

Assurance of Student Learning 2019-2020	
Ogden College of Science and Engineering	School of Engineering and Applied Sciences
Civil Engineering, 534/534P	

Use this page to list learning outcomes, measurements, and summarize results for your program. Detailed information must be completed in the subsequent pages.

Student Learning Outcome 1: Ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.

Instrument 1	Apply rubric to solution examples from selected course exams
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Based on your results, circle or highlight whether the program met the goal Student Learning Outcome 1.	Met	Not Met
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Student Learning Outcome 2: Ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgement to draw conclusions.

Instrument 1	Apply Rubric to Lab & Project Reports from selected courses
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Based on your results, circle or highlight whether the program met the goal Student Learning Outcome 2.	Met	Not Met
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Student Learning Outcome 3: Ability to communicate effectively with a range of audiences.

Instrument 1	Apply Rubrics to Artifacts (reports, posters, and presentations)
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Based on your results, circle or highlight whether the program met the goal Student Learning Outcome 3.	Met	Not Met
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Program Summary (Briefly summarize the action and follow up items from your detailed responses on subsequent pages.)

The assessment of student performance under Student Learning Outcomes 1, 2 and 3 is acceptable according to rubric-based evaluation of student work. In addition, graduates are completing relevant courses with good grades, and student positive perception of skills learned. Program assessment indicates the curriculum for Civil Engineering prepares graduates with the abilities and skills needed to be successful practicing engineers. The WKU Civil Engineering Program will continue to prepare graduates with the same Student Learning Outcome activities and measures of all accrediting bodies.

Student Learning Outcome 1

Student Learning Outcome	Upon graduation, our students have the ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.		
Measurement Instrument 1	A scoring rubric (attached) specifically structured to directly assess the attributes stated in the outcome is applied to final exam questions in CE 382 (Structural Analysis), CE 342 (Fluid Mechanics), and CE 332 (Transportation Engineering), which capture key aspects of civil engineering students' study. The rubric assesses 4 main attributes of problem solving. The selected courses have, at a minimum, EM 222 (Statics) as pre-requisites and utilize those specific skills in the solution of engineering problems. Furthermore, EM 222 has pre/co-requisites of MATH 137 (Calculus I) and PHYS 255 (University Physics I) pre-requisites. The CE courses are usually taken in the junior or senior year and students have by then developed strong analytical skills and have experience applying math and science concepts in earlier design course projects and in earlier engineering science courses.		
Criteria for Student Success	Numerical results from applying the rubric to student work should reach a minimum value of 3.0 on a 4.0 scale for senior level work. Scores of sophomore/junior level work may be somewhat lower, which can be used to track student development in the curriculum.		
Program Success Target for this Measurement	Cohort Average of 3.0 on a 4.0 scale	Percent of Program Achieving Target	Cohort Average of 3.3
Methods	The final exam solutions from each student in the course is reviewed separately from course grading. Select questions are identified and the outcome rubric applied to assess achievement. Values from each student are recorded, and a class average is determined. This approach captures every student graduating in the assessment year, and students who are rising to senior status.		
Based on your results, circle or highlight whether the program met the goal Student Learning Outcome 1.		Met	Not Met
Actions (Describe the decision-making process and actions planned for program improvement. The actions should include a timeline.)			
The assessment of student performance under Outcome 1 is acceptable according to rubric-based direct evaluation of student work. Graduates are completing relevant courses with satisfactory grades in the curriculum assuring that CE graduates have the ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics. The WKU Civil Engineering Program will continue to prepare graduates with the same curriculum content, and monitor this student learning outcome with these measures. No need for programmatic adjustments has been found.			
Follow-Up (Provide your timeline for follow-up. If follow-up has occurred, describe how the actions above have resulted in program improvement.)			
The civil engineering faculty will continue with program assessment on an annual basis. The accrediting agency, ABET, requires continual improvement through systematic assessment of student learning outcomes.			

Student Learning Outcome 1: Upon graduation, our students have the ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.

