

TQF. 3



Bachelor's Degree

Master's Degree

## Course Specification

**Course Code:** BMA 3301

**Course Title:** Blended Learning in Secondary Mathematics

**Credits:** 3(3-0-6)

**Programs:** Bachelor of Education Program in  
Mathematics Education  
(Bilingual Program)

**Semester:** 3

**Academic Year:** 2021

**College of Hospitality Industry Management  
Suan Sunandha Rajabhat University  
(CHM, SSRU)**

## Section 1 General Information

**1. Code and Course Title:** BMA 3301 Blended Learning in Secondary Mathematics

**2. ชื่อวิชา (ภาษาไทย):** BMA 3301: การเรียนรู้แบบผสมผสานในคณิตศาสตร์มัธยมศึกษา

**3. Credits:** 3(2-2-5)

**3. Curriculum and Course Category :**

Curriculums: Bachelor's of Education, Mathematics (Bilingual Program)

Course Category:

- General Education     Required Course  
 Elective Course     Others: .....

**4. Lecturers:**

Asst. Prof. Dr. Krongthong Khairiree & Mr. Luechai Tiprungsri

**5. Year / Semester**

Students Year 1 / Semester 3/2564

**6. Prerequisite Course**

None

**7. Co-requisite Course :**

None

**8. Learning Location**

College of Hospitality Management, Suan Sunandha Rajabhat University,  
Nakorn Patom Education Center

**9. Last Date for Preparing and Revising this Course:**

April, 2022

## Section 2 - Aims and Objectives

### 2.1 Course Objectives

At the end of this course, the students will be able to perform in the following areas of performance:

- 1) Have strong mathematical content knowledge and pedagogical content knowledge in teaching secondary mathematics.
- 2) identify students' misconceptions, students' learning styles and use blended learning in mathematics classes;
- 3) use critical thinking to connect various mathematical topics and mathematical software applications; and
- 4) create assessment and evaluation rubrics for secondary mathematics.

### 2.2 Purposes for Developing / Revising Course (content / learning process / assessment / etc.)

## Section 3 Course Structure

### 3.1 Course Descriptive

Methods of teaching secondary mathematics; learning difficulties and misconception; learning styles; cooperative learning and/or collaborative learning; higher order thinking skills in 21st Century; Massive Open Online Course (MOOC) in mathematics; flipped classroom; handheld technology; Advanced level of using The Geometer's Sketchpad; Augmented Reality (AR) and blended learning through smartphone; problem based learning and project based learning; assessment and action research in secondary mathematics classroom.

### 3.2 Time Length per Semester (Lecture – hours / Practice – hours / Self Study – hours)

| Lecture  | Practice/Field Work/Internship | Self Study | Remedial Class |
|----------|--------------------------------|------------|----------------|
| 32 hours | 32                             | 80 hours   | 6 (if any)     |

### **3.3 Time Length per Week for Individual Academic Consulting and Guidance**

At least 5 hours / week

#### **Individual consulting and guidance**

##### **Self-consulting at the lecturer's office:**

Room Number 305, CHM Building, Nakhon Education Campus

Mon, 9.00 – 12.00

Tue: 9.00 – 12.00

##### **Consulting via office telephone/mobile phone:**

081-3432853

##### **Consulting via email:**

krongthong.kh@ssru.ac.th

##### **Consulting via social media platform (Facebook/Twitter/Line):**

None

##### **Consulting via Computer Network (Internet/Web board):**

[www.elic.ssru.ac.th/](http://www.elic.ssru.ac.th/)

## Section 4 Developing Student's Learning Outcomes

Expected students' learning outcomes are categorized into five domains, developed from curriculum specification (TQF2), as follows:

### 1. Morals and ethics

#### 1.1 Learning outcomes to be developed

- 1) To have personal responsibility, corporate responsibility and moral reasoning
- 2) Can adjust to work as a team both as leader or follower and work effectively with others;
- 3) Have discipline, self, and social responsibility.

#### 2. Teaching strategies

- 1) using Blended Learning and on Line Learning, lecture and group discussion
- 2) Using Student-centered: Problem-Based learning and Cooperative learning approaches
- 3) Encouraging the students to have integrity, honesty, and discipline such as unselfishness and self-control.

