



Bachelor's Degree

Master's Degree

## Course Specification

Course Code: MTP5108

Course Title : Innovations in Teaching Mathematics

Credits : 3(2-2-5)

Program: Master of Arts Program in Mathematics Education  
(International Program)

International College  
Suan Sunandha Rajabhat University  
(SSRUIC)

Semester : 2

Academic Year : 2017

# Content

<b>Section</b>		<b>Pages</b>
Section 1	General Information	2
Section 2	Aims and Objectives	3
Section 3	Characteristics and Operations	5
Section 4	Developing Student's Learning Outcomes	6
Section 5	Lesson Plan and Assessment	11
Section 6	Learning and Teaching Resources	18
Section 7	Course Evaluation and Improvement	19

## Section 1 General Information

### 1. Code and Course Title :

Course Code: MTP5108

Course Title (English): Innovations in Teaching Mathematics

Course Title (Thai): นวัตกรรมในการสอนคณิตศาสตร์

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

### 3. Curriculum and Course Category :

3.1 Curriculum: Master of Arts Program in Mathematics Education  
(International Program)

3.2 Course Category:

General Education

Required Course

Elective Course

*Cluster in International  
Teaching Profession*

### 4. Lecturer Responsible for Course and Instructional Course

Lecturer (s) :

4.1 Lecturer Responsible for Course:

Assoc.Prof.Chaweewan Kaewsaiha

4.2 Instructional Course Lecturer(s):

(1) Asst. Prof. Dr.Krongthong Khairiree

(2) Asst.Prof. Dr. Junchai Yingprayoon

(3) Assoc. Prof. Chaweewan Kaewsaiha

### 5. Contact/Get in Touch

Building Number 21

Room Number 2121

Tel. 081-484-4361

E-mail chaweewan.ka@ssru.ac.th

## **6. Semester/ Year of Study**

6.1 Semester: 2 Year of Study: 1

6.2 Number of the students enrolled: 3

## **7. Prerequisite Course**

None

## **8. Co-requisite Course :**

None

## **9. Learning Location**

Building Number : 21

Friday 9.00 – 12.00 Room No. 2122

## **10. Last Date for Preparing and Revising this Course:**

November 10, 2017

# **Section 2 Aims and Objectives**

## **1. Course Aims**

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

### **1.1 Morals and Ethics to be developed:**

- (1) Have integrity, honesty and teaching profession ethics;
- (2) Have discipline, self and social responsibility;
- (3) Have awareness of actions affect other people.

### **1.2 Knowledge to be acquired:**

- (1) Be able to compile courses to create innovation and technology for teaching mathematics.
- (2) Be able to design an innovation and technology in teaching appropriate to the learners' ages.

- (3) Be able to select, develop and produce learning materials to promote learning.

### **1.3 Cognitive Skills to be developed:**

- (1) Be able to organize activities that using innovation and technology to promote learning.
- (2) Be able to manage learning resources and classroom environment for learning with innovation and technology.
- (3) Be able to support new approach to innovative learning centered on the development of 21<sup>st</sup> Century.

### **1.4 Interpersonal Skills and Responsibility to be developed:**

- (1) Have responsibility for assignment: select ideas in education from different theoretical perspectives, application to standards.
- (2) Be able to work in team both as leader or follower.
- (3) Be able to develop innovation approach related to application in mathematics.

### **1.5 Numerical Analysis, Communication and Information**

#### **Technology Skills to be developed:**

- (1) Be able to apply numerical analysis to interpret and critically assess data involves innovation and technological research.
- (2) Be able to use innovative methods in teaching mathematical communication skills.
- (3) Have information technology skills on searching a particular topic related to mathematics education.

### **1.6 Learning Management Skills to be developed:**

- (1) Be able to use different types of ICT and innovation to maximize concepts, skills and processes in learning;
- (2) Be able to plan, implement and evaluate learning in an ICT assisted curriculum and innovation in mathematics;
- (3) Be able to acquire effective and usable skills in managing ICT assisted classrooms and innovation for quality learning.

