



สภามหาวิทยาลัยมหิดล

ในคราวประชุมครั้งที่ 545

เมื่อวันที่ 19 มิ.ย. 2562

ได้อนุมัติการปรับปรุงหลักสูตรนี้แล้ว

(นายสมชาติ พนาเกษม)  
ผู้อำนวยการกองบริหารการศึกษา  
11ก.ด.62



Bachelor of Science Program  
in  
Industrial Mathematics and Data Science  
(International Program)

Department of Mathematics Faculty of Science  
Mahidol University

Revised Program of Academic Year 2019



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## Table of Contents:

	Page
<b>Section 1</b> General Information	(1)
<b>Section 2</b> Specific Data of the Program	(8)
<b>Section 3</b> Educational Management System, Program Implementation, and Structure	(11)
<b>Section 4</b> Program-level Learning Outcomes, Teaching Methods, and Evaluation	(86)
<b>Section 5</b> Student Evaluation Criteria	(89)
<b>Section 6</b> Instructor's Professional Development	(92)
<b>Section 7</b> Quality Assurance	(93)
<b>Section 8</b> Evaluation, Improvement, and Implementation of the Program	(100)
<b>Appendix</b>	
<b>Appendix 1</b> Mahidol University Degree Profile	(105)
<b>Appendix 2</b>	
<b>2.1</b> Program-level Learning Outcomes and Sub Program-level Learning Outcomes	(113)
<b>2.2</b> Relationship between Program-level Learning Outcomes and MU Graduate Attributes	(115)
<b>2.3</b> Goals for each academic year for Bachelor of Science Program in Industrial Mathematics and Data Science	(116)
<b>Appendix 3</b> Table Showing the Comparison between the PLOs and the National TQF level 2	(117)
<b>Appendix 4</b> Curriculum Mapping	(121)
<b>Appendix 5</b> Major Improvements of the Bachelor of Science Program in 2014 (International Program) Issued in Academic Year 2014	(133)

<b>Appendix 6</b>	Details of the instructors responsible for the program, regular instructors, and special instructors	(141)
<b>Appendix 7</b>	Mahidol University Regulations on Diploma and Undergraduate Studies of the Year B.E. 2552-2560 and the affiliation's educational announcements/regulations	(157)
<b>Appendix 8</b>	Order of Curriculum Development Committee or Curriculum Screening Procedure Committee or Person In-charge	(195)
<b>Appendix 9</b>	MOUs documents made with agencies inside and outside Thailand	(199)





Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

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## Program Specification

### Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Revised Program of Academic Year 2019

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Name of Institution Mahidol University

Campus / Faculty / Department Faculty of Science / Department of Mathematics

## Section 1 General Information

### 1. Code and Program Title

In Thai : หลักสูตรวิทยาศาสตรบัณฑิต สาขาวิชาคณิตศาสตร์อุตสาหกรรมและวิทยาการข้อมูล  
(หลักสูตรนานาชาติ)

In English : Bachelor of Science Program in Industrial Mathematics and Data Science  
(International Program)

### 2. Degree Offered and Field of Study

In Thai Full Name : วิทยาศาสตรบัณฑิต (คณิตศาสตร์อุตสาหกรรมและวิทยาการข้อมูล)  
Abbreviation : วท.บ. (คณิตศาสตร์อุตสาหกรรมและวิทยาการข้อมูล)

In English Full Name : Bachelor of Science (Industrial Mathematics and Data Science)  
Abbreviation : B.Sc. (Industrial Mathematics and Data Science)

### 3. Major Subject (If Applicable) None



#### 4. Total Credits Required

**Plan A:** no less than 120 credits of courses taken while studying at Faculty of Science, Mahidol University

**Plan B:** no less than 84 credits of courses taken while studying at Faculty of Science, Mahidol University and no less than 300 credits of courses taken while studying at Curtin University

#### 5. Curriculum

**5.1 Degree Level** Bachelor's Degree, four-year program

**5.2 Type of the Program** Academic program

**5.3 Language Recruitment** English

**5.4 Admission** Thai and International Students

**5.5 Collaboration with Other Institutions** Curtin University of Technology, Perth Australia

**5.6 Degree Offered** Plan A: one degree (B.Sc. in Industrial Mathematics and Data Science offered by Mahidol University)  
Plan B: double degree (one B.Sc. in Industrial Mathematics and Data Science from Mahidol University and B.Sc. in Industrial Optimisation or B.Sc. in Data Science from Curtin University)

#### 6. Record of Program Status and Approval / Endorsement

6.1 Program starts: Since 1<sup>st</sup> semester in academic Year 2015

6.2 Revised program for 1<sup>st</sup> semester in academic year 2019. The program was updated from the last revised version in 2017.

6.3 The SC Faculty curriculum screening procedure committee approved the program in its meeting No. 6/2018 on December 12, 2018.

6.4 The MU curriculum screening procedure committee approved the program in its meeting No. 4/2019 on April 4, 2019.

6.5 The Deans approved the program in its meeting No. 11/2019 on June 12, 2019.

6.6 The MU council approved the program in its meeting No. 545 on June 19, 2019.



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

## 7. Expected Date for the Implementation of Program under the Thai Qualifications Register (TQR) Record

The program will be ready to publicize its quality and standards according to National Qualifications Framework for Higher Education in Thailand in academic year 2021 (2 years after program starts).

## 8. Career Opportunities after Graduation

Graduates of the Bachelor of Science Program in Industrial Mathematics and Data Science can find employment in

- 8.1 **Business and Industry:** such as data scientist, data analyst, information technology planners, investment planner, logistics, warehouse management and pricing, project analyst, project manager, scheduler, supply chain manager.
- 8.2 **Computer professionals:** such as computer programmers, software developer, and system analysts and designer.
- 8.3 **Information professionals:** such as information technologist, Statistician, policy analyst, project feasibility study, quality assurance engineer, and risk management.
- 8.4 **Education:** such as teacher, teacher assistant, and academician.

## 9. Name, Surname, Identification Number, Academic Position, Educational Qualifications, and Academic Works published in the past 5 years of the Instructors Responsible for the Program

No.	Name-Surname	Academic Position	Degree (field)/ Institute/ Graduation year	Most recent Academic Works in 5 years
1	Mr. Meechoke Chooduang National ID number 3-1014-0097X-XXX	Lecturer	- Ph.D. (Applied Mathematics) Curtin University of Technology, Australia : 2004 (B.E.2547) - M.Sc. (Computer Science) Asian Institute of	Irwan Rahadi, <b>Meechoke Chooduang</b> , Arunsri Chooduang, Moltira Promkan, Phantip Vattanaviboon, Vichanan Yamkamon, Normal and Hypochromic Red Blood Cells (RBCs) Detection by Using Image Processing., Proceeding

Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

No.	Name-Surname	Academic Position	Degree (field)/ Institute/ Graduation year	Most recent Academic Works in 5 years
			Technology, Thailand: 1997 (B.E.2540) - B.Sc. (Mathematics) Mahidol University, Thailand : 1994 (B.E.2537)	the 23rd Annual Meeting in Mathematics AMM2018, 3-5 May 2018, page 442-447.
2	Ms. Umaporn Nuntaplook National ID number 3-5201-0006X-XXX	Lecturer	- Ph.D. (Computational and Applied Mathematics) Old Dominion University, Norfolk, Virginia, USA : 2013 (B.E.2556) - M.Sc. (Computational and Applied Mathematics) Old Dominion University, Norfolk, Virginia, USA : 2008 (B.E.2551) - B.Sc. (Mathematics) Mahidol University, Thailand : 2005 (B.E.2548)	<b>Nuntaplook U</b> , Adam JA., Shape resonances of the transverse magnetic mode in a spherically stratified medium., Int J Appl Phys Math. 2018;8(3):18-30.
3	Mr. Wasin Padungwech National ID number 1-1303-0009X-XXX	Lecturer	- Doctor of Philosophy (Mathematics), Cardiff University, 2018 (B.E.2561) - Bachelor of Arts and Master of Mathematics, University of Cambridge, 2013 (B.E.2556)	Alrajhi K., Thompson J., <b>Padungwech W.</b> (2018) A Heuristic Approach for the Dynamic Frequency Assignment Problem. In: Chao F., Schockaert S., Zhang Q. (eds) Advances in Computational Intelligence Systems. UKCI 2017. Advances in Intelligent Systems and

Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

No.	Name-Surname	Academic Position	Degree (field)/ Institute/ Graduation year	Most recent Academic Works in 5 years
				Computing, vol 650. Springer, Cham
4	Mr. Nathnarong Khajohnsaksumeth National ID number 3-1506-0066X-XXX	Lecturer	<ul style="list-style-type: none"> <li>- Ph.D. (Mathematics and Statistics) Curtin University of Technology, Australia : 2014 (B.E.2557)</li> <li>- M.Sc. (Industrial Mathematics) University of Kaiserslautern, Germany : 2009 (B.E.2552)</li> <li>- B.Sc. (Mathematics) Mahidol University, Thailand : 2003 (B.E.2546)</li> </ul>	A. Charoenloedmongkhon, B. Wiwatanapataphee, W. Sawangtong, <b>N. Khajohnsaksumeth</b> , and L. Giannini, Numerical simulation of air-bulk solid flows in a silo with inserts., Advances and Applications in Fluid Mechanics. 19 (3): pp. 643-667, 2016.
5	Mr. Wasakorn Laesanklang National ID number 1-5099-0027X-XXX	Lecturer	<ul style="list-style-type: none"> <li>- Ph.D. (Computer Science) The University of Nottingham, United Kingdom : 2017</li> <li>- M.Sc. (Computational Science) Chulalongkorn University, Thailand : 2010</li> <li>- B.Sc. (Mathematics) Chiang Mai University, Thailand : 2008</li> </ul>	Binhui Chen, Rong Qu, Ruibin Bai, <b>Wasakorn Laesanklang</b> , A hyper-heuristic with two guidance indicators for bi-objective mixed-shift vehicle routing problem with time windows. Applied Intelligence, Vol 48, Issue 12, pp. 4937 - 4959, December 2018.

## 10. Study Site Location

Mahidol University, Payatai Campus, Ratchathewi District, Bangkok, Thailand.



## **11. External Factors and/or Development Considered in Program Planning**

### **11.1 Economic Circumstances / Development**

The curriculum is revised according to the 12<sup>th</sup> National Economic and Social Development Plan (2017-2021), especially the policies to pull the country out of the middle-income trap and to promote Thailand 4.0. In order to cope with the challenges of economic and social development dynamic, natural resource depletion, and environmental crises, building human capital for science, technology, and innovation readiness are the strategy keys of successes. Consequently, the curriculum is planned to produce the science and technology personnel who are ready for any workplace in fields of industrial optimization and data science.

### **11.2 Social and Cultural Circumstances / Development**

Technological advances in communication have changed the face and the pace of the world. It provides convenience and speeds up information delivery. However, not all massive information can be trusted. To balance two sides of the same coin, the curriculum is planned to produce fully-equipped graduates with intercultural communications, analytical skills, and creative ideas which are required as important skills for the 21<sup>st</sup> century.

## **12. Impacts of Factors in 11.1 and 11.2 on Curriculum Development and Related Institutional Missions**

### **12.1 Curriculum Development**

To develop the revised curriculum effectively, aforementioned changes and developments in science, technology, and the socio-economic structure must be taken into consideration. Consequently, the students must be prepared with 21<sup>st</sup> century knowledge and skills in order to be ready for change, transformation, and adaptation. The curriculum is developed under the guidelines of Thai Quality Framework (TQF), focusing on the learning areas including ethics, moral, knowledge, cognitive skills, interpersonal skills, responsibility, numerical analysis, communication, and information technology skills based on the guidelines of AUN-QA focusing on the expected learning outcome.



## 12.2 Related Institutional Missions

The mission of Mahidol University is to excel in health, sciences, arts, and innovation with integrity for the betterment of Thai society and the benefit of mankind. Thus the revised curriculum aims to provide outcome-based education, in order to produce graduates who are able to develop their potential of using undergraduates' knowledge and skills. The graduates are expected to acquire MU graduate attributes; i.e., T-shape breadth and depth, globally talented, socially contributing and entrepreneurially minded (see Appendix 2.2 page 115).

## 13. Relations to Other Programs Offered by Other Faculties / Departments in the Institution

For the courses in General Education, students in the program have the opportunity to study in the following subjects. These courses are taught by other departments or other faculties.

credits (theory – lab/practice – self-study)

SHSS 103	Man and Society	2 (2-0-4)
SHHU 133	Rhetoric for Leadership	2 (2-0-4)
LAEN 180	English for Academic Purposes I	2 (2-0-4)
LAEN 181	English for Academic Purposes II	2 (2-0-4)
LAEN 338	Effective Presentation in English	2 (1-2-3)
LAEN 341	Situational-based Communicative English	2 (1-2-3)
SCBE 100	Wonder of Life	3 (3-0-6)
SCGI 110	Chemistry in Everyday Life	3 (3-0-6)

For free elective courses, there are some courses those give students the opportunity to choose their own or interested. Students can choose from all faculties offered at the university. There are some conditions of the courses those can be used as the free elective courses.

### Coordination

The Program Director will coordinate with other relevant programs/faculty under the university regulations.



## Section 2 Specific Data of the Program

### 1. Philosophy, Rationale, and Objectives of the Program

#### 1.1 Program Philosophy

Our primary focus is on educating the students to attain academic achievement through learning-centered education, outcome-based education, and constructivism. To become a wisdom graduate, learners combine what they have learned so far with the new knowledge, and with experiential learning activities. While the role of a lecturer in the learning process is a shift from an information provider to a coach or a facilitator creating challenge-based activities.

#### 1.2 Program Objectives

##### 1.2.1 Program Objectives

Teaching to produce graduates to have the following qualifications.

1. Knowledge, understanding, and skills in optimization techniques and Mathematics, which can be applied to work in various stages in industry.
2. Knowledge, understanding and skills that combine both statistical computer knowledge with programming and the use of appropriate software to manage and interpret the meaning of observed big data to predict the related future events.
3. Capable ability to analyze and apply mathematical knowledge to other related sciences and can solve the problem effectively.
4. Can communicate and work with others and use the technology properly.
5. Morality, ethics, and responsibility.
6. Good attitude and readiness to develop themselves.

##### 1.2.2 Program-level Learning Outcomes: PLOs

At the end of the program, successful students will be able to:

1. PLO1 Make an operational decision logically and systematically to solve industrial and business management problems by applying appropriate optimization techniques.
2. PLO2 Apply data analysis and data science strategy for trend prediction to support making data driven decision with the regard to data privacy, ethics, and protection.





3. PLO3 Create an independent project in industrial mathematics and data science based on related-concepts with professional code of conduct.
4. PLO4 Communicate industrial- and data science related information clearly and purposefully with target audiences in English, in both written and oral forms with appropriate technologies in an organized manner.
5. PLO5 Work independently and coordinate with others to achieve team goals based on roles and responsibilities of an industrial mathematician and data scientist.

## 2. Improvement Plan

Improvement / Modification Plan	Strategy	Evidence / Indicators
1. To revise curriculum continuously according to social and economic changes including labor market demands	<ol style="list-style-type: none"><li>1. Develop a new outcome-based curriculum based on stakeholders' inputs</li><li>2. Obtain constants feedbacks on the characteristics, knowledge and skills of graduates to improve upon the curriculum</li></ol>	<ol style="list-style-type: none"><li>1. TQF 5, TQF 7</li><li>2. Summary of stakeholders' input</li><li>3. Academic meeting report, Employers' Satisfaction Survey results, Students' Teaching Evaluation, and a summary of focus group research with students, parents, and alumni</li></ol>
2. To ensure the quality of teaching and learning activities	<ol style="list-style-type: none"><li>1. Enhance a faculty's teaching techniques to promote practical learning through faculty trainings and seminars</li><li>2. Monitor and improve upon a faculty's teaching performance</li></ol>	<ol style="list-style-type: none"><li>1. Faculty's training needs survey, and a summary of new teaching techniques deployment</li><li>2. Teaching evaluation records with continuous improvement goal</li></ol>



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

Improvement / Modification Plan	Strategy	Evidence / Indicators
3. To improve students' soft skills	1. Encourage students' participation in extra-curricular activities through student clubs and academic activities organized by external organizations	1. Activity transcript, certifications and awards



## Section 3 Educational Management System, Program Implementation, and Structure

### 1. Educational Management System

#### 1.1 System

Semester system

#### 1.2 Summer Sessions

According to Mahidol University Regulations on Diploma and Undergraduate Studies of the Year B.E. 2552-2560 and SC's Announcement of the Year B.E. 2553, the summer session is not compulsory session. For Faculty of Science, each course offered in the summer session must have at least 15 failing students.

#### 1.3 Credit Equivalence Ratio (In Reference to Semester System)

None

### 2. Program Implementation

#### 2.1 Academic Calendar

In regular management, the offered courses are scheduled during normal working hours (08:30 a.m. – 04:30 p.m.) on weekday (Monday – Friday). However, teaching and learning outside of normal working hour are possible with appropriate management.

Semester: 1<sup>st</sup> Semester : August-December

2<sup>nd</sup> Semester : January-May

Academic calendar is subject to change in process by the University Council.

#### 2.2 Admission Requirements

##### Mahidol Admission Requirements for Plan A and Plan B

2.2.1 Graduate from Mathayom Suksa 6 of Secondary Education in Thailand (M.6), or high school, or its equivalent certificate or studying in the final term of grade 12 or M. 6, or equivalent, following the admission regulation of the Office of the Higher Education Commission and/or the regulation of direct admission of Mahidol University or other rules and regulations for special admission approved by Mahidol University Council.

2.2.2 The applicant must pass the entrance examination in Mathematics given by the Department of Mathematics, Faculty of Science, Mahidol University



2.2.3 The applicant must demonstrate his/her proficiency in listening, speaking, reading, and written English by passing an English examination given by the Department of Mathematics, Faculty of Science, Mahidol University, or provide evidence of an English test score: IELTS  $\geq 6.0$ , TOEFL (CBT)  $\geq 173$ , MU-TEST  $\geq 45$ , SAT  $\geq 400$ , or other equivalent test scores within 2 years of the application date.

2.2.4 No health or mental problems that could affect the studying

2.2.5 It is the discretion of the Programme Committee to make the final decision in cases where the above conditions are not met.

### **Curtin Admission Requirements for Plan B**

B.Sc. student in Industrial Mathematics and Data Science who would like to study at Curtin University to develop learning experience in the field of industrial mathematics and data science in a multicultural-international environment during the 3<sup>rd</sup> and 4<sup>th</sup> years of study has to meet the following criteria:

2.2.6 Applicants who are enrolled at Mahidol in a Bachelor of Science (Industrial Mathematics and Data Science) program will be deemed eligible for entry to a Curtin Bachelor of Science (Data Science) program based on successful completion of 75 credits out of the 120 credits of the Mahidol Bachelor of Science (Industrial Mathematics and Data Science) program including the required Mahidol University units listed in Table 2.2a, plus demonstration of English competency as specified in Table 2.2c.

2.2.7 Applicants who are enrolled at Mahidol in a Bachelor of Science (Industrial Mathematics and Data Science) program will be deemed eligible for entry to a Curtin Bachelor of Science (Industrial Optimisation) program based on successful completion of 75 credits out of the 120 credits of the Mahidol Bachelor of Science (Industrial Mathematics and Data Science) program including the required Mahidol University units listed in Table 2.2b, plus demonstration of English competency as specified in Table 2.2c.



Table 2.2a (B.Sc. Data Science from Curtin University)

Years 1&2	Curtin Unit No.	Curtin Unit	Equivalent Mahidol Unit	Credits
Exempt	STAT1003	Introduction to Data Science	Introduction to Data Science	25
	COMP1005	Fundamentals of Programming	Introduction to Scientific Computing	25
	STAT1001 STAT1002	Statistical Probability Statistical Data Analysis	Statistical Data Analysis I Statistical Data Analysis II	25
	MATH1016 MATH1015	Calculus 1 Linear Algebra 1	Mathematics I Mathematics II	50
	ISYS1001	Database Systems	Database management	25
	COMS1000	Science communications	Science communications	12.5
	STAT1000	Regression and non- Parametric Inference	Statistical Data Analysis III	12.5
	MATH2015	Mathematical Computing	Numerical Analysis	25
	ISEC2001	Fundamental Concepts of Data Security	Data Communications	25
	STAT2005	Computer Simulation	Simulation modelling	25
	MEDA3000	Mobile, Locative and Ubiquitous Media	Mobile, Locative and Ubiquitous Media	25
	COMP1002	Data Structures and Algorithms	Data Structures in Mathematics	25
Total Credits				300

NOTE: Curtin University reserves the right to change the internal composition of any course to ensure learning outcomes retain maximum relevance. Any changes to the internal composition of a course will protect the right of students to complete the course within the normal timeframe and will not result in additional cost to students through a requirement to undertake additional units.



Table 2.2b (B.Sc. Industrial Optimisation from Curtin University)

Years 1&2	Curtin Unit No.	Curtin Unit	Equivalent Mahidol Unit	Credits
Exempt	MATH1015	Linear Algebra 1	Mathematics I	150
	MATH1016	Calculus 1	Mathematics II	
	MATH1006	Mathematical Modelling	Linear Algebra	
	MATH2009	Calculus 2	Calculus of Several Variables	
	MATH2010	Linear Algebra 2	Advanced Calculus	
	Math2011	Operations Research	Partial Differential Equations for Engineers and Scientists Operations Research	
	NPSC1001	Scientific Computing	Introduction to Scientific Computing	50
	MATH2015	Mathematical Computing	Introduction to Mathematical Software Numerical Analysis	
	STAT1002	Statistical Data Analysis	Statistical Data Analysis I	37.5
	STAT1001	Statistical Probability	Statistical Data Analysis II	
	STAT1000	Regression and non- Parametric Inference	Statistical Data Analysis III	
	COMS1000	Science Communications	Science Communications	12.5
	INDE2000	Supply Chain Modelling and Optimisation	Supply Chain Modelling and Optimization	25
		Elective Unit	<b>Completion of one of the following units:</b>	25
			Current Moral Issues and Logical Thinking	
			Technology in Daily Life	
		<b>Total Credits</b>		<b>300</b>



*NOTE: Curtin University reserves the right to change the internal composition of any course to ensure learning outcomes retain maximum relevance. Any changes to the internal composition of a course will protect the right of students to complete the course within the normal timeframe and will not result in additional cost to students through a requirement to undertake additional units.*

Table 2.2c

IELTS Academic (International English Language Testing System)	
Writing and Speaking	6.0
Reading and Listening	6.0
Overall	6.0

*\*NOTE: Articulation Students are responsible for meeting Australian Department of Immigration and Border Protection English Language requirements for visa entry to Australia, which may, from time to time, be different to the level of English Language proficiency required for entry to a Curtin degree program and which may vary from time to time.*

### 2.3 Limitations for Certain Groups of Newly Enrolled Students/ 2.4 Strategies to Resolve Students' Limitations in 2.3

Limitations of Newly Enrolled Students	Strategies to Resolve Students' Limitations
1. Students have problems adjusting to the university teaching system.	1. There is a system of advisors to advise students on teaching and learning.
2. Students may not have enough English skills, Mathematics, and Statistics background required to study in the program.	2. Department of Mathematics, Faculty of Science, Mahidol University will provide preparation courses in mathematics and English for some 1 <sup>st</sup> year students who want to improve themselves before the first semester start in every academic year. 3. There is a system of advisors to advise students on teaching and learning.



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

## 2.5 A Five-year Plan for Admission and Graduation

Academic Year	2019	2020	2021	2022	2023
First-year student	40	40	40	40	40
Second-year student	-	40	40	40	40
Third-year student	-	-	40	40	40
Fourth-year student	-	-	-	40	40
Cumulative number	40	80	120	160	160
Number of expected graduates	-	-	-	-	40

## 2.6 Budget Plan

### Investment

#### Plan A

##### 2.6.1 Breakeven/worthiness

- Income per person/throughout the program: 586,000 Baht
- Expenses per person/ throughout the program: 512,427 Baht
- The smallest number of students above the breakeven point: 14
- The expected number of students: 30-40





## 2.6.2 Budget and costs for producing graduates (baht per year)

### 1) Costs in producing graduates

<b>Variable cost per student (V)</b>		
Money allocated to faculty / university ( 10 % )		14,650.00
<b>Total variable cost per student (V)</b>		14,650.00
<b>Fixed cost for operations (FC<sub>o</sub>)</b>	<b>Share cost</b>	<b>Program Cost</b>
<b>Educational Staff</b>		
Compensation for teachers who teach with the regular programme( 1,380 Hours.)	1,200,000.00	300,000.00
Teacher compensation (Special lecturer, special remuneration)( 1,200 Hours.)		684,000.00
Teacher compensation for basic adjustment courses	72,000.0	18,000.0
Teaching assistant compensation (TA) made in conjunction with the normal programme (10 persons)	675,000.00	75,000.00
Remuneration for support staff for this project		280,000.0
<b>Equipments</b>		
<b>Depreciation of the place used in teaching and learning with the normal programme</b>		
1. Cost of improvement	250,000.00	277,777.78
2. Maintenance fee	125,000.0	13,888.89
<b>Depreciation of equipment used in teaching and learning with the normal programme</b>		
1. Photocopy Machines	8,000.0	888.8
<b>Depreciation of equipment used in teaching and learning in this programme</b>		
1 Projectors and screens	95,000.00	10,555.5
2. Computers	48,000.0	5,333.33
3. Audio system	120,000.00	13,333.33
4. Laboratory expenses	160,000.00	17,777.78
5. Maintenance fee	240,000.0	26,666.67



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

<b>Consumption of supplies in teaching and learning</b>		
1. Projector bulbs	35,800.00	3,977.78
2. Paper, Office supplies	50,000.00	9,000.0
<b>Building</b>		
Water Cost	42,000.0	7,777.78
Electricity Cost	420,000.00	77,777.78
<b>Total Fixed Cost for Operations(FCo)</b>		<b>1837,255.56</b>

## 2) Income from tuition fee and others

<b>Estimated income per student</b>		
Registration fee		
Credit fee		94,500.00
Educational support fee		40,000.00
Language preparation course fee (per 80% of the total number of students)		6,000.00
Sciences preparation course fee (per 80% of the total number of students)		6,000.00
<b>Total Income per student (P)</b>		<b>146,500.00</b>
<b>Total income for programme (per year)</b>		<b>439,500.00</b>
The smallest number of students above the breakeven point		14
The expected number of students in each academic year		30

## Plan B

As the students in Plan B will share the class with students in Plan A during the first- and second-year study at Faculty of Science, Mahidol University, so the budget and cost are equivalent. The students who will study at Curtin University will have to pay for approximately 15,700 \$AUD per semester for tuition fee.



## 2.7 Academic System

### (Plan A)

- ☒ In Class
- ☐ Distance Learning Mainly Through Printed Materials
- ☐ Distance Learning Mainly Through Broadcast Media
- ☐ Distance Learning Mainly Through Electronic Media (E-learning)
- ☐ Distance Learning Through the Internet
- ☐ Others (Please Specify)

### (Plan B)

- ☒ In Class
- ☐ Distance Learning Mainly Through Printed Materials
- ☐ Distance Learning Mainly Through Broadcast Media
- ☐ Distance Learning Mainly Through Electronic Media (E-learning)
- ☐ Distance Learning Through the Internet
- ☐ Others (Please Specify)

## 2.8 Credit Transfer and Cross-institutional Enrollment (If any)

According to Mahidol University Regulations on Diploma and Undergraduate Studies of the Year B.E. 2552-2560

## 3. Curriculum and Faculty Members

### 3.1 Curriculum

#### 3.1.1 Total Number of Credits

For Plan A: The required number of credits in total must not be less than 120 credits of courses taken while studying at Mahidol University.

For Plan B: The required number of credits in total must not be less than 84 credits of courses taken while studying at Mahidol University and no less than 300 credits of courses taken while studying at Curtin University of Technology



**3.1.2 Curriculum Structure** complies with the Standard of Undergraduate Programs of Study 2015 announced by the Ministry of Education.

Course Category	Standard guideline of the Ministry of Education for the undergraduate level of education of the year B.E. 2558. (4-year program) (credits)	Plan A (credits)	Plan B (credits)
1. <b>General Education Courses</b> 1. Social Sciences and Humanities 2. Languages 3. Science and Mathematics	no less than 30	30 <sup>#</sup>	30 <sup>#</sup>
2. <b>Specific Courses</b> 1. Core Courses 2. Major Elective Courses	no less than 72	84 30 54	54+300*
3. <b>Free Elective Courses</b>	no less than 6	6	
<b>Total Credits</b>	no less than 120	120	84+300*

# Students may choose the general education courses provided by other programs/departments/faculties to fulfill the credit requirement.

\* credits while studying at Mahidol University + credits while studying at Curtin University

### 3.1.3 Courses of the Program

Courses are listed respectively in the categories: general education courses, specific courses and free electives, each with course codes alphabetically listed.

In each course code, credit numbers are shown before the parentheses, and teaching hours and/or practicing hours and self-study hours are shown in the parentheses.

Course codes of the Bachelor of Science Program in Biomedical Sciences at Faculty of Science, Mahidol University, consist of 7 characters: 4 letters and 3 numbers.



**a. Meaning of the 4 letters**

- **The first 2 letters** are the initials of the faculty/institution in charge, namely

สว : EN indicates that the course is managed by Faculty of Environment and Resource Studies  
ศศ : LA indicates that the course is managed by Faculty of Liberal Arts  
มม. : MU indicates that the course is jointly managed by different faculties in Mahidol University  
วจ : PR indicates that the course is managed by Institute of Population and Social Research  
วท : SC indicates that the course is managed by Faculty of Science  
สผ : SH indicates that the course is managed by Faculty of Social Sciences and Humanities

- **The last 2 letters** are the initials of the department/program in charge of teaching management.

ทส : BE indicates that the course is in charged by Program of Bioresources and Environmental Biology  
ชว : BI indicates that the course is in charged by Department of Biology  
คม : CH indicates that the course is in charged by Department of Chemistry  
ภอ : EN indicates English  
ศท : GE indicates General Educations  
คร : ID indicates Interdisciplinary Course  
คอ : IM indicates Industrial Mathematics  
คณ : MA indicates that the course is in charged by Department of Mathematic  
ปส : PR indicates Population and Social  
ฟส : PY indicates that the course is in charged by Department of Physics

**b. The 3 digits after the course initials**

- **The first digit** indicates the year of study for the specific courses.
- **The last 2 digits** indicate the order of the course offered in each course category to avoid repetition

**Courses in Bachelor of Science Program in Industrial Mathematics and Data Science****Plan A****a. General Education** no less than 30 Credits

Courses are selected from the following course list.

credit (theory – lab/practice – self-study)

**1. Social Sciences and Humanities**

SHSS 103	Man and Society	2 (2-0-4)
สมสค ๑๐๓	มนุษย์และสังคม	
SHHU 133	Rhetoric for Leadership	2 (2-0-4)
สมมน ๑๓๓	วาทศาสตร์ผู้นำแนวใหม่	

**2. Languages**

LAEN 180	English for Academic Purposes I	2 (2-0-4)
ศศกอ ๑๘๐	ภาษาอังกฤษเพื่อวัตถุประสงค์ทางวิชาการ ๑	
LAEN 181	English for Academic Purposes II	2 (2-0-4)
ศศกอ ๑๘๑	ภาษาอังกฤษเพื่อวัตถุประสงค์ทางวิชาการ ๒	
LAEN 338	Effective Presentations in English	2 (1-2-3)
ศศกอ ๓๓๘	การนำเสนอผลงานเป็นภาษาอังกฤษ	
LAEN 341	Situational-based Communicative English	2 (1-2-3)
ศศกอ ๓๔๑	การสื่อสารด้วยภาษาอังกฤษตามสถานการณ์	

**3. Science and Mathematics**

SCBE 100	Wonder of Life	3 (3-0-6)
วททส ๑๐๐	มหัศจรรย์แห่งชีวิต	
SCGI 110	Chemistry in Everyday Life	3 (3-0-6)
วทศน ๑๑๐	เคมีในชีวิตประจำวัน	
SCMA 161	Technology in Daily Life	3 (3-0-6)
วทคณ ๑๖๑	เทคโนโลยีในชีวิตประจำวัน	



SCMA 172	Current Moral Issues and Logical Thinking	3 (3-0-6)
วทคณ ๑๗๒	ประเด็นศีลธรรมจรรยาปัจจุบันกับการคิดเชิงตรรกะ	
SCMA 175	Introduction to Business Software	3 (3-0-6)
วทคณ ๑๗๕	ซอฟต์แวร์ธุรกิจขั้นแนะนำ	
SCMA 196	Science Communications	3 (3-0-6)
วทคณ ๑๙๖	การสื่อสารเชิงวิทยาศาสตร์	

**Note:** Students can choose to study other courses in general education course category offered at Mahidol University with the approval of the advisor as can be implemented and not contrary to the regulations of the university.

#### b. Specific Courses no less than 84 Credits

##### 1. Core Courses no less than 30 Credits

Students can select from the following courses:

		credit (theory – lab/practice – self-study)
SCIM 101	Mathematics I	4 (4-0-8)
วทคณ ๑๐๑	คณิตศาสตร์ ๑	
SCIM 102	Mathematics II	4 (4-0-8)
วทคณ ๑๐๒	คณิตศาสตร์ ๒	
SCIM 111	Introduction to Scientific Computing	4 (4-0-8)
วทคณ ๑๑๑	การคำนวณทางวิทยาศาสตร์เบื้องต้น	
SCIM 121	Statistical Data Analysis I	3 (3-0-6)
วทคณ ๑๒๑	การวิเคราะห์ข้อมูลสถิติ ๑	
SCIM 122	Statistical Data Analysis II	3 (3-0-6)
วทคณ ๑๒๒	การวิเคราะห์ข้อมูลสถิติ ๒	
SCIM 221	Statistical Data Analysis III	3 (3-0-6)
วทคณ ๒๒๑	การวิเคราะห์ข้อมูลสถิติ ๓	
SCIM 223	Calculus of Several Variables	3 (3-0-6)
วทคณ ๒๒๓	แคลคูลัสหลายตัวแปร	

Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program)

Department of Mathematics

SCIM 291	Numerical Analysis	3 (3-0-6)
วทคอ ๒๙๑	การวิเคราะห์เชิงตัวเลข	
SCIM 407	Industrial Project	3 (3-0-6)
วทคอ ๔๐๗	โครงการเชิงอุตสาหกรรม	
or		
SCIM 409	Internship for Experience	3 (0-18-9)
วทคอ ๔๐๙	การฝึกงานเพื่อประสบการณ์	

## 2. Major Elective Courses no less than 54 Credits

Students can select from the following courses:

		credit (theory – lab/practice – self-study)
SCIM 201	Ordinary Differential Equations and Mathematical Transforms	3 (3-0-6)
วทคอ ๒๐๑	สมการเชิงอนุพันธ์สามัญและผลการแปลงทางคณิตศาสตร์	
SCIM 202	Advanced Calculus	3 (3-0-6)
วทคอ ๒๐๒	แคลคูลัสขั้นสูง	
SCIM 203	Partial Differential Equations for Engineers and Scientists	3 (3-0-6)
วทคอ ๒๐๓	สมการเชิงอนุพันธ์ย่อยสำหรับวิศวกรและนักวิทยาศาสตร์	
SCIM 204 <sup>#</sup>	Operations Research	3 (3-0-6)
วทคอ ๒๐๔	การวิจัยดำเนินการ	
SCIM 205	Mathematics for Finance and Economics	3 (3-0-6)
วทคอ ๒๐๕	คณิตศาสตร์สำหรับการเงินและเศรษฐศาสตร์	
SCIM 206 <sup>#</sup>	Supply Chain Modelling and Optimization	3 (3-0-6)
วทคอ ๒๐๖	การจำลองสายโซ่อุปทาน และการหาคำตอบที่ดีที่สุด	
SCIM 211*	Simulation Modelling	3 (3-0-6)
วทคอ ๒๑๑	การจำลองเลียนแบบ	
SCIM 222	Linear Algebra	3 (3-0-6)
วทคอ ๒๒๒	พีชคณิตเชิงเส้น	
SCIM 231*	Introduction to Data Science	3 (3-0-6)
วทคอ ๒๓๑	การแนะนำวิทยาการข้อมูล	





Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program)

Department of Mathematics

SCIM 251*	Data Structures in Mathematics	3 (3-0-6)
วทคอ ๒๕๑	โครงสร้างข้อมูลในคณิตศาสตร์	
SCIM 252*	Database Management	3 (3-0-6)
วทคอ ๒๕๒	การจัดการฐานข้อมูล	
SCIM 253*	Mobile, Locative and Ubiquitous Media	3 (3-0-6)
วทคอ ๒๕๓	โทรศัพท์เคลื่อนที่ สื่อตำแหน่งชัดเจน และการแพร่หลาย	
SCIM 254*	Data Communications	3 (3-0-6)
วทคอ ๒๕๔	การสื่อสารข้อมูล	
SCIM 302 <sup>#</sup>	Stochastic Processes and Applications in Industry	3 (3-0-6)
วทคอ ๓๐๒	กระบวนการสโตแคสติก และการประยุกต์ในอุตสาหกรรม	
SCIM 303	Seminar	1 (1-0-2)
วทคอ ๓๐๓	สัมมนา	
SCIM 304 <sup>#</sup>	Network Optimization	3 (3-0-6)
วทคอ ๓๐๔	การทำให้เครือข่ายดีที่สุด	
SCIM 305 <sup>#</sup>	Logistic Modelling and Optimization	3 (3-0-6)
วทคอ ๓๐๕	การจำลองโลจิสติกส์ และการหาคำตอบที่ดีที่สุด	
SCIM 307 <sup>#</sup>	Control Theory and Optimization	3 (3-0-6)
วทคอ ๓๐๗	ทฤษฎีการควบคุม และการหาคำตอบที่ดีที่สุด	
SCIM 309	Mathematical Statistics	3 (3-0-6)
วทคอ ๓๐๙	สถิติเชิงคณิตศาสตร์	
SCIM 311	Statistical Modelling	3 (3-0-6)
วทคอ ๓๑๑	การจำลองรูปแบบเชิงสถิติ	
SCIM 321	Computer Applications in Statistics	3 (3-0-6)
วทคอ ๓๒๑	การประยุกต์คอมพิวเตอร์ในสถิติศาสตร์	
SCIM 322	Mathematics for Artificial Intelligence	3 (3-0-6)
วทคอ ๓๒๒	คณิตศาสตร์สำหรับปัญญาประดิษฐ์	
SCIM 323*	Data Mining	3 (3-0-6)
วทคอ ๓๒๓	การทำเหมืองข้อมูล	
SCIM 324	Design and Analysis of Algorithms	3 (3-0-6)
วทคอ ๓๒๔	การออกแบบและวิเคราะห์อัลกอริทึม	

Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program)

Department of Mathematics

SCIM 325*	Interactive, Virtual & Immersive Environments	3 (3-0-6)
วทคอ ๓๒๕	สภาพแวดล้อมที่สามารถตอบสนองและเสมือนจริง	
SCIM 401	Scientific Computing	3 (3-0-6)
วทคอ ๔๐๑	การคำนวณทางวิทยาศาสตร์	
SCIM 402 <sup>#</sup>	Industrial Modelling and Optimization	3 (3-0-6)
วทคอ ๔๐๒	การจำลองเชิงอุตสาหกรรม และการหาคำตอบที่ดีที่สุด	
SCIM 403	Numerical Optimization	3 (3-0-6)
วทคอ ๔๐๓	การหาคำตอบที่ดีที่สุดเชิงตัวเลข	
SCIM 404 <sup>#</sup>	Applied Mathematical Modelling in Industrial Processes	3 (3-0-6)
วทคอ ๔๐๔	การจำลองคณิตศาสตร์ประยุกต์ในกระบวนการอุตสาหกรรม	
SCIM 405 <sup>#</sup>	Dynamic and Stochastic Modelling and Optimization	3 (3-0-6)
วทคอ ๔๐๕	การจำลองสโตนอสติกไดนามิก และการหาคำตอบที่ดีที่สุด	
SCIM 406 <sup>#</sup>	Production Planning and Management	3 (3-0-6)
วทคอ ๔๐๖	การวางแผนการผลิตและการจัดการการผลิต	
SCIM 411 <sup>#</sup>	Special Topic in Industrial Mathematics I	3 (3-0-6)
วทคอ ๔๑๑	หัวข้อพิเศษด้านคณิตศาสตร์อุตสาหกรรม ๑	
SCIM 412 <sup>#</sup>	Special Topic in Industrial Mathematics II	3 (3-0-6)
วทคอ ๔๑๒	หัวข้อพิเศษด้านคณิตศาสตร์อุตสาหกรรม ๒	
SCIM 421*	Special Topic in Data Science I	3 (3-0-6)
วทคอ ๔๒๑	หัวข้อพิเศษด้านวิทยาการข้อมูล ๑	
SCIM 422*	Special Topic in Data Science II	3 (3-0-6)
วทคอ ๔๒๒	หัวข้อพิเศษด้านวิทยาการข้อมูล ๒	

**Note:** 1) <sup>#</sup> Recommend for Industrial Mathematics (optimization).

\* Recommend for Data Science

2) Students can choose to study other courses offered at Mahidol University with the approval of the program committees as can be implemented and not contrary to the regulations of the university.

