

# Mathematics + Cancer: An Undergraduate “Bridge” Course in Applied Mathematics\*

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**Abstract.** Most undergraduates have limited experience with mathematical modeling. In an effort to respond to various initiatives, such as the recommendations outlined in the Guidelines for Assessment and Instruction in Mathematical Modeling Education (GAIMME) report [S. Garfield and M. Montgomery, eds., *GAIMME: Guidelines for Assessment & Instruction in Mathematical Modeling Education*, SIAM, 2016], this paper describes a course on the mathematical models of cancer growth and treatment. Among the aims is to provide a template for a “bridge” course between the traditional calculus and differential equations sequence and more advanced courses in mathematics and statistics. Prerequisites for the course include a course in ordinary differential equations. Linear algebra is a useful co-requisite but no previous programming experience is required. The content includes classical models of tumor growth as well as models for the growth of specific cancer types. Relevant research articles are provided for further study. Material for student projects and effective communication is supplied, as well as suggestions for homework assignments and computer labs. This paper aims to assist instructors in developing their own “Mathematics + Cancer” course.

**Key words.** mathematical modeling, cancer, differential equations, undergraduate education

**AMS subject classifications.** 97M10, 92C50, 34A99

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**1. Introduction.** This paper describes an undergraduate course, accessible to students who have completed a standard sequence of calculus and ordinary differential equations, on the mathematical modeling of cancer. The content and format of the course are derived from the authors’ experiences in advising undergraduates in a program funded by the National Science Foundation’s Mentoring through Critical Transition Points (MCTP) initiative. Our objectives in developing this course are threefold. First, we are interested in providing a model of a “bridge” course between the traditional calculus sequence and higher-level courses besides the typical “intro-

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# Mathematics For Cancer Education

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