

**Minor Program in Applied Mathematics  
(International Program)  
Revised Program 2013**

**Name of institution** Mahidol University  
**Campus/Faculty/Department** International College

**Section 1 General Information**

**1. Curriculum Name**

<b>Thai</b> (หลักสูตรนานาชาติ)	หลักสูตรวิชาโทคณิตศาสตร์ประยุกต์
<b>English</b>	Minor Program in Applied Mathematics (International Program)

**2. Subjects (if any)** -

**3. Required Credits** No less than 20 credits beyond General Education and Major requirements

**4. Curriculum Characteristics**

**4.1 Curriculum type/model**  
Bachelor's Degree, minor program

**4.2 Language**  
English

**4.3 Recruitment**  
Thai and international students

**4.4 Duration of Study**  
For students who take minor program(s) along with their major program, the minimum study time of major program will be extended by two trimesters per minor.

**4.5 Certificate offered to the graduates**  
One certificate for one minor subject

**5. Curriculum Status and Curriculum Approval**

**5.1** Revised program 2013 The program was revised from 2006  
Program start: Trimester 2 Academic Year 2014

**5.2** The MU Council approved the program in its meeting no. ....  
on .....

**6.**

### **Opportunities of the graduates**

- 1) Graduates can work in research and development in commercial sector and in academia;
- 2) Graduates can work as actuaries in insurance policy design;
- 3) Graduates can work in government sector as statisticians and planners;
- 4) Graduates can pursue their study in graduate school in Applied Mathematics (either in Thailand or outside Thailand);

### **7. Name, I.D. Number, title and degree of the person in charge of the curriculum**

#### **1. Applied Mathematics Minor**

1)	Mr.Pornrat Ruengrot Academic Position	I.D. No. 313060007XXXX Lecturer B.A. Cambridge University, UK, 2006 M.Sc. Imperial College, UK, 2007 Ph.D. University of Manchester, UK, 2011
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### **8. Venue to conduct the study**

Mahidol University International College, Salaya Campus

### **9. External factors to be considered in curriculum planning**

#### **11.1 Economic situation/development**

The minor program in applied mathematics aims to prepare students for their careers in an era with global economic turbulence and highly competitive environment. In addition, the effect of globalization makes the program beneficial for students in other fields to be equipped with fundamental applied mathematics theories, concepts and tools that can assist them in planning, analyzing, making sound decisions and implementing their work effectively.

#### **11.2 Social and Cultural situation/development**

In an era of social complexity and workforce diversity, excelling in soft skills becomes as important as having applied mathematics knowledge and skills. The minor program in applied mathematics, with its global focus, aims to develop students to become professional and ethical citizens who are aware of oneself and others while engaging in mathematics-related activities.

## **Section 2 Information of the Curriculum**

### **1. Philosophy, justification and objectives of the curriculum**

#### **1.1 Philosophy**

Our philosophy is to provide our MUIC students with an education of international quality, both in mathematics and in the liberal arts general education, in order for them to be competitive in the employment market and in the

ever-changing world. At MUIC, students ethics and morality teachings are part of our philosophical goals so that we would be able to produce socially, morally, and ethically-responsible students while equipping them with in-depth knowledge of mathematics and other subject matters.

## 1.2 Justification

Having basic understanding of applied mathematics knowledge and skills are paramount in an increasingly competitive job market. For those students who are looking to enter into the corporate world, a minor in Applied Mathematics will provide graduates an applicable skill set. Whether it be working for a multinational corporation, international organization, local company or establishing one's own business; students will be able to combine their acquired applied mathematics knowledge and skills with their specialized field of studies to produce more all-rounded and trans-disciplinary work output and outcome. The completion of a minor in Applied Mathematics will demonstrate to potential employers a level of mathematical knowledge and skills with which the student is able to function well in any English-speaking environment or workplace.

## 1.3 Objectives: To produce graduates who have the characteristics, knowledge and skills as follows:

- 1) Academic excellence. Courses in the minor require students to demonstrate a high degree of ability.
- 2) Personal responsibility for their own studies/work. Only ones who work hard can be successful.
- 3) Ability to think critically and independently. The Division encourages students to think, not to be passive learners.
- 4) Understanding of and appreciation for fundamental knowledge relating to applied mathematics.
- 5) Capacity to analyse and think logically as well as make sound decisions using both quantitative and qualitative tools
- 6) Capability of communicating effectively in English, both in written and spoken forms.

