Program B.SC Industrial Mathematics and Data Science   Program Level   ☑ Bachelor ☐ Graduate Diploma ☐ Master ☐ Higher Graduate Diploma ☐ Doctor

Course Title   Fundamental Scientific Computing   Faculty of Science

Course Code   SCIM 105   Department of Mathematics

Course Specification

Section 1 General Information

1. Course Code and Title

In Thai   วทคอ ๑๐๕ การคำนวณทางวิทยาศาสตร์ขั้นพื้นฐาน

In English   SCIM 105 Fundamentals of Scientific Computing

2. Number of Credits   3 (3-0-6)

(Theory 3 hrs. Practice 0 hrs. Self-Study 6 hrs./week)

3. Curriculum and Course Type

3.1 Program   Bachelor of Science (Material Science and Engineering)

3.2 Course Type   Specific Course   ☑ Compulsory Course   ☐ Elective Course

4. Course Coordinator and Instructor

4.1 Course Responsible Instructor   Lect. Panyada Sriphathurat

4.2 Instructor   Lect. Panyada Sriphathurat

Room B203/19, B Building, Department of Mathematics,

Faculty of Science (Phayathai campus), Mahidol University

E-mail: panyada.sri@mahidol.ac.th

5. Semester/Class Level

5.1 Semester   2 / Class Level 2

5.2 Number of Students Allowed   Approximately 30 Students

6. Prerequisites

None

7. Co-requisites

None

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

20 December 2025

Section 2 Course Goals and Course Description

1. Course Goals

This course introduces some fundamental concepts of computer programming. Students will learn and practice how to design the input/output control statements, variables and constants declarations, assignment statements, conditional and iteration control statements. Students will be practiced how to solve some scientific and statistical problems, manage large volumes of data, and data representation by using concepts and techniques of computer program in this course. Basic Object Oriented Programming design will be also introduced.

2. Course Description

(In Thai)   การแสดงผลข้อมูลในคอมพิวเตอร์ การออกแบบอัลกอรึทึม ฟังก์ชัน ตัวดำเนินการทางคณิตศาสตร์และตรรกศาสตร์ โครงสร้างแบบทางเลือกและทำซ้ำ การออกแบบโปรแกรมเชิงวัตถุพื้นฐานและการนำเข้าหรือแสดงผลผ่านไฟล์ข้อมูล

(In English) Data representation in a computer; algorithm design; functions; mathematical and logical operators; selection and repetition control structures; basic Object-Oriented programming design and file I/O

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

1. Course Objectives

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

1) Describe basic concept of computer programming

2) Demonstrate understanding of a flow chart and algorithm design

3) Solve some real-world problems using Python

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2. Course-level Learning Outcomes: CLOs

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

1) CLO1   Comply with the regulations of the curriculum and the university. Have academic and professional ethics, do not copy or bring the work of others to be their own.

2) CLO2   Understand syntax and semantics of computer programming statements.

3) CLO3   Use computer programming concepts to create the source codes for solving scientific or statistical assigned problems.

4) CLO4   Communicate concepts of computer programming content in English

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 managements			Learning outcomes measurements		
	Interactive lecture	Practice	Problem solving activities	Individual assign-ment	Group Project	Written exam
CLO1		✓		✓	✓	
CLO2	✓	✓	✓	✓	✓	✓
CLO3	✓	✓	✓	✓	✓	✓
CLO4	✓	✓	✓		✓	✓

Section 4 Lesson Plan and Evaluation

1. Lesson Plan

Teach-ing period	Topics/Details	Number of hours		Methods: Teaching Media	Lec-turer
		Theory	Practice		
1	Data representation	3	0	Interactive lecture, Problem solv-ing demonstration, Discussion	Lect. Panya-da
2	Flowchart and Algorithm design	3	0		

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Teaching period	Topics/Details	Number of hours		Methods: Teaching Media	Lecturer
		Theory	Practice		
3	Introduction to Python, data types, variables and expression	3	0		
4	Mathematical and Logical operators, Conditional statements	3	0		
5	Loop control statements	3	0		
6	Loop control statements (cont.)	3	0		
7	Strings, List, Nested List, List Comprehension	3	0		
8	Tuple, Dictionary and Set	3	0		
9	Midterm Examination				
10	Functions	3	0	Interactive lecture, Problem solving demonstration, Discussion	Lect. Panyada
11	Functions (cont.)	3	0		
12	Basic OOP	3	0		
13	Basic OOP (cont.)	3	0		
14	File input/output	3	0		
15	Application to real world problem	3	0		
16	Project presentation	3	0	Project presentation	
	Final Examination				

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Teaching period	Topics/Details	Number of hours		Methods: Teaching Media	Lecturer
		Theory	Practice		
	Total hours of the entire semester	45	0		

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, the 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)
	Individual assignment	Group Project	Written exam	
CLO1 Comply with the regulations of the curriculum and the university. Have academic and professional ethics, do not copy or bring the work of others to be their own.	6%	2%	-	**8%**
CLO2 Understand syntax and semantics of computer programming statements.	12%	5%	25%	**42%**
CLO3 Use computer programming concepts to create the source codes for solving scientific or statistical assigned prob-	12%	5%	25%	**42%**

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lems.				
CLO4 Communicate concepts of computer programming content in English	-	3%	5%	**8%**
Total	30%	15%	55%	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.

