Department name: Engineering (ABET accreditation)

Department mission: Graduates of the Engineering Program will be technically competent and broadly educated, prepared for interdisciplinary work in the global workplace. The character and conduct of Messiah Engineering graduates will be consistent with Christian faith and commitments.

| **ULOs** | **CWMLO** | **ABET standard** | **Student Learning Outcome / Objective** | Courses in which students **receive feedback** on obj  (see [table](#_Mapping_Courses_to)) | **Measure** (Method to gauge achievement) | **Target** (Overall level for satisfactory performance.) | **Timeline**  **(more details** [**here**](#_Assessment_Timeline)**)** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **2. Breadth and depth of knowledge** Develop knowledge common to the liberal arts and sciences in the fields of arts, humanities, natural sciences, and social sciences. Students will also develop specialized nowledge and disciplinary expertise | **4.1 Breadth and depth of knowledge:** Understanding the foundational content and philosophical assumptions of one’s specialized area of study | a. Ability to apply knowledge of mathematics, science, and engineering | Analysis: Student will demonstrate ability to apply knowledge of mathematics, science, and engineering to real-world engineering problems. |  | Project Records (ENGR 288, 388, 488, 489) in the “Analysis” category were used to assess student performance with respect to this outcome. The rubric used for the assessment is shown [here](#_Outcome_A_Rubric) | 80 percent of students will score a four or higher out of 5. | Spring 2016 |
| 2 | 4.1 | j. Knowledge of contemporary issue | Student will integrate knowledge of contemporary issues into engineering solutions. |  | Students take a quiz within the ENGR 302 course that evaluates their ability to list contemporary issues relevant to their discipline and articulate details of those issues. | 80 percent of students will score a four or higher out of 5. | Fall 2014 |
| **4.2 Specialized scholarship.** Become proficient in the scholarship of their discipline and demonstrate specialized skills needed to pursue a career and/or graduate school | **4.2 Scholarship:** Engaging in scholarship in one’s specialized area of study | b. Ability to design and conduct experiments, as well as to analyze and interpret data. | Testing: Student will demonstrate ability to design and conduct experiments, analyze and interpret data. |  | Project Records (ENGR 288, 388, 488, 489) in the “Testing” category were used to assess student performance with respect to this outcome. The rubric used for the assessment is shown [here](#_Outcome_B_Rubric) | 80 percent of students will score a four or higher out of 5. | Spring 2016 |
| 4.2 | 4.2 | k. Ability to use the techniques, skills, and modern engineering | Student will use the techniques, skills and modern engineering tools necessary for engineering research and practice. |  | Graduating seniors are randomly selected to participate in an exit survey with one of the faculty to discuss their competency with various techniques and methods common to their chosen discipline in order to evaluate the student’s proficiency. A consistent [list](#_Outcome_K_list) is provided to the faculty evaluators as talking points for the exit interview. | 80 percent of students will score a four or higher out of 5. {but we have struggled to consistently define this} | Spring 2015 |
| **4.3 Specialized skills** Become proficient in the scholarship of their discipline and demonstrate specialized skills needed to pursue a career and/or graduate school | **4.3 Specialized skills:** Developing proficiency in one’s specialized area of study sufficient to pursue a career and/or continue education at the graduate level | e. Ability to identify, formulate, and solve engineering problems | Problem Definition: Student will identify, formulate, and solve engineering problems |  | All project teams (ENGR 288, 388, 488, 489) are expected to clearly document their scope and purpose in a project charter document. Among other things, this process is intended to coach students through identification of the root problem to be solved, not necessarily limiting themselves to the initial plea of the client that may predispose them to a particular solution.  Charters are assessed according to this [rubric](#_Outcome_E_Rubric). | 80 percent of students will score a four or higher out of 5. | Spring 2016 |
| 4.3 | 4.3 | c. Ability to design a system, component, or process to meet desired needs | Prototyping: Student will demonstrate ability to design and use engineering systems, components, or processes to help solve practical problems. |  | Project Records (ENGR 288, 388, 488, 489) in the “Prototyping” category were used to assess student performance with respect to this outcome. The rubric used for the assessment is shown [here](#_Outcome_C_Rubric) | 80 percent of students will score a four or higher out of 5. | Spring 2016 |
