

COLLEGE OF ENGINEERING

<http://www.eng.ncat.edu>

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The College of Engineering consists of five academic departments: Civil Architectural Agricultural and Environmental Engineering, Computer Science, Electrical and Computer Engineering, Industrial and Systems Engineering, and Mechanical and Chemical Engineering. These departments together offer eight Bachelor of Science, six Master of Science and three Doctor of Philosophy degree programs. These include Bachelor of Science degrees in architectural; bioenvironmental, (previously known as agricultural and biosystems), chemical; civil; electrical; industrial; and mechanical engineering and computer science. In addition, Master of Science degrees in chemical engineering, civil engineering, electrical engineering, industrial engineering, mechanical engineering, and computer science, and Doctor of Philosophy degrees in electrical, industrial and mechanical engineering are available.

For many years, the College of Engineering has been the nation's leading producer of African American engineers at the bachelor's level and the second largest producer at the master's levels. Approximately one-third of the students are women.

ACCREDITATION

All undergraduate Engineering programs are accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (EAC-ABET) and the Computer Science program is accredited by the Computer Science Accreditation Commission of the Computer Science Accreditation Board (CSAC-CSAB).

DEGREES OFFERED

Bioenvironmental Engineering – Bachelor of Science
Architectural Engineering – Bachelor of Science
Chemical Engineering – Bachelor of Science
Civil Engineering – Bachelor of Science
Computer Science – Bachelor of Science
Electrical Engineering – Bachelor of Science
Industrial Engineering – Bachelor of Science
Mechanical Engineering – Bachelor of Science
Chemical Engineering – Master of Science*
Civil Engineering – Master of Science*
Computer Science – Master of Science*
Electrical Engineering – Master of Science*
Industrial Engineering – Master of Science*
Mechanical Engineering – Master of Science*
Electrical Engineering – Doctor of Philosophy*
Mechanical Engineering – Doctor of Philosophy*
Industrial Engineering – Doctor of Philosophy*

* See the *Graduate School Bulletin*

MISSION

The Mission of the College of Engineering at North Carolina A&T State University is to maintain quality educational programs that are responsive to student needs, interdisciplinary research programs that involve strategic partnerships to extend the frontiers of knowledge, and outreach programs to serve the Piedmont Triad community, the state, and the nation.

OBJECTIVES

The programs of study are aimed at preparing a student for engineering practice in all phases of his/her chosen field. The educational objectives College of Engineering are as follows:

1. To prepare the student for an active career in his/her chosen discipline within the profession.
2. To provide the student a comprehensive background in all phases of the engineering design process.
3. To provide the student a basic knowledge of the mathematical and natural sciences upon which the practice of engineering depends.

4. To develop the student's ability to analyze and interpret data
5. To improve the students' communication, interpersonal and teamwork skills
6. To develop the student's understanding of professional and ethical responsibilities
7. To develop the student's judgment to utilize effectively and economically the materials and forces of nature for the benefit of humankind.
8. To develop in the student an appreciation for lifelong learning.
9. To develop in the student an awareness of social, political and global issues that impact the profession
10. To develop the student's ability to effectively utilize modern technology.

UNCONDITIONAL ADMISSION

Admission into the college of engineering is coordinated through the University's Office of Admissions. Admission decisions are based on SAT or ACT scores, class rank and GPA. For admission to all programs in the college of engineering, the applicant must present the following minimum units of high school credit:

1. English - 4 units emphasizing grammar, composition and literature
2. Science - 3 units (including at least one unit in a biological or life science, one unit in a physical science, and one unit in Chemistry. At least one unit should have a laboratory component.)
3. Mathematics - 4 units (including Algebra I, Algebra II, Geometry, and an additional unit beyond Algebra II - e.g., Trigonometry, Math Analysis, etc.). Students entering with a deficiency in mathematics must begin with Pre-Engineering Mathematics, which is not counted towards the required semester hours for graduation. In this case the normal mathematics sequence is shifted one semester.
4. Social Sciences - 2 units (including at least one unit in United States History)
5. Foreign Language – 2 units are recommended in one foreign language.
6. Electives - 3 units (no more than 2 units in vocational subjects and 2 units in the disciplines of Music and Physical Education)

Transfer students are accepted into the college of engineering if the applicant has a minimum 2.5 GPA if transferring from a four-year institution with an accredited engineering program, or a minimum 3.0 GPA if transferring from other institutions.