#### 3. Assessment & evaluation strategies

- 1) Attendance record
- 2) Performance Assessment (on-site)
- 3) System log (online/on-demand)

## 2. Knowledge

### 2.1 Learning outcomes to be developed

- 1) apply mathematical content knowledge and pedagogical content knowledge to solve mathematical problem solving
- 2) Have knowledge and understanding principles and concepts of mathematical problem solving skills and mathematical problem solving strategies.
- 3) Able to apply computer dynamic software program such as the Geometer's Sketchpad and/or other program in solving mathematics problems;

#### 2.2 Teaching strategies

- 1) Students are able to learn both independently and cooperatively through online learning;
- 2) Students learn new skills and apply Blended Learning and on Line Learning in new knowledge and unexpected situations.
- 3) Using brainstorming to encourage students generate many ideas and using higher order thinking.

#### 2.3 Assessment and evaluation strategies

- 1) Using rubrics for complex authentic task
- 2) Using formative and summative tests

- 3) Using students' report and presentation.

### **3. Cognitive skills**

#### **3.1 Learning outcomes to be developed**

- 1) Be able to apply knowledge learned to solve problem-based learning;
- 2) Able to create learning instruction to solve mathematics problems in corporate with The Geometer's Sketchpad; and
- 3) Able to develop instructional materials in mathematics using The Geometer's Sketchpad and/or other program including AR/AI.

#### **3.2 Teaching strategies**

- 1) Use internet-based learning and blended learning in using dynamic software program in mathematics.
- 2) Use problem-based learning in mathematics and real life problems;
- 3) students write reports, and able to present their findings from discussion / searching information.

#### **3.3 Assessment and Evaluation strategies**

- 1) Using rubrics for complex authentic task
- 2) Using formative and summative tests
- 3) Using group report and presentation.

## **4. Interpersonal Skills and Responsibilities**

#### **4.1 Learning outcomes to be developed**

- 1) Have responsibility for assignments: select ideas in mathematical problem solving strategies from different theoretical perspectives;
- 2) effective problem-solvers, applying critical and creative thinking to a range of problems.
- 3) Can adjust to work in team both as leader or follower and work effectively with others

#### **4.2 Teaching strategies**

- 1) Find, acquire, evaluate, manage and use relevant information in a range of media.
- 2) Use internet-based learning and web-based data on business statistics; and
- 3) Apply cooperative learning method and Problem-Based Learning (PBL) in business statistics.

#### **4.3 Assessment & evaluation strategies**

- 1) Performance Assessment (on-site)
- 2) System log (online/on-demand)

- 3) Project work, group report and presentation.

## 5. Numerical Analysis, Communication, and Information Technology Skills

### 5.1 Learning outcomes to be developed

- 1) Able to develop instructional materials in mathematics using The Geometer's Sketchpad and/or other program including AR/AI.;
- 2) Able to apply knowledge from website incorporate with dynamic software in teaching primary and secondary mathematical problem solving;
- 3) Able to present well-reasoned arguments using technology as appropriate.

### 5.2 Teaching strategies

- 1) Using problem-based learning research-based learning and internet-based learning to enhance students' thinking skills.
- 2) Using dynamic mathematics software such as the Geometer's Sketchpad and/or other program including AR/AI;
- 3) Encourage the students to develop their higher thinking skills and providing diversity environments for students to construct and implement their knowledge.

### 5.3 Assessment and evaluation strategies

- 1) Using rubrics for complex authentic task;
- 2) Using formative and summative tests; and
- 3) Using individual portfolio, project work, group report and presentation.

**Remark:** Symbol ● means “major responsibility”

Symbol ○ means “minor responsibility”

No symbol means “no responsibility”

During of pandemic of COVID -19, teaching strategies may be changed by using Massive Open Online Courses (MOOC) prepared by lecturers and/or other educational organization.