| 4.3 | 4.3 | d. Ability to function on multi-disciplinary teams | Teamwork: Student will demonstrate ability to work productively on multi-disciplinary teams. |  | Outcome D is assessed considering student performance on their Collaboratory team in the Integrated Projects Curriculum (ENGR 288, 388, 488, 489) according to this [rubric](#_Outcome_D_Rubric). | 80 percent of students will score a four or higher out of 5. | Spring 2017 |
| 4.3 | 4.3 | g. Ability to communicate effectively | Communication: Student will use written and oral communication effectively. | Seminar I  Project III | Quality of communication in written format is assessed considering the quality of reports submitted in the Project (ENGR 288, 388, 488, 489) courses, according to this [rubric](#_Outcome_G_(Written)) (which focused on the quality of the document more so than the content, itself).  Quality of communication in oral format is assessed in the design review meetings conducted on a regular cycle for all Project teams (ENGR 288, 388, 488, 489). Assessment in that setting includes input from industry professionals according to this [rubric](#_Outcome_G_(Oral)). | 100 percent of students will score a four or higher out of 5. (resubmission is permitted)  90 percent of students will score a four or higher out of 5. | Spring 2017 |
| **5. Self-Awareness** Gain awareness of identity, character, and vocational calling | **4.4 Intrapersonal Awareness:** Gaining an awareness of options for employment, voluntary service, and/or graduate education in one’s specialized area of study | h. Education necessary to understand the impact of engineering solutions in a global and societal context | Student will identify non-technical issues in an engineering problem and understand the impact of engineering solutions in a global and societal context. |  | [update in progress]  In the past this was being assessed only in the form of tracking students’ General Education GPA. This data was not useful in drawing meaningful conclusions. | In progress. | Spring 2017 |
| 5 | 4.4 | i. Recognition of the need for, and an ability to engage in life-long learning | Student will recognize the need for, and engage in life-long learning |  | Students write a culminating paper in Seminar II (ENGR 302) that is something of a personal manifesto and includes articulating their current thoughts about career path and trajectory. This paper provides an opportunity for faculty to observe affective outcomes (those that have more to do with changes in attitude or mentality than capability). Student submissions on this assignment are assessed against this [rubric](#_Outcome_I_Rubric). | 80 percent of students will score a four or higher out of 5. | Spring 2015 |
| **3. Faith knowledge & application** Develop informed and mature convictions about Christian faith and practice | **4.5 Faith knowledge & application:** Articulating how faith connects to one’s specialized area of study and to potential career options in that area of study | l. Work toward the integration of Christian faith, learning, and professional life. | Work toward the integration of Christian faith, learning, and professional life. |  | The student submissions for the final paper in Seminar II (ENGR 302) are scored against this [rubric](#_Outcome_L_Rubric) | 80 percent of students will score a four or higher out of 5. | Fall 2014 |
| 3 | 4.5 | f. Understanding of professional and ethical responsibility | Describe and purpose to keep a personal and professional ethical lifestyle consistent with the Christian faith. |  | The department has used the FE Exam results specific to the category “ethics and professional practice” to monitor student aptitude and performance in this outcome. NCEES, as part of the exam results package available to institutions, provides two different metrics expressly for program assessment. One of the metrics, called the “scaled score,” is specifically intended for use by institutions with relatively small sample sizes, so we have adopted that as the primary data source. | To meet or exceed the published national average in this category. | Fall 2015 |

# Mapping Courses to Outcomes

The following table details locations in the curriculum where could content/activity supports one of our outcomes.

I: Introduce

R: Reinforce

M: Master



# Assessment Timeline



# Outcome A Rubric



# Outcome B Rubric



# Outcome C Rubric



# Outcome D Rubric



# Outcome E Rubric



# Outcome G (Written) Rubric



# Outcome G (Oral) Rubric

# 

# Outcome I Rubric



# Outcome K list



# Outcome L Rubric

