



Program B.Sc. In Science and Technology
 Course Title Mathematics I
 Course Code SCMA101

Program Level ☒ Bachelor ☐ Graduate Diploma ☐ Master ☐ Higher Graduate Diploma ☐ Doctor
 Faculty of Science
 Department of Mathematics.

Course Specification

Section 1 General Information

1. Course Code and Title

In Thai วิชาคณิตศาสตร์ ๑
 In English SCMA 101 Mathematics I

2. Number of Credits

2(2-0-4) credits.
 (Theory 2 hrs. Practice 0 hrs. Self-Study 4 hrs./week)

3. Curriculum and Course Type

2.1 Program Bachelor's Degree Program in Science and Technology
 (International Program)
 EGBI, EGCG, EGII, ENNM, SCBM
 2.2 Course Type Specific Course ☒ Compulsory Course ☐ Elective Course

4. Course Coordinator and Instructor

4.1 Course Responsible Instructors Assoc. Prof. Dr. Nattapong Bosuwan and Dr. Chutchawon Weeranukunjit
 4.2 Instructors Assoc. Prof. Dr. Nattapong Bosuwan
 email: nattapong.bos@mahidol.ac.th
 Dr. Chutchawon Weeranukunjit
 e-mail: chutchawon.weeranukunjit@gmail.com

5. Semester/Class Level

5.1 Semester First Semester / Class Level First Year
 5.2 Number of Students Allowed Approximately 30 - 70 Students

6. Prerequisites

None



7. Co-requisites

None

8. Date of Preparation/Latest Revision of the Course Specifications

1 July 2026

Section 2 Course Goals and Course Description

1. Course Goals

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

2. Course Description

ฟังก์ชัน ลิมิต ภาวะต่อเนื่อง อนุพันธ์ของฟังก์ชันพีชคณิต ฟังก์ชันลอการิทึม ฟังก์ชันเลขชี้กำลัง ฟังก์ชันตรีโกณมิติและฟังก์ชันตรีโกณมิติผกผัน การหาอนุพันธ์โดยปริยาย อนุพันธ์อันดับสูงกว่า ผลต่างเชิงอนุพันธ์ การประยุกต์ การหาอนุพันธ์รูปแบบยังไม่กำหนดและหลักเกณฑ์ไลบ์ตาล ฟังก์ชันของหลายตัวแปรและอนุพันธ์ย่อย ผลต่างเชิงอนุพันธ์รวมและอนุพันธ์รวม ปริพันธ์และการหาปริพันธ์ เทคนิคการหาปริพันธ์ การประยุกต์ การหาปริพันธ์

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 solving integral and applications.

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

1. Course Objectives

Instructors expect 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. Course-level Learning Outcomes: CLOs

On completion of the course, the 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.

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 method	Problem based activities	Assignment, project, Q&A	Exam
CLO1	/	/			/	/
CLO2	/	/	/	/	/	/
CLO3	/	/	/	/	/	/
CLO4				/	/	



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Section 4 Lesson Plan and Evaluation

1. Lesson

Teaching Period	Topics/Details	Number of hours		Methods: Teaching Media	Lecturers
		Theory*	Practice**		
1	Functions and limits	2:00	0	Lecture: Lecture Note	NB & CW
2	Continuity and derivatives	2:00	0	Lecture: Lecture Note	NB & CW
3	Differentiation formulas	2:00	0	Lecture: Lecture Note	NB & CW
4	Chain rule and power rule	2:00	0	Lecture: Lecture Note	NB & CW
5	Derivatives of transcendental functions	2:00	0	Lecture: Lecture Note	NB & CW
6	Implicit differentiation, Higher-order derivatives Differentials	2:00	0	Lecture: Lecture Note	NB & CW
7	Applications of differentiation	2:00	0	Lecture: Lecture Note	NB & CW
8	Indeterminate forms and l' Hospital's rule	2:00	0	Lecture: Lecture Note	NB & CW
9	Midterm Examination				
10	Functions of several variables, partial derivatives, total differentials, total derivatives	2:00	0	Lecture: Lecture Note	NB & CW
11	Antiderivatives and indefinite integration	2:00	0	Lecture: Lecture Note	NB & CW
12	Integrations	2:00	0	Lecture: Lecture Note	NB & CW
13	Integration by parts	2:00	0	Lecture: Lecture Note	NB & CW
14	Integrating rational functions	2:00	0	Lecture: Lecture Note	NB & CW
15	Definite integrals	2:00	0	Lecture: Lecture Note	NB & CW
16	Applications of integration	2:00	0	Lecture: Lecture Note	NB & CW
17	Final Examination				
	Total hours of the entire semester	30:00	0:00		

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**

Learning Outcomes	Evaluation Method*		Weight (Percentage)
	Assignments	Exams	
CLO1: Explain fundamental knowledge of calculus such as limits, continuity, derivatives and integration.	4%	6%	10%
CLO2: Evaluate limits, derivatives, and integrals by multiple methods.	9%	56%	65%
CLO3: Apply calculus to real-world problems.	12%	8%	20%
CLO4: Demonstrate abilities to study and work both independently and collaboratively.	5%	--	5%
Total	30%	70%	100%

(2) Grading Rules

After completion of the evaluation process each student is assigned a criterion-referenced grade (as shown on 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
74 – 79	B+
68 – 73	B
60 – 67	C+
52 – 59	C
46 – 51	D+
40 – 45	D
0 – 39	F

(3) Measurement and Evaluation

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
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 5 Teaching Resources

1. Required Texts

- 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. 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>

Section 6 Evaluation and Improvement of Course Implementation



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1. Analysis and Evaluation of Course Implementation

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

2. Revision Process and Improvement Plan for Course Effectiveness

Course responsible faculty member and instructors revise and improve strategies by reviewing 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.

3. The self-assessment report of the course

Lecturers and Course responsible faculty members 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.



Appendix

1. Relations between the course and the program

Table 1 Relations between the course and the PLOs

Mathematic I	Program-Level Learning Outcomes (PLOs)							
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8
SCMA 101								

แสดงระดับการจัดการเรียนรู้ของรายวิชา ด้วยอักษร I, R, P หรือ M โดยนำข้อมูลของรายวิชาที่แสดงไว้ในหลักสูตร Curriculum Mapping มาแสดงให้สอดคล้องกัน

Table 2 Relation between CLOs and PLOs

SCMA101	Program-Level Learning Outcomes (PLOs)							
	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.								

ระบุว่าแต่ละ CLO สอดคล้องกับ PLO ในระดับ SubPLO ไດบ้าง โดยใช้หมายเลขของ SubPLO ใน column PLO ที่ตรงกัน เพื่อ แสดงความเชื่อมโยงให้ชัดเจน (Program-level Constructive Alignment)

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



SDG1 No poverty



SDG2 Zero Hunger



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- ☐ 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
 - ☐ SGD11 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