Score	0-49	50-54	55-60	61-64	65-70	71-74	75-80	81-100
Letter grade	F	D	D+	C	C+	B	B+	A

(3) Measurement and Evaluation

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

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

None

3. Students' Appeal

According to Mahidol University's Regulations on Disciplinary Measures 2010, the student, who is subject to disciplinary punishment, has the right to appeal to the procedures out-lined here. In the case that student wishes to check on the scores, the student can contact the instructor directly or submit a formal complaint or academic appeal directly to

Educational Affair Division, Faculty of Science, Mahidol University

Address Room K-133, K Building, 1st floor (Phayathai Campus)

272 Rama VI Road, Ratchathewi District, Bangkok, Thailand, 10400

Opening Hours Mon. – Fri. (08.30 – 16.30) Closed on Public holidays

Telephone: +66 2201 5050-54, Fax: +66 2354 7143, E-mail: scedmu.133@gmail.com.

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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)   Lee, Kent D., Python Programming Fundamentals, 2014.

    2)   Python data science essentials : become an efficient data science practitioner by thoroughly understanding the key concepts of Python/ Alberto Boschetti, Luca Massaron, Birmingham : Packt, c2015.

    3)   Stax, O. (2024) *Introduction to python programming*. La Vergne: OPEN STAX TEXTBOOKS.

2. Suggested Materials

    1)   Handouts

    2)   PowerPoint presentations

    3)   Python Program (https://www.python.org)

    4)   Visual Studio Code Program (https://code.visualstudio.com)

3. Other Resources (if any)

1. Electronic information available through MU Library-subscribed databases

2. https://www.khanacademy.org

3. https://www.edx.org

4. https://www.coursera.org

5. https://medium.com/

6. https://towardsdatascience.com/

Section 6 Evaluation and Improvement of Course Implementation

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1. Analysis and Evaluation of Course Implementation

A. Data for Analysis

Analysis of students' learning outcome using student's total percentage of evaluation taken from 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

Opinions of instructors and students are gathered. Problems and obstacles are identified along with analyzing solutions to provide basic information for adjusting teaching techniques and content for teaching next time.

2. Revision Process and Improvement Plan for Course Effectiveness

When teaching ends, the person responsible for the course and/or the instructor must prepare MU5 within 30 days. Curriculum Management Committee will be taken into consideration at the meeting to determine the areas that should be improved in the next teaching.

3. The self-assessment report of the course

Teachers must prepare MU5 within 30 days.

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Appendix

1. Relations between the course and the program

Table 1 Relations between the course and the PLOs

Fundamentals of Scientific Computing	Program-Level Learning Outcomes (PLOs)					
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
SCIM105		I	I	I	I	

Table 2 Relation between CLOs and PLOs

SCIM105	Program-Level Learning Outcomes (PLOs)					
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
CLO1 Comply with the regulations of the curriculum and the university. Have academic and professional ethics, do not copy or bring the work of others to be their own.		2.1				
CLO2 Understand syntax and semantics of computer programming statements.			3.1 3.2			
CLO3 Use computer programming concepts to create the source codes for solving scientific or statistical assigned problems.			3.3	4.3	5.1 5.2 5.3	
CLO4 Communicate concepts of computer programming content in English				4.3		

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Table 3 PLOs and SubPLOs that the course is responsible for

PLOs	SubPLOs
PLO2 Make a fact-based mathematical model of trend prediction in industrial and business management to support making data-driven decision with the respect of data privacy, ethics, and protection.	2.1 Prepare quantitative and qualitative data relevant to a given situation using IT and complying with scientist ethics.
PLO3 Conduct an independent project and/or work in the field of industrial mathematics and data science with professional code of conduct.	3.1 Identify pain points of current issues in the field of industrial mathematics and data science and related fields based on fact in a holistic way.
	3.2 Plan a project from pain points of current issues in the field of industrial mathematics and data science and related fields.
	3.3 Independently carry out the project in the field of industrial mathematics and data science and related fields from pain points complying with professional code of conduct.
PLO4 Communicate concepts in the field of industrial mathematics and data science clearly and purposefully with respect to the target audience, in English, in both written and oral formats.	4.3 Present result of the finding in the field of industrial mathematics and data science effectively in English to general audience.
PLO5 Work with others to achieve team goals based on the roles and responsibilities of an industrial mathematician or a data scientist.	5.1 Participate in team's activities to get solutions in the field of industrial mathematics and data science.
	5.2 Respect different ideas and culture among team to enhance a healthy group-work environment.
	5.3 Accept team's consensus for good science practice outcomes.

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2. Rubric scoring

The score for each individual work is awarded according to the following rubric.

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 most questions with lower than 50% mistakes.
4	Demonstrates the required work for most questions with more than 50% mistakes.
2	Demonstrates the required work for most questions with more than 75% mistakes.
0	No response.

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
- ☐ SGD11 Sustainable Cities and Communities
- ☐ SDG12 Responsible Consumption and Production
- ☐ SDG13 Climate Action
- ☐ SDG14 Life Below Water
- ☐ SDG15 Life on Land

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☐ SDG16 Peace, Justice and Strong Institutions

☐ SDG17 Partnerships for the goals