Revised Plan for the Communication Program
of the Mechanical Engineering Department

Goals for Incorporating Visual Expression, Written, and Spoken Communication

The Mechanical Engineering Department has fewer than 40 faculty members, but more than 700 undergraduates. To meet the requirements of the accreditation board in engineering, the Mechanical Engineering Department must show that its graduating seniors have, among other criteria, an ability "to communicate effectively." Given in Table 1 are the learning objectives of the communication program in the Mechanical Engineering Department to meet this criterion.

Table 1. Department’s learning objectives for visual expression, writing, and spoken communication.
1. Students should know how to compose an analytical document that responds to a critical reading of a general text
2. Students should know how to speak in response to an analytical discussion of a general topic
3. Students should know how to compose an engineering document that responds to a specific audience, purpose, and occasion
4. Students should know how to make an engineering presentation that responds to a specific audience, purpose, and occasion
5. Students should know how to create visual aids, including figures, tables, and presentation slides, to communicate technical information
6. Students should know how to collaborate on engineering document or presentation
7. Students should know how to articulate the differences between strong and weak engineering communication

Curriculum Plan for Meeting Objectives

This section presents the Department’s plan for meeting the learning objectives discussed in the previous section. The plan is divided by years, with at least two courses containing communication assignments in each year, as shown in Figure 1.

Freshman Year. Although students are not officially in the Mechanical Engineering Department until their second year, the first year is a pivotal year in educating mechanical engineering students to become visual expression, written, and spoken communicators. The first year calls for mechanical engineering students to take four classes that address many of the learning objectives stated in the first section. The first course is English 1105, which calls upon students to compose analytical essays that respond to critical readings of various short texts. This course is instrumental in teaching students that writing and reading are interwoven. Also, in this course, through class discussions and in some cases a formal assignment, students learn to speak in response to an analytical discussion of a general topic. The second course is English 1106, which calls upon students to compose analytical essays that respond to critical readings of
novels. In this course, students have to write about a number of complex subjects. The writing in the course culminates in an inquiry essay that explores a key issue. These two courses address the learning objectives 1 and 2 of the Department.

**Freshman Year**
- English 1105: Several essays
- English 1106: Several essays
- EngE 1024: Visuals
- EngE 1114: Documents Group presentation

**Sophomore Year**
- ME 2024: Sophomore Design
  - 1 group report (peer review of draft)
  - 2 individual memos; 1 presentation
- ME 2124: Intro to Thermal Fluids
  - 3 individual reports

**Junior Year**
- ME 3514: Dynamics
  - 3 short reports (group)
- ME 3614: Machine Design
  - 2 reports (individual)
- ME 4005: Mech Engr Lab I
  - 6 short reports (5 pages each)
  - 2 sets of presentation slides (12 slides)

**Senior Year**
- ME 4006: Mech Engr Lab II
  - 2 long reports (each submitted twice)
  - 2 long reports (each submitted once)
  - 2 formal presentations
- ME 4015 and 4016: Senior Design
  - 2 long group reports
  - Several progress memos
  - 2 long group presentations

**Figure 1.** Visual depiction of communication assignments for students in the Mechanical Engineering curriculum. Each assignment provides students with written feedback from a faculty member or trained grader.

The first year also calls upon students to take a sequence of two-credit engineering courses in Engineering Education: EngE 1024 and 1114. In the first course, students learn how to model and visually represent abstract and physical concepts—this learning is important in visual expression. The second course calls on students to write
and make a presentation about engineering topics. The course also calls upon students to work in teams on those communications. These two engineering courses address learning objectives 3, 4, 5, and 6.

**Sophomore Year.** In the first semester of their studies in Mechanical Engineering, students begin learning how to communicate work in their discipline. The first required course in which students face this challenge is Sophomore Design (ME 2024). In this course, which has multiple sections and multiple instructors, the students work in groups of three to four to create a 15-page, double-spaced report. After receiving either a peer review or instructor’s comments on the first submission, the students revise their report and resubmit it. The primary audience in this course, as in almost every course in the curriculum, is a technical manager who knows much about the technical area, but is managing several different projects and therefore needs to be oriented. Students also have three individual writing assignments (typically memos). During the second semester of the sophomore year, students take an introductory course to thermal fluids (ME 2124), which is typically taught in different sections by different instructors. During this course, students write three individual reports with 2-3 pages of double-spaced text and 3-4 pages of illustrations. Students receive marked and graded copies of their work.

These two courses address learning objectives 3, 4, 5, and 6.

