School of Mathematical Sciences

☑ New  □ Revised  COURSE: COS-MATH-461 Topology

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>4-08-10</td>
<td>4-15-10</td>
</tr>
<tr>
<td>College Curriculum Committee</td>
<td>11-01-10</td>
<td>9-20-11</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>
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</tbody>
</table>

2.0 Course information:

Course Title: Topology
Credit Hours: 3
Prerequisite(s): COS-MATH-431
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>3</td>
</tr>
<tr>
<td>Lab</td>
<td>35</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: 1016-571
☐ 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)
None

Students who might elect to take the course:
Students majoring in mathematics, computer science, or statistics

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

3.1 To introduce concepts of topology.
3.2 To relate topological thinking to analysis.

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

COS-MATH-461 Topology
This course defines metric spaces and topological spaces. For metric spaces, it examines continuity, spaces of continuous functions, and completeness in Euclidean spaces. For topological spaces, it examines compactness, continuous functions, and separation axioms. (COS-MATH-431) Class 3, Credit 3 (S)

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


6.0 Topics: (outline) Topics with an asterisk(*) are at the instructor’s discretion, as time permits

6.1 Metric Spaces
   6.1.1 Open and closed sets, closures
   6.1.2 Convergence and completeness
   6.1.3 Continuity and spaces of continuous functions
   6.1.4 Completeness in Euclidean spaces

6.2 General Topological Spaces
   6.2.1 Definition of a topology by open bases and sub-bases
   6.2.2 Compactness and continuity
   6.2.3 Separation axioms and examples

6.3 Optional Topics
   6.3.1 Quotient spaces, quotient maps, and weak topologies
6.3.2 Product topologies, subspace topologies
6.3.3 Urysohn’s lemma, Tietze’s theorem
6.3.4 Tychonoff’s theorem, compactification
6.3.5 Hilbert spaces, Banach spaces, $C[0, 1]$, compact operators, and examples
6.3.6 Stone-Weierstrass theorem
6.3.7 Connectedness and continua
6.3.8 Homotopy and the fundamental group

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 Define and describe metric spaces</td>
<td>✓</td>
</tr>
<tr>
<td>7.2 Define and describe topological spaces</td>
<td>✓</td>
</tr>
<tr>
<td>7.3 Contrast topological concepts with comparable ideas of real analysis</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>9.1 Communication</td>
<td></td>
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</tbody>
</table>
### General Education Learning Outcomes

<table>
<thead>
<tr>
<th>Assessment Methods</th>
<th>Homework</th>
<th>Quiz/Exam/Final</th>
<th>Project</th>
<th>Computer Work</th>
<th>Class Presentation</th>
</tr>
</thead>
</table>

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

**Quiz/Exam/Final**
- 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

**Project**

**Computer Work**

**Class Presentation**

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### Intellectual Inquiry

9.2
- 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

### Ethical, Social and Global Awareness

9.3
- 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

### Scientific, Mathematical and Technological Literacy

9.4
- Explain basic principles and concepts of one of the natural sciences
- Apply methods of scientific inquiry and problem solving to contemporary issues
- Comprehend and evaluate mathematical and statistical information
- Perform college-level mathematical operations on quantitative data
- Describe the potential and the limitations of technology
- Use appropriate technology to achieve desired outcomes

### Creativity, Innovation and Artistic Literacy

9.5
<table>
<thead>
<tr>
<th>General Education Learning Outcomes</th>
<th>Assessment Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demonstrate creative/innovative approaches to course-based assignments or projects</td>
<td>Homework</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