



Degree Bachelor Master Doctoral

Course Title Mathematics I

Faculty of Science

Course Code SCMA 101

Department of Mathematics

TQF 3 Course Specification

Section 1 General Information

1. Course code and title

Thai	วทศณ ๑๐๑ คณิตศาสตร ๑
English	SCMA 101 Mathematics I

2. Number of credits

2 (2–0–4) credits
(Lecture 2 – Laboratory 0 – Self-study 4 hours/week)

3. Program and category of the course

3.1 Program	Bachelor’s Degree Program in Science and Technology (International Program) EGCG, EGII, ENNM
3.2 Category of the course	Specific Course

4. Course responsible faculty member and instructors

4.1 Course responsible faculty member

Assoc. Prof. Dr. Nattapong Bosuwan
Department of Mathematics, Faculty of Science

4.2 Instructors

Assoc. Prof. Dr. Nattapong Bosuwan (NB)
E-mail: nattapong.bos@mahidol.ac.th
Asst. Prof. Dr. Watthanan Jaturiyapornchai (WJ)
E-mail: watthanan.jat@mahidol.ac.th

Department of Mathematics, Faculty of Science

5. Semester / Level of study

5.1 Semester	First Semester / First year
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5.2 Number of student	30-50 students
6. Pre-requisite	None
7. Co-requisites	None
8. Venue of study	Mahidol University, Salaya campus
9. Date of preparation/ latest revision	July 2022

Section 2 Goals and Objectives

1. Course goals

Calculus is an important tool used to describe continuous change. This introductory course intends to develop students' knowledge to explain fundamental knowledge of differential and integral calculus and apply calculus to the real-world problem.

2. Objectives of development/revision

2.1 Course objectives

Instructor expects students to acquire skills and knowledge as follows. Students should:

- 1) Demonstrate understanding of fundamental knowledge of calculus
- 2) Be able to calculate and use derivatives and integrals to solve assigned problems
- 3) Know various applications of the derivative and the integration.

2.2 Course-level learning outcomes: CLOs

After successful completion of this course, students should 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 real-world problems.
- 4) CLO4 **Demonstrate abilities to study and work both independently and collaboratively.**



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Section 3 Description and Implementation

1. Course description

ฟังก์ชัน ลิมิต ภาวะต่อเนื่อง อนุพันธ์ของฟังก์ชันพีชคณิต ฟังก์ชันลอการิทึม ฟังก์ชันเลขชี้กำลัง ฟังก์ชันตรีโกณมิติและฟังก์ชันตรีโกณมิติผกผัน การหาอนุพันธ์โดยปริยาย อนุพันธ์อันดับสูงกว่า ผลต่างเชิงอนุพันธ์ การประยุกต์การหาอนุพันธ์รูปแบบยังไม่กำหนดและหลักเกณฑ์โลปีตาล ฟังก์ชันของหลายตัวแปรและอนุพันธ์ย่อย ผลต่างเชิงอนุพันธ์รวมและอนุพันธ์รวม ปฏิยานุพันธ์และการหาปริพันธ์ เทคนิคการหาปริพันธ์ การประยุกต์การหาปริพันธ์

Functions; limits; continuity; derivatives of algebraic functions, logarithmic functions, exponential functions and trigonometric functions; implicit differentiation; higher-order derivatives; differentials; applications of differentiation; indeterminate forms and l' Hospital's rule; functions of several variables and partial derivatives; total differentials and total derivatives; antiderivatives and integration; techniques of

2. Credit hours/Semester

Lecture (hours)	Laboratory/Field trip/Internship (hours)	Self-study (hours)
30 hours/semester (2 hours x 15 weeks)	None	60 hours/semester (4 hours x 15 weeks)

3. Number of hours that the instructors provide individual counseling and guidance

Instructors provide academic counseling and guidance to individual at least 1 hour/week or upon request during office hours (Monday-Friday).



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Section 4 Development of Students' Learning Outcomes

1. Short conclusion on knowledge or skills that the course intends to develop students

After successful completion of this course, students should 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 real-world problems.
- 4) CLO4 Demonstrate abilities to study and work both independently and collaboratively.

