Project Title
Interactive Discrete Mathematics

Applicant:

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<td>Information Technology</td>
<td>College</td>
<td>Golisano</td>
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Project Summary

The purpose of this project is to facilitate the development of a set of interactive instructional materials for the two-course sequence 1016-205/206 Discrete Mathematics for Technologists I/II. The requested funds would provide the means for the applicant, a faculty member from the GCCIS (to which college belong the IT and NSSA departments whose students are required to take the courses), to teach the course offered by the School of Mathematics.

The instructional materials to be developed concurrently with the teaching of the course would be used within the Content, Quizzes, and Survey sections of myCourses, RIT’s course management system. As such, these materials can subsequently be made available to every student taking the course. A description of the proposed materials follows.

Interactive instructional applications will be developed for inclusion within the Content section of myCourses. These applications can make the instruction and learning of many essential topics in discrete mathematics more engaging and accessible, thus encouraging more time to be spent by students thinking about the subject matter. By incorporating logic and graphics into the design of an interactive movie, the solving of relevant mathematical problems can be made to closely resemble the activity of playing video games. Specifically, it is intended that interactive Flash (.swf) applications will be authored to be used by students in mastering the fundamental concepts of induction, combinatorial reasoning, recursion, matrix computations, graph algorithms, finite state machines, and regular expressions.

Numerous questions consisting a variety of multiple choice/select, matching, ordering, fill-in-blank, and short answer type will be created within the Quizzes section of myCourses. These questions will be devised so that they are associated with specific learning objectives and outcomes for the course, and thus would be potentially valuable documentation that can be collected for assessment purposes. Most of these questions would be designed to optionally provide hints, automatically generated feedback, and whenever possible be devised along with several variations to allow retries.

The Survey section of myCourses allows for non-graded/anonymous questions to be presented along with student access to the overall summary of results as the survey is being conducted. Furthermore, it is also possible to configure the survey so that it is editable during the period in which it is available. In this way, challenging questions can be posed, the solution of which effectively becomes a group exercise. In the experiments that the applicant has done using this approach, it has been interesting to observe the outcome. For example, whether the majority of a class actually converges upon the correct answer to a difficult problem (which the instructor has the option of posting as a “seed”). This approach can also lead to interesting discussions and stimulate critical thinking.
that normally wouldn’t arise from the common situation where just a single answer is provided, e.g. in the back of
the textbook.

It should be noted that the interactive materials, quiz and survey questions described above are not intended to
replace traditional homework exercises that appear at the end of each section in the textbook. However, using these
materials offers several advantages in that they can provide a student with immediate feedback of his/her
understanding, and they don't consume valuable class minutes often used up in handling the logistics of collecting,
grading, and handing back written assignments in a timely manner.

Targeted learners

Potentially, all students pursuing the B.S. in Information Technology (IT), Networking, Security, and Systems
Administration (NSSA), and Game design and development are required to take 1016-205/206.

Each section of 205/206 has approximately 30-35 students. These sections were offered during 2006-7.

<table>
<thead>
<tr>
<th></th>
<th>20061</th>
<th>20062</th>
<th>20063</th>
<th>total</th>
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<tbody>
<tr>
<td>205 (sections)</td>
<td>6</td>
<td>3</td>
<td>2</td>
<td>11</td>
</tr>
<tr>
<td>206 (sections)</td>
<td>2</td>
<td>5</td>
<td>4</td>
<td>11</td>
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<tr>
<td>205/206 (total students)</td>
<td>8 x 30 = 240</td>
<td>8 x 30 = 240</td>
<td>6 x 30 = 180</td>
<td>22 x 30 = 660</td>
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Anticipated impact on student success/retention

The immediate impact would be on students enrolled in 1016-205 in the Fall (20071) and 1016-206 in the Winter
(20072) terms, who would be taking the particular section being taught with the materials being developing during
that time. It is expected that students in these sections will become more engaged with the subject matter during the
course and have greater success relative to their peers taking other sections. Since the students generally take this
course during their first two terms at RIT, it most certainly could have a significant positive impact on retention.
Needless to say, mathematics courses taken by non-math majors are generally among those in which students
potentially can have difficulty, especially during their freshman year.

After the first year during which the materials described above are developed, an impact upon a much larger group
would occur as they become available to the students taking the course, as can easily happen using the capability
within myCourses to import various components to other course sections.

Measurement of impact

A number of surveys will be conducted to gather students’ opinions regarding their satisfaction with using the
interactive materials, how much time they spent using them, and how the experience of using them compared with
the traditional textbook readings and homework assignments. Statistical information collected from the Quizzes
section of myCourses will also be studied to gain insight into the mastery of topics and course objectives and to help
pinpoint areas of difficulty.

Informal feedback from students will also be frequently solicited to gather comments, develop new ideas, and
suggestions for improvement.
Project Rationale

There is no general provision that permits a faculty member from one college to teach a course in another college within RIT. This project would allow the applicant to teach for and contribute to RIT’s School of Mathematics in the College of Science without negatively impacting the budget of RIT’s Department of Information Technology in the Golisano College of Computing and Information Sciences.

Discrete mathematics courses are part of the required curriculum for virtually every accredited degree program in Computer Science/Information Technology. In fact, frequently such courses are actually taught within a Computer Science/Information Technology Department itself.

The applicant holds a Ph.D. in Mathematics and has taught discrete mathematics courses numerous times while a faculty member at Michigan Technological University, Duke University, University of Louisiana-Lafayette, and Western New England College.

The funding of this grant proposal would make it possible for the applicant to be involved in an area in which he has vast experience, keen interest, and a strong desire to contribute to cross-disciplinary activity that is essential for keeping the core curriculum in this subject area up to date and relevant.

Project Timetable

Fall Term 2007-1 Develop materials concurrently with teaching the course 205

Winter Term 2007-2 Develop materials concurrently with teach the course 206.

Spring 2007-3 Study the student surveys and assess the effectiveness of the materials.

Summer 2007-4 Revise and prepare materials to be made available to students and faculty to use in the next academic year 2007-2008