Science and Engineering Practice (SEP) Rubric

SEP's	Not Yet	Approaches Expectation	Meets Expectation	Advanced
Points Scale	**1**	**2-3**	**4**	**5**
ASKING QUESTIONS AND DEFINING PROBLEMS	• Asks general, imprecise questions that require greater specificity to be testable. • Identifies dependent and independent variables with unclear predicted relationships. • Identifies inappropriate control(s) (if applicable) and/or inappropriate model(s). • Defines a problem or design statement that partially matches the intent of the problem or the constraints.	• Asks testable questions that require sufficient and relevant evidence to answer. • Identifies predicted relationships between dependent and independent variables with minor errors. • Identifies control(s) (if applicable) OR relationships in the relevant model(s) with minor errors or omissions. • Defines a problem or design statement that matches the intent of the problem and identifies the constraints.	• Asks precise, testable questions that require sufficient and relevant evidence to answer. • Discusses predicted relationships between dependent and independent variables. • Identifies appropriate control(s) (if applicable) OR relationships in the relevant model(s) • Defines a problem and explains specific design elements necessary for a suitable design (e.g., fit to the problem, addresses the constraints, etc.).	• Asks precise, testable questions that require sufficient and relevant evidence to answer and evaluates the testability of the questions. • Discusses predicted relationships, including quantitative relationships, between dependent and independent variables and appropriate controls (if applicable). • Thoroughly explains the predicted relationships in the relevant model(s). • Defines a problem precisely and thoroughly explains why specific design elements are necessary for a suitable design (e.g., fit to the problem, addresses the constraints, etc.).
DEVELOPING AND USING MODELS	• Designs and explains a model that generates data to support explanations, predict phenomena, analyze systems, and/or solve problems. Design or explanation of the model includes major errors or omissions. • Uses or tests the model and identifies the limitations OR accuracy of the model (with minor errors or omissions) to support explanations, predict phenomena, analyze systems, or solve problems. • Explanation or evaluation of the model includes major errors or omissions.	• Designs and explains a model that generates data to support explanations, predict phenomena, analyze systems, and/or solve problems. Design or explanation of the model includes minor errors or omissions • Uses or tests the model and evaluates the accuracy and limitations of the model to support explanations, predict phenomena, analyze systems, or solve problems. • Explanation or evaluation of model includes minor errors or omissions.	• Designs and explains a model that generates data to support explanations, predict phenomena, analyze systems, and/or solve problems. • Uses or tests the model and evaluates the accuracy and limitations of the model to support explanations, predict phenomena, analyze systems, or solve problems • Makes recommendations to revise the model.	• Designs, explains, and evaluates a model to generate data to support explanations, predict phenomena, analyze systems, and/or solve problems. • Uses or tests two different models of the same proposed tool, process, mechanism or system. • Evaluates the accuracy and limitations of the two different models in order to select a model that best fits the evidence or design criteria.

PLANNING AND CARRYING OUT INVESTIGATIONS	• Designs an investigation that will produce relevant data but with minimal detail about the variables • Includes incomplete description of data collection procedures that impede replication • Describes general evidence to be used to answer the question(s) with minimal detail. • Uses appropriate scientific methods and collects multiple trials (if appropriate) of relevant data but the data is not consistent within a reasonable range.	• Designs an investigation identifying variables (dependent, independent, and controls). • Includes data collection procedures that are mostly replicable. • Identifies tools/instrument and type of measurements that will produce relevant data and/or evidence to answer the question(s). • Uses appropriate scientific methods and collects multiple trials (if appropriate) of relevant data consistent within a reasonable range.	• Designs an investigation identifying and explaining the variables (dependent, independent, and controls). • Includes sufficiently detailed description of replicable data collection procedures. • Describes tools/instrument and type of measurements that will produce relevant data and/or evidence to answer the question(s). • Uses appropriate scientific methods and systematically collects multiple trials (if appropriate) of relevant data consistent within a reasonable range • Evaluates the consistency (precision) of the data.	• Designs and evaluates an investigation identifying and explaining the variables (dependent, independent, and controls) • Identifies possible confounding variables. • Includes thorough description of replicable data collection procedures. • Justifies the selection of the tools/instrument and type of measurements that will produce relevant data and/or evidence to answer the question(s). • Uses appropriate scientific methods and systematically collects multiple trials (if appropriate) of relevant data consistent within a narrow range. • Evaluates the consistency (precision) of the data as well as the appropriateness of the data collection procedures.
ANALYZING AND INTERPRETING DATA	• Attempts to analyze data using tools, technologies, and/or models (e.g., computational, mathematical) in order to identify patterns, to make scientific claims, or to determine an optimal design solution. Analysis or explanation includes major errors or omissions. • Identifies the limitations of the data analysis (e.g., measurement error, sample selection) with incomplete or inaccurate elements	• Analyzes and explains data using tools, technologies, and/or models (e.g., computational, mathematical) in order to identify patterns, to make reasonable scientific claims, or to determine an optimal design solution. Analysis or explanation includes minor errors or omissions. • Identifies the limitations of the data analysis (e.g., measurement error, sample selection).	• Analyzes and explains data using tools, technologies, and/or models (e.g., computational, mathematical) in order to identify patterns, to make reasonable and supported scientific claims, or to determine an optimal design solution. • Evaluates the limitations of the data analysis (e.g., measurement error, sample selection) and identifies some implications for the findings.	• Analyzes and evaluates data using tools, technologies, and/or models (e.g., computational, mathematical) in order to identify patterns, to make reasonable and well-supported scientific claims, or to determine an optimal design solution. • Thoroughly evaluates the limitations of data analysis (e.g., measurement error, sample selection) and provides a detailed explanation of the implications on the findings.

