



TQF.3 Course Specification

Course Code : MME5201

Course Title: Discovering Geometry with Technology

Credits: 3(1-2-3)

Semester /Academic Year : 1/2016

Students : Master of Arts Program in Mathematics Education

Lecturers : Asst.Prof.Dr.Krongthong Khairiree

Asst.Prof.Dr. Supotch Chaiyasang

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Section 1 General Information

1. Code and Course Title:MME5201Discovering Geometry with Technology

2. Credits:3(1-2-3)

3. Curriculum and Course Category :

This course of Master of Arts ,International College, SSRU is categorized in *Mathematics Major Elective Course*.

4. Lecturers:

Asst.Prof.Dr.Krongthong Khairiree

Asst.Prof. Dr. Supotch Supotch Chaiyasang

5. Year / Semester

Graduate Student Year 1 / Semester 1/2016

6. Prerequisite Course

None

7. Co-requisite Course :

None

8. Learning Location

Building Number :21

Wednesday 9.00 – 12.00; Room No. 2122

9. Last Date for Preparing and Revising this Course:

May 15, 2013

Section 2 Objectives and Purposes

1. Course Objectives

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

- (1) Able to explain precise geometric structures: definitions, postulates, logical reasoning, and theorems;
- (2) Able to verify experimentally structures and implications of Euclidean , non-Euclidean geometries and analytic geometry;
- (3) Able to use technologies for formulating and testing conjectures about the concepts, properties and attributes of two-dimensional and three-dimensional geometric figures;
- (4) Able to prove theorems and solve problems involving geometric theorems.

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

According to Thailand Quality Framework: HEd. (TQF), the Institute for the Promotion of Teaching Science and Technology (IPST) 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 and competencies in major subjects and using technology for learning.

Section 3 Course Structure

1. Course Outline

Geometric structure: definitions, postulates, logical reasoning, and theorems; Structures and Implications of Euclidean and non-Euclidean geometries; Technologies for formulating and testing conjectures about the concepts, properties and attributes of two-dimensional and three-dimensional geometric figures. Computer applications are included as teaching materials.

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

Lecture	Practice/ Field Work/Internship	Self Study	Remedial Class
16 hours	32 hours	48 hours	3+ (if any)

3. Time Length per Week for Individual Academic Consulting and Guidance

3 hour / week

Section 4 Developing Student’s Learning Outcomes

Learning Standards/Outcomes	Learning Activities	Learning Assessment
1. Ethics and Morals To have ethic and moral behavior (personal responsibility , corporate responsibility)	Work in group to discuss on using copyright technology in learning geometry.	- Group discussion - Report

Learning Standards/Outcomes	Learning Activities	Learning Assessment
<p>2. Knowledge</p> <p>2.1 Able to explain precise geometric structures: definitions, postulates, logical reasoning, and theorems.</p> <p>2.2 Able to prove theorems and solve problems involving geometric theorems.</p>	<p>1. Introduce the geometric structures.</p> <p>2. Compare and contrast among Euclidean geometry and non-Euclidean Geometry</p> <p>3. Have the students develop their plans to prove theorems and solve problem.</p>	<p>1. Term papers</p> <p>2. Group report presentation</p>
<p>3. Cognitive Skills</p> <p>3.1 Have ability to search for knowledge : research on using technology for teaching and learning geometry .</p> <p>3.2 Have analytical thinking : analyze geometry strands in mathematics curriculum and sources of pedagogy in teaching and learning geometry with technology.</p>	<p>1. Use research-based learning and internet-based learning to construct cognitive skills in learning geometry.</p> <p>2. Discussion and presentation of research findings – students write reports, and other forms of work documentation to include in their portfolios or oral presentation their findings from discussion / searching information.</p>	<p>1. Individual portfolio</p> <p>2. Term papers</p> <p>3. Group report presentation</p>
<p>4. Interpersonal Skills and Responsibilities</p> <p>4.1 Have responsibility for assignment : select technology from different sources</p>	<p>1. Use research-based learning and internet-based learning on using copyright technology for learning and teaching geometry.</p>	<p>1. Term papers</p> <p>2. Group report presentation</p>