**c. Free Electives** no less than 6 Credits

Students can select from the following courses:

		credit (theory – lab/practice – self-study)
SCIM 290	Introduction to Mathematical Software	3 (3-0-6)
วทศน ๒๙๐	ซอฟต์แวร์คณิตศาสตร์ขั้นแนะนำ	
SCIM 207	Elements of Accounting	3 (3-0-6)
วทศอ ๒๐๗	องค์ประกอบของระบบบัญชี	
SCIM 208	Mathematical Methods	3 (3-0-6)
วทศอ ๒๐๘	วิธีการเชิงคณิตศาสตร์	
SCIM 209	Probabilistic Models in Operations Research	3 (3-0-6)
วทศอ ๒๐๙	ตัวแบบเชิงความน่าจะเป็นในการวิจัยดำเนินการ	

**Note:** Students can choose to study other courses in free elective courses category offered at Mahidol University or Curtin University with the approval of the program committees as can be implemented and not contrary to the regulations of the university

Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

### 3.1.4 Study Plan

#### Plan A

#### 1<sup>st</sup> Year 1<sup>st</sup> Semester

Course Code	Course Title	Credit (theory - lab/practice – self-study)
SHSS 103 สมสค ๑๐๓	Man and Society มนุษย์และสังคม	2 (2-0-4)
LAEN 180 ศศกอ ๑๘๐	English for Academic Purpose I ภาษาอังกฤษเพื่อวัตถุประสงค์ทางวิชาการ ๑	2 (2-0-4)
SCBE 100 วททส ๑๐๐	Wonder of Life มหัศจรรย์แห่งชีวิต	3 (3-0-6)
SCIM 111 วทคอ ๑๑๑	Introduction to Scientific Computing การคำนวณทางวิทยาศาสตร์เบื้องต้น	4 (4-0-8)
SCMA 196 วทคณ ๑๙๖	Science Communications การสื่อสารเชิงวิทยาศาสตร์	3 (3-0-6)
SCIM 101 วทคอ ๑๐๑	Mathematics I คณิตศาสตร์ ๑	4 (4-0-8)
SCIM 121 วทคอ ๑๒๑	Statistical Data Analysis I การวิเคราะห์ข้อมูลสถิติ ๑	3 (3-0-6)
	<b>Total</b>	<b>21</b>

Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

**1<sup>st</sup> Year 2<sup>nd</sup> Semester**

Course Code	Course Title	Credit (theory - lab/practice – self-study)
LAEN 181 ศศภอ ๑๘๑	English for Academic Purposes II ภาษาอังกฤษเพื่อวัตถุประสงค์ทางวิชาการ ๒	2 (2-0-4)
SCMA 161 วทคณ ๑๖๑	Technology in Daily Life เทคโนโลยีในชีวิตประจำวัน	3 (3-0-6)
SCMA 172 วทคณ ๑๗๒	Current Moral Issues and Logical Thinking ประเด็นศีลธรรมจรรยาปัจจุบันกับการคิดเชิงตรรกะ	3 (3-0-6)
SCMA 175 วทคณ ๑๗๕	Introduction to Business Software ซอฟต์แวร์ธุรกิจขั้นแนะนำ	3 (3-0-6)
SCIM 122 วทคณ ๑๒๒	Statistical Data Analysis II การวิเคราะห์ข้อมูลสถิติ ๒	3 (3-0-6)
SCIM 102 วทคณ ๑๐๒	Mathematics II คณิตศาสตร์ ๒	4 (4-0-8)
SCGI 110 วทศน ๑๑๐	Chemistry in Everyday Life เคมีในชีวิตประจำวัน	3 (3-0-6)
<b>Total</b>		<b>21</b>


Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

### 2<sup>nd</sup> Year 1<sup>st</sup> Semester

Course Code	Course Title	Credit (lecture - lab/practice – self-study)
SHHU 133 สมมน ๑๓๓	Rhetoric for Leadership วาทศาสตร์ผู้นำแนวใหม่	2 (2-0-4)
LAEN 341 ศศภ ๓๔๑	Situational-based communicative English สื่อสารด้วยภาษาอังกฤษตามสถานการณ์	2 (1-2-3)
SCIM 223 วทค ๒๒๓	Calculus of Several Variables แคลคูลัสหลายตัวแปร	3 (3-0-6)
SCIM 201 วทค ๒๐๑	ODE & Mathematical Transforms สมการเชิงอนุพันธ์สามัญและผลการแปลงทางคณิตศาสตร์	3 (3-0-6)
SCIM 254 วทค ๒๕๔	Data Communication การสื่อสารข้อมูล	
SCIM 202 วทค ๒๐๒	Advanced Calculus แคลคูลัสขั้นสูง	3 (3-0-6)
SCIM 252 วทค ๒๕๒	Database Management การจัดการฐานข้อมูล	
SCIM 204 วทค ๒๐๔	Operations Research การวิจัยดำเนินการ	3 (3-0-6)
SCIM 211 วทค ๒๑๑	Simulation Modelling การจำลองเลียนแบบ	3 (3-0-6)
SCIM 291 วทค ๒๙๑	Numerical Analysis การวิเคราะห์เชิงตัวเลข	3 (3-0-6)
Total		22

Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

2<sup>nd</sup> Year 2<sup>nd</sup> Semester

Course Code	Course Title	Credit (lecture - lab/practice – self-study)
LAEN 338 ศศภอ ๓๓๘	Effective Presentations in English การนำเสนอผลงานเป็นภาษาอังกฤษ	2 (2-0-4)
SCIM 222 วทคอ ๒๒๒	Linear Algebra พีชคณิตเชิงเส้น	3 (3-0-6)
SCIM 231 วทคอ ๒๓๑	Introduction to Data Science การแนะนำวิทยาการข้อมูล	3 (3-0-6)
SCIM 203 วทคอ ๒๐๓	PDEs for Engineers and Scientists สมการเชิงอนุพันธ์ย่อยสำหรับวิศวกรและ นักวิทยาศาสตร์ OR	3 (3-0-6)
SCIM 251 วทคอ ๒๕๑	Data Structure in Mathematics โครงสร้างข้อมูลในคณิตศาสตร์	
SCIM 221 วทคอ ๒๒๑	Statistical Data Analysis III การวิเคราะห์ข้อมูลสถิติ ๓	3 (3-0-6)
SCIM 206 วทคอ ๒๐๖	Supply Chain Modelling and Optimization การจำลองสายโซ่อุปทาน และการหาคำตอบที่ดีที่สุด	3 (3-0-6)
SCIM 290 วทคณ ๒๙๐	Introduction to Mathematical Software ซอฟต์แวร์คณิตศาสตร์ขั้นแนะนำ OR	3 (3-0-6)
SCIM 253 วทคอ ๒๕๓	Mobile, Locative and Ubiquitous Media โทรศัพท์เคลื่อนที่ สื่อตำแหน่งชัดเจน และการ แพร่หลาย	
Total		20

Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

**3<sup>rd</sup> Year 1<sup>st</sup> Semester**

Course Code	Course Title	Credit (lecture - lab/practice – self-study)
	Major Elective Courses	12 (12-0-24)
	Total	12

**3<sup>rd</sup> Year 2<sup>nd</sup> Semester**

Course Code	Course Title	Credit (lecture - lab/practice – self-study)
	Major Elective Courses	12 (12-0-24)
	Total	12

**4<sup>th</sup> Year 1<sup>st</sup> Semester**

Course Code	Course Title	Credit (lecture - lab/practice – self-study)
	Major Elective Courses	9 (9-0-18)
	Total	9

**4<sup>th</sup> Year 2<sup>nd</sup> Semester**

Course Code	Course Title	Credit (lecture - lab/practice – self-study)
SCIM 407 วทคอ ๔๐๗	Industrial Project โครงการเชิงอุตสาหกรรม	3 (3-0-6)
SCIM 409 วทคอ ๔๐๙	OR Internship for Experience การฝึกงานเพื่อประสบการณ์	3(0-18-9)
	Total	3



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

**Plan B****1<sup>st</sup> Year 1<sup>st</sup> Semester**

Course Code	Course Title	Credit (theory - lab/practice – self-study)
SHSS 103 สมสค ๑๐๓	Man and Society มนุษย์และสังคม	2 (2-0-4)
LAEN 180 ศสภอ ๑๘๐	English for Academic Purpose I ภาษาอังกฤษเพื่อวัตถุประสงค์ทางวิชาการ ๑	2 (2-0-4)
SCBE 100 วททส ๑๐๐	Wonder of Life มหัศจรรย์แห่งชีวิต	3 (3-0-6)
SCIM 111 วทคอ ๑๑๑	Introduction to Scientific Computing การคำนวณทางวิทยาศาสตร์เบื้องต้น	4 (4-0-8)
SCMA 196 วทคณ ๑๙๖	Science Communications การสื่อสารเชิงวิทยาศาสตร์	3 (3-0-6)
SCIM 101 วทคอ ๑๐๑	Mathematics I คณิตศาสตร์ ๑	4 (4-0-8)
SCIM 121 วทคอ ๑๒๑	Statistical Data Analysis I การวิเคราะห์ข้อมูลสถิติ ๑	3 (3-0-6)
	<b>Total</b>	<b>21</b>

Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

1<sup>st</sup> Year 2<sup>nd</sup> Semester

Course Code	Course Title	Credit (theory - lab/practice – self-study)
LAEN 181 ศศภ ๑๘๑	English for Academic Purposes II ภาษาอังกฤษเพื่อวัตถุประสงค์ทางวิชาการ ๒	2 (2-0-4)
SCMA 161 วทคณ ๑๖๑	Technology in Daily Life เทคโนโลยีในชีวิตประจำวัน	3 (3-0-6)
SCMA 172 วทคณ ๑๗๒	Current Moral Issues and Logical Thinking ประเด็นศีลธรรมจรรยาปัจจุบันกับการคิดเชิงตรรกะ	3 (3-0-6)
SCMA 175 วทคณ ๑๗๕	Introduction to Business Software ซอฟต์แวร์ธุรกิจขั้นแนะนำ	3 (3-0-6)
SCIM 122 วทคณ ๑๒๒	Statistical Data Analysis II การวิเคราะห์ข้อมูลสถิติ ๒	3 (3-0-6)
SCIM 102 วทคณ ๑๐๒	Mathematics II คณิตศาสตร์ ๒	4 (4-0-8)
SCGI 110 วทศน ๑๑๐	Chemistry in Everyday Life เคมีในชีวิตประจำวัน	3 (3-0-6)
Total		21


Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

### 2<sup>nd</sup> Year 1<sup>st</sup> Semester

Course Code	Course Title	Credit (lecture - lab/practice – self-study)
SHHU 133 สมมน ๑๓๓	Rhetoric for Leadership วาทศาสตร์ผู้นำแนวใหม่	2 (2-0-4)
LAEN 341 ศศภอ ๓๔๑	Situational-based communicative English สื่อสารด้วยภาษาอังกฤษตามสถานการณ์	2 (1-2-3)
SCIM 223 วทคอ ๒๒๓	Calculus of Several Variables แคลคูลัสหลายตัวแปร	3 (3-0-6)
SCIM 201 วทคอ ๒๐๑	ODE & Mathematical Transforms สมการเชิงอนุพันธ์สามัญและผลการแปลงทางคณิตศาสตร์	3 (3-0-6)
SCIM 254 วทคอ ๒๕๔	OR Data Communication การสื่อสารข้อมูล	
SCIM 202 วทคอ ๒๐๒	Advanced Calculus แคลคูลัสขั้นสูง	3 (3-0-6)
SCIM 252 วทคอ ๒๕๒	OR Database Management การจัดการฐานข้อมูล	
SCIM 204 วทคอ ๒๐๔	Operations Research การวิจัยดำเนินการ	3 (3-0-6)
SCIM 211 วทคอ ๒๑๑	Simulation Modelling การจำลองเลียนแบบ	3 (3-0-6)
SCIM 291 วทคอ ๒๙๑	Numerical Analysis การวิเคราะห์เชิงตัวเลข	3 (3-0-6)
Total		22

Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

**2<sup>nd</sup> Year 2<sup>nd</sup> Semester**

Course Code	Course Title	Credit (lecture - lab/practice – self-study)
LAEN 338 ศศภอ ๓๓๘	Effective Presentations in English การนำเสนอผลงานเป็นภาษาอังกฤษ	2 (2-0-4)
SCIM 222 วทคอ ๒๒๒	Linear Algebra พีชคณิตเชิงเส้น	3 (3-0-6)
SCIM 231 วทคอ ๒๓๑	Introduction to Data Science การแนะนำวิทยาการข้อมูล	3 (3-0-6)
SCIM 203 วทคอ ๒๐๓	PDEs for Engineers and Scientists สมการเชิงอนุพันธ์ย่อยสำหรับวิศวกรและ นักวิทยาศาสตร์ OR	3 (3-0-6)
SCIM 251 วทคอ ๒๕๑	Data Structure in Mathematics โครงสร้างข้อมูลในคณิตศาสตร์	
SCIM 221 วทคอ ๒๒๑	Statistical Data Analysis III การวิเคราะห์ข้อมูลสถิติ ๓	3 (3-0-6)
SCIM 206 วทคอ ๒๐๖	Supply Chain Modelling and Optimization การจำลองสายโซ่อุปทาน และการหาคำตอบที่ดีที่สุด	3 (3-0-6)
SCIM 290 วทคณ ๒๙๐	Introduction to Mathematical Software ซอฟต์แวร์คณิตศาสตร์ขั้นแนะนำ OR	3 (3-0-6)
SCIM 253 วทคอ ๒๕๓	Mobile, Locative and Ubiquitous Media โทรศัพท์เคลื่อนที่ สื่อตำแหน่งชัดเจน และการ แพร่หลาย	
<b>Total</b>		<b>20</b>



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

### 3<sup>rd</sup> Year 1<sup>st</sup> Semester

#### (B.Sc. Industrial Optimisation)

Code	Module title	Credits
MATH2000	Network Optimisation	25
MATH3001	Applied Mathematical Modelling	25
INDE2001	Logistics Modelling and Optimisation	25
MATH2002	Computational Mathematics	25
<b>Total</b>		<b>100</b>

Or

#### (B.Sc. Data Science)

Code	Module title	Credits
ICTE2000	Interactive Virtual and Immersive Environments	25
STAT2003	Analytics for Experimental and Simulated Data	25
MATH2002	Computational Mathematics	25
INDE2001	Logistics Modelling and Optimisation OR	25
MATH2000	Network Optimisation OR	
MATH3001	Applied Mathematical Modelling	
<b>Total</b>		<b>100</b>



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

### 3<sup>rd</sup> Year 2<sup>nd</sup> Semester

#### (B.Sc. Industrial Optimisation)

Code	Module title	Credits
INDE3000	Industrial Modelling and Optimisation	25
INDE2002	Network Optimisation for Transport and Logistics	25
STAT2001	Mathematical Statistics	25
	Elective Unit	25
	<b>Total</b>	<b>100</b>

Or

#### (B.Sc. Data Science)

Code	Module title	Credits
COMP3006	Artificial and Machine Intelligence	25
COMP3001	Design and Analysis of Algorithms	25
CNCO3003	Mobile Cloud Computing	25
MATH3002	Numerical Optimization OR	25
MATH2009	Calculus 2 OR	
STAT2001	Mathematical Statistics	
	<b>Total</b>	<b>100</b>



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

### 4<sup>th</sup> Year 1<sup>st</sup> Semester

#### (B.Sc. Industrial Optimisation)

Code	Module title	Credits
INDE3004	Dynamic and Stochastic Modelling and Optimisation	25
INDE3003	Production Planning and Management	25
MATH3004	Industrial Project	25
MATH5004	Advanced Numerical Analysis OR Elective	25
<b>Total</b>		<b>100</b>

Or

#### (B.Sc. Data Science)

Code	Module title	Credits
COMP3009	Data Mining	25
STAT2004	Analytics for Observational Data	25
MATH5004	Advanced Numerical Analysis OR Elective	25
MATH3004	Industrial Project OR	25
COMP3005	Computer Project 2 OR	
MEDA3001	Major Digital Humanities Project OR	
ISYS3002	Information Systems and Technology Project 2	
<b>Total</b>		<b>100</b>

### 3.1.5 Curriculum Mapping shown in Appendix 4



### 3.1.6 Course Description

#### a. General Education

no less than 30 Credits

(theory - lab/practice – self-study)

#### 1. Social Sciences and Humanities

SHSS 103	Man and Society	2 (2-0-4)
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สมสค ๑๐๓	มนุษย์และสังคม	
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Prerequisites:	None	
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วิชาบังคับก่อน:	ไม่มี	
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Foundation of Psychology, Sociology and Anthropology are provided. The course is specified to man and society and their relations. The knowledge of Foundation of Psychology will involve varieties and mind process which influence human behaviors such as Motivation, Emotion, Perception, and the social purified process. The trait will help in developing personality, attitude, healthy mind, and adjustment, etc. Foundation of Sociology and Anthropology consists of the study of evolution of family, religion, etc., as well as differences between rural and urban societies, including the changes of Thai Society

ความรู้พื้นฐานทางด้านจิตวิทยา สังคมวิทยาและมนุษย์วิทยาแก่นักศึกษา โดยจะเน้นที่มนุษย์และสังคม ตลอดจนความสัมพันธ์ระหว่างมนุษย์กับสังคม ความรู้พื้นฐานทางด้านจิตวิทยาจะเป็นการศึกษาตัวแปร และกระบวนการทางจิตใจ ที่มีอิทธิพลต่อการแสดงพฤติกรรมของมนุษย์เช่น แรงจูงใจ อารมณ์การรับรู้และกระบวนการคิดทางสังคมที่มีผลต่อบุคลิกภาพ ทัศนคติ สุขภาพจิตและการปรับตัว เป็นต้น ความรู้พื้นฐานทางด้านสังคมวิทยาและมนุษย์วิทยาจะประกอบไปด้วยการศึกษาลักษณะและปรากฏการณ์ เช่น สถาบันครอบครัว สถาบันศาสนา เป็นต้น ความแตกต่างระหว่างสังคมชนบทและสังคมเมือง ตลอดจนการเปลี่ยนแปลงของสังคมไทย

SHHU 133	Rhetoric for Leadership	2 (2-0-4)
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สมมน ๑๓๓	วาทศาสตร์ผู้นำแนวใหม่	
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Prerequisites:	None	
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วิชาบังคับก่อน:	ไม่มี	
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Theories and practices on the new trend of rhetoric for leadership including training skill in public speaking and personal development for leadership in preparing for academic presentations, ideas, and thoughts. Multi-dimensional thinking practices





motivating individuals' intellectual development of effective communication to the public

ทฤษฎีและการปฏิบัติแนวใหม่ทางวิทยาศาสตร์สำหรับผู้นำทักษะการฝึกพูดต่อสาธารณะ และพัฒนาบุคลิกภาพสู่ภาวะผู้นำสำหรับการเตรียมพร้อมในด้านการนำเสนอความรู้ความคิดเห็น และความคิด ด้วยทักษะการคิดหลากหลายมิติที่กระตุ้นการพัฒนา และการพัฒนาภูมิปัญญาของแต่ละบุคคลในเรื่องการสื่อความหมายไปยังสาธารณชนได้อย่างมีประสิทธิภาพ

## 2. Languages

LAEN 180 English for Academic Purposes I 2 (2-0-4)

ศศกอ ๑๘๐ ภาษาอังกฤษเพื่อวัตถุประสงค์ทางวิชาการ ๑

Prerequisites: None

วิชาบังคับก่อน: ไม่มี

Vocabulary, expressions, grammar, and contextualized social language; essential communicative skills in small groups; simulations in various university and academic situations; introduction to academic writing; and reading and listening from various sources

คำศัพท์วิชาการ สำนวน ไวยากรณ์ และภาษาที่ใช้บ่อยในบริบทสังคมวิชาการ ทักษะการสื่อสารที่จำเป็นในการสนทนากลุ่มย่อยการจำลองสถานการณ์ที่เกี่ยวข้องกับบริบทมหาวิทยาลัยและวิชาการ การเขียนเชิงวิชาการเบื้องต้น การอ่านและการฟังจากแหล่งข้อมูลต่างๆ

LAEN 181 English for Academic Purposes II 2 (2-0-4)

ศศกอ ๑๘๑ ภาษาอังกฤษเพื่อวัตถุประสงค์ทางวิชาการ ๒

Prerequisites: None

วิชาบังคับก่อน: ไม่มี

Essential strategies for four language skills: reading and listening from various sources, speaking in academic contexts and essay-writing, including sub-skills i.e., grammar, academic vocabulary, and summary with a focus on academic English and issues that enhance students world knowledge

กลยุทธ์ที่สำคัญในทักษะการใช้ภาษาทั้งสี่ การอ่านและการฟังตัวบททางวิชาการ การพูดในเชิงวิชาการและการเขียนระดับเรียงความ รวมทั้งทักษะย่อย คือ ไวยากรณ์ คำศัพท์วิชาการ การเขียนสรุป เน้นภาษาอังกฤษที่ใช้ในระดับอุดมศึกษา และเนื้อหาเกี่ยวกับสังคมโลก

Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program)

Department of Mathematics

LAEN 338	Effective Presentations in English	2 (1-2-3)
ศศภอ ๓๓๘	การนำเสนอผลงานเป็นภาษาอังกฤษ	
Prerequisites:	None	
วิชาบังคับก่อน:	ไม่มี	
	<p>Presentation skills in the students' fields of study using appropriate and accurate English to deliver the message clearly, interestingly and effectively emphasizing language use, statistics description, presentation strategies and research skills that enhance life-long learning</p> <p>การนำเสนอผลงานในสาขาวิชาต่างๆ โดยใช้ภาษาอังกฤษได้อย่างถูกต้องเหมาะสม เพื่อให้ข้อมูลชัดเจน น่าสนใจ และมีประสิทธิภาพ เน้นภาษาที่ใช้ในการนำเสนอผลงาน การบรรยายข้อมูลทางสถิติกลยุทธ์ในการนำเสนอ และทักษะการวิจัยซึ่งช่วยส่งเสริมการเรียนรู้ตลอดชีวิต</p>	
LAEN 341	Situational-based Communicative English	2 (1-2-3)
ศศภอ ๓๔๑	การสื่อสารด้วยภาษาอังกฤษตามสถานการณ์	
Prerequisites:	None	
วิชาบังคับก่อน:	ไม่มี	
	<p>English speaking skills relevant to different daily situations and situations related to students' fields of study, also including communication through e-mails in English</p> <p>ทักษะการพูดภาษาอังกฤษที่จำเป็นต้องใช้ในสถานการณ์ต่างๆ ทั้งในชีวิตประจำวันและในสาขาวิชาต่างๆ ของนักศึกษารวมทั้งการสื่อสารด้วยการเขียนจดหมายอิเล็กทรอนิกส์</p>	

### 3. Science and Mathematics

SCBE 100	Wonder of Life	3 (3-0-6)
วทส ๑๐๐	มหัศจรรย์แห่งชีวิต	
Prerequisites:	No	
วิชาบังคับก่อน:	ไม่มี	
	<p>Origin of the earth; composition of life and its organization: cell and its life; from breakfast to ATP; reproduction or death, a chip from the old block; adapt to evolve; we are the world; pollution not in my backyard</p> <p>กำเนิดโลก องค์ประกอบและโครงสร้างของชีวิต เซลล์และชีวิต จากอาหารเข้าสู่เอทีพี สืบพันธุ์หรือสูญพันธุ์ ลูกไม้หล่นไม่ไกลต้น ปรับเพื่อเปลี่ยนโลก เราคือโลก มลพิษนอกบ้านของฉัน</p>	



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

SCGI 110	Chemistry in Everyday Life	3 (3-0-6)
วทศน ๑๑๐	เคมีในชีวิตประจำวัน	
Prerequisites:	None	
วิชาบังคับก่อน:	ไม่มี	
	Chemical principles related to everyday phenomena and activities; air pollution; ozone depletion; global warming; energy from combustion; nuclear energy; energy from electron transfer; water for life; acid-base; drugs and medicines; nutritions; food; polymers	
	หลักการทางเคมีที่เกี่ยวกับเหตุการณ์ในชีวิตประจำวัน มลพิษทางอากาศ การลดลงของชั้นโอโซน ภาวะโลกร้อน พลังงานจากการเผาไหม้ พลังงานนิวเคลียร์ พลังงานจากการถ่ายโอนอิเล็กตรอน น้ำ กรด-เบส ยา โภชนาการ อาหาร พอลิเมอร์ เป็นต้น	
SCMA 161	Technology in Daily Life	3 (3-0-6)
วทศน ๑๖๑	เทคโนโลยีในชีวิตประจำวัน	
Prerequisites:	None	
วิชาบังคับก่อน:	ไม่มี	
	Information and communication technologies, meaning and component; the computer system, hardware and software, communication applications, data handling applications, measurement applications and modelling application; computer security, cloud computing, ethics and related laws	
	เทคโนโลยีสารสนเทศและการสื่อสาร ความหมายและส่วนประกอบ ระบบคอมพิวเตอร์ ฮาร์ดแวร์ และซอฟต์แวร์ โปรแกรมประยุกต์ด้านการสื่อสาร โปรแกรมประยุกต์ด้านการจัดการข้อมูล โปรแกรมประยุกต์ด้านการวัดและโปรแกรมประยุกต์ด้านแบบจำลอง การรักษาความปลอดภัยของคอมพิวเตอร์ การประมวลผลแบบกลุ่มเมฆ จริยธรรมและกฎหมายที่เกี่ยวข้อง	
SCMA 172	Current Moral Issues and Logical Thinking	3 (3-0-6)
วทศน ๑๗๒	ประเด็นศีลธรรมจรรยาปัจจุบันกับการคิดเชิงตรรกะ	
Prerequisites:	None	
วิชาบังคับก่อน:	ไม่มี	
	Skills related to logical thinking, learning to think by discussions, moral or controversial issues, ethics in everyday life or business dealings	



ทักษะด้านการคิดเชิงตรรกะ เรียนรู้การคิดจากการสนทนาปรึกษาหารือ ประเด็นศีลธรรมจรรยา หรือข้อโต้แย้ง จรรยาบรรณในชีวิตประจำวัน หรือการติดต่อธุรกิจ

SCMA 175	Introduction to Business Software	3 (3-0-6)
วทศณ ๑๗๕	ซอฟต์แวร์ธุรกิจขั้นแนะนำ	
Prerequisites:	None	
วิชาบังคับก่อน:	ไม่มี	
<p>An introduction to some mathematical and statistical software packages; the use of mathematical software packages in some mathematical and statistical topics; basic statistical data analysis; statistical computing; the use of Microsoft Excel in performing statistical procedures; an introduction to computer programming; a practice of information searching skill for working on group assignments and doing presentation in classrooms</p> <p>ซอฟต์แวร์คณิตศาสตร์และเชิงสถิติขั้นแนะนำ การใช้ซอฟต์แวร์คณิตศาสตร์ในหัวข้อเชิงคณิตศาสตร์ และเชิงสถิติ การวิเคราะห์ข้อมูลเชิงสถิติขั้นพื้นฐาน การคำนวณเชิงสถิติ การใช้โปรแกรมเอ็กเซลในวิธีดำเนินการเชิงสถิติ การเขียนโปรแกรมคอมพิวเตอร์ขั้นแนะนำ การฝึกทักษะสืบค้นข้อมูลเพื่อทำรายงานกลุ่มและนำเสนอในห้องเรียน</p>		
SCMA 196	Science Communications	3 (3-0-6)
วทศณ ๑๙๖	การสื่อสารเชิงวิทยาศาสตร์	
Prerequisites:	None	
วิชาบังคับก่อน:	ไม่มี	
<p>Emphasizing on key aspects of research and written communication in academic and professional contexts, as well as working to develop students' skills in oral communication; focusing on students' ability to work collaboratively in research and oral work; students learning to locate, understand and critically evaluate information from books, journals, the internet and primary sources in order to research relevant scientific topics; using these sources of information, students then producing an extended piece of analytical writing and an oral presentation to their peers; skills in accessing information, synthesizing and paraphrasing information, argument development, the Harvard referencing system, principles of effective communication</p>		



and the professional presentation of documents all covered during the development of the key assignments

รายวิชาเน้นมุมมองทางด้านการสื่อสารในการเขียน และการวิจัยที่มีเนื้อหาในทางวิชาการและวิชาชีพเฉพาะทาง รวมถึงเน้นพัฒนาทักษะการสื่อสารทางการพูด เน้นความสามารถเพื่อการทำงานแบบร่วมมือในการวิจัย และงานที่เน้นการพูด การเรียนรู้เพื่อสามารถกำหนดขอบเขต เข้าใจ และจับประเด็นสำคัญของข้อมูลจากหนังสือ วารสาร อินเทอร์เน็ต และแหล่งค้นคว้าข้อมูลอื่นๆ เพื่อการทำวิจัยในทางวิทยาศาสตร์ที่เกี่ยวข้อง สามารถใช้แหล่งข้อมูลดังกล่าวในการเขียนเชิงวิเคราะห์ และนำเสนอได้ต่อผู้อื่น ทักษะในการค้นคว้าหาข้อมูล สังเคราะห์ และถอดข้อมูล การให้เหตุผลในข้อโต้แย้ง ระบบการอ้างอิงแบบฮาร์วาร์ด หลักการของการสื่อสารที่มีประสิทธิผล และการนำเสนอเอกสารอย่างมืออาชีพ

**b. Specific Courses** no less than 84 Credits

(theory - lab/practice – self-study)

### 1. Core Course

SCIM 101	Mathematics I	4 (4-0-8)
วทคอ ๑๐๑	คณิตศาสตร์ ๑	
Prerequisites:	None	
วิชาบังคับก่อน:	ไม่มี	
The topics of this unit including functions and their graphs; limits and continuity; differentiation and integration; transcendental functions; Vectors; Matrices; systems of linear equations and solution methods; eigenvalues and eigenvectors; complex numbers		
หัวข้อของวิชานี้รวมถึงฟังก์ชันและกราฟ ลิมิตและความต่อเนื่อง การหาอนุพันธ์และการหาปริพันธ์ ฟังก์ชันอดิศัย เวกเตอร์ เมตริกซ์ ระบบสมการเชิงเส้นและวิธีหาผลเฉลย ค่าลักษณะเฉพาะและเวกเตอร์ลักษณะเฉพาะ จำนวนเชิงซ้อน		
SCIM 102	Mathematics II	4 (4-0-8)
วทคอ ๑๐๒	คณิตศาสตร์ ๒	
Prerequisites:	None	
วิชาบังคับก่อน:	ไม่มี	



Vectors; functions of several variables; first-order differential equations; second-order ordinary differential equations; sequences and series; advanced integration techniques

เวกเตอร์ ฟังก์ชันหลายตัวแปร สมการเชิงอนุพันธ์อันดับหนึ่ง สมการเชิงอนุพันธ์สามัญอันดับสอง ลำดับและอนุกรม และเทคนิคการหาปริพันธ์ขั้นสูง

SCIM 111 Introduction to Scientific Computing

4 (4-0-8)

วทคอ ๑๑๑ การคำนวณทางวิทยาศาสตร์เบื้องต้น

Prerequisites: None

วิชาบังคับก่อน: ไม่มี

Introduction to scientific computing; Writing computer programs in C and Python computer languages; representing numbers in a computer: scalar data types; variables and constants; guidelines for variable names; assignment statements: Mathematical and logical operators; keyboard input and screen output; writing a simple, linear program; conditional statements; arrays and subscripts; loops. file I/O; functions and subroutines; program design; writing well structured programs; debugging techniques; scientific applications of computer programs; solving nonlinear equations; numerical integration; data analysis; plotting and smoothing; simulating simple physical, chemical and/or mathematical systems; writing simple program for managing large volume of data, data representation and plotting, basic Object Oriented Programming design

ความรู้เบื้องต้นเกี่ยวกับการคำนวณทางวิทยาศาสตร์ การเขียนโปรแกรมคอมพิวเตอร์ การแสดงผลในรูปของตัวเลขในคอมพิวเตอร์ชนิดข้อมูลตัวเลข ตัวแปรและค่าคงที่ แนวทางในการตั้งชื่อตัวแปร คำสั่งการทำงานแบบต่างๆ การดำเนินการทางคณิตศาสตร์และตรรกะ การรับค่าจากแป้นพิมพ์และแสดงค่าออกทางหน้าจอ เขียนโปรแกรมอย่างง่าย เช่น โปรแกรมเชิงเส้น การใช้เงื่อนไขอาร์เรย์ การใช้คำสั่งวนซ้ำ การรับค่าและแสดงผลผ่านไฟล์ข้อมูล; การเขียนฟังก์ชันและซับรูทีน การออกแบบโปรแกรมการเขียนโปรแกรมที่มีโครงสร้างที่ดี เทคนิคการแก้จุดบกพร่อง การประยุกต์ใช้งานทางวิทยาศาสตร์ของโปรแกรมคอมพิวเตอร์ การแก้สมการไม่เชิงเส้น การหาปริพันธ์เชิงตัวเลข การวิเคราะห์ข้อมูล การพล็อตข้อมูล และการปรับให้เรียบจำลองระบบทางฟิสิกส์เคมีและ/หรือทางคณิตศาสตร์อย่างง่าย เขียนโปรแกรมอย่างง่ายเพื่อจัดการข้อมูลจำนวนมาก การแสดงข้อมูลและการแสดงกราฟ การออกแบบโปรแกรมเชิงวัตถุขั้นพื้นฐาน



SCIM 121	Statistical Data Analysis I	3 (3-0-6)
วทคอ ๑๒๑	การวิเคราะห์ข้อมูลสถิติ ๑	
Prerequisites:	None	
วิชาบังคับก่อน:	ไม่มี	
	<p>Exploratory data analysis: numerical and graphical summaries, and transformations of univariate data; graphical evaluation and basic regression analysis of bi-variate data; probability calculations for normal distribution and checks for normality; design of experiments, different types of random sampling; central limit theorem; confidence intervals and hypothesis tests for single mean, two means and variances; checking assumptions; interference for more than two means: an analysis of variance; using the package SPSS to perform most of the statistical analysis covered in this unit</p> <p>การวิเคราะห์ข้อมูลเชิงสำรวจ: การสรุปในรูปแบบกราฟและตัวเลข การแปลงข้อมูลหนึ่งตัวแปร การประเมินผลเชิงกราฟ และพื้นฐานการวิเคราะห์เชิงถดถอยของข้อมูลสองตัวแปร การคำนวณความน่าจะเป็นของการแจกแจงแบบปกติและการตรวจสอบความปกติ การออกแบบการทดลอง รูปแบบต่างๆของการชักตัวอย่างแบบสุ่ม ทฤษฎีขีดจำกัดส่วนกลาง ช่วงความเชื่อมั่น และการทดสอบสมมติฐานสำหรับค่าเฉลี่ยหนึ่งค่า ค่าเฉลี่ยสองค่า และค่าความแปรปรวน การตรวจสอบข้อสมมติ การอนุมานในกรณีค่าเฉลี่ยมากกว่าสองค่า การวิเคราะห์ความแปรปรวน วิชานี้จะใช้โปรแกรมสำเร็จรูป SPSS ในการวิเคราะห์เชิงสถิติ</p>	
SCIM 122	Statistical Data Analysis II	3 (3-0-6)
วทคอ ๑๒๒	การวิเคราะห์ข้อมูลสถิติ ๒	
Prerequisites:	None	
วิชาบังคับก่อน:	ไม่มี	
	<p>Probability; discrete and continuous probability distributions; joint probability distributions and distribution of some simple functions such linear and quadratic functions of random variables; mathematical expectation; discrete probability models, their mean and variance; functions of random variables; inference for proportions; Chi-square and F-distributions; inference for one and two variances; goodness of fit; tests for independence and homogeneity</p>	



ความน่าจะเป็นการแจกแจงความน่าจะเป็นแบบต่อเนื่อง และการแจกแจงเชิงวิยุต การแจกแจงความน่าจะเป็นร่วม และการแจกแจงฟังก์ชันเชิงเดียวเช่น ฟังก์ชันเชิงเส้นและฟังก์ชันกำลังสองของตัวแปรสุ่ม ค่าคาดหวังเชิงคณิตศาสตร์ แบบจำลองความน่าจะเป็นเชิงวิยุต รวมถึงค่าเฉลี่ย และค่าความแปรปรวน ฟังก์ชันตัวแปรสุ่ม การอนุมานค่าสัดส่วน การแจกแจงเอฟ และไคสควร์ การอนุมานค่าความแปรปรวนแบบหนึ่งค่า และสองค่า ภาวะรูปสถิติ การทดสอบความเป็นอิสระ และความเป็นเอกพันธ์

SCIM 211	Simulation Modelling	3 (3-0-6)
วทคอ ๒๑๑	การจำลองเลียนแบบ	
Prerequisites:	SCIM 121 Statistical Data Analysis I	
วิชาบังคับก่อน:	วทคอ ๑๒๑ การวิเคราะห์ข้อมูลสถิติ ๑	
	<p>The importance of simulation; example models; generating random numbers, simulating random variables, Monte Carlo simulation, modelling inputs; analyzing outputs; Markov chains and discrete events; discrete event simulation; variance reduction techniques; model validation, computer techniques for simulation</p> <p>ความสำคัญของการจำลอง แบบจำลองตัวอย่าง การสร้างตัวเลขแบบสุ่ม การจำลองตัวแปรสุ่ม การจำลองมอนติคาร์โล แบบจำลองการป้อนข้อมูล การวิเคราะห์ผลการจำลอง ลูกโซ่มาร์คอฟและเหตุการณ์ไม่ต่อเนื่อง การจำลองเหตุการณ์ไม่ต่อเนื่อง เทคนิคการลดความแปรปรวน การตรวจสอบความถูกต้องของแบบจำลอง เทคนิคทางคอมพิวเตอร์สำหรับการจำลอง</p>	
SCIM 221	Statistical Data Analysis III	3 (3-0-6)
วทคอ ๒๒๑	การวิเคราะห์ข้อมูลสถิติ ๓	
Prerequisites:	SCMA 189 Statistical Data Analysis II	
วิชาบังคับก่อน:	วทคณ ๑๘๙ การวิเคราะห์ข้อมูลสถิติ ๒	
	<p>Regression analysis, simple linear regression, measures of model adequacy, residual analysis, transformations, inference for slope and intercept, confidence and prediction intervals for future responses; multiple linear regression analysis, an estimation of model parameters, inference regarding model parameters and predictions, an analysis of variance, regression diagnostics, variable selections and model building; non-parametric methods: sign test, signed-rank test, rank-sum test,</p>	





runs test; the Kruskal Wallis Test, rank correlation coefficient checking distributions:

