

**Outcome 1a: An ability to apply knowledge of math & science, chemical & biochemical science in particular,  
to chemical engineering  
Performance Indicator Scoring Rubrics**

Course: \_\_\_\_\_

Semester taught: \_\_\_\_\_

Type of Student Work Used for Assessment  
(e.g., Homework #4, Exam #2 problem 3, final project): \_\_\_\_\_

Number of students in course: \_\_\_\_\_

Number of students sampled: \_\_\_\_\_

Rating Scale Element	0	Needs Improvement	1	2	Meets Expectations	3	4	Exceeds Expectations	5	N/A
<b>Ability to apply theory/first principles and appropriate assumptions in mathematical descriptions of physical and chemical systems and processes.</b>		Identifies which fundamental principles govern the process or system. Unable to carry through from knowing principles or theory to generating solution.			Has good knowledge of governing principles/theory. Generally is able to apply correct principles to problem solutions, but may make inappropriate assumptions or simplifications.			Combines scientific and engineering principles/theory to formulate correct solutions to engineering problems. Evaluates validity of model solutions		
<b>Appropriate mathematical techniques to achieve solution to engineering problems (examples: integration of diff eqs, algebraic solutions of multiple equations; use of proper units in eqns and correlations)</b>		Recognizes that mathematical techniques are required to reach a solution, but can only apply correct mathematical techniques with guidance or applies them incorrectly			Applies mathematical principles to obtain analytical or numerical solution to model equations; generally chooses an appropriate method, but maybe not best method and/or without analysis of results			Has strong understanding of mathematical techniques and applies "best" methods to achieve solutions; evaluates validity and reliability of results.		
<b>Problem solutions via appropriate calculations, including proper manipulation of units and achievement of reasonable numerical values.</b>		Recognizes a solution approach, but makes mistakes in calculations, does not use and/or convert units, calculates unreasonable values without question			Has occasional minor errors in calculations, unit conversions, etc.			Executes calculations correctly and validates results.		