

Program: Bioresources and Environmental Biology
 Course Title: Mathematics I
 Course Code: SCIM 103

Program Level Bachelor Master Doctor
 Faculty of Science
 Department of Mathematics

Course Specification

Section 1 General Information

1. Course Code and Title

In Thai	วทคอ ๑๐๓ คณิตศาสตร์ ๑
In English	SCIM 103 Mathematics 1

2. Number of Credits

4 (4-0-8) Credits
 (Theory 4 hrs. Practice 0 hrs. Self-Study 8 hrs./week)

3. Curriculum and Course Type

3.1 Program	Bachelor of Science in Bioresources and Environmental Biology (International Program)
3.2 Course Type	Specific Course <input checked="" type="checkbox"/> Compulsory Course <input type="checkbox"/> Elective Course

4. Course Coordinator and Instructor

4.1 Course Responsible Instructor	Assoc. Prof. Kornkanok Bunwong Department of Mathematics, Faculty of Science Tel. 02-201-5340 e-mail: kornkanok.bun@mahidol.ac.th
-----------------------------------	---

4.2 Instructors	1. Lect. Panyada Sriphathurat Department of Mathematics, Faculty of Science Tel. 02-201-5340 e-mail: sripaturad.pan@gmail.com 2. Assoc. Prof. Kornkanok Bunwong B203/9, Department of Mathematics, Faculty of Science Tel. 02-201-5340 e-mail: kornkanok.bun@mahidol.ac.th
-----------------	---

5. Semester/Class Level

5.1 Semester	Second semester/First Year
5.2 Number of Students Allowed	Approximately 20 Students
5.3 Lecture Room	SC1-153

6. Prerequisites None

7. Co-requisites None

8. Date of Preparation/Latest Revision of the Course Specifications 4 January 2025

Section 2 Course Goals and Course Description

1. Course Goals

Calculus and matrix algebra are important tools used to describe continuous change and solve complex problems. This introductory course intends to develop students' knowledge in these fundamental areas of mathematics. Moreover, students are trained their communication skills, especially writing, to exchange mathematical knowledge in English.

2. Course Description

เวกเตอร์ เมทริกซ์ ระบบสมการเชิงเส้น ฟังก์ชันและกราฟ ฟังก์ชันอดิศัย ลิมิตและความต่อเนื่อง อนุพันธ์ของฟังก์ชัน อนุพันธ์โดยปริยายและลอการิทึม รูปแบบไม่กำหนดและหลักเกณฑ์โลปีตาล ปฏิยานุพันธ์ และการหาปริพันธ์ เทคนิคการหาปริพันธ์ การประยุกต์ที่เกี่ยวข้องกับวิทยาศาสตร์และธุรกิจ

Vectors; matrices; systems of linear equations; functions and their graphs; transcendental functions; limits and continuity; derivatives of functions; implicit and logarithmic differentiation; indeterminate forms and L'Hospital's rule; antiderivatives and integration; techniques of integration; applications to sciences and business-related fields

Section 3 Course Objectives, Course-level Learning Outcomes and Course Implementation

1. Course Objectives

After successful completion of this course, students should be able to:

- 1) Demonstrate understanding of standard practices in calculus and vector algebra
- 2) Solve derivative and integration problems
- 3) Manipulate matrices and systems of linear equations

2. Course-level Learning Outcomes: CLOs

On completion of the course, the students will be able to

(Panyada)

- 1) CLO1 Explain the fundamental concepts of functions and calculus such as limits, continuity, derivatives and integration
- 2) CLO2 Evaluate limits, derivatives, and integrals by using multiple methods
- 3) CLO3 Apply calculus to solve area, science, and business problems

(Kornkanok)

- 4) CLO4 Evaluate limits involving the indeterminate forms and the derivative of complicated functions by using implicit and logarithmic differentiation
- 5) CLO5 Apply calculus to curve sketching, optimization problems, and rates of change
- 6) CLO6 Compute standard vectors and matrices properties and operations such as norm, dot product, cross product, and determinant
- 7) CLO7 Formulate and solve systems of linear equations from given contexts

3. How to organize learning experiences to develop the knowledge or skills stated in number 2 and how to measure the learning outcomes

SCIM 103	Teaching and learning experience management			Learning outcomes measurements		
	Interaction Lecture	Exercise	Problem solving activities	In class activity	Individual assignment	Written exam
Panyada						
CLO1	✓	✓		✗	✗	
CLO2	✓	✓	✓	✗	✗	✗
CLO3	✓	✓	✓	✗	✗	✗
Kornkanok						
CLO4	✓	✓	✓	✗	✗	✗
CLO5	✓	✓	✓	✗	✗	✗
CLO6	✓	✓	✓	✗	✗	✗
CLO7	✓	✓	✓	✗	✗	✗