Q-Q plots and the Kolmogorov Smirnov Test

การวิเคราะห์การถดถอย: การวิเคราะห์การถดถอยเชิงเดี่ยว การวัดความเหมาะสมของแบบจำลอง การวิเคราะห์ตกค้าง การแปลง การอนุมานสำหรับค่าความชัน และระยะตัดแกน ช่วงความเชื่อมั่น และการทำนายสำหรับค่าตอบสนองอนาคต การวิเคราะห์การถดถอยเชิงเส้นพหุคูณ: การประมาณค่าพารามิเตอร์ของแบบจำลอง การอนุมานค่าพารามิเตอร์ของแบบจำลองและการทำนาย การวิเคราะห์ความแปรปรวน การวินิจฉัยการถดถอย การเลือกตัวแปร และการสร้างแบบจำลองวิธีการแบบไม่อิงพารามิเตอร์: การทดสอบเครื่องหมาย การทดสอบเครื่องหมายโดยลำดับที่การทดสอบผลบวกโดยลำดับ การทดสอบแบบลำดับตัวเลขโดยครัสคัลวอลลิช สัมประสิทธิ์สหสัมพันธ์ลำดับที่ การตรวจสอบการแจกแจง: การลงจุดแบบคิวกิว และการทดสอบโดยวิธีคอลโมโกรอฟชาไมนอฟ

SCIM 222	Linear Algebra	3 (3-0-6)
วทคอ ๒๒๒	พีชคณิตเชิงเส้น	
Prerequisites:	SCIM 102 Mathematics II	
วิชาบังคับก่อน:	วทคอ ๑๐๒ คณิตศาสตร์ ๒	
	Vector spaces. Linear transformations; inner product spaces, projections on to subspaces; least squares; eigenvalues and eigenvectors; diagonalisation and Jordan forms; complex vector spaces; singular value decomposition and the pseudoinverse; systems of linear differential equations	
	ปริภูมิเวกเตอร์ การแปลงเชิงเส้น ปริภูมิผลคูณภายใน ภาพฉายบนปริภูมิย่อย ค่ากำลังสองน้อยที่สุด ค่าลักษณะเฉพาะและเวกเตอร์ลักษณะเฉพาะ รูปแบบดิจิทัลไลเซชันและจอร์แดน ปริภูมิเวกเตอร์เชิงซ้อน การแยกค่าเอกฐาน ตัวผกผันเทียม ระบบสมการอนุพันธ์เชิงเส้น	
SCIM 223	Calculus of Several Variables	3 (3-0-6)
วทคอ ๒๒๓	แคลคูลัสหลายตัวแปร	
Prerequisites:	SCIM 101 Mathematics I	
วิชาบังคับก่อน:	วทคอ ๑๐๑ คณิตศาสตร์ ๑	
	Quadratic surfaces; functions of several variables; limits; continuity; partial derivatives; Jacobians; maxima and minima; Lagrange Multipliers; Taylor Series; line integrals; double integrals; multiple integrals; multiple integrals by cylindrical coordinates and spherical coordinates; surface integrals	

Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program)

Department of Mathematics

ผิวกำลังสอง ฟังก์ชันหลายตัวแปร ลิมิต ภาวะต่อเนื่อง อนุพันธ์ย่อย จาคอบีเยน ค่าสูงสุดและต่ำสุด  
ตัวคูณลากรางจ์ อนุกรมเทย์เลอร์ ปริพันธ์ตามเส้น ปริพันธ์สองชั้น ปริพันธ์หลายชั้น ปริพันธ์หลาย  
ชั้นโดยพิภพทรงกระบอกและพิภพทรงกลม ปริพันธ์ตามผิว

SCIM 291 Numerical Analysis 3 (3-0-6)

วทคอ ๒๙๑ การวิเคราะห์เชิงตัวเลข

Prerequisites: SCIM 101 Mathematics I

วิชาบังคับก่อน: วทคอ ๑๐๑ คณิตศาสตร์ ๑

An error analysis; solution to nonlinear equations; interpolation and polynomial approximation; curve fitting; systems of linear equations; fast Fourier transform; numerical solution to differential equations; applications to research

การวิเคราะห์ค่าคลาดเคลื่อน ผลเฉลยของสมการไม่เชิงเส้น การประมาณค่าในช่วงและการประมาณค่าพหุนาม พิตตั้งเส้นโค้ง ระบบสมการเชิงเส้น ผลการแปลงฟูเรียร์แบบเร็ว ผลเฉลยเชิงตัวเลขของสมการเชิงอนุพันธ์ การประยุกต์ในการวิจัย

SCIM 407 Industrial Project 3 (3-0-6)

วทคอ ๔๐๗ โครงการเชิงอุตสาหกรรม

Prerequisites: None

วิชาบังคับก่อน: ไม่มี

A supervised investigation of significant industrial problem involving modelling, data collection and analysis, parameter estimation; the development of strategies for optimizing one or more user-defined objective functions; integration of several processes; practices in industrial factory, and project reports

การตรวจสอบภายใต้การดูแลของปัญหาที่สำคัญทางด้านอุตสาหกรรมซึ่งเกี่ยวข้องกับการสร้างแบบจำลอง การเก็บรวบรวมข้อมูลและการวิเคราะห์ การประมาณค่าพารามิเตอร์ การพัฒนากลยุทธ์เพื่อหาผลลัพธ์ที่ดีที่สุดที่สอดคล้องกับฟังก์ชันวัตถุประสงค์ตามที่ผู้กำหนดที่อาจมีหนึ่งหรือมากกว่าหนึ่ง การบูรณาการของกระบวนการต่างๆที่เรียนรู้ การเรียนรู้และปฏิบัติจริงในโรงงานและรายงานโครงการ

Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

SCIM 409	Internship for Experience	3 (0-18-9)
วทคอ ๔๐๙	การฝึกงานเพื่อประสบการณ์	
Prerequisites:	None	
วิชาบังคับก่อน:	ไม่มี	
	<p>Internship in the factory or business organization under guidance of the advisors.</p> <p>การฝึกงานในโรงงานหรือองค์กรธุรกิจที่นักศึกษาสนใจ ภายใต้การแนะนำและควบคุมของอาจารย์ที่ปรึกษา</p>	

## 2. Major Elective Courses

SCIM 201	Ordinary Differential Equations and Mathematical Transforms	3 (3-0-6)
วทคอ ๒๐๑	สมการเชิงอนุพันธ์สามัญและผลการแปลงทางคณิตศาสตร์	
Prerequisites:	SCIM 102 Mathematics II	
วิชาบังคับก่อน:	วทคอ ๑๐๒ คณิตศาสตร์ ๒	
	<p>Ordinary differential equations with variable coefficients; systems of ordinary differential equations; Fourier Series; Fourier Transforms; Laplace Transforms; Z-Transforms</p> <p>สมการเชิงอนุพันธ์สามัญที่มีสัมประสิทธิ์เป็นตัวแปร ระบบสมการเชิงอนุพันธ์สามัญ อนุกรมฟูรีเยร์ การแปลงฟูรีเยร์ การแปลงลาปลาซ การแปลงแซด</p>	
SCIM 202	Advanced Calculus	3 (3-0-6)
วทคอ ๒๐๒	แคลคูลัสขั้นสูง	
Prerequisites:	SCIM 102 Mathematics II	
วิชาบังคับก่อน:	วทคอ ๑๐๒ คณิตศาสตร์ ๒	
	<p>First-order differential equations, Linear constant coefficient differential equations, power series solutions, Fourier Series, partial differential equations, gradient; directional derivatives, maxima and minima, double and triple integrals, line and surface integrals, Green's theorem, Divergence theorem and Stokes theorem, div and curl, path independence</p> <p>สมการเชิงอนุพันธ์ลำดับแรกสมการเชิงอนุพันธ์เชิงเส้นที่มีสัมประสิทธิ์เป็นค่าคงที่ การหาคำตอบในรูปของอนุกรมยกกำลัง อนุกรมฟูรีเยร์ สมการเชิงอนุพันธ์ย่อย แกรเดียนต์ อนุพันธ์บอกทิศทาง การ</p>	



หาค่าสูงสุดและต่ำสุด ปริพันธ์สองหรือสามชั้น การหาปริพันธ์ตามเส้นและพื้นผิว ทฤษฎีบทของกรีน ทฤษฎีบทไดเวอร์เจนซ์และทฤษฎีบทสต็อกส์ ไดเวอร์เจนซ์และ เควอริอิสระของเส้นทาง

SCIM 203 Partial Differential Equations for Engineers and Scientists 3 (3-0-6)

วทคอ ๒๐๓ สมการเชิงอนุพันธ์ย่อยสำหรับวิศวกรและนักวิทยาศาสตร์

วิชาบังคับก่อน: วทคอ ๑๐๒ คณิตศาสตร์ ๒

Prerequisites: SCIM 102 Mathematics II

An introduction to the subject of partial differential equations: first order equations (linear and nonlinear), heat equation, wave equation, and Laplace equation; examples of nonlinear equations of each type; qualitative properties of solutions; method of characteristics for hyperbolic problems; solution methods of initial boundary value problems using a separation of variables and eigenfunction expansions; some numerical methods

ความรู้เบื้องต้นเกี่ยวกับเรื่องสมการเชิงอนุพันธ์ย่อย: สมการอันดับที่หนึ่ง (เชิงเส้นและไม่เชิงเส้น) สมการความร้อนสมการคลื่นและสมการลาปลาซ ตัวอย่างของสมการไม่เชิงเส้นของแต่ละประเภท คุณสมบัติเชิงคุณภาพของคำตอบ วิธีการปัญหาแบบไฮเพอร์โบลิก วิธีแก้ปัญหาค่าขอบเขตและค่าเริ่มต้นโดยใช้การแยกของตัวแปรและการขยายของฟังก์ชันลักษณะเฉพาะวิธีการแก้ปัญหาค่าเชิงตัวเลขบางวิธี

SCIM 204 Operations Research 3 (3-0-6)

วทคอ ๒๐๔ การวิจัยดำเนินการ

Prerequisites: None

วิชาบังคับก่อน: ไม่มี

The nature and purpose of operations research; overview of important prototype problems: inventory, queuing, project management, simulation and mathematical programming; linear programming: formulation, solution techniques and post - optimality analysis; using of linear programming computer programs and case studies; Game theory

วัตถุประสงค์ของการวิจัยดำเนินการ ภาพรวมของสำคัญของปัญหาต้นแบบ: สินค้าคงคลัง แลควอย การบริหารจัดการโครงการ แบบจำลอง และโปรแกรมทางคณิตศาสตร์ การสร้างตัวแบบโปรแกรมเชิงเส้น เทคนิคในการหาคำตอบ และการวิเคราะห์หลังจาก การใช้โปรแกรมคอมพิวเตอร์ในการแก้ปัญหาโปรแกรมเชิงเส้น และ กรณีสึกษา ทฤษฎีเกม

Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program)

Department of Mathematics

SCIM 205	Mathematics for Finance and Economics	3 (3-0-6)
วทคอ ๒๐๕	คณิตศาสตร์สำหรับการเงินและเศรษฐศาสตร์	
Prerequisites:	SCIM 102 Mathematics II, SCMA 189 Statistical data analysis II	
วิชาบังคับก่อน:	วทคอ ๑๐๒ คณิตศาสตร์ ๒ ,วทคณ ๑๘๙ การวิเคราะห์ข้อมูลสถิติ ๒ An introduction to Theory of Interest; probability and normal random variables; the Arbitrage Theorem; Random Walks and Brownian Motion; options; the Black-Scholes Equations ทฤษฎีดอกเบี้ยเบื้องต้น ความน่าจะเป็นและตัวแปรสุ่มแบบปกติ ทฤษฎีที่เกี่ยวข้องกับการซื้อขายและการแลกเปลี่ยนเงินตรา การเดินแบบสุ่มและการเคลื่อนที่แบบบราวน์ สัญญาการรับประกันการลงทุนสมการแบล็คโพลส์	
SCIM 206	Supply Chain Modelling and Optimization	3 (3-0-6)
วทคอ ๒๐๖	การจำลองสายโซ่อุปทาน และการหาคำตอบที่ดีที่สุด	
Prerequisites:	None	
วิชาบังคับก่อน:	ไม่มี Key concepts and activities in the areas of logistics and supply chain management; role in industrial modelling and optimization; basic skills in analysing, classifying, and solving the fundamental components of inventory systems based on both single and multi-commodity deterministic and stochastic models; forecasting techniques and practices; case studies แนวคิดหลักและกิจกรรมในด้านของโลจิสติก และการจัดการห่วงโซ่อุปทาน บทบาทในการสร้างแบบจำลองทางอุตสาหกรรมและการเพิ่มประสิทธิภาพ ทักษะพื้นฐานในการวิเคราะห์จำแนกและการแก้ปัญหาเกี่ยวกับองค์ประกอบพื้นฐานของระบบสินค้าคงคลังทั้งในกรณีสินค้าชนิดเดียวและแบบสินค้าหลายชนิดโดยใช้แบบจำลองเชิงกำหนดได้ และแบบจำลองรูปแบบสุ่ม เทคนิคการพยากรณ์และการปฏิบัติ กรณีศึกษา	
SCIM 231	Introduction to Data Science	3 (3-0-6)
วทคอ ๒๓๑	การแนะนำวิทยาการข้อมูล	
Prerequisites:	None	
วิชาบังคับก่อน:	ไม่มี An introduction to key aspects of data science: data retrieval and manipulation, data visualization, statistical computation and machine learning, presentation and	



communication; an introduction to contemporary computing and database environments such as R and SQL; case studies from outside the classroom; foundational skills necessary to turn data into information; practicing of information searching skill for working on group assignments and doing presentation in the classroom

การแนะนำสู่แง่มุมสำคัญของวิทยาการข้อมูล การดึงข้อมูล และการจัดการข้อมูล การแสดงข้อมูล การคำนวณเชิงสถิติ การเรียนรู้ด้วยเครื่อง การนำเสนอและการสื่อสาร การคำนวณร่วมสมัย สิ่งแวดล้อมด้านฐานข้อมูล เช่น อาร์ และ เอสคิวแอล กรณีศึกษาจากนอกห้องเรียน ทักษะพื้นฐานสำคัญสำหรับการเปลี่ยนข้อมูลเป็นความรู้ การฝึกทักษะการสืบค้นข้อมูลเพื่อทำงานกลุ่มและนำเสนอในห้องเรียน

SCIM 251	Data Structures in Mathematics	3 (3-0-6)
วทคอ ๒๕๑	โครงสร้างข้อมูลในคณิตศาสตร์	
Prerequisites:	SCIM 111 Introduction to Scientific Computing	
วิชาบังคับก่อน:	วทคอ ๑๑๑ การคำนวณทางวิทยาศาสตร์เบื้องต้น	
	Data; data structures; array; stack; recursion; link lists; queues; trees; graphs; coding; sorting and searching; storage management; filing systems design and implementation; a practice of information searching skill for working on group assignments and conducting presentations in classroom	
	ข้อมูล โครงสร้างข้อมูล แถวลำดับ สแตก การเวียนเกิด ลิงค์ลิสต์ แถวคอย รูปต้นไม้ กราฟ การลงรหัส การเรียงและการค้นหาข้อมูล การจัดการหน่วยเก็บ การออกแบบระบบไฟล์ข้อมูลและการนำไปใช้ การฝึกทักษะการสืบค้นข้อมูลเพื่อทำงานกลุ่มและนำเสนอในห้องเรียน	
SCIM 252	Database Management	3 (3-0-6)
วทคอ ๒๕๒	การจัดการฐานข้อมูล	
Prerequisites:	None	
วิชาบังคับก่อน:	ไม่มี	
	Basic concepts of database management; the entity-relationship model; the development of relational database from E-R diagram; relational algebra and SQL; integrity constraints; normalization theory for design; relational database; concepts of crash recovery; concurrency control; the distributed database management	



แนวคิดพื้นฐานของการจัดการฐานข้อมูล แบบจำลองความสัมพันธ์เอนทิตี การพัฒนาของฐานข้อมูลเชิงสัมพันธ์จากแผนภาพอีอาร์ พีชคณิตเชิงสัมพันธ์และเอสคิวแอล เงื่อนไขบังคับบูรณาการ ทฤษฎีการทำให้เป็นบรรทัดฐานสำหรับการออกแบบ ฐานข้อมูลเชิงสัมพันธ์ แนวคิดของการฟื้นฟูสภาพแคช การควบคุมภาวะพร้อมกัน การจัดการฐานข้อมูลแบบกระจาย

SCIM 253 Mobile, Locative and Ubiquitous Media 3 (3-0-6)

วทคอ ๒๕๓ โทรศัพท์เคลื่อนที่ สื่อตำแหน่งชัดเจน และการแพร่หลาย

Prerequisites: None

วิชาบังคับก่อน: ไม่มี

An exploration of the ways in which mobile interfaces have become part of our everyday life; how they are developed and marketed; the culture that has evolved around them; the impact of locative and ubiquitous media on lifestyle and information transfer; the identification of what makes a successful application; the notion of personalization and intelligence in media environments; visualization and the development of simple applications; practicing information searching skill for working on group assignments and doing presentation in the classroom

การสำรวจวิถีทางที่อินเทอร์เน็ตเฟื่องฟูของโทรศัพท์เคลื่อนที่ ซึ่งกลายเป็นส่วนหนึ่งของชีวิตประจำวัน วิธีการพัฒนา และวางตลาดโทรศัพท์เคลื่อนที่ วัฒนธรรมที่พัฒนาขึ้นโดยรอบ ผลกระทบของสื่อตำแหน่งชัดเจน และการแพร่หลายของสื่อต่อวิถีการดำเนินชีวิต และการถ่ายโอนข้อมูล การบ่งชี้สิ่งที่ทำให้โปรแกรมแอพลิเคชันประสบความสำเร็จ ความคิดเกี่ยวกับการทำให้เป็นส่วนบุคคลและสติปัญญาในสภาพแวดล้อมสื่อ การสร้างภาพและพัฒนาแอพลิเคชันแบบง่าย การฝึกทักษะการสืบค้นข้อมูลเพื่อทำงานกลุ่มและนำเสนอในห้องเรียน

SCIM 254 Data Communications 3 (3-0-6)

วทคอ ๒๕๔ การสื่อสารข้อมูล

Prerequisites: None

วิชาบังคับก่อน: ไม่มี

An introduction to data communications; character codes; interface standard; bandwidths; noises; transmission medias; modulation efficiency; data integrity; protocols; data security; system architecture; networks; network access; internet; network reliability



การแนะนำการสื่อสารข้อมูล รหัสแทนตัวอักขระ มาตรฐานการติดต่อผู้ใช้ ความกว้างของสัญญาณ ข้อมูล การรบกวนสัญญาณ วัสดุในการติดต่อสื่อสาร ประสิทธิภาพของการโมดูเลชั่น บุณภาพ ข้อมูล โปรโตคอล การรักษาความปลอดภัยข้อมูล สถาปัตยกรรมระบบ ช่างงาน การเข้าถึงช่างงาน อินเทอร์เน็ต ความไว้วางใจได้ของช่างงาน

SCIM 302	Stochastic Processes and Applications in Industry	3 (3-0-6)
วทคอ ๓๐๒	กระบวนการสโตนอสติก และการประยุกต์ในอุตสาหกรรม	
Prerequisites:	SCMA 189 Statistical Data Analysis II	
วิชาบังคับก่อน:	วทคณ ๑๘๙ การวิเคราะห์ข้อมูลสถิติ ๒	
	An introduction to random processes and their applications to industrial work; Gaussian processes; Markov processes in the discrete time; Martingales in the discrete time; Poisson processes and Markov processes in the continuous time; applications to finance and engineering	
	ความรู้เบื้องต้นเกี่ยวกับกระบวนการสุ่มและตัวอย่างการประยุกต์ใช้งานเชิงอุตสาหกรรม กระบวนการเกาส์เซียน กระบวนการมาร์คอฟ ในเวลาแบบไม่ต่อเนื่อง มาร์ติงเกลในเวลาแบบไม่ต่อเนื่อง กระบวนการปัวร์ซอง และกระบวนการมาร์คอฟในเวลาแบบต่อเนื่อง ตัวอย่างการประยุกต์ใช้ในทาง การเงินและวิศวกรรม	
SCIM 303	Seminar	1 (1-0-2)
วทคอ ๓๐๓	สัมมนา	
Prerequisites:	None	
วิชาบังคับก่อน:	ไม่มี	
	Presentations and discussions of academic publications in industrial mathematics by students through academic seminars; the students will be free to choose their own topic, but a list of suggested topics will be provided by instructors	
	การนำเสนอและอภิปรายเกี่ยวกับบทความทางวิชาการในคณิตศาสตร์อุตสาหกรรมโดยนักศึกษาในห้องสัมมนาทางวิชาการ นักเรียนจะได้รับอิสระในการเลือกหัวข้อของตนเอง แต่อาจารย์ผู้สอน อาจจะเสนอรายการของหัวข้อที่น่าสนใจ	
SCIM 304	Network Optimization	3 (3-0-6)
วทคอ ๓๐๔	การทำให้เครือข่ายดีที่สุด	
Prerequisites:	None	





วิชาบังคับก่อน: ไม่มี

Basic definitions and applications of the graph theory to network design and analysis, scheduling, facility layout design and various allocation problems; basic concepts of network flows: max-flow min-cut theorem; feasible flows and algorithms; algorithm for maximum matchings in bipartite graphs; project and planning: critical path method (CPM) and program evaluation and review technique (PERT); resource allocation problems and time constraints

คำนิยามพื้นฐานและการประยุกต์ใช้ทฤษฎีกราฟในการออกแบบเครือข่ายและการวิเคราะห์ การจัดเวลาและทรัพยากรในการทำงาน การออกแบบสิ่งอำนวยความสะดวกและปัญหาการจัดสรรต่างๆ แนวคิดพื้นฐานของเครือข่ายการทำงานที่ได้ผลลัพธ์สูงสุด ทฤษฎีบทการตัดที่น้อยที่สุด รูปแบบการทำงานที่เป็นไปได้ในเครือข่ายและขั้นตอนวิธี ขั้นตอนวิธีการจับคู่สูงสุดในกราฟสองฝ่าย โครงการและการวางแผน: วิธีการเส้นทางวิกฤตและการประเมินผลโครงการและเทคนิคการทบทวน ปัญหาการจัดสรรทรัพยากรและข้อจำกัดด้านเวลา

SCIM 305 Logistic Modelling and Optimization

3 (3-0-6)

วทคอ ๓๐๕ การจำลองโลจิสติกส์ และการหาคำตอบที่ดีที่สุด

Prerequisites: SCIM206 Supply Chain Modelling and Optimization

วิชาบังคับก่อน: วทคอ ๒๐๖ การจำลองสายโซ่อุปทาน และการหาคำตอบที่ดีที่สุด

Skills necessary for optimal decision-making in relation to the warehouse design and operation; basic concepts of warehouse models and processes; decisions concerning the design, tactical and operational aspects of warehousing and their flow-on effects; design decisions involving layout issues as well as storage and retrieval transport mechanisms; tactical decisions involving allocation and products to space; operational decisions with storage and retrieval planning as well as online assembly; systems for total quality management to handle the material flow and an analysis of the interface between logistics and manufacturing; investigation of the problem of optimal facility location and evaluation of several core facility location models; the use of heuristic algorithms to obtain optimal solutions; case studies

ทักษะที่จำเป็นในการตัดสินใจที่เหมาะสมที่สุดเกี่ยวกับการออกแบบคลังสินค้าและการดำเนินการ แนวคิดพื้นฐานของตัวแบบคลังสินค้าและกระบวนการ การตัดสินใจเกี่ยวกับการออกแบบ นโยบาย และการดำเนินการในคลัง และผลกระทบของการไหลของสินค้า การตัดสินใจด้านการออกแบบเกี่ยวกับแผนผังของคลัง และกลไกการขนส่งในการจัดเก็บและจำหน่าย การตัดสินใจด้านนโยบาย



เกี่ยวกับการหาที่ตั้งและพื้นที่การจัดเก็บการตัดสินใจในการดำเนินการในการวางแผนการจัดเก็บและจำหน่าย รวมทั้งการประกอบสินค้า ระบบสำหรับการจัดการคุณภาพในการไหลของวัสดุ และการวิเคราะห์การประสานงานระหว่างฝ่ายโลจิสติกส์และฝ่ายผลิต การศึกษาปัญหาที่ตั้งของโรงงานและการประเมินตัวแบบของที่ตั้งของโรงงานหลายแห่ง การใช้ขั้นตอนวิธีฮิวริสติกในการหาคำตอบที่เหมาะสมที่สุด กรณีศึกษา

SCIM 307	Control Theory and Optimization	3 (3-0-6)
วทคอ ๓๐๗	ทฤษฎีการควบคุม และการหาคำตอบที่ดีที่สุด	
Prerequisites:	SCIM 203 Partial Differential Equations for Engineers and Scientists	
วิชาบังคับก่อน:	วทคอ ๒๐๓ สมการเชิงอนุพันธ์ย่อยสำหรับวิศวกรและนักวิทยาศาสตร์ Controllability, observability, and stabilization for linear and nonlinear systems. Kalman and Nyquist criteria; frequency domain methods, Liapunov functions การควบคุม การสังเกต และการมีเสถียรภาพสำหรับระบบเชิงเส้นและไม่เชิงเส้น เกณฑ์ของคาลมาน และไนควิสต์ วิธีบนโดเมนความถี่ ฟังก์ชันไลปูนอฟ	
SCIM 309	Mathematical Statistics	3(3-0-0)
วทคอ ๓๐๙	สถิติเชิงคณิตศาสตร์	
Prerequisites:	SCIM 121 Statistical Data Analysis I, SCIM 101 Mathematics I	
วิชาบังคับก่อน:	วทคอ ๑๒๑ การวิเคราะห์ข้อมูลสถิติ ๑, วทคอ ๑๐๑ คณิตศาสตร์ ๑ A review of probability axioms and probability rules, including Bayes rule; special univariate distributions; multivariate, marginal and conditional distributions; independent random variables; functions of random variables, including random sums and order statistics; expected values, covariance and correlation, conditional expectation and moment generating function; convergence of random sequences; introduction to the stochastic process (discrete time Markov chain); distribution derived from the normal distribution to study sampling distributions of sample mean and the sample variance; an introduction to estimation of parameters (MLE). ทฤษฎีความน่าจะเป็น การแจกแจงหนึ่งตัวแปรแบบพิเศษ การแจกแจงหลายตัวแปร การแจกแจงตามขอบและการแจกแจงอย่างมีเงื่อนไข การแนะนำกระบวนการสโตแคสติก ลูกโซ่แบบมาร์คอฟ ค่าคาดหวัง และฟังก์ชันก่อกำเนิดของฟังก์ชันตัวแปรสุ่ม และอนุพันธ์การแจกแจง ผลบวกสุ่ม การลู่เข้าของลำดับสุ่ม การแจกแจงการชักตัวอย่าง วิธีพื้นฐานของการประมาณ การประมาณค่าความควรจะเป็นสูงสุด และการประมาณค่าแบบจำลองพหุคูณ การไม่เอนเอียง และความตึงกัน การ	

Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program)

Department of Mathematics

แนะนำทฤษฎีการตัดสินใจ วิธีการมินิแมกซ์ และเบส์ โครงสร้างของกฎมินิแมกซ์ และเบส์ กฎชั้น  
บริบูรณ์ การประมาณค่าแบบจุดและแบบช่วงในปัญหาการตัดสินใจ และการทดสอบสมมติฐานใน  
ปัญหาการตัดสินใจ

SCIM 311	Statistical Modelling	3 (3-0-6)
วทคอ ๓๑๑	การจำลองรูปแบบเชิงสถิติ	
Prerequisites:	SCIM 121 Statistical Data Analysis I, SCIM 101 Mathematics I	
วิชาบังคับก่อน:	วทคอ ๒๔๑ สถิติเชิงคณิตศาสตร์	
	Basic concepts of the decision theory; fundamentals of Bayesian statistics and Bayesian estimators; the Generalized Linear Model (GLM) and its application; an analysis of time series models; the Monte Carlo simulation	
	ความคิดรวบยอดแบบพื้นฐานของทฤษฎีการตัดสินใจ สถิติเบย์เขียนเบื้องต้น และตัวประมาณค่าเบย์เขียน แบบจำลองเชิงเส้นวางนัยทั่วไป (จีแอลเอ็ม) และการประยุกต์การวิเคราะห์แบบจำลองอนุกรมเวลา การจำลองมอนติคาร์โล	
SCIM 321	Computer Applications in Statistics	3 (3-0-6)
วทคอ ๓๒๑	การประยุกต์คอมพิวเตอร์ในสถิติศาสตร์	
Prerequisites:	None	
วิชาบังคับก่อน:	ไม่มี	
	The use of computers in statistics; significance testing; correlation; analysis of variance; curve fitting; the factor analysis; the nonparametric method; case studies from outside the classroom	
	การใช้คอมพิวเตอร์ในสถิติศาสตร์ การทดสอบนัยสำคัญ สหสัมพันธ์ การวิเคราะห์ความแปรปรวน การปรับเส้นโค้ง การวิเคราะห์ตัวประกอบ วิธีไม่อิงพารามิเตอร์ กรณีศึกษาจากนอกห้องเรียน	
SCIM 322	Mathematics for Artificial Intelligence	3 (3-0-6)
วทคอ ๓๒๒	คณิตศาสตร์สำหรับปัญญาประดิษฐ์	
Prerequisites:	None	
วิชาบังคับก่อน:	ไม่มี	
	Artificial intelligence: root and scope; artificial intelligence as representation and search; knowledge representation; expert systems; reasoning; other topics (topics	



covered depending on class interests); practicing information searching skill for working on group assignments and doing presentation in the classroom

รากฐานและขอบเขตของปัญญาประดิษฐ์ ปัญญาประดิษฐ์ในฐานะตัวแทนและการค้นหา ตัวแทนความรู้ ระบบผู้เชี่ยวชาญ การให้เหตุผล หัวข้ออื่น (ซึ่งขึ้นกับความสนใจของกลุ่ม) การฝึกทักษะการสืบค้นข้อมูลเพื่อทำงานกลุ่มและนำเสนอในห้องเรียน

SCIM 323 Data Mining 3 (3-0-6)

วทคอ ๓๒๓ การทำเหมืองข้อมูล

Prerequisites: None

วิชาบังคับก่อน: ไม่มี

An introduction to data mining; virtuous cycle of data mining; data mining methodology and best practices; data for data mining; an introduction to classification: Naive-Bayes and nearest neighbor; decision trees; estimating the predictive accuracy of a classifier; continuous attributes; avoiding over-fitting of decision trees; association rule mining; clustering

การทำเหมืองข้อมูลขั้นแนะนำ วัฏจักรของการทำเหมืองข้อมูล ระเบียบวิธีของการทำเหมืองข้อมูล และวิธีปฏิบัติที่เป็นเลิศ ข้อมูลสำหรับการทำเหมืองข้อมูล การจำแนกขั้นแนะนำ นาอีฟเบย์ส และย่านใกล้เคียงที่ใกล้ที่สุด ต้นไม้การตัดสินใจ การประมาณความถูกต้องของตัวจำแนก ลักษณะประจำแบบต่อเนื่อง การหลีกเลี่ยงการเกิดโอเวอร์ฟิตของต้นไม้การตัดสินใจ การทำเหมืองกฎความสัมพันธ์ การจัดกลุ่ม

SCIM 324 Design and Analysis of Algorithms 3 (3-0-6)

วทคอ ๓๒๔ การออกแบบและวิเคราะห์อัลกอริทึม

Prerequisites: SCIM 111 Introduction to Scientific Computing

วิชาบังคับก่อน: วทคอ ๑๑๑ การคำนวณทางวิทยาศาสตร์เบื้องต้น

Standard algorithm design techniques and analysis; divide and conquer strategy; greedy and dynamic programming; sorting algorithms; graph algorithms; data compression; 0/1 knapsack; string searching; matrix-chain multiplication; the longest common subsequence; parallel and distributed algorithms; the use of the growth of functions concept to analyze the algorithm resource requirement; practicing



information searching skill for working on group assignments and doing presentations in the classroom

เทคนิคการออกแบบขั้นตอนอัลกอริทึมมาตรฐานและการวิเคราะห์ กลยุทธ์แบ่งแยกและพิชิต การเขียนโปรแกรมแบบโลกละและแบบพลวัต อัลกอริทึมการจัดเรียง อัลกอริทึมกราฟ การบีบอัดข้อมูล ปัญหาเป้กระสอบ การค้นหาข้อความ การคูณเมทริกซ์แบบต่อเนื่อง การเรียงลำดับร่วมกันที่ยาวที่สุด อัลกอริทึมแบบขนานและแบบกระจาย การใช้แนวคิดด้านการโตขึ้นของฟังก์ชันเพื่อวิเคราะห์ความต้องการทรัพยากรของอัลกอริทึม การฝึกทักษะการสืบค้นข้อมูลเพื่อทำงานกลุ่มและนำเสนอในห้องเรียน

SCIM 325 Interactive, Virtual & Immersive Environments

3 (3-0-6)

วทคอ ๓๒๕ สภาพแวดล้อมที่สามารถตอบสนองและเสมือนจริง

Prerequisites: None

วิชาบังคับก่อน: ไม่มี

Basic concepts and understanding of the Virtual Reality systems and interfaces; several aspects of virtual and immersive environments such as users' experience; interaction design; virtual collaboration; software and hardware involved in the virtual immersive applications; 3D immersive interfaces and interaction; 3D displays; Head-Mounted Displays; tiled and stereo displays; collaborative and networked virtual environments; applications relating to virtual and immersive environments; practical components suited to various discipline interests; theoretical and practical approaches and challenges in virtual and immersive environments; a practice of information searching skill for working on group assignments and doing presentation in the classroom

แนวคิดพื้นฐานและความเข้าใจเกี่ยวกับระบบเสมือนจริงและอินเทอร์เน็ตเฟส หลาย ๆ แง่มุมของสภาพแวดล้อมเสมือนและเชิงอิมเมอร์ซีฟเช่นประสบการณ์ของผู้ใช้ การออกแบบระบบที่สามารถปฏิสัมพันธ์กับผู้ใช้ได้ การทำงานร่วมกันเสมือน ซอฟต์แวร์และฮาร์ดแวร์ที่เกี่ยวข้องกับแอปพลิเคชันอิมเมอร์ซีฟเชิงเสมือน อินเทอร์เน็ตเฟสเชิงอิมเมอร์ซีฟและปฏิสัมพันธ์ 3 มิติ จอภาพ 3 มิติ จอแสดงผลแบบเชื่อมกับศีรษะ จอแสดงผลแบบประกอบและระบบสเตอริโอ สภาพแวดล้อมเสมือนร่วมกันและเครือข่าย แอปพลิเคชันที่เกี่ยวข้องกับสภาพแวดล้อมเสมือนและเชิงอิมเมอร์ซีฟ องค์ประกอบที่เหมาะสมกับความสนใจในสาขาต่าง ๆ วิธีการทางทฤษฎี ปฏิบัติและความท้าทายในสภาพแวดล้อมเสมือนจริงเชิงอิมเมอร์ซีฟ การฝึกทักษะการสืบค้นข้อมูลเพื่อทำงานกลุ่มและนำเสนอในห้องเรียน



SCIM 401	Scientific Computing	3 (3-0-6)
วทค ๔๐๑	การคำนวณทางวิทยาศาสตร์	
Prerequisites:	SCIM 111 Introduction to Scientific Computing	
วิชาบังคับก่อน:	วทค ๑๑๑ การคำนวณทางวิทยาศาสตร์เบื้องต้น	
	<p>The Fortran 95 programming language: arithmetic computations; selection and repetition structures; precision control; formatted I/O; array processing; procedures and modules, program design and debugging; numerical methods and their computer implementation: an analysis and control of errors; the solution of nonlinear equations and error analysis; solutions of the linear system of equations by direct methods; numerical interpolation and integration; introduction to the solution of ordinary differential equations</p> <p>ภาษาโปรแกรมฟอร์แทรน รวมทั้ง การคำนวณเลขคณิต โครงสร 95 ำงการเลือกและโครงสร้างการ ทำซ้ำ การควบคุมความเที่ยง โอ/โอ จัดรูปแบบ การประมวลผลแถวลำดับ กระบวนคำสั่งและโมดูล การออกแบบโปรแกรมและการแก้จุดบกพร่อง วิธีเชิงตัวเลขและการทำให้เกิดผลโดยใช้ คอมพิวเตอร์ที่รวมการวิเคราะห์และการควบคุมค่าคลาดเคลื่อน ผลเฉลยของสมการไม่เชิงเส้นและ การวิเคราะห์ค่าคลาดเคลื่อน ผลเฉลยของระบบสมการเชิงเส้นด้วยวิธีโดยตรง การประมาณค่า ในช่วงเชิงตัวเลขและการหาปริพันธ์ ผลเฉลยของสมการเชิงอนุพันธ์สามัญเบื้องต้น</p>	
SCIM 402	Industrial Modelling and Optimization	3 (3-0-6)
วทค ๔๐๒	การจำลองเชิงอุตสาหกรรม และการหาคำตอบที่ดีที่สุด	
Prerequisites:	None	
วิชาบังคับก่อน:	ไม่มี	
	<p>Skills development in constructing and applying integer linear programming models to large-scale industrial problems including the airline scheduling, communication systems, distribution networks, production planning, defence warfare systems, environmental modelling, resource management and many more; these problems are computationally difficult, but improved solutions have significant impact on the competitiveness and viability of businesses and industries; modelling with binary and integer variables; and solving mixed integer linear programming (MILP) problems using commercial software packages; integer programming techniques: branch algorithms, Lagrangian relaxations, LP rounding heuristics, and hybrid algorithms; case studies</p>	



การพัฒนาทักษะในการสร้างและการใช้แบบจำลองโปรแกรมเชิงเส้นสำหรับปัญหาอุตสาหกรรมขนาดใหญ่ เช่น การจัดตารางเที่ยวบิน ระบบการติดต่อสื่อสาร ข่ายงานแจกแจง การวางแผนการผลิต ระบบการป้องกันสงคราม การจำลองทางสิ่งแวดล้อม การบริหารทรัพยากร และอื่นๆ ปัญหาเหล่านี้มีความยากในการคำนวณ แต่ผลเฉลยที่ได้รับการปรับปรุงให้ดีขึ้นแล้วนั้น มีผลกระทบต่อการแข่งขันและการเจริญเติบโตของเศรษฐกิจและอุตสาหกรรม การจำลองของตัวแปรทวิภาคและเชิงจำนวนเต็ม และการหาผลเฉลยของปัญหาโปรแกรมเชิงเส้นเชิงจำนวนเต็มผสม (MILP) โดยใช้โปรแกรมสำเร็จ เทคนิคการโปรแกรมเชิงจำนวนเต็ม เช่น ขั้นตอนวิธีแตกกิ่ง การผ่อนคลายแบบลากรางจ์ ฮิวริสติกพิเศษแอลพี และขั้นตอนวิธีการไฮบริด กรณีศึกษา

