IE Undergraduate Handbook

Accompanying the IE Academic and Registration Syllabus

August 22, 2019

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 their curriculum in order to receive a degree.

2. This handbook outlines the procedures and policies for the BS program in Industrial Engineering. There is a complementary Advising and Registration Syllabus that accompanies this Handbook.

3. There is now an Industrial Engineering BS with an emphasis area in Computing. Information about this emphasis area is available in this document and the Undergraduate Catalog.

Existing notes about the curriculum and policies:

1. As of Spring 2018, IE 2800 is renumbered as IE 3800.

2. Students who fail to pass an IE course with a D or better within three attempts will be dismissed from the program (see Section 5).

3. Students who fail to maintain a 2.0 engineering grade point average (EGPA) will be placed on IE probation (see Section 5).

4. 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.

5. For all IE courses, a D is a passing grade. However, some of the prerequisite courses have to be completed with a C or better:
   -In order to register for IE 2100 a student must have a C in CE 2010, if a student has already passed IE 2100, the prerequisite grade requirement does not apply.

   -In order to register for IE 3600 a student must have a C in MATH 2060, if a student has already passed IE 3600, the prerequisite grade requirement does not apply.

   -In order to register for IE 3800 a student must have a C in MATH 3110, if a student has already passed IE 3800, the prerequisite grade requirement does not apply.

> **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. --*Policy of Student Responsibility, Undergraduate Catalog***

2 BSIE Curriculum

IE courses are offered each fall and spring semester. IE classes can be taken in any semester as long as prerequisite and other requirements are satisfied. If you are on a catalog year prior to the 2014 catalog please contact your academic advisor for your curriculum and curriculum related questions. **Your catalog year is identified at the top of the degree works page.**

The 2016-current IE curriculum

Year 1			
16	**First Semester**[1]	17	**Second Semester**[1]
4	CH 1010 General Chemistry	3	ENGR 1410 Programming
3	ENGL 1030 Comp. & Rhetoric	4	MATH 1080 Calc of One Var II
2	ENGR 1020 Engr Discip. & Skills	3	PHYS 1220 Physics I
4	MATH 1060 Calc. of One Var I	3	Arts and Human./Social Sciences[5]
3	Arts and Human./Social Sciences[5]	4	Lab Science Requirement[5]
		3	Social Science Requirement[5]
Year 2			
16	**First Semester**	17	**Second Semester**
3	CE 2010 Statics[2,6]	3	IE 2100 Design and Ana. of Work Sys.[4]
4	MATH 2060 Calc. of Several Var.[2]	4	IE 3010 Systems Design I
3	MATH 3110 Linear Algebra[2]	1	IE 3140 Seminar in IE
3	PHYS 2210 Physics with Calc. II	3	IE 3600 Ind. App. of Prob./Stat. I[4]
1	PHYS 1240 Physics Lab. II [3]	3	IE 3800 Deterministic Oper. Res.[4]
2	ENGR 2080 (or 2090 or 2100)	3	MSE 2100 Intro to Mater. Science
Year 3			
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.[4]	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[5]	3	Oral Communication[5]
Year 4			
15	**First Semester**	13	**Second Semester**
3	IE 4880 Human Factors Engr.	4	IE 4670 Systems Design II
6	***IE Technical Requirement***[5]	3	***IE Technical Requirement***[5]
3	ECE 2070/2080 or 2020/2110	3	Management Requirement [5]
3	Ethics and Prof. Practice[5]	3	Arts and Human./Social Sciences[5]

Notes:

1 Refer to the General Engineering first year curriculum.
2 This course must be passed with a C or better as a prereq for other courses.
3 PHYS 2230 may be substituted.
4 This course has prereq with C or better requirements.
5 Select from the list in Degree Works or Advising and Registration Syllabus.
6 ME 2010 completed with a C or better can be used to satisfy this requirement.

