEG-314.**

**CIEG-472 Structures Project Research. 3 credits.** An investigation conducted independently by a student and guided by the instructor that makes an original and creative contribution to the structural engineering discipline. **CIEG-314.**

**CIEG-556 Hydraulic Project Research, 3 credits.** Course is designed for individual students who seek deeper knowledge of hydrology and hydraulics, through research, the use of software, and publication of research in journals. **Prereq: CIEG 352.**

### **Comprehensive Sciences**

**COMP-001. Life Sciences Lecture & Laboratory, 3 Credits.** This course explores the basic concepts of the biological (life) sciences. These concepts will be presented through the examination of the principal characteristics that all living things (life forms) have in common (i.e., ecology, genetics, taxonomy, metabolism, evolution, reproduction and development, etc.). The lecture information surveys living systems on the chemical, cellular and organismal levels. The exploration is complemented by key laboratory applications and observations that will enable the students to recognize, comprehend and appreciate the complexities of biological organization that exist in nature. **Note: Students must register for the Lecture and Lab.**

**COMP-002. Planetary Science Lecture & Laboratory, 3 Credits.** The planetary science course involves studies of astronomy (planets, stars, the universe) and geology (the earth). In geology, the principal features of planet earth such as size, shape, composition, motions are presented. How planet earth changes as a result of internal and external forces act on it provides a topic of interest. In astronomy, emphasis is on the other planets, the solar system and other celestial bodies that exist in the universe. Laboratory investigations involve the examination of various samples, planetarium visits and field trips to area geological sites and venues where advanced technological telescopes can be used. **Note: Students must register for the Lecture and Lab.**

### **English**

**Note - Each student must complete the minimum requirement of six (6) credit hours in English as follows:**

**ENGW-102 (or 103, 105). Freshmen Composition I, 3 credits.** Designed to develop the student's ability to express ideas clearly and effectively in writing and to read with perception and accuracy; emphasizes the power and value of written communication by reading exemplary text.

**ENGW-103 (or 104, 105). Freshmen Composition II, 3 credits.** Intended to increase the student's ability to write effectively, to read critically, and to present ideals logically. **Prereq:**

ENGW-102 (or 103, 104).

### **Mathematics**

**MATH-156. Calculus I, 4 credits.** Limits, continuity, and the derivative and integral of functions of one variable, with applications.

**MATH-157. Calculus II, 4 credits.** Continuation of MATH-156, including more integration, sequences, series, Taylor's theorem, improper integrals, and L'Hospital's rule. **Prereq.: MATH 156.**

**MATH-158. Calculus III, 4 credits.** Continuation of MATH-157, including calculus of functions of several variables, with applications. **Prereq.: MATH-157.**

**MATH-159. Differential Equations, 4 credits.** Elementary techniques of solving ordinary differential equations, including slope fields, equilibrium, separation of variables, linear differential equations, homogeneous differential equations, undetermined coefficients, bifurcations, power series, Laplace transforms, systems, and numerical methods. **Prereq.: MATH-157.**

**MATH 164. Introduction to Numerical Analysis.** 3 crs. Treats numerical integration and numerical solution of differential equations, numerical linear algebra, matrix inversion, characteristic values; error propagation; and stability. **Prereq.: CIEG-103; Coreq: MATH-159.**

### **Mechanical Engineering**

**MEEG 209. Materials Science, 3 credits.** Correlation of the structure of metals, ceramics, and organic materials with their mechanical and physical properties, control of properties by modifying the microstructure, and stability of materials in service environments. **Prereq.: CHEM-003; PHYS 014; MATH-158.**

### **Physics**

**PHYS-013. Physics for Science and Engineering Lecture I, 3 credits.** This lecture/recitation calculus-based course deals with mechanics, heat and sound. **Prereq.: MATH-156; Coreq: PHYS-023.**

**PHYS-023 Physics for S&E Lab I, 1 credit.** Laboratory course to accompany introductory physics course, **Coreq: PHYS-013.**

**PHYS-014. Physics for Science and Engineering Lecture II, 3 credits.** This lecture and recitation calculus-based course covers electricity and magnetism, light and optics. **Prereq.: PHYS-013, MATH 157; Coreq.: PHYS-023.**