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

According to TQF (Thailand Quality Framework: HEd.) and the Institute for the Promotion of Teaching Science and Technology (IPST) with the ICT curriculum standards implementation guide, graduate students program in mathematics education should have essence of knowledge and competencies in ICT include the following components:

- Fundamental Concepts of Information Technology
- Computer Assisted Task Creation
- Assessment Tools
- Internet and Web Creation
- Hardware, Software, and Computer Network
- Algorithm and Problem Solving Tools

## **Section 3 Characteristics and Operations**

### **1. Course Outline**

Information Technology for Communication, Development of innovation in mathematics education; the use of dynamic software program in mathematics; designing and developing mathematics instruction at secondary mathematics for e-learning and computer tablet.

เทคโนโลยีสารสนเทศเพื่อการสื่อสาร การพัฒนานวัตกรรมในคณิตศาสตร์ศึกษา การใช้โปรแกรมพลวัตทางคณิตศาสตร์ การออกแบบและการพัฒนาการสอนคณิตศาสตร์ระดับมัธยมศึกษา สำหรับการเรียนรู้บทเรียนออนไลน์และแท็บเล็ตคอมพิวเตอร์

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

Lecture	Practice/ Field Work/Internship	Self Study	Remedial Class
32 hours	32	90 hours	3+ (if any)

## 3. Time Length per Week for Individual Academic

### Consulting and Guidance

3.1 Self consulting at the lecturer's office: Building 21 Room 2121  
Suan Sunandha Rajabhat University

3.2 Consulting via office telephone: Tel. 02-160-1200 or lecturer's  
mobile phone: Tel. 081-484-4361

3.3 Consulting via E-Mail: [chaweewan.ka@ssru.ac.th](mailto:chaweewan.ka@ssru.ac.th)

## Section 4 Developing Student's Learning Outcomes

According to TQF (Thailand Quality Framework: HEd.) and the Teachers' Council of Thailand with the standards of professional knowledge and experience for requirement courses, graduate students program in mathematics education should have essence of knowledge in educational innovation and information technology as follows:

- (1) Educational concept, theory, technology and innovation that promote the learning quality development;
- (2) Technology and Information;
- (3) Analysis of problems arising from use of technology and information innovation;

(4) Learning sources and network;

(5) Innovation design, creation, implementation, evaluation and improvement;

(6) Information technology for teachers

At the end of this course, the student will reach to six domains by applying the following teaching strategies and assessments:

### **1.1 Morals and Ethics to be developed**

○	(1) Have integrity, honesty and teaching profession ethics;
○	(2) Have discipline, self and social responsibility;
●	(3) Have awareness of actions affect other people.

### **1.2 Teaching Strategies**

(1) Encourage the students to have integrity, honesty, and discipline such as unselfishness and self-control.

(2) Train the students to have good characteristics with the teaching profession morals and ethics.

### **1.3 Assessment Strategies**

(1) Authentic Assessment

(2) Performance Assessment

## **2. Knowledge**

### **2.1 Knowledge to be acquired:**

- (1) Be able to compile courses to create innovation and technology for teaching mathematics;
- (2) Be able to design an innovation and technology in teaching appropriate to the learners' ages;



- (3) Be able to select, develop and produce learning materials to promote learning.

## **2.2 Teaching Strategies**

(1) Using brainstorming to encourage students generate a large number of ideas and using higher order thinking skills.

(2) Using problem-based learning, research-based learning, and computer-based learning to enhance students' knowledge.

## **2.3 Assessment Strategies**

(1) Using rubrics for complex authentic task

(2) Using formative and summative tests

(3) Using report writing and presentation

## **3. Cognitive Skills**

### **3.1 Cognitive Skills to be developed:**

- (1) Be able to organize activities that using innovation and technology to promote learning;
- (2) Be able to manage learning resources and classroom environment for learning with innovation and technology;
- (3) Be able to support new approach to innovative learning centered on the development of 21<sup>st</sup> Century.

