

ABET Criteria and Assessment Instruments related to Experimental Engineering

Criteria	Degrees of Achievement			
	Unsatisfactory 0 (0-50)	Marginal 1 (50-70)	Satisfactory 2 (70-85)	Exemplary 3 (85-100)
Lab Safety	No appreciation of safety guidelines	Unsafe lab procedures frequent.	Unsafe lab procedures infrequent.	Observes good lab safety procedures.
Instrumentation usage	Does not understand how the instruments work. Cannot select appropriate instrumentation to perform measurements. Is unable to operate the instrumentation provided.	Has minimal understanding on how instruments operate. Needs significant supervision to select the proper equipment and instruments, and to operate equipment.	Has mostly a basic understanding on how instruments operate. Needs some guidance to select the proper equipment and instruments, and to operate equipment.	Has an understanding on how instruments operate. Can select the proper equipment and instruments, and is able to properly operate equipment.
Experimental procedures	Cannot follow experimental procedures. Unable to formulate a logic experimental plan. Data documentation is poor leading to loss of data.	Has problems following the logic of the procedures in pre-set experiments. Requires significant supervision to develop and implement experimental procedures. Is aware of standards on data collection and documentation, but has problems following them.	Mostly understands the logic of the procedures in pre-set experiments. With guidance, is able to develop and implement experimental procedures. Follows standards on data collection and documentation, though occasional oversight can cause loss of efficiency or data.	Understands the logic of the procedures in pre-set experiments. Improves on what is suggested. Is able to develop and implement sound experimental procedures. Follows good standards on data collection and documentation.
Error analysis	Is unaware of the importance of error analysis. Cannot compute errors.	Is aware of measurement errors but has problem applying the theory, and requires significant help to achieve a final result.	Is aware of measurement errors and can estimate most, but requires some help to achieve a final result.	Defines and estimates elemental errors. Produces proper statistical estimates of precision errors and evaluation of bias errors, and propagates to final result.
Data analysis	Cannot relate data to theory.	Attempts analysis of the data, but does so with considerable errors.	Most of the time analyzes the data correctly, but does not have grasp of the theory behind. Misses results that are not included in the write-ups.	Uses appropriate theory to analyze the data, and extracts information from it. Identifies features in the results that are of interest or deviate from the theory or expected outcome.
Experiment design	Unable to design an experiment.	Needs considerable guidance and supervision to design an experiment. Has problems obtaining good data and meaningful results.	Can mostly design adequate experiments. Chooses instrumentation, designs procedures, acquires data, performs analysis and obtains meaningful results with some help.	Able to design an experiment that will produce the desired outcome. Can choose instrumentation, design procedures, acquire the data, perform analysis and obtain meaningful results without help.

	Assessment Instrument
Lab Safety	Laboratory observation throughout the semester (graded daily by TAs) and quiz.
Instrumentation Usage	Individual Logbooks in Labs 1/2.
Experimental procedures	"Experimental considerations" section in individual technical report (ITR).
Error analysis	All questions in midterm Exam I, "Error Analysis" section in ITR.
Data analysis	"Results and discussion" section in ITR.
Experiment design	Individual log book in Final Project.

Criteria	Degrees of Achievement			
	Unsatisfactory 0 (0-50)	Marginal 1 (50-70)	Satisfactory 2 (70-85)	Exemplary 3 (85-100)
Organization in writing	No sequence of information. No graphics. Poor discussion and conclusions. Poorly designed contents.	Poor sequence of information. Some graphics but not referenced. Limited discussion and conclusions. Unclear content.	The student has used logical sequence of information. Some graphics are used to explain and interpret the text. Proper discussion and conclusions. Clear content.	The student has used logical sequence of information. Proper graphics are used to explain and interpret the text. Thoughtful discussion and conclusions. Clear and interesting writing.
Writing skills	Numerous grammar and spelling errors. Long and confusing sentences. Poor syntax.	A few grammar and/or spelling errors. Understandable sentences. Fair syntax.	Hardly any grammar and/or spelling errors. Good syntax and sentences.	Error free. Appropriate and concise syntax and sentences.

	Assessment Instrument
Organization in writing	Individual technical report in 58:080. The assessment of this criterion is based on 1) the employment of logical sequence of the information; 2) usage and interpretation of graphics; 3) discussion and conclusions; and 4) clarity of the content.
Writing skills	Individual technical report in 58:080. The assessment of this criterion is based on 1) grammar spelling errors; 2) sentence structures; and 3) syntax.

Criteria	Degrees of Achievement			
	Unsatisfactory 0 (0-50)	Marginal 1 (50-70)	Satisfactory 2 (70-85)	Exemplary 3 (85-100)
Use of hardware and laboratory equipment	Very limited knowledge about laboratory equipment; no attempts made to learn.	Has general idea of hardware and equipment, but the selection is ineffective; uses them but needs significant assistance.	Knowledgeable about lab equipment and hardware; selects appropriate pieces; knows their use for lab tests, design or research.	Same as (2); knows hardware limitations and their efficient use; uses them very effectively.

	Assessment Instrument
Use of hardware and laboratory equipment	Individual Log Books in Labs 1/2 and Individual Log Book in Final Project (58:080 Experimental Engineering). These experimental projects require the students to use instrumentation to complete a fairly complex experiment (Lab 1/2), and to design and run an experiment (Independent Project).