OMT020 - ELEMENTARY DIFFERENTIAL EQUATIONS
3-4 Semester Hours/4-5 Quarter Hours

Related TAGs: AACM Engineering, Chemical Engineering, Math, Physics

In an Elementary Differential Equations course, students should:

- develop mathematical thinking and communication skills and learn to apply precise, logical reasoning to problem solving, as emphasized in the calculus renewal movement.
- be able to communicate the breadth and interconnections of the mathematical sciences through being presented key ideas and concepts from a variety of perspectives, a broad range of examples and applications, connections to other subjects, and contemporary topics and their applications.
- experience geometric as well as algebraic viewpoints and approximate as well as exact solutions.
- use computer technology to support problem solving and to promote understanding (e.g., most modern texts make use of a differential equation solver that can permit the early introduction of modeling with systems of differential equations).
- for students in the mathematical sciences, progress from a procedural/computational understanding of mathematics to a broad understanding encompassing logical reasoning, generalization, abstraction, and formal proof; gain experience in careful analysis of data; and become skilled at conveying their mathematical knowledge in a variety of settings, both orally and in writing.

- Adapted from the MAA/CUPM 2004 Curriculum Guide

The prerequisite for an Elementary Differential Equations course is generally either a year-long sequence in calculus (TMM005 Calculus I & TMM006 Calculus II) or OMT018 Calculus III. Since an Elementary Differential Equations course follows from differential and integral calculus, adapted statements regarding Calculus in the MAA/CUPM 2004 Curriculum Guide also apply to Elementary Differential Equations.

To qualify for OMT020 (Elementary Differential Equations), a course must cover as a minimum the essential learning outcomes, denoted by an asterisk *. A course in Elementary Differential Equations may also commonly include some of

the listed nonessential learning outcomes. These optional topics should be included only if there is adequate course time to do so beyond giving primary course attention to the essential learning outcomes. At least 70% of the classroom instructional time has to be spent on the essential learning outcomes. The optional learning outcomes are learning experiences that enhance, reinforce, enrich or are further applications of the essential learning outcomes. If review of prerequisite course content is necessary, only a minimal amount of time should be devoted to such review .

The successful Elementary Differential Equations student should be able to:

1. Solve first-order differential equations that are separable, linear or exact. *
2. Solve first-order differential equations by making the appropriate substitutions, including homogeneous and Bernoulli equations.*
3. Use linear or nonlinear first-order differential equations to solve application problems such as exponential growth and decay, population logistics growth, velocity, solution mixtures, two component series circuits and chemical reactions.*
4. Understand the relationship between slope fields and solution curves for differential equations. Use a slope field and an initial condition to estimate a solution curve to a differential equation.*

1. Approximate solutions of first-order differential equations using Euler and Runge-Kutta methods.

6. Use the method of reduction of order.

7. Solve higher-order homogeneous linear equations with constant coefficients. *

8. Solve higher-order nonhomogeneous linear equations with constant coefficients by the method of undetermined coefficients. *

9. Solve higher-order nonhomogeneous linear equations by the method of variation of parameters. *

10. Use linear second-order differential equations to solve application problems such as spring/mass system motion problems, acceleration, or three component series circuits. *

11. Solve application problems requiring the use of higher-order differential equations with boundary conditions, such as the whirling string, the deflection of a uniform beam and the buckled rod.

12. Use power series to solve higher-order differential equations about ordinary or singular points.

13. Solve special classes of equations such as Cauchy-Euler, Bessel and Legendre equations.

14. Perform operations with Laplace and inverse Laplace transforms to solve higher-order differential equations.*

15. Solve systems of differential equations.