2. Method to evaluate students' learning outcome in this course and to evaluate the learning outcomes specified in the standard

Course learning outcomes	Teaching strategies				Evaluation strategies	
	Interactive lecture	Effective questioning	Problem solving method	Problem based activities	Assignment, project, Q&A	Exam
CLO1	✓	✓			✓	✓
CLO2	✓	✓	✓	✓	✓	✓
CLO3	✓	✓	✓	✓	✓	✓
CLO4				✓	✓	



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Section 5 Teaching and Evaluation Plans

1. Teaching plan

Week	Topics	Number of hours		Teaching method /Media	Instructors
		In-class activity	Lab		
1	Functions and limits	2	0	Teaching method: Interactive lecture, effective questioning, Media: lecture notes, individual assignments	WJ
2	Continuity and derivatives	2	0		
3	Differentiation formulas	2	0		
4	Chain rule and power rule	2	0		
5	Derivatives of transcendental functions	2	0		
6	Implicit differentiation Higher-order derivatives Differentials	2	0		
7	applications of differentiation	2	0		
8	Indeterminate forms and l' Hospital's rule	2	0		
9	Midterm examination				
10	Functions of several variables, partial derivatives, total differentials, total derivatives	2	0	Teaching method: Interactive lecture, effective questioning Media: lecture notes, individual assignments, project	NB
11	Antiderivatives and indefinite integration	2	0		
12	Integrations	2	0		
13	Integration by parts	2	0		
14	Integrating rational functions	2	0		
15	Definite integrals	2	0		
16	Applications of integration	2	0		
17	Final examination				
	Total	30	0		



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2. Evaluation plan

2.1 Learning measurement and evaluation

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) Evaluation methods and weight

Course learning outcomes	Evaluation methods				Weight
	Assignments	Quizzes	Project	Exams	
CLO1: Explain fundamental knowledge of calculus such as limits, continuity, derivatives and integration.	2%	2%	-	6%	10%
CLO2: Evaluate limits, derivatives, and integrals by multiple methods.	6%	8%	-	46%	60%
CLO3: Apply calculus to real-world problems.	2%	-	10%	8%	20%
CLO4: Demonstrate abilities to study and work both independently and collaboratively.	5%	-	5%	-	10%
Total	15%	10%	15%	60%	100%

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
10	Demonstrates the required work for all questions.
8	Demonstrates the required work for most questions with lower than 25% mistakes.
6	Demonstrates the required work for many questions with lower than 50% mistakes.
4	Demonstrates the required work for some questions with more than 50% mistakes.
2	Demonstrates the required work for few questions with more than 75% mistakes.
0	No response

(2) Grading system



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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 justify 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
75– 100	A
70 – 74	B+
65 – 69	B
60 – 64	C+
55 – 59	C
50 – 54	D+
45 – 49	D
0 – 44	F

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

(3) Re-exam (if any)

None

3. Academic Appeal

Students may submit formal complaint or academic appeal directly to

International Education And Administration Unit, Division of Salaya Campus
Room SC1-116, SC1-Building, Faculty of Science (Salaya Campus), Mahidol University
999 Phuttamonthon 4 Road, A. Phuttamonthon, Nakhon Pathom 73170, Thailand
E-mail: scsim@mahidol.ac.th; Phone: + 66 2 4419820 ext. 1199.

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 6 Teaching Materials and Resources



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1. Textbooks and required documents

- 1) Anton H, Bivens I, Davis S. Calculus. 10th ed., New York: Wiley; 2012.
- 2) Lecture Note

2. Suggested Materials

- 1) James Stewart, Calculus: Early Transcendentals. 8th ed., Brooks Cole; 2015.

3. Electronic information and websites

- 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 7 Evaluation and Improvement of Course Management

1. Strategies for effective course evaluation by students

Evaluation of instructor and course through Mahidol University E-Evaluation System

2. Evaluation strategies in teaching methods

Evaluated by course evaluation by student (Mahidol University E-Evaluation System) and student performance (Section 5)

3. Improvement of teaching methods

Course responsible faculty member and instructors revise and improve strategies by reviewing of the output of the student evaluation. Review of turning-in individual work assignment quality as planned (Section 5) is used to adjust teaching method to enhance student's learning achievement.

4. Evaluation of students' learning outcomes

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. The evaluation results are peer-reviewed.

5. Review 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), student evaluation (Section 5), and formal complaint or academic appeal (if any) to determine further improvement plan.



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Appendix

Alignment between course and program

Table 1 Curriculum mapping of course learning outcomes (CLOs) to program learning outcomes (PLOs)

The PLOs in the table are the program learning outcomes of(title of the program).....

Course title: Mathematics I	Program learning outcomes							
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8
Course code: SCMA 101								

Table 2 Alignment between CLOs and PLOs

Course code: SCMA 101	Program learning outcomes							
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8
CLO1: Explain fundamental knowledge of calculus such as limits, continuity, derivatives and integration.								
CLO2: Evaluate limits, derivatives, and integrals by multiple methods.								
CLO3: Apply calculus to real-world problems.								
CLO4: Demonstrate abilities to study and work both independently and collaboratively.								

The course learning outcomes is introductory level (I).