

Course Title & Number: MAT*H285 Differential Equations

Competency Area: **QUANTITATIVE REASONING** (Goal: Students will learn to recognize, understand, and use the quantitative elements they encounter in various aspects of their lives. Students will develop a habit of mind that uses quantitative skills to solve problems and make informed decisions.)

Faculty submitting the Learning Outcomes: Jane Wampler, Harry Burt, Ruth Urbina-Lilback, Katie Lozo

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[Instructions: Please match the Learning Outcomes in the left hand column to those of the course you are submitting for Gen Ed approval. List the corresponding course outcomes in the right hand column to indicate a match.]

BOR TAP's Learning Outcomes	Corresponding Outcomes for Course Named Above
1. Represent mathematical and quantitative information symbolically, graphically, numerically, and verbally.	A1. Draw direction fields.
2. Apply quantitative methods to investigate routine and novel problems. This includes calculations/procedures, mathematical and/or statistical modeling, prediction, and evaluation.	<ul style="list-style-type: none">A. First-order Differential Equations<ul style="list-style-type: none">1. Use Euler's approximation method to numerically solve first-order equations.2. Solve separable first-order differential equations.3. Solve linear first-order differential equations.4. Solve exact first-order differential equations.5. Design and solve application problems involving heating and cooling, Newtonian mechanics, and electrical circuits.6. Apply the methods of Taylor and Runge-Kutta to the solution of equations.B. Linear Second-order Differential Equations —<ul style="list-style-type: none">1. Determine the general solution to homogeneous linear equations.2. Solve auxiliary equations with complex roots.3. Use the method of undetermined coefficients to solve nonhomogeneous equations.4. Solve second-order equations using variation of parameters.5. Describe free and forced mechanical vibrations using second-order equations.

	<p>C. Theory of Higher-order Linear Differential Equations —</p> <ol style="list-style-type: none"> 1. Solve higher-order linear equations with constant coefficients. 2. Use the annihilator method and the method of undetermined coefficients to solve higher-order equations. <p>D. The Laplace Transform —</p> <ol style="list-style-type: none"> 1. Determine the Laplace Transform of a function. 2. Determine the conditions for existence of the Laplace Transform. 3. Use the properties of the Laplace Transform to derive new transforms. 4. Determine the inverse Laplace Transform including the use of the method of partial fractional decomposition. 5. Solve initial value problems using Laplace Transforms.
3. Interpret mathematical and quantitative information and draw logical inferences from representations such as formulas, equations, graphs, tables, and schematics.	<p>A1. Draw direction fields.</p> <p>A6. Design and solve application problems involving heating and cooling, Newtonian mechanics, and electrical circuits.</p> <p>B5. Describe free and forced mechanical vibrations using second-order equations.</p>
4. Evaluate the results obtained from quantitative methods for accuracy and/or reasonableness.	Evaluate the results obtained from quantitative methods for accuracy and/or reasonableness.
	<i>Additional Outcomes</i>