



Department of Civil and Environmental Engineering

**Bachelor of Science
in Civil Engineering**

Curriculum Handbook

Revised February 2018

HOWARD UNIVERSITY
Bachelor of Science in Civil Engineering Undergraduate Curriculum

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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 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 educational objectives. The specific student outcomes are as follows.

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

- (a) an ability to apply knowledge of mathematics, science, and engineering
- (b) an ability to design and conduct experiments, as well as to analyze and interpret data
- (c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- (d) an ability to function on multidisciplinary teams
- (e) an ability to identify, formulate, and solve engineering problems
- (f) an understanding of professional and ethical responsibility
- (g) an ability to communicate effectively
- (h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
- (i) a recognition of the need for, and an ability to engage in life-long learning
- (j) a knowledge of contemporary issues
- (k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

¹ 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 course work 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

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

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

All courses that are taken at external institutions, which a student would like to have considered as part of the curriculum for the **Bachelor of Science degree in Civil Engineering**, must be approved by the Department. Continuing students must receive approval from their advisors prior to taking courses from other institutions. Students desiring to transfer courses must provide official transcripts and course descriptions from source institutions to his or her advisor. The advisor will recommend for or against the transfer credits within the context of curriculum requirements. The Chair will ultimately provide approval for transfer credits. Upon approval, the Department will prepare the Application for Advance Standing that will enable approved courses to transfer to the student's transcript. 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 amount of credits they are registered for at Howard University.
5. Be in good academic standing (2.0 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
- Catholic University
- Gallaudet University
- Georgetown University
- George Mason University
- George Washington University
- Marymount College
- Mount Vernon College
- Southeastern University
- Trinity College
- University of the District of Columbia
- University of Maryland at College Park

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 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 pre-requisites/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.

Bachelor of Science in CIVIL ENGINEERING UNDERGRADUATE PLAN OF STUDY (revised February 2018)

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		
FRESHMAN YEAR TOTAL		14	15		
SOPHOMORE YEAR					
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 013	
SOPHOMORE YEAR TOTAL		14	16		
JUNIOR YEAR					
CIEG-207	Environmental Engineering I	3		CHEM-003	
CIEG-301	Mechanics of Materials Lecture	3		CIEG-302; 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-301	
CIEG-354	Engineering Economics		3	MATH-157	
CIEG-352	Water Resources Engineering		3	CIEG-351	
CIEG-416	Transportation Engineering		3	CIEG 104	CIEG-354
CIEG-434	Soil Mechanics Lecture		3	CIEG-301; CIEG 311	CIEG-438
CIEG-438	Soil Mechanics Lab		1		CIEG-434
JUNIOR YEAR TOTAL		17	16		
SENIOR YEAR					
CIEG-439	Senior Design I	1		CIEG 207, 314, 352, 416, 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-354	
CIEG-441	Senior Design II		2	CIEG-439	
CIEG-462	Seminar I		1	CIEG-439	CIEG-441
CIEG Electives	CIEG Discipline Elective 4		3		
Electives	Technical Elective 1		3		
Electives	Technical Elective 2		3		
Electives	African American Elective		3		
SENIOR YEAR TOTAL		13	15		

*all five courses are required: CIEG- 207, 314, 352, 416, 434

CURRICULUM POLICIES

IMPORTANT – To meet the requirements for graduation, a student must successfully complete the required **120 credit hours** of course work 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 can only be waived if the student has unsuccessfully completed 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. 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 and the Department Chair. 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.

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 will be able to enroll in this course.

CHEM-005. General Chemistry Laboratory, 1 credit. Designed to teach some of the techniques of chemical experimentation, 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 taking the course with an introduction to programming with MATLAB, designing structures using SAP 2000 and drawing 2D and 3D objects using AutoCAD. It also teaches the students preparing a professional project report using MS Word and helps them develop technical writing competencies appropriate for civil engineering practice. **Prereq.: EGPP-101.**

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-302, MEEG-309; Coreq.: CIEG-303.**

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 engineering loads. **Prereq.: CIEG-301.**

CIEG-328. Unit Operations in Environmental Engineering, 3 credits. Analysis and basic design of treatment facilities for the remediation of air, water and land pollution. **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.: MATH-157.**

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: 416, CIEG 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; 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, 1 credit. 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-305; 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.

Note:

Beginning in the Fall 2018 semester, Senior Design I and II will be combined and will be taken in the spring semester (3 cr):

CIEG-441. Senior Design, 3 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-104, 207; CIEG-305; CIEG-352; CIEG-416; CIEG-434.**

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.: CIEG-351**

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-462. Seminar, 1 credit. Forum for presentation of current topics of interest in civil engineering by individuals from industry, government and practice. **Prereq.: CIEG-439; Co-req.: CIEG-441.**

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 project proposal writing. **Prereq.: CIEG-354 or equivalent.**

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-500. Special Topics in Structural Eng. 3 credits. Presentation of material not normally available in regular structural engineering course offerings or offering of new courses on a trial basis. Content determined by faculty member in consultation with the Department Chair. **Prereq.:** CIEG-314.