SCIM 403	Numerical Optimization	3 (3-0-6)
วทคอ ๔๐๓	การหาคำตอบที่ดีที่สุดเชิงตัวเลข	
Prerequisites:	SCIM 202 Advanced Calculus	
วิชาบังคับก่อน:	วทคอ ๒๐๒ แคลคูลัสขั้นสูง	
<p>Optimization models; one-dimensional search techniques; unconstrained optimization techniques for functions with several variables, including searching methods using function values only; the steepest descent method, Newton's method; quasi-Newton's methods, conjugate gradient methods, accurate and inaccurate line searches, convergence and the rate of convergence; constrained optimization techniques, including Lagrangian multipliers, Kuhn-Tucker optimality conditions, penalty function methods, quadratic programming techniques, sequential quadratic programming technique; dynamic programming; branch and bound methods</p> <p>ตัวแบบเหมาะสมที่สุด เทคนิคการค้นหามิติ เทคนิคเหมาะสมที่สุดไร้เงื่อนไขสำหรับฟังก์ชันหลายตัวแปร รวมทั้งวิธีการค้นหาโดยใช้ค่าของฟังก์ชันอย่างเดียว วิธีการลดขั้นที่สุด วิธีของนิวตัน วิธีควอลิ-นิวตัน วิธีคอนจูเกตเกรเดียนต์ วิธีการค้นหาเชิงแนวเส้นแบบแม่นยำและไม่แม่นยำ การลู่เข้าและอัตราการลู่เข้า เทคนิคการหาค่าที่ดีที่สุดตามเงื่อนไขจำกัดรวมทั้งตัวคูณลากรางจ์ เงื่อนไขคุนท-ทัคเคอร์สำหรับการหาค่าที่เหมาะสมที่สุด วิธีฟังก์ชันพินัลทิ เทคนิคการโปรแกรมกำลังสอง เทคนิคการโปรแกรมกำลังสองเชิงลำดับ การโปรแกรมเชิงพลวัต วิธีขยายและจำกัดเขต</p>		
SCIM 404	Applied Mathematical Modelling in Industrial Processes	3 (3-0-6)
วทคอ ๔๐๔	การจำลองคณิตศาสตร์ประยุกต์ในกระบวนการอุตสาหกรรม	
Prerequisites:	SCIM 202 Advanced Calculus	
วิชาบังคับก่อน:	วทคอ ๒๐๒ แคลคูลัสขั้นสูง	



Advanced principles in mathematical modelling for industrial systems and processes: classification of mathematical models and modelling methods; mathematical models for the mechanical systems, the electronical systems and the fluid and thermal systems with examples from business and industry

หลักการขั้นสูงในการสร้างแบบจำลองตัวแบบเชิงคณิตศาสตร์ที่ใช้อธิบายระบบและกระบวนการทางอุตสาหกรรม การแยกประเภทของแบบจำลองทางคณิตศาสตร์และการสร้างแบบจำลอง แบบจำลองทางคณิตศาสตร์ของระบบเชิงกล แบบจำลองทางคณิตศาสตร์ของระบบไฟฟ้า และแบบจำลองทางคณิตศาสตร์ของระบบของไหลและความร้อน พร้อมด้วยตัวอย่างจากภาคธุรกิจและภาคอุตสาหกรรม

SCIM 405 Dynamic and Stochastic Modelling and Optimization 3 (3-0-6)

วทคอ ๔๐๕ การจำลองสโตนัสติกไดนามิก และการหาคำตอบที่ดีที่สุด

Prerequisites: SCIM 102 Mathematics II, SCMA 189 Statistical data analysis II

วิชาบังคับก่อน: วทคอ ๑๐๒ คณิตศาสตร์ ๒, วทคณ ๑๘๙ การวิเคราะห์ข้อมูลสถิติ ๒

Dynamic and stochastic systems and a solid foundation in a range of tools applicable to the complex problems arising in industrial modelling and optimization; dynamic programming: basic concepts, applications, models and algorithms being investigated with optimal solutions developed and implemented for relevant applications. queuing models: basic concepts. several types of queuing models and their advantages and disadvantages and optimal solutions; simulation: the industrial modeler with the ability to study complex systems in considerable detail; simulation modelling comprising three major components: input generation that allowing the system to be viewed "in action"; a bookkeeping phase keeping track of transactions occurring in the system and keeping counters on going processes in order to calculate appropriate performance measures and output analysis that establish the effectiveness of the system's performance; necessary skills to analyse, develop, and implement simulation models; techniques and methodologies for the effective optimization of simulations

ระบบสโตนัสติกไดนามิก และ เครื่องมือที่สามารถนำไปใช้ศึกษาปัญหาที่ซับซ้อนในการจำลองตัวแบบทางอุตสาหกรรมและการหาคำตอบที่ดีที่สุด การโปรแกรมไดนามิกตรวจสอบแนวคิดพื้นฐาน การประยุกต์ ตัวแบบ และ ขั้นตอนวิธี ด้วยผลเฉลยที่ดีที่สุด สำหรับการประยุกต์ใช้ในงานที่เกี่ยวข้อง ตัวแบบแถวคอยแนวคิดพื้นฐานชนิดต่างๆของตัวแบบแถวคอย ข้อดีข้อเสียและผลเฉลยที่ดีที่สุด การประมวลผลตัวแบบเชิงอุตสาหกรรมที่สามารถนำไปใช้ในการศึกษาระบบที่ซับซ้อนได้ การสร้างแบบจำลองเพื่อการประมวลผลต้องอาศัยส่วนประกอบที่สำคัญสามส่วนคือ การสร้างอินพุตเพื่อให้





ระบบสมบูรณสามารถดำเนินการได้ ขั้นตอนการดำเนินการซึ่งเก็บรายการปฏิกิริยาที่เกิดขึ้นในระบบ และการวิเคราะห์เอาต์พุตเพื่อเสริมสร้างประสิทธิผลของการดำเนินการของระบบ ทักษะที่จำเป็นในการวิเคราะห์ การพัฒนาตัวแบบและการนำไปใช้ประโยชน์ เทคนิคและวิธีการสำหรับการหาคำตอบที่ดีที่สุดอย่างมีประสิทธิภาพของการประมวลผล

SCIM 406	Production Planning and Management	3 (3-0-6)
วทค ๔๐๖	การวางแผนการผลิตและการจัดการการผลิต	
Prerequisites:	None	
วิชาบังคับก่อน:	ไม่มี	
<p>Providing the skills needed to effectively tack the range of planning and management decisions arising in the manufacturing systems; a key objective of a manufacturing system is the timely production of products conforming to the specifications while minimizing costs; different types of manufacturing systems, including single machine schedule, parallel machine schedule, and job-shop flow</p> <p>จุดมุ่งหมายของวิชานี้ เพื่อสร้างเสริมทักษะความต้องการทางการติดตามขอบเขตของการวางแผนและการจัดการการตัดสินใจที่เกิดขึ้นในระบบอุตสาหกรรมการผลิต จุดประสงค์หลักของระบบอุตสาหกรรมการผลิตคือการผลิตผลิตภัณฑ์ตามเวลา ซึ่งเป็นข้อจำกัดในขณะที่จะต้องคำนึงถึงการลดต้นทุน ระบบอุตสาหกรรมผลิตชนิดต่างๆจะถูกนำมาศึกษา รวมถึง ตารางแบบเครื่องจักรเดียว ตารางเครื่องจักรแบบคู่ขนานและ การไหลของงานร้านค้า</p>		
SCIM 411	Special Topic in Industrial Mathematics I	3 (3-0-6)
วทค ๔๑๑	หัวข้อพิเศษด้านคณิตศาสตร์อุตสาหกรรม ๑	
Prerequisites:	None (Depend on project advisor and program committee)	
วิชาบังคับก่อน:	ไม่มี (ขึ้นอยู่กับอาจารย์ที่ปรึกษาโครงการและกรรมการบริหารหลักสูตร)	
<p>Topics of current interest related to mathematical optimization techniques for industrial problems</p> <p>หัวข้อที่กำลังเป็นที่สนใจในปัจจุบันซึ่งเกี่ยวข้องกับการใช้แนวคิดทางคณิตศาสตร์และเทคนิคการหาค่าที่ดีที่สุดที่แก้ปัญหาทางอุตสาหกรรม</p>		
SCIM 412	Special Topic in Industrial Mathematics II	3 (3-0-6)
วทค ๔๑๒	หัวข้อพิเศษด้านคณิตศาสตร์อุตสาหกรรม ๒	
Prerequisites:	None (Depend on project advisor and program committee)	

Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

วิชาบังคับก่อน:	ไม่มี (ขึ้นอยู่กับอาจารย์ที่ปรึกษาโครงการและกรรมการบริหารหลักสูตร)	
	Topics of current interest related to mathematical optimization techniques for industrial problems	
	หัวข้อที่กำลังเป็นที่สนใจในปัจจุบันซึ่งเกี่ยวข้องกับการใช้แนวคิดทางคณิตศาสตร์และเทคนิคการหาค่าที่ดีที่สุดที่สุดในปัญหาทางอุตสาหกรรม	
SCIM 421	Special Topic in Data Science I	3 (3-0-6)
วทคอ ๔๒๑	หัวข้อพิเศษด้านวิทยาการข้อมูล ๑	
Prerequisites:	None (Depend on project advisor and program committee)	
วิชาบังคับก่อน:	ไม่มี (ขึ้นอยู่กับอาจารย์ที่ปรึกษาโครงการและกรรมการบริหารหลักสูตร)	
	Topics of current interest related to mathematical or computational techniques for data science	
	หัวข้อที่กำลังเป็นที่สนใจในปัจจุบันซึ่งเกี่ยวข้องกับการใช้แนวคิดทางคณิตศาสตร์และเทคนิคการคำนวณสำหรับวิทยาการข้อมูล	
SCIM 422	Special Topic in Data Science II	3 (3-0-6)
วทคอ ๔๒๒	หัวข้อพิเศษด้านวิทยาการข้อมูล ๒	
Prerequisites:	None (Depend on project advisor and program committee)	
วิชาบังคับก่อน:	ไม่มี (ขึ้นอยู่กับอาจารย์ที่ปรึกษาโครงการและกรรมการบริหารหลักสูตร)	
	Topics of current interest related to mathematical or computational techniques for data science	
	หัวข้อที่กำลังเป็นที่สนใจในปัจจุบันซึ่งเกี่ยวข้องกับการใช้แนวคิดทางคณิตศาสตร์และเทคนิคการคำนวณสำหรับวิทยาการข้อมูล	

**c. Free Electives** no less than 6 Credits

(theory-lab/practice –self-study)

SCIM 207	Elements of Accounting	3 (3-0-6)
วทคอ ๒๐๗	องค์ประกอบของระบบบัญชี	
Prerequisites:	None	
วิชาบังคับก่อน:	ไม่มี	



An introduction to the use of accounting in the decision making process; information presented with a bias toward user's orientation as opposed to preparer orientation; identifying the role of accounting in society; basic accounting and business terminology; concepts behind financial information; accepted accounting practices; analysis and interpretation of financial statements of sole proprietorships and corporations

การแนะนำการใช้บัญชีในกระบวนการตัดสินใจ ข้อมูลไม่เที่ยงตรงที่มีผลต่อการวางแผนจากผู้ซึ่งตรงข้ามกับการวางแผนจากผู้จัดเตรียม การระบุบทบาทของการบัญชีในสังคม บัญชีเบื้องต้นและคำศัพท์ทางธุรกิจ แนวคิดเบื้องหลังข้อมูลทางการเงิน การบัญชีที่รับรองทั่วไป การวิเคราะห์และการแปลผลของงบการเงินของเจ้าของแต่เพียงผู้เดียวและบริษัท

SCIM 208 Mathematical Methods 3 (3-0-6)

วทค ๒๐๘ วิธีการเชิงคณิตศาสตร์

Prerequisites: SCIM 202 Advanced Calculus

วิชาบังคับก่อน: วทค ๒๐๒ แคลคูลัสขั้นสูง

The complex analysis: functions of a complex variable; analytic functions; the Cauchy's theorem and the Cauchy's integral theorem; the Taylor and Laurent series and the residue theorem; the Laplace transform and the inverse Laplace transform: operational properties, used in solving differential equations; convolution; and solution to some integro-differential equations; Sturm-Liouville systems: orthogonal function; generalised Fourier series expansions; special functions including Bessel and modified Bessel functions; Legendre polynomials; and the Green's function

การวิเคราะห์เชิงซ้อนฟังก์ชันของตัวแปรเชิงซ้อน ฟังก์ชันวิเคราะห์ ทฤษฎีบทโคชีและทฤษฎีบทปริพันธ์โคชี อนุกรมเทย์เลอร์และอนุกรมลอเรน และทฤษฎีบทส่วนตกค้าง ผลการแปลงลาปลาซและการแปลงลาปลาซผกผันสมบัติผลการแปลง การใช้ผลการแปลงแก้ปัญหามหาสมการเชิงอนุพันธ์สังวัตนาการและผลเฉลยของบางสมการเชิงปริพันธ์-อนุพันธ์ระบบสตูม-ลีอูวิลการกระจายฟังก์ชันเชิงตั้งฉาก อนุกรมฟูเรียร์วางนัยทั่วไป ฟังก์ชันพิเศษรวมถึงฟังก์ชันเบสเซลและฟังก์ชันเบสเซลแบบดัดแปลง โพลีโนเมียลเลอจองด์ร์และวิธีฟังก์ชันกรีน

Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program)

Department of Mathematics

SCIM 209	Probabilistic Models in Operations Research	3 (3-0-6)
วทคอ ๒๐๙	ตัวแบบเชิงความน่าจะเป็นในการวิจัยดำเนินการ	
Prerequisites:	SCMA 189 Statistical Data Analysis II	
วิชาบังคับก่อน:	วทคณ ๑๘๙ การวิเคราะห์ข้อมูลสถิติ ๒	
	<p>An introduction to the probability models for investigating the behaviors of the industrial systems; elementary counting processes: Poisson processes; discrete-time and continuous-time Markov chains; the use of these tools to model queues, inventories, process behavior and equipment reliability</p> <p>การแนะนำเบื้องต้นเกี่ยวกับแบบความน่าจะเป็นที่ใช้ในการตรวจสอบการทำงานของระบบอุตสาหกรรม กระบวนการนับเบื้องต้น กระบวนการปัวซอง ลูกโซ่มาร์คอฟแบบเป็นคาบเวลาและแบบต่อเนื่อง การใช้เครื่องมือเหล่านี้เพื่อสร้างตัวแบบของแถวคอย ตัวแบบสินค้าคงคลัง การทำงานของกระบวนการ และความน่าเชื่อถือของอุปกรณ์ต่างๆ</p>	
SCIM 290	Introduction to Mathematical Software	3 (3-0-6)
วทคณ ๒๙๐	ซอฟต์แวร์คณิตศาสตร์ขั้นแนะนำ	
Prerequisites:	None	
วิชาบังคับก่อน:	ไม่มี	
	<p>An introduction to some mathematical software packages, the use of mathematical software packages in some mathematical and statistical topics including matrices; solving linear system of equations; plotting mathematical functions, minimizing function and finding zeros, derivative, integrations; basic data analysis and statistics and statistical distribution</p> <p>ซอฟต์แวร์คณิตศาสตร์ขั้นแนะนำ การใช้ซอฟต์แวร์คณิตศาสตร์ในหัวข้อเชิงคณิตศาสตร์และเชิงสถิติดังนี้ เมทริกซ์ การหาคำตอบของระบบเชิงเส้นของสมการ การวาดกราฟ การหาอนุพันธ์ การหาปริพันธ์ การวิเคราะห์ข้อมูลพื้นฐานและสถิติศาสตร์ และการแจกแจงเชิงสถิติ</p>	

Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

### 3.2 Name, Surname, Identification Number, Academic Position, and Educational Qualifications of the Instructors Responsible for the Program

#### 3.2.1 Instructors Responsible for the Program

No.	Name-Surname	Academic Position	Degree (field)/ Institute/ Graduation year	Most recent Academic Works in 5 years
3.2.1.1	Mr. Meechoke Choodoung National ID number 3-1014-0097X-XXX	Lecturer	<ul style="list-style-type: none"> <li>- Ph.D. (Applied Mathematics) Curtin University of Technology, Australia : 2004 (B.E.2547)</li> <li>- M.Sc. (Computer Science) Asian Institute of Technology, Thailand : 1997 (B.E.2540)</li> <li>- B.Sc. (Mathematics) Mahidol University, Thailand : 1994 (B.E.2537)</li> </ul>	Irwan Rahadi, Meechoke Choodoung, Arunsri Choodoung, Moltira Promkan, Phantip Vattanaviboon, Vichanan Yamkamon, Normal and Hypochromic Red Blood Cells (RBCs) Detection by Using Image Processing., Proceeding the 23rd Annual Meeting in Mathematics AMM2018, 3-5 May 2018, page 442-447.
3.2.1.2	Ms. Umaporn Nuntaplook National ID number 3-5201-0006X-XXX	Lecturer	<ul style="list-style-type: none"> <li>- Ph.D. (Computational and Applied Mathematics) Old Dominion University, Norfolk, Virginia, USA : 2013 (B.E.2556)</li> </ul>	Nuntaplook U, Adam JA., Shape resonances of the transverse magnetic mode in a spherically stratified medium.,



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

			<ul style="list-style-type: none"> <li>- M.Sc. (Computational and Applied Mathematics) Old Dominion University, Norfolk, Virginia, USA : 2008 (B.E.2551)</li> <li>- B.Sc. (Mathematics) Mahidol University, Thailand : 2005 (B.E.2548)</li> </ul>	Int J Appl Phys Math. 2018;8(3):18-30.
3.2.1.3	Mr. Wasin Padungwech National ID number 1-1303-0009X-XXX	Lecturer	<ul style="list-style-type: none"> <li>- Doctor of Philosophy (Mathematics), Cardiff University, 2018 (B.E.2561)</li> <li>- Bachelor of Arts and Master of Mathematics, University of Cambridge, 2013 (B.E.2556)</li> </ul>	Alrajhi K., Thompson J., Padungwech W. (2018) A Heuristic Approach for the Dynamic Frequency Assignment Problem. In: Chao F., Schockaert S., Zhang Q. (eds) Advances in Computational Intelligence Systems. UKCI 2017. Advances in Intelligent Systems and Computing, vol 650. Springer, Cham
3.2.1.4	Mr. Nathnarong Khajohnsaksumeth National ID number 3-1506-0066X-XXX	Lecturer	<ul style="list-style-type: none"> <li>- Ph.D. (Mathematics and Statistics) Curtin University of Technology, Australia : 2014 (B.E.2557)</li> <li>- M.Sc. (Industrial</li> </ul>	A. Charoenloedmongkhon, B. Wiwatanapataphee, W. Sawangtong, N. Khajohnsaksumeth, and L. Giannini, Numerical simulation of air-bulk solid flows in a silo with inserts., Advances and Applications



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

			Mathematics) University of Kaiserslautern, Germany : 2009 (B.E.2552) - B.Sc. (Mathematics) Mahidol University, Thailand : 2003 (B.E.2546)	in Fluid Mechanics. 19 (3): pp. 643-667, 2016.
3.2.1.5	Mr. Wasakorn Laesanklang National ID number 1-5099-0027X-XXX	Lecturer	- Ph.D. (Computer Science) The University of Nottingham, United Kingdom : 2017 (B.E.2560) - M.Sc. (Computational Science) Chulalongkorn University, Thailand : 2010 (B.E.2553) - B.Sc. (Mathematics) Chiang Mai University, Thailand : 2008 (B.E.2551)	Binhui Chen, Rong Qu, Ruibin Bai, Wasakorn Laesanklang, A hyper-heuristic with two guidance indicators for bi- objective mixed-shift vehicle routing problem with time windows. Applied Intelligence, Vol 48, Issue 12, pp. 4937 - 4959, December 2018.

Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

### 3.2.2 The Regular Instructors

No.	Name-Surname	Academic Position	Degree (field)/Institute/ Graduation year	Most recent Academic Works in 5 years
3.2.2.1	Miss Kornkanok Bunwong 3-1002-0093X-XXX	Asst Prof	Ph.D. (Mathematics) / University of Warwick, UK : 2006 (B.E.2549)	Bunwong, K., Sae-jie, W., Evolutionary consequences of age- specific harvesting: age at first reproduction. Advances in Difference Equations (2017) 2017: 157.
3.2.2.2	Mr. Kittisak Chayantrakom 3-1020-0098X-XXX	Lecturer	Ph.D. (Mathematics) / Curtin University, Australia :2009 (B.E.2552)	Kittipong Srikhaetai, Kittisak Chayantrakom and Wattana Kanbua. A numerical study of oil spill spreading in the Gulf of Thailand. Advances in Difference Equations <a href="https://doi.org/10.1186/s13662-019-2143-z">https://doi.org/10.1186/s13662-019-2143-z</a> (2019) 2019:214
3.2.2.3	Miss Chontita Rattanakul 3-1005-0300X-XXX	Assoc Prof	Ph.D. (Mathematics)/ Mahidol University: 2003 (B.E.2546)	Matkhao P., Lenbury Y., Rattanakul C., Chuchalerm N. Modeling porcine reproductive and respiratory syndrome incorporating decaying infectiousness and delayed infection incidences. Southeast



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

				Asian J Sciences 5(1) (2017): 32-46.
3.2.2.4	Mr. Chanun Lewchalermvongs 3-1023-0019X-XXX	Lecturer	Ph.D. (Mathematics) / Louisiana State University, U.S.A. : 2016 (B.E.2559)	Ding, G., Lewchalermvongs, C., Maharry, J., Graphs with no -minor, The Electronic Journal of Combinatorics, 23(2) (2016).
3.2.2.5	Mr. Chaiwat Maneesawarnng 5-1006-9907X-XXX	Asst Prof	Ph.D. (Mathematics) / University of Illinois at Urbana-Champaign, U.S.A. : 2000 (B.E.2543)	M. Chudtong and C. Maneesawarnng, An upper length estimate for curves in CAT(K) spaces, East- West Journal of Mathematics 18 (1) 2016, 1-26.
3.2.2.6	Mr. Nattakorn Phewchean 3-1009-0451X-XXX	Lecturer	Ph.D. (Applied Mathematics) / Curtin University, Australia : 2013 (B.E.2556)	Phewchean N., Chaiyapo N. An application of Ornstein-Uhlenbeck process to commodity pricing in Thailand. Advances in Difference Equations. 14 (2017): 1 – 10.
3.2.2.7	Mr. Nathnarong Khajohnsaksumeth 3-1506-0066X-XXX	Lecturer	Ph.D. (Applied Mathematics) / Curtin University, Australia : 2014 (B.E.2557)	A. Charoenloedmongkhon, B. Wiwatanapataphee, W. Sawangtong, N. Khajohnsaksumeth, and L. Giannini, Numerical simulation of air-bulk solid flows in a silo with inserts., Advances and



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

				Applications in Fluid Mechanics. 19 (3): pp. 643-667, 2016.
3.2.2.8	Mr. Nattapong Bosuwan 3-7798-0001X-XXX	Lecturer	Ph.D. (Mathematics) / Vanderbilt University, U.S.A. : 2013 (B.E.2556)	N. Bosuwan, G. López Lagomasino, and Y. Zaldivar Gerpe, Direct and inverse results for multipoint, Analysis and Mathematical Physics, accepted (Impact Factor 2017: 1.381).
3.2.2.9	Miss Duangkamon Baowan 3-6097-0030X-XXX	Assoc Prof	Ph.D. (Applied Mathematics) / University of Wollongong, Australia : 2008 (B.E.2551)	Tiangtrong P, Thamwattana N*, Baowan D. Modelling water molecules inside cyclic peptide nanotubes. Applied Nanoscience 2016; 6(3): 345 – 357.
3.2.2.10	Mr. Dmitry Berdinskiy	Lecturer	Ph.D. (Computer Sciences) / The University of Auckland, New Zealand : 2016 (B.E.2559)	Berdinsky D. Cayley automatic groups and numerical characteristics of Turing transducers. S. Brlek and C. Reutenauer (Eds.): Developments in Language Theory 2016. Lecture Notes in Computer Science 2016; 9840: 26-37.
3.2.2.11	Miss Tipaluck Krityakierne 3-1004-0070X-XXX	Lecturer	Ph.D. (Applied Mathematics) / Cornell	Pirot G., Krityakierne T., Ginsbourger D., and Renard P. Contaminant



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

			University, U.S.A. : 2016 (B.E.2559)	source localization via Bayesian global optimization, Hydrol Earth Syst. Sci., 2019, 23, 351- 369.
3.2.2.12	Miss Piyanan Pasom 3-7105-0106X-XXX	Lecturer	Ph.D. (Mathematics)/ Chiang Mai University : 2013 (B.E.2556)	Pasom P., Cuntavepanit A. On the Strong and delta- convergence of NSP- iteration on CAT(0) spaces, Thai Journal of Mathematics 2016: 14(2): 341-351.
3.2.2.13	Mr. Pallop Huabsomboon 5-1016-9901X-XXX	Asst Prof	Ph.D. (Computational Applied Mathematics) / Old Dominion University, U.S.A. : 2006 (B.E.2549)	Lomthong P, Huabsomboon P, Tamagawa M. Image Segmentation Using Fast Implementation of Level Set Without Re- initialization. ICIC Express Letters Part B: Applications. January 2016; 7(1): 23-29.
3.2.2.14	Mr. Pairote Satiracoo 3-1006-0128X-XXX	Asst Prof	Ph.D. (Mathematics) / University of Warwick, UK : 2003 (B.E.2546)	Sangngam, R., Lenbury, Y., Bunwong, K., Satiracoo, P., De Gaetano, A. and Panunzi, S. A mathematical modeling of gastrointestinal tract : an influence of gastric emptying on glucose

Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

				concentration. Proceeding of ICMA-MU 2018.
3.2.2.15	Miss Farida Chamchod 3-5002-0083X-XXX	Lecturer	Ph.D. (Mathematics) / University of Bath, UK : 2012 (B.E.2555)	Chamchod F, Palittapongarnpim P., Modeling Clostridium difficile in a hospital setting: Control and admissions of colonized and symptomatic patients., Theoretical Biology and Medical Modelling, Theor Biol Med Model 2019 Jan;16:2.
3.2.2.16	Mr. Meechoke Chooduang 3-1014-0097X-XXX	Lecturer	Ph.D. (Applied Mathematics) / Curtin University, Australia : 2004 (B.E.2547)	Irwan Rahadi, Meechoke Chooduang, Arunsri Chooduang, Moltira Promkan, Phantip Vattanaviboon, Vichanan Yamkamon, Normal and Hypochromic Red Blood Cells (RBCs) Detection by Using Image Processing., Procceeding the 23rd Annual Meeting in Mathematics AMM2018, 3-5 May 2018, page 442-447.
3.2.2.17	Miss Rawee Suwandechochai 3-1012-0045X-XXX	Lecturer	Ph.D. (Industrial and Systems Engineering) / Virginia Polytechnic Institute and State	Intarapak, S., R. Suwandechochai and T. Supapakorn (2017), Comparison of the



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

			University, U.S.A. : 2005 (B.E.2548)	Estimators of the Intra-cluster Correlation for the Nested Error Regression Model, Communications in Statistics – Simulation and Computation, 46:3, pp. 2057-2070.
3.2.2.18	Miss Ruth J. Skulkhu 3-1006-0021X-XXX	Lecturer	Ph.D. (Mathematics) / University of Illinois at Urbana-Champaign, U.S.A. : 2012 (B.E.2555)	Yensiri, S.; Skulkhu, R.J.*, An Investigation of Radial Basis Function-Finite Difference (RBF-FD) Method for Numerical Solution of Elliptic Partial Differential Equations. Mathematics. 2017, 5(4), 54.
3.2.2.19	Miss Wannika Sawangtong 3-1202-0043X-XXX	Asst Prof	Ph.D. (Mathematics)/ Mahidol University: 2009 (B.E.2552)	Sawangtong W., Sawangtong P., A single quenching point for a fractional heat equation based on the Riemann-Liouville fractional derivative with a nonlinear concentrate source, Boundary Value Problems, 97, (2017), 1-7.
3.2.2.20	Mr. Wasakorn Laesanklang 1-5099-0027X-XXX	Lecturer	Ph.D. (Computer Science) / University of Nottingham, UK : 2017 (B.E.2560)	Binhui Chen, Rong Qu, Ruibin Bai, Wasakorn Laesanklang, A hyper-heuristic with two guidance indicators for bi-



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

				objective mixed-shift vehicle routing problem with time windows. Applied Intelligence, Vol 48, Issue 12, pp. 4937 - 4959, December 2018.
3.2.2.21	Mr. Wittawat Kositwattananarerk 3-7098-0001X-XXX	Asst Prof	Ph.D. (Mathematical Science) / Clemson University, U.S.A. : 2011 (B.E.2554)	W. Kositwattananarerk, Pseudocodeword-free criterion for codes with cycle-free Tanner graph, Designs, Codes and Cryptography, 86 (2018), no. 12, 2791-2805.
3.2.2.22	Mr. Somkid Amornsamankul 3-7399-0027X-XXX	Asst Prof	Ph.D. (Mathematics) / Curtin University, Australia : 2008 (B.E.2551)	Pipatsart, N., Modchang, C., Triampo, W., Amornsamankul, S. Network based model of infectious disease transmission in Macroalgae. International Journal of Simulation: Systems, Science and Technology, 19(5) (2018) 11.1-11.8
3.2.2.23	Mr. Somsak Orankitjaroen 3-1016-0000X-XXX	Lecturer	Ph.D. (Applied Mathematics) / State University of New York at Stony Brook, U.S.A. : 2002 (B.E.2545)	Chuchard P., Orankitjaroen S., Wiwatanapataphee B., Study of pulsatile pressure-driven electroosmotic flows through an elliptic



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

				cylindrical microchannel with the Navier slip condition, Adv Differ Eqn, (2017) 2017:160
3.2.2.24	Miss Suntaree Unhapipat 1-7399-0006X-XXX	Lecturer	Ph.D. (Mathematics)/ Mahidol University: 2014 (B.E.2557)	Unhapipat, S., Tiensuwan, M., and Pal, N. A revisit to testing the equality of several Poisson parameters, Model Assisted Statistics and Applications, 11(1)(2016): 27-38.
3.2.2.25	Mr. Man V.M. Nguyen	Lecturer	Ph.D. (Mathematical and Applied Statistics) / Eindhoven University of Technology, The Netherlands : 2005 (B.E.2548)	Man VM. Nguyen and Nhut C. Nguyen. Analyzing Incomplete Spatial Data For Air Pollution Prediction Southeast-Asian J. of Sciences:, Vol. 6, No 2 (2018), pp. 111-133
3.2.2.26	Miss Umaporn Nuntaplook 3-5201-006X-XXX	Lecturer	Ph.D. (Computational and Applied Mathematics) / Old Dominion University, U.S.A. : 2013 (B.E.2556)	Nuntaplook U, Adam JA., Shape resonances of the transverse magnetic mode in a spherically stratified medium., Int J Appl Phys Math. 2018;8(3):18-30.
3.2.2.27	Miss Wattanun Jatuviriyapornchai 1-6599-0028X-XXX	Lecturer	Ph.D. (Mathematics), University of Warwick, UK : 2017 (B.E.2560)	Grosskinsky, S. and Jatuviriyapornchai, W., 2019. Derivation of mean-field equations for stochastic particle

Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

				systems. Stochastic Processes and their Applications, 129(4), 1455-1475.
3.2.2.28	Mr. Wasin Padungwech 1-1303-0009X-XXX	Lecturer	Ph.D. (Mathematics),Cardiff University, U.S.A. : 2018 (B.E.2561)	Alrajhi K., Thompson J., Padungwech W. (2018) A Heuristic Approach for the Dynamic Frequency Assignment Problem. In: Chao F., Schockaert S., Zhang Q. (eds) Advances in Computational Intelligence Systems. UKCI 2017. Advances in Intelligent Systems and Computing, vol 650. Springer, Cham
3.2.2.29	Mr. Ekawat Chaowicharat 1-2499-0009X-XXX	Lecturer	Ph.D. (Mathematics),Mahidol University, Thailand : 2016 (B.E.2559)	Wichaidit, S. Assapun, S. Putwattana, N. Joongpan, C. Tabthong, S. and Chaowicharat, E. (2019) The STEM flower: The designing tool for effective STEM instruction. AIP Conference Proceedings, 2081. <a href="https://doi.org/10.1063/1.5094013">https://doi.org/10.1063/1.5094013</a>
3.2.2.30	Mr. Tanapon Tantisripreecha 1-4299-9000X-XXX	Lecturer	Ph.D.(Computer Science)	Tantisripreecha T.; and Soonthornphisaj N.*; "Stock Market Movement



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

			Kasetsart University : 2016 (B.E.2559)	Prediction Using LDA- Online Learning Model”, IEEE/ACIS 19th International Conference on Software Engineering, Artificial Intelligence, Networking and Parallel/Distributed Computing (SNPD), 2018, pp.135-139.
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**3.2.3 Full-time Instructors from other Faculties**

None

**3.2.4 Special Instructors**

No.	Name-Surname	Academic Position	Degree (field)/Institute/ Graduation year	Most recent Academic Works in 5 years
3.2.4.1	Mrs.Yongwimon Lenbury 5-1014-0009X-XXX	Prof	Ph.D. (Mathematics) / Vanderbilt University U.S.A. : 1985 (B.E.2528)	Matkhao P., Lenbury Y., Rattanakul C., Chuchalerm N. Modeling porcine reproductive and respiratory syndrome incorporating decaying infectiousness and delayed infection incidences. Southeast Asian J Sciences 5(1) (2017): 32-46.



#### **4. Components Related to Field Training Experience (Trainings or Multi-Activity Education)**

(If any)

##### **4.1 Standard of Learning Outcome for Field Training Experience**

Students are trained by working on the real problems in industrial, data science, or related fields under the close guidance of an advisors. Students are expected to independently carry out the learning process, employing their knowledge and technical skills, and implement the scientific process to the assigned works during the training processes.

##### **4.2 Duration**

4<sup>th</sup> Year.

##### **4.3 Schedule and Timetable**

Monday – Friday during working hours of the training places.

##### **4.4 Number of Credits**

3(0-18-9)

##### **4.5 Preparation**

4.5.1 Collect the names of advisors and places for internship during 3<sup>rd</sup> year.

4.5.2 Advisors provide advice and advice on determining issues, topics to be studied or practiced during intership, writing the outline and presenting the outline.

4.5.3 Students prepare a complete project report including documents and data files and present oral training results

##### **4.6 Evaluation Procedures**

4.6.1 The advisor evaluates the student's training performance with the assessment form.

4.6.2 Evaluate the presentation by the appointed committee.

#### **5. Requirements for Project or Research Work (If any)**

##### **5.1 Brief Description**

Students are introduced to research project in industrial, data science, or related fields under the close guidance of an advisor. Students are expected to independently carry out the learning process, employing their knowledge and technical skills, and implement the scientific process to address the research question of interest.



## 5.2 Standard of Learning Outcome

5.2.1 Have morality and ethics according to academic and professional standards

5.2.2 Can apply knowledge to conduct research in the business sector, industry and government and related fields.

5.2.3 Can analyze and solve problems systematically in research and development of new knowledge in the field of industrial mathematics.

5.2.4 Good interpersonal skills leadership and listen to other opinions for reasons

5.2.5 Can apply appropriate knowledge in research in technology and statistics for research.

5.2.6 Can write research reports and do oral research results presentation.

## 5.3 Duration

4<sup>th</sup> Year

## 5.4 Number of Credits

3(0-9-3)

## 5.5 Preparation

5.5.1 Collect the names of advisors. In semester 1

5.5.2 Divide students into groups of 4-5 people. Consult the topic of the project with the advisor.

5.5.3 Advisors provide advice and advice on determining issues, topics to be studied, writing the outline and presenting the outline.

5.5.4 Advisors advise and supervise the project process at every step.

5.5.5 Students prepare a complete project report including documents and data files and present oral research results

## 5.6 Evaluation Procedures

5.6.1 The advisor evaluates the student's project performance with the assessment form.

5.6.2 Evaluate the presentation by the appointed committee.



## Section 4 Program-level Learning Outcomes, Teaching Methods, and Evaluation

### 1. Development of Student Characteristics

Special Characteristics	Teaching Strategies and Student Activities
1.1 Having leadership and working with others creatively	<ul style="list-style-type: none"> <li>- Cultivate students to be "Mahidol" is to treat others like themselves.</li> <li>- Manage learning in the curriculum To develop leadership and work with others creatively</li> <li>- extracurricular activities based on interest, encourage to work with others Develop management skills and leadership</li> </ul>
1.2 Have self-learning skills	<ul style="list-style-type: none"> <li>- Manage learning skills in using information technology in education and research</li> <li>- Manage learning evidence-based skills in education and working</li> <li>- Assign tasks / projects to research and present the work.</li> </ul>
1.3 Have a volunteer mind	<ul style="list-style-type: none"> <li>- Social service activities and academic services</li> <li>- Voluntary volunteer activities</li> </ul>
1.4 Have the ability to use English in communication.	-Encourage students to use English regularly in the classroom.

### 2. Relationship between PLOs and the professional standard or National Qualifications Framework for Higher Education / TQF (Shown in Appendix 3)



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

### 3. Program-level Learning Outcomes, Teaching Strategy, and Assessment

Program-level Learning Outcomes	Teaching Strategy	Assessment and Evaluation Strategy
PLO1 Make an operational decision logically and systematically to solve industrial and business management problems by applying appropriate optimization techniques.	1) Lectures 2) Case studies 3) Group and individual discussions and feedback	1) Behavior observation in classrooms 2) Examinations 3) Evaluation of class participation and group discussion by rubrics 4) Evaluation of the quality of reports and group presentations by rubrics
PLO2 Apply data analysis and data science strategy for trend prediction to support making data driven decision with the regard for data privacy, ethics, and protection.	1) Lectures 2) Case studies 3) Group and individual discussions and feedback	1) Behavior observation in classrooms 2) Examinations 3) Evaluation of class participation and group discussion by rubrics 4) Evaluation of the quality of reports and group presentations by rubrics
PLO3 Create an independent project in industrial mathematics and data science based on related-concepts with professional code of conduct.	1) Lectures 2) Case studies 3) Group and individual discussions and feedback 4) Individual and group presentations 5) Research projects	1) Behavior observation in classrooms 2) Examinations 3) Evaluation of class participation and group discussion by rubrics 4) Evaluation of the quality of reports and group presentations by rubrics



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

		5) Evaluation of the quality of research projects 6) Regular progress meeting and evaluation by senior project advisors using rubrics
PLO4 Communicate industrial and data science related information clearly and purposefully with target audiences in English, in both written and oral forms with appropriate technologies in an organized manner.	1) Group assignments 2) Poster and oral presentation for research projects	1) Behavior observation in classrooms 2) Evaluation of class participation and group discussion by rubrics 3) Evaluation of the quality of reports and group presentations by rubrics
PLO5 Work independently and coordinate with others to achieve team goals based on roles and responsibilities of an industrial mathematician and data scientist.	1) Group discussion 2) Report assignments 3) Individual and group presentations 4) Research projects 5) Case studies and problem-based	1) Behavior observation in classrooms 2) Evaluation of class participation and group discussion by rubrics 4) Evaluation of the quality of reports and group presentations by rubrics



## Section 5 Student Evaluation Criteria

### 1. Grading Rules/Guidelines

Students receive grades according to the criteria stated in Mahidol University's regulations on undergraduate studies as well as SC's regulations and/or announcements.