The 2018-current IE curriculum (with computing emphasis)

Year 1			
16	**First Semester**[1]	17	**Second Semester**[1]
4	CH 1010 General Chemistry	3	ENGR 1410 Programming
3	ENGL 1030 Comp. & Rhetoric	4	MATH 1080 Calc. of One Var II
2	ENGR 1020 Engr Discip. & Skills	3	PHYS 1220 Physics I
4	MATH 1060 Calc. of One Var I	3	Arts and Human./Social Sciences[5]
3	Arts and Human./Social Sciences[5]	4	Lab Science Requirement[5]
		3	Social Science Requirement[5]
Year 2			
16	**First Semester**	17	**Second Semester**
3	CE 2010 Statics[2,6]	4	CPSC 1020 Computer Science II[7]
4	CPSC 1010 Computer Science I[7]	3	IE 2100 Design and Ana. of Work Sys.[4]
4	MATH 2060 Calc. of Several Var.[2]	4	IE 3010 Systems Design I
3	MATH 3110 Linear Algebra[2]	3	IE 3600 Ind. App. of Prob./Stat. I[4]
2	ENGR 2080 (or 2090 or 2100)	3	IE 3800 Deterministic Oper. Res.[4]
Year 3			
16	**First Semester**	17	**Second Semester**
3	IE 3610 Ind. App. of Prob./Stat. II	1	IE 3140 Seminar in IE
3	IE 3810 Probabilistic Oper. Res.[4]	3	IE 3860 Production Plan. and Cont.
3	IE 3840 Engr. Economic Ana.	3	IE 4610 Quality Engineering
3	IE 4400 Dec. Support Systems in IE	3	IE 4650 Facilities Plan. and Design
3	PHYS 2210 Physics with Calc. II	4	IE 4820 Systems Modeling
1	PHYS 1240 Physics Lab. II[3]	3	Oral Communication[5]
Year 4			
15	**First Semester**	13	**Second Semester**
4	CPSC 2120 Algorithms & Data Struct.	4	IE 4670 Systems Design II
3	ECE 2070/2080 or 2020/2110	3	MSE 2100 Intro to Mater. Science
3	IE 4880 Human Factors Engr.	3	Management Requirement[5]
3	Social Science Requirement[5]	3	Arts and Human./Social Sciences[5]
3	Ethics and Prof. Practice.[5]		

Notes:
1 Refer to the General Engineering first year curriculum.
2 This course must be passed with a C or better as a prereq for other courses.
3 PHYS 2230 may be substituted.
4 This course has prereq with C or better requirements.
5 Select from the list in Degree Works or Advising and Registration Syllabus.
6 ME 2010 completed with a C or better can be used to satisfy this requirement.
7 CPSC 1060 and CPSC 1070 may be substituted for CPSC 1010 and CPSC 1020.

The 2015-2016 IE curriculum (2014-2015 and 2015-2016 years)

Year 1			
16	**First Semester**	17	**Second Semester**
2	ENGR 1020 Engr. Discip. and Skills[1,2]	3	ENGR 1410 Prog. and Prob. Sol.[1,3]
4	CH 1010 General Chemistry [1]	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	ENGL 1030 Accel. Composition [1]	4	Lab Science Requirement [4]
3	Arts and Human./Social Sciences[4]	3	Arts and Human./Social Sciences [4]
Year 2			
15	**First Semester**	18	**Second Semester**
1	IE 2000 Sophomore Seminar in IE	3	IE 2100 Design and Ana. of Work Sys.[8]
4	MATH 2060 Calc. of Several Var.[1,9]	4	IE 3010 Systems Design I
3	CE 2010 Statics [5,9]	3	IE 2800 Deterministic Oper. Res.[8]
3	PHYS 2210 Physics with Calc. II	2	ENGR 2080 (or 2090 or 2100)
1	PHYS 2230 Physics Lab. II [6]	3	IE 3840 Engr. Economic Ana.
3	Math/Science Requirement [4,7]	3	MSE 2100 Intro to Mater. Science
Year 3			
16	**First Semester**	15	**Second Semester**
1	IE 3680 Professional Practice in IE	3	IE 3860 Production Plan. and Cont.
3	Ethics and Prof. Practice [4]	3	IE 3810 Probabilistic Oper. Res.[8]
3	IE 3600 Ind. App. of Prob./Stat. I[8]	3	IE 3610 Ind. App. of Prob./Stat. II
3	IE 4400 Dec. Support Systems in IE	3	ECE 2070/2080 or 2020/2110
6	Arts and Human./Social Sciences	3	COMM 1500 or 2500
Year 4			
16	**First Semester**	12	**Second Semester**
4	IE 4820 Systems Modeling	3	IE 4670 Systems Design II
6	IE Technical Requirement [4]	3	IE Technical Requirement [4]
3	IE 4610 Quality Engineering	3	Management Requirement [4]
3	IE 4650 Facilities Plan. and Design	3	Arts and Human./Social Sciences[4]

Notes:

1 This course must be passed with a C or better.

2 ENGR 1050 and 1060, completed with a C or better, will satisfy this requirement.

3 ENGR 1070, 1080, and 1090, completed with a C or better, will satisfy this requirement. Alternatively, completing ENGR 1300 (or CHE 1300) plus one of CPSC 1610, 1110 or 1010 (with C or better) will satisfy this.