Section 4 Lesson Plan and Evaluation

1. Lesson Plan

Teaching Period	Topic / Details	Number of hours		Methods: Teaching Media	Instructors
		Theory	Practice		
1 06/01/25	08.30-10.30 Relations, functions and their graphs	2	0	Teaching method: interaction lecture, practice, problem solving activities Media: lecture notes, individual assignment, group assignment	Panyada
	10.30-12.30 Vectors in two and three dimensions (geometric description of vectors; vectors in the co-ordinate plane; arithmetic operations on vectors)	2	0		Kornkanok
2 13/01/25	08.30-10.30 Transcendental functions	2	0		Panyada
	10.30-12.30 Vectors in two and three dimensions (vectors with initial point not at the origin; rules of vector arithmetic; norm of vectors; unit vectors)	2	0		Kornkanok
3 20/01/25	08.30-10.30 Transcendental functions (cont.)	2	0		Panyada
	10.30-12.30 Limits	2	0		Panyada
4 27/01/25	08.30-10.30 Vectors in two and three dimensions (normalizing a vector; vectors determined by length and angle)	2	0		Kornkanok
	10.30-12.30 Vectors in two and three dimensions (Dot product; angle between two vectors; orthogonal vectors; orthogonal projections)	2	0		Kornkanok
5 03/02/25	08.30-10.30 Limits (cont.)	2	0		Panyada
	10.30-12.30 Vectors in two and three dimensions (Cross product; determinant; scalar triple products)	2	0		Kornkanok
6 10/02/25	08.30-10.30 Continuity and Differentiation rules	2	0		Panyada
	10.30-12.30 Introduction to systems of linear equations; Matrices and matrix operations; diagonal, triangular, and symmetric matrices	2	0		Kornkanok
7 17/02/25	08.30-10.30 Differentiation rules (cont.)	2	0		Panyada
	10.30-12.30 Gaussian elimination; Gauss-Jordan elimination	2	0		Kornkanok

Program: Bioresources and Environmental Biology
 Course Title: Mathematics I
 Course Code: SCIM 103

Program Level Bachelor Master Doctor
 Faculty of Science
 Department of Mathematics

Teaching Period	Topic / Details	Number of hours		Teaching activities/ media	Instructors
		Theory	Practice		
8 24/02/25	08.30-10.30 Wrap up	2	0	Teaching method: interaction lecture, practice, problem solving activities Media: lecture notes, individual assignment, group assignment	Panyada
	10.30-12.30 Wrap up	2	0		Kornkanok
9	Midterm examination (03/03/25-07/03/25)				
10 10/03/25	08.30-10.30 Antiderivatives and Integration	2	0		Panyada
	10.30-12.30 Inverse of a matrix by elementary row operations on an augmented matrix	2	0		Kornkanok
11 17/03/25	08.30-10.30 Techniques of integration (the substitution rule, integration by parts and the tabular method, partial fractions, improper integrals)	2	0		Panyada
	10.30-12.30 Determinants; Cramer's Rule	2	0		Kornkanok
12 24/03/25	08.30-10.30 Techniques of integration (cont.)	2	0		Panyada
	10.30-12.30 Implicit and logarithmic differentiation	2	0		Kornkanok
13 27/03/25 Make up	13.00-15.00 Techniques of integration (cont.)	2	0		Panyada
	15.00-17.00 Indeterminate forms and L'Hospital's rule	2	0		Kornkanok
14 31/03/25	08.30-10.30 Area between curves	2	0		Panyada
	10.30-12.30 Applications of differentiation (maximum and minimum values, curve sketching)	2	0		Kornkanok
15 03/04/25 Make up	13.00-15.00 Applications of integration	2	0		Panyada
	15.00-17.00 Applications of differentiation (optimization problems, rates of change)	2	0		Kornkanok
16 21/04/25	08.30-10.30 Wrap up	2	0		Panyada
	10.30-12.30 Wrap up	2	0		Kornkanok
17-18	Final examination (28/04/25-09/05/25)				
	Total	60	0		

* The schedule is tentative and subject to change as appropriate.

2. Plan for Assessment of Expected Course-Level Learning Outcomes (CLOs)

2.1 Measurement and Evaluation of learning achievement

A. Formative Assessment

During a lesson, instructor keeps the question going and monitors students' progress in general. There are also quick quizzes to check the current understanding of individual students.

B. Summative Assessment

(1) Tool and weight for measurement and evaluation

Course learning outcomes	Evaluation Method			Weight (%)
	In class activity	Individual assignment	Written exam	
Panyada				
CLO1	8%	10%	14%	32%
CLO2	8%	12%	14%	34%
CLO3	8%	12%	14%	34%
Total 1	24%	34%	42%	100%
Kornkanok				
CLO4	4%	4%	10%	18%
CLO5	4%	4%	10%	18%
CLO6	10%	10%	12%	32%
CLO7	8%	8%	16%	32%
Total 2	26%	26%	48%	100%
Total	(Total 1 + Total 2)/2			100%

(2) Grading Rules

After completion of the evaluation process each student is assigned a criterion-referenced grade (as shown in the table below). Evaluation and achievement will be justified according to Faculty and University code, conducted by grading system of A, B+, B, C+, C, D+, D and F.