#### (1) The symbols and their assigned scores

Grade results of each course may be shown in symbolic type as follows

Symbol	Meaning	Score
A	Excellent	4.00
B+	Very Good	3.50
B	Good	3.00
C+	Fairly Good	2.50
C	Fair	2.00
D+	Poor	1.50
D	Very Poor	1.00
F	Failed	0.00

#### (2) The symbols without scores

The outcome of the study for each course may be in the forms of certain symbols with the meaning as follows

Symbol	Meaning
AU	Audit
O	Outstanding
S	Satisfactory
T	Transfer of Credit
U	Unsatisfactory
I	Incomplete
P	In Progress
X	No Report
W	Withdrawal



## 2. Standard Verification Process for Student Achievement

- 2.1 Analyze students' learning from class participation, group activities, presentations, quizzes and examinations.
- 2.2 Consider student evaluation of teachers
- 2.3 Consider course reports
- 2.4 Consider feedbacks from stakeholders including students, employers, alumni, and outside experts

## 3. Graduation Requirements

### Plan A

- 3.1.1 Following Mahidol University Regulations on Diploma and Undergraduate Studies, B.E. 2552 (2009) and the Announcement of Faculty of Science, Mahidol University on Undergraduate Study, B.E. 2553 (2010)
- 3.1.2 Total time of study should not exceed 8 academic years
- 3.1.3 Students have to complete their credits as stated in the curriculum which includes:
  - General education courses
  - Specific courses
  - Free elective courses
- 3.1.4 Students must have a minimum 2.00 CUM-GPA
- 3.1.5 Students must pass the criteria set for the English competency prior to their graduation as specified by the Mahidol University's announcement.
- 3.1.6 Students must demonstrate proper conduct in compliance with the Bachelor of Science degree.

### Plan B

- 3.2.1 Following Mahidol University Regulations on Diploma and Undergraduate Studies, B.E. 2552 (2009) and the Announcement of Faculty of Science, Mahidol University on Undergraduate Study, B.E. 2553 (2010)
- 3.2.2 Students must have a minimum 2.00 CUM-GPA.
- 3.2.3 Students must demonstrate proper conduct in compliance with the Bachelor of Science degree.





3.2.4 Students must pass the criteria for the English competency, i.e. TOEFL or IELTS, declared in the student transfer agreement between the Faculty of Science, Mahidol University and Curtin University.

3.2.5 Students must pass all the required courses within Year 1 and Year 2 according to the program curriculum and completed all the required courses in Year 3 and Year 4 following the agreement between the Faculty of Science, Mahidol University and Curtin University of Technology

#### 4. Students' Appeals

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 outlined 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](mailto:scedmu.133@gmail.com).

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 Instructor's Professional Development

### 1. New Instructor Orientation

1) New instructors have to attend an orientation that aims to provide objectives and goals of program complying with National Qualifications Framework for Higher Education in Thailand and the Standard of Undergraduate Programs of Study B.E. 2558 announced by the Ministry of Education.

2) New instructors will be made aware of teaching and learning strategies, quality assurance, and related regulation or announcement.

3) Mentor will be available for new instructors to help and advice as necessary

4) Head of the department and mentor explain responsibilities, related regulations, program curriculum, and teaching processes to new instructors

5) New instructors will be assigned to help coordinate courses and co-advise senior projects of the students to be familiar with the teaching and research processes. New instructors will also partially be responsible for student affairs.

### 2. Knowledge and Skill Development for Instructor

#### 2.1 Development of Teaching Skills, Assessment, and Evaluation

1) Provide workshops to develop skills on teaching and learning methods.

2) Allow instructors to participate in the evaluation and revision of the curriculum and courses as well as develop a new curriculum.

#### 2.2 Other Academic and Professional Development

1) Support instructors to do research, produce and present academic projects and continue their studies.

2) Encourage and support instructors to attend meetings, training sessions, seminars and studies at other institutes and organizations.

3) Provide university's promotion standards

#### 2.3 Indicators / Measurements

(1) Every new instructor (if any) has to participate in the orientation and receive adequate information on teaching and learning requirements.

(2) Full-time instructors must demonstrate academic and/or profession improvement at least once a year.



## Section 7 Quality Assurance

### 1. Standard Control

The curriculum has employed the Thai Qualification Framework for Higher Education and the Standard of Undergraduate Programs of Study B.E. 2558. The curriculum committee is set up to develop and improve the curriculum every 5 years based on stakeholders' requirement. Stakeholders are identified as academic faculty, current students, alumni, parents and employers. The curriculum committee also monitors the qualification of instructors.

Indicators/measurements used in the evaluation of this process's efficiency and effectiveness:  
Use the TQF indicator guidelines

### 2. Graduates

Graduates achieve the learning areas including ethics and moral, knowledge, cognitive skills, interpersonal skills and responsibility, numerical analysis, communication, and information technology skills. The survey is conducted to obtain feedback from employers on their satisfaction with the graduates. All survey results are used to improve the quality of our teaching and learning.

Indicators/measurements used in the evaluation of this process's efficiency and effectiveness.

- (1) At least 70 percent of new graduates either go on to employment or further study.
- (2) The average graduate users' satisfaction score is at least 3.5 from 5.0.

### 3. Students

#### 3.1 Student recruitment and admission

Recruitment involves activities such as roadshows, open houses, campus visits, and public communication. Student admission criteria will be according to TCAS.

#### 3.2 Academic consultation and guidance

Each student is assigned an academic advisor upon entering the program. The advisor's role is to oversee students' academic performance, approve their registration, and guide both the academic and non-academic matter.

- (1) There is an advisor system for all students at a rate of not more than 1 per 10. The advisor will introduce the course plan in the curriculum, learning plan, choosing and planning for the



career, and living on campus. With at least 3 hours/semester for the student to be consulted. The advisor will take care of students from start studying in the programme until graduation. In addition, there will be an activity advisor to provide information on how to organize activities for students.

(2) There is a follow-up survey and the results of students studying in the courses will be evaluated 2 times/semester to provide timely help for students with problems.

### 3.3 Students' satisfaction and management of students' appeal

Students have a right to review their exam papers and grades. Moreover, if students are charged and/or punished for cheating, they can appeal within seven days after the time that they received such a notice. The procedure for filing a complaint is according to Mahidol University's Regulations on Disciplinary Measures 2010.

Indicators/measurements used in the evaluation of this process's efficiency and effectiveness.

- (1) At least 70 percent of students remain in the program.
- (2) The average students' satisfaction score towards the courses' quality is at least 3.5 from 5.0.
- (3) At least 80 percent of final-year students graduate.

## 4. Instructors

### 4.1 Recruitment of new faculty members

General requirements are made according to Mahidol University and Faculty of Science regulations. New faculty members have to pass a trial period of teaching before being accepted as fulltime instructors. New instructors are required to participate in a new staff orientation and a teaching and learning workshop

### 4.2 Instructor's main responsibility

Program committee and instructors are committed to meet at least once per semester to plan and improve teaching and learning methods according to student and self-evaluations. Faculty members are also encouraged to produce one academic product every three academic years as well as participate in conferences or training that may be beneficial to their profession. Indicators/measurements used in the evaluation of this process's efficiency and effectiveness.



- (1) Each instructor must produce TQF3 and TQF5 for all assigned courses.
- (2) Every new instructor (if any) has participated in the orientation or received advice on teaching and learning.
- (3) Every full-time instructor has been academically/professionally developed at least once a year.

## 5. Program, Teaching and Learning, Student Evaluation

The program description stated in TQF2 form complies with the Thai Qualifications Framework for Higher Education. Descriptions of all courses and field work sessions are stated in the TQF3 and TQF4 forms at least before the semesters begin. Students' achievement verification is made as stated in the TQF3 and TQF4 at least 20 percent of the subjects in each semester. The teaching and learning approaches for this curriculum follow an outcome-based education (OBE) strategy, based on the AUN-QA criteria. Teaching strategy and students evaluation are developed/improved based on the information in the previous year's TQF7 reported within 60 days after the academic year ends.

5.1 Instructors responsible for the curriculum, instructors of courses (Not less than 80 percent) must meet together in the course design. Control the course preparation by having an assessment method Various teaching and learning activities In order to achieve the goals of the course and get graduates to follow the features desirable graduates according to the national higher education standards And in accordance with the philosophy, aspiration, mission and policy of Mahidol University.

5.2 The department executive committee will implement the instructor system and the teaching and learning process in each course by considering the expertise and qualifications of professors

5.3 Students will be assessed from written / oral examination / practice Behavior observation Presentation of work and others as specified in the TQF 3 of the course, the curriculum committee will follow and evaluating the evaluation by the instructor must submit the assessment results, including the criteria for scoring grants to the Program Management



Committee for importing to the meeting and approving every evaluation.

Indicators/measurements used in the evaluation of the processes in such as the efficiency of a course management, students' satisfaction on teaching in a course, etc.

## 6. Learning Supports

### 6.1 Budgeting

Mahidol University and Faculty of Science provide an annual budget for providing a suitable physical environment for studying and purchasing an adequate number of materials in order to support studying both inside and outside the classrooms.

(1) There is a committee to consider the purchase of materials and equipment for use in teaching and research to use the budget that has been allocated for maximum benefit

(2) There is an Executive Committee to control cost evaluation of the programme.

### 6.2 Available resources

Students have access to papers, books, journals, teaching media, internet databases from the Mahidol University Library, Salaya Campus and the Faculty of Science Library (Stang Mongkolsuk Library). The Faculty of Science Library, also known as the Stang Mongkolsuk Library, houses a large collection of books and information on science and medical science. It also provides services in inter-library loan and retrieval of articles and databases on science and technology. There are about 35,000 books in chemistry and related fields as well as 1,200 printed journals. The Mahidol University Library, Salaya Campus, houses and collects books and information on science, medical sciences and technology to support teaching, learning, and research of university members, government officials, scientists, researchers and students of the university. The library services include books, journals, research reports, electronic journals, web databases, and also educational technology resources in the form of videotapes, recorded cassette tapes, slides and microfilms. Information technology (IT) facilities, including e-learning, are also available.



### 6.3 Studying the sufficiency of the resources

A survey of instructor and student satisfaction towards services and resources is carried out every semester. This survey is used to improve the number and quality of resources. If the resources are not adequate, the faculty committee will take into consideration and set action plan.

Indicators/measurements used in the evaluation of this process's efficiency and effectiveness.

- The average staffs and students' satisfaction score towards the learning supports is at least 3.5 from 5.0

## 7. Key Performance Indicators

Key Performance Indicators	Academic Years				
	2019	2020	2021	2022	2023
(1) At least 80 percent of the instructors responsible for the program take part in meetings to plan, monitor, and revise the program's operation.	✓	✓	✓	✓	✓
(2) The program description stated in TQF2 form complies with TQFHE or the program TQF (if any).	✓	✓	✓	✓	✓
(3) Descriptions of all courses and field work sessions (if any) are stated in the TQF3 and TQF4 forms at least before the semesters begin.	✓	✓	✓	✓	✓
(4) The assessment of all courses and fieldwork sessions (if any) are reported in the TQF5 and TQF6 forms within 30 days after the semester ends.	✓	✓	✓	✓	✓
(5) The program report is made in the TQF7 form within 60 days after the academic year ends.	✓	✓	✓	✓	✓
(6) Students' achievement verification is made as stated in the TQF3 and TQF4 (if any) in at least 20 per cent of the subjects in each semester.	✓	✓	✓	✓	✓

Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

Key Performance Indicators	Academic Years				
	2019	2020	2021	2022	2023
(7) Teaching strategy and students evaluation are developed/ improved based on the information in the previous year's TQF7.		✓	✓	✓	✓
(8) Every new instructor (if any) has to participate in the orientation and receive adequate information on teaching and learning requirements.	✓	✓	✓	✓	✓
(9) Full-time instructors must demonstrate academic and/or profession improvement at least once a year.	✓	✓	✓	✓	✓
(10) At least 50 per cent of the teaching assistants (if any) receive academic or professional development annually.	✓	✓	✓	✓	✓
(11) The average final-year students' satisfaction score or the fresh graduates' satisfaction score towards the program's quality is at least 3.5 from 5.0.				✓	✓
(12) The average graduate users' satisfaction score is at least 3.5 from 5.0.					✓

**Evaluation criteria:** A curriculum that meets the standards of Thai Qualifications Framework must qualify for the following conditions: (1) the compulsory performance indicators (numbers 1-5) must pass beyond expectations and (2) the total number of performance indicators must reach their goal by no less than 80 percent each year.





Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

### Additional indicators from Section 7

Indicators and Goal	Academic Years				
	2019	2020	2021	2022	2023
<b>2. Graduates</b>					
2.1 At least 70 percent of new graduates either go on to employment or further study.					✓
<b>3 Students</b>					
3.1 At least 70 percent of students remain in the program.			✓	✓	✓
3.2 The average students' satisfaction score towards the courses' quality is at least 3.5 from 5.0.		✓	✓	✓	✓
3.3 At least 80 percent of final-year students graduate.				✓	✓
<b>4. Instructors</b>					
4.1 Each instructor must produce TQF3 and TQF5 for all assigned courses.	✓	✓	✓	✓	✓
<b>6. Academic Supports</b>					
6.1 The average staffs and students' satisfaction score towards the learning supports is at least 3.5 from 5.0	✓	✓	✓	✓	✓



## Section 8 Evaluation, Improvement, and Implementation of the Program

### 1. Assessment of Teaching Effectiveness

#### 1.1 Assessment of Teaching Strategy

- 1.1.1 Students' evaluation toward courses and instructors.
- 1.1.2 Teaching observation by peer instructors.
- 1.1.3 Observation of behavior and responses of the students.
- 1.1.4 Regular meeting of the instructors to share information and ask for suggestion.
- 1.1.5 Inquiring from students.

#### 1.2 Assessment of the Instructor's Skills in Applying Teaching Strategies

- 1.2.1 Analyze from students' evaluation toward courses and instructors.
- 1.2.2 Workshop on course improvement with the participation of all instructors in the courses.
- 1.2.3 Self-evaluation and peer evaluation.

### 2. Overall Evaluation of the Program

- 2.1 Survey on final-year students' satisfaction towards the program's quality.
- 2.2 Survey on employers' satisfaction with graduates.
- 2.3 Curriculum evaluation from external expertise.
- 2.4 Meeting between student and instructor representatives.

### 3. Assessment of the Program Implementation Based on the Program Specification

Evaluation is made annually by instructors and the curriculum committee according to key performance indicators of section 7, item 7.

- "Poor" means Program implementation does not meet the first 10 indicators
- "Good" means Program implementation meets the first 10 indicators
- "Very Good" means Program implementation meets all indicators



Regardless, Mahidol University requires all programs to always keep the program up-to-date, to occasionally demonstrate improvement in educational standard and quality indices at least every 3 years, and to perform program evaluation for program improvement every 5 years.

#### 4. Review of Evaluation Results and Plans for Improvement

Instructors in the program involved in revising, evaluating, and planning to improve and/or develop courses and the curriculum by analyzing results from students' evaluations of instructors; job availability of graduates; level of employers' satisfaction with graduates; and other evaluation results that relate to courses. In general, the curriculum committee has five-year cycle for curriculum change.



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

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Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

**Appendix shown in the TQF2**  
**Revised program of academic year 2019**

<b>Appendix 1</b>	Mahidol University Degree Profile
<b>Appendix 2</b>	2.1 Program-level Learning Outcomes (PLOs) and Sub Program-level Learning Outcomes (SubPLOs) 2.2 Relationship between Program-level Learning Outcomes and MU Graduate Attributes 2.3 Goals for each academic year for Bachelor of Science Program in Industrial Mathematics and Data Science
<b>Appendix 3</b>	Table showing the comparison of the PLOs and the national TQF( Level 2 )
<b>Appendix 4</b>	Curriculum Mapping <i>Shown with the symbols I, R, P, M, A</i>
<b>Appendix 5</b>	Major Improvements of the Bachelor of Science Program in 2014 (International Program) Issued in Academic Year 2014
<b>Appendix 6</b>	Details of the instructors responsible for the program, regular instructors, and special instructors
<b>Appendix 7</b>	Mahidol University Regulations on Diploma and Undergraduate Studies of the Year B.E. 2560 and the affiliation's educational announcements/ regulations
<b>Appendix 8</b>	Order of Curriculum Development Committee or Curriculum Screening Procedure Committee or Person In-charge
<b>Appendix 9</b>	MOUs made between domestic and foreign organizations (if any)
<b>Other Appendixes</b>	



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

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Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

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## Appendix 1

### Mahidol University Degree Profile



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

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Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

**Mahidol University Degree Profile**

Bachelor's Degree Program	
<b>1. Name of the Program</b> (In Thai)      วิทยาศาสตร์บัณฑิต สาขาวิชาคณิตศาสตร์อุตสาหกรรมและวิทยาการข้อมูล (หลักสูตรนานาชาติ) (In English)    Bachelor of Science Program in Industrial Mathematics and Data Science (International Program)	
<b>2. Degree Name</b> (In Thai)      วิทยาศาสตร์บัณฑิต (คณิตศาสตร์อุตสาหกรรมและวิทยาการข้อมูล) (In English)    Bachelor of Science (Industrial Mathematics and Data Science)	
<b>General information of the program</b>	
Type of program	Bachelor's Degree (International Program), Academic Program
Required number of credits	<b>Plan A:</b> no less than 120 credits of courses taken while studying at Faculty of Science, Mahidol University (MUSC) <b>Plan B:</b> no less than 84 credits of courses taken while studying at Faculty of Science, Mahidol University (MUSC) and no less than 300 credits of courses taken while studying at Curtin University
Studying duration / Program cycle	4-Year Program
The Program's status and opening schedule	1. Revised Program 2019 (พ.ศ. 2562) 2. Program start: Semester 1 Academic Year 2019
Degree offered	One degree of one major



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program)

Department of Mathematics

Degree-granting Institutions (MOU with other institutions)	Mahidol University, Thailand Curtin University of Technology, Australia
Organization certifying the standards	-
<b>Specific information of the Program</b>	
Purpose/Goals/Objectives	<p><b>Goals</b></p> <p>To produce the B.Sc. graduated students who enter the profession which requires the knowledge and skills to apply the optimization techniques in industry and data science at the international standards. Graduates have specialized knowledge of their interests and the characteristics of the desirable graduates of the Mahidol University, according to the skills of the 21st century related to Thailand 4.0 Strategy, to be ready for working and graduate study.</p> <p><b>Objectives</b></p> <p>Teaching to produce graduates to have the following qualifications.</p> <ol style="list-style-type: none"><li>1. Have the knowledge, understanding, and skills in optimization mathematics, which can be applied to work in various stages in industry.</li><li>2. Have the knowledge, understanding and skills that combine both statistical computer knowledge and programming and the use of appropriate software to manage and interpret large data to predict future events.</li><li>3. Can analyze and apply mathematical knowledge to other related sciences and be able to solve the problem effectively.</li><li>4. Can communicate and work with others. And use the technology properly.</li><li>5. Morality, ethics, responsibility, and ethics</li><li>6. Have a good attitude and readiness to develop themselves.</li></ol>



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

Distinctive features	<ol style="list-style-type: none"> <li>1. Elective courses in mathematics, statistics and computer diverse and up-to-date for working requirements such as optimization and data science.</li> <li>2. Academic cooperation with Curtin University in curriculum design and conduct joint teaching.</li> <li>3. Learners have opportunity to choose a study plan abroad through double degree with Curtin University.</li> </ol>
Educational system	Semester System
<b>Graduates' advancement</b>	
Career opportunities	<ol style="list-style-type: none"> <li>1. <b>Business:</b> such as information technologist, investment planner, logistics system warehouse manager, and pricing analyst.</li> <li>2. <b>Computer professionals:</b> such as information technician, system analyst, programmer and software developer.</li> <li>3. <b>Information professionals:</b> such as information technologist, data analyst, data scientist, statistician, policy analyst, project manager, quality assurance engineer and risk analyst.</li> <li>4. <b>Education:</b> such as teacher, teacher assistant, and academician.</li> </ol>
Further fields of study	Graduate studies in Mathematics, Statistics, Engineering Information and related fields
<b>Educational philosophy in program management</b>	
Program philosophy	Our primary focus is on educating the learners, as for them to attain academic achievement through learning-centered education, outcome-based education and constructivism. To become a wisdom graduate, learners combine what they have learned so far with the new knowledge, and with experiential learning activities. While the role of a lecturer in the learning process is shift from an information provider to a coach or a facilitator creating challenge-based activities.



Strategy / teaching guidelines	The program is aware of student differences in backgrounds, strengths and weaknesses, interests, and learning styles. Therefore, a range of teaching styles are set through the diverse learning activities according to the learning outcomes including interactive lectures, laboratory practical, individual and group discussions and assignments, active research projects with emphasis on student's demonstration of ideas, logical reasoning, and problem-solving.
Strategy / student's evaluation guidelines	The assessments and evaluations align with the teaching strategies and the desired learning outcomes such as written and oral examination, practical test, oral presentation, individual or group class participation and project-based research learning. Rubrics based on the objectives of the course are announced clearly and used to score the students' achievement.
Competences provided to the students	
Generic Competences	<ol style="list-style-type: none"><li>1. <b>Ethics:</b> demonstrate moral and ethical behavior and be responsible in their own action including awareness of plagiarism</li><li>2. <b>Critical thinking and analysis:</b> be capable of analytical and critical thinking and be able to evaluate both general and scientific information with logical and systematic thinking</li><li>3. <b>Creativity:</b> be able to bridge research to innovation which further enhance basic knowledge.</li><li>4. <b>Communication:</b> be able to choose appropriate forms of English communication such as listening, speaking, reading and writing skills, depending on target audience and for academic purposes</li><li>5. <b>Collaboration:</b> be able to work with others appropriately and accept the difference between people</li><li>6. <b>ICT:</b> be able to choose the appropriate information technology for searching of information and data and be able to analyze the reliability of data from various sources.</li></ol>



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

Subject-specific Competences	<ol style="list-style-type: none"><li>1. Describe the basic concepts of mathematics and related statistics.</li><li>2. Describe the key concepts for subjects that related to optimization and data science. Such as operation research, computer programming, and statistical analysis.</li><li>3. Use mathematical knowledge, computer, statistics, and mathematical process skills to explain, problem solving, decision making, or predicting future events. For situations involving other sciences such as physical and biological sciences, engineering, social sciences, economics or business administration under ethical codes.</li><li>4. Write and use the appropriate computer programming language to analyze and solve mathematical problems.</li></ol>
<b>Graduates' learning outcomes (PLOs)</b> At the end of the program, successful students will be able to:	
PLO1	Make an operational decision logically and systematically to solve industrial and business management problems by applying appropriate optimization techniques.
PLO2	Apply data analysis and data science strategy for trend prediction to support making data driven decision with the regard for data privacy, ethics, and protection.
PLO3	Create an independent project and/or work in industrial mathematics and data science based on related concepts with professional code of conduct.
PLO4	Communicate industrial and data science related information clearly and purposefully with target audiences in English, in both written and oral forms with appropriate technologies in an organized manner
PLO5	Work independently and coordinate with others to achieve team goals based on roles and responsibilities of an industrial mathematician and data scientist.



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

### Alignment between PLOs & Higher Education TQF Level 2 or TQF 1

TQF Level 2 Graduates Competencies / Skills / LOs	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5
<b>Competency/skill 1 : Moral (<i>Ethics and Moral</i>)</b>					
1.1 Have honesty and integrity			✓	✓	
1.2 Have self-discipline					✓
1.3 Have awareness and realize in compliance with academic and professional ethics			✓	✓	
1.4 Respect rights and opinion of other people				✓	✓
<b>Competency/skill 2 : Knowledge</b>					
2.1 Have knowledge on principles and theories of science and/or mathematics	✓	✓	✓		
2.2 Have basic knowledge on science and mathematics that can be used to explain principles and theories in specific field	✓	✓	✓		
2.3 Be able to catch up academic advancement and development of new knowledge especially in science and mathematics				✓	
2.4 Possess broad knowledge in various fields that can be applied in daily life		✓	✓	✓	
<b>Competency/skill 3 : Cognitive</b>					
3.1 Be able to systematically and reasonably analyze based on scientific principles and methods	✓	✓	✓		
3.2 Correctly and appropriately apply scientific and mathematical knowledge in various situations	✓	✓	✓		
3.3 Have desire for knowledge, be able to correctly analyze and synthesize knowledge from various sources of data that will lead to creating innovation	✓	✓	✓		
<b>Competency/skill 4 : Communication (<i>Interpersonal Skills and Responsibility</i>)</b>					
4.1 Have leadership and be able to work with other people as a good leader and a good team member					✓
4.2 Have responsibility for society and organization as well as self-development and work development				✓	✓



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

TQF Level 2 Graduates Competencies / Skills / LOs	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5
4.3 Be able to adapt self to organizational situation and culture					✓
<b>Competency/skill 5 : ICT</b> <i>(Numerical Analysis, Communication and Information Technology)</i>					
5.1 Be able to apply mathematical and statistical knowledge to appropriately analyze, process, solve problem and present information	✓	✓	✓	✓	
5.2 Possess language skills to effectively communicate knowledge on science and mathematics as well as be able to select appropriate forms of communication				✓	
5.3 Possess skills and knowledge on English or other foreign language that are suitable and necessary for doing research				✓	
5.4 Be able to apply information technology on searching and collecting data that is effective and suitable for the situation		✓		✓	



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

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Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

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## Appendix 2

### 2.1 Program-level Learning Outcomes and Sub Program-level Learning Outcomes (PLOs and SubPLOs)



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

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**Table in Appendix 2.1****Program-Level Learning Outcomes (PLOs) and Sub Program-Level Learning Outcomes (SubPLOs)**

At the end of the program, successful students will be able to:

PLOs	SubPLOs
PLO1 Make an operational decision logically and systematically to solve industrial and business management problems by applying appropriate optimization techniques.	<ul style="list-style-type: none"><li>1.1 Describe the principles and procedures of mathematics, statistics and related disciplines correctly.</li><li>1.2 Plan and solve problems by choosing the appropriate mathematical, statistical and computer methods.</li><li>1.3 Verify the accuracy or reasonableness of the solutions of the given problem.</li><li>1.4 Interpret, analyze, and improve the results of mathematical or statistical models using the optimization, numerical methods, statistical methods and computer programs.</li></ul>
PLO2 Apply data analysis and data science strategy for trend prediction to support making data driven decision with the regard for data privacy, ethics, and protection.	<ul style="list-style-type: none"><li>2.1 Collect quantitative and qualitative data related to the situation by using of information technology and ethics.</li><li>2.2 Determine the domain of the problem that needs to be transformed into an appropriate mathematical model.</li><li>2.3 Use the appropriate Statistical and computational techniques to solve problem about interpret meaning of information from the given big data.</li></ul>
PLO3 Create an independent project in industrial mathematics and data science based on related-concepts with professional code of conduct.	<ul style="list-style-type: none"><li>3.1 Describe the structure of input and output data, statements and conditions in algorithms.</li><li>3.2 Analyze and define the scope of the problem. Design a sequence of statements in the program that fit the given problem.</li><li>3.3 Use appropriate computer programming language and statements to make the processing according to the designed results.</li><li>3.4 Test the integrity of the output from the written computer program and modify the program codes for the better results.</li></ul>



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

PLO4 Communicate industrial and data science related information clearly and purposefully with target audiences in English, in both written and oral forms with appropriate technologies in an organized manner.	<p>4.1 Listen, speak, read and write to exchange knowledge and communicate mathematical knowledge in English.</p> <p>4.2 Presenting the results of statistical analysis in the appropriate way to the target group such as colleagues, lecturers, academic participants, and others.</p> <p>4.3 Use information technology to find and collect information efficiently and up to date with respect to the principles of intellectual property.</p>
PLO5 Work independently and coordinate with others to achieve team goals based on roles and responsibilities of an industrial mathematician and data scientist.	<p>5.1 Define the job description of team members effectively. Express their roles and duties appropriately and be responsible for the assigned tasks.</p> <p>5.2 Respect the rights and opinions of others. Work with others as leaders and members to achieve the goals of the group.</p> <p>5.3 Encourages social and corporate responsibility. Compliance with social and organizational regulations.</p>

## 2.2 Relationship between Program-Learning Outcomes and MU Graduate Attributes

Table in Appendix 2.2

**Relationship between Program Learning Outcomes & MU Graduate Attributes**

Program Learning Outcomes / 4 Graduate Attributes	PLO1	PLO2	PLO3	PLO4	PLO5
T-shaped Breadth & Depth – Understanding thoroughly both breadth & depth	✓	✓			
Globally Talented – Having talented and experiences to contending against globally	✓	✓	✓	✓	✓
Socially Contributing - Having a public consciousness advantaging to the society				✓	✓
Entrepreneurially Minded Decisively thinking, doing, making a decision to accordingly contributing creativity	✓	✓	✓		



## 2.3 Goals for each academic year for Bachelor of Science Program in Industrial Mathematics and Data Science

Table in Appendix 2.3

### Goals for each academic year for Bachelor of Science Program in Industrial Mathematics and Data Science

Goal for each academic year			
at the end of year 1	at the end of year 2	at the end of year 3	at the end of year 4
Students are able to relate knowledge of Mathematics, Statistics, computer programming and computer software skills to other disciplines.	Students are able to understand principles of optimization techniques and data science concepts and can solve study cases by using coding or software under the guidance	Students are able to understand the process and can use computer programming skills to solve some study cases about industrial optimization or data science problems.	Students are able to complete the project base on industrial optimization or data science successfully under supervision from project advisor.



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

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Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

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### Appendix 3

Table Showing the Comparison between the PLOs and the National TQF level 2



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

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**Table in Appendix 3**

**Relationship between Program-Level Learning Outcomes (PLOs) and TQF**

TQF Level 2 Graduates Competencies / Skills / LOs	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5
<b>Competency/skill 1 : Moral (<i>Ethics and Moral</i>)</b>					
1.1 Have honesty and integrity			✓	✓	
1.2 Have self-discipline					✓
1.3 Have awareness and realize in compliance with academic and professional ethics			✓	✓	
1.4 Respect rights and opinion of other people				✓	✓
<b>Competency/skill 2 : Knowledge</b>					
2.1 Have knowledge on principles and theories of science and/or mathematics	✓	✓	✓		
2.2 Have basic knowledge on science and mathematics that can be used to explain principles and theories in specific field	✓	✓	✓		
2.3 Be able to catch up academic advancement and development of new knowledge especially in science and mathematics				✓	
2.4 Possess broad knowledge in various fields that can be applied in daily life		✓	✓	✓	
<b>Competency/skill 3 : Cognitive</b>					
3.1 Be able to systematically and reasonably analyze based on scientific principles and methods	✓	✓	✓		
3.2 Correctly and appropriately apply scientific and mathematical knowledge in various situations	✓	✓	✓		
3.3 Have desire for knowledge, be able to correctly analyze and synthesize knowledge from various sources of data that will lead to creating innovation	✓	✓	✓		
<b>Competency/skill 4 : Communication (<i>Interpersonal Skills and Responsibility</i>)</b>					



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program)

Department of Mathematics

TQF Level 2 Graduates Competencies / Skills / LOs	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5
4.1 Have leadership and be able to work with other people as a good leader and a good team member					✓
4.2 Have responsibility for society and organization as well as self-development and work development				✓	✓
4.3 Be able to adapt self to organizational situation and culture					✓
<b>Competency/skill 5 : ICT</b> <i>(Numerical Analysis, Communication and Information Technology)</i>					
5.1 Be able to apply mathematical and statistical knowledge to appropriately analyze, process, solve problem and present information	✓	✓	✓	✓	
5.2 Possess language skills to effectively communicate knowledge on science and mathematics as well as be able to select appropriate forms of communication				✓	
5.3 Possess skills and knowledge on English or other foreign language that are suitable and necessary for doing research				✓	
5.4 Be able to apply information technology on searching and collecting data that is effective and suitable for the situation		✓		✓	



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

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## Appendix 4

### Curriculum Mapping



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

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Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

### Table in Appendix 4.1

#### Curriculum Mapping Plan A

Course Codes and Titles	Number of credits	Program-level Learning Outcomes (PLOs)				
		PLO 1	PLO 2	PLO 3	PLO 4	PLO 5
Bachelor of Science Program in Industrial Mathematics and Data Science						
Year 1						
Semester 1						
SHSS 103    Man and Society	2 (2-0-4)				I	
LAEN 180 English for Academic Purpose I	2 (2-0-4)				I	
SCBE 100 Wonder of Life	3 (3-0-6)				I	
SCGI 110 Chemistry in Everyday Life	3 (3-0-6)				I	
SCMA 196 Science Communications	3 (3-0-6)				I	
SCIM 101 Mathematics I	4 (4-0-8)	I	I			
SCIM 121 Statistical Data Analysis I	3 (3-0-6)	I	I			
Semester 2						
LAEN 181 English for Academic Purposes II	2 (2-0-4)				R	
SCMA 161 Technology in Daily Life	3 (3-0-6)				R	
SCMA 172 Current Moral Issues and Logical Thinking	3 (3-0-6)				R	
SCMA 175 Introduction to Business Software	3 (3-0-6)				R	



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

SCIM 111 Introduction to Scientific Computing	4 (4-0-8)	I	I	I		
SCIM 102 Mathematics II	4 (4-0-8)	R	I			
SCIM 122 Statistical Data Analysis II	3 (3-0-6)	R	R			
<b>Bachelor of Science Program in Industrial Mathematics and Data Science</b>						
<b>Year 2</b>						
<b>Semester 1</b>						
SHHU 133 Rhetoric for Leadership	2 (2-0-4)				R	
LAEN 341 Situational-based communicative English	2 (1-2-3)				R	
SCIM 223 Calculus of Several Variables	3 (3-0-6)	R		R		
SCIM 201 ODE & Mathematical Transforms	3 (3-0-6)	R		R		
SCIM 254 Data Communication	3 (3-0-6)				R	
SCIM 202 Advanced Calculus	3 (3-0-6)	R				I
SCIM 252 Database Management	3 (3-0-6)	R		R		I
SCIM 204 Operations Research	3 (3-0-6)	R		R		I
SCIM 211 Simulation Modelling	3 (3-0-6)	R		R		R
<b>Semester 2</b>						
LAEN 338 Effective Presentations in English	2 (2-0-4)				R	
SCIM 222 Linear Algebra	3 (3-0-6)	R		R		R
SCIM 231 Introduction to Data Science	3 (3-0-6)		I	R		



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

SCIM 203 PDEs for Engineers and Scientists	3 (3-0-6)	R				
SCIM 251 Data Structure in Mathematics	3 (3-0-6)		R			
SCIM 221 Statistical Data Analysis III	3 (3-0-6)	R	R			
SCIM 206 Supply Chain Modelling and Optimization	3 (3-0-6)	R				
SCIM 290 Intro to Mathematical Software	3 (2-2-5)	R	R			R
SCIM 291 Numerical Analysis	3 (3-0-6)	R		R		
SCIM 211 Mobile, Locative and Ubiquitous	3 (3-0-6)		R		R	
<b>Bachelor of Science Program in Industrial Mathematics and Data Science</b>						
<b>Year 3</b>						
<b>Semester 1</b>						
SCIM 304 Network Optimisation	3 (3-0-6)	R				
SCIM 305 Logistics Modelling and Optimisation	3 (3-0-6)	R				
SCIM 309 Mathematical Statistics	3 (3-0-6)	R	R	R		
SCIM 325 Interactive Virtual and Immersive Environments	3 (3-0-6)		R		R	
<b>Semester 2</b>						
SCIM 322 Mathematics for Artificial Intelligence	3 (3-0-6)		R			
SCIM 324 Design and Analysis of Algorithms	3 (3-0-6)	R	R	R		
SCIM 323 Data Mining	3 (3-0-6)		R			



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

Bachelor of Science Program in Industrial Mathematics and Data Science						
Year 4						
<b>Semester 1</b>						
SCIM 402 Industrial Modelling and Optimization	3 (3-0-6)	R				
SCIM 405 Dynamic and Stochastic Modelling and Optimization	3 (3-0-6)	R		R	R	
SCIM 406 Production Planning and Management	3 (3-0-6)	R			R	R
SCIM 403 Numerical Optimization	3 (3-0-6)	R		R		
SCIM 404 Applied Mathematical Modelling in Industrial Processes	3 (3-0-6)	M			M	
<b>Semester 2</b>						
SCIM 407 Industrial Project	3 (3-0-6)	M/A	M/A	M/A	M/A	M/A
SCIM 409 Internship for Experience	3 (0-18-9)	M/A	M/A	M/A	M/A	M/A

I : PLO is Introduced and Assessed

R : PLO is Reinforced and Assessed

P : PLO is Practiced and Assessed

M : Level of Mastery is Assessed

A : Assessment





Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

### Curriculum Mapping Plan B

Course Codes and Titles	Number of credits	Program-level Learning Outcomes (PLOs)				
		PLO 1	PLO 2	PLO 3	PLO 4	PLO 5
Bachelor of Science Program in Industrial Mathematics and Data Science ( from Mahidol University)						
Bachelor of Science Program in Industrial Optimisation or Data Science ( from Curtin University of Technology)						
Year 1						
Semester 1						
SHSS 103 Man and Society	2 (2-0-4)				I	
LAEN 180 English for Academic Purpose I	2 (2-0-4)				I	
SCBE 100 Aesthetics for Fragrance and flavor	3 (3-0-6)				I	
SCCH 150 Integrated Chemistry	3 (3-0-6)				I	
SCMA 196 Science Communications	3 (3-0-6)				I	
SCIM 101 Mathematics I	4 (4-0-8)	I	I			
SCIM 121 Statistical Data Analysis I	3 (3-0-6)	I	I			
Semester 2						
LAEN 181 English for Academic Purposes II	2 (2-0-4)				R	
SCMA 161 Technology in Daily Life	3 (3-0-6)				R	
SCMA 172 Current Moral Issues and Logical Thinking	3 (3-0-6)				R	
SCMA 175 Introduction to Business Software	3 (3-0-6)				R	


Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

Course Codes and Titles	Number of credits	Program-level Learning Outcomes (PLOs)				
		PLO 1	PLO 2	PLO 3	PLO 4	PLO 5
SCIM 111 Introduction to Scientific Computing	4 (4-0-8)	I	I	I		
SCIM 102 Mathematics II	4 (4-0-8)	R	I			
<b>Bachelor of Science Program in Industrial Mathematics and Data Science ( from Mahidol University)</b> <b>Bachelor of Science Program in Industrial Optimisation or Data Science ( from Curtin University of Technology)</b> <b>Year 2</b>						
<b>Semester 1</b>						
SHHU 133 Rhetoric for Leadership	2 (2-0-4)				R	
LAEN 341 Situational-based communicative English	2 (1-2-3)				R	
SCIM 223 Calculus of Several Variables	3 (3-0-6)	R		R		
SCIM 201 ODE & Mathematical Transforms	3 (3-0-6)	R		R		
SCIM 254 Data Communication	3 (3-0-6)				R	
SCIM 202 Advanced Calculus	3 (3-0-6)	R				I
SCIM 252 Database Management	3 (3-0-6)	R		R		I
SCIM 204 Operations Research	3 (3-0-6)	R		R		I
SCIM 211 Simulation Modelling	3 (3-0-6)	R		R		R


Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

Course Codes and Titles	Number of credits	Program-level Learning Outcomes (PLOs)				
		PLO 1	PLO 2	PLO 3	PLO 4	PLO 5
<b>Semester 2</b>						
LAEN 338 Effective Presentations in English	2 (2-0-4)				R	
SCIM 222 Linear Algebra	3 (3-0-6)	R		R		R
SCIM 231 Introduction to Data Science	3 (3-0-6)		I	R		
SCIM 203 PDEs for Engineers and Scientists	3 (3-0-6)	R				
SCIM 251 Data Structure in Mathematics	3 (3-0-6)		R			
SCIM 221 Statistical Data Analysis III	3 (3-0-6)		R			
SCIM 206 Supply Chain Modelling and Optimization	3 (3-0-6)	R				
SCIM 290 Intro to Mathematical Software	3 (2-2-5)	R	R			R
SCIM 291 Numerical Analysis	3 (3-0-6)	R		R		
SCIM 211 Mobile, Locative and Ubiquitous	3 (3-0-6)		R		R	
<b>Bachelor of Science Program in Industrial Mathematics and Data Science ( from Mahidol University)</b> <b>Bachelor of Science Program in Industrial Optimisation ( from Curtin University of Technology)</b> <b>Year 3</b>						
<b>Semester 1</b>						
MATH2000 Network Optimisation	25	R				
MATH3001 Applied Mathematical Modelling	25	R			R	



