The 2014-2015 UI College of Engineering Curriculum Committee consists of:

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<th>Members</th>
<th>Term Expiring</th>
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<tr>
<td>Allen Bradley (CEE) (chair)</td>
<td>May 2015</td>
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<td>Anton Kruger (ECE)</td>
<td>May 2017</td>
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<td>David Murhammer (CBE)</td>
<td>May 2016</td>
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<td>David Wilder (BME)</td>
<td>May 2016</td>
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<td>Olesya Zhupanska (MIE)</td>
<td>May 2015</td>
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<td>Dean Keri Hornbuckle, <em>ex officio</em>, nonvoting</td>
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<td>Ella Wassweiler, Student Representative, nonvoting</td>
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<td>Edwin Dove, Engineering Faculty Council liaison</td>
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The Committee’s general charge is as follows: “The Curriculum Committee shall be responsible for reviewing and evaluating all existing and any proposed curricula within the college, for reviewing and evaluating all existing and any proposed courses taught within the college or required in any of its curricula, and for making appropriate recommendations to the dean and the faculty.”

The Committee’s specific charges for the 2014-2015 academic year are:

1. Work with the Dean’s office to gather and review Course Activity Reports (CARs) for the College of Engineering core curriculum courses (59: xxx and 57:xxx) in coordination with the core course coordinators; make these easily available to all departments.
2. Monitor course quality for the mathematics, physics, and chemistry courses that are part of the engineering core curriculum.
3. Monitor Mathematics, Physics, and Chemistry departments’ reliance on multiple choice questions, and recommend whether such reliance is pedagogically appropriate for engineering students.
4. Continue communication between the Curriculum Committee and the Mathematics, Physics, and Chemistry departments.
5. Begin a broad discussion with engineering faculty, students, and alumni of the GEC requirements of the College curriculum, with the goal of developing new GEC policy for the College.
7. Study the TA resources needed to maintain the quality of undergraduate instruction in light of increased enrolments.
Regarding Charge #1:

The Committee reviewed the CARs for all of the 059:xxx courses in the College. The CARs for two courses have not yet been submitted. The CAR for one is missing a syllabus. The Committee has contacted the core course coordinators to obtain the CARs or missing information. The format and content of all the CARs is similar. Although quantitative evaluations are no longer mandated, most CARs employ a quantitative evaluation of course goals; one course evaluates the overall student performance only, while another no longer includes any quantitative evaluation. All CARs contain a running log describing changes and qualitative self-evaluations from semester to semester (some of which are nearly ten years long). Overall, course assessments for each 059:xxx offering appears to be satisfactory. The Committee has no recommendations for changes.

The Committee also reviewed the CARs for all the 057:xxx courses in the College. For all the courses, at least one CAR for the academic year 2013-14 has been submitted. The CARs for three are missing a syllabus. The Committee has contacted the core course coordinators to obtain the missing information. The format and content of the CARs is widely varied. Some use the same format as the 059:xxx courses; others follow formats developed by individual departments. Although quantitative evaluations are no longer mandated, most CARs employ a quantitative evaluation; some evaluate course goals, one evaluates the overall student performance, and one uses student surveys. Only two CARs do not include a quantitative evaluation. Every CAR includes a qualitative self-evaluation and recommendations, either in the form of a running log, or a self-reflection on the semester. Overall, course assessments for each 057:xxx offering appears to be satisfactory.

Recommendation #1: The Committee recommends that the Dean’s office gather CARs for these courses again from the 2014-2015 academic year so that they are available for departments.

Regarding Charge #2:

The Curriculum Committee examined additional information on Math, Chemistry, and Physics courses from the course materials gathered for the ABET folders. Comparisons of the new materials with those archived by last year’s Committee show that the course coverages are similar and appropriate.

