
BSIE Course Planning Guide

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Clemson University
Department of Industrial Engineering

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1 HIGHLIGHTS AND CHANGES FROM PREVIOUS VERSION

1. **All students are responsible for their own course planning. This document is for assistance only.** Each student must satisfy the requirements of his/her curriculum in order to receive a degree.
2. This document is for the 2016 and later curricula. The previous version of this document is still available on the IE website
(http://www.clemson.edu/cecas/departments/ie/degree-programs/undergraduate/course_planning.html).
3. Students who fail to pass an IE course with a D or better within three attempts will be dismissed from the program (see Section 6.2).
4. Students who fail to maintain a 2.0 engineering grade point average (EGPA) will be placed on IE probation (see Section 6.2).
5. All IE creative inquiry (CI) classes are pass/fail (i.e., they are not graded). Up to six credit hours of IE CI can be counted as technical elective hours.

All colleges and departments establish certain academic requirements that must be met before a degree is granted. Advisors, department chairs, and deans are available to help the student understand and meet these requirements; but the student is responsible for fulfilling them. If, at the end of a student's course of study, the requirements for graduation have not been satisfied, the degree will not be granted. For this reason, it is important for students to acquaint themselves with all academic requirements throughout their college careers and to be responsible for completing all requirements within prescribed deadlines and time limits.

2 BSIE CURRICULUM (2016 AND LATER)

IE courses can be taken in any semester they are offered as long as prerequisite and other requirements are satisfied.

Freshman Year

16 First Semester	17 Second Semester
4 CH 1010 General Chemistry ¹	1 ENGR 1070 Prog. and Prob. Sol. I ^{1,2}
3 ENGL 1030 Accel. Composition ¹	1 ENGR 1080 Prog. and Prob. Sol. II ^{1,2}
1 ENGR 1050 Engr. Discip. and Skills I ^{1,3}	1 ENGR 1090 Prog. and Prob. Sol. App. ^{1,2}
1 ENGR 1060 Engr. Discip. and Skills II ^{1,3}	3 PHYS 1220 Physics with Calc. I ¹
4 MATH 1060 Calc. of One Var. I ¹	4 MATH 1080 Calc. of One Var. II ¹
3 Arts and Human./Social Sciences	3 Arts and Human./Social Sciences
	4 Lab Science Requirement ⁴

Sophomore Year

16 First Semester	17 Second Semester
3 CE 2010 Statics ⁵	3 IE 2100 Design and Ana. of Work Sys.
4 MATH 2060 Calc. of Several Var.	4 IE 3010 Systems Design I
3 MATH 3110 Linear Algebra	1 IE 3140 Seminar in IE
3 PHYS 2210 Physics with Calc. II	3 IE 3600 Ind. App. of Prob./Stat. I
1 PHYS 2230 Physics Lab. II ⁶	3 IE 3800 Deterministic Oper. Res.
2 ENGR 2080 (or 2090 or 2100)	3 MSE 2100 Intro to Mater. Science

Junior Year

15 First Semester	16 Second Semester
3 IE 3610 Ind. App. of Prob./Stat. II	3 IE 3860 Production Plan. and Cont.
3 IE 3810 Probabilistic Oper. Res.	3 IE 4610 Quality Engineering
3 IE 3840 Engr. Economic Ana.	3 IE 4650 Facilities Plan. and Design
3 IE 4400 Dec. Support Systems in IE	4 IE 4820 Systems Modeling
3 Arts and Human./Social Sciences	3 Oral Communication

Senior Year

15 First Semester	13 Second Semester
3 IE 4880 Human Factors Engr.	4 IE 4670 Systems Design II
6 IE Technical Requirement ⁴	3 IE Technical Requirement ⁴
3 ECE 2070/2080 or 2020/2110	3 Management Requirement ⁴
3 Ethics and Prof. Practice ⁴	3 Arts and Human./Social Sciences

¹ This course must be passed with a C or better either to transfer into IE from General Engineering or to satisfy later course prerequisites.

² ENGR 1410, completed with a C or better, will satisfy this course. Alternatively, completing ENGR 1300 (or CHE 1300) plus one of CPSC 1610, 1110 or 1010 (with C or better) will satisfy this.

³ ENGR 1020, completed with a C or better, will satisfy this course.

⁴ Select from department-approved lists (see Section 3).

