Program: Industrial Mathematics and Data Science   Program Level ☑ Bachelor ☐ Graduate Diploma ☐ Master ☐ Higher Graduate Diploma ☐Doctor

Course Title   Mathematics I   Faculty of Science

Course Code SCIM 103   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 Industrial Mathematics and Data Science (International Program)

3.2   Course Type   Specific Course ☑ Compulsory Course   ☐ Elective Course

4. Course Coordinator and Instructor

4.1 Course Responsible Instructor

Lect. Panyada Sriphathurat

Asst. Prof. Wathanan Jatuviriyapornchai

4.2 Instructors   Lect. Panyada Sriphathurat

Department of Mathematics, Faculty of Science

panyada.sri@mahidol.ac.th

Asst. Prof. Wathanan Jatuviriyapornchai

Department of Mathematics, Faculty of Science

watthanan.jat@mahidol.ac.th

5. Semester/Class Level

5.1 Semester   2 / First Year

5.2 Number of Students Allowed   Approximately 20   Students

6. Prerequisites   -

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7. Co-requisites   -

8. Date of Preparation/Latest Revision of the Course Specifications
    20 December, 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.

2. Course Description

(In Thai   เวกเตอร์ เมทริกซ์ ระบบสมการเชิงเส้น ฟังก์ชันและกราฟ ฟังก์ชันอดิศัย ลิมิตและความต่อเนื่อง อนุพันธ์ของฟังก์ชัน อนุพันธ์โดยปริยายและลอการึทึม รูปแบบไม่กำหนดและหลักเกณฑ์โลปีตาล ปฏิยานุพันธ์และการหาปริพันธ์ เทคนิคการหาปริพันธ์ การประยุกต์ที่เกี่ยวข้องกับวิทยาศาสตร์และธุรกิจ

(In English)   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

Instructor expects the students to acquire the following skills and abilities:

1. To demonstrate understanding of standard practices in calculus and vector algebra.

2. To solve derivative and integration problems.

3. To manipulate matrices and systems of linear equations.

4. To read, write, and listen to mathematical contents in English.

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2. Course-level Learning Outcomes: CLOs

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

1) CLO1 Explain fundamental knowledge of calculus such as limits, continuity, derivatives and integration.

2) CLO2 Evaluate limits, derivatives, and integrals by multiple methods.

3) CLO3 Apply calculus to solve science and business problems

4) CLO4 Compute standard vectors and matrices properties and operations such as norm, dot product, and determinant.

5) CLO5 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

CLOs	Teaching and learning experience management			Learning outcomes measurements	
	Interactive lecture	Effective questioning	Problem Solving Demonstration	Individual Work	Written exam
CLO1	✓	✓	✓	X	
CLO2	✓	✓	✓	X	X
CLO3	✓	✓	✓	X	X
CLO4	✓	✓	✓	X	X
CLO5	✓	✓	✓	X	X

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Section 4 Lesson Plan and Evaluation

1. **Lesson Plan**

Teach-ing Period	Topics/Details	Number of hours		Methods: Teaching Media	Lec-turer
		The-ory	Prac-tice		
1	Vectors and Matrices	4	0	Interactive lecture Effective questioning Problem Solving Demonstration	P.S.
2	systems of linear equations	4	0		
3	Relations, functions and their graphs	4	0		
4	Limits and continuity	4	0		
5-6	Differentiation rules	8	0		
7	Implicit and logarithmic differen-tiation	4	0		
8	Applications of differentiation	4	0		
9	Midterm Examination				
10	Antiderivatives and integration	4	0	Interactive lecture Effective questioning Problem Solving Demonstration	W.J
11-14	Techniques of integration	12	0		
15	Application of integration	4	0		
16	Review	4	0		
	Total	60	0		
	Final Examination				

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

   2.1 **Measurement and Evaluation of learning achievement**

   A. **Formative Assessment**

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Assisted problem solving and discussion. There are also quick quizzes to check the current understanding of individual students.

B. Summative Assessment

(1) Tool and weight for measurement and evaluation

Learning Outcomes		Evaluation Method*		Weight (Percentage)
		Individual Work	Examinations	
CLO1	Explain fundamental knowledge of calculus such as limits, continuity, derivatives and integration.	7	5 (2.5+2.5)	**12**
CLO2	Evaluate limits, derivatives, and integrals by multiple methods.	20	30 (12.5+17.5)	**50**
CLO3	Apply calculus to solve science and business problems	8	15 (5+10)	**23**
CLO4	Compute standard vectors and matrices properties and operations such as norm, dot product, and determinant.	2	5 (5+0)	**7**
CLO5	Formulate and solve systems of linear equations from given contexts.	3	5 (5+0)	**8**
	Total	40	60	100%

(2) Grading Rules

Students are evaluated their performance using assessment rubric according to course objectives and learning outcomes. Rubric scores for a single piece of individual assignment

Score	Description
5	Demonstrates the required work for all questions.
4	Demonstrates the required work for most questions with lower than 25% mistakes.
3	Demonstrates the required work for many questions with lower than 50% mistakes.
2	Demonstrates the required work for some questions with more than 50% mistakes.

| 1 | Demonstrates the required work for few questions with more than 75% mistakes. |
| 0 | No response |

The percentage of individual work is the average rubric scores of all pieces of individual work.

(3) Measurement and Evaluation

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. To pass this course, student must earn a grade of at least D.

Total percentage of evaluation	0-39	40-44	45-49	50-54	55-64	65-74	75-79	80-100
Grade	F	D	D+	C	C+	B	B+	A

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

Up to the Program Committee.

3. Students' Appeal

Students may submit a formal complaint or an academic appeal directly to International Education and Administration Unit, Division of Salaya Campus, Mahidol University.

Section 5 Teaching Resources

1. Required Texts

1) Anton, H., Bivens, I. and Davis, S. (2017). Calculus Early Transcendentals, 11th Edition. John Wiley & Sons.

2) Anton, H. *Elementary Linear Algebra,* 11th Edition. John Wiley & Sons. 2013.

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2. Suggested Materials

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3. Other Resources (if any)

1) Available through MU Library-subscribed databases

2) https://www.khanacademy.org

3) https://www.edx.org

4) https://www.coursera.org

5) http://tutorial.math.lamar.edu

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Section 6 Evaluation and Improvement of Course Implementation

1. Analysis and Evaluation of Course Implementation

    - Course and instructor evaluation system

2. Revision Process and Improvement Plan for Course Effectiveness

    After obtaining the course evaluation, students' needs and comments will be developed by course responsible faculty member and instructors.

3. The self-assessment report of the course

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Appendix