4 Select from the list in Degree Works or Advising and Registration Syllabus.

5 ME 2010 completed with a C or better can be used to satisfy this requirement (if IE 2100 has not yet been completed.

6 PHYS 1240 may be substituted.

7 If a course other than MATH 3110 chosen to satisfy this requirement, and you haven't yet completed IE 3800 and IE 3810 then you still need to take MATH 3110 to satisfy the prerequisites for IE 3800 and 3810.

8 This course has prereq with C or better requirements.

9 A grade of a C or better is required if later course has not yet been passed.

3 Approved Courses

Degree Works provides a list of the current set of courses associated with your degree. Please consult your academic advisor you have questions about your Degree Works audit.

All graduation and course requirements are available in the Industrial Engineering section of the Catalog available at http://catalog.clemson.edu/

Important notes from the Clemson Catalog:
Arts and Humanities/Social Science (HSS) Requirement:
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 for the CCA and STS attribute requirements.

The CCA and the STS attribute requirements require that at least one course be taken that has the CCA attribute and one course that has the STS attribute. 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://catalog.clemson.edu/.

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 below.

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

IE Course	Prerequisites
IE 2100	ENGL 1030 (C or better), CE 2010 (C or better, starting Fall 19)
IE 3010	ENGL 1030 (C or better), ENGR 1020 (C or better)
IE 3140	-
IE 3600	MATH 2060 (C or better, starting Fall 19)
IE 3610	IE 3600
IE 3800	MATH 3110 (C or better)
IE 3810	MATH 3110 (C or better, starting Fall 19), IE 3600
IE 3840	MATH 1080 (C or better)
IE 3860	IE 3800
IE 4400	ENGR 1410 (C or better)
IE 4610	IE 3610
IE 4650	IE 2100, IE 3800, IE 3810
IE 4820	IE 3610, IE 3810
IE 4880	Junior Standing
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)**]

Prerequisite flowchart 2016- current curriculum

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.

