Poster paper

Aligning our first year maths course to better meet student needs

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Differential and integral calculus have been included in the first year mathematics course in the Bachelor of Information Technology programme at Otago Polytechnic since the inception of the degree in 1993, yet this course does not meet the needs of our students in their studies or in their future employment. Our students come to the programme with a range of educational backgrounds and work experiences. Some students have as little as two years of secondary mathematics. Students who are new to continuous mathematics struggle to master the concepts in the 30 hour time frame. Thus the course provides a taste of calculus, but does not allow sufficient time to develop the skills and knowledge necessary to apply these calculus tools in their study of information technology. Even the simpler concepts that are developed in the calculus paper are not used explicitly in our degree programme or in the majority of IT positions in which our students are ultimately employed. During a recent curriculum review, we decided to redesign the course to develop mathematical knowledge and understandings that underpin the learning of information technology, and to provide mathematical tools that are applicable to the current study and future employment of our students.

The ACM/IEEE Computing Curricula Computer Science guidelines (2001) recommend

> *that students study discrete mathematics early in their academic program, preferably in their first year .... so students can more easily appreciate how these mathematical tools apply in practical contexts. ... It is important that students have sufficient exposure to discrete mathematics to provide the necessary mastery of the material.*

This is endorsed by the ACM/IEEE Computing Curricula Software Engineering Draft guidelines (2004)

> *Discrete mathematics is the mathematics underlying all computing, including software engineering. It has the importance to software engineering that calculus has to other branches of engineering.*

The paper provides students with a variety of mathematical tools that can be used in an IT context. We will investigate the mathematics of number theory, functions, recursion, iteration, induction, counting techniques and game theory to explore the applications in encryption methods, generation of random numbers, computational complexity, and decision making. Each topic will be presented as a series of problems with students actively involved in the development of the solutions. The mathematical concepts will be developed and highlighted during the evolution of these solutions. This will encourage students to see mathematics, not as a stand alone body of knowledge, but as a tool to be used and applied in many IT contexts.

References

The Joint Task Force on Computing Curricula IEEE Computer Society Association of Computing Machinery. (2001). *Computer curricula 2001: Computer science.* Retrieved March 9, 2004, from http://www.computer.org/education/cc2001/final/index.htm

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