

Introduction to Mathematics Research

A Survey of Applied Mathematics¹

Course Development Summary

The department of mathematics at the University of Iowa offers a wide array of courses at the undergraduate level for students interested in math. In addition to the standard calculus and linear algebra courses, there are introductory courses in real analysis, abstract algebra, and point-set topology. Noticeably absent from this curriculum are courses focusing on the application of mathematics outside of academia. In order to address this shortcoming, we proposed a new undergraduate course focused specifically on the modeling of real-world phenomena using mathematics.

In order to provide students with a broad understanding of the types of problems they can solve and the techniques they can use to solve them, we decided to break the course into five isostructural modules. Each module is composed of several introductory lectures, followed by computer simulation and experimentation, classroom discussion, and ultimately group projects and presentations. This modular format also allows for dynamic course content between offerings, as modules are designed to be interchangeable.

This course was first offered in the fall semester of 2007 as a section of “Introduction to Mathematics Research.” Topics covered included areas of active applied mathematics research within our department, such as collision modeling, traffic flow, subsurface fluid flow, epidemiology, and financial options pricing. The course was supervised by Professor David Stewart.

Student reaction to this course has been very positive. At the end of each module, students were asked to complete an anonymous online survey regarding the content of the module and the framework of the course. Overwhelmingly, students found it very beneficial to dedicate class time to discussing models with classmates and instructors. Additionally, many appreciated the time spent on computer implementation of the models. In general, students felt better prepared to approach mathematical models in either research or in industry.

At present, this course is scheduled to be offered again in the spring of 2009. The current head of the department of mathematics has requested funding from the College of Liberal Arts and Sciences to make this course a permanent part of the undergraduate mathematics curriculum. Professor Stewart has agreed to retain a supervisory role, and preparations are being made to include several new modules in the next offering.

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