## 6. Learning Management

## Section 5 - Lesson Plan and Assessment

### 1. Lesson plan

| No. | Topic/Outline  | Teaching-Learning Model | Program/Teaching Strategies   | Content Management  | Assessment  |
|-----|--|-------------------------|---|---|---|
| 1   | <ul style="list-style-type: none"> <li>Course Outline</li> <li>Pretest</li> <li>Learning styles</li> </ul>   | Onsite/Online           | Room 2011/<br>Google Meet   | <ul style="list-style-type: none"> <li>GSP</li> <li>PowerPoint</li> <li>YouTube</li> <li>VDO</li> </ul>             | <ul style="list-style-type: none"> <li>Attendance Record</li> <li>Moodle</li> <li>Pretest</li> </ul>                    |
| 2   | <ul style="list-style-type: none"> <li>Learning difficulties and misconception;</li> <li>Methods of teaching secondary mathematics</li> </ul>                | Onsite/Online           | Room 2011/<br>Google Meet   | <ul style="list-style-type: none"> <li>GSP</li> <li>PowerPoint</li> <li>Lecture Notes</li> <li>Worksheet</li> </ul> | <ul style="list-style-type: none"> <li>Attendance Record</li> <li>Moodle</li> <li>System log - Quiz</li> </ul>          |
| 3-4 | <ul style="list-style-type: none"> <li>Cooperative learning</li> <li>Collaborative learning</li> </ul>   | Onsite/Online           | Room 2011/<br>Google Meet   | <ul style="list-style-type: none"> <li>GSP</li> <li>PowerPoint</li> <li>Lecture Notes</li> <li>Worksheet</li> </ul> | <ul style="list-style-type: none"> <li>Attendance Record</li> <li>Moodle</li> <li>System log - Quiz</li> </ul>          |
| 5   | <ul style="list-style-type: none"> <li>Higher order thinking skills in 21st Century;</li> </ul>  | Online/<br>On Demand    | Room 2011/<br>Google Meet<br><br><a href="http://www.elic.ssrु.ac.th/">http://www.elic.ssrุ.ac.th/</a>  | <ul style="list-style-type: none"> <li>GSP</li> <li>Lecture Notes</li> <li>Worksheet</li> </ul>                     | <ul style="list-style-type: none"> <li>Attendance Record</li> <li>Moodle</li> <li>System log - Quiz</li> </ul>          |
| 6.  | <ul style="list-style-type: none"> <li>Flipped classroom;</li> </ul>   | Online/<br>On Demand    | Room 2011/<br>Google Meet<br><br><a href="http://www.elic.ssrุ.ac.th/">http://www.elic.ssrุ.ac.th/</a>  | <ul style="list-style-type: none"> <li>GSP</li> <li>Lecture Notes</li> <li>Worksheet</li> </ul>                     | <ul style="list-style-type: none"> <li>Attendance Record</li> <li>Moodle</li> <li>Quiz</li> </ul>                       |
| 7.  | <ul style="list-style-type: none"> <li>Massive Open Online Course (MOOC) in mathematics</li> <li><b>Project Work Assignments &amp; Activities</b></li> </ul> | Online/<br>On Demand    | <ul style="list-style-type: none"> <li>Room 2011/</li> <li>Google Meet</li> <li>Google Meet</li> </ul><br><a href="http://www.elic.ssrุ.ac.th/">http://www.elic.ssrุ.ac.th/</a> | <ul style="list-style-type: none"> <li>GSP</li> <li>Lecture Notes</li> <li>Worksheet</li> <li>Moodle</li> </ul>     | <ul style="list-style-type: none"> <li>Attendance Record</li> <li>Moodle</li> <li>System log</li> <li>- Quiz</li> </ul> |
| 8.  | <ul style="list-style-type: none"> <li><b>Mid - Term Test</b></li> <li><b>Project Work</b></li> </ul>  | Online/<br>On Demand    | Google Meet<br><br><a href="http://www.elic.ssrุ.ac.th/">http://www.elic.ssrุ.ac.th/</a>  | <ul style="list-style-type: none"> <li>GSP</li> <li>Lecture Notes</li> <li>Worksheet</li> <li>Moodle</li> </ul>     | <ul style="list-style-type: none"> <li>Moodle</li> <li>Quiz</li> </ul>  |



