ROCHESTER INSTITUTE OF TECHNOLOGY
COURSE OUTLINE FORM

COLLEGE OF SCIENCE

School of Mathematical Sciences

☑ **New** ☐ **Revised COURSE: COS-MATH-172 Calculus B**

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 Education	✓			
Writing Intensive		✓		
Honors		✓		

2.0 Course information:

Course Title: Calculus B
Credit Hours: 3
Prerequisite(s): C or better in COS-MATH-171
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: 1016-273 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 progress in previous courses 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 the 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 for 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-172 **Calculus B**

This is the second course in three-course sequence (COS-MATH-171, -172, -173). This course includes Riemann sums, the Fundamental Theorem of Calculus, techniques of integration, and applications of the definite integral. The techniques of integration include substitution and integration by parts. The applications of the definite integral include areas between curves, volumes, arc length, and average values of functions. (C or better in COS-MATH-171) **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 Integration

6.1.1 Estimating area

6.1.2 Sigma notation and Riemann sums

6.1.3 The definite integral

6.1.4 Antiderivatives and indefinite integrals

6.1.5 The Fundamental Theorem of Calculus

6.1.6 The definition of the logarithm as an integral

6.2 Techniques of Integration

6.2.1 Substitution

6.2.2 Integration by parts

6.2.3 Trigonometric integrals

6.2.4 Simpson's Rule (other numerical methods optional)

6.2.5 Partial fractions

6.2.6 Trigonometric substitution

6.2.7 Introduction to improper integrals of the form $\int_0^\infty f(x)\,dx$

6.3 Applications of Integration

6.3.1 Areas between curves

6.3.2 Volumes of solids of revolution via the methods of discs/washers and shells

6.3.3 Volumes of general solids using cross-sections*

6.3.4 Average value of a function

6.3.5 Arc length

6.3.6 Further applications of Integration (at least one of the following should be taught):

6.3.6.1 Areas of surfaces of revolution

6.3.6.2 Work

6.3.6.3 Moments and centers of mass

6.3.6.4 Hydrostatic force

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 Integrate algebraic and transcendental functions	✓	✓			
7.4 Apply differential and integral 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:

		Assessment Methods				
	General Education Learning Outcomes	**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					
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**					

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