CIEG-529 Intro to Structural Protection Systems. 3 credits. An introductory course about the application of emerging technologies for the protection of civil engineering structures and basic concepts for analysis and design. **Prereq.:** CIEG-314.

CIEG-555 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:

ENGL-002. 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.

ENGL-003. Freshmen Composition II, 3 credits. Intended to increase the student's ability to write effectively, to read critically, and to present ideals logically. **Prereq.:** ENGL-002.

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.**

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>			
Discipline	Course Number	Course Name	Pre-requisite(s)
Environmental	CIEG-328	Unit Operations in Environmental Engineering	CIEG-207
Geotechnical	CIEG-433	Foundation Engineering	CIEG-434
Structural	CIEG-435	Reinforced Concrete	CIEG-314
Transportation	CIEG-465	Traffic Engineering I	CIEG-351; CIEG 416
Water Resources	CIEG-457	Advanced Hydrology	CIEG-352

Table 2. Technical Elective Courses

Course	CIEG Discipline of Focus
CHEG 412 Transport Phenomena	Environmental Engineering
CIEG 440 Water & Wastewater Treatment	Environmental Engineering
CIEG 511 Aquatic Chemistry	Environmental Engineering
CIEG 442 Advanced Foundations	Geotechnical Engineering
CIEG 5... Introduction to Rock Mechanics and Tunneling	Geotechnical Engineering
CIEG 5... Forensic Geotechnical Engineering	Geotechnical Engineering
CIEG-555 Structures Project Research	Structural Engineering
CIEG-422 Steel Design	Structural Engineering
CIEG-500 Special Topics in Structural Eng.	Structural Engineering
CIEG-529 Intro to Structural Protection Systems	Structural Engineering
MATH-164 Numerical Analysis	Structural Engineering
CIEG-466 Traffic Engineering II	Transportation Engineering
CIEG-467 Construction Project Management	Transportation Engineering
CIEG-579 Advanced Traffic Engineering	Transportation Engineering
CIEG 556 Hydraulic Project Research	Water Resources Engineering
CIEG 407 Intelligent Transportation Systems	Transportation Engineering
CIEG 445 Undergraduate Research	General

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

Humanities Elective Courses		Social Sciences Elective Courses	
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, & Env	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 Feb 2018)

Student Name

Student ID#

Entry Date: _____
20__

Faculty Advisor: _____

Graduation Date: Dec 20__ May

Course No.	Course Title	Credits	Advance Standing Transfer of Credits	Semester/Year Course Title for all Electives	Grade
FRESHMAN YEAR					
EGPP-101	Introduction to Engineering	2			
CIEG-104	CE Software & Design	3			
MATH-156	Calculus I	4			
MATH-157	Calculus II	4			
ENGL-002	Freshman Composition I	3			
ENGL-003	Freshman Composition II	3			
CHEM-003	General Chemistry Lecture I	4			
CHEM-005	General Chemistry Lab I	1			
PHYS-013	Physics/S&E Lecture I	3			
PHYS-023	Physics/S&E Lab I	1			
Electives	Humanities Elective	3			
Electives	ROTC/Physical Education	1			
FRESHMAN YEAR TOTAL		32			
SOPHOMORE YEAR					
Electives	Basic Science Elective	3			
CIEG-202	Statics	3			
CIEG-302	Dynamics	3			
MATH-158	Calculus III	4			
MATH-159	Differential Equations	4			
Electives	African American Studies Elective	3			
PHYS-014	Physics/S&E Lecture II	3			
PHYS-024	Physics/S&E Lab II	1			
MEEG-209	Material Science	3			
CIEG-351	Probability & Statistics	3			
Electives	Social Science Elective	3			
SOPHOMORE YEAR TOTAL		33			

JUNIOR YEAR					
CIEG-207	Environmental Eng I	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 Eng	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		30			
SENIOR YEAR					
CIEG Electives	CIEG Discipline Elective 1	3			
CIEG Electives	CIEG Discipline Elective 2	3			
CIEG Electives	CIEG Discipline Elective 3	3			
CIEG Electives	CIEG Discipline Elective 4	3			
CIEG Electives	Technical Elective 1	3			
CIEG Electives	Technical Elective 2	3			
CIEG-441	Senior Design	3			
CIEG-462	Seminar I	1			
CIEG-464	Engineering Project Management	3			
SENIOR YEAR TOTAL		25			

BSCE Total 120

Faculty Advisor Signature: _____

Date: _____

Student Signature: _____

Date: _____

Chairperson Signature: _____

Date: _____