**PHYS-024 Physics for S&E Lab II, 1 credit.** Laboratory course to accompany introductory physics course, PHYS-023.

## ELECTIVE TABLES

**Table 1. CIEG Discipline Elective Courses**

<i>Every student must complete any four of the following five CIEG Discipline Electives.</i>			
Course Number	Course Name	Pre-requisite(s)	Offered
CIEG-328	Unit Operations in Environmental Engineering	CIEG-207	Spring
CIEG-433	Foundation Engineering	CIEG-434	Fall
CIEG-435	Reinforced Concrete	CIEG-314	Fall
CIEG-465	Traffic Engineering I	CIEG-351; CIEG 416	Fall
CIEG-457	Advanced Hydrology	CIEG-352	Fall

**Table 2. Technical Elective Courses**

Course	CIEG Discipline	Offered
CHEG 412 Transport Phenomena	Environmental	Fall
CIEG 440 Water & Wastewater Treatment	Environmental	Consortium
CIEG 470 Biological Processes	Environmental	Fall
CIEG 511 Aquatic Chemistry	Environmental	Consortium
CIEG 442 Advanced Foundations	Geotechnical	Spring
CIEG-472 Structures Project Research	Structural	Fall/Spring
CIEG-420. Matrix Structural Analysis	Structural	Consortium
CIEG-422 Steel Design	Structural	Consortium
CIEG-474 Special Topics in Structural Eng.	Structural	Spring
CIEG-476 Intro to Structural Protection Systems	Structural	Fall
MATH-164 Numerical Analysis	General	Fall/Spring
CIEG-466 Traffic Engineering II	Transportation Engineering	Fall/Spring
CIEG-467 Construction Project Management	Transportation	Fall/Spring
CIEG-579 Advanced Traffic Engineering	Transportation	Fall/Spring
CIEG 556 Hydraulic Project Research	Water Resources	Fall/Spring
CIEG 407 Intelligent Transportation Systems	Transportation	Spring
CIEG 445 Undergraduate Research	General	Fall/Spring

**Table 3. African American Elective Courses**

AFRO-005	Intro to Afro-American Studies I	ENGL-055	African-American Literature from 1940 to Present
AFRO-006	Intro to Afro-American Studies II	AFST-101	African World
HIST-005	Intro to the Black Diaspora I	FASH-102	African-American Dress
HIST-006	Intro to the Black Diaspora II	ARTH-193	Black Body Dress and Culture
MUTP-100	Blacks in Arts	POLS-006	Pan-Africanism
ENGL-054	African-American Literature to 1940		

**Table 4. Humanities and Social Science Elective Courses**

<b>Humanities Elective Courses</b>		<b>Social Sciences Elective Courses</b>	
CLAS-001	Elementary Latin	CLAS-104	Greek Civilization
CLAS-016	Literature of the Ancient World	CLAS-105	Roman Civilization
CLAS-101	Greek Literature	HIST-001	Intro to Civilization I
CLAS-102	Roman Literature	HIST-002	Intro to Civilization II
CLAS-103	Classical Art	HIST-005	Intro to Black Diaspora I
CLAS-109	Classical Mythology	HIST-006	Intro to Black Diaspora II
CLAS-011	Satire and Comedy in the Ancient World	HIST-009	US History to 1877
CLAS-015	Humanities II	HIST-010	US History since 1877
CLAS-114	Love in Antiquity	HIST-030	Intro to African History I
CLAS-030	Vocabulary Building	HIST-031	Intro to African History II
ENGL-014	Intro to Humanities I	HIST-041	Intro to History of Latin Am & Caribbean
ENGL-015	Humanities II	HIST-101	World Geography
ENGL-054	African- American Literature to 1940	HIST-102	Economic Geography
ENGL-055	African-American Literature from 1940	HIST-140	History of the Caribbean
ENGL-056	Intro to Caribbean Literature	HIST-176	Afro-American History to 1877
ENGL-117	Intro to Creative Writing- Fiction	HIST-177	Afro-American History since 1877
ENGL-118	Intro to Creative Writing- Poetry	AFRO-005	Afro-American Studies I
FREN-100	Francophone Literature in English	AFRO-006	Afro-American Studies II
RUSS-100	Russian Short Stories	AFST-101	African World
SPAN-100	Hispanic Literature in English	PSYC-080	Intro to Psychology
GERM-107	Women in Literature	PSYC-125	General Social Psychology
AFST-111	African Systems of Thought	SOCI-001	Intro to Sociology
AFST-701	African World- Writing	SOCI-020	Intro to Social Psychology
GERM-100	Individual and Society	SOCI 180	Sociology of Afro-Americans
HIST-170	Global Warming, People, & Environment	SOCI-181	Sociology of Poverty
MUSC-100	Introduction to Music	ANTH-110	Intro to Cultural Anthropology
MUTP-100	Blacks in Arts	ANTH-120	Intro to Biological Anthropology
ARTH-161	Art Appreciation	FASH-102	African-American Dress
THFD-010	Introduction to the Theater	ARTH-193	Black Body Dress and Culture
PHIL-051	Principles of Reasoning	POLS-001	Intro to Black Politics
PHIL-055	Introduction to Philosophy	POLS-006	Pan-Africanism
		ECON-001	Principles of Economics I
		ECON-002	Principles of Economics II