⁵ ME 2010 can be used to satisfy this.

⁶ PHYS 1240 may be substituted.

3 LIST OF APPROVED COURSES

DegreeWorks provides a list of the current set of courses associated with your degree. Please consult your *curriculum advisor*¹ if there appears to be an error.

Lab Science Requirement (4 credit hours):

BIOL 1030 and 1050	BIOL 1200 and 1210	BIOL 1200 and 1240
BIOL 1040 and 1060	BIOL 1200 and 1220	CH 1020
BIOL 1100	BIOL 1200 and 1230	GEOL 1010 and 1030

Management Requirement (3 credit hours):

ACCT 2010	ELE 4000	MGT 4110
ACCT 2020	MGT 2010	MKT 4210
AS 3090	MGT 3070	ML 3010

Ethics and Professional Practice Requirement (3 credit hours):

PHIL 1030	PHIL 3450	LAW 3220
PHIL 3440	PHIL 3460	

IE Technical Requirement (9 credit hours):

IE 4000 (6 units maximum)	IE 4570	IE 4850
IE 4040 (6 units maximum)	IE 4600	IE 4860
IE 4300	IE 4620	IE 4870
IE 4460	IE 4630	IE 4890
IE 4520	IE 4810	IE 4910
IE 4560		

Arts and Humanities/Social Science (HSS) Requirement (12 credit hours):

The 2016 and later IE curricula include a minimum of 12 credits of HSS courses to satisfy Clemson University's General Education Humanities and Social Science Requirements. Each requirement in the degree must be satisfied without "**double-dipping**," except CCA and STS. Students can take certain HSS courses that will also satisfy the CCA and STS requirements. The Undergraduate Catalog provides the list of HSS, CCA, and STS courses (<http://www.registrar.clemson.edu/html/catalog.htm>).

4 PREREQUISITE REQUIREMENTS

The IE department strictly enforces course prerequisites. Students should familiarize themselves with all course prerequisites. The course prerequisite information for required IE classes is presented in three different formats in Sections 4.1, 4.2, and 4.3.

¹Your *curriculum advisor* is Ms. Jessica LeCroy if your last name begins with A-K, otherwise it is Dr. Jon Lowe. Your *primary advisor* is listed in iRoar. For course planning related questions please consult your curriculum advisor. For other issues you can consult your primary advisors.

4.1 Prerequisite list (2016 and later)

The table below shows the prerequisite list for all required IE classes.

IE Course	Prerequisites
IE 2100	ENGL 1030, CE 2010 (effective Spring 2018)
IE 3010	ENGL 1030, ENGR 1060
IE 3140	-
IE 3600	MATH 2060
IE 3610	IE 3600
IE 3800	MATH 3110 (effective Spring 2018)
IE 3810	MATH 3110 (effective Spring 2018), IE 3600
IE 3840	MATH 1080
IE 3860	IE 3800
IE 4400	ENGR 1090
IE 4610	IE 3610
IE 4650	IE 2100, IE 3800, IE 3810
IE 4670	IE 2100, IE 3010, IE 3600, IE 3610, IE 3800, IE 3810, IE 3840, IE 3860, IE 4400, IE 4610, IE 4650, IE 4820, IE 4880 (effective Spring 2020)
IE 4820	IE 3610, IE 3810
IE 4880	TBD

