Program-Level Assessment Plan

Program: BS Mechanical Engineering	Degree Level (e.g., UG or GR certificate, UG major, master's program, doctoral program): UG Major
Department: Aerospace & Mechanical Eng	College/School: School of Science and Engineering
Date (Month/Year): 11/23	Primary Assessment Contact:

Note: Each cell in the table below will expand as needed to accommodate your responses.

#	Student Learning Outcomes What do the program faculty expect all students to know or be able to do as a result of completing this program? Note: These should be measurable and manageable in number (typically 4-6 are sufficient).	Curriculum Mapping In which courses will faculty intentionally work to foster some level of student development toward achievement of the outcome? Please clarify the level at which student development is expected in each course (e.g., introduced, developed, reinforced, achieved, etc.).	Assessment Methods	
			Artifacts of Student Learning (What) 1. What artifacts of student learning will be used to determine if students have achieved this outcome? 2. In which courses will these artifacts be collected?	Evaluation Process (How) 1. What process will be used to evaluate the artifacts, and by whom? 2. What tools(s) (e.g., a rubric) will be used in the process? Note: Please include any rubrics as part of the submitted plan documents.
1	Students will be able to identify, formulate, and solve complex engineering problems in the mechanical domain by applying principles of engineering, science, and mathematics.	Introduced: MENG 2100 Statics, MENG 2150 Dynamics, MENG 2300 Thermodynamics Developed: MENG 3100 Mechanics of Solids, MENG 3200 Fluid Dynamics, MENG 2400 Mechatronics Systems Design Reinforced: MENG 3010 Machine Design, MENG 3110 Linear Vibrations, MENG 3600 Manufacturing Processes, MENG 3510 Material Science Achieved: MENG 4300 Heat Transfer, MENG 4450 PLC's and Robotics	MENG 2150 Dynamics – Exam question MENG 3200 Fluid Dynamics – Exam question MENG 4300 Heat Transfer – Exam question	Artifacts are initially evaluated by the instructor of the course based on rubrics. The faculty member will report student performance and assessment observations on an assessment form. Examples of the assessment form and rubrics are provided. The faculty will collectively then review the assessment form, discuss the outcomes, and develop plans of action.
2	Students will be able to apply engineering methods to	Introduction: SE 1700 Engineering Fundamentals	MENG 1000 Design Thinking – design report and presentation	Same approach as Outcome 1

	design mechanical and thermal systems that meet specified mission needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.	Developing: MENG 1000 Design Thinking, MENG 2400 Mechatronics Systems Design Reinforced: MENG 3010 Machine Design Achieved: MENG 4004 Senior Design I, MENG 4014 Senior Design II, MENG 4304 Thermal Systems Design, MENG 4024 Mechanical Systems Design	MENG 2400 Mechatronics Systems Design MENG 4004 Senior Design I – assignments, design report MENG 4304 Thermal Systems Design	
3	Students will be able to communicate effectively with a range of audiences.	Introduction: SE 1700 Fundamentals of Engineering Developing: MENG 1000 Design Thinking Reinforced: MENG 3111 Mechanics Lab, MENG 3201 Fluids Lab Achieved: MENG 4004 Senior Design I, MENG 4014 Senior Design II, MENG 4304 Thermal Systems Design, MENG 4024 Mechanical Systems Design, MENG 3001 Mechanical Engineering Lab	MENG 1000 Design Thinking - report and presentation MENG 3111 Mechanics Lab – formal lab report MENG 3201 Fluids Lab – formal lab report MENG 4014 Senior Design II – presentation and design report MENG 4024 Mechanical Systems Design	Same approach as Outcome 1
4	Students will be able to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.	Introduced: SE 1700 Engineering Fundamentals Developing: MENG 3010 Machine Design Reinforced/Achieved: MENG 4004 Senior Design I, MENG 4304 Thermal Systems Design	SE 1700 Engineering Fundamentals – Play Pump assignment MENG 3010 Machine Design MENG 4004 Senior Design I – assignments, presentation MENG 4304 Thermal Systems Design	Same approach as Outcome 1