	Capstone	Milestones		Benchmark
	4	3	2	1
Calculation (Quantitative Literacy VALUE Rubric)	Calculations attempted are essentially all successful and sufficiently comprehensive to solve the problem. Calculations are also presented elegantly (clearly, concisely, etc.)	Calculations attempted are essentially all successful and sufficiently comprehensive to solve the problem.	Calculations attempted are either unsuccessful or represent only a portion of the calculations required to comprehensively solve the problem.	Calculations are attempted but are both unsuccessful and are not comprehensive.
Define Problem (Problem Solving VALUE Rubric)	Demonstrates the ability to construct a clear and insightful problem statement with evidence of all relevant contextual factors.	Demonstrates the ability to construct a problem statement with evidence of most relevant contextual factors, and problem statement is adequately detailed.	Begins to demonstrate the ability to construct a problem statement with evidence of most relevant contextual factors, but problem statement is superficial.	Demonstrates a limited ability in identifying a problem statement or related contextual factors.
Identify Strategies (Problem Solving VALUE Rubric)	Identifies and applies one or more approaches for solving the problem within a specific context.	Identifies and applies one or more approaches for solving the problem that generally applies within the specific context.	Identifies and applies one or more approaches for solving the problem that narrowly applies within a specific context.	Does not identify and apply one or more approaches for solving the problem within a specific context.
Solving Problems	Obtains the correct solution in a manner that addresses the problem statement	Has minor errors, but nearly obtains the correct solution in a manner that addresses the problem statement.	Has significant errors that results in an incorrect solution but still somewhat addresses the problem statement.	Has significant errors that results in an incorrect solution and does not apply or address the problem statement.

Student Learning Outcome 2

Student Learning Outcome	Upon graduation, our students have the ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgement to draw conclusions.		
Measurement Instrument 1	Program faculty apply a scoring rubric (attached), specifically structured to directly assess the attributes stated in the outcome, to selected student work from CE 310 (Strength of Materials Lab), CE 371 (Construction Materials Lab), ENGR 491 (Senior Project). These courses capture the many aspects of experimentation, analyzing and interpreting data, and the use of engineering judgement that are undertaken to prepare the students to be capable engineers. The rubric assesses 5 main attributes. The selected courses have engineering science pre-requisites and utilize those specific skills in the creation of feasible mechanical designs.		
Criteria for Student Success	Numerical results from applying the rubric to student work should reach a value of 3.0 on a 4.0 scale for senior level work. Scores of sophomore/junior level work may be somewhat lower, which can be used to track student development in the curriculum.		
Program Success Target for this Measurement	Score of 3.0 out of 4.0	Percent of Program Achieving Target	Score 3.4 out of 4.0
Methods	The design reports from each team in the course is reviewed separately from course grading. The outcome rubric is applied to assess achievement. Values from each report are recorded, and a class average is determined. This approach captures every student graduating in the assessment year, and students who are rising to senior status. As such ENGR490/ENGR491 results give a representation of the graduating cohort through this capstone experience.		
Based on your results, circle or highlight whether the program met the goal Student Learning Outcome 2.		Met	Not Met
Actions (Describe the decision-making process and actions planned for program improvement. The actions should include a timeline.)			
The assessment of student performance under Outcome 2 is acceptable according to rubric-based direct evaluation of student work. Graduates are completing these courses with satisfactory grades assuring that CE graduates have the ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgement to draw conclusions. The WKU Civil Engineering Program will continue to prepare graduates with the same curriculum content, and monitor this student learning outcome with these measures. No need for programmatic adjustments has been found.			
Follow-Up (Provide your timeline for follow-up. If follow-up has occurred, describe how the actions above have resulted in program improvement.)			
The civil engineering faculty will continue with program assessment on an annual basis. The accrediting agency, ABET, requires continual improvement through systematic assessment of student learning outcomes.			

Student Learning Outcome 2: Upon graduation, our students have the ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions

	Capstone 4	Milestones		Benchmark 1
		3	2	
Design Process (Inquiry and Analysis VALUE Rubric)	All elements of the methodology or theoretical framework are skillfully developed. Appropriate methodology or theoretical frameworks may be synthesized from across disciplines or from relevant subdisciplines.	Critical elements of the methodology or theoretical framework are appropriately developed, however, more subtle elements are ignored or unaccounted for.	Critical elements of the methodology or theoretical framework are missing, incorrectly developed, or unfocused.	Inquiry design demonstrates a misunderstanding of the methodology or theoretical framework.
Conclusions (Inquiry and Analysis VALUE Rubric)	States a conclusion that is a logical extrapolation from the inquiry findings.	States a conclusion focused solely on the inquiry findings. The conclusion arises specifically from and responds specifically to the inquiry findings.	States a general conclusion that, because it is so general, also applies beyond the scope of the inquiry findings.	States an ambiguous, illogical, or unsupported conclusion from inquiry findings.
Compliance with Standards	Test performed in full compliance with applicable standard	Test performed in general compliance with standard with only minor procedural error that does not completely invalidate the result	Test performed in general compliance with standard, but a procedural error resulted in faulty results	Test not performed in compliance with standard and results invalid
Application of Results	Results of experiment applied completely and accurately to the situation	Results applied generally/conceptually correct with only a minor error	Results applied generally/conceptually correct with a few errors	Results not applied correctly to the situation
Designing an experiment or experimental procedure	Students select and/or design all appropriate test(s) or process(es) to the situation at hand.	Students generally select and/or design the appropriate test(s) or process (es) to the situation at hand.	Students select or design some appropriate tests or processes, with a notable error or omission.	Students select or design some appropriate tests or processes, with significant errors or omissions.