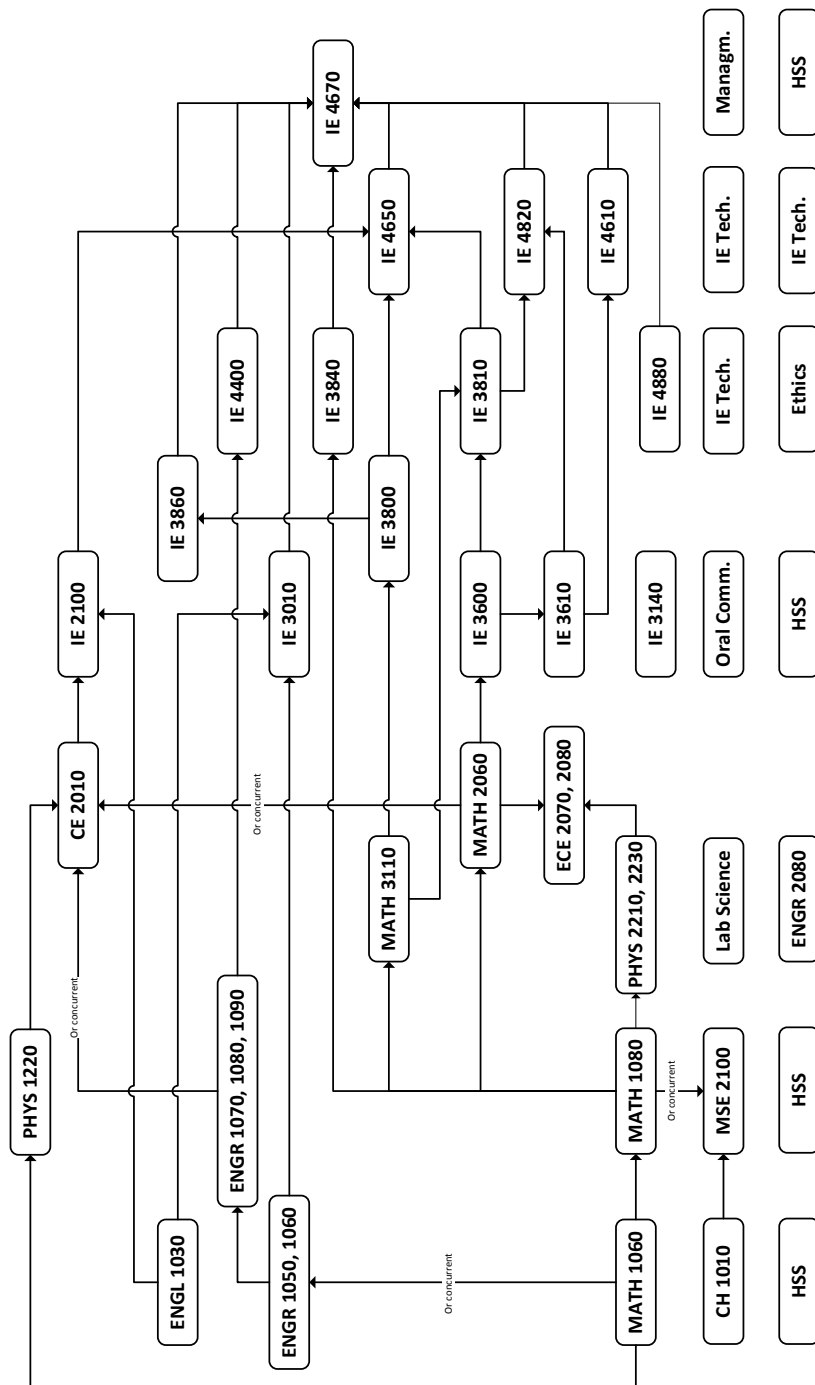
4.2 Prerequisite sequence (2016 and later)

The table below shows the same prerequisite information as the one above but in a different format. This table should make it easy to see the sequence in which the courses must be taken. Note that the first year courses are not shown in the table below since a student transferring into IE must already satisfy those courses.

			IE 3010	IE 4670
			IE 3840	IE 4670
	MATH 3110	IE 3800	IE 3860	IE 4670
			IE 4400	IE 4670
MATH 2060	IE 3600	IE 3610	IE 4610	IE 4670
	CE 2010	IE 2100	IE 4650	IE 4670
	MATH 3110	IE 3800	IE 4650	IE 4670
	MATH 3110	IE 3810	IE 4650	IE 4670
MATH 2060	IE 3600	IE 3810	IE 4650	IE 4670
MATH 2060	IE 3600	IE 3610	IE 4820	IE 4670
	MATH 3110	IE 3810	IE 4820	IE 4670
MATH 2060	IE 3600	IE 3810	IE 4820	IE 4670
			IE 4880	IE 4670

4.3 Prerequisite flowchart (2016 and later)

The flowchart below shows the prerequisite requirements but not the semester in which each course is to be taken. **IE courses can be taken in any semester they are offered as long as prerequisite and other requirements are satisfied.**



5 PLANNED COURSE OFFERINGS

The table below shows the projected offerings of IE courses. Note that this list is subject to change, but we are trying to offer all required IE classes (with the exception of IE 3140) both in the fall and spring semesters. We are also planning to offer three IE technical electives in the fall and the spring semesters.