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

Course Codes and Titles	Number of credits	Program-level Learning Outcomes (PLOs)				
		PLO 1	PLO 2	PLO 3	PLO 4	PLO 5
INDE2001 Logistics Modelling and Optimisation	25	R				
MATH2002 Computational Mathematics	25	R		R		
<b>Semester 2</b>						
INDE3000 Industrial Modelling and Optimisation	25	R				
INDE2002 Network Optimisation for Transport and Logistics	25	R				
STAT2001 Mathematical Statistics	25	R	R	R		
<b>Bachelor of Science Program in Industrial Mathematics and Data Science (from Mahidol University)</b> <b>Bachelor of Science Program in Data Science (from Curtin University of Technology)</b> <b>Year 3</b>						
<b>Semester 1</b>						
ICTE2000 Interactive Virtual and Immersive Environments	25		R		R	
STAT2003 Analytics Experimental and Simulate Data	25		R			
MATH2000 Network Optimisation	25	R				
MATH2002 Computational Mathematics	25	R		R		
INDE2001 Logistics Modelling and Optimisation	25	R				


Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

Course Codes and Titles	Number of credits	Program-level Learning Outcomes (PLOs)				
		PLO 1	PLO 2	PLO 3	PLO 4	PLO 5
MATH3001 Applied Mathematical Modelling	25	R			R	
<b>Semester 2</b>						
COMP3006 Artificial and Machine Intelligence	25		R			
COMP3001 Design and Analysis of Algorithms	25	R	R	R		
CNCO3003 Mobile Cloud Computing	25		R		R	
MATH2009 Calculus 2	25	R				
STAT2001 Mathematical Statistics	25	R	R			
MATH3002 Numerical Optimisation	25	R		R		
<b>Bachelor of Science Program in Industrial Mathematics and Data Science ( from Mahidol University)</b> <b>Bachelor of Science Program in Industrial Optimisation ( from Curtin University of Technology)</b> <b>Year 4</b>						
<b>Semester 1</b>						
SCIM 402 Industrial Modelling and Optimization	3 (3-0-6)	R				
SCIM 403 Numerical Optimization	3 (3-0-6)	R		R		
SCIM 404 Applied Mathematical Modelling in Industrial Processes	3 (3-0-6)	R			R	



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

Course Codes and Titles	Number of credits	Program-level Learning Outcomes (PLOs)				
		PLO 1	PLO 2	PLO 3	PLO 4	PLO 5
SCIM 405 Dynamic and Stochastic Modelling and Optimization	3 (3-0-6)	R		R	R	
SCIM 406 Production Planning and Management	3 (3-0-6)	R			R	R
<b>Bachelor of Science Program in Industrial Mathematics and Data Science ( from Mahidol University)</b> <b>Bachelor of Science Program in Data Science (from Curtin University of Technology)</b> <b>Year 4</b>						
<b>Semester 1</b>						
COMP3009 Data Mining	25		R			
STAT2001 Analytics for Observation Data	25		R		R	
MATH5004 Advanced Numerical Analysis	25	R				
MATH3004 Industrial Project	25	M/A	M/A	M/A	M/A	M/A
COMP3005 Computer Project2	25		M/A		M/A	M/A
MEDA3001 Major Digital Humanities Project	25		M/A		M/A	M/A
ISYS3002 Information Systems and Technology Project 2	25			M/A	M/A	

I : PLO is Introduced and Assessed

R : PLO is Reinforced and Assessed

P : PLO is Practiced and Assessed

M : Level of Mastery is Assessed

A : Assessment



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

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## Appendix 5

Major Improvements of the Bachelor of Science Program in 2014  
(International Program) Issued in Academic Year 2014



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

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Program under Revision Bachelor of Science  
Program in Industrial Mathematics and Data Science (International Program)  
Academic Year 2017  
Faculty of Science, Mahidol University

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1. This program has been approved by the Office of the Higher Education Commission on 20 June 2018.
2. The Mahidol University Council has approved this revision in its meeting No. 532 on 16 May 2018.
3. The revised program is to be implemented starting in the academic year of 2019 from semester 1 of the year 2019 onwards.
4. Reasons for the revision
  - 4.1) To update the program in accordance with the Thailand Qualifications Framework for Higher Education
  - 4.2) To raise the teaching and learning to a higher standard meeting the advancing knowledge and technology, meeting the requirement of students and employers
  - 4.3) To meet the challenges of living and working in a diverse and globalized world, ensuring that our graduates have the MU Graduate Attributes
  - 4.4) To modify the courses in accordance with the outcome-based education, having the effective teaching and learning pedagogy



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

## 5. The contents of the revision

### 5.1 Request to change the program title and the offered degree.

#### Before Revision:

##### Program Title

In Thai : หลักสูตรวิทยาศาสตรบัณฑิต สาขาวิชาคณิตศาสตร์อุตสาหกรรม  
(หลักสูตรนานาชาติ)

In English : Bachelor of Science Program in Industrial Mathematics and Data Science  
(International Program)

##### Degree Offered and Field of Study

In Thai Full Name : วิทยาศาสตรบัณฑิต (คณิตศาสตร์อุตสาหกรรม)  
Abbreviation : วท.บ. (คณิตศาสตร์อุตสาหกรรม)

In English Full Name : Bachelor of Science (Industrial Mathematics)  
Abbreviation : B.Sc. (Industrial Mathematics)

#### After Revision:

##### Program Title

In Thai : หลักสูตรวิทยาศาสตรบัณฑิต สาขาวิชาคณิตศาสตร์อุตสาหกรรมและวิทยาการข้อมูล  
(หลักสูตรนานาชาติ)

In English : Bachelor of Science Program in Industrial Mathematics and Data Science  
(International Program)

##### Degree Offered and Field of Study

In Thai Full Name : วิทยาศาสตรบัณฑิต (คณิตศาสตร์อุตสาหกรรมและวิทยาการข้อมูล)  
Abbreviation : วท.บ. (คณิตศาสตร์อุตสาหกรรมและวิทยาการข้อมูล)

In English Full Name : Bachelor of Science (Industrial Mathematics and Data Science)  
Abbreviation : B.Sc. (Industrial Mathematics and Data Science)



## 5.2 Removing General Education Courses

ENGE 105	Integrating Health and Environment	3 (3-0-6)
SCBI 163	Essential Biology	2 (2-0-4)
SCCH 161	General Chemistry	3 (3-0-6)
SCPY 169	Elementary Physics	3 (3-0-6)
SCMA 173	Introduction to Mathematical Software	3 (3-0-6)
SCID 202	Basic Information Literacy	1 (1-0-2)
PRPR 101	Population and Development	2 (2-0-4)
PRPR 102	Regional Studies	2 (2-0-4)
LAEN 280	Science Fiction and Society	2 (2-0-4)
LAEN 281	The Science of Speech Sound	2 (2-0-4)
LAEN 380	Academic Presentations in English	2 (2-0-4)

## 5.3 Adding General Education Courses

(which are courses that have been approved for teaching in other programs)

SHSS 103	Man and Society	2 (2-0-4)
SHHU 133	Rhetoric for Leadership	2 (2-0-4)
LAEN 338	Effective Presentations in English	2 (1-2-3)
LAEN 341	Situational-based Communicative English	2 (1-2-3)
SCBE 100	Aesthetics for Fragrance and flavor	3 (3-0-6)
SCGI 110	Chemistry in Everyday Life	3 (3-0-6)
SCMA 172	Current Moral Issues and Logical Thinking	3 (3-0-6)
SCMA 175	Introduction to Business Software	3 (3-0-6)
SCMA 196	Science Communications	3 (3-0-6)

## 5.4 Removing Specific Courses

SCMA 188	Statistical Data Analysis I	3 (3-0-6)
SCMA 189	Statistical Data Analysis II	3 (3-0-6)
SCMA 259	Linear Algebra	3 (3-0-6)
SCMA 213	Calculus of Several Variables	3 (3-0-6)
SCMA 286	Mathematical Statistics	4 (3-2-7)
SCIM 103	Introduction to Scientific Computing	3 (3-0-6)



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

SCIM 301	Numerical Analysis	3 (3-0-6)
SCIM 408	Internship in Industrial Mathematics	3 (3-0-6)

#### 5.5 Changing the Course Code (Course title, description and credits are not changed)

SCIM 121	Statistical Data Analysis I	3 (3-0-6)
SCIM 122	Statistical Data Analysis II	3 (3-0-6)
SCIM 222	Linear Algebra	3 (3-0-6)
SCIM 223	Calculus of Several Variables	3 (3-0-6)
SCIM 291	Numerical Analysis	3 (3-0-6)

#### 5.6 Adding the New Courses

SCIM 111	Introduction to Scientific Computing	4 (4-0-8)
SCIM 231	Introduction to Data Science	3 (3-0-6)
SCIM 221	Statistical Data Analysis III	3 (3-0-6)
SCIM 309	Mathematical Statistics	3 (3-0-6)
SCIM 251	Data Structures in Mathematics	3 (3-0-6)
SCIM 252	Database Management	3 (3-0-6)
SCIM 253	Mobile, Locative and Ubiquitous Media	3 (3-0-6)
SCIM 254	Data Communications	3 (3-0-6)
SCIM 290	Introduction to Mathematical Software	3 (2-2-5)
SCIM 311	Statistical Modelling	3 (3-0-6)
SCIM 321	Computer Applications in Statistics	3 (3-0-6)
SCIM 322	Mathematics for Artificial Intelligence	3 (3-0-6)
SCIM 323	Data Mining	3 (3-0-6)
SCIM 324	Design and Analysis of Algorithms	3 (3-0-6)
SCIM 325	Interactive, Virtual & Immersive Environments	3 (3-0-6)
SCIM 409	Internship for Experience	3 (0-18-9)
SCIM 411	Special Topic in Industrial Mathematics I	3 (3-0-6)
SCIM 412	Special Topic in Industrial Mathematics II	3 (3-0-6)
SCIM 421	Special Topic in Data Science I	3 (3-0-6)
SCIM 422	Special Topic in Data Science II	3 (3-0-6)



6. **Program structure after revision** compared to the previous structure and the undergraduate curriculum standard and guidelines issued by the Commission of Higher Education B.E. 2558.

Plan A

Course Category	Standard guideline of the Ministry of Education for the undergraduate level of education of the year B.E. 2558.	Before Revision	After Revision
1. General Education Courses	no less than 30	30 <sup>#</sup>	30 <sup>#</sup>
1. Social Sciences and Humanities		4	
2. Languages		8	
3. Science and Mathematics		18	
2. Specific Courses	no less than 72	85	84
1. Core Courses			30
2. Major Elective Courses			54
3. Free Elective Courses	no less than 6	6	6
Total Credits	no less than 120	121	120

Plan B

Course Category	Standard guideline of the Ministry of Education for the undergraduate level of education of the year B.E. 2558.	Before Revision	After Revision
1. General Education Courses	no less than 30	30 <sup>#</sup>	30 <sup>#</sup>
1. Social Sciences and Humanities		4	
2. Languages		8	
3. Science and Mathematics		18	
2. Specific Courses	no less than 72	85	54 + 300*
1. Core Courses			
2. Major Elective Courses			
3. Free Elective Courses	no less than 6	6	
Total Credits	no less than 120	121	84 + 300*



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

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# Students may choose the general education courses provided by other programs/departments/faculties to fulfill the credit requirement.

\* credits while studying at Mahidol University + credits while studying at Curtin University

#### 7. For Double Degree Options:

Students can choose to study in 2 programs from Curtin University of Technology:

- 1) B.Sc. in Industrial Optimisation
- 2) B.Sc. in Data Science



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

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## Appendix 6

Details of the instructors responsible for the program, regular instructors, and special instructors



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

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Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

## Appendix for details of the instructors responsible for the program, regular instructors, and special instructors

### a. Instructors responsible for the program and regular instructors

#### 1. Full Name Mr. Meechoke Choodoung

**Title/Academic Title** Lect. Ph.D.

**Affiliation** Department of Mathematics, Faculty of Science, Mahidol University

**Work Place** Department of Mathematics, Faculty of Science, Mahidol University

Degree	Field of Study	Institution	Year
Ph.D.	Applied Mathematics	Curtin University of Technology, Australia	2004 (B.E.2547)
M.Sc.	Computer Science	Asian Institute of Technology	1997 (B.E.2540)
B.Sc.	Mathematics	Mahidol University	1994 (B.E.2537)

#### Research Interests or Research Skills

- 1) Finite Element Method
- 2) Optimization Techniques.
- 3) Python programming
- 4) Data Science

#### Research or academic works (according to Standards Criteria for the Higher Education

##### Curriculum (B.E. 2558)

- 1) Irwan Rahadi, Meechoke Choodoung, Arunsri Choodoung, Moltira Promkan, Phantip Vattanaviboon, Vichanan Yamkamon, Normal and Hypochromic Red Blood Cells (RBCs) Detection by Using Image Processing Proceeding the 23<sup>rd</sup> Annual Meeting in Mathematics AMM2018, 3-5 May 2018, page 442-447.

#### Teaching responsibility

SCIM 405	Numerical Optimization	3 (3-0-6)
SCIM401	Scientific Computing	3 (3-0-6)



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

2. **Full Name** Ms. Umaporn Nuntaplook

**Title/Academic Title** Lect. Ph.D.

**Affiliation** Department of Mathematics, Faculty of Science, Mahidol University

**Work Place** Department of Mathematics, Faculty of Science, Mahidol University

Degree	Field of Study	Institution	Year
Ph.D.	Computational and Applied Mathematics	Old Dominion University, USA	2013 (B.E.2556)
M.Sc.	Computational and Applied Mathematics	Old Dominion University, USA	2008 (B.E.2551)
B.Sc.	Mathematics	Mahidol University	2005 (B.E.2548)

### Research Interests or Research Skills

Applied Mathematical Physics: Quantum Mechanics, Light Scattering, Resonances, Refractive Index Profiles, Scattering Potential Profiles.

### Research or academic works (according to Standards Criteria for the Higher Education Curriculum (B.E. 2558)

1. **Nuntaplook U**, Adam JA., Shape resonances of the transverse magnetic mode in a spherically stratified medium., Int J Appl Phys Math. 2018;8(3):18-30.
2. Umaporn Nuntaplook, John A. Adam, Michael A. Pohrivchak, Some Wave-Theoretic Problems in Radially Inhomogeneous Media, Light Scattering Reviews, Volume 11: Light Scattering and Radiative Transfer, Springer Praxis Books, 339-362, 2016

### Teaching responsibility

SCIM 101	Mathematics I	4 (4-0-8)
SCIM 102	Mathematics II	4 (4-0-8)
SCIM 201	Ordinary Differential Equation and Mathematical Transforms	3(3-0-6)
SCIM203	Partial Differential Equations for Engineers and Scientists	3(3-0-6)



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

3. **Full Name** Mr. Wasin Padungwech

**Title/Academic Title** Lect. Ph.D.

**Affiliation** Department of Mathematics, Faculty of Science, Mahidol University

**Work Place** Department of Mathematics, Faculty of Science, Mahidol University

Degree	Field of Study	Institution	Year
Ph.D.	Mathematics	Cardiff University	2018 (B.E.2561)
M.Sc.	Mathematics	University of Cambridge	2013 (B.E.2556)

#### Research Interests or Research Skills

Operation Research

#### Research or academic works (according to Standards Criteria for the Higher Education Curriculum (B.E. 2558)

1. Alrajhi K., Thompson J., Padungwech W. (2018) A Heuristic Approach for the Dynamic Frequency Assignment Problem. In: Chao F., Schockaert S., Zhang Q. (eds) Advances in Computational Intelligence Systems. UKCI 2017. Advances in Intelligent Systems and Computing, vol 650. Springer, Cham

#### Teaching responsibility

SCIM 101	Mathematics I	4 (4-0-8)
SCIM 102	Mathematics II	4 (4-0-8)
SCIM 201	Ordinary Differential Equation and Mathematical Transforms	3(3-0-6)
SCIM 204	Operation Research	3(3-0-6)

4. **Full Name** Mr. Nathnarong Khajohnsaksumeth

**Title/Academic Title** Lect. Ph.D.

**Affiliation** Department of Mathematics, Faculty of Science, Mahidol University

**Work Place** Department of Mathematics, Faculty of Science, Mahidol University

Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

Degree	Field of Study	Institution	Year
Ph.D.	Mathematics and Statistics	Curtin University of Technology, Australia	2014 (B.E.2557)
M.Sc.	Industrial Mathematics	University of Kaiserslautern, Germany	2009 (B.E.2552)
B.Sc.	Mathematics	Mahidol University	2003 (B.E.2546)

**Affiliation** Department of Mathematics, Faculty of Science, Mahidol University**Research Interests or Research Skills**

Mathematical Modelling and Industrial Mathematics

**Research or academic works (according to Standards Criteria for the Higher Education****Curriculum (B.E. 2558)**

1. A. Charoenloedmongkhon, B. Wiwatanapataphee, W. Sawangtong, N. Khajohnsaksumeth, and L. Giannini, Numerical simulation of air-bulk solid flows in a silo with inserts. *Advances and Applications in Fluid Mechanics*. 19 (3): pp. 643-667, 2016.
2. Elayaraja Aruchunan, Nathnarong Khajohnsaksumeth, Benchawan Wiwatanapataphee, A New Algorithm of Geometric Mean for Solving High-Order Fredholm Integro-differential Equations. *DASC/PiCom/DataCom/CyberSciTech* , 2016.

**Teaching responsibility**

SCIM 101	Mathematics I	4 (4-0-8)
SCIM 102	Mathematics II	4 (4-0-8)
SCIM 201	Ordinary Differential Equation and Mathematical Transforms	3 (3-0-6)
SCIM203	Partial Differential Equations for Engineers and Scientists	3 (3-0-6)
SCIM 301	Numerical Analysis	3 (3-0-6)
SCIM 307	Control Theory and Optimization	3 (3-0-6)
SCIM 402	Industrial Modelling and Optimization	3 (3-0-6)



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

5. **Full Name** Mr. Wasakorn Laesanklang

**Title/Academic Title** Lect. Ph.D.

**Affiliation** Department of Mathematics, Faculty of Science, Mahidol University

**Work Place** Department of Mathematics, Faculty of Science, Mahidol University

Degree	Field of Study	Institution	Year
Ph.D.	Computer Science	The University of Nottingham, United Kingdom	2017 (B.E.2560)
M.Sc.	Computational Science	Chulalongkorn University	2010 (B.E.2553)
B.Sc.	Mathematics	Chiang Mai University	2008 (B.E.2551)

#### Research Interests or Research Skills

Mathematical Modelling and Industrial Mathematics

#### Research or academic works (according to Standards Criteria for the Higher Education Curriculum (B.E. 2558)

1. Binhui Chen, Rong Qu, Ruibin Bai, Wasakorn Laesanklang, A hyper-heuristic with two guidance indicators for bi-objective mixed-shift vehicle routing problem with time windows. Applied Intelligence, Vol 48, Issue 12, pp. 4937 - 4959, December 2018.
2. Large neighbourhood search with adaptive guided ejection search for the pickup and delivery problem with time windows. Timothy Curtois, Dario Landa-Silva, Yi Qu, Wasakorn Laesanklang. EURO Journal on Transportation and Logistics, Volume 7, Issue 2, pp 151–192, June 2018.

#### Teaching responsibility

SCIM 101	Mathematics I	4 (4-0-8)
SCIM 102	Mathematics II	4 (4-0-8)
SCIM401	Scientific Computing	3 (3-0-6)
SCIM 204	Operation Research	3 (3-0-6)

Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

Table: Name lists of regular instructors

No.	Name-Surname	Academic Position	Degree (field)/Institute/ Graduation year	Most recent Academic Works in 5 years
1	Miss Kornkanok Bunwong 3-1002-0093X-XXX	Asst Prof	Ph.D. (Mathematics) / University of Warwick, UK : 2006 (B.E.2549)	Bunwong, K., Sae-jie, W., Evolutionary consequences of age- specific harvesting: age at first reproduction. Advances in Difference Equations (2017) 2017: 157.
2	Mr. Kittisak Chayantrakom 3-1020-0098X-XXX	Lecturer	Ph.D. (Mathematics) / Curtin University, Australia :2009 (B.E.2552)	Kittipong Srikhaetai, Kittisak Chayantrakom and Wattana Kanbua. A numerical study of oil spill spreading in the Gulf of Thailand. Advances in Difference Equations <a href="https://doi.org/10.1186/s13662-019-2143-z">https://doi.org/10.1186/s13662-019-2143-z</a> (2019) 2019:214
3	Miss Chontita Rattanakul 3-1005-0300X-XXX	Assoc Prof	Ph.D. (Mathematics)/ Mahidol University: 2003 (B.E.2546)	Matkhao P., Lenbury Y., Rattanakul C., Chuchalem N. Modeling porcine reproductive and respiratory syndrome incorporating decaying infectiousness and delayed infection incidences. Southeast



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

				Asian J Sciences 5(1) (2017): 32-46.
4	Mr. Chanun Lewchalermvongs 3-1023-0019X-XXX	Lecturer	Ph.D. (Mathematics) / Louisiana State University, U.S.A. : 2016 (B.E.2559)	Ding, G., Lewchalermvongs, C., Maharry, J., Graphs with no -minor, The Electronic Journal of Combinatorics, 23(2) (2016).
5	Mr. Chaiwat Maneesawarnng 5-1006-9907X-XXX	Asst Prof	Ph.D. (Mathematics) / University of Illinois at Urbana-Champaign, U.S.A. : 2000 (B.E.2543)	M. Chudtong and C. Maneesawarnng, An upper length estimate for curves in CAT(K) spaces, East- West Journal of Mathematics 18 (1) 2016, 1-26.
6	Mr. Nattakorn Phewchean 3-1009-0451X-XXX	Lecturer	Ph.D. (Applied Mathematics) / Curtin University, Australia : 2013 (B.E.2556)	Phewchean N., Chaiyapo N. An application of Ornstein-Uhlenbeck process to commodity pricing in Thailand. Advances in Difference Equations. 14 (2017): 1 – 10.
7	Mr. Nathnarong Khajohnsaksumeth 3-1506-0066X-XXX	Lecturer	Ph.D. (Applied Mathematics) / Curtin University, Australia : 2014 (B.E.2557)	A. Charoenloedmongkhon, B. Wiwatanapataphee, W. Sawangtong, N. Khajohnsaksumeth, and L. Giannini, Numerical simulation of air-bulk solid flows in a silo with inserts., Advances and



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

				Applications in Fluid Mechanics. 19 (3): pp. 643-667, 2016.
8	Mr. Nattapong Bosuwan 3-7798-0001X-XXX	Lecturer	Ph.D. (Mathematics) / Vanderbilt University, U.S.A. : 2013 (B.E.2556)	N. Bosuwan, G. López Lagomasino, and Y. Zaldivar Gerpe, Direct and inverse results for multipoint, Analysis and Mathematical Physics, accepted (Impact Factor 2017: 1.381).
9	Miss Duangkamon Baowan 3-6097-0030X-XXX	Assoc Prof	Ph.D. (Applied Mathematics) / University of Wollongong, Australia : 2008 (B.E.2551)	Tiangtrong P, Thamwattana N*, Baowan D. Modelling water molecules inside cyclic peptide nanotubes. Applied Nanoscience 2016; 6(3): 345 – 357.
10	Mr. Dmitry Berdinskiy	Lecturer	Ph.D. (Computer Sciences) / The University of Auckland, New Zealand : 2016 (B.E.2559)	Berdinsky D. Cayley automatic groups and numerical characteristics of Turing transducers. S. Brlek and C. Reutenauer (Eds.): Developments in Language Theory 2016. Lecture Notes in Computer Science 2016; 9840: 26-37.
11	Miss Tipaluck Krityakierne 3-1004-0070X-XXX	Lecturer	Ph.D. (Applied Mathematics) / Cornell	Pirot G., Krityakierne T., Ginsbourger D., and Renard P. Contaminant





Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

			University, U.S.A. : 2016 (B.E.2559)	source localization via Bayesian global optimization, Hydrol Earth Syst. Sci., 2019, 23, 351- 369.
12	Miss Piyanan Pasom 3-7105-0106X-XXX	Lecturer	Ph.D. (Mathematics)/ Chiang Mai University : 2013 (B.E.2556)	Pasom P., Cuntavepanit A. On the Strong and delta- convergence of NSP- iteration on CAT(0) spaces, Thai Journal of Mathematics 2016: 14(2): 341-351.
13	Mr. Pallop Huabsomboon 5-1016-9901X-XXX	Asst Prof	Ph.D. (Computational Applied Mathematics) / Old Dominion University, U.S.A. : 2006 (B.E.2549)	Lomthong P, Huabsomboon P, Tamagawa M. Image Segmentation Using Fast Implementation of Level Set Without Re- initialization. ICIC Express Letters Part B: Applications. January 2016; 7(1): 23-29.
14	Mr. Pairote Satiracoo 3-1006-0128X-XXX	Asst Prof	Ph.D. (Mathematics) / University of Warwick, UK : 2003 (B.E.2546)	Sangngam, R., Lenbury, Y., Bunwong, K., Satiracoo, P., De Gaetano, A. and Panunzi, S. A mathematical modeling of gastrointestinal tract : an influence of gastric emptying on glucose



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

				concentration. Proceeding of ICMA-MU 2018.
15	Miss Farida Chamchod 3-5002-0083X-XXX	Lecturer	Ph.D. (Mathematics) / University of Bath, UK : 2012 (B.E.2555)	Chamchod F, Palittapongarnpim P., Modeling Clostridium difficile in a hospital setting: Control and admissions of colonized and symptomatic patients., Theoretical Biology and Medical Modelling, Theor Biol Med Model 2019 Jan;16:2.
16	Mr. Meechoke Chooduang 3-1014-0097X-XXX	Lecturer	Ph.D. (Applied Mathematics) / Curtin University, Australia : 2004 (B.E.2547)	Irwan Rahadi, Meechoke Chooduang, Arunsri Chooduang, Moltira Promkan, Phantip Vattanaviboon, Vichanan Yamkamon, Normal and Hypochromic Red Blood Cells (RBCs) Detection by Using Image Processing., Procceeding the 23rd Annual Meeting in Mathematics AMM2018, 3-5 May 2018, page 442-447.
17	Miss Rawee Suwandechochai 3-1012-0045X-XXX	Lecturer	Ph.D. (Industrial and Systems Engineering) / Virginia Polytechnic Institute and State	Intarapak, S., R. Suwandechochai and T. Supapakorn (2017), Comparison of the



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

			University, U.S.A. : 2005 (B.E.2548)	Estimators of the Intra-cluster Correlation for the Nested Error Regression Model, Communications in Statistics – Simulation and Computation, 46:3, pp. 2057-2070.
18	Miss Ruth J. Skulkhu 3-1006-0021X-XXX	Lecturer	Ph.D. (Mathematics) / University of Illinois at Urbana-Champaign, U.S.A. : 2012 (B.E.2555)	Yensiri, S.; Skulkhu, R.J.*, An Investigation of Radial Basis Function-Finite Difference (RBF-FD) Method for Numerical Solution of Elliptic Partial Differential Equations. Mathematics. 2017, 5(4), 54.
19	Miss Wannika Sawangtong 3-1202-0043X-XXX	Asst Prof	Ph.D. (Mathematics)/ Mahidol University: 2009 (B.E.2552)	Sawangtong W., Sawangtong P., A single quenching point for a fractional heat equation based on the Riemann-Liouville fractional derivative with a nonlinear concentrate source, Boundary Value Problems, 97, (2017), 1-7.
20	Mr. Wasakorn Laesanklang 1-5099-0027X-XXX	Lecturer	Ph.D. (Computer Science) / University of Nottingham, UK : 2017 (B.E.2560)	Binhui Chen, Rong Qu, Ruibin Bai, Wasakorn Laesanklang, A hyper-heuristic with two guidance indicators for bi-



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

				objective mixed-shift vehicle routing problem with time windows. Applied Intelligence, Vol 48, Issue 12, pp. 4937 - 4959, December 2018.
21	Mr. Wittawat Kositwattananarerk 3-7098-0001X-XXX	Asst Prof	Ph.D. (Mathematical Science) / Clemson University, U.S.A. : 2011 (B.E.2554)	W. Kositwattananarerk, Pseudocodeword-free criterion for codes with cycle-free Tanner graph, Designs, Codes and Cryptography, 86 (2018), no. 12, 2791-2805.
22	Mr. Somkid Amornsamankul 3-7399-0027X-XXX	Asst Prof	Ph.D. (Mathematics) / Curtin University, Australia : 2008 (B.E.2551)	Pipatsart, N., Modchang, C., Triampo, W., Amornsamankul, S. Network based model of infectious disease transmission in Macroalgae. International Journal of Simulation: Systems, Science and Technology, 19(5) (2018) 11.1-11.8
23	Mr. Somsak Orankitjaroen 3-1016-0000X-XXX	Lecturer	Ph.D. (Applied Mathematics) / State University of New York at Stony Brook, U.S.A. : 2002 (B.E.2545)	Chuchard P., Orankitjaroen S., Wiwatanapataphee B., Study of pulsatile pressure-driven electroosmotic flows through an elliptic



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

				cylindrical microchannel with the Navier slip condition, Adv Differ Eqn, (2017) 2017:160
24	Miss Suntaree Unhapipat 1-7399-0006X-XXX	Lecturer	Ph.D. (Mathematics)/ Mahidol University: 2014 (B.E.2557)	Unhapipat, S., Tiensuwan, M., and Pal, N. A revisit to testing the equality of several Poisson parameters, Model Assisted Statistics and Applications, 11(1)(2016): 27-38.
25	Mr. Man V.M. Nguyen	Lecturer	Ph.D. (Mathematical and Applied Statistics) / Eindhoven University of Technology, The Netherlands : 2005 (B.E.2548)	Man VM. Nguyen and Nhut C. Nguyen. Analyzing Incomplete Spatial Data For Air Pollution Prediction Southeast-Asian J. of Sciences:, Vol. 6, No 2 (2018), pp. 111-133
26	Miss Umaporn Nuntaplook 3-5201-006X-XXX	Lecturer	Ph.D. (Computational and Applied Mathematics) / Old Dominion University, U.S.A. : 2013 (B.E.2556)	Nuntaplook U, Adam JA., Shape resonances of the transverse magnetic mode in a spherically stratified medium., Int J Appl Phys Math. 2018;8(3):18-30.
27	Miss Wattanun Jatuririyapornchai 1-6599-0028X-XXX	Lecturer	Ph.D. (Mathematics), University of Warwick, UK : 2017 (B.E.2560)	Grosskinsky, S. and Jatuririyapornchai, W., 2019. Derivation of mean-field equations for stochastic particle



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

				systems. Stochastic Processes and their Applications, 129(4), 1455-1475.
28	Mr. Wasin Padungwech 1-1303-0009X-XXX	Lecturer	Ph.D. (Mathematics),Cardiff University, U.S.A. : 2018 (B.E.2561)	Alrajhi K., Thompson J., Padungwech W. (2018) A Heuristic Approach for the Dynamic Frequency Assignment Problem. In: Chao F., Schockaert S., Zhang Q. (eds) Advances in Computational Intelligence Systems. UKCI 2017. Advances in Intelligent Systems and Computing, vol 650. Springer, Cham
29	Mr. Ekawat Chaowicharat 1-2499-0009X-XXX	Lecturer	Ph.D. (Mathematics),Mahidol University, Thailand : 2016 (B.E.2559)	Wichaidit, S. Assapun, S. Putwattana, N. Joongpan, C. Tabthong, S. and Chaowicharat, E. (2019) The STEM flower: The designing tool for effective STEM instruction. AIP Conference Proceedings, 2081. <a href="https://doi.org/10.1063/1.5094013">https://doi.org/10.1063/1.5094013</a>
30	Mr. Tanapon Tantisripreecha 1-4299-9000X-XXX	Lecturer	Ph.D.(Computer Science)	Tantisripreecha T.; and Soonthornphisaj N.*; "Stock Market Movement

Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

			Kasetsart University : 2016 (B.E.2559)	Prediction Using LDA- Online Learning Model”, IEEE/ACIS 19th International Conference on Software Engineering, Artificial Intelligence, Networking and Parallel/Distributed Computing (SNPD), 2018, pp.135-139.
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**b. List of special instructors**

No.	Name-Surname	Academic Position	Degree (field)/Institute/ Graduation year	Most recent Academic Works in 5 years
1	Mrs.Yongwimon Lenbury 5-1014-0009X-XXX	Prof	Ph.D. (Mathematics) / Vanderbilt University U.S.A. : 1985 (B.E.2528)	Matkhao P., Lenbury Y., Rattanakul C., Chuchalerm N. Modeling porcine reproductive and respiratory syndrome incorporating decaying infectiousness and delayed infection incidences. Southeast Asian J Sciences 5(1) (2017): 32-46.



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

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Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

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## Appendix 7

Mahidol University Regulations on Diploma and Undergraduate Studies  
of the Year B.E. 2552-2560  
and the affiliation's educational announcements/regulations

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Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

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**Mahidol University Regulations on Diploma and Undergraduate Studies, B.E. 2552 (2009)**

Rules and guidelines for diploma and undergraduate studies are to be enforced in accordance with Mahidol University's act, 2007.

Mahidol University Council, under Section 24 (2) of Mahidol University Act B.E.2550 (2007), agreed to enact the following regulations in its 526<sup>th</sup> meeting, April 22, 2009.

**Rule 1:** These regulations are referred to as "Mahidol University Regulations on Diploma and Undergraduate Studies, B.E. 2552 (2009)"

**Rule 2:** These regulations shall become effective for the diploma and undergraduate students who enroll at Mahidol University in 2009 academic year onwards.

**Rule 3:** In these regulations

"University"	means	Mahidol University
"Faculty"	means	Faculties and divisions otherwise named, equivalent to other faculties that conduct teaching.
"Faculty committee"	means	Committee of the faculties and other divisions named equivalent to the faculties that conduct teaching.
"Dean"	means	Head of the faculties or other divisions, otherwise named, equivalent to the faculties that conduct teaching.
"Curriculum"	means	Diploma and undergraduate curriculum that supports the policies or operation or regulations and rules of Federations or Division of Art of Healing (if any) approved by the university council and acknowledged by the Higher Education Commission.
"Program Lecturers"	means	Lecturers in the diploma or undergraduate program.
"Program Committee"	means	Committee appointed by the Dean to manage and take the curriculum under consideration.



#### Rule 4: Admission

University or faculty, through the faculty committee, can accept students according to the conditions and methods indicated in the curriculum or the faculty's announcements approved by the president. Admission can be classified into three types;

- 4.1 Students are accepted by the quota system.
- 4.2 Students are accepted through the Office of Higher Education Commission.
- 4.3 Faculty can select and accept students directly according to the faculty's announcement which has been approved by the university.

#### Rule 5: Teaching System

- 5.1 **Semester System:** each academic year is divided into two regular semesters; Semester 1 and Semester 2. Each semester consists of at least 15 weeks broken into intervals. A faculty can organize a summer session if necessary. However, the summer session time period and registered credits must be comparable to the regular semester.
- 5.2 **Trimester System:** each academic year consists of three regular terms which are Trimester 1, Trimester 2, and Trimester 3, with at least 12 weeks in each trimester with semester breaks. The faculty can organize a summer session if necessary. However, the summer session time period and credit registration must be comparable to the regular semester.
- 5.3 **Others:** Faculty may use another system, the details of which must be clearly given in the curriculum period and credit registration must be equivalent to the semester or the trimester system.

#### Rule 6: Credits in each course are assigned according to the following criteria.

##### 6.1 Semester System

- 1. A theoretical course with lectures or discussions or equivalent that is one hour per week or at least 15 hours per semester and two hours self-study per week or at least 30 hours per semester is assigned one semester credit.
- 2. A practical, laboratory course, or equivalent that is 2-3 hours per week or 30-45 hours per semester, and one hour self-study per week or 15 hours per semester is assigned one semester credit.



3. An internship, a project or any learning activity that has been assigned which is 3-6 hours per week or 45-90 hours per semester, and one hour self-study per week or 15 hours per semester is assigned one semester credit.

## 6.2 Trimester System

1. A theoretical lecture course or equivalent that is one hour per week or at least 12 hours per semester, and two hours self-study per week or at least 24 hours per semester is assigned one trimester credit.
2. A practice, laboratory course or equivalent that is 2-3 hours per week or 24-36 hours per semester, and one hour self-study per week or 12 hours per semester is assigned one trimester credit.
3. An internship, a project or any learning activity that has been assigned which is 3-6 hours per week or 36-72 hours per semester, and one hour self-study per week or 12 hours per semester is assigned one trimester credit.

- 6.3 **If Rule 6.1 or 6.2 cannot be applied**, the faculty committee or the person appointed by the faculty committee can assign the credits for each course as he/she sees fit and clearly details how they compare with the semester credit system in the curriculum.

## Rule 7: Total credits and time of study

- 7.1 In an undergraduate study (4 years), the total number of credits must be at least 120 semester credits or 150 trimester credits, and the maximum time of study is 8 academic years.
- 7.2 In an undergraduate study (5 years), the total number of credits must be at least 150 semester credits or 187.5 trimester credits, and the maximum study time is 10 academic years.
- 7.3 In an undergraduate study (not less than 6 years), the total number of credits must be at least 180 semester credits or 225 trimester credits, and the maximum study time is 12 academic years.
- 7.4 In an undergraduate study (continuing), the total number of credits must be at least 72 semester credits or 90 trimester credits, and the maximum study time is 4 academic years.



An undergraduate study (continuing) has to be considered as part of an undergraduate study and must reflect the philosophy and contents of that particular undergraduate curriculum completely. The word “continuing” must be clearly written put in the parentheses after the name of the program.

In all cases, study time is to be counted from the first day of the first term for which the student has been accepted in that program.

### **Rule 8: Symbols showing evaluation results**

#### **8.1 Symbols and their assigned scores**

Grade results of each course may be shown in symbolic type as follows;

<b>Symbol</b>	<b>Score</b>
A	4.00
B+	3.50
B	3.00
C+	2.50
C	2.00
D+	1.50
D	1.00
F	0.00

#### **8.2 Symbols without scores**

Grade results of each course may be shown in symbolic type as follows;

<b>Symbol</b>	<b>Meaning</b>
AU	Study which leads to no credit (Audit)
I	Awaiting for evaluation (Incomplete)
P	The study is incomplete (In Progress)
S	Satisfactory
T	Transfer of credit
U	Unsatisfactory
W	Withdraw
X	No report

#### **8.3 Grading system**



1. Symbols with at least 2.00 points, or the symbol S, means **Pass** in that course
2. Symbols with 1.00 or 1.5 points, or the symbol U, means that knowledge or ability of the student is below average. Other grading results are at the discretion of the faculty committee or the person appointed by the committee. On re-grading a course, the grade score will be 2.00 (or S), at the maximum.

**8.4 F will be given** in the following situations;

1. The student took the examination and failed in the exam or project.
2. The student was absent from the exam without any permission from the faculty committee or person appointed by the faculty committee.
3. The student was not allowed to take the exam according to Rule 11.
4. The student violated the examination regulation; for example, being late to the exam, dressed inappropriately according to student uniform regulation or act as in Rule 22.
5. The student who received an I and did not take the exam or finish the project within one regular semester or trimester after they received the I grade, except that the student has the permission as in Rules 15.1 and 15.2.
6. The student who received a P and did not take the exam and/or did not hand in report on time.
7. The student who does not re-take the exam or re-do the project as indicated in 8.3 (2), or the student has re-taken the exam or re-done the project and is still evaluated as “failed”.

**8.5 S or U are given** only in non-credit courses or courses with credits for which the faculty has decided to use the non-score grading system.

**8.6 AU is given** only in the courses in which the student gives his/her intention to study for no credit and the student must participate in classes or practical activities not less than 80 percent of the total study time and practice time period must not be less than 80 percent.