Learning Standards/Outcomes	Learning Activities	Learning Assessment
<p>to design materials for learning and teaching geometry.</p> <p>4.2 Can adjust to work in team both as leader or follower.</p>	<p>2. Students work in group of five. They plan to use PBL technique to search information demonstrate interpersonal skills and responsibility in a variety of assignments.</p>	
<p>5. Numerical Analysis, Communication and Information Technology Skills</p> <p>5.1 Have statistical and mathematical skills to present research finding on using technology in learning and teaching geometry.</p> <p>5.2 Can use correct language in oral and written presentations.</p> <p>5.3 Can use computer and IT to discover geometric concepts and conjectures.</p>	<p>1. Use research-based learning and internet-based learning to analyze technology imply to geometry class.</p> <p>2. Students work in group of five. They plan to use technology to communicate pedagogy content knowledge (PCK) in geometry class and present their report both in oral and written.</p>	<p>1. Individual portfolio</p> <p>2. Term papers</p> <p>3. Group report presentation</p>
<p>6. Learning Management Skills</p> <p>6.1 Be able to design learning activities within the context of a unit of geometry and real world.</p>	<p>1. Use basic techniques for integration of contents for learner-oriented learning management.</p> <p>2. Discussion and presentation of development of geometric</p>	

Learning Standards/Outcomes	Learning Activities	Learning Assessment
6.2 Be able to develop the learners with essential opportunities to enhance learning concepts and motivate active engagement in geometrical process for problem solving.	theory and research on the learning of geometry, development of geometric thinking and knowledge in school and other settings.	<ol style="list-style-type: none"> 1. Individual portfolio 2. Term papers 3. Group report presentation

Section 5 Lesson Plan and Assessment

1. Lesson Plan

Week	Topic/Outline	Hours	Learning Activities and Medias
1-2 19/06/13 26/06/13	Unit 1 Geometric Structures	6	<ol style="list-style-type: none"> 1. Introduce geometric structures and using the Geometer's Sketchpad (GSP) to visualize geometric definition. 2. Students work with a group of five to discuss about using GSP to verify geometric concepts and theorems. 3. Make geometric constructions using GSP.

Week	Topic/Outline	Hours	Learning Activities and Medias
<p>3-4 3/07/13 10/07/13</p>	<p>Unit 2 Congruence : Experiment with Transformations in the Plane</p>	<p>6</p>	<ol style="list-style-type: none"> 1. Introduce definition of congruence in terms of rigid motions to transform figures and to predict the effect of a given rigid motion by using GSP. 2. Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions by using GSP. 3. Prove geometric theorems about lines and angles, triangles, and parallelograms. 4. Group discussion about PCK in teaching this unit, design and develop activity using technology.
<p>5-6 17/07/13 24/07/13</p>	<p>Unit 3 Similarity, Right Triangles, and Trigonometry</p>	<p>6</p>	<ol style="list-style-type: none"> 1. Introduce similarity in terms of similarity transformations by using GSP. 2. Define trigonometric ratios and solve problems involving right triangles by using GSP. 3. Apply trigonometry to general triangles by using GSP. 4. Group discussion about PCK in teaching this unit,

Week	Topic/Outline	Hours	Learning Activities and Medias
			design and develop activity using technology.
7 (31/07/13)	Midterm		Paper-Test
8-9 7/08/13 14/08/13	Unit 4 Circle	6	<ol style="list-style-type: none"> 1. Identify and describe relationships among the components of a circle by using GSP. 2. Prove theorems about circles and apply theorems about circles. 3. Group discussion about PCK in teaching this unit, design and develop activity using technology.
10-11 21/08/13 28/08/13	Unit 5 Geometric Dimensions ,Measurement , and Analytic Geometry	6	<ol style="list-style-type: none"> 1. Identify and describe geometric dimension. 2. Explain volume formulas and use them to solve problems. 3. Group discussion about PCK in teaching this unit, design and develop activity using technology.