Fall	Spring	Summer
IE 2100	IE 2100	Summer I
IE 2680 (and H2680)	IE 2680 (and H2680)	IE 3600 (online)
IE 3010	IE 3010	IE 4620 (online)
IE 3600	IE 3600	
IE 3610	IE 3610	Summer II
IE 2800 (will be IE 3800)	IE 2800 (will be IE 3800)	IE 3610 (online)
IE 3810	IE 3810	IE 3810 (online)
IE 3840	IE 3840	IE 4880 (online)
IE 3860	IE 3860	
IE 4400	IE 4400	Long Summer
IE 4610	IE 4610	IE 3840 (online)
IE 4650	IE 4650	
IE 4670	IE 4670	
IE 4820	IE 4820	
IE 4xxx (tech. elective)	IE 4xxx (tech. elective)	
IE 4xxx (tech. elective)	IE 4xxx (tech. elective)	
IE 4xxx (tech. elective)	IE 4xxx (tech. elective)	
	IE 3140 (beginning Spring 2018)	

6 OTHER REGISTRATION AND COURSE PLANNING TOPICS

6.1 Attempting to register for closed classes

In the event that an IE class is closed, add your name to the *wait list* (if available). When a seat becomes available, the first student on the wait list will have the opportunity to add the class. Note that wait lists are not created for all classes. Also, note that adding your name to the wait list does not guarantee that you will eventually get in to the class.

6.2 Petitions

Students may petition for exceptions to Departmental registration policies and curriculum requirements. The merits of the petition should first be discussed with your primary advisor.

If you elect to pursue a petition, the documentation is then routed to the Undergraduate Program Committee through your primary advisor for review. The Committee then makes a recommendation to the Chair, who renders a decision based on your documentation and the recommendation of the Committee. The Undergraduate Program Coordinator will contact your primary advisor with the findings.

The majority of petitions are requests to enroll in a course and one or more of its prerequisites concurrently. In these cases, the Undergraduate Committee seeks to find a way to satisfy the prerequisite content for this course through other means - usually, by completing courses similar to the prerequisites in other departments (e.g., mathematics or management). Thus, these petitions must be submitted far enough in advance to allow time for these courses to be completed.

Enrolling in a course and its prerequisites concurrently

The IE department strictly enforces prerequisite requirements. At the present time, only the following exceptions are allowed:

- IE 3860 may be taken concurrently with IE 4670 provided that MGT 3900 has been completed. Please note that as of Fall 2016, MGT 3900 has the following prerequisites: MGT 2180 and IE 3610.
- IE 3610 may be taken concurrently with IE 4610 and/or IE 4820 provided that one of STAT 2300 (not AP credit), MATH 3020, or STAT 4110 has been successfully completed before either IE 4610 or IE 4820 is taken.

Online summer courses offered by other institutions may also be a viable option to satisfy prerequisite content. It is the responsibility of the petitioner to identify any candidate course and to assemble documentation for review by the Undergraduate Committee.

IE course attempt

No student may exceed three attempts, including a W and grade forgiveness (with the exception of a withdrawal from the University), to complete successfully any IE course (with a grade of D or better). Moreover, a third attempt is granted by a written request to the department chair before the deadline to add a course in a subsequent term.

IE academic eligibility

Industrial Engineering students who have a cumulative grade-point average (GPA) or cumulative engineering grade-point average (EGPA) below 2.0 are on probation and will have restricted enrollment in classes. Students whose cumulative grade-point average is below

2.0 are subject to the regulations stipulated under Academic Eligibility Policy. Students on probation for EGPA below 2.0 who fail to recover in the first regular semester (fall or spring) will not be allowed to register for industrial engineering classes. After one year, such students may petition the Industrial Engineering Department for continued enrollment. An advising policy for students on probation is available from the Industrial Engineering Department.

6.3 Course and curriculum requirements of other departments

There are certain curriculum requirements of other departments that do not currently apply to IE majors. One example is the requirement of the mechanical engineering curriculum that "a student is allowed to enroll in any ME course only when all prerequisites, as defined by current official listings for that course, have been passed with a grade of C or higher". However, requirements of courses apply to all students in all majors taking that course. For example, as of Fall 2012, CE 2080 requires CE 2010 be passed with a C or better. Since this is a course requirement, it applies to all students. Contact the Undergraduate Coordinator if you experience any difficulty with registering for these kinds of courses.