CONDITIONAL ADMISSION

Conditional admission to engineering programs may be given to some freshman students who do not otherwise meet admission criteria. These students will receive advising services directly from engineering professors. All conditionally admitted students will be required to document that they have taken Algebra I, Algebra II, Geometry and an additional unit beyond Algebra II (for example, Trigonometry, Mathematical Analysis, etc.).

Based on deficiencies noted, conditionally admitted students will be advised to register for additional freshman level courses prior to taking required courses and may even be advised to take a reduced course load. Students should consult their advisor for specific requirements. It should be noted that these students may not be able to graduate in four years. Based on a review of the student's academic record, courses such as College Algebra and Trigonometry, Pre-Calculus, Introductory Chemistry and Introductory Physics may be assigned. These courses are preparatory in nature and do not count toward degree credit in engineering and computer science. All students admitted under this policy will undergo an academic review after one year's courses. Based on a cumulative GPA of 2.5 and a "C" or better in assigned courses, conditionally admitted freshmen will be unconditionally admitted to their intended engineering major. Students who do not meet the requirements of the one-year review will be transferred to The Center for Student Success for further advisement.

Transfer students may also be conditionally accepted into engineering programs. All students transferred into engineering programs under this policy will undergo an academic review after one semester. The conditions for transfer will be stipulated by the department chair in writing and will form the basis for the review after one semester. After satisfaction of the transfer conditions, conditionally admitted transfer students will be unconditionally admitted to their intended engineering major. Students who do not meet the requirements of the review will be transferred to the Center for Student Success for further advisement.

TRANSFER CREDIT EVALUATION

Students are advised to receive prior approval from their academic advisor and department chairperson for courses to

be considered for transfer credit from other colleges and universities. The Office of Admissions may recommend a preliminary award of transfer credits. However, the authority and responsibility for the final decision for approval of transfer credits rests with the academic departments.

ADVISING

All students will be assigned an academic advisor. Students are expected to meet their advisor for help with the following issues:

- Interpreting university, college and department regulations
- Providing general information, advice, and academic recommendations
- Planning course selections. Students must consult their advisor before registering for courses.
- Ensuring that students take electives that satisfy University and ABET category requirements
- Helping students to understand the degree to which they must assume responsibility for their program planning
- Providing vocational and career guidance
- Referring students to appropriate individuals and offices when further assistance is needed.

MATHEMATICS AND CHEMISTRY PLACEMENT

Admitted (conditionally or unconditionally) students must demonstrate proficiency in mathematics and chemistry before being permitted to take freshman Mathematics and Chemistry courses. Mathematics proficiency can be demonstrated through acceptable scores on SAT or ACT Math, AP Calculus, or Math Placement test. Otherwise the student will be required to first take MATH 110 or 111. Chemistry proficiency can be demonstrated through acceptable scores on High School Chemistry, AP Chemistry, or Chemistry Placement Test. Otherwise the student will be required to first take CHEM 099.

MINIMUM C GRADE POLICY

This policy applies to all engineering programs in the college of engineering. Specifically, when an engineering program requires students to take any of the following courses, students will have to obtain a minimum grade of "C" in each such course to meet graduation requirements. Furthermore, a minimum grade of "C" on any such course will be required to satisfy prerequisite requirements of subsequent courses. This applies to each Bachelor of Science curricula in the college of engineering - both to courses that are explicitly required and those that are recommended as elective courses. The complete set of courses with this "Minimum C" requirement is listed below:

CHEM 106	MATH 224	PHYS 242	INEN 270
CHEM 107	MATH 231	GEEN 100	MEEN 260
MATH 131	MATH 431	ELEN 440	MEEN 313
MATH 132	PHYS 241	INEN 260	MEEN 413

Individual programs may have additional courses that require a minimum C grade. Please refer to the requirements of each program stated in this bulletin or in the program handbook available from the department chairperson.

GLOBAL AND AFRICAN AMERICAN STUDIES REQUIREMENT

All College of Engineering students must take at least six credits from the Humanities column and at least six credits from the Social Sciences column. Of these, at least three credits must be from the African American Studies row (either African American Studies Humanities or African American Studies Social Sciences) and at least three credits must be from the Global Studies row (either Global Studies Humanities or Global Studies Social Sciences). A single course can fulfill both a row and column requirement.