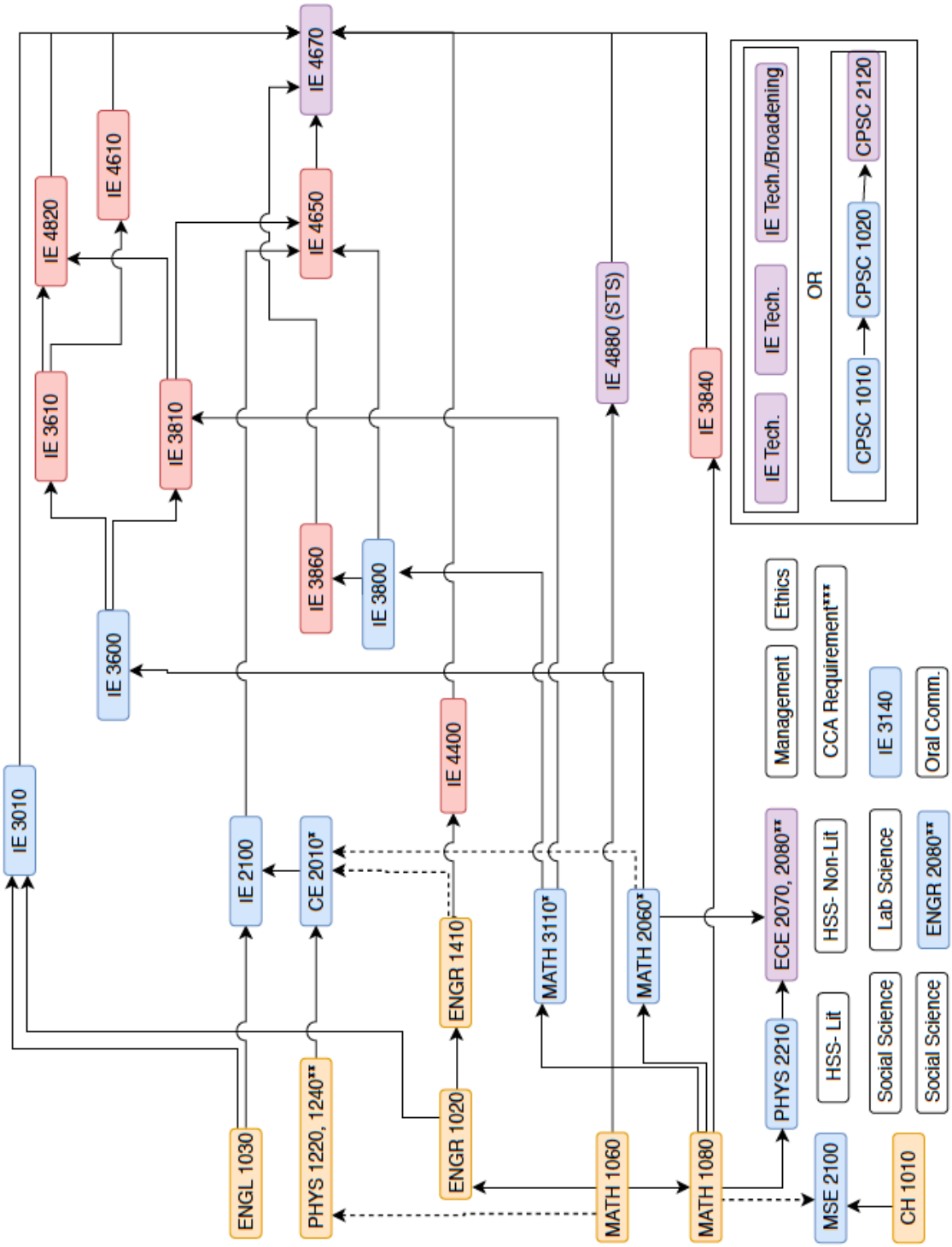
Notes: Courses are color coded according to the semester identified in the curriculum

* Must be passed with a C or better

** Alternative courses are listed in DegreeWorks

***CCA requirement may be satisfied by another course with CCA attribute.

- - - (a dotted line) Indicates Corequisites



4 Planned Course Offerings

Please see the Advising and Registration Syllabus for the projected offerings of IE courses.

5 Other Registration and Course Planning Topics

Credit to be earned at another school

The student should obtain approval of each course *prior* to scheduling the class. By obtaining advance approval, the student is assured of receiving proper credit at Clemson upon satisfactory completion of the course. Information and forms relative to this approval may be obtained at https://www.clemson.edu/registrar/forms/student-forms/index.html. The *Transfer Credit Equivalency List*, which is a database containing the Clemson University course equivalencies for approximately 1200 accredited colleges and universities nationwide, may be found at https://www.clemson.edu/admissions/tcel/.

Please reference this list before seeking approval from your advisor. When considering taking courses elsewhere, keep in mind that to qualify for an undergraduate degree, a student must complete through instruction from Clemson *a minimum of 37 of the last 43 credits* presented for the degree. However, a waiver may be obtained for approved study abroad experiences through the Undergraduate Academic Services Office, E-103 Martin Hall.

Petitions

Students may petition for exceptions to departmental registration policies and curriculum requirements. The merits of the petition should first be discussed with your academic advisor. If you elect to pursue a petition, the petition form (that you must complete) and the associated documentation is then routed to the Undergraduate Curriculum Committee through your academic advisor for review. The Committee 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 academic advisor with the results of the petition.

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, 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.

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 policy (2016 – 2017 catalog year and later)

No student may exceed three attempts, including a W and grade forgiveness (with the exception of a withdrawal from the University), to complete any IE course with a grade of D or better. Moreover, a third attempt is granted by a written request to the department chair (through the Undergraduate Program Coordinator) before the deadline to add a course in a subsequent term. This policy applies only to students in the 2016 and later catalog years.

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.