### **3.2 Teaching Strategies**

(1) Encourage the students develop their higher thinking skills such as providing diversity environments for students to construct and implement their knowledge.

(2) Using problem-based learning, research-based learning, and computer-based learning to enhance student's thinking skills.

### **3.3 Assessment Strategies**

(1) Using rubrics for complex procedures of problem solving

(2) Using formative and summative tests

(3) Using report writing and presentation

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

### **4.1 Interpersonal Skills and Responsibilities to be developed:**

- (1) Have responsibility for assignment: select ideas in education from different theoretical perspectives, application to standards;
- (2) Be able to work in team both as leader or follower;
- (3) Be able to develop innovation approach related to application in mathematics.

### **4.2 Teaching Strategies**

(1) Using cooperative learning through interpersonal communication and interaction.

(2) Demonstrate the ability to apply appropriate interpersonal and teamwork skills in a variety of learning environments.

(3) Using problem-based learning, research-based learning, and computer-based learning to enhance students' experiences for further development their learning.

### **4.3 Assessment Strategies**

- (1) Using personality assessments
- (2) Using rubrics for group work
- (3) Using report writing and presentation

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

### **5.1 Numerical Analysis, Communication and Information Technology to be developed:**

- (1) Be able to apply numerical analysis to interpret and critically assess data involves innovation and technological research;
- (2) Be able to use innovative methods in teaching mathematical communication skills;
- (3) Have information technology skills on searching a particular topic related to mathematics education.

## **5.2 Teaching Strategies**

- (1) Using problem-based learning
- (2) Using computer-based learning

## **5.3 Assessment Strategies**

- (1) Using interviewing and observation
- (2) Using authentic task assessment
- (3) Using report writing and presentation

# **6. Learning Management Skills**

## **6.1 Learning Management Skills to be developed:**

- (1) Be able to use different types of ICT and innovation to maximize concepts, skills and processes in learning;
- (2) Be able to plan, implement and evaluate learning in an ICT assisted curriculum and innovation in mathematics;
- (3) Be able to acquire effective and usable skills in managing ICT assisted classrooms and innovation for quality learning.

## **6.2 Teaching Strategies**

- (1) Using real world situation for ICT and innovation within the classroom.
- (2) Using innovation approaches to reduce anxiety and negativity attitude in learning.
- (3) Using research-based learning to investigate the appropriate innovative in learning to prevent problems and promote optimal learning.

### 6.3 Assessment Strategies

- (1) Using authentic task assessment
- (2) Using report writing and presentation

**Remark:** Symbol ● means ‘major responsibility’

Symbol ○ means ‘minor responsibility’

## Section 5 Lesson Plan and Assessment

### 1. Lesson Plan

Week	Topic/Outline	Hours	Learning Activities and Medias
1	<b>Unit 1</b> Information and communication technology in education	4	<ol style="list-style-type: none"> <li>1. Demonstration using information communication technology in mathematics classroom.</li> <li>2. Students work with a small group to discuss about the importance of information and communication technology</li> </ol>
2	<b>Unit 2</b> Development of innovation in mathematics education	8	<ol style="list-style-type: none"> <li>1. Introduce types of innovation in mathematics classroom.</li> <li>2. Students work with a small group to discuss about the benefit of using innovation in mathematics classroom.</li> </ol>