Note that the table shown below is a general guideline. Individual programs may require specific courses to satisfy the Humanities, Social Sciences, African American Studies and Global Studies requirements. Please consult the curriculum requirements of the programs for specifics.

	Humanities 6 credits required from this column	Social Sciences 6 credits required from this column
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African American Studies At least 3 credits required from this row	ENGL 333, 650, 652, 654, 656, 658, 660, FOLA 417*, 618*, MUSI 220, 221, THEA 630	ECON 615, HIST 201, 202, 215*, 216*, 310, 311, 320*, 328, 412*, 416, 615, 616*, POLI 220, 445*, 446*, SOCI 314, SPCH 302
Global Studies At least 3 credits required from this row	FOLA 100, FOLA 101, FOLA 102, FOLA 103, FOLA 104, FOLA 105, FOLA 106, FOLA 107, FOLA 108, FOLA 109, FOLA 110, FOLA 111, FOLA 417*, FOLA 450, FOLA 618*	AERO 421, 422, ECON 505, 537, HIST 100, 101, 210, 215*, 216*, 303, 304, 312, 320*, 321, 322, 327, 330, 331, 332, 405, 412*, 605, 616*, 626, 630, 631, POLI 310, 444, 445*, 446*, 544, 646, SOCI 300
Other	AREN 112, ART 224, 225, 400, 459, 520, THEA 201, 630, 631, ENGL 200, 201, 202, 203, 204, 220, 221, 333, 420, 425, 603, 650, 652, 654, 656, 658, 660, MUSI 216, 217, 220, 221, HIST 262, PHIL 260, 261, 262, 308, 309	AGECE 330, 440, 530, ECON 300, 301, 401, 405, 410, 420, 425, 501, 515, 601, 610, HIST 204, 205, 208, 220, 225, 230, 300, 302, 305, 306, 307, 401, 402, 407, 410, 442, 450, 600, 603, 606, 607, 610, 620, GEOG 200, 210, 319, 322, POLI 200, 210, 250, 400, 410, 440, 410, 420, 430, 448, 541, 542, 543, 640, 642, 643, 653, PSYC 320, 324, 325, 420, 434, 439, 445, 526, 541, 545, 550, 644, 645, SOCI 100, 200, 301, 304, 313, 406, 420, 673, SOWK 312, 313, 314, 370, 372, 373, 374, 503

* Note that these courses can be considered either as Black Studies or Global Studies, but no single course can fulfill both requirements simultaneously.

PREREQUISITES

Students are advised to follow their prescribed curriculum, especially noting the prerequisite requirements. It should be noted that prerequisites are subject to change and will normally be effective immediately. It is the responsibility of the student to understand and follow prerequisite requirements. The department chairperson reserves the right to drop a student from any course if the proper prerequisites are not satisfied. Any prerequisite waivers must be formally approved by the student's advisor and department chairperson.

GRADUATION UNDER A GIVEN CATALOG

A student may expect to earn a degree in accordance with the requirements of the curriculum outlined in the catalog in force when he or she first entered the University, provided the courses are being offered. Moreover, he or she must complete these requirements within six years. In addition, a student may graduate under any subsequent catalog published while he or she is a student; in that case, he or she must meet all requirements of the catalog he or she elects. The approval of the advisor, department chairperson and the dean is needed for any course substitutions.

LICENSURE AS A PROFESSIONAL ENGINEER

The North Carolina Board of Examiners for Engineers and Surveyors is charged with the responsibility of issuing a certificate of licensure to those determined to be properly qualified. In order to be licensed to practice engineering in North Carolina, an individual, in addition to paying the required fees, must be of good character and reputation, must satisfactorily pass the examinations administered by the Board, and must submit evidence of education, and a specific record of progressive engineering work of a nature and level acceptable to the Board.

To prepare for engineering licensure, all engineering majors are encouraged to prepare for and take the Fundamentals of Engineering (FE) Examination during their Senior Year. An FE review course is offered to all seniors in the college of engineering.

After successful completion of the Fundamentals Examination, and upon completion of a minimum of four (4) years of progressive engineering experience, applicants are eligible to apply for the Engineering Principles and Practice Examination. Upon successful completion of the requirements for licensure, the Board will approve the applicant for licensure. For more information, visit the website www.ncbels.org.