Week	Topic/Outline	Hours	Learning Activities and Medias
12-14 4/09/13 11/09/13 18/09/13	Unit 6 Explore Euclidean and non-Euclidean Geometry	9	1. Activities for exploring: Cevian Triangles, Anticevian Triangles, Perspective Triangles, Pedal Triangles, Antipedal Triangles, Transformations Geometry, Hyperbolic Geometry. 2. Group discussion about project designs for this unit, design and develop activity using technology.
15 25/09/13	Presentation	3	Group Presentation
16 2/10/13	Final Examination	3	Paper-Test
Total of Hours		48	

Remark :Reserve 1 – 2 weeks for searching related topics.

2. Learning Assessment Plan

Learning Outcomes	Assessment Activities	Time Schedule (Week)	Proportion for Assessment (%)
<p>1. Ethics and Morals</p> <p>To have ethicand moral behavior (personal responsibility , corporate responsibility)</p>	<p>1.Individual portfolio</p> <p>2.Group discussion</p>	<p>Through out semester</p>	<p>5 %</p>
<p>2. Knowledge</p> <p>2.1 Able to explain precise geometric structures: definitions, postulates, logical reasoning, and theorems.</p> <p>2.2 Able to prove theorems and solve problems involving geometric theorems.</p>	<p>1.Term papers</p> <p>2.Group report presentation</p>	<p>Through out semester</p>	<p>40 %</p>
<p>3. Cognitive Skills</p> <p>3.1 Have ability to search for knowledge : research on using technology for teaching and learning geometry .</p>	<p>1. Individual portfolio</p> <p>2. Term papers</p> <p>3. Group report presentation</p>	<p>Through out semester</p>	<p>30 %</p>

Learning Outcomes	Assessment Activities	Time Schedule (Week)	Proportion for Assessment (%)
3.2 Have analytical thinking : analyze geometry strands in mathematics curriculum and sources of pedagogy in teaching and learning geometry with technology.			
<p>4. Interpersonal Skills and Responsibilities</p> <p>4.1 Have responsibility for assignment : select technology from different sources to design materials for learning and teaching geometry.</p> <p>4.2 Can adjust to work in team both as leader or follower.</p>	<p>1. Checklists</p> <p>2. Interviews</p>	Through out semester	5 %
<p>5. Numerical Analysis, Communication and Information Technology Skills</p> <p>5.1 Have statistical and mathematical skills to present research finding on using technology in learning and teaching geometry.</p>	<p>1. Individual portfolio</p> <p>2. Term papers</p> <p>3. Group report presentation</p>	Through out semester	10 %

Learning Outcomes	Assessment Activities	Time Schedule (Week)	Proportion for Assessment (%)
<p>5.2 Can use correct language in oral and written presentations.</p> <p>5.3 Can use computer and IT to discover geometric concepts and conjectures.</p>			
<p>6. Learning Management Skills</p> <p>6.1 Be able to design learning activities within the context of a unit of geometry and real world.</p> <p>6.2 Be able to develop the learners with essential opportunities to enhance learning concepts and motivate active engagement in geometrical process for problem solving.</p>	<p>1. Individual portfolio</p> <p>2. Term papers</p> <p>3. Group report presentation</p>	<p>Through out semester</p>	<p>10 %</p>

Section 6 Learning and Teaching Resources

1. Textbook and Main Documents

Kimberling, Clark (2003). **Geometry in action: A discovery approach using the Geometer's Sketchpad**. New York: Key College Publishing.

2. Important Documents for Extra Study

ยุพิน พิพิธกุลและอุษณีย์ สิริวัฒน์ . (2004). **เรขาคณิต(โครงการตำราวิทยาศาสตร์และคณิตศาสตร์มูลนิธิ สอวน)**. กรุงเทพมหานคร: บริษัทด้านสุทธาการพิมพ์ จำกัด.

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

Posamentier, A.F. (2002). **Advanced Euclidean geometry: Excursions for secondary teachers and students**.New York: Key College Publishing.

Reynolds, B.E. & Fenton, W.E. (2006).**College geometry: Using the Geometer's Sketchpad**. New York: Key College Publishing.

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.

2.2 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.