5	Students will be able to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.	Introduction: SE 1700 Engineering Fundamentals Developing: MENG 1000 Design Thinking Reinforcing: MENG 3101 Solid Mechanics Lab, MENG 3111 Mechanics Lab, MENG 3201 Fluids Lab Achieved: MENG 4004 Senior Design I, MENG 4014 Senior Design II, MENG 4304 Thermal Systems Design, MENG 4024 Mechanical Systems Design, MENG 3001 Mechanical Engineering Lab	SE 1700 Engineering Fundamentals MENG 3101 Solid Mechanics Lab – team survey MENG 3111 Mechanics Lab – team survey MENG 4004 Senior Design I – assignments, design report MENG 4304 Thermal Systems Design	Same approach as Outcome 1
6	Students will be able to develop and conduct appropriate experimentation in the mechanical engineering domain, analyze and interpret data, and use engineering judgment to draw conclusions.	Introduction/Developing: MENG 2450 Engineering Experimentation, MENG 3101 Solid Mechanics Lab, MENG 3111 Mechanics Lab, MENG 3201 Fluids Lab Reinforced/Achieved: MENG 3001 Mechanical Engineering Lab, MENG 4450 PLC's and Robotics	MENG 3101 Solid Mechanics Lab – formal lab report MENG 3111 Mechanics Lab – formal lab report MENG 3201 Fluids Lab – formal lab report MENG 3001 Mechanical Engineering Lab – formal lab report	Same approach as Outcome 1
7	Students will be able to acquire and apply new knowledge applicable to a mechanical engineering career using appropriate learning strategies.	Introduction: SE 1700 Engineering Fundamentals Developing: MENG 2450 Engineering Experimentation Reinforced/Achieved: MENG 4004 Senior Design I, MENG 4014 Senior Design II, MENG 4024 Mechanical Systems Design, MENG 4304 Thermal Systems Design	SE 1700 Fundamentals of Engineering - bibliography MENG 2450 Engineering Experimentation MENG 4014 Senior Design II MENG 4024 Mechanical Systems Design	Same approach as Outcome 1

Use of Assessment Data

1. How and when will analyzed data be used by program faculty to make changes in pedagogy, curriculum design, and/or assessment practices?
   The appropriate outcomes will be assessed each fall based on prior academic year(s) data in meetings of the full department. The outcomes of these meetings will include plans for changes to classes, curriculum, and assessment. The overall assessment plan will be reviewed every two years.

2. How and when will the program faculty evaluate the impact of assessment-informed changes made in previous years?

   The full department assessment meetings also include review of prior changes to assess their effectiveness.

Additional Questions

1. On what schedule/cycle will program faculty assess each of the program's student learning outcomes? (Please note: It is not recommended to try to assess every outcome every year.)

   Review meetings in even years - even outcomes and an overall review of the assessment plan
   Review meetings in odd years – odd outcomes

2. Describe how, and the extent to which, program faculty contributed to the development of this plan.

The general format for the plan was developed and adopted in a full faculty meeting in Fall 2022, and then the adoption of this version for UAC/HLC occurred in Fall 2023 after further faculty consultation. The artifacts for courses are generally chosen by the faculty who teach those courses. Other modifications have occurred due to faculty discussion over the past year, and the expectation is that will continue (see overall review of the assessment plan).

IMPORTANT: Please remember to submit any rubrics or other assessment tools along with this plan.

Example Rubrics

Example rubrics are provided below. Not all rubrics are available at this time – updated versions will be provided with the annual reports for the appropriate outcomes.

OUTCOME 1:

MENG 2150 Dynamics

Indicator	Below Expectations	Meets Expectations	Above Expectations
Ability to analyze and solve two-dimensional rigid body kinematic problems involving rotation around an external instantaneous center of zero velocity.	Student fails to solve the problem due to significantly improper procedures, incorrect equations, incomplete work, and/or significant mathematical errors.	Student uses mostly proper procedures to formulate and solve the resulting governing equation with at most a few errors.	Student uses proper procedures to formulate and solve the governing equations with minimal errors.

MENG 3200 Fluid Dynamics

Indicator	Below Expectations	Meets Expectations	Above Expectations
Ability to formulate and solve a two-dimensional control volume mass momentum conservation problem.	Student fails to solve the problem due to significantly improper procedures, incorrect equations, incomplete work, and/or significant mathematical errors.	Student uses mostly proper procedures to formulate and solve the resulting governing equation with at most a few errors.	Student uses proper procedures to formulate and solve the governing equations with minimal errors.

Indicator	Below Expectations	Meets Expectations	Above Expectations
Ability to formulate and a Buckingham-PI dimensional analysis problem.	Student fails to solve the problem due to significantly improper procedures, incorrect equations, incomplete work, and/or significant mathematical errors.	Student uses mostly proper procedures to formulate the proper dimensionless PI groups with at most a few errors.	Student uses proper procedures to formulate the proper dimensionless PI groups with minimal errors.

MENG 4300 Heat Transfer

Indicator	Below Expectations	Meets Expectations	Above Expectations
Ability to analyze and solve combined heat transfer problems where conduction-convection are present.	Student fails to solve the problem due to significantly improper procedures, incorrect equations, incomplete work, and/or significant mathematical errors.	Student uses mostly proper procedures to formulate and solve the resulting governing equation with at most a few errors.	Student uses proper procedures to formulate and solve the governing equations with minimal errors.