**8.7 I will be given** in according to the following situations;

1. The student did not come to the exam or did not hand in the report in time due to ill health, as evidenced by a medical certificate endorsed by the university's Health Service Unit. However, the final decision will be made by the person appointed by the committee.



2. The student was not allowed to take the exam according to Rule 11 due to ill health, as evidenced by a medical certificate endorsed by the university's Health Service Unit. However, the final decision will be made by the committee.
3. The student was not able to take the exam or hand in the report due to force majeure. However, the final decision will be made by the person appointed by the committee.

8.8 **P can be** given only in the courses in which the classes are still on going, and/or the courses last longer than one semester/trimester.

8.9 **T can be given** in the case that the credits for the course have been transferred from another faculty or institute.

8.10 **W will be given** in the following situations;

1. The student is allowed to withdraw from the courses according to Rule 10.3.
2. The student is allowed to take a leave.
3. The student is suspended.

8.11 **X can be given** only in courses in which the faculty has not yet received the grade report.

#### **Rule 9: Registration**

Students have to register for courses and the total credits must be no less than specified in the curriculum according in the following criteria.

9.1 For a full time student, the number of registered credits should be no less than 9 and no more than 22 credits in each regular session. In the summer session, the number of registered credits can be no greater than 9. Registration will be completed only if the student has completed everything in the specified time period.

The faculty may allow registration which differs from the above criteria if necessary. However, changes must not disrupt the standard and quality of learning, while the total number of registered credits must be as specified in the curriculum

.

9.2 Re-registration or re-grading can be done in the following situations;

1. The student received F or W or U, or the committee or the person appointed by the committee agreed that the student should re-grade according to Rule 8.3(2). If it is an





elective course, a student is allowed to register for any other elective courses instead.

Or,

2. The student has to re-grade in order to improve CUM-GPA, in which case the approval of the advisor and instructor is needed.
3. The student is allowed to re-grade in each course as stated in Rules 9.2(1) and 9.2 (2), at the number of times set by the faculty, but no more than twice, except when the student has been allowed to take a leave according to Rules 15.1(2), 15.1(2), and 15.1(3).

### 9.3 Registration in more than one program

A student who wants to study in more than one program can register for courses according to Rule 9.1 for each program. Once the student completes all courses required in each program of study, the student receives a degree of that program. However, the study time must not exceed 8 academic years, counted from his/her first enrollment in the undergraduate study.

## Rule 10: Add, drop, and withdrawal

A student can request to add, drop, and withdraw from courses provided the instructors approves and the request has to be approved by the Dean or a person appointed by the Dean. Approval is given according to the following criteria;

**10.1 Adding:** Request for adding the course must be done within the second week of a regular session, counted from the session's starting date or within the first week of summer session. For the courses that are not offered at the start of that session, adding can be requested in the first week of that course counted from the time the course starts.

**10.2 Dropping:** Dropped courses will not be shown in the transcript or grade report. The course will not be counted as having been registered once if dropping is done within the second week of a regular session, counted from the session's starting date or within the first week of the summer session. For the courses that are not offered at the start of that session, dropping can be requested in the first week of that course counted from the time when the course starts.

**10.3 Withdrawal:** Course withdrawal can be done after the second week of the regular session or after the first week of the summer session, or after the first week of the courses that do not start at the start of the session, until the week before the exams are



held. Courses that are withdrawn will be shown in the transcript and grade report, and the course is counted as registered once.

Reasons must be given for either approval or disapproval by the Dean or an appointed person.

#### **Rule 11: Study time**

The student has to be present in a theoretical, lecture, practice, internship, or field study no less than 80 percent of the total study time of that course in order to be allowed to take the exam.

#### **Rule 12: Credits counting**

12.1 Credits identified as “pass” will be counted in order to complete the program of study.

Only the credits for courses that have been given a “pass” grade are to be counted towards graduation. If the student has re-graded the course; only the credits of the course last registered for will be counted if evaluated as passed, and counted only once.

12.2 All scored credits will be counted to calculate the CUM-GPA.

If a student registers for the course more than once, only the latest score will be considered and used to calculate the CUM-GPA.

#### **Rule 13: Calculating GPA**

There are 2 types of GPA; GPA per session and CUM-GPA. GPA can be calculated as follows;

13.1 **GPA per session** is calculated from the grades in that session by dividing the sum of the products of the score and the number of credits by the total number of credits in that session. GPA is rounded off to two decimal places.

13.2 **CUM-GPA** is calculated from the first session of study to the last session by dividing the sum of all the products of the score and the number of credits by the total number of credits earned under Rule 12.2. CUM-GPA is rounded off to two decimal places.

If a student has registered for a course more than once, only the latest score is used.

#### **Rule 14: Credits Transfer**

A student who changes division or faculties within the university, or transfers from another institute is allowed to request credit transfer in order to acquire the total number of credits in the



program without having to register for those courses again. The transferred courses are shown as T in the transcript and grade report. The transfer of credits or courses can be done only for a student who has been approved to take such courses by the program committee or the person appointed by the faculty committee to be responsible for the program of study from which the transfer is to be made.

#### 14.1 Credits transfer conditions

1. The standard quality of the institute from which the credits are transferred to Mahidol University must be comparable to that of Mahidol University's, and approval must be given by the program committee.
2. The course content must overlap with at least three quarters of the content of the corresponding course, or group of courses, in the university, and the courses must be approved by the program committee.
3. The transferred courses must have been registered for within the last 5 years, if not the decision is up to the program committee.
4. The transferred courses must receive at least Grade C or the equivalence.
5. Credits transfer can be made at most half of the total number of credits in that program.

14.2 In order to transfer the credits, the student has to write a letter to the Dean together with documents related to the course under consideration. Then the program committee and/or the faculty committee considers the request and gives reasons for approval. The matter is then presented to the university and/or the president for approval.

14.3 Grades of transferred courses are shown in the transcript and grade report as T and are not used to calculate the GPA or CUM-GPA.

14.4 Students with transferred courses according to Rules 14.1(1)-14.1(3) are able to receive a degree with honors complying with Rule 21.

14.5 Courses that do not follow the regulation, can still be transferred under the program committee and/or faculty committee with the university/president's approval in compliance with Rule 14.1

#### **Rule 15: Leave of Absence**

15.1 A student can request for leave of absence in the following situations;

1. Being conscripted or drafted for the army or military service.



2. Receiving grants to go abroad or on an exchange program under the university's approval.
3. Being sick or having health problems requiring more than 20 percent of class time in order to recover or to be cured as evidenced by a medical certificate endorsed by the Student Health Service of the university.
4. A student having personal reasons may ask for leave provided the student has been studying in the university for at least one session and has a CUM-GPA of at least 2.00.

Under Rule 15.1, the student has to request for leave as soon as possible to get approval from the Dean or the appointed person.

15.2 Under the force majeure, students' reasons may not come under Rule 15.1. The student must request for leave as soon as possible to get approval from the faculty committee or the person appointed by the faculty committee.

15.3 On the approval of leave of absence under Rules 15.1 and 15.2, the maximum time allowed is two regular semesters or 3 regular trimesters. If more time for leave of absence is needed, the student has to request for another leave of absence according to Rule 15.1 or 15.2.

15.4 During a leave of absence, study time is still counted: except in the case of 15.1(1) and 15.1(2) or other force majeure approved by the president.

15.5 During the leave, the student must maintain student status by paying fees according to university regulations; otherwise the student status will not be maintained.

15.6 If a student who has been approved leave wishes to return to study, the student has to request for re-admission to the Dean or the appointed person at least 1 week before the registration period.

Reasons must be given for approval or disapproval of leave of absence by the Dean or an appointed person.

#### **Rule 16: Student Status Classification**

16.1 Student status for a freshman is classified at the end of the second semester or trimester after entry. From sophomore onwards, classification is made at the end of each regular session or at the end of the academic year for the continuing program of study. For



students who request to graduate with a diploma or a bachelor's degree, classification may be done at the end of the summer session.

16.2 A student is classified normal or as under probation according to the following;

1. Normal status applies to students who are registered in the very first session or students who have CUM-GPA of at least 2.00.
2. Probation status applies to students who have CUM-GPA greater than or equal to 1.50 but less than 2.00, which can be further classified into 2 types.

**Type 1** means a group of students who have Cum-GPA of 1.50 or higher but less than 1.80.

**Type 2** means a group of students who have Cum-GPA of 1.80 or higher but less than 2.00.

#### **Rule 17: Student's level**

A student's level is classified from the total number of credits that the student has earned out of the total number of credits in the curriculum.

**Rule 18: Student status will not be maintained** according to the following conditions;

18.1 The student has completed the program of study according to the curriculum and has been approved to receive a diploma or a bachelor's degree under Rule 20.

18.2 The student has been approved from the Dean to be dismissed.

18.3 The president orders the student to be dismissed according to the following situations;

1. After classification, the student has CUM-GPA less than 1.50.
2. The student is under type 1 probation having CUM-GPA less than 1.80 and is still under probation in the next 2 semesters or the next 3 trimesters continuously or for one academic year by Rule 5.3.
3. The student is under type 2 probation having CUM-GPA less than 2.00 and is still under probation in the next 4 semesters or the next 6 trimesters continuously or 2 academic years by Rule 5.3.
4. The student registers in the same course at the maximum number of times stipulated in Rule 9.2(3) and still does not pass the course.
5. The student has used twice the time specified in the curriculum.



6. No registration or no leave of absence request has been made after the first two weeks of the session. The university cannot contact the student and the student has no appropriate reason to explain the situation.
7. The student acts against the university or joint institute regulations on students' discipline.
8. The student has difficulty with studying or working due to mental disorders. In this case, the university will appoint a committee to deliberate on the situation and make recommendations for the university council's approval.
9. The student is punished according to Rule 22.
10. Death.

#### **Rule 19: Graduation**

- 19.1 Graduation from full-time undergraduate study (4 years) can be made on or after the 6<sup>th</sup> regular semester.
- 19.2 Graduation from full-time undergraduate study (5 years) can be made on or after the 8<sup>th</sup> regular semester.
- 19.3 Graduation from full-time undergraduate study (not less than 6 years) can be made on or after the 10<sup>th</sup> regular semester.
- 19.4 Graduation for full-time undergraduate study (continuing) can be made on or after the 4<sup>th</sup> regular semester.

#### **Rule 20: Granting Diploma or Bachelor's Degree**

In order to be eligible to receive a Diploma or a Bachelor's Degree, a student has to;

- 20.1 Pass all courses and fulfill other criteria indicated in the curriculum.
- 20.2 Have CUM-GPA of at least 2.00
- 20.3 Have good behavior suitable for the prestige of the degree.

#### **Rule 21: Degree with Honors**

A student who has studied in an undergraduate program in the university with at least 120 credits including transferred courses, is eligible to receive a degree





with honors. However, transferred courses require at least Grade B (or equivalent) and are not used to calculate the CUM-GPA. In order to receive Class 1 honors, the student must have a CUM-GPA of 3.50 or above, while a Class 2 honors student must have a CUM-GPA of 3.25 or above, also a student must;

21.1 Not used time that exceeds that which is indicated in the curriculum.

21.2 Be eligible to receive a degree according to Rule 20.

21.3 Never have re-graded or re-registered in other courses or re-taken an exam or re-done a report or project in any course in the curriculum including the transferred courses.

21.4 If the student has transferred some credits, the sum of the transferred credits should not exceed one quarter of the total number of credits in the curriculum.

#### **Rule 22: Dishonesty Punishments**

Cheating during the exam is punished as follows;

22.1 Given F on the course in which cheating is committed.

22.2 Given F on the course in which cheating is committed, and be suspended in the next session for at least one session.

22.3 Given F to all courses registered in that session.

22.4 Given F to all courses registered in that session and be suspended in the next session for at least one session.

22.5 Be dismissed.

The president has the right to dismiss a student who has cheated in the exam, and that student cannot be re-admitted to study at Mahidol University.

**Rule 23:** Any act that is not included in this regulation, regulations of other universities or faculties that conforms to this regulation may be adopted.

**Rule 24:** The president is in charge of these regulations. In case of any problems concerning these regulations, the president has the power to make diagnostic interpretation and issue a command as he deems appropriate.



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

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Announced on 27<sup>th</sup> April, 2009

(Professor Dr. Vicharn Panich, M.D.)

Chairman of Mahidol University Council





## **Mahidol University Regulations on Diploma and Undergraduate Studies (2<sup>nd</sup> Issue), B.E. 2556 (2013)**

Whereas it is deemed as appropriate to modify the Mahidol University Regulations on Diploma and Undergraduate Studies B.E. 2552 (2009).

Mahidol University Council, under Section 24 (2) of Mahidol University Act B.E.2550 (2007), agreed to enact the following regulations in its 478<sup>th</sup> meeting held on 20<sup>th</sup> November 2013.

1. These regulations are referred to as “Mahidol University Regulations on Diploma and Undergraduate Studies (2<sup>nd</sup> Issue), B.E. 2556 (2013).”
2. These regulations shall become effective after the promulgation date and henceforth.
3. The statement, hereby called Number 4 of Mahidol University Regulations on Diploma and Undergraduate Studies, 2009 shall be cancelled, and the following statement shall be applied.  
“4. Each faculty committee shall consider admitting applicants into their programs in accordance with conditions and procedures stated in the curriculum or in the faculty announcements approved by the President of Mahidol University. The university shall determine the types of opening for undergraduate students which will be in the university announcement.”
4. The statement, hereby called Number 18.3 (6) of Mahidol University Regulations on Diploma and Undergraduate Studies, B.E. 2552 (2009) shall be cancelled, and the following statement shall be applied.  
“18.3 The President shall expel a student in the following cases:  
(6) within 2 weeks of registration, the student not registering for regular semester, not registering to retain student status, or not being approved for postponing the registration.
5. The following statement shall be added as Number 18/1 to Mahidol University Regulations on Diploma and Undergraduate Studies, B.E. 2552 (2009):

### “18/1 Student status reinstatement

18/1.1 The student whose status ends due to Number 18.3 (6) may request reinstatement of student status by presenting the request form for reinstatement of student status to the President within 1 year after the expulsion.

18/1.2 Reinstatement of student status must be approved by the President following the consent of the Chairperson of the Program, the Dean, and Vice President for Education respectively.

18/1.3 After approval by the President, the student can earn student status and return to study regularly in the following semester.

18/1.4 The duration of the study absence will be included in the duration of the program’s maximum study period.



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

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18.1.5 The student must pay the fee for the reinstatement of student status as well as the fees incurred during the period of the study absence.

18/1.6 After the return of student status is approved, the student will have his/her regular status as before. However, the computation of the study duration will be made according to Number 7.”

Announced on 16<sup>th</sup> December, 2013

(Professor Dr. Vicharn Panich)

Chairman of Mahidol University Council



**Mahidol University Regulations  
on Diploma and Undergraduate Studies (3<sup>rd</sup> Issue), B.E. 2558 (2015)**

Whereas it is deemed as appropriate to modify Mahidol University Regulations on the Bachelor's Degrees and the Diploma/Certificate Program B.E. 2552 (2009) and the additionally modified (2<sup>nd</sup> Issue) B.E. 2556 (2013).

Mahidol University Council, under Section 24 (2) of Mahidol University Act B.E. 2550 (2007), agreed to enact the following regulations in its 495<sup>th</sup> meeting on 22<sup>nd</sup> April, 2015.

1. These regulations are referred to as “Mahidol University Regulations on Diploma and Undergraduate Studies (3<sup>rd</sup> Issue), B.E. 2558 (2015).”
2. These regulations shall become effective from the promulgation date and henceforth.
3. The following statement, hereby called Number 23/1, is to be added to Mahidol University Regulations on on Diploma and Undergraduate Studies, B.E. 2552 (2009) and additionally modified (2<sup>nd</sup> Issue) B.E. 2556 (2013).

“Number 23/1: The University Council has the authority to consider cases for exemptions of the regulations provided that the cases have gained approvals from no less than a quarter of the council members presented in the meeting.”

Announced on 20th May, 2015

(Professor Dr. Vicharn Panich

Chairman of Mahidol University Council



## **Mahidol University Regulations on Diploma and Undergraduate Studies (Issue 4), 2015**

Mahidol University Regulations on Diploma and Undergraduate Studies was under consideration for improvement, and thus Mahidol University Council, under Section 24(2) of Mahidol University Act B.E.2550 (2007), agreed to enact the following regulations in its 500<sup>th</sup> meeting on 16<sup>th</sup> September 2015.

1. These regulations are referred to as “Mahidol University Regulations on Diploma and Undergraduate Studies (Issue 4), 2015.”

2. These regulations shall be effective from academic year of 2015 and henceforth.

3. The definitions of a “faculty” and a “faculty committee” stated in number 3 of Mahidol University Regulations on Diploma and Undergraduate Studies 2009 shall be cancelled, and the following statements shall be applied:

A “working unit” refers to a faculty, a college, an institute, a graduate school, and other working units, called by other terms that are responsible for teaching and are an equivalent to a faculty; this includes a campus with a curriculum/curricular complying with the university’s regulations.

A “working unit committee” is a term that covers other working unit committees or working units that are called by other terms and are responsible for teaching.

4. The statement in number 8.4 of Mahidol University Regulations on Diploma and Undergraduate Studies 2009 shall be cancelled, and the following statements shall be applied:

“8.4 An “F” grade shall be given to students with the following circumstances:

(1) students who have attended the examination and/or failed the examination or failed in an evaluation of their work

(2) students who have missed the examination despite not being allowed to by the faculty committee or the person authorized by the faculty

(3) students who have not been allowed to take the examination as stated in number 11

(4) students who have violated examination rules, such as showing up later than the indicated time, not following the dress code, or having performed an action as stated in number 22 and therefore it has been decided to fail them in the examination

(5) students who have received an “I” and have not proceeded with the examination or the assigned work after receiving an “I” within one normal academic year of the semester or the trimester system, except for those who have been allowed to drop the semester as stated in numbers 15.1 and 15.2

(6) students who have received a “P” and have not taken the examination and/or submitted the assigned work

(7) students who have not taken the re-examination or have not re-submitted the assigned work as stated in number 8.3 (2); or students who have taken the re-examination or re-submitted the work but still have failed the evaluation

(8) students who lack the qualifications for the subject’s evaluation as stated by the “working unit committee”



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

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5. The statement in number 22 of Mahidol University Regulations on Diploma and Undergraduate Studies 2009 shall be cancelled, and the following statements shall be applied:

“22. Students who have cheated in the subject’s examination shall get an “F” for that particular subject, and disciplinary actions shall be taken against each student according to the Mahidol University Regulations on Student Disciplines”.

6. If the terms “faculty” and “the faculty committee” are used in the Mahidol University Regulations on Diploma and Undergraduate Studies 2009, they shall refer to a “working unit” and a “working unit committee” as stated in this announcement.

Announced on 15<sup>th</sup> October 2015

(Professor Dr. Vicharn Panich)

Chairman of Mahidol University Council



## **Mahidol University Regulations on Diploma and Undergraduate Studies (Issue 5), 2016**

Mahidol University Regulations on Undergraduate Studies were under consideration for improvement, and thus Mahidol University Council, under Section 24(2) of Mahidol University Act 2007, agreed to enact the following regulations in its 507<sup>th</sup> meeting on 20<sup>th</sup> April 2016.

1. These regulations are referred to as “Mahidol University Regulations on Diploma and Undergraduate Studies (Issue 5), 2016.”

2. These regulations shall be effective from the next day after the announcement.

3. The following statement shall be added as number 19/1 in the Mahidol University Regulations on Diploma and Undergraduate Studies 2009:

“19/1 English Proficiency Tests

Undergraduate students shall pass English proficiency test(s) according to the university’s conditions and regulations”

4. The following statement shall be added as number 20.4 in the Mahidol University Regulations on Diploma and Undergraduate Studies 2009:

“20.4 Students are able to pass the English proficiency test according to the university’s announcement.”

Announced on 30<sup>th</sup> May 2016

(Professor Dr. Vicharn Panich)

Chairman of Mahidol University Council



## Mahidol University Regulations

### on Diploma and Undergraduate Studies (Issue 6), 2017

Mahidol University Regulations for Diploma and Undergraduate Studies have been under consideration for improvement, and thus the Mahidol University Council, under section 24(2) of the Mahidol University Act of B.E. 2550 (2007), agreed to enact the following regulations in its 517<sup>th</sup> meeting on 15th February 2017.

1. These regulations are referred to as “Mahidol University Regulations for Diploma and Undergraduate Studies (Issue 6), 2017”.
2. These regulations shall be effective from the announcement date and henceforth.
3. Statement number 14 of the Mahidol University Regulations for Diploma and Undergraduate Studies 2009 shall be cancelled, and the following statements shall be applied:

“14 Credit Transfer

Students who wish to transfer credits from their subjects or their working units (within Mahidol University or from other higher education institutes) may request to transfer credits up to the number of credits that they are required to take to complete their program, without having to enrol in subjects in the program, and the results will be shown as “T”. The transfer can be made only after the students have obtained permission to do so, or for students who have been approved to enrol in subjects in other higher education institutes. Such conduct must be agreed by the lecturers responsible for the program, the working unit committee, or the program committee. The credit transfer must follow the following rules:

#### 14.1 Conditions for credit transfer

(1) The credit(s) to be transferred must be of subject(s) in other higher education institutes in Thailand or overseas with a higher or equivalent standard to Mahidol University, and they must have been approved by the program committee.

(2) The credit(s) to be transferred must be of subject(s) that provide at least a three-quarter similarity or equivalent content and learning experiences to students compared to subjects in the program, and this must have been approved by the program committee.



(3) The credit(s) to be transferred must be from subject(s) which the student has been enrolled in within 5 years. If not, the program committee and the working unit committee will consider the matter.

(4) The grade(s) of the credited subject(s) to be transferred must be at least a C.

(5) Students can transfer no more than half of the total number of credits in the program.

14.2 Students who wish to transfer their credits must send evidence regarding those subjects and a letter to the working unit. The head of the working unit, agreed by the relevant department and program committee and/or the working unit committee, is responsible for the credit transfer consideration and will present their findings to the Mahidol University President for approval.

14.3 The transferred credit(s) will be shown in the student's transcript under the name of the subject(s) transferred, marked with "T", and their scores will not be included in the GPA.

14.4 Students who have their credit transferred as stated in number 14.1 (1) – (3) can still obtain a bachelor's degree according to the Mahidol University Regulations for Diploma and Undergraduate Studies.

14.5 Credit transfer can be done under student exchange and student mobility projects between Mahidol University and other higher education institutes in a program or in an MOU, as detailed below:

(1) Bilingual programs that cooperate with overseas higher education institutes – Students will graduate with two bachelor's degrees, one from Mahidol University and another from the overseas institute;

(2) Double or multiple degree programs that cooperate with overseas higher education institutes – Students will graduate with two bachelor's degrees, one from Mahidol University and another from the overseas institute that cooperates in teaching in the program;

(3) Joint degree programs which are programs that cooperate in teaching with overseas institutes – Students will graduate with one bachelor's degree;

(4) Distance education programs with reliable planning, teaching methods, teaching services, and quality assessments; or





(5) MOU between Mahidol University and overseas higher education institutes.

Concerning credit transfer in the cases of numbers 14.5 (1) - (5), students can obtain results for transferred credits as grades and they can be included in the GPA and be recorded on their transcripts. The head of the working unit, agreed by the relevant department and program committee and/or the working unit committee, is responsible for the matter consideration and present it to Mahidol University President for approval.

14.6 Any case of credit transfer other than those described in these regulations shall be considered by the head of the working unit, agreed upon by the relevant department and program committee and/or the working unit committee, and he or she will be responsible for presenting it to the Mahidol University President for approval.”

4. The credit transfer that has been made in MOU programs between Mahidol University and other overseas higher education institutes before the inauguration of these regulations shall follow number 14.5 in this announcement.

Announced on 1st March 2017

Prof. Emeritus Kasem Watanachai

Chairman of the Mahidol University Council



**Mahidol University Regulations  
on Diploma and Undergraduate Studies (Issue 7) 2017  
(B.E. 2560)**

Mahidol University Regulations on Diploma and Undergraduate Studies have been under consideration for improvement.

Thus, Mahidol University Council, under the Article 24 (2) of the Mahidol University Act B.E. 2550 (2007), agreed to enact the following regulations in its 525<sup>th</sup> meeting on October 18, 2017.

1. These regulations are referred to as “Mahidol University Regulations on Diploma and Undergraduate Studies (Issue 7) 2017 (B.E. 2560).”

2. These regulations shall be effective from the day after the announcement date and henceforth.

3. The statement in Clause 8.2 of Mahidol University Regulations on Diploma and Undergraduate Studies 2009 (B.E. 2552) shall be cancelled, and the following statements shall be applied:

“8.2 The symbols without grades

The outcome of the study for each course may be in the forms of certain symbols with the meaning as follows:

<u>Symbols</u>	<u>Meaning</u>
AU	Audit
O	Outstanding
S	Satisfactory
T	Transfer of Credit
U	Unsatisfactory
I	Incomplete
P	In progress
X	No report
W	Withdrawal”

4. The following clause shall be added as (3) of Clause 8.3 of Mahidol University Regulations on Diploma and Undergraduate Studies B.E. 2552 (2009):

“(3) The symbol O in each course signifies outstanding knowledge, ability, and skills or knowledge, ability, and skills that are above the normal criteria used for the assessment of each course.”

Announced on 28 November, 2017

Professor Emeritus Kraisit Tantisirin  
Vice Chairman of Mahidol University Council  
Acting Chairman of Mahidol University Council



## **Mahidol University Regulation on Diploma and Undergraduate Studies (8th issue) B.E. 2561**

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Mahidol University Regulation on Diploma and Undergraduate Studies has been deemed appropriate for a revision.

As empowered by the virtue of the Article 24 (2) of the Mahidol University Act B.E. 2550, Mahidol University Council, in the 531st meeting on April 18, 2018, announced the following statements.

1. This regulation is referred to as “Mahidol University Regulation on Diploma and Undergraduate Studies (8th issue) B.E. 2561.”

2. This regulation shall be enforced on the announcement date and henceforth.

3. The following statements shall be added as Clause 4/1 in Mahidol University Regulation on Diploma and Undergraduate Studies B.E. 2552.

“4/1 All students shall be supervised by appointed advisors who facilitates their educational planning according to their study plan. The Head of each work unit shall appoint instructors in all programs as advisors for all students of all years as stated in the first paragraph.

The advisors should meet their advisees according to the program's requirements, and the advisors should set certain dates and time when their advisees can meet. All work units shall evaluate the advisors' work every semester. The advisors shall be responsible for the following.

4/1.1 Giving advice and help their advisees plan their study that complies with the program's requirements.

4/1.2 Giving advice about rules, regulations, and announcements in their study.

4/1.3 Giving advice about course registration, adding, dropping, and withdrawing and about their credits in each semester.

4/1.4 Giving advice about their studying and follow up on their study results.

4/1.5 Giving advice about how to process all matters in accordance with the University's rules and regulations.

4/1.6 Giving advice about their advisees' university life and education.

4/1.7 Making sure their advisees' behaviors are appropriate in accordance with the University's rules and regulations.

4/1.8 Reporting their consultation to the Head of the work unit every semester.

4/1.9 Being responsible for other assigned tasks.”

Announced on May 21, 2018

(Signature)

(Emeritus Professor Kraissid Tontisirin, MD., PhD)  
Vice President of Mahidol University Council  
and Acting President of Mahidol University Council



## Mahidol University Announcement

### on English Competence Standards for Undergraduate Students of Mahidol University 2017 (B.E. 2560)

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Mahidol University agrees to set the English competence standards for undergraduate students of Mahidol University to be in accordance with the Announcement of the Office of Higher Education Commission Thailand on the Policy of the Improvement of the Standard of English Competency dated April 12, 2016, stating that institutions of higher education shall establish the policy and objectives to improve the standard of English ability in every program and every level of education of higher education institutions in order to serve as guideline for developing the English skills and abilities of undergraduate students and enable them to become graduates who have knowledge and abilities both in terms of academic, professional, and English communication skills, as well as to develop a plan to achieve the goals set in the policy, with the objectives and their indicators, as well as a clear system of evaluation.

As empowered by the virtue of the Article 19/1 of Mahidol University Regulations on Diploma and Undergraduate Studies (Issue 5) 2016 (B.E. 2559), in correspondence with the resolution of the 15/2017 meeting of Mahidol University Committee Board on 23 August, 2017, the President of Mahidol University issued This Announcement as follows:

1. The following announcements shall be cancelled

(1) Mahidol University Announcement on English Competence Standards for Undergraduate Students of Mahidol University 2017 (B.E. 2560), dated September 7, 2017

(2) Mahidol University Announcement on English Competence Standards for Undergraduate Students of Mahidol University 2017 (B.E. 2560), dated October 25, 2017

2. All undergraduate students of Mahidol University must meet the standard of English competency equivalent to the average English competency of students based on the Common European Framework of Reference for Languages (CEFR), and in accordance with the National Education Plan B.E. 2560-2574 issued by the Ministry of Education as follows:

2.1 an MU-ELT score of 84 and higher, or



2.2 a TOEIC score of 600 and higher, or

2.3 a TOEFL IBT score of 64 and higher, or

2.4 an IELTS score of 5.0 and higher

3. The MU-ELT test will be held by Mahidol University every semester.

4. Students can take an English competency test every semester prior to graduation and they have to submit the score according to Article number 2 of this announcement within two years after being accepted as an undergraduate student of Mahidol University, so that they can have opportunities to improve their English competency to meet the criteria set by the university before graduation.

5. The test fee for MU-ELT is 400 baht per test.

6. Undergraduate students must pass the criteria set for the English competency prior to their graduation. This is considered one of the requirements for the approval of an undergraduate degree as stated in Article number 20.4 of Mahidol University Regulations on Diploma and Undergraduate Studies (Issue 5) B.E 2559 (2016).

7. The President of Mahidol University is in position of authority over this Announcement. In case of any dispute, the judgment of the President shall be final.

This shall be effective for undergraduate students who enroll in Mahidol University from the academic year 2017 onwards.

Announced on 10 November, 2017

Prof. Banchong Mahaisavariya, M.D

Acting President of Mahidol University



## **Mahidol University**

### **Disciplinary Measures 2010**

To minimize constraints to study within the Mahidol University community, students are protected and bound by a set of social rules. These rules or codes of conduct provide a framework within which students' rights and freedoms can be exercised.

Mandated by Article 24 (2) of the Mahidol University Act, 2007, the 442<sup>nd</sup> meeting of Mahidol University Council on September 15, 2010 enacted the following measures.

1. These measures are hereby called the "Mahidol University Disciplinary Measures 2010".
2. These measures will be activated on the day of the announcement.
3. They override Mahidol University Disciplinary Measures 2004.
4. With regard to these measures,

*"University"* denotes Mahidol University.

*"President"* denotes President of Mahidol University.

*"Department"* denotes Faculty, College, Institute, Faculty of Graduate Studies, and also any provincial campus using the university curriculum.

*"Chair"* denotes Dean, Director of an institute, and also a Vice President who supervises a provincial campus under the university curriculum.

*"Staff"* denotes civil servants, employees, and university officials at Mahidol University who possess work permits.

*"Student"* denotes certificated, undergraduate and graduate students.

## **Chapter 1**

### **Codes of Conduct**

5. Students must maintain discipline and ethical values. They should abide by any university/department announcements and follow the measures outlined.

6. Students must uphold unity, peace, and the reputation of the university. They should not instigate or participate in any quarrels, physical assaults, or damage to university or the other property.





**7. Students must behave themselves. They must abstain from behavior that could demean themselves, others, or the reputation of the university.**

**8. Students must listen to instructions and warnings from instructors and staff and act accordingly.**

**9. Students must dress appropriately. They must conform to the dress code of their department. Upon entering a class, an examination, or a department within the university, students must make their identification cards available in case any instructor or staff needs to see them.**

**10. Students must not drink alcohol or use drugs (or any prohibited substance) while they are in the university (including the provincial campuses) or while they are wearing their university uniform.**

**11. Students who engage in the following misconduct will be subject to serious disciplinary violation:**

- (1) Gamble or take part in gambling businesses, or support thereof
- (2) Use, possess, or sell illegal drugs
- (3) Steal, extort, cheat, embezzle, threaten, force, or rob the other or engage in corruption for financial gain
- (4) Possess or carry weapons or toxic substances that may endanger the lives or properties of others
- (5) Perform immoral or inappropriate sexual or public behavior that could affect the reputation of the university
- (6) Quarrel or cause physical harm that ensues a severe injury or death or an adverse effect on the university's reputation
- (7) Commit a crime with the final court decision of imprisonment, except for mistakes made by carelessness
- (8) Intentionally cheat in an exam or make an effort to take part in an exam dishonesty
- (9) Produce, circulate, or possess media, publications, drawings, or writings or act in other ways to defile the other or the university
- (10) Forge a signature, fake a document, or change details in the original document, or file a document that has been adjusted to the university or the other entities that could result in damage to the university or the other
- (11) Willingly ruin university properties or those belonging to other
- (12) Act in a manner that the President determines as violating the codes of conduct

**12. Students who carry out any of the misconducts listed above will be subject to disciplinary punishment. For minor misdemeanors, the departmental chair may omit punishment and instead give the student verbal warning.**

**13. There are six (6) main types of disciplinary punishment.**

- (1) Verbal warnings
- (2) Written warnings
- (3) Dismissal from examination



- (4) Cancel, reconsider, or suspend the student's candidacy for a degree or a diploma
- (5) Withdraw for study up to one academic year
- (6) Dismiss the student from the university

14. Students who are considered as not severely violating the codes of conduct will be on the condition of written promise to behave appropriately. Verbal warnings of misconduct will be administered in cases where the violation is minor or there is a good reason for applying a reduced form of punishment.

15. Students who severely violate the codes of conduct will be subject to dismissal from an examination, degree cancellation, degree reconsideration, suspension of degree, withdrawal for up to one academic year, or dismissal from the university.

16. The departmental chair has the right to make departmental announcements regarding disciplinary measures - as long as the announcements are consistent with, and supplementary to, these existing measures and that they notify the university of their announcements.

## Chapter 2

### Disciplinary Proceeding

17. For cases with sufficient evidence, investigations and disciplinary punishments will be conducted promptly and fairly.

18. The investigation of the accused student will be performed by the Jury Council as appointed by the President or the departmental chair. This step can be skipped for the cases already settled as follows:

- (1) The court makes a judgment on the case, resulting in imprisonment or heavier penalties, except for minor misdemeanors, such as those caused by carelessness.
- (2) The student who conducted a wrongdoing confessed in person or in writing to the departmental chair or the Jury Council and the confession was recorded in writing.

19. The Jury Council in item 18 consists of at least 3 people including a President, a Secretary, and Jury(s). An investigation is carried out as early as possible and within 60 days from the date of the Jury Council appointment. If the investigation cannot be finished within the time period, the Jury Council can submit to the authority who appointed them for a maximum extension of 30 days for each submission.

20. The Jury Council must notify the accused person of his or her charges with the available supportive evidence. The name(s) of the witness(es) may or may not be disclosed. This information will allow the accused person to bring to the jury his or her witness(es) and testimonies prior to judgment decision.

21. For minor cases, the departmental chair may give verbal warnings or in writing as they consider appropriate, then notify the university of the incident as soon as possible.





22. For severe cases, departmental chair will report the causes and investigation results to the President for a decision regarding punishment. Depending on severity of the case, they will then proceed to dismiss the student's right of taking an exam, cancel, reconsider, or suspend their degree, or withdraw the student for a maximum of one (1) academic year, or dismiss the student from the university. Withdrawal from the university that the President may order a departmental chair to carry out on his behalf shall be for a maximum of one (1) semester.

23. Disciplinary punishments must be carried out following a formal letter of order. The authority must also provide information about making an appeal and the length of time allowed for this. Depending on the case, once punishment is delivered, the student's parent or guardian, adviser, and the university will be notified.

### **Chapter 3**

#### **Appeal**

24. If a student is subject to a disciplinary punishment and does not accept it, the student has the right to appeal according to the procedures outlined here. During the appeal process, the student will still be subject to punishment.

25. The student who makes an appeal must file a signed formal document. Each individual can only appeal for themselves. A student cannot make an appeal on behalf of another student.

26. To support an appeal, the student can ask to check or make a copy of the past investigation record. The record of witness investigations and other documents may or may not be disclosed depending on judgment of the departmental chair or the Jury Council.

27. The Appeal Committee comprises of 5 to 7 people, one of which must be a paralegal professional or a law graduate appointed by the President with a specified operation period.

28. The Appeal Committee will perform the following tasks;

- (1) Analyze the appealed matter;
- (2) Make a written request for additional documents or visits from a person involved in the case as considered necessary;
- (3) Appoint a person or a group of people to make a consideration or to operate on a duty within the committee scope; and
- (4) Carry out other responsibilities designated by the university.

29. An appeal must be made to the Appeal Committee within fifty (50) working days starting from the first day that the accused student knows or should know about his or her punishment.

30. An appeal must be made directly to the Appeal Committee. The Committee must finish working on a case within thirty (30) days beginning from the day of the appeal being filed. The length of time for a case consideration may be extended no longer than sixty (60) days from the last of the given thirty (30) days. Written reports and records of the appeal must be made.

31. The Appeal Committee may render the punishment either appropriate or unjust. The Committee will then make a proposal to the President to either immediately dismiss the appealed case, increase, or reduce the punishment. The first deliberation of the Appeal Committee is final. The Committee must immediately pass the deliberation onto the student who made the appeal.



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

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**32. To count the exact number of days for these measures, if the end of the period takes place on the weekend, the next working day will be considered as the end.**

**34. The President acknowledges these measures. When any problem arises regarding compliance with these measures, the President has the power to order an action and his word is final.**

## **Chapter 4**

### **Provisional Clauses**

**35. Any disciplinary proceedings or appeals that took place prior to the enactment of these measures shall comply with Mahidol University Disciplinary Measures 2004.**

**36. Until new appointments are made, the appointed body for the Mahidol University Disciplinary Measures 2004 will continue to act in its duty and in compliance with the details in Mahidol University Disciplinary Measures 2010.**

**Announced on October 8, 2010**

**Prof. Wijarn Panich, M.D.  
Chairman of Mahidol University Council**



Faculty of Science, Mahidol University Announcement

Subject:

Undergraduate Education B.E. 2553 (2010)

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Whereas it is deemed appropriate to define the criteria of undergraduate education to comply with the Mahidol University Regulation on Undergraduate and Diploma Education B.E. 2552 (2009).

Under the provisions of the Mahidol University Regulations on Diploma and Undergraduate Education B.E. 2552 (2009), the Dean of Faculty of Science, by the agreement of the Faculty Committee in its 4/2553 meeting on 7<sup>th</sup> April 2010, the criteria for undergraduate education has been stipulated as follows:

1. The following regulations and announcements shall be repealed:

1.1 Faculty of Science, Mahidol University Regulations on Education Assessment B.E. 2543 (), Dated 12<sup>th</sup> May B.E. 2543 (2000)

1.2 Faculty of Science, Mahidol University Regulations on Education Assessment (No. 2) B.E. 2545, Dated 9 January B.E. 2545 (2002)

1.3 Faculty of Science, Mahidol University Announcement, Subject: Criteria and Procedures of Re-examination for Undergraduate Students B.E. 2547, Dated 20<sup>th</sup> May B.E. 2547 (2004)

1.4 Faculty of Science, Mahidol University Announcement, Subject: Criteria and Procedures of Re-examination for Undergraduate Students B.E. 2547 (Addendum), Dated 15<sup>th</sup> March B.E. 2550 (2007)

2. In this announcement,

“Faculty” means the Faculty of Science, Mahidol University.

“Dean” means the Dean of Faculty of Science, Mahidol University

“Students” means the undergraduate students of Faculty of Science, Mahidol University, and students enrolled in the subjects provided by the Faculty of Science, Mahidol University.