| No.   | Topic/Outline   | Teaching-Learning Model          | Program/Teaching Strategies  | Content Management  | Assessment  |
|-------|---|----------------------------------|--|---|---|
|       | <b>Assignments &amp; Activities</b>   |                                  |  |   |   |
| 9.-10 | <ul style="list-style-type: none"> <li>Advanced level of using The Geometer's Sketchpad;</li> <li>Handheld technology;</li> </ul> | Online                           | Room 2011/<br>Google Meet  | <ul style="list-style-type: none"> <li>GSP</li> <li>Lecture Notes</li> <li>Worksheet</li> <li>Moodle</li> </ul> | <ul style="list-style-type: none"> <li>Attendance Record</li> <li>Moodle</li> <li>System log</li> <li>- Quiz</li> </ul>                     |
| 11    | <ul style="list-style-type: none"> <li>Augmented Reality (AR) and blended learning through smartphone</li> </ul>                  | Online/<br>On Demand             | Room 2011/<br>Google Meet<br><a href="http://www.elic.ssruc.ac.th/">http://www.elic.ssruc.ac.th/</a> | <ul style="list-style-type: none"> <li>GSP</li> <li>Lecture Notes</li> <li>Worksheet</li> <li>Moodle</li> </ul> | <ul style="list-style-type: none"> <li>Attendance Record</li> <li>Moodle</li> <li>System log</li> <li>- Quiz</li> <li>Assignment</li> </ul> |
| 13-14 | <ul style="list-style-type: none"> <li>Problem based learning</li> <li>Project based learning;</li> </ul>                         | Online/<br>On Demand/<br>On site | Room 2011/<br>Google Meet<br><a href="http://www.elic.ssruc.ac.th/">http://www.elic.ssruc.ac.th/</a> | <ul style="list-style-type: none"> <li>GSP</li> <li>Lecture Notes</li> <li>Worksheet</li> <li>Moodle</li> </ul> | <ul style="list-style-type: none"> <li>Attendance Record</li> <li>Moodle</li> <li>Work assignment</li> </ul>                                |
| 15    | <ul style="list-style-type: none"> <li>Assessment and action research in secondary mathematics classroom.</li> </ul>              | Online/<br>On Demand             | Room 2011/<br>Google Meet<br><a href="http://www.elic.ssruc.ac.th/">http://www.elic.ssruc.ac.th/</a> | <ul style="list-style-type: none"> <li>GSP</li> <li>Lecture Notes</li> <li>Worksheet</li> </ul>                 | <ul style="list-style-type: none"> <li>Attendance Record</li> <li>System log</li> <li>Assignment</li> </ul>                                 |
| 16    | <ul style="list-style-type: none"> <li>Students' Project Work Assignments &amp; Activities</li> </ul>                             |                                  | Room 2011/<br>Google Meet<br><a href="http://www.elic.ssruc.ac.th/">http://www.elic.ssruc.ac.th/</a> | <ul style="list-style-type: none"> <li>GSP</li> <li>Lecture Notes</li> <li>Worksheet</li> </ul>                 |   |
| 17.   | <b>Final Examination</b>  |                                  |  |   |   |

**Note:** Lesson plan might be affected by the COVID-19 pandemic.

## 2. Learning assessment plan

| Learning Outcomes   | Assessment Activities  | Schedule (Week)              | Proportion for Assessment (%) |
|---|--|------------------------------|-------------------------------|
| 1.1, 1.2, 1.3<br>2.1, 2.2, 2.3,<br>4.1, 4.2, 4.3<br>5.1, 5.3<br>6.1, 6.2, 6.3 | 1) Attendance record<br>2) Performance Assessment (on-site/online)<br>3) System log (online/on-demand)<br>4) Quiz                              | 1, 3, 5, 7, 9,<br>11, 13, 15 | 40                            |
| 2.2, 2.3, 5.2   | Examination  | 17                           | 30                            |
| 3.1, 3.2, 3.3<br>4.1, 4.2, 4.3,<br>5.1, 5.2, 5.3<br>6.1, 6.2, 6.3             | 1) Criteria for assignment<br>2) Self-and peer assessments<br>3) Using group report and presentation<br>4) Using formative and summative tests | 2, 4, 6, 10,<br>12, 14       | 30                            |

## Section 6 – Learning and Teaching Resources

### 1. Textbook and main documents

(1) Dynamic Software Program: The Geometer’s Sketchpad

(2) Textbook:

Bergmann, J. & Sams, A. (2012). *Flip Your Classroom: Reach Every Student in Every Class Every Day*. ISTE: International Society for Technology in Education.