## **Section 3 Educational Management System, Curriculum Implementation and Structure**

### **1. Educational Management System**

#### **1.1 System**

Trimester system

#### **1.2 Summer session**

Summer session is not offered

#### **1.3 Credits equivalent to semester system**

Three semester credits are equal to four trimester credits

### **2. Curriculum Implementation**

#### **2.1 Teaching schedule**

Monday – Friday, 8:00-18:00

Trimester: 1<sup>st</sup> Trimester : September-December

2<sup>nd</sup> Trimester: January-April

3<sup>rd</sup> Trimester: April-July

## 2.2 Qualifications of prospective students

MUIC undergraduate students

## 2.3 Educational system

Classroom Mode

## 2.4 Transfer of credits, courses and cross university registration (If any)

According to Mahidol University's and MUIC's Regulations

## 3. Curriculum and Lecturers of the Curriculum

### 3.1 Curriculum (for students placed into the regular track)

3.1.1 Number of credits 32 Credits

#### 3.1.2 Curriculum Structure (all minor subjects)

Required Courses 32 Credits

#### 3.1.3 Course Lists

Required Courses: Eight courses (32 credits) from the following:

Code รหัส	Title ชื่อรายวิชา	Prerequisite รายวิชาบังคับก่อน	Credits หน่วยกิต
ICMA 106	Calculus I		4 (4-0-8)
	แคลคูลัส ๑		๔ (๔-๐-๘)
ICMA 213	Calculus II	ICMA 106	4 (4-0-8)
	แคลคูลัส ๒		๔ (๔-๐-๘)
ICMA 214	Ordinary Differential Equations	ICMA 106	4 (4-0-8)
	สมการเชิงอนุพันธ์สามัญ		๔ (๔-๐-๘)
ICMA 219	Calculus of Several Variables		4 (4-0-8)
	แคลคูลัสหลายตัวแปร		๔ (๔-๐-๘)
ICSC 303	Statistics		4 (4-0-8)
	สถิติ		๔ (๔-๐-๘)

ICMA 321	Linear Algebra		4 (4-0-8)
	พีชคณิตเชิงเส้น		๔ (๔-๐-๘)
ICMA 322	Advanced Calculus		4 (4-0-8)
	แคลคูลัสขั้นสูง		๔ (๔-๐-๘)
ICMA 200	Principles and Mathematical Concepts		4(4-0-8)
	หลักการทางคณิตศาสตร์		๔ (๔-๐-๘)

### 3.1.4 Study plan

## Applied Mathematics

คณิตศาสตร์ประยุกต์

### Trimester 1 / ไตรภาคที่ ๑

ICMA 106	Calculus 1 แคลคูลัส ๑	4 (4-0-8) ๔ (๔-๐-๘)
ICMA 303	Statistics สถิติ	4 (4-0-8) ๔ (๔-๐-๘)

### Trimester 2 / ไตรภาคที่ ๒

ICMA 213	Calculus 2 แคลคูลัส ๒	4 (4-0-8) ๔ (๔-๐-๘)
ICMA 200	Principles and Mathematical Concepts หลักการทางคณิตศาสตร์	4 (4-0-8) ๔ (๔-๐-๘)

### Trimester 3 / ไตรภาคที่ ๓

ICMA 219	Calculus of Several Variables แคลคูลัสหลายตัวแปร	4 (4-0-8) ๔ (๔-๐-๘)
ICMA 214	Ordinary Differential Equations สมการเชิงอนุพันธ์สามัญ	4 (4-0-8) ๔ (๔-๐-๘)

### Trimester 4 / ไตรภาคที่ ๔

ICMA 322	Advanced Calculus แคลคูลัสขั้นสูง	4 (4-0-8) ๔ (๔-๐-๘)
ICMA 321	Linear Algebra พีชคณิตเชิงเส้น	4 (4-0-8) ๔ (๔-๐-๘)

**Total 32 (32-0-64)**

**รวม ๓๒ (๓๒-๐-๖๔)**

## Course description

### Appendix 1

#### 3.2 Name, I.D. Number, title and degree of lecturers of the curriculum

##### 3.2.1 Business Administration Minor

1)	Mr. Chatchawan Panraksa Academic Position Education Data	ID. No. 336100063XXXX  Lecturer B.Sc. (Mathematics), Khon Kaen University, Thailand, 2002 M.Sc. (Mathematics), Chulalongkorn University, Thailand, 2005 Ph.D. (Mathematics), University of Maryland, USA 2011
2)	Mr. Pornrat Ruengrot Academic Position Education Data	I.D. No. 313060007XXXX  Lecturer B.A. Cambridge University, UK, 2006 M.Sc. Imperial College, UK, 2007 Ph.D. University of Manchester, UK, 2011
3)	Mr. Aram Tangboonduangjit Academic Position Education Data	ID. No. 371990003XXXX  Lecturer B.Sc. (Mathematics), Carnegie Mellon University, USA, 2000 M.A. (Mathematics), University of Maryland, USA, 2004 Ph.D. (Mathematics), University of Maryland, USA, 2006

## Section 4 Learning Outcome, Teaching Strategies and Evaluation

### How to develop learning outcome in each area

#### 1. Morality and Ethics

##### 1.1 Expected outcome on morality and ethics

- 1) Possess morality, ethics, and integrity.
- 2) Have self-discipline, honesty, compassion, self-responsibility, and social responsibility.
- 3) Have a positive attitude toward profession and express their morality and ethics.
- 4) Respect other people's rights and be a good listener.
- 5) Respect rules and regulations of institution and society.
- 6) Can adapt and adjust to work as a good team player.