The Math I (MATH:1550) course uses multiple choice questions in exams. Quizzes are open-ended problems where students must show their work. Homework problems are open-ended; one discussion instructor used MyMathLab (Spring 2014), which contains multiple choice and “enter your answer” as a number or equation. In Fall 2014, homework is ungraded and quiz scores are used “only to raise and not lower grades”. In Spring 2014, both homework and quizzes are graded and used to determine final grades.

The Math II (MATH:1560) course also uses multiple choice questions in exams. ICON Quizzes are used that contain multiple choice and enter your answer questions. Homework and in-class
assignment are open-ended problems. There are also several computer labs, with one introducing the use of Mathematica. Homework and quizzes are graded and used to determine final grades.

The Math III (MATH:2550) course is a mixture — the majority of exams use problems where students need to show their work, although multiple choice exams may be used in a limited way (certain instructors). Homework is problem-based and accounts for between 10 to 30% of the course grade.

The Math IV (MATH:2560) course uses problem-based exams and homework. Quizzes are a mixture of multiple-choice, short-answer, and problems. Homework and quizzes account for about 30% of the course grade.

The Principles of Chemistry I (CHEM:1110) course uses multiple choice questions in exams. Homework is done online using Mastering Chemistry, which includes “enter your answer” questions and some multiple choice. Homework and discussion account for about 15% of the course grade; the laboratory counts for another 20%.

The Introductory Physics I (PHYS:1611) course uses multiple choice questions in exams. Homework consists of assigned problems from the textbook. Homework and laboratories each account for about 15% of the course grade.

The Committee has worked with the Dean’s Office to secure all the ABET materials gathered for these classes, and to archive them so that they are available to future committees. The Committee will also archive ABET materials for the engineering core courses. We believe that these materials are useful, and sufficient (in the near-term), to investigate most questions about the manner and content of these required courses.

**Regarding Charge #3:**

Using course materials gathered for the ABET folders, the Committee examined multiple choice exams for the Math, Chemistry, and Physics courses that use them. Comparisons of the new materials with those archived by last year’s committee show no significant differences in the nature and coverages of the exams.

In their evaluation of exam materials last year, the Curriculum Committee concluded that there were no pedagogically inappropriate multiple choice exams. In addition, no negative feedback from students on their use had been received by the Dean’s Office. That committee also found that the use of multiple choice exams is driven by resource constraints; departments are aware of potential issues and pitfalls arising from multiple-choice exams and have worked to make their exams as pedagogically appropriate as possible. Based on this year’s examination of materials and communications with the Dean’s Office, our conclusion regarding multiple choice exams is the same.

**Regarding Charge #4:**
There were no direct communications between the Curriculum Committee and the Mathematics, Physics, and Chemistry Departments in AY 2014-2015. Last year there were extensive communications with these departments for ABET evaluation (to facilitate gathering of sample work for ABET folders on these courses). This year there were no specific questions that required communications with these departments. The extensive materials gathered for this past Fall’s ABET evaluation were sufficient for our charges to monitor course quality and the reliance on multiple choice exams.

On March 5th, Prof. Mike Hero made a presentation to the “Engineering Lecture and Something More” group about the UI online math course “MATH:1550:0EXW Engineer Math I Single Variable Calculus” that will be offered for the first time in the 2015 Summer semester. The class has been designed to be reasonable and rigorous, and to encourage learning with academic incentives, evaluation, and feedback. The presentation and planned class appeared to have been well-received by representatives of both the UI Math and Engineering academic units.

Regarding Charge #5:

Last year, the Curriculum Committee proposed that the GEC policy be modified, given the changes to the UI course numbering system and CLAS course designations. However, this was intended to be a temporary measure until the college considers a new GEC policy in light of changes in ABET GEC requirements.

The current general education component (GEC) has its root in ABET’s old requirements for courses in social science and humanities. Students must take at least one social science and one humanities course, and they must take at least two courses in the same department. The college maintains a list of approved departments for humanities and for social science courses; for many departments, only certain courses are approved for GEC credit.