**Check Sheet for Bachelor of Science Prospective Graduates (revised September 2020)**

**Student Name** \_\_\_\_\_

**Student ID#** \_\_\_\_\_

**Entry Date:** \_\_\_\_\_ **Faculty Advisor:** \_\_\_\_\_

**Graduation Date:** ☐ Dec 20\_\_ ☐ May 20\_\_

Course No.	Course Title	Credits	Advance Standing Transfer of Credits	Semester/Year Course Title for all Electives	Grade
<b>FRESHMAN YEAR</b>					
EGPP-101	Introduction to Engineering	2			
CIEG-104	CE Software & Design	3			
MATH- ----	Calculus I	4			
MATH- ----	Calculus II	4			
ENGL-002	Freshman Composition I	3			
ENGL-003	Freshman Composition II	3			
CHEM- ----	General Chemistry Lecture I	4			
CHEM- ----	General Chemistry Lab I	1			
PHYS-013	Physics/S&E Lecture I	3			
PHYS-023	Physics/S&E Lab I	1			
Electives	ROTC/Physical Education	1			
<b>FRESHMAN YEAR TOTAL</b>		<b>29</b>			
<b>SOPHOMORE YEAR</b>					
Electives	Humanities Elective	3			
Electives	Basic Science Elective	3			
CIEG-202	Statics	3			
CIEG-302	Dynamics	3			
MATH- ----	Calculus III	4			
MATH- ----	Differential Equations	4			
PHYS-014	Physics/S&E Lecture II	3			
PHYS-024	Physics/S&E Lab II	1			
MEEG- ----	Material Science	3			
CIEG-351	Probability & Statistics	3			
<b>SOPHOMORE YEAR TOTAL</b>		<b>30</b>			
<b>JUNIOR YEAR</b>					
CIEG-207	Environmental Engineering I	3			

Electives	Social Science Elective	3			
CIEG-301	Mechanics of Materials Lecture	3			
CIEG-303	Mechanics of Materials Lab	1			
CIEG-311	Fluid Mechanics Lecture	3			
CIEG-313	Fluid Mechanics Lab	1			
CIEG-314	Basic Structural Analysis	3			
CIEG-354	Engineering Economics	3			
CIEG-352	Water Resources Engineering	3			
CIEG-416	Transportation Engineering	3			
CIEG-434	Soil Mechanics Lecture	3			
CIEG-438	Soil Mechanics Lab	1			
Electives	Free Elective	3			
JUNIOR YEAR TOTAL		33			
SENIOR YEAR					
CIEG	CIEG Discipline Elective 1	3			
CIEG	CIEG Discipline Elective 2	3			
CIEG	CIEG Discipline Elective 3	3			
CIEG	CIEG Discipline Elective 4	3			
CIEG	Technical Elective 1	3			
CIEG	Technical Elective 2	3			
CIEG-439	Senior Design I	2			
CIEG-441	Senior Design II	2			
CIEG-464	Engineering Project	3			
Electives	African American Elective	3			
SENIOR YEAR TOTAL		28			

**BSCE Total**

**120**

Faculty Advisor Signature: \_\_\_\_\_

Date: \_\_\_\_\_

Student Signature: \_\_\_\_\_

Date: \_\_\_\_\_

Chairperson Signature: \_\_\_\_\_

Date: \_\_\_\_\_