##### 1.2 Teaching strategies

- 1) Learning-centered education with emphasis on

- Ethics and morality
- Traditional learning
  - 2) Courses containing moral and ethical issues
  - 3) Case studies with past experiences and current events
  - 4) Group discussion
  - 5) Group assignment

### 1.3 Evaluation strategies

- 1) Students' activities, presentation, and seminar
- 2) Class attendance, class participation, and classroom behavior
- 3) Punctual submission of reports and assignments with good quality

## 2. Knowledge

### 2.1 Expected outcome on knowledge development

- 1) Possess basic knowledge, theories and concepts towards the understanding of self, society, surrounding in order to be well-rounded person
- 2) Can process the knowledge related to principles, theories and practice in the course
- 3) Can integrate the knowledge to other related subjects
- 4) Can remain current in research and new knowledge

### 2.2 Teaching Strategies

- 1) Lecture
- 2) Learning-centered education with emphasis on
  - knowledge development
  - important skills in career development and living
  - encourage students to use their full potentials
- 3) Diverse teaching methods that serve the education objective
- 4) Appropriate IT
- 5) Integrate theory and practice
- 6) Case studies with past experiences and current events
- 7) Group discussion
- 8) Group assignment

### 2.3 Evaluation Strategies

- 1) Evaluate knowledge and application in career using written examination
- 2) Students' activities, assignment, presentation and seminar in course
- 3) Class attendance, class participation

## 3. Intellectual development

### 3.1 Expected outcome on intellectual development

- 1) Have systematic and analytical thinking
- 2) Can apply knowledge and experience to creatively solve problems both in general and academic and synthesize of solutions and precautions.
- 3) Can apply theoretical and practical knowledge to their real life

### 3.2 Teaching Strategies

- 1) Lecture
- 2) Diverse teaching methods that serve the education objective



- 3) Appropriate IT
  - 4) Integrate theory and practice
  - 5) Case studies with past experiences and current events
  - 6) Group discussion
  - 7) Group assignment
- 3.3 Evaluation Strategies
- 1) Evaluate knowledge and application in career using written examination
  - 2) Students' activities, assignment, presentation and seminar in course
  - 3) Class attendance, class participation

#### **4. Interpersonal skills and responsibility**

- 4.1 Expected outcomes on interpersonal skills and responsibility
- 1) possess good interpersonal skills (self esteem and dignity) and have respect for the rights and value of others.
  - 2) Be a constructive team member (in various roles) and be responsible for assignments, profession and society.
  - 3) possess initiative in problem solving.
- 4.2 Teaching strategies
- 1) Emphasis on training and practice
  - 2) Courses containing ethical and moral issues
  - 3) Group discussion in case studies and assignments
- 4.3 Evaluation strategies
- 1) Students' activities, assignments, presentations, and seminars in courses
  - 2) Class attendance, class participation, and classroom behavior

#### **5. Skills in numerical analysis, communication, and information technology**

- 5.1 Expected outcomes on skills in numerical analysis, communication, and information technology.
- 1) Be able to select and apply appropriate statistical and mathematical thinking to resolve research problems.
  - 2) Be able to information technology for data gathering, processing, interpreting, and presenting information/results .
  - 3) Be able to communicate effectively and select appropriate methods of presentation.
  - 4) Be able to effectively use English or other languages to research data and information appropriately.

### **1. Curriculum Mapping**

Appendix 2

## **Section 5 Criteria for Student Evaluation**

### **1. Grading system**

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

### **2. Evaluation process for the learning outcome of students**

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

### **3. Requirements for graduation**

3.1 Total time of study should not exceed 8 academic years

3.2 Students have to complete their credits as stated in the curriculum which includes:

- General education courses
- Major courses
- Free elective courses

3.3 Students must have a minimum 2.00 CUM-GPA

## **Section 6 Evaluation of the Curriculum Implementation**

### **1. Evaluation on the teaching efficiency**

#### **1.1 Evaluation of teaching strategies**

- 1) Analysis of students' evaluations of courses and instructors
- 2) Teaching observations by Program Director and/or Division Chair
- 3) Workshops on course improvement

#### **1.2 Evaluation of lecturers' skills in using teaching strategies**

- 1) Analysis of range of grades awarded and students' achievement in later courses
- 2) Analysis of students' evaluations of courses and instructors
- 3) Teaching observations by Program Director and/or Division Chair

### **2. Evaluation of the curriculum in general**

Survey instructors' opinions toward students and their development during their progression through the program, and survey students' opinions toward courses and instructors.