ROCHESTER INSTITUTE OF TECHNOLOGY
COURSE OUTLINE FORM

COLLEGE OF SCIENCE

School of Mathematical Sciences

☑ **New** ☐ **Revised COURSE: COS-MATH-171 Calculus A**

1.0 Course designations and approvals:

Required Course Approvals:	**Approval Request Date**	**Approval Grant Date**
Academic Unit Curriculum Committee	4-08-10	4-15-10
College Curriculum Committee	11-01-10	11-17-10

Optional Course Designations:	**Yes**	**No**	**Approval Request Date**	**Approval Grant Date**
General Edcation	✓			
Writing Intensive		✓		
Honors		✓		

2.0 Course information:

Course Title: Calculus A
Credit Hours: 3
Prerequisite(s): grade of C- or better in COS-MATH-111, or
grades of C- or better in (NTID-NMTH-275 and -220), or
grades of C- or better in (NTID-NMTH-272 and -220), or
grades of C- or better in (NTID-NMTH-260 and -220), or
or a score of at least 60% on the RIT Mathematics Placement Exam
Co-requisite(s): None
Course proposed by: School of Mathematical Sciences
Effective date: Fall 2013

	Contact Hours	**Maximum Students/section**
Classroom	3	35
Lab		
Workshop	2	35
Other (specify)		

2.1 Course conversion designation: (Please check which applies to this course)

☐ Semester Equivalent (SE) to:
☑ Semester Replacement (SR) to: 1016-271 and parts of 1016-272
☐ 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:

First-year Engineering, Chemistry, Physics, Medical Informatics, Bioinformatics, Imaging Science, Mathematics, Statistics, Computer Science, Engineering Technology, and Economics majors whose placement scores indicate that this is the appropriate course

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

3.1 To practice techniques of algebra, geometry and trigonometry by solving calculus problems.

3.2 To learn the basic definitions, concepts, rules, vocabulary, and mathematical notation of calculus.

3.3 To provide the necessary manipulative skills required for solving problems in calculus.

3.4 To provide knowledge and appreciation of calculus as a tool in solving technical and applied physical problems.

3.5 To provide a background in mathematics which can be used in the study of science and engineering.

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

COS-MATH-171 **Calculus A**

This is the first course in a three-course sequence (COS-MATH-171, -172, -173). This course includes a study of functions, continuity, and differentiability. The study of functions includes the definition, representations and the trigonometric functions. Limits of functions are used to study continuity and differentiability. The study of the derivative includes the definition, basic rules, and implicit differentiation. Applications of the derivative include related-rates problems and curve sketching. (C or better in COS-MATH-111, or at least three years of high school mathematics and a score of at least 55% on the RIT Mathematics Placement Exam) **Class 3, Workshop 2, Credit 3 (F, S)**

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

5.1 J. Stewart, *Calculus: Early Transcendentals*, Brooks/Cole, Belmont, CA.

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

6.1 Functions

6.1.1 Review of basics (as needed)

- Functions and their graphs
- Algebra of functions, including shifting and scaling graphs, and composition
- Exponential functions
- Trigonometric functions

6.1.2 Hyperbolic trigonometric functions

6.1.3 Inverse functions and logarithms

6.2 Limits

6.2.1 Rates of change and tangent lines

6.2.2 Properties of limits

6.2.3 One-sided limits

6.2.4 Continuity and types of discontinuities

6.2.5 Limits at infinity, infinite limits and asymptotes

6.3 Differentiation

6.3.1 Tangents and the derivative at a point

6.3.2 The derivative as a function

6.3.3 Differentiation rules for elementary functions

6.3.4 The Product Rule and Quotient Rule

6.3.5 The Chain Rule

6.3.6 Implicit differentiation

6.3.7 Derivatives of inverse functions (including logarithms and inverse trigonometric functions)

6.3.8 Linear approximations and differentials

6.4 Applications of differentiation

6.4.1 Newton's Method

6.4.2 Rates of change

6.4.3 Related rates

6.4.4 Extreme values of functions, critical points and Fermat's Theorem

6.4.5 Rolle's Theorem and the Mean Value Theorem

6.4.6 Monotonicity and the First Derivative Test

6.4.7 Concavity, the Second Derivative Test and curve sketching

6.4.8 Optimization

6.4.9 Indeterminate Forms and L'Hôpital's Rule

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

Learning Outcomes	Assessment Methods				
	Homework	Quiz/Exam/Final	Project	Computer Work	Class Presentation
7.1 Define basic concepts and notations of calculus	✓	✓			
7.2 Demonstrate the manipulative skills required to solve problems in calculus	✓	✓			
7.3 Differentiate algebraic and transcendental functions	✓	✓			
7.4 Apply differential calculus to physical problems	✓	✓			

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:

	General Education Learning Outcomes	Assessment Methods				
		Homework	Quiz/Exam/Final	Project	Computer Work	Class Presentation
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					

	General Education Learning Outcomes	Assessment Methods				
		Homework	Quiz/Exam/Final	Project	Computer Work	Class Presentation
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					
✓	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					
9.5	**Creativity, Innovation and Artistic Literacy**					
	Demonstrate creative/innovative approaches to course-based assignments or projects					
	Interpret and evaluate artistic expression considering the cultural context in which it was created					

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

10.1 Smart classroom

10.2 Workshop room equipped with tables and chairs to accommodate groups of 3 or 4 students

10.3 SMS Calculator Policy:
All electronic devices are prohibited on the final exam for this course.