3. First and Second Semesters are normal mandatory semesters, and students must register their subjects and credits as required by the Faculty of Science, which required at least 9 credits and no more than 23 credits for each normal semester.

4. For subjects with prerequisite(s), the students must be evaluated as “pass” in the prerequisite subjects(s) before they can register for the subject. Except when the requisite and the subject are offered in the same year.

5. Students cannot take 2 subjects which are offered at the same date and time.



6. To evaluate students in more detail, the (+) mark was employed, meaning there will be B+, C+, and D+. The required score and the meaning of the mark would follow the regulations stipulated by the university.

7. The A, B+, B, C+, C, D+, D, S, T, and AU are evaluated as “pass”, while F and U are evaluated as “not pass”.

8. In cases where the student has to be absent with a cause, the student must submit the examination rescheduling before the exam or within 3 days after the exam to the Educational Affair Division and the penalty of 30% score. Rescheduling without penalty require the consideration of the committee of no less than 3 persons which include the executive of the Educational Affair Division and lecturers of the department.

9. Summer is not a mandatory semester. The Faculty of Science will not offer classes during summer semester, EXCEPT for subjects in which the students received F grade in the first or second semester or have more than 15 accumulated students with the F grade. For subjects with less than 15 accumulated students, the respective department shall arrange a re-examination of the subject(s) during the summer semester, and no course(s) will be offered during the summer semester.

10. If other condition applies, the offer of summer subject(s) shall be considered by the Deputy Dean for Education.

11. Students eligible to register in summer semester include:

11.1 Students with the mark F in the subject offered during the summer semester or

11.2 Students with GPA lower than 2.00 or

11.3 Students approved by the department responsible for the subject offered.

Students must not have been evaluated as Dismissed or prone to being dismissed. In cases that the student has already registered for the subject, but the GPA fell into Dismissed classification, the registration shall be considered void.

12. Students eligible to register for the re-examination include students who had received the F mark in the subject(s) which are open for re-examination in the same year as the opened subject(s).

Students must not have been evaluated as Dismissed or prone to being dismissed. In cases that the student has already registered for the subject, but the GPA fell into Dismissed classification, the registration shall be considered void.

13. Classes in summer semester last for 6 weeks, with the final examination on the 7<sup>th</sup> week, and the evaluation completed in the 8<sup>th</sup> week. The maximum credits for the summer semester is 9 credits, and the subjects can be withdrawn within 4 weeks after the class started.

14. The re-examination of the subjects in either the first or the second semester will be held at least 4 weeks after the announcement of the second semester's final results. This is to allow the students to prepare for the examination and submit the re-examination request. The latest grades of the students must also be submitted to the Educational Affair Division within 8 weeks after the announcement of the final examination results, and no re-examination is permitted beyond the given time.



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

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15. The re-examination grade can only be D or F. Except the re-examination of 2<sup>nd</sup> or 3<sup>rd</sup> year students of the Faculty of Medicine Ramathibodi Hospital, Bangkok Medical College and Vajira Hospital, Maharat Nakhon Ratchasima Hospital Medical Education Center, Sawanpracharak Hospital Medical Education Center, and Maharaj Nakhonsithammarat Hospital Medical Education Center, which the re-examination grade can be D+, D, or F.

16. The Dean of Faculty of Science shall ensure the announcement is followed. Should any problem arise following this announcement, the Dean of Faculty of Science shall rule, consider, and make decision as deemed appropriate.

The announcement shall be in effect from 1 June B.E. 2553 (2010).

Announcement made on 11 May B.E. 2553 (2010)

(Prof. Dr. Skorn Mongkolsuk)  
Dean  
Faculty of Science  
Mahidol University



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

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Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

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## Appendix 8

Order of Curriculum Development Committee  
or Curriculum Screening Procedure Committee or Person In-charge

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Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

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Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program)

Department of Mathematics



มหาวิทยาลัยราชภัฏสกลนคร  
 00384  
 24 มี.ค. 2562  
 11.17 น.

คำสั่งคณะวิทยาศาสตร์ มหาวิทยาลัยมหิดล

ที่ ๐๕๒/ ๒๕๖๒

เรื่อง แต่งตั้งคณะกรรมการพัฒนาหลักสูตรระดับปริญญาตรี  
 สาขาวิชาคณิตศาสตร์อุตสาหกรรมและวิทยาการข้อมูล (หลักสูตรนานาชาติ)  
 หลักสูตรปรับปรุง ปีการศึกษา ๒๕๖๒

เพื่อให้การดำเนินการพัฒนาหลักสูตรวิทยาศาสตรบัณฑิต สาขาวิชาคณิตศาสตร์อุตสาหกรรมและวิทยาการข้อมูล (หลักสูตรนานาชาติ) หลักสูตรปรับปรุง ปีการศึกษา ๒๕๖๒ เป็นไปด้วยความเรียบร้อยและมีประสิทธิภาพ อาศัยอำนาจตามความในมาตรา ๓๗ แห่งพระราชบัญญัติมหาวิทยาลัยมหิดล พ.ศ. ๒๕๕๐ คณะบดีจึงยกเลิคำสั่งคณะวิทยาศาสตร์ มหาวิทยาลัยมหิดล ที่ ๙๑๒/๒๕๖๑ เรื่อง แต่งตั้งคณะกรรมการพัฒนาหลักสูตรระดับปริญญาตรี สาขาวิชาคณิตศาสตร์อุตสาหกรรมและวิทยาการข้อมูล (หลักสูตรนานาชาติ) หลักสูตรปรับปรุง ปีการศึกษา ๒๕๖๒ และให้แต่งตั้งคณะกรรมการพัฒนาหลักสูตรวิทยาศาสตรบัณฑิต สาขาวิชาคณิตศาสตร์อุตสาหกรรมและวิทยาการข้อมูล (หลักสูตรนานาชาติ) หลักสูตรปรับปรุง ปีการศึกษา ๒๕๖๒ ดังรายนามต่อไปนี้

- |   |                      |
|---|----------------------|
| ๑. อาจารย์มิโชค ชูดวง                     | ประธานกรรมการ        |
| ๒. ผู้ช่วยศาสตราจารย์ทรงคุณวุฒิ คำนึ่งกิจ | กรรมการผู้ทรงคุณวุฒิ |
| ๓. คุณกมลวิทย์ สุขสุเมธ                   | กรรมการผู้ทรงคุณวุฒิ |
| ๔. อาจารย์ยวสิน ผดุงเวช                   | กรรมการ              |
| ๕. อาจารย์ยวสกร แลสันกลาง                 | กรรมการ              |
| ๖. อาจารย์อุมาพร นันทาปลุก                | กรรมการ              |
| ๗. อาจารย์ณัฐณรงค์ ขจรศักดิ์สุเมธ         | กรรมการและเลขานุการ  |

หน้าที่

๑. ดำเนินการพัฒนากลยุทธ์ให้แล้วเสร็จตามกำหนด โดยจัดทำรายละเอียดของหลักสูตร รายละเอียดของรายวิชา และรายละเอียดของประสบการณ์ภาคสนาม (ถ้ามี) ให้ชัดเจนตามกรอบมาตรฐานคุณวุฒิระดับอุดมศึกษาแห่งชาติและนโยบายของมหาวิทยาลัย
๒. กำหนดการประกันคุณภาพภายในของหลักสูตร เช่น กำหนดตัวบ่งชี้และเกณฑ์การประเมินผลการดำเนินงาน ฯลฯ
๓. ประสานงานกับงานการศึกษา และกองบริหารการศึกษา เพื่อขอความเห็นชอบจากคณะกรรมการที่เกี่ยวข้อง ตามขั้นตอนการพิจารณาหลักสูตร

ทั้งนี้ ตั้งแต่บัดนี้เป็นต้นไป โดยสิ้นสุดภาระหน้าที่เมื่อสภามหาวิทยาลัยอนุมัติการพัฒนากลยุทธ์

เขียน ☐ ผู้ปฏิบัติงานภาควิชา  
☒ ประธานหลักสูตร IM/คุณสมภารณ์  
☐ เวียน e-mail กว.ทมทว.๕๐.  
☐ แฟ้มเวียน

สั่ง ณ วันที่ ๒๗ มกราคม พ.ศ. ๒๕๖๒

(รองศาสตราจารย์ ดร.สิทธิวัฒน์ เลิศศิริ)

คณบดีคณะวิทยาศาสตร์

ผู้ช่วยศาสตราจารย์วรรณิกา แสงทอง

หัวหน้าภาควิชาคณิตศาสตร์

24 มี.ค. 2562



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics



คำสั่งคณะวิทยาศาสตร์ มหาวิทยาลัยมหิดล

ที่ ๙๘๓ / ๒๕๖๑

เรื่อง แต่งตั้งคณะกรรมการพิจารณากลับกรองหลักสูตรวิทยาศาสตร์บัณฑิต

ด้วยมีกรรมการบางท่านแจ้งความประสงค์ขอลาออกจากการเป็นคณะกรรมการพิจารณากลับกรองหลักสูตรวิทยาศาสตร์บัณฑิต อาศัยอำนาจตามความในมาตรา ๓๗ แห่งพระราชบัญญัติมหาวิทยาลัยมหิดล พ.ศ. ๒๕๕๐ คณะบดีจึงยกเลิกลำดับคำสั่งคณะวิทยาศาสตร์ มหาวิทยาลัยมหิดล ที่ ๖๖๔/๒๕๖๑ ลงวันที่ ๒๙ สิงหาคม พ.ศ. ๒๕๖๑ เรื่อง แต่งตั้งคณะกรรมการพิจารณากลับกรองหลักสูตรวิทยาศาสตร์บัณฑิต และให้แต่งตั้งคณะกรรมการพิจารณากลับกรองหลักสูตรวิทยาศาสตร์บัณฑิต ดังรายนามต่อไปนี้

๑. ศาสตราจารย์ ดร.สุมาลี ตั้งประดับกุล	ที่ปรึกษา
๒. รองคณบดีฝ่ายการศึกษาและพัฒนาคุณภาพ	ประธานกรรมการ
๓. รองคณบดีฝ่ายแพทยศาสตร์และบัณฑิตศึกษา	รองประธานกรรมการ
๔. รองคณบดีฝ่ายบริการการศึกษา ศาลายา	รองประธานกรรมการ
๕. ผู้ช่วยคณบดีฝ่ายการศึกษา	รองประธานกรรมการ
๖. รองศาสตราจารย์ ดร.กิตติศักดิ์ หยกทองวัฒนา	กรรมการ
๗. ผู้ช่วยศาสตราจารย์ ดร.ขวัญ อารยะธนิกุล	กรรมการ
๘. ผู้ช่วยศาสตราจารย์ ดร.ไพโรจน์ สลธิ์	กรรมการ
๙. ผู้ช่วยศาสตราจารย์ ดร.มณฑนา จริยาบุรณ์	กรรมการ
๑๐. ผู้ช่วยศาสตราจารย์ ดร.ศศิวิมล แสงผล	กรรมการ
๑๑. ผู้ช่วยศาสตราจารย์ ดร.สุพิชา คุ้มเกตุ	กรรมการ
๑๒. หัวหน้างานการศึกษา	กรรมการ
๑๓. นางสาวสายพิน ทองพัค	กรรมการและเลขานุการ
๑๔. นางสาวเมธาวี กาจจุลศรี	กรรมการและผู้ช่วยเลขานุการ

#### อำนาจหน้าที่

๑. พิจารณากลับกรองหลักสูตร ให้ความเห็น และข้อเสนอแนะเกี่ยวกับหลักสูตรที่เสนอเปิดใหม่ และหลักสูตรปรับปรุง ในระดับปริญญาตรี คณะวิทยาศาสตร์ รวมถึงตรวจสอบและกำกับคุณภาพของหลักสูตรให้เป็นไปตามเกณฑ์มาตรฐานหลักสูตรระดับปริญญาตรี พ.ศ.๒๕๕๘ และสอดคล้องกับนโยบายของมหาวิทยาลัย
๒. ปฏิบัติหน้าที่อื่นตามที่ได้รับมอบหมายจากคณบดีคณะวิทยาศาสตร์ มหาวิทยาลัยมหิดล

ทั้งนี้ ตั้งแต่บัดนี้เป็นต้นไป

สั่ง ณ วันที่ ๑๙ ธันวาคม พ.ศ.๒๕๖๑

(รองศาสตราจารย์ ดร.สิทธิวัฒน์ เลิศศิริ)

คณบดีคณะวิทยาศาสตร์



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

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## Appendix 9

MOUs documents made with agencies inside and outside Thailand



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

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Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

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## STUDENT ARTICULATION PRINCIPAL AGREEMENT

**BETWEEN**

**CURTIN UNIVERSITY**



**AND**

**MAHIDOL UNIVERSITY**







## STUDENT ARTICULATION PRINCIPAL AGREEMENT

### BETWEEN

**CURTIN UNIVERSITY ('Curtin')**, a body corporate established under the Curtin University Act 1966, and situated at Kent Street, Bentley, Western Australia

### AND

**MAHIDOL UNIVERSITY ('Mahidol')**, an autonomous University established under the laws of Thailand at 999 Phuttamonthon 4 Road, Salaya.

### BACKGROUND

- A. Overseas Institutions seeking assurances from Curtin regarding Credit for Recognised Learning (CRL) for students articulating from their courses into Curtin degree programs must be covered by an Articulation (Credit Transfer) Agreement.
- B. Students who successfully complete the Mahidol Degree program/s specified in the Articulation Schedule/s, who meet Australian Department of Immigration and Border Protection visa requirements, and who meet Curtin's English requirements for their selected Degree program, will be considered for entry to Curtin's Degree programs under the terms specified in the Articulation Schedule/s.
- C. Curtin has agreed to accept Articulation Students from Mahidol to enrol in Curtin Degree programs with CRL, at the Curtin campus, in accordance with the terms and conditions of this Agreement and the Articulation Schedule/s.

### AGREEMENT

#### 1. DEFINITIONS

##### 1.1 In this Agreement:

**'Articulation Students'** means students of Mahidol who have successfully completed the academic requirements specified in the Articulation Schedule/s, who hold an Australian student visa, and who have received a Letter of Offer to enrol in a Curtin Degree program at Curtin's Bentley campus with CRL as specified in the Articulation Schedule/s.

**'Curtin Degree program/s'** means the full time registered courses specified in the Articulation Schedule/s, which are offered by Curtin and registered on the Commonwealth Register of Institutions and Courses for Overseas Students (CRICOS).

**'CRICOS'** means the Commonwealth Register of Institutions and Courses for Overseas Students.

**'Prospective Student'** means a person (whether within or outside Australia) who intends to become, or who has taken any steps towards becoming, an 'overseas student' in Australia, as defined by Section 5 of the *Education Services for Overseas Students Act 2000 (Cth)* (access via <http://www.comlaw.gov.au/> ).



## **2. PRINCIPAL AGREEMENT AND ARTICULATION SCHEDULES**

- 2.1 The parties agree that the terms and conditions of this Student Articulation Principal Agreement ("Principal Agreement") will apply to each Curtin Degree program that is articulated between the parties. Every time an additional Curtin Degree program is agreed to be articulated between the parties, a Schedule for that Curtin Degree program will be created on the terms and conditions set out in this Student Articulation Principal Agreement ("Articulation Schedule"), effective from the date that the authorised representative of each party signs the Articulation Schedule.
- 2.2 Each Articulation Schedule shall constitute a separate binding Articulation Agreement between the parties and the terms and conditions of the Student Articulation Principal Agreement shall be deemed to be incorporated in and apply to the Articulation Schedule. The waiver or exercise of any right or remedy under one Articulation Schedule will not affect any other Articulation Schedule.
- 2.3 Each Articulation Schedule will include the following information:
1. Partner program and contact details.
  2. Curtin program and contact details.
  3. Articulation standard required for credit transfer to Curtin.
  4. Quality review procedures.
  5. Special conditions.

## **3. TERM OF THE PRINCIPAL AGREEMENT**

The term of this Principal Agreement is 5 years, from the date on which the second party signs the Principal Agreement. At the expiration of the initial term, the parties may renew the Principal Agreement by exchange of letters, subject to the same conditions or such variations as the parties may agree in writing.

## **4. RESPONSIBILITIES OF MAHIDOL**

Mahidol agrees to:

- 4.1 Promote the arrangement in an ethical, honest and responsible manner and not provide false or misleading information regarding the articulation arrangement, Curtin courses or Mahidol's relationship with Curtin.
- 4.2 Ensure that any promotional and marketing activities that are connected to or make reference to Curtin or Curtin programs are expressly authorised by Curtin.
- 4.3 Refer all queries regarding Curtin's admission requirements, application procedures and/ or English requirements to Curtin University International Admissions website <http://international.Curtin.edu.au/> or to a registered Curtin agent (list available at the above web address).
- 4.4 Refer all queries regarding Australian student visa requirements to the Australian Department of Immigration and Border Protection, contact details for which are available at: <http://www.border.gov.au/Trav/Visa-1>.



- 4.5 Inform Curtin of any actual or planned changes to their respective program curricula that might impact on the articulation arrangements. If the changes are deemed significant, the articulation arrangements may be suspended until they are reviewed and new arrangements are negotiated.
- 4.6 Acknowledge and at all times act to support Curtin's obligations under Standard 1 of the *Education Services for Overseas Students Act 2000 (Cth) National Code of Practice for Providers of Education and Training to Overseas Students 2018* by displaying the Curtin main CRICOS Code 00301J on all publications and websites where there is reference to Curtin and its courses, as outlined in Schedule 1 to the Principal Agreement.

## 5. CURTIN'S RESPONSIBILITIES

Curtin agrees to:

- 5.1 Duly process all completed applications received from Prospective Students and issue a Letter of Offer, subject to availability of places, to students who have completed a Mahidol program specified in the Articulation Schedule/s and who meet Curtin's minimum English language requirements.
- 5.2 Award a Curtin Degree to students who successfully complete all the requirements of the Degree Program as specified in the Articulation Schedule/s.
- 5.3 Abide by any other undertakings as specified in the relevant Articulation Schedule for each Degree program.
- 5.4 Inform Mahidol of any actual or planned changes to their respective Degree Program curricula that might impact on the articulation arrangements. If the changes are deemed significant, the articulation arrangements may be suspended until they are reviewed and new arrangements are negotiated. Failure to inform Mahidol of any changes will constitute a breach of this agreement.
- 5.5 Seek authorisation from Mahidol before undertaking any advertising or promotional activity about Mahidol programs, or about Mahidol.
- 5.6 Without limiting Curtin's right at all times to refuse entry to any student applying to undertake a Curtin degree program under this agreement, Curtin will not unreasonably refuse Prospective Students who meet all of the necessary requirements for entry into a Curtin Degree program as outlined in the Schedule/s.

## 6. PROCESS OF REVIEW

- 6.1 Curtin and Mahidol will review the success of arrangements conducted under this Principal Agreement and the Articulation Schedules every two years or as required. The review will address the following matters:
  - (a) Mahidol course changes;
  - (b) Curtin course changes;
  - (c) Comparative student academic performance in the Curtin course; and
  - (d) Other factors determined relevant by the Parties responsible for managing the Agreement.





- 6.2 If, during the review process, issues of concern that affect the performance of the articulation agreement are identified, Curtin and Mahidol will inform each other in writing of their concerns, and the party responsible for the issues of concern will be required to rectify those issues to the satisfaction of the other party. Either party can terminate this Agreement in accordance with Clause 7 where the other party fails to adequately rectify issues of concern, either by remedial action or within what is considered a reasonable period of time.

## **7. TERMINATING THIS AGREEMENT**

- 7.1 Curtin and Mahidol can terminate this Principal Agreement or one or all of the Articulation Schedules at any time by mutual written agreement.
- 7.2 A party ("the non-defaulting party") can terminate this Principal Agreement or Articulation Schedules forthwith by giving written notice to the other party ("the defaulting party") if the defaulting party breaches any term or condition of this Principal Agreement or of the Articulation Schedules and such breach is not remedied within fourteen (14) days of receipt of written notice from the non-defaulting party to remedy such breach.
- 7.3 Upon termination of this Principal Agreement or Articulation Schedule at any time, Mahidol will promptly return to Curtin or otherwise dispose of as Curtin may instruct, all manifestations of the Curtin confidential information in whatever media they may exist and all other materials relating to Curtin intellectual property, which Mahidol may have in its possession or under its control. Mahidol must immediately cease to use any advertising, promotional or other material supplied by Curtin and return all such material to Curtin.
- 7.4 The termination of this Principal Agreement or related Articulation Schedules by either party does not affect any accrued rights or remedies of either party.

## **8. RELATIONSHIP BETWEEN CURTIN AND MAHIDOL**

- 8.1 The Principal Agreement cannot be construed as constituting an agency, association, joint venture, or partnership of any kind between the parties, nor to confer upon either party the right to sign or complete any instrument or to pledge credit on behalf of the other party.
- 8.2 Neither party shall act as an agent of the other party, or make any suggestion or implication that such an agency exists.
- 8.3 Neither party will hold itself out as representing the other party in any way whatsoever, in any matter connected to or arising from this Principal Agreement.
- 8.4 Each party enters into this Principal Agreement as an independent contractor.

## **9. COMPLIANCE WITH LAWS**

Curtin and Mahidol will comply with all relevant State and Federal laws applicable to this Agreement.



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

#### 10. REPRESENTATIVES OF THE PARTIES TO THE AGREEMENT

The representatives of each party for the purposes of this Principal Agreement are set out in the Articulation Schedule/s.

#### 11. NOTICES

- 11.1 A notice under this Principal Agreement must be in writing and sent by prepaid airmail, or electronic mail to the party at the address specified in the Articulation Schedule/s, or such revised address notified in accordance with Clause 11.2.
- 11.2 A party that changes its address, phone number or electronic mail address must give notice of that change to the other party within a commercially practical timeframe.

#### 12. VARIATION

This Principal Agreement and the Articulation Schedules may only be altered in writing. Any variations must be signed and dated by both parties in order for them to be effective.

#### 13. SIGNATURES

Signed for and on behalf of  
MAHIDOL UNIVERSITY

Assoc. Professor Sittiwat Lertsiri  
Dean, Faculty of Science

Date: 29 MAY 2019

Signed for and on behalf of  
CURTIN UNIVERSITY

A/ Deputy Vice-Chancellor International

Date: 08/05/2019



**SCHEDULE 1 TO STUDENT ARTICULATION PRINCIPAL AGREEMENT: Extract from  
Education Services for Overseas Students Act 2000 (Cth) - National Code of Practice  
for Providers of Education and Training to Overseas Students 2018**

**Part B – Standards for Providers of Education and Training to Overseas Students**

**Standard 1**

**Marketing information and practices**

- 1.1 The registered provider must ensure that the marketing and promotion of its courses and education services in connection with the recruitment of overseas students or intending overseas students, including through an education agent (in accordance with Standard 4), is not false or misleading, and is consistent with Australian Consumer Law.
- 1.2 The registered provider must, in seeking to enter into written agreements with overseas students or intending overseas students, not provide any false or misleading information on:
  - 1.2.1 its association with any other persons or organisations the registered provider has arrangements with for the delivery of the course in which the student intends to enrol or may apply to enrol
  - 1.2.2 any work-based training a student is required to undertake as part of the course
  - 1.2.3 prerequisites—including English language proficiency—for entry to the course
  - 1.2.4 any other information relevant to the registered provider, its courses or outcomes associated with those courses.
- 1.3 The registered provider must not:
  - 1.3.1 claim to commit to secure for, or on the student or intending student's behalf, a migration outcome from undertaking any course offered by the registered provider
  - 1.3.2 guarantee a successful education assessment outcome for the student or intending student.
- 1.4 The registered provider must include its CRICOS registered name and registration number in any written or online material that it disseminates or makes publicly available for the purposes of:
  - 1.4.1 providing or offering to provide a course to an overseas student
  - 1.4.2 inviting a student to undertake or apply for a course, or
  - 1.4.3 indicating it is able or willing to provide a course to overseas students.
- 1.5 The registered provider must not actively recruit a student where this conflicts with its obligations under Standard 7 (Overseas student transfers).





Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

## **SCHEDULE 2 TO STUDENT ARTICULATION PRINCIPAL AGREEMENT: Articulation Schedule, Bachelor of Science (Data Science)**

### **2.1 ADDRESSES FOR NOTICES**

#### **Curtin University**

Attention: Mr Nigel de Silva  
Manager, International Business Development  
Address: Curtin International  
Building 100  
Kent Street  
Bentley, Western Australia 6102, Australia  
Mailing address: GPO Box S1512  
Perth WA 6845  
Australia  
Phone number: +61 8 9266 4426  
Facsimile number: +61 8 9266 3960  
Email: n.desilva@curtin.edu.au

#### **Mahidol University**

Attention: Ms. Wanpimon Senapadpakorn  
Director, International Relations Division  
Address: 999 Phuttamonthon 4 Road, Salaya, Nakorn Pathom  
73170, Thailand  
Mailing address: As above  
Phone number: +662 849 6230  
Facsimile number: +662 849 6237  
Email: wanpimon.sen@mahidol.ac.th

### **2.2 OFFICERS RESPONSIBLE FOR THIS ARTICULATION AGREEMENT**

#### **Curtin University**

Name: Professor Yong Hong Wu  
Position: John Curtin Distinguished Professor  
Faculty: Mathematics and Statistics, Faculty of Science and  
Engineering  
Address: Building 314, Level 3  
GPO Box U1987  
Perth, WA 6845, Australia  
Phone: +61 8 9266 3142  
Facsimile: +61 8 9266 3197  
Email: y.wu@curtin.edu.au

#### **Mahidol University**

Name: Asst. Prof. Somkid Amornsamarnkul  
Position: Deputy Dean for Administration  
Faculty: Faculty of Science, Mahidol University  
Address: Rama 6 Rd., Bangkok 10400 Thailand  
Phone: +66 2 2015002  
Facsimile: +66 2 2015839  
Email: somkid.amo@mahidol.ac.th



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

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Name:	Dr. Meechoke Choodoung
Position:	Chair, B.Sc. in Industrial Mathematics
Faculty:	Faculty of Science, Mahidol University
Address:	Rama 6 Rd., Bangkok 10400 Thailand.
Phone:	+66 2 201 5344
Facsimile:	+66 2 201 5343
Email:	meechoke.chu@mahidol.ac.th



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

## 2.3 MAHIDOL PROGRAMS FROM WHICH STUDENTS WILL ARTICULATE

Bachelor of Science (Industrial Mathematics)

## 2.4 CURTIN BACHELOR PROGRAM TO WHICH STUDENTS WILL ARTICULATE

### 2.4(a) Matriculation Entry Requirements

Table 2.4a

<b>Curtin Bachelor of Science (Data Science) program</b>	
Applicants who are enrolled at Mahidol in a Bachelor of Science (Industrial Mathematics) program will be deemed eligible for entry to a Curtin Bachelor of Science (Data Science) program based on successful completion of 75 credits out of the 120 credits of the Mahidol Bachelor of Science (Industrial Mathematics) program including the required Mahidol University units listed in Table 2.4c, plus demonstration of English competency as specified in 2.4(b).	

### 2.4(b) English Language Entry Requirements (General Undergraduate)\*

Table 2.4b

<b>IELTS Academic (International English Language Testing System)</b>	
<b>Writing and Speaking</b>	6.0
<b>Reading and Listening</b>	6.0
<b>Overall</b>	6.0

*\*NOTE: Articulation Students are responsible for meeting Australian Department of Home Affairs English Language requirements for visa entry to Australia, which may, from time to time, be different to the level of English Language proficiency required for entry to a Curtin degree program as specified in Table 2.4b and which may vary from time to time.*



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

## 2.4(c) Curtin Bachelor of Science (Data Science) Program Outline

Table 2.4c

Years 1&2	Curtin Unit No.	Curtin Unit	Equivalent Mahidol Unit	Credits
Exempt	STAT1003	Introduction to Data Science	Introduction to Data Science	25
	COMP1005	Fundamentals of Programming	Introduction to Scientific Computing	25
	STAT1001	Statistical Probability	Statistical Data Analysis I	25
	STAT1002	Statistical Data Analysis	Statistical Data Analysis II	
	MATH1016	Calculus 1	Mathematics I	50
	MATH1015	Linear Algebra 1	Mathematics II	
	ISYS1001	Database Systems	Database management	25
	COMS1000	Science communications	Science communications	12.5
	STAT1000	Regression and non- Parametric Inference	Statistical Data Analysis III	12.5
	MATH2015	Mathematical Computing	Numerical Analysis	25
	ISEC2001	Fundamental Concepts of Data Security	Data Communications	25
	STAT2005	Computer Simulation	Simulation modelling	25
	MEDA3000	Mobile, Locative and Ubiquitous Media	Mobile, Locative and Ubiquitous Media	25
	COMP1002	Data Structures and Algorithms	Data Structures in Mathematics	25
Total Credits				300
TO BE COMPLETED AT CURTIN				Credits
Year 3 – Sem 1 (Sem 2 in Curtin's academic year)	ICTE2000	Interactive, Virtual and Immersive Environments		25
	STAT2003	Analytics for Experimental and Simulated Data		25
	MATH2002	Computational Mathematics		25
	INDE2001	Logistics Modelling and Optimisation OR		25
	MATH2000	Network Optimisation OR		
	MATH3001	Applied Mathematical Modelling		
Year 3 – Sem 2 (Sem 1 in Curtin's academic year)	COMP3006	Artificial and Machine Intelligence		25
	COMP3001	Design and Analysis of Algorithms		25
	CNCO3003	Mobile Cloud Computing		25
	MATH3002	Numerical Optimization OR		25
	MATH2009	Calculus 2 OR		
	STAT2001	Mathematical Statistics		
Year 4 – Sem 1, (Sem 2 in Curtin's academic year)	COMP3009	Data Mining		25
	STAT2004	Analytics for Observational Data		25
	MATH5004	Advanced Numerical Analysis OR ELECTIVE		25
	MATH3004	Industrial Project OR		25
	COMP3005	Computer Project 2 OR		
	MEDA3001	Major Digital Humanities Project OR		
	ISYS3002	Information Systems and Technology Project 2		

NOTE: Curtin University reserves the right to change the internal composition of any course to ensure learning outcomes retain maximum relevance. Any changes to the internal composition of a course will protect the right of students to complete the course within the normal timeframe and will not result in additional cost to students through a requirement to undertake additional units.





Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

## 2.5 ARTICULATION STANDARD REQUIRED FOR CREDIT TRANSFER TO CURTIN

Articulation Students who have successfully completed Year 1 and Year 2 (75 credits out of the 120 credits) of the Mahidol Bachelor of Science (Industrial Mathematics) program including the required Mahidol University units listed in Table 2.4c will receive Credit for Recognised Learning ('CRL') equivalent to 300 credits in Curtin's Bachelor of Science (Data Science) program.

## 2.6 QUALITY REVIEW PROCEDURES

As per Clause 6 of the Principal Agreement.

## 2.7 REQUIREMENTS FOR NEW-TO-CURTIN STUDENTS (if applicable)

All new-to-Curtin students are required to complete, in their first semester of study, the following components:

- (a) Post-entry Language Assessment (PELA) which is a compulsory non-weighted assessment. Students identified at risk on the PELA are required to attend, for no additional cost, a series of weekly one-hour, content-aligned, language focused tutorials, called SUCCESS.
- (b) Academic Integrity Program (AIP) that will inform students about a range of academic integrity related concepts including ethics, Curtin's values and expectations for students, referencing, plagiarism, cheating, misconduct processes and possible outcomes, which is a compulsory non-weighted assessment.

## 2.8 SIGNATURES

EXECUTED as an Agreement pursuant to the Student Articulation Principal Agreement between Curtin University and Mahidol University dated

Signed for and on behalf of  
MAHIDOL UNIVERSITY

Assoc. Professor Sittiwat Lertsiri  
Dean, Faculty of Science

Date:

29 MAY 2019

Signed for and on behalf of  
CURTIN UNIVERSITY

A/Deputy Vice-Chancellor International

Date:

08/09/2019





Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

### **SCHEDULE 3 TO STUDENT ARTICULATION PRINCIPAL AGREEMENT: Articulation Schedule, Bachelor of Science (Industrial Optimisation)**

#### **3.1 ADDRESSES FOR NOTICES**

##### **Curtin University**

Attention: Mr Nigel de Silva  
Deputy Director, Transnational Education and Partnerships

Address: Curtin International  
Building 100, Level 2  
Kent Street  
Bentley Western Australia 6102  
Australia

Mailing address: GPO Box S1512  
Perth WA 6845  
Australia

Phone number: +61 8 9266 4426

Email: n.desilva@curtin.edu.au

##### **Mahidol University**

Attention: Ms. Wanpimon Senapadpakorn  
Director, International Relations Division

Address: 999 Phuttamonthon 4 Road, Salaya, Nakorn Pathom  
73170, Thailand

Mailing address: As above

Phone number: +662 849 6230

Facsimile number: +662 849 6237

Email: wanpimon.sen@mahidol.ac.th

#### **3.2 OFFICERS RESPONSIBLE FOR THIS ARTICULATION AGREEMENT**

##### **Curtin University**

Name: Professor Yong Hong Wu

Position: John Curtin Distinguished Professor

Faculty: Mathematics and Statistics, Faculty of Science and Engineering

Address: Building 314, Level 3  
GPO Box U1987  
Perth, WA 6845, Australia

Phone: +61 8 9266 3142

Facsimile: +61 8 9266 3197

Email: y.wu@curtin.edu.au

##### **Mahidol University**

Name: Asst. Prof. Somkid Amornsamarnkul

Position: Deputy Dean for Administration

Faculty: Faculty of Science, Mahidol University

Address: Rama 6 Rd., Bangkok 10400 Thailand

Phone: +66 2 2015002

Facsimile: +66 2 2015839

Email: somkid.amo@mahidol.ac.th



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

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Name:	Dr. Meechoke Choodoung
Position:	Chair, B.Sc. in Industrial Mathematics
Faculty:	Faculty of Science, Mahidol University
Address:	Rama 6 Rd., Bangkok 10400 Thailand.
Phone:	+66 2 201 5344
Facsimile:	+66 2 201 5343
Email:	meechoke.chu@mahidol.ac.th



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

### 3.3 MAHIDOL PROGRAMS FROM WHICH STUDENTS WILL ARTICULATE

Bachelor of Science (Industrial Mathematics)

### 3.4 CURTIN BACHELOR PROGRAM TO WHICH STUDENTS WILL ARTICULATE

#### 3.4(a) Matriculation Entry Requirements

Table 3.4a

<b>Curtin Bachelor of Science (Industrial Optimisation) program</b>
Applicants who are enrolled at Mahidol in a Bachelor of Science (Industrial Mathematics) program will be deemed eligible for entry to a Curtin Bachelor of Science (Industrial Optimisation) program based on successful completion of 75 credits out of the 120 credits of the Mahidol Bachelor of Science (Industrial Mathematics) program including the required Mahidol University units listed in Table 3.4c, plus demonstration of English competency as specified in 3.4(b).

#### 3.4(b) English Language Entry Requirements (General Undergraduate)\*

Table 3.4b

<b>IELTS Academic (International English Language Testing System)</b>	
<b>Writing and Speaking</b>	6.0
<b>Reading and Listening</b>	6.0
<b>Overall</b>	6.0

*\*NOTE: Articulation Students are responsible for meeting Australian Department of Home Affairs English Language requirements for visa entry to Australia, which may, from time to time, be different to the level of English Language proficiency required for entry to a Curtin degree program as specified in Table 3.4b and which may vary from time to time.*


Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

### 3.4(c) Curtin Bachelor of Science (Industrial Optimisation) Program Outline

Table 3.4c

Years 1&2	Curtin Unit No.	Curtin Unit	Equivalent Mahidol Unit	Credits
Exempt	MATH1015 MATH1016 MATH1006 MATH2009 MATH2010 Math2011	Linear Algebra 1 Calculus 1 Mathematical Modelling Calculus 2 Linear Algebra 2 Operations Research	Mathematics I Mathematics II Linear Algebra Calculus of Several Variables Advanced Calculus Partial Differential Equations for Engineers and Scientists Operations Research	150
	NPSC1001 MATH2015	Scientific Computing Mathematical Computing	Introduction to Scientific Computing Introduction to Mathematical Software Numerical Analysis	50
	STAT1002	Statistical Data Analysis	Statistical Data Analysis I	37.5
	STAT1001	Statistical Probability	Statistical Data Analysis II	
	STAT1000	Regression and non- Parametric Inference	Statistical Data Analysis III	
	COMS1000	Science Communications	Science Communications	12.5
	INDE2000	Supply Chain Modelling and Optimisation	Supply Chain Modelling and Optimization	25
		Elective Unit	<b>Completion of one of the following units:</b> General Chemistry Essential Biology Elementary Physics Current Moral Issues and Logical Thinking Technology in Daily Life	25
<b>Total Credits</b>				<b>300</b>
<b>TO BE COMPLETED AT CURTIN</b>				<b>Credits</b>
Year 3 – Sem 1 (Sem 2 in Curtin's academic year)	MATH2000	Network Optimisation		25
	MATH3001	Applied Mathematical Modelling		25
	INDE2001	Logistics Modelling and Optimisation		25
	MATH2002	Computational Mathematics		25
Year 3 Sem 2 (Sem 1 in Curtin's academic year)	INDE3000	Industrial Modelling and Optimisation		25
	INDE2002	Network Optimisation for Transport and Logistics		25
	STAT2001	Mathematical Statistics		25
		Elective Unit		25
	INDE3004	Dynamic and Stochastic Modelling and Optimisation		25



Degree ☒ Bachelor ☐ Master ☐ Doctoral

Faculty of Science

TQF 2 Bachelor of Science Program in Industrial Mathematics and Data Science (International Program) Department of Mathematics

Year 4 - Sem 1 (Sem 2 in Curtin's academic	INDE3003	Production Planning and Management	25
	MATH3004	Industrial Project	25
	MATH5004	Advanced Numerical Analysis OR Elective	25

*NOTE: Curtin University reserves the right to change the internal composition of any course to ensure learning outcomes retain maximum relevance. Any changes to the internal composition of a course will protect the right of students to complete the course within the normal timeframe and will not result in additional cost to students through a requirement to undertake additional units.*

### 3.5 ARTICULATION STANDARD REQUIRED FOR CREDIT TRANSFER TO CURTIN

Articulation Students who have successfully completed Year 1 and Year 2 (75 credits out of the 120 credits) of the Mahidol Bachelor of Science (Industrial Mathematics) program including the required Mahidol University units listed in Table 4.4c will receive Credit for Recognised Learning ('CRL') equivalent to 300 credits in Curtin's Bachelor of Science (Industrial Optimisation) program.

### 3.6 QUALITY REVIEW PROCEDURES

As per Clause 6 of the Principal Agreement.

### 3.7 REQUIREMENTS FOR NEW-TO-CURTIN STUDENTS (if applicable)

All new-to-Curtin students are required to complete, in their first semester of study, the following components:

- Post-entry Language Assessment (PELA) which is a compulsory non-weighted assessment. Students identified at risk on the PELA are required to attend, for no additional cost, a series of weekly one-hour, content-aligned, language focused tutorials, called SUCCESS.
- Academic Integrity Program (AIP) that will inform students about a range of academic integrity related concepts including ethics, Curtin's values and expectations for students, referencing, plagiarism, cheating, misconduct processes and possible outcomes, which is a compulsory non-weighted assessment.

### 3.8 SIGNATURES

EXECUTED as an Agreement pursuant to the Student Articulation Principal Agreement between Curtin University and Mahidol University dated

Signed for and on behalf of  
MAHIDOL UNIVERSITY

Assoc. Professor Sittiwat Lertsiri  
Dean, Faculty of Science

Date: 29 MAY 2019

Signed for and on behalf of  
CURTIN UNIVERSITY

A Deputy Vice-Chancellor International

Date: 08/05/2019