6.4 Graduate coursework

Seniors with 3.0 or higher GPA are eligible to request enrollment in graduate level courses by completing the GS6 form. For additional information and to obtain a copy of the GS6 form please visit (<https://www.clemson.edu/graduate/students/forms.html>).

Seniors with 3.4 or higher GPA are eligible to request participation in the Combined Bachelor's/Master's Plan. Under this plan, students may reduce the time necessary to earn both degrees by applying graduate credits to both undergraduate and graduate program requirements. Interested students need to complete the GS6BS/MS form. For additional information and to obtain a copy of the GS6BS/MS form please visit (<https://www.clemson.edu/graduate/students/forms.html>).

What is the difference between GS6 and GS6BS/MS forms? The GS6 form allows you to take graduate level courses, but there is no double-counting. Graduate courses taken using the GS6 form can either be used to meet BS requirements or MS requirements but not both. On the other hand, the GS6BS/MS form allows you to double-count up to 12 credit hours towards both B.S. and M.S. requirements. However, students following the IE curriculum can typically double-count up to 9 credit hours. The following examples show how a student can take

advantage of these opportunities:

- Using the GS6BS/MS form take 3 credit hours of an approved IE technical elective at the 6000-level and count these hours for both BS and MS programs.
- Using the GS6BS/MS form take 6 credit hours of two approved IE technical electives at the 6000-level and count these hours for both BS and MS programs.
- Using the GS6BS/MS form take 9 credit hours of three approved IE technical electives at the 6000-level and count these hours for both BS and MS programs.
- Using the GS6BS/MS form take 9 credit hours of three approved IE technical electives at the 6000-level and count these hours for both BS and MS programs, and using the GS6 form take 3 credit hours of an 8000-level course and count these hours for MS only.

7 RESEARCH EXPERIENCE AND DEPARTMENTAL HONORS

Creative Inquiry (CI)

Creative Inquiry (CI) is a discovery-oriented approach to learning that promotes an understanding of the methods of scientific research while at the same time supporting the overall mission of general education. ("Undergraduate students must be broadly educated and technically skilled to be informed and productive citizens. As citizens, they need to be able to think critically about significant issues... The mission requires a high level of knowledge about and competence in the following areas: arts and humanities, mathematics, natural sciences, social sciences, cross-cultural awareness, science and technology in society, communication, critical thinking, and ethical judgment." - CU Undergraduate Announcements).

CI provides opportunities in the form of open-ended problems that extend beyond the classroom. The IE curriculum offers both universal CI experiences, and the potential for an individualized experience. The sequence of design courses, Systems Design I and II, afford everyone an opportunity for a CI experience, and thus is universal. The individualized experiences are research oriented (almost exclusively). Research is a process that seeks better solutions to existing problems through novel approaches, or uncovers solutions where none exist. These research experiences are guided by one or more faculty mentors and will typically involve other undergraduate and graduate students.

Unlike the universal experiences, though, research opportunities are limited both by the number of faculty participating and the number of slots available in the groups of the participating faculty. In order to be considered as a member of a research group, you must first

apply. The application process varies across the faculty, from very informal to formal. It may include an interview and/or a written statement of purpose (a brief essay about one's research goals, including motivation), for example; GPA may also be a criterion. General information about CI may be found at (<http://www.clemson.edu/academics/programs/creative-inquiry/>).

Departmental Honors

Departmental Honors, unlike General Honors, is thesis-based rather than course-based. The IE honors students must complete IE H2680 and IE H4000. These courses serve as a mechanism to get academic credit for the thesis. While the word 'thesis' may be somewhat intimidating, it basically documents the research process and outcomes. Moreover, it differs from a master's thesis in several respects; in particular, with regard to working in groups. In a team setting, while each student must make a distinct contribution, team members may be able to submit a common document as his or her thesis. Honors students may satisfy up to 6 hours of the IE technical requirement by completing their 6-hour thesis requirement (via IE H4000). For additional information please visit (<http://www.clemson.edu/cuhonors/studenthandbook/departmentalhonors/>).

IE technical requirement

The 2016 and later IE curricula have a 9-hour industrial engineering technical requirement. This requirement is usually satisfied by taking 4000-level IE courses on the applicable approved list (see Section 3). This requirement may be partially satisfied through CI experiences. Credit for CI experiences is received via IE 4040 for the majority of students, and IE H4000 for students in the Departmental Honors program. The latter are variable-hour courses, and as such, offer more flexibility than the fixed 3-hour, 4000-level classes.