**Junior Year.** During the junior year, students continue learning to write and speak about their discipline in three main courses: System Dynamics, Machine Design, and Mechanical Engineering Lab I. While System Dynamics and Machine Design give the students more practice in writing, Mechanical Engineering Lab I addresses engineering communication with formal instruction.

In Mechanical Engineering Lab I, students learn how to assess the differences between strong and weak engineering writing. This formal instruction occurs in a lecture (the first in a series of thirteen over the calendar year) that discusses these differences. A second way that this course achieves depth on engineering communication is through downloadable outlines, for six laboratory reports for the semester, that help the students target the audience, purpose, and occasion. Because the outlines save time for the students on their writing, the students are generally eager to download them. Included in the outlines are stylistic tips for such things as designing graphs and writing first sentences of sections.

This course devotes a class period to the design of presentation slides—a focus in this design is the creation of a key visual expression, rather than a bullet list, that serves as the main piece of evidence for the slide’s assertion. To practice the design of slides, students have two individual assignments in which they must create a set of slides for someone else (a technical manager) to be able to present.

**Senior Year.** During the senior year, students continue developing their writing and speaking skills in three main courses: Mechanical Engineering Lab II, Senior Design I, and Senior Design II. Mechanical Engineering Lab II is the program’s centerpiece for writing and speaking instruction: nine lectures devoted to writing and speaking, two report assignments that involve marked and graded drafts, two other report assignments, and two group presentations in which students receive immediate oral feedback from two
faculty members and written feedback from a GTA and several peers. In the sequence of Senior Design I and II, teams of students write a series of progress reports, write two long completion reports, and make two formal presentations (30-40 minutes each). In Senior Design I, students also hear one lecture discussing the writing of a proposal, which is an assignment in this course.

These courses during the senior correlate with learning objectives 3, 4, 5, 6, and 7. A summary of the courses and assignments for the three years that the students are in the Mechanical Engineering Department is given in Figure 1.

Assessment of Outcomes

The main way in which we assess the outcomes is through evaluation of student writing and presentations during all four years of the program. During the first year, student writing is assessed in English 1105, English 1106, and EngE 1114. During the second year, most of the assessment arises in ME 2024, in which mechanical engineering faculty assess the writing and presentations of students. During the third year, most of the assessment occurs in ME 4005, in which trained graduate students assess the individual writing of six reports and two sets of presentation slides. In this course, students write and receive feedback on more than 36 pages (typed, double-spaced).

During the senior year, assessment occurs in two main courses: ME 4006 and the ME 4015-4016 sequence. In ME 4006, students receive written feedback from trained graduate students on more than 60 pages (typed, double-spaced) of individual writing. This feedback targets certain criteria that are shown in Table 2. Corresponding criteria are used for communication assignments in other courses as well. In addition to feedback on writing, students receive about 10 minutes of oral feedback from faculty on more than 40 minutes worth of small-group presentations. In the ME 4015-4016 sequence, students receive faculty feedback on a number of group documents and presentations.

Table 2. Sample assessment criteria for a writing assignment in Mechanical Engineering.

<table>
<thead>
<tr>
<th>Structure</th>
<th>Language</th>
<th>Illustration</th>
<th>Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>Details are organized?</td>
<td>Language is precise?</td>
<td>Choice is appropriate?</td>
<td>Format is followed?</td>
</tr>
<tr>
<td>Beginning outlines?</td>
<td>Language is clear?</td>
<td>Assertions are supported?</td>
<td>No run-ons or fragments?</td>
</tr>
<tr>
<td>Middle is methodical?</td>
<td>Language is forthright?</td>
<td>Conventions followed?</td>
<td>No faulty parallelisms?</td>
</tr>
<tr>
<td>Ending emphasizes?</td>
<td>Language is familiar?</td>
<td>Formal introductions?</td>
<td>Punctuation used correctly?</td>
</tr>
<tr>
<td>Depth is achieved?</td>
<td>Language is concise?</td>
<td>Captions or headings?</td>
<td>Word choices correct?</td>
</tr>
<tr>
<td>Key details are emphasized?</td>
<td>Language is fluid?</td>
<td></td>
<td>Usage conventions followed?</td>
</tr>
</tbody>
</table>

While written and oral feedback from faculty and trained graduate students constitute the assessment that we make on how well the students achieve the learning objectives, senior surveys and alumni surveys constitute the main form of feedback that we receive on how well our program has prepared students for the mechanical engineering profession. In our last survey of more than 313 alumni from the Department, we found that more than 92% claimed that the Department's curriculum greatly (52%) or somewhat (39%) contributed to their personal growth in the area of written communication. In addition, 89% of these alumni claimed that the Department's curriculum greatly (45%) or somewhat (44%) contributed to their personal growth in the area of presentation skills.