School of Mathematical Sciences

☑ New ☐ Revised COURSE: COS-MATH-190T Discrete Mathematics for Computing (Transition)

1.0 Course designations and approvals:

<table>
<thead>
<tr>
<th>Required Course Approvals:</th>
<th>Approval Request Date</th>
<th>Approval Grant Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic Unit Curriculum Committee</td>
<td>11.30.12</td>
<td>11.30.12</td>
</tr>
<tr>
<td>College Curriculum Committee</td>
<td>12.04.12</td>
<td>12.04.12</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Optional Course Designations:</th>
<th>Yes</th>
<th>No</th>
<th>Approval Request Date</th>
<th>Approval Grant Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Education</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Writing Intensive</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Honors</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2.0 Course information:

Course Title: Discrete Mathematics for Computing (Transition)
Credit Hours: 1
Prerequisite(s): 1016-265
Co-requisite(s): None
Course proposed by: School of Mathematical Sciences
Effective date: Fall 2013

<table>
<thead>
<tr>
<th>Contact Hours</th>
<th>Maximum Students/section</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classroom</td>
<td>1</td>
</tr>
<tr>
<td>Lab</td>
<td></td>
</tr>
<tr>
<td>Workshop</td>
<td></td>
</tr>
<tr>
<td>Other (specify)</td>
<td></td>
</tr>
</tbody>
</table>

2.1 Course conversion designation: (Please check which applies to this course)
☐ Semester Equivalent (SE) to:
☐ Semester Replacement (SR) to:
☑ New

2.2 Semester(s) offered:
☐ Fall  ☐ Spring  ☐ Summer
☐ Offered every other year only  ☑ Other
2.3 Student requirements:

Students required to take this course: (by program and year, as appropriate)

Students in a program that required 1016-265 and 1016-366 on the quarter calendar, who finished 1016-265 but not 1016-366.

Students who might elect to take the course:

None

3.0 Goals of the course: (including rationale for the course, when appropriate)

3.1 To introduce structures and fundamental techniques in discrete mathematics that are central to mathematics, computer science, and statistics.

3.2 To foster the skill of understanding and creating mathematically valid arguments.

3.3 To develop the formal methods of logical reasoning by studying symbolic logic in general and logical proofs in discrete mathematics in particular.

3.4 To develop skills in concise exposition, cogent communication of mathematical ideas and how to use them in computer applications.

4.0 Course description: (as it will appear in the RIT Catalog, including pre- and co-requisites, semesters offered)

COS-MATH-190T Discrete Mathematics for Computing (Transition)
This course will be offered one time. It is intended to facilitate the calendar transition for students in a program that required 1016-265 and 1016-366 on the quarter calendar; specifically, the course is needed by students who finished 1016-265 but not 1016-366. The course includes content covered in COS-MATH-190 that is not found in 1016-265. (Prerequisite 1016-265) Class 1, Credit 1 (F)

5.0 Possible resources: (texts, references, computer packages, etc.)


5.2 K. Rosen, Discrete Mathematics and Its Applications, McGraw-Hill, Columbus, OH.


5.5 R. Graham, D. E. Knuth and O. Patashnik, Concrete Mathematics: A Foundation for Computer Science, Addison-Wesley, Reading, MA.

5.6 J. Hein, Discrete Structures, Logic, and Computability, Jones & Bartlett, Sudbury, MA.
6.0 **Topics: (outline)** Topics with an asterisk(*) are at the instructor’s discretion, as time permits

6.1 Sets
   - 6.1.1 Partitions of a set
   - 6.1.2 Countable and uncountable sets

6.2 Relations
   - 6.2.1 Binary, ternary, \(n\)-ary relations
   - 6.2.2 Properties of binary relations between sets
     - 6.2.2.1 Partial, total, one to one, onto
     - 6.2.2.2 Inverse relations
     - 6.2.2.3 Composition: Boolean product
   - 6.2.3 Properties of relations from a set to itself
     - 6.2.3.1 Representations: matrices and graphs
     - 6.2.3.2 Reflexive, symmetric, anti-symmetric, and transitive
     - 6.2.3.3 Equivalence relations: using partitions and using functions
     - 6.2.3.4 Closures of relations
     - 6.2.3.5 Ordering: partial, total, topological and well founded
   - 6.2.4 Functions
     - 6.2.4.1 Recursive definitions of functions
     - 6.2.4.2 Operations on functions

6.3 Recursive Definitions of Discrete Structures and Mathematical Induction
   - 6.3.1 Recursively defined sequences
   - 6.3.2 Recursively defined sets: strings and formulas
   - 6.3.3 Induction: complete and structural

7.0 **Intended learning outcomes and associated assessment methods of those outcomes:**

<table>
<thead>
<tr>
<th>Learning Outcomes</th>
<th>Assessment Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Homework</td>
</tr>
<tr>
<td>7.1 Solve problems in set theory</td>
<td>✓</td>
</tr>
<tr>
<td>7.2 Write and explain mathematical proofs</td>
<td>✓</td>
</tr>
<tr>
<td>7.3 Solve introductory problems from various topics in mathematics and apply them to problems in computer science</td>
<td>✓</td>
</tr>
</tbody>
</table>

8.0 **Program goals supported by this course:**

8.1 To develop an understanding of the mathematical framework that supports engineering,
science, and mathematics.

8.2 To develop critical and analytical thinking.

8.3 To develop an appropriate level of mathematical literacy and competency.

8.4 To provide an acquaintance with mathematical notation used to express physical and natural laws.

9.0 General education learning outcomes and/or goals supported by this course:

<table>
<thead>
<tr>
<th>General Education Learning Outcomes</th>
<th>Assessment Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Homework</td>
</tr>
</tbody>
</table>

9.1 Communication

Express themselves effectively in common college-level written forms using standard American English

Revise and improve written and visual content

Express themselves effectively in presentations, either in spoken standard American English or sign language (American Sign Language or English-based Signing)

Comprehend information accessed through reading and discussion

9.2 Intellectual Inquiry

Review, assess, and draw conclusions about hypotheses and theories

Analyze arguments, in relation to their premises, assumptions, contexts, and conclusions

Construct logical and reasonable arguments that include anticipation of counterarguments

Use relevant evidence gathered through accepted scholarly methods and properly acknowledge sources of information

9.3 Ethical, Social and Global Awareness

Analyze similarities and differences in human experiences and consequent perspectives

Examine connections among the world’s populations

Identify contemporary ethical questions and relevant stakeholder positions

9.4 Scientific, Mathematical and Technological Literacy

Explain basic principles and concepts of one of the natural sciences

Apply methods of scientific inquiry and problem solving to contemporary issues
<table>
<thead>
<tr>
<th>General Education Learning Outcomes</th>
<th>Assessment Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ Comprehend and evaluate mathematical and statistical information</td>
<td>✗ ✗</td>
</tr>
<tr>
<td>✓ Perform college-level mathematical operations on quantitative data</td>
<td>✗</td>
</tr>
<tr>
<td>Describe the potential and the limitations of technology</td>
<td></td>
</tr>
<tr>
<td>Use appropriate technology to achieve desired outcomes</td>
<td></td>
</tr>
<tr>
<td>9.5 Creativity, Innovation and Artistic Literacy</td>
<td></td>
</tr>
<tr>
<td>Demonstrate creative/innovative approaches to course-based assignments or projects</td>
<td></td>
</tr>
<tr>
<td>Interpret and evaluate artistic expression considering the cultural context in which it was created</td>
<td></td>
</tr>
</tbody>
</table>

10.0 Other relevant information: (such as special classroom, studio, or lab needs, special scheduling, media requirements, etc.)

None