ROCHESTER INSTITUTE OF TECHNOLOGY
COURSE OUTLINE FORM

COLLEGE OF SCIENCE

School of Mathematical Sciences

☑ New ☐ Revised COURSE: COS-MATH-621 Complex Analysis

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>10-20-10</td>
<td>10-27-10</td>
</tr>
<tr>
<td>College Curriculum Committee</td>
<td>11-01-10</td>
<td>9-27-11</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Optional Course Designations:</th>
<th>Yes</th>
<th>No</th>
</tr>
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<tbody>
<tr>
<td>General Education</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>Writing Intensive</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>Honors</td>
<td>✔</td>
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</table>

2.0 Course information:

Course Title: Complex Analysis
Credit Hours: 3
Prerequisite(s): COS-MATH-601 or permission of instructor
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></td>
</tr>
<tr>
<td>Workshop</td>
<td></td>
</tr>
<tr>
<td>Other (specify)</td>
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</table>

2.1 Course Conversion Designation: (Please check which applies to this course)

☑ Semester Equivalent (SE) to: 1016-720
☐ 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 the course:
None

Students who might elect to take the course:
Graduate students and advanced undergraduate students in mathematics, physics, imaging science, or engineering

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

3.1 To analyze complex-valued functions, the Cauchy integral, the calculus of residues, and conformal mappings.
3.2 To examine examples of physical phenomena modeled with complex functions.
3.3 To develop sound logical arguments and the communication of them in written form.

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

COS-MATH-621 Complex Analysis
This course provides a brief discussion of preliminaries leading to the concept of analyticity. It includes complex integration, Cauchy’s integral theorem, integral formulas, Taylor and Laurent series, calculus of residues and its applications, and conformal mappings and their applications. It concludes with the argument principle and Rouché’s theorem. (COS-MATH-601 or permission of instructor) Class 3, Credit 3 (F)

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

5.1 Fisher, Complex Variables, Dover, New York, NY.
5.2 Mathews and Howell, Complex Analysis for Mathematics and Engineering, Jones and Bartlett, Sudbury, MA.
5.3 Marsden and Hoffman, Basic Complex Analysis, W.H.Freeman and Company, New York, NY.
5.4 Ahlfors, Complex Analysis, McGraw-Hill, Columbus, OH.

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

6.1 Functions of Complex Numbers
   6.1.1 Limits
   6.1.2 Continuity
   6.1.3 Differentiability and analyticity
   6.1.4 Contour integrals
6.2 Cauchy’s Theorem
   6.2.1 Cauchy integral formula
   6.2.2 Maximum modulus theorem
   6.2.3 Harmonic functions
6.3 Series Representations
   6.3.1 Taylor series
   6.3.2 Laurent series

6.4 Calculus of Residues
   6.4.1 Residue theorem
   6.4.2 Evaluation of definite integrals

6.5 Conformal Mappings
   6.5.1 Basic theory
   6.5.2 Linear fractional mappings
   6.5.3 Applications

6.6 Further Developments
   6.6.1 The argument principle
   6.6.2 Rouché’s theorem

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>7.1 Develop the basic elements of calculus of complex valued functions of a complex variable</td>
<td>✓</td>
</tr>
<tr>
<td>7.2 Compute certain types of integrals</td>
<td>✓</td>
</tr>
<tr>
<td>7.3 Determine residues, their types and real valued integrals</td>
<td>✓</td>
</tr>
<tr>
<td>7.4 Construct conformal mappings</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: Not applicable
10.0 Other relevant information: (such as special classroom, studio, or lab needs, special scheduling, media requirements, etc.)

None