IE academic probation: A student who fails to maintain a cumulative engineering grade-point average (EGPA) of 2.0 or higher is placed on academic probation. A student on academic probation may enroll in a maximum of 13 credit hours, unless permission for a higher course load is granted by the undergraduate committee. Students on academic probation are expected to participate in the Department's Academic Recovery Program.

IE academic suspension: A suspended student is ineligible to enroll in IE classes immediately following the suspension notification. Suspension is for one semester only, and the student is eligible to reenroll the following semester. A student who enrolls after a suspension is not allowed to register for IE classes if he/she does not meet the academic eligibility criteria listed below.

IE academic eligibility standards: A student on academic probation (EGPA below 2.0) will remain academically eligible if one of the following conditions is met.

1. The student earns a 2.4 or higher grade-point average on the engineering courses for the semester.
2. The student achieves the minimum cumulative Engineering Grade-Point Average (EGPA) listed below.

Total Attempted Engineering Hours	EGPA
10-19	1.75
20-39	1.85
40-59	1.95
60+	2.00

6 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 a master's degree by applying graduate credits to both undergraduate and graduate program requirements. Interested students need to complete the GS6-Bachelor-to-Graduate form. For additional information and to obtain a copy of the GS6-Bachelor-to-Graduate form please visit https://www.clemson.edu/graduate/students/forms.html.

What is the difference between GS6 and GS6-Bachelor-to-Graduate forms? In the IE Department, the GS6-Bachelor-to-Graduate form allows IE students to double-count up to 12 credit hours towards both BS and MS requirements. The total credit hours taken for the bachelor's and master's must be at least 150 credit hours; that is, the credit hours counted towards the bachelor's degree plus the credit hours taken after the bachelor's is awarded must total at least 150. For the bachelor's and PhD, the

total must be 180 credit hours. 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.

7 Expanding Experiences Outside of the Classroom

Creative Inquiry (CI)

CI provides opportunities in the form of open-ended problems that extend beyond the classroom. These research experiences are guided by one or more faculty mentors and will typically involve other undergraduate and graduate students. Industrial Engineering CIs 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/centers-institutes/watt/creative-inquiry/.

Universal CIs are listed on the Creative Inquiry website with details on how to apply. Universal CIs do not count towards the IE curriculum but are encouraged experiences. Departmental CIs (IE 4040) are listed in Banner and the student may contact the faculty member for details on how to apply. Departmental CI experiences (IE4040) may count towards the IE Technical Requirements with a maximum of 6-credits.

IE 2680: CI Seminar

IE 2680/2680 (HON) 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 2680 (HON) is required of all students seeking Departmental Honors. Individual faculty mentors may require IE 2680 of other students at their discretion. IE 2680/2680 (HON) does not necessarily have to be taken prior to beginning the IE 4040/4000 (HON) sequence. In instances where it is required, individual mentors may permit it to be taken concurrently.

Departmental Honors

Departmental Honors, unlike General Honors, is thesis-based rather than course-based. The IE honors students must complete IE 2680 (HON) and IE 4000 (HON). 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. If students are researching in a team setting, each student must make a distinct contribution, but team members may 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, IE 4000 (HON). For additional information please visit https://www.clemson.edu/cuhonors/current-students/student-handbook/departmental-honors.html.

Co-op

The IE Department supports the Co-operative Education Program. Since all required IE courses are offered both in fall and spring semesters, students have flexibility to obtain co-op experiences if they choose to do so. Students should be prepared that engaging in the Co-op experience involves delaying graduation by one calendar year. Please consult your academic advisor before taking a co-op assignment in order to create a new plan to graduation (see Advising and Registration Syllabus) For additional information please visit https://career.sites.clemson.edu/cooperative_education/.

Study abroad

The IE Department also encourages students to consider study abroad and obtaining international experiences. Please refer to the Advising and Registration Syllabus for pre-approved programs and courses, and the process for studying abroad. If you'd like to participate in a program or experience that is not listed, please consult your academic advisor.

8 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 the 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 https://ncees.org/engineering/fe/. 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, PHYS 2210, and Ethics and Professional Practice, and the Management Requirement.

9 Student Outcomes for the BSIE degree

Students in the Industrial Engineering program attain:

- an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
- 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
- an ability to communicate effectively with a range of audiences
- an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgements, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
- 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
- an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgement to draw conclusions
- an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Student Outcomes adopted by the IE department May, 8, 2019