USING MATHEMATICS AND COMPUTATIONAL THINKING	• Identifies mathematical concepts or methods (e.g., ratio, rate, percent, basic operations, algebra, and functions) relevant to scientific questions or engineering problems, but applies them with major errors or omissions.	• Applies appropriate mathematical concepts or methods (e.g., ratio, rate, percent, basic operations, algebra, and functions) relevant to scientific questions or engineering problems, but applies them with minor errors or omissions.	• Accurately applies appropriate mathematical concepts and methods (e.g., ratio, rate, percent, basic operations, algebra, and functions) to answer scientific questions or engineering problems.	• Accurately applies appropriate mathematical concepts and methods (e.g., ratio, rate, percent, basic operations, algebra, and functions) to represent and solve scientific questions or engineering problems and explains whether the answer "makes sense".
CONSTRUCTING EXPLANATIONS AND DESIGNING SOLUTIONS	• Proposes a design plan and description that misses one or more important aspects of the criteria, constraints, OR intent of the problem. • Uses inaccurate or irrelevant evidence (data or scientific knowledge) to explain how the design addresses the problem/constraints OR identifies an impractical redesign without explanation or supporting evidence.	• Proposes a design plan and provides a general description that addresses the criteria, constraints, or intent of the problem. • Uses minimal relevant evidence (data or scientific knowledge) to explain how the design addresses the problem/constraints OR identifies a potential redesign with limited explanation and supporting evidence.	• Proposes a design plan with detailed explanation that completely addresses the criteria, constraints, and intent of the problem. • Uses relevant and adequate amounts of evidence (data or scientific knowledge) to explain how the design addresses the problem/constraints AND uses the evidence to explain an appropriate redesign of the original model or prototype	• Proposes a design plan and evaluates the suitability of the design to address the criteria, constraints, AND intent of the problem. • Uses detailed and multiple sources of evidence (data or scientific knowledge) to evaluate how well the design addresses the problem as well as constraints AND provides a detailed rationale with supporting data for the appropriate redesign of the original model or prototype.
ENGAGING IN ARGUMENT FROM EVIDENCE	• The student is able to present arguments on disciplinary content, which are unfocused or unsupported with evidence. • The student is able to communicate some procedures but lack details needed for others to replicate.	• The student is able to present arguments on disciplinary content, which are logical and focused, but lack evidence that supports the argument. • The student is able to provide step by step procedures that lack the detail needed for others to replicate.	• The student is able to present arguments on disciplinary content that are logical, focused and supported with sufficient and relevant evidence. • The student is able to provide step by step procedures that are precise and detailed enough so that others can replicate them and (possible) produce the same results.	• The student is able to present arguments on disciplinary content that are logical, focused and supported with sufficient and relevant data. Interpretation of the data makes insightful connections to other contents or disciplines, or draws relevant conclusions to real world applications or problems.

OBTAINING, EVALUATING, AND COMMUNICATING INFORMATION	• When conducting independent research, relies on one or two relevant sources without evaluating their credibility. • The student is able to communicate with some clarity but concepts may be inaccurate or inappropriate as related to the task, purpose or audience.	• When conducting independent research, selects a limited number of relevant scientific sources and evaluates their credibility minimally. • The student is able to communicate in a way that is clear and coherent, but the organization and style may not be appropriate to the task, purpose or audience.	• When conducting independent research, selects multiple relevant scientific sources, and evaluates the evidence and credibility of each source. • The student communicates in a way that is clear and coherent, and in which the development, organization and style are appropriate to task, purpose and audience.	• When conducting independent research, selects multiple relevant, high-quality scientific sources representing a variety of viewpoints, and thoroughly evaluates the evidence and credibility of each source. • The student communicates in a way that is clear and coherent, and in which the development, organization and style are appropriate to the task, purpose and audience.

Science and Engineering Practice Score Sheet
Semester 1

SEP's	Not Yet	Approaches Expectation	Meets Expectation	Advanced
Points Scale	**1**	**2-3**	**4**	**5**
ASKING QUESTIONS AND DEFINING PROBLEMS				
DEVELOPING AND USING MODELS				
PLANNING AND CARRYING OUT INVESTIGATIONS				
ANALYZING AND INTERPRETING DATA				
USING MATHEMATICS AND COMPUTATIONAL THINKING				
CONSTRUCTING EXPLANATIONS AND DESIGNING SOLUTIONS				
ENGAGING IN ARGUMENT FROM EVIDENCE				
OBTAINING, EVALUATING, AND COMMUNICATING INFORMATION				

Science and Engineering Practice Score Sheet
Semester 2

SEP's	Not Yet	Approaches Expectation	Meets Expectation	Advanced
Points Scale	**1**	**2-3**	**4**	**5**
ASKING QUESTIONS AND DEFINING PROBLEMS				
DEVELOPING AND USING MODELS				
PLANNING AND CARRYING OUT INVESTIGATIONS				
ANALYZING AND INTERPRETING DATA				
USING MATHEMATICS AND COMPUTATIONAL THINKING				
CONSTRUCTING EXPLANATIONS AND DESIGNING SOLUTIONS				
ENGAGING IN ARGUMENT FROM EVIDENCE				
OBTAINING, EVALUATING, AND COMMUNICATING INFORMATION				