The Committee reviewed the GEC requirements for several peer institutions. Some closely resemble our own system, with course requirements in humanities and social sciences (and some minor additions in specific topics). Others are designed as part of a university-wide general education program, with course requirements in defined topic areas.

The Committee developed objectives for a new GEC policy consistent with ABET’s requirement that it “complements the technical content of the curriculum and is consistent with the program and institution objectives”. We considered our college objectives (as outlined in the 2010-2016 Strategic Plan), with its focus on the engineer and something more, partnerships with UI colleges, and integrating global awareness, communication skills, and team building across the curriculum. We also considered how the GEC could complement the technical content of our programs by providing opportunities to develop skills consistent with ABET outcomes. Based on that review and discussions, the Committee defined the following objectives:

- Broaden the definition of general education component to cover more than just humanities and social science.
- Integrate the “engineer and something more” theme as a guiding principle for the general education component.
- Encourage students to define the “something more” they seek through the general education component.
- Create unique opportunities for students through partnership with outstanding UI Arts programs.
- Maintain opportunities for students to use the general education component to obtain a minor or a double major.
- Provide a large degree of flexibility to take any non-engineering courses.
- Provide a degree of structure to help students make choices that complement their technical education.

As part of our discussion of GEC requirements, the Committee met with the University of Iowa’s Arts Advancement Committee to discuss their plans to enhance curricula and opportunities for students. We had an engaging discussion on how students from engineering could benefit from courses and resources within the UI Arts units. We also discussed how an educational partnership with Arts units could offer additional opportunities for engineering students to mix with other students (including majors) in the creative process of “doing art”, through hands-on courses in Art (graphical, studio, sculpture, painting, etc.), Music, Dance, Theatre, Cinema, and Writing.

The College of Liberal Arts (CLAS) has also recently revised its general education program. CLAS defines a common core in general education. Within the three cores areas, there are course requirements in nine topics areas. Based on course requirements within the COE, engineering students already meet the general education requirements in three topic areas (Rhetoric, Natural Science, and Quantitative or Formal Reasoning). Although engineering students could not meet all the remaining CLAS general education requirements with a 15 sh GEC, the Committee considered how the structure of their program could be effectively utilized by engineer students in the GEC.

The Committee prepared a proposal for a new GEC policy for the College of Engineering. The proposal is consistent with the objectives outlined, includes a requirement for a hands-on creative course with the UI Arts units, and utilizes the CLAS general education program structure. The proposal was submitted to the EFC for their review.

**Regarding Charge #6:**

The Committee reviewed all of the pre-requisites and co-requisites for core classes. Pre- and co-requisites were found to be acceptable for most courses. However, the Committee recommends removing Engr Math 1 (MATH:1550) from the list of pre-requisites for Dynamics (ENGR:2710), and removing Engr Math 2 (MATH:1560) from the list of co-requisites for Statics (ENGR:2110).

With regards to Dynamics, the current pre-requisites are Statics and Engr Math 1. However, Engr Math 1 is also a pre-requisite for Statics, thereby making its inclusion as a pre-requisite for
Dynamics redundant. The Committee also recommends removing Engr Math 2 from the list of co-requisites for Statics. Although multidimensional drawings and analysis are sometimes required in the class, there is no multivariable integration. Including Engr Math 2 adds an unnecessary requirement, and its removal would not hamper the student’s ability to take the class. As noted above, Engr Math 1 is a pre-requisite and provides students with the basic integration and math skills needed for Statics. After confirming with the Statics core course coordinators, the Committee recommends the removal of Engr Math 2.

The committee members propose to the EFC that core course requirements be modified as follows:

- **Statics (ENGR:2110):** Pre-requisite: Engineer Math I Single Variable Calculus (MATH:1550); Co-requisite: Introductory Physics I (PHYS:1611).

- **Dynamics (ENGR:2710):** Pre-requisite: Statics (ENGR:2110); Co-requisite: None

**Regarding Charge #7:**

The Curriculum Committee reviewed how Departments use TA resources in undergraduate education. It is clear that Departments are changing the way they are using available TA financial resources. These changes are being driven in large part by costs associated with employing graduate TAs.

