Program: B.Sc. Bioinnovation

Course Title: Statistics

Course Code: SCMA 192

Degree ☑ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

Department of Mathematics

TQF 3 Course Specification

Section 1 General Information

1. **Course code and title**

   Thai   วทคณ ๑๙๒ สถิติศาสตร์

   English   SCMA 192 Statistics

2. **Number of credits**   3 (3–0–6) credits

   (Lecture 3 – Laboratory 0 – Self-study 6 hours/week)

3. **Program and category of the course**

   3.1 Program   Bachelor's Degree Program in Science and Technology

   (International Program)

   3.2 Category of the course   Specific Courses

4. **Course responsible faculty member and instructors**

   4.1 Course responsible faculty member

                              Asst. Dr. Kornkanok Bunwong

                              Department of Mathematics, Faculty of Science

                              Tel. 02-201-5340   e-mail: kornkanok.bun@mahidol.ac.th

   4.2 Instructors   Dr. Watthanan Jatuviriyapornchai

                              Department of Mathematics, Faculty of Science

                              Tel. 02-201-5356   e-mail: watthanan.jat@mahidol.ac.th

5. **Semester / Level of study**

   5.1 Semester   Second Semester/ 2021

   5.2 Number of student   30 students

6. **Pre-requisite**   None

7. **Co-requisites**   None

8. **Venue of study**   Online: Cisco WebEx or

   Onsite: Faculty of Science, Mahidol University, Salaya campus

9. **Date of preparation/**   December 2021

   latest revision

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Section 2 Goals and Objectives

1. **Course goals**

   Student will be able to demonstate the understanding and skills in analysing data by descriptive and inferential statistical methods. Student will learn the statistical foundation for subsequent courses and experience various statistical knowledge for their future careers.

2. **Objectives of development/revision**

   2.1 Course objectives

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

   1. Explain probability concepts and descriptive statistics.

   2. Choose appropriate estimation and hypothesis testing for a given data set using interential statistics.

   2.2 Course-level learning outcomes: CLOs

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

   1. CLO1 Explain fundamental concepts of probability and statistical analysis.

   2. CLO2 Compute probability of events, probability distributions and confidence interval.

   3. CLO3 Select a suitable estimation and hypothesis testing for a given set of data.

   4. CLO4 Apply statistical methods in real world problems.

Section 3 Description and Implementation

1. **Course description**

   แนวคิดความน่าจะเป็นและการแจกแจงความน่าจะเป็นและการประยุกต์กับเหตุการณ์หลากหลาย   การตีความ ค่าสถิติ สถิติพรรณนา การชักตัวอย่างเพื่อให้ได้ตัวแทนที่ดีของประชากรและการนำไปใช้ในการประมาณค่าและการ ทดสอบสมมุติฐาน การนำเสนอบทความหรืองานวิจัยที่ตีพิมพ์ตามความสนใจของกลุ่มนักศึกษาโดยวิธีเชิงสถิติ

Program...

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Concepts and applications of probability and probability distributions in various events; interpretation of statistical values; descriptive statistics; sampling for good representatives of populations and its use in estimation and hypothesis testing; presentation of article or published research according to groups of student's interest by statistical methods

2. Credit hours/Semester

Lecture (hours)	Laboratory/Field trip/Internship (hours)	Self-study (hours)
45 hours (3 hours / week)	None	90 hours (6 hours / week)

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 concepts of probability and statistical analysis.
2. CLO2 Compute probability of events, probability distributions and confidence interval.
3. CLO3 Select a suitable estimation and hypothesis testing for a given set of data.
4. CLO4 Apply statistical methods in real world problems.
5. CLO5 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	Problem based activities	Discussion	Assignment	Exams	Q&A	Project
CLO1	✓	✓	✓	✓	✓	✓	✓
CLO2	✓	✓	✓	✓	✓	✓	✓
CLO3	✓	✓	✓	✓	✓	✓	✓
CLO4	✓	✓	✓	✓	✓	✓	✓
CLO5			✓			✓	✓

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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	Introduction to Statistics	3	0	Interactive & problem-based learning, Assignments	Dr. Watthanan Jatuviriyapornchai
2	Descriptive statistics	3	0		
3	Probability	3	0		
4	Conditional probability	3	0		
5	Random variables	3	0		
6	Probability distributions	3	0		
7	Discrete distributions	3	0		
8	Continuous distributions	3	0		
9	Midterm examination				
10	Sampling distributions	3	0	Interactive & problem-based learning, Assignments, Discussion	Dr. Watthanan Jatuviriyapornchai
11	Confidence intervals	3	0		
12	Hypothesis testing (I)	3	0		
13	Hypothesis testing (II)	3	0		
14	Project: Data analysis (I)	3	0		
15	Project: Data analysis (II)	3	0		
16	Project Presentation	3	0		
17	Final examination				
	Total	45	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 (%)
	Assignment	Q&A	Exams	Project	
CLO1: Explain fundamental concepts of probability and statistical analysis.	5%		10%		15%
CLO2: Compute probability of events, probability distributions and confidence interval.	5%		18%	2%	25%
CLO3: Select a suitable estimation and hypothesis testing for a given set of data.	5%		17%	3%	25%
CLO4: Apply statistical methods in real world problems.	5%		5%	10%	20%
CLO5: Demonstrate abilities to study and work both independently and collaboratively.		10%		5%	15%
Total	20%	10%	50%	20%	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

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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

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
80– 100	A
75– 79	B+
70 – 74	B
65 – 69	C+
60 – 64	C
55 – 59	D+
50 – 54	D
0 – 49	F

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

(3) Re-exam (if any)

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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

1. Textbooks and required documents

1. Walpole, R.E. et al. **Probability & Statistics for Engineers & Scientists**, 9th edition, Pearson 2016.

2. Weiss, Neil A., **Introductory statistics**, 10th ed., Addison-Wesley; 2015.

3. De Veaux, R. **Stats: Data and Models**, 5th ed., Pearson 2019

2. Suggested Materials

1. Johnson, Richard A., **Statistics: principles and methods**, 8th ed., John Wiley & Sons; 2019.

2. Hogg, Robert V., **Probability and statistical inference**, 9th ed., Pearson; 2014.

3. Mendenhall, William., **Probability and statistics**, 15th ed., Cengage Learning; 2019.

3. Electronic information and websites

1. khanacademy.org

2. wikipedia.org

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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 the international committee for undergraduate study of the Industrial Engineering Department.

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.