<b>Week</b>	<b>Topic/Outline</b>	<b>Hours</b>	<b>Learning Activities and Medias</b>
3-5	<p><b>Unit 3</b> Dynamic software program in mathematics</p> <ul style="list-style-type: none"> <li>- GSP</li> <li>- Geo Gebra</li> <li>- etc.</li> </ul>	12	<ol style="list-style-type: none"> <li>1. Introduce and practice the dynamic software in mathematics classroom;</li> <li>2. Students work with a small group to practice on techniques for using the GSP in learning mathematical concepts.</li> </ol>
6-8	<p><b>Unit 4</b> Technology assisted in teaching mathematics</p> <ul style="list-style-type: none"> <li>- Cloud computing</li> <li>- QR Code</li> <li>- Augmented Reality</li> <li>- Virtual Reality</li> </ul>	12	<ol style="list-style-type: none"> <li>1. Introduce technology assisted in teaching mathematics;</li> <li>2. Students work with a small group to practice on technology assisted in teaching mathematics.</li> </ol>
9-11	<p><b>Unit 5</b> Online and blended learning</p> <ul style="list-style-type: none"> <li>- Virtual Learning Environment (VLE)</li> <li>- Web-based and Mobile Learning</li> <li>- Learning Management System (LMS) and Course Management System (CMS)</li> </ul>	12	<ol style="list-style-type: none"> <li>1. Introduce online and blended learning;</li> <li>2. Students work with a small group to design and develop mathematics instruction at secondary mathematics for e-learning, computer tablet and blended learning.</li> </ol>

<b>Week</b>	<b>Topic/Outline</b>	<b>Hours</b>	<b>Learning Activities and Medias</b>
12-13	<b>Unit 6</b> Problem-Based learning and Inquiry-based learning	8	<ol style="list-style-type: none"> <li>1. Introduce problem-based learning and inquiry-based learning in mathematics.</li> <li>2. Students discuss about how to establish project using problem-based learning and inquiry-based learning.</li> </ol>
14-16	<b>Unit 7</b> Research synthesis on using innovation and technology		Each student chooses one topic in innovation in mathematics education (e.g. e-learning, social media as a learning tool, Artificial Intelligence, Virtual Reality, ...), find 5 research articles, conclude their methodologies (participants, context, implementation, ...) and findings, compare advantages/disadvantages/debates, create a synthesis matrix and/or a concept map.
17	<b>Final Examination</b>	3	<b>Paper-Test</b>
<b>Total of Hours</b>		62+	<b>Extra hours for independence study</b>

## 2. Learning Assessment Plan

<b>Learning Outcomes</b>	<b>Assessment Activities</b>	<b>Time Schedule (Week)</b>	<b>Proportion for Assessment (%)</b>
<p><b>1. Ethics and Morals</b></p> <p>(1) Have integrity, honesty and teaching profession ethics;                      (2) Have discipline, self and social responsibility;                      (3) Have awareness of actions affect other people.</p>	<p>(1) Authentic Assessment                      (2) Performance Assessment</p>	<p>Throughout semester</p>	<p>5 %</p>
<p><b>2. Knowledge</b></p> <p>(1) Be able to compile courses to create innovation and technology for teaching mathematics.                      (2) Be able to design an innovation and technology in teaching appropriate to the learners' ages.                      (3) Be able to select, develop and produce learning materials to promote learning.</p>	<p>(1) Using rubrics for complex authentic task                      (2) Using formative and summative tests                      (3) Using report writing and presentation</p>	<p>Throughout semester</p>	<p>40 %</p>

<b>Learning Outcomes</b>	<b>Assessment Activities</b>	<b>Time Schedule (Week)</b>	<b>Proportion for Assessment (%)</b>
<p><b>3. Cognitive Skills</b></p> <p>(1) Be able to organize activities that using innovation and technology to promote learning.</p> <p>(2) Be able to manage learning resources and classroom environment for learning with innovation and technology.</p> <p>(3) Be able to support new approach to innovative.</p>	<p>(1) Using rubrics for complex procedures of problem solving</p> <p>(2) Using formative and summative tests</p> <p>(3) Using report writing and presentation</p>	<p>Throughout semester</p>	<p>30 %</p>
<p><b>4. Interpersonal Skills and Responsibilities</b></p> <p>(1) Have responsibility for assignment: select ideas in education from different theoretical perspectives, application to standards.</p>	<p>(1) Using personality assessments</p> <p>(2) Using rubrics for group work</p> <p>(3) Using report writing and presentation</p>	<p>Throughout semester</p>	<p>5 %</p>