OUTCOME 2:

OUTCOME 3:

MENG 3201 Fluids Lab

Indicator	Below Expectations	Meets Expectations	Above Expectations
1) Ability to communicate in an orderly and complete manner.	Sections of the lab report are absent and/or have significant misplaced or missing material.	All required sections of the lab report are included with only occasional misplaced or absent material.	All required sections of the lab report are included with the appropriate material in each section.
2) Ability to communicate technical concepts through written descriptions, equations, data, and figures.	Report does not include needed equations, data tables, plots, and/or figures, or these items are not clear, accurate, and/or properly constructed	Report contains the equations, data tables, plots, and figures necessitated by the laboratory description. These are generally accurate, complete, and properly constructed following the laboratory manual	The equations, data tables, plots, and figures are well-constructed, accurate, and complete and are integrated into the text so as to significantly enhance the understanding of the written report by the reader.
3) Ability to use proper grammar and spelling.	Final report has numerous grammatical and spelling errors, no evidence of proofreading.	Final report has several grammatical and spelling errors, appears to have been incompletely proofread.	Final report has minimal grammatical and spelling errors, appears to have been proofread.

4) Ability to use effective writing syntax and voice.	Final report has sufficient syntax, tense, and voice issues to significantly hamper the understanding of the report by the reader.	Final report has occasional sections where the voice and tense are inconsistent or incorrect, or where the sentence/paragraph structure is not well organized or lacks sufficient clarity.	Final report uses readily comprehensible and followable syntax and uses proper voice and tense consistently throughout the report.
5) Overall communication quality.	Report fails to convey main points of the lab without significant parsing and re-reading of sections, if at all.	Report conveys information in a sufficiently logical, efficient, precise, and complete manner such that the main points of the lab are generally understood with a single read.	Report conveys information in a logical, efficient, precise, and complete manner such that the lab is fully understood with a single read.

OUTCOME 4:

OUTCOME 5:

OUTCOME 6:
MENG 3201 Fluids Lab

Indicator	Below Expectations	Meets Expectations	Above Expectations
1) Data Collection	Procedure is incomplete and/or data is implausible or inaccurately presented.	Procedure is complete and necessary data is presented appropriately.	Additional useful data or procedural steps beyond what is required is provided.

2) Data analysis	Data analysis has major errors	Data analysis has minor errors that do not significantly change lab conclusions.	Data analysis is accurate and complete including error calculations.

3) Discussion and Conclusions	There is no significant discussion or conclusions drawn from the lab.	The discussion and conclusions cover expected topics	The discussion and conclusions provide further information than the standard expectations.

OUTCOME 7:

SE 1700 Engineering Fundamentals

Criteria	**Ratings**					**Pts**
First Research Question The research question is a) relevant to your part of the project, b) involves a question to be answered or something to be learned, and c) is narrow enough that it can be resolved with a search.	**6 pts Full Marks**	**5 pts Some answers are incomplete or missing**	**4 pts Mostly there**	**2 pts Lots of missing items**	**0 pts Didn't do this**	6 pts
Second Research Question The research question is a) relevant to your part of the project, b) involves a question to be answered or something to be learned, and c) is narrow enough that it can be resolved with a search.	**6 pts Full Marks**	**5 pts Some answers are incomplete or missing**	**4 pts Mostly there**	**2 pts Lots of missing items**	**0 pts Didn't do this**	6 pts
Third Research Question The research question is a) relevant to your part of the project, b) involves a question to be answered or something to be learned, and c) is narrow enough that it can be resolved with a search.	**6 pts Full Marks**	**5 pts Some answers are incomplete or missing**	**4 pts Mostly there**	**2 pts Lots of missing items**	**0 pts Didn't do this**	6 pts

Reference 1-1 [Note: the first number is the question, the second is the reference] The reference is from a Libraries search, and addresses the research question Repeat for References 1-2 to 1-3, 2-1 to 2-3, and 3-1 to 3-3.	**4 pts Full Marks**	**3 pts Library search but relevance is iffy**	**2 pts Not from a library search**	**1 pts Not from the library, doesn't seem to address the question**	**0 pts Didn't do this**	4 pts

Criteria	**Ratings**				**Pts**
Explanation for Reference 1-1 [Note: the first number is the question, the second is the reference] Explains why this reference was selected and what was learned Repeat for References 1-2 to 1-3, 2-1 to 2-3, and 3-1 to 3-3.	**3 pts Full Marks**	**2.5 pts Decent effort, but incomplete answers**	**1.5 pts Only did 1 of the 2 (why selected or what was learned)**	**0 pts Didn't do this**	3 pts

Criteria	**Ratings**			**Pts**
Found a technical citation style	**3 pts Full Marks**	**2.5 pts Found a style, but it's not a technical one**	**0 pts Did not cite a style**	3 pts

Implemented the Style consistently	**6 pts** **Full Marks**	**5 pts** **Mostly there**	**3 pts** **A few egregious mistakes**	**0 pts** **Wildly inconsistent or no style evident**	6 pts
Total Points: 90					