Total percentage of evaluation	Grade
80 – 100	A
75 – 79	B+
70 – 74	B
60 – 69	C+
50 – 59	C
45 – 49	D+
40 – 44	D
0 – 39	F

(3) Measurement and Evaluation

Performance of the students is evaluated and assessed according to course objectives and learning outcomes. To pass this course, students must earn a grade of at least D.

2.2 Re-examination (if the course allows any.)

None

3. Students' Appeal

Students may submit formal complaint or academic appeal directly to

International Education and Administration Unit, Division of Salaya Campus, Mahidol University.

If it is considered that a case exists, the matter will be investigated in accordance with the procedures, and the complainant informed of the outcome

Section 5 Teaching Resources

1. Required Texts

- 1) Calculus, Early Transcendentals, 9th. Ed., H. Anton, I.C. Bivens, S. Davis, John Wiley & Sons
- 2) Elementary Linear Algebra, 11th Ed., H. Anton, C. Rorres, John Wiley & Sons.

2. Suggested Materials

-

3. Other Resources (if any)

- 1) <https://www.khanacademy.org>
- 2) <https://www.edx.org>
- 3) <https://www.coursera.org>
- 4) <http://tutorial.math.lamar.edu>

Program: Bioresources and Environmental Biology
Course Title: Mathematics I
Course Code: SCIM 103

Program Level Bachelor Master Doctor
Faculty of Science
Department of Mathematics

Section 6 Evaluation and Improvement of Course Implementation

1. Analysis and Evaluation of Course Implementation

A. Data for Analysis

Analysis of students' learning outcomes using student's total percentage of evaluation taken from review of class attendance record, review of on-time assignment submission, review of individual response according to examination rules and regulations, review of turning-in individual work assignment quality, and written examination by the course responsible faculty member and instructors.

B. Course Effectiveness Evaluation

Evaluated by course evaluation by student (Mahidol University E-Evaluation System) and student performance.

2. Revision Process and Improvement Plan for Course Effectiveness

Course responsible faculty member and instructors review course effectiveness in achieving course learning outcomes using outputs from course and instructor evaluation (Mahidol University E-Evaluation System), the results of student evaluation, and formal complaint or academic appeal (if any) to determine further improvement plan.

3. The self-assessment report of the course

Reports on course performance based on MU5 are prepared within 30 days after the end of the semester.

Appendix

1. Relations between the course and the program

Table 1 Relations between the course and the PLOs

Course Name: Mathematics I	PLOs					
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
SCIM 103	I					

Table 2 Relation between CLOs and PLOs

SCIM 103	PLOs					
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
CLO1 Explain fundamental knowledge of calculus such as limits, continuity, derivatives and integration	1.2					
CLO2 Evaluate limits, derivatives, and integrals by multiple methods	1.2					
CLO3 Apply calculus to solve area, science, and business problems	1.2					
CLO4 Evaluate limits involving the indeterminate forms and the derivative of complicated functions by using implicit and logarithmic differentiation	1.2					
CLO5 Apply calculus to curve sketching, optimization problems, and rates of change	1.2					
CLO6 Compute standard vectors and matrices properties and operations such as norm, dot product, cross product, and determinant	1.2					
CLO7 Formulate and solve systems of linear equations from given contexts	1.2					

Program: Bioresources and Environmental Biology
Course Title: Mathematics I
Course Code: SCIM 103

Program Level Bachelor Master Doctor
Faculty of Science
Department of Mathematics

Table 3 PLOs and SubPLOs that the course is responsible for

PLOs	SubPLOs
PLO1 Solve biology- and environment-related problems logically and systematically at local, regional and global levels by applying interdisciplinary approaches.	1.2 Apply concepts in basic science, including biology, chemistry, mathematics, and physics, logically and systematically necessary for the study of bioresources and environmental biology

2. Rubric scoring* TBA

3. Relations between the course and Sustainable Development Goals (SDGs)

- SDG1 No poverty
- SDG2 Zero Hunger
- SDG3 Good Health and Well – being
- SDG4 Quality Education
- SDG5 Gender Equality
- SDG6 Clean Water and Sanitation
- SDG7 Affordable and Clean Energy
- SDG8 Decent Work and Economic Growth
- SDG9 Industry, Innovation and Infrastructure
- SDG10 Reduced Inequalities
- SDG11 Sustainable Cities and Communities
- SDG12 Responsible Consumption and Production
- SDG13 Climate Action
- SDG14 Life Below Water
- SDG15 Life on Land
- SDG16 Peace, Justice and Strong Institutions
- SDG17 Partnerships for the goals