COOPERATIVE EDUCATION PROGRAM

Cooperative Education (Co-op) is a highly recommended, voluntary plan of education in which students alternate sessions of full-time work with sessions of full-time study. Usually, the plan is a five-year professional development experience, designed to combine practical on-the-job experiences with the classroom training of a four-year college curriculum. It helps students integrate theory and practice, confirm career choices, investigate potential job opportunities, and become better graduates. At the same time, it allows students to earn money and help finance their education. Cooperative Education provides a valuable opportunity for students, employers, and the university to work together to benefit one another.

How is Co-op different than an Internship? An internship is a flexible employment arrangement, negotiated and arranged on a case-by-case basis between the student and employer. By contrast, the Cooperative Education Program is a structured program with defined schedules and student, employer, and university responsibilities. Once you become a co-op student, you will continue with your chosen employer throughout the entire program, although the employer site location could change during the program. At least four semesters of work are required alternating with academic semesters. After qualifying for the Co-op Program your first year (GPA above 2.8), you continue to be eligible to remain in the program by maintaining satisfactory academic (GPA above 2.8) and work records. Reasons to Co-op instead of Intern include:

- Co-ops receive job offers from their employers about two-thirds of the time; Co-ops receive more job offers than interns; and some companies during economic slowdowns only hire co-ops.
- Freshman and Sophomores are given hiring preference with Co-ops, whereas Juniors are given preference for Interns.
- Co-op provides 18 months of work experience, whereas Interns provide at most 9 months.
- Co-ops receive better work assignments with more responsibility than Interns.
- Co-ops have more opportunities to learn people skills than Interns.
- Co-ops can accumulate benefits such as vacation time and retirement benefits that Interns cannot.

What is the co-op schedule? There are two typical co-op schedules. In the first, after attending fall, spring, and summer sessions of the Freshman year on campus, the co-op student completes the first work session in the fall of the sophomore year and then returns to campus for the spring semester. Work and study sessions then alternate until the senior year, which is spent completely on campus. In the second schedule, after attending fall and spring sessions of the Freshman year on campus, the co-op student completes the first work session in the summer and then returns to campus for the fall semester. Work and study sessions then alternate until the senior year. In either schedule, you acquire about eighteen months of work experience during the five-year Co-op Program.

Department handbooks should be referenced for department specific co-op policies as well as typical co-op employers and locations. Also see information on Cooperative Education Program elsewhere in this Bulletin.

GENERAL ENGINEERING

Undergraduate

GEEN 100. Engineering Design and Ethics

Credit 2(2-0)

This course introduces students to engineering and computer science disciplines and functions, professional licensure, the Fundamentals of Engineering exam, code of ethics, safety, the design process, creative thinking, teamwork, and technical writing. A case study on ethics and the application of the design process through a team project are required. **(F;S;SS)**

GEEN 102. Introduction to Computer Programming

Credit 2(0-4)

This is an introductory course in computer programming. Problem solving techniques and writing algorithms will be stressed. Students will write programs for such tasks as engineering decision-making and numerical computation. **(F;S;SS)**

GEEN 103. Computers in Engineering**Credit 2(1-2)**

Students will use engineering and mathematical computer applications to solve engineering problems. Students will solve numerical problems and learn to use the computer for engineering design. **(F;S;SS)**

GEEN 110. Colloquium I**Credit 0(1-0)**

Contemporary issues, corporate information sessions, campus resources, information literacy, and professional society activities will be discussed. This is the first of two freshman colloquia.

(F;S)**GEEN 120. Colloquium II****Credit 0(1-0)**

Contemporary issues, corporate information sessions, campus resources, information literacy, and professional society activities will be discussed. This is the second of two freshman colloquia. **(F;S)**

GEEN 165. Computer Program Design**Credit 4(3-2)**

This is a second course in computer programming for students with an interest in computers. Students will learn to write programs in a high level programming language. Prerequisite: GEEN 102 **(F;S;SS)**

GEEN 601. Industrial Automation**Credit 3(2-2)**

This course provides study of automation and market competitiveness, sensors and measurements, circuit board designs, materials, handling systems production control, and computer-integrated manufacturing systems. Laboratory experimentation in selected modern manufacturing technologies will also take place. (Senior standing and EE 410 for EE Majors) **(DEMAND)**

GEEN 602. Advanced Manufacturing Laboratory**Credit 3(0-6)**

Students will work in interdisciplinary teams to design and manufacture products based on the concepts required in GEEN 601-Industrial Automation. **(DEMAND)**

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