Student Learning Outcome 3

Student Learning Outcome	Graduates of the civil engineering program should show an ability to communicate effectively with a range of audiences		
Measurement Instrument 1	Program faculty apply scoring rubrics (attached) specifically structured to directly assess 5 major attributes supporting the outcome, to selected student work from ENGR 490 (Senior Project). This course capture the many aspects of engineering communication that prepare the students to be effective communicators. The rubrics assess the Written, Graphical and Visual aspects of communication. The selected courses have students create artifacts which represent those specific skills.		
Criteria for Student Success	Numerical results from applying the rubric to student work should reach a value of 3.0 on a 4.0 scale for senior level work.		
Program Success Target for this Measurement	3.0 out of 4.0	Percent of Program Achieving Target	Score of 3.7 out of 4.0
Methods	The written reports from each team in the course is reviewed separately from course grading. The outcome rubric is applied to assess achievement. Values from each report are recorded, and a class average is determined. This approach captures every student graduating in the assessment year. As such ENGR490/ENGR491 results give a representation of the graduating cohort through this capstone experience.		
Based on your results, circle or highlight whether the program met the goal Student Learning Outcome 3.		Met	Not Met
Actions (Describe the decision-making process and actions planned for program improvement. The actions should include a timeline.)			
The assessment of student performance under Outcome 3 is acceptable according to rubric-based direct evaluation of student work. Graduates are completing relevant courses which produce assessable communication artifacts with in the CE curriculum assuring that CE graduates have the ability to communicate effectively with a range of audiences. The WKU Civil Engineering Program will continue to prepare graduates with the same curriculum content, and monitor this student learning outcome with these measures. No need for programmatic adjustments has been found.			
Follow-Up (Provide your timeline for follow-up. If follow-up has occurred, describe how the actions above have resulted in program improvement.)			
The civil engineering faculty will continue with program assessment on an annual basis. The accrediting agency, ABET, requires continual improvement through systematic assessment of student learning outcomes.			

Student Learning Outcome 3: Upon graduation, our students have the ability to communicate effectively with a range of audiences.				
Written Communication	Capstone 4	Milestones		Benchmark 1
		3	2	
Context of and Purpose for Writing (Written Communication VALUE Rubric)	Demonstrates a thorough understanding of context, audience, and purpose that is responsive to the assigned task(s) and focuses all elements of the work.	Demonstrates adequate consideration of context, audience, and purpose and a clear focus on the assigned task(s) (e.g., the task aligns with audience, purpose, and context).	Demonstrates awareness of context, audience, purpose, and to the assigned tasks(s) (e.g., begins to show awareness of audience's perceptions and assumptions).	Demonstrates minimal attention to context, audience, purpose, and to the assigned tasks(s) (e.g., expectation of instructor or self as audience).
Content Development (Written Communication VALUE Rubric)	Uses appropriate, relevant, and compelling content to illustrate mastery of the subject, conveying the writer's understanding, and shaping the whole work.	Uses appropriate, relevant, and compelling content to explore ideas within the context of the discipline and shape the whole work.	Uses appropriate and relevant content to develop and explore ideas through most of the work.	Uses appropriate and relevant content to develop simple ideas in some parts of the work.
Control of Syntax and Mechanics (Written Communication VALUE Rubric)	Uses graceful language that skillfully communicates meaning to readers with clarity and fluency, and is virtually error free.	Uses straightforward language that generally conveys meaning to readers. The language in the portfolio has few errors.	Uses language that generally conveys meaning to readers with clarity, although writing may include some errors.	Uses language that sometimes impedes meaning because of errors in usage.
Interpretation (Quantitative Literacy VALUE Rubric)	Provides accurate explanations of information presented in mathematical forms. Makes appropriate inferences based on that information.	Provides accurate explanations of information presented in mathematical forms. <i>For instance, accurately explains the trend data shown in a graph.</i>	Provides somewhat accurate explanations of information presented in mathematical forms, but occasionally makes minor errors related to computations or units.	Attempts to explain information presented in mathematical forms, but draws incorrect conclusions about what the information means.
Content	Technical/Professional information at an appropriate level for course, Key concepts and terms explained clearly. Research and/or analysis of topic clearly evident Reader gains significant new knowledge and insight	Technical/Professional information at an appropriate level for course, some concepts not completely clarified, research and/or analysis of topic generally evident. Reader gains some new knowledge and insight.	Technical/Professional information at a marginal level for course, many concepts unclear or not discussed. Reader gains little new knowledge or insight	Technical/Professional information unacceptable for course, most concepts unclear or not discussed, reader gains no new knowledge or insight