<b>Learning Outcomes</b>	<b>Assessment Activities</b>	<b>Time Schedule (Week)</b>	<b>Proportion for Assessment (%)</b>
<p>(2) Be able to work in team both as leader or follower.</p> <p>(3) Be able to develop innovation approach related to application in mathematics.</p>			
<p><b>5. Numerical Analysis, Communication and Information Technology Skills</b></p> <p>(1) Be able to apply numerical analysis to interpret and critically assess data involves innovation and technological research.</p> <p>(2) Be able to use innovative methods in teaching mathematical communication skills.</p>	<p>(1) Using interviewing and observation</p> <p>(2) Using authentic task assessment</p> <p>(3) Using report writing and presentation</p>	<p>Throughout semester</p>	<p>10 %</p>

<b>Learning Outcomes</b>	<b>Assessment Activities</b>	<b>Time Schedule (Week)</b>	<b>Proportion for Assessment (%)</b>
(3) Have information technology skills on searching a particular topic related to mathematics education			
<p><b>6. Learning Management Skills</b></p> <p>(1) Be able to use different types of ICT and innovation to maximize concepts, skills and processes in learning;</p> <p>(2) Be able to plan, implement and evaluate learning in an ICT assisted curriculum and innovation in mathematics;</p> <p>(3) Be able to acquire effective and usable skills in managing ICT assisted classrooms and innovation for quality learning.</p>	<p>(1) Using authentic task assessment</p> <p>(2) Using report writing and presentation</p>	<p>Throughout semester</p>	<p>10 %</p>

## **Section 6 Learning and Teaching Resources**

### **1. Textbook and Main Documents**

Morrison G.R. & Lowther, D.L. (2005). Integrated computer technology into classroom. N.J., Pearson Education, Inc.

### **2. Important Documents for Extra Study**

*National Educational Technology Standards (NETS) for Students: Connecting curriculum and technology.* (2000). Eugene, OR: International Society for Technology in Education in cooperation with the U.S. Department of Education.

### **3. Suggestion Information (Printing Materials/Website/CD/Others)**

Keywords for searching : innovation and technology in mathematics

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

### **1. Strategies for Course Evaluation by Students**

Using survey questions to collect information from the students' opinions to improve the course and enhance the curriculum. Examples of questions:

- (1) Content objectives were made clear to the students.
  - (2) The content was organized around the objectives.
  - (3) Content was sufficiently integrated.
  - (4) Content was sufficiently integrated with the rest of the first year curriculum.
  - (5) The instructional materials used were effectively.
  - (6) The learning methods appropriate assessed the students' understanding of the content.
  - (7) Overall, Students are satisfied with the quality of this course
- ..... etc. ....

### **2. Strategies for Course Evaluation by Lecturer**

2.1 Lecturers team observe the class and discuss the results as

follow:

- (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 assignment are interesting and stimulating.
  - (11) The lecturer's use of technology enhanced learning in the classroom.
- ..... etc. ....

1.2 The director / head of program construct assessment items to

evaluate four dimensions of lecturer's competencies : teaching skills, organization and presentation of materials, management of the learning environment, and teaching attitudes.

### **3. Teaching Revision**

Lecturer revises teaching / learning process based on the results from the students' survey questions, the lecturer team's observation, and classroom research.

### **4. Feedback for Achievement Standards**

International College Administrator Committee monitor to 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 teach this course to enhance students' performance.

*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			6. Learning Management Skills			
Course Category: Requirement Course-- Teaching Profession Core Course	● Major Responsibility									○ Minor Responsibility									
Course Code: MTP5108 Course Title: Innovation in Teaching Mathematics	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
	○	○	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●