The money to hire TAs comes from the College of Engineering (for engineering core courses), and from the Departments (through faculty salary release funds). Along with rising enrollments, the cost of employing a graduate TA is also rising. With recent shifts in the financial burden for graduate TA tuition waivers to the Departments, hiring a graduate TA for a 1/4 time appointment requires the Department to pay the full tuition waiver.

As a consequence of the rising cost for graduate TAs, the Departments are hiring more undergraduates to fill TA positions. Departments are also moving from paying stipends for an undergraduate TA position, to paying hourly wages (to reflect the time they actually spend on their work assignments). Some are looking to allocate TA hours to courses based on their enrollment. Graduate TAs are still being utilized, but more so in courses where their experience and expertise is necessary (e.g., laboratory sections).

For many of the TA roles, undergraduate TAs provide a high-level of service. In general, they are knowledgeable about a course, having recently completed it themselves. They are also not burdened by the demands of graduate research. Many embrace the opportunity to serve in this role. However, there are issues for some TA roles. In higher-level (i.e., junior or senior) courses, the pool of potential undergraduate TAs is limited. For laboratory sections, where a high-level of training and experience is necessary for safety and competence, training new TAs each year can be a burden for instructors. Finally, undergraduate TAs often cannot bring the depth and breadth of understanding in course topics that can come with graduate-level training (in courses and research).
There are also changes in the roles of TAs. In a traditional lecture course, TAs are used primarily as graders (for homework and exams), or to lead laboratory sections. In a “flipped classroom” setting, a new role for TAs is as a mentor or tutor during the class-time activities. There are other reasons why instructors are changing how they use TAs. For example, students today have far greater access to materials (e.g., solution manuals and electronic copies of past homework assignments/solutions). Some instructors have responded by eliminating graded homework assignments; others now grade only a fraction of assigned homework problems. Instead, instructors may use ICON quizzes (auto-graded), or use TAs more as graders for in-class quizzes or in-class activities. In other words, instructors are adapting to changes (including growing enrollments) by reducing the amount of graded assignments.

TAs also interact directly with students during TAs’ office hours. With increasing enrollments, there is greater demand for engagement with students. In core courses, this burden is likely being reduced by the growth and popularity of the Engineering Tutorial Center, where undergraduates serve as peer tutors.

**Regarding Charge #8:**

The Committee recommends the following charges for the next year:

**Recommended Charge #1:** Continue work to develop, implement, and monitor a new CoE GEC policy.

The specific wording of this charge will depend on whether a new policy is adopted in the coming months or not. If a new policy is adopted, one activity proposed by the Committee is to survey students in the First-Year Seminar to gauge student interest in specific hands-on creative courses from the UI Arts units to obtain information that can be used to effectively plan with these departments for implementation.

**Recommended Charge #2:** Examine the merits of introducing a laboratory component to the ENGR:2120 Electrical Circuits course, and the implications for the curriculum of adding a laboratory.

Many engineering programs have a laboratory component in their Electrical Circuits course. We do not. The Committee would seek to understand how a laboratory component might enhance the course, and assess the impacts on the curriculum if a laboratory were introduced.

**Recommended Charge #3:** Monitor course quality for the mathematics, physics, and chemistry courses that are part of the engineering core curriculum.

The Committee believes that all elements of this year’s charges #2 through #4 can be accomplished in future years through this single broad standing charge. The Committee also recommends that subsequent committees discuss and implement strategies for (1) assessing
course quality, (2) gathering any information that is needed for monitoring, and (3) engaging in direct communications with the relevant departments.

**Regarding Charge #9:**

Submission of this report completes Charge #9

**Other Activities:**

At the request of the Dean’s Office, the Committee reviewed General Education Course Substitution petitions for six individual cases, and made its recommendation on each.

Respectfully submitted April 1, 2015.