Khairiree, K. (2018). *Flipped classroom and the geometer’s sketchpad: students’ investigation-a square peg in a round hole*. International College, Suan Sunandha Rajabhat University, Bangkok, Thailand.

Khairiree, K. & Tran Vui. (2021). *Discovering Mathematics: Mathematical Problem Solving Approach 1-6*. Bangkok: Pada Education Publication.

Krulik, S. (2008). *Problem Solving Strategies for Efficient and Elegant Solutions Grades 6-12: A Resource for the mathematics Teacher*. California: Corwin Press. A SAGE Company, U.S.A.

(3) Course materials provided by the lecturers

### 2. Important documents for extra study

Documents suggested by the lecturers

### 3. Suggested information (Printing Materials/Website/CD/Others)

Information retrieved from search engines (e.g., Google) and online videos

## **Section 7 - Course Evaluation and Revising**

### **1. Strategies for course evaluation by students**

Using a questionnaire to collect students' opinions to improve the course and enhance the curriculum. Sample questions:

- (1) The Learning Management System (e.g. Moodle & Google Classroom) and social media platforms (e.g. Facebook & Line) are useful and provide accessibility to learners. Other online learning tools such as Kahoot! and Quizizz are also fun to interact with.
- (2) Online contents are highly accessible and have better quality comparing with printed materials.
- (3) With the Learning Management System used, students can follow up with the course and check their learning progress.
- (4) Students can contact the lecturer easily using the internal messaging system, feedback system, and social networking.
- (5) As this course is skill-focused, students have mathematical knowledge and skills useful to students' studying and future jobs.

..... etc. ....

### **2. Strategies for course evaluation by the lecturer**

The lecturer observes the class and determine if:

- 1) The lecturer is well prepared for class sessions.
- 2) The lecturer answers questions carefully and completely.
- 3) The lecturer uses examples to make the materials easy to understand.
- 4) The lecturer stimulated interest in the course.
- 5) The lecturer made the course material interesting.
- 6) The lecturer is knowledgeable about the topics presented in this course.
- 7) The lecturer treats students respectfully.
- 8) The lecturer is fair in dealing with students.
- 9) The lecturer makes students feel comfortable about asking question.
- 10) Course assignments are interesting and stimulating.
- 11) The lecturer's use of technology enhanced learning in the classroom.

..... etc. ....

### **3. Teaching revision**

The lecturer revises the teaching and learning process based on the results from the questionnaire results.

### **4. Feedback for achievement standards**

CHM administrator committees monitor the assessment process and grading.

### **5. Methodology and planning for course review and improvement**

- 1) Revise and develop course structure and process every two years.
- 2) Assign different lecturers to teach this course to enhance students' vision.

### Curriculum Mapping Illustrating the Distribution of Program Standard Learning Outcomes to Course Level

| Courses   | 1. Morals and Ethics   |   |   | 2. Knowledge |   |   | 3. Cognitive Skills |   |   | 4. Interpersonal Skills and Responsibility |   |   | 5. Numerical Analysis, Communication and Information Technology Skills |   |   |
|---|------------------------|---|---|--------------|---|---|---------------------|---|---|--|---|---|--|---|---|
|   | ● Major Responsibility |   |   |              |   |   |                     |   |   | ○ Minor Responsibility                     |   |   |  |   |   |
| Course Category:<br>Requirement Course<br>Major Required Course | 1                      | 2 | 3 | 1            | 2 | 3 | 1                   | 2 | 3 | 1  | 2 | 3 | 1  | 2 | 3 |
| BMA2303 Mathematical Problem Solving                            | ●                      | ○ | ○ | ●            | ● | ○ | ○                   | ● | ○ | ○  | ● | ○ | ○  | ● | ○ |

**Remark:** Symbol ● means “major responsibility”

Symbol ○ means “minor responsibility”

No symbol means “no responsibility”

Expected learning outcomes are combined for all types of instructional activities.