IE 2680: CI Seminar

IE 2680/H2680 is our introductory CI course. It is a one-hour seminar that is graded on a Pass/Fail basis. The objectives of this seminar are to introduce the research process and to make known research opportunities in the Department. It is one way to dip your toe into the water before diving in, so to speak. While it is not a degree requirement, IE H2680 is required of all students seeking Departmental Honors. Individual faculty mentors may require IE 2680 of other students at their discretion. IE 2680/H2680 does not necessarily have to be taken prior to beginning the IE 4040/H4000 sequence. In instances where it is required, individual mentors may permit it to be taken concurrently.

8 CHANGING MAJORS INTO IE

To transfer into the Industrial Engineering BS program, a student must have completed the following courses with a grade of C or better:

CH 1010				
ENGL 1030				
ENGR 1050 ENGR 1060	or	ENGR 1020		
ENGR 1070 ENGR 1080 ENGR 1090	or	ENGR 1410	or	ENGR 1300 (or CHE 1300) plus one of CPSC 1610, 1110 or 1010
MATH 1060	or	MATH 1040 and 1070		
MATH 1080				
PHYS 1220				

The paperwork for students transferring from General Engineering will be handled by their CoES advisors. As long as the student has a 2.0 overall GPA and has completed the courses documented above, the change of major will be processed.

The paperwork for students transferring from any other major will be handled by the IE Undergraduate Coordinator. First, the student must have a 2.0 overall GPA and have completed the courses documented above. Additionally, non-General Engineering students are required to complete a plan of study that documents all courses to be taken until graduation. Instructions for preparing a course plan can be found at

(http://www.clemson.edu/cecas/departments/ie/degree-programs/undergraduate/course_planning.html).

9 CO-OP AND STUDY ABROAD

The IE Department supports the Co-operative Education Program. Since all required IE courses are offered both in fall and spring semesters, students have a lot of flexibility to take co-op assignment. However, you need to be prepared for your graduation to be delayed by one calendar year, even if you only participate in the co-op program for one regular semester. Please consult your primary advisor before taking any co-op assignment. For additional information please visit (https://career.sites.clemson.edu/cooperative_education/).

The IE Department also encourages students to consider study abroad, whether through a summer or semester experience. The best advice is to assume that nothing you take while

studying abroad will be usable in the IE curriculum, and then, be happy if something is usable. In this way, you are less constrained on schools and courses to be taken at those schools. Additional information is available at (<https://www.clemson.edu/studyabroad/>).

10 INFORMATION REGARDING THE FE EXAM

The BSIE curriculum at Clemson University is designed to offer students the opportunity to prepare for the Fundamentals of Engineering (FE) Exam. Passing FE Exam is the first step in pursuing a professional engineering license. The National Council of Examiners for Engineering and Surveying manages the process and documents it on their website (<http://ncees.org/exams/fe-exam/>). The courses allowed to satisfy the *Management Requirement* support the IE FE exam topics in Industrial Management. The BSIE curriculum also includes the following required courses outside of Industrial Engineering in part to support instruction in the topics on the FE: CE 2010, ECE 2070/2080, MSE 2100, and Ethics and Professional Practice.

11 BSIE OBJECTIVES AND OUTCOMES

Program Educational Objectives (PEOs):

Within three to five years after graduation, Industrial Engineering alumni will achieve the following objectives:

- Build a record of successful work experiences designing, developing, implementing and/or improving engineering systems.
- Demonstrate a commitment to professional development through their pursuit of professional certification, advanced degrees, and/or knowledge of advances in their field.
- Take on greater responsibility or leadership roles in their workplace, profession and/or community.

Program Outcomes:

Students in the Industrial Engineering program attain:

- an ability to apply knowledge of mathematics, science, and engineering
- an ability to design and conduct experiments, as well as to analyze and interpret data
- 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
- an ability to function on multi-disciplinary teams
- an ability to identify, formulate, and solve engineering problems
- an understanding of professional and ethical responsibility
- an ability to communicate effectively
- the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
- a recognition of the need for, and an ability to engage in life-long learning
- a knowledge of contemporary issues
- an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice