TQF.3

| ☑ Bachelor's Degree |
| ☐ Master's Degree |

TQF. 3 Course Specification

Course Code: BMA3303

Course Title: Digital for STEM Learning

Credits: 3(2-2-5)

Program: Bachelor of Education Program in Mathematics

(Bilingual Program)

Semester: 1   **Academic Yea**r: 2024

College of Hospitality Industry Management

Suan Sunandha Rajabhat University

(CHM, SSRU)

Content

Section 1 General Information

1. **Code and Course Title:**

   Course Code: BMA3303

   Course Title (English): Digital for STEM Learning

   ชื่อวิชา (ภาษาไทย): ดิจิทัลเพื่อการเรียนรู้สะเต็ม

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

3. **Curriculum and Course Category:**

   3.1 Curriculum: Bachelor of Education Program in Mathematics

   3.2 Course Category:

   ☐ General Education   ☑ Required Course

   ☐ Elective Course   ☐ Cluster in Teaching Profession

4. Lecturers Responsible for Course and Instruction

   4.1 Lecturer Responsible for the course:

   Asst.Prof. Dr. Krongthong Khairiree

   and   Mr. Luechai Tiprungsri

   4.2 Instructional Course Lecturers:

   (1) Asst.Prof. Dr. Krongthong Khairiree

   (2) Mr. Luechai Tiprungsri

5. Contact / Get in Touch:

   Room Number 305   Tel. 034-964946 Ext. 321

   E-mail: Luechai.ti@ssru.ac.th

6. Semester / Year of Study

   6.1 Semester: 1/2024   Year of Study: Undergraduate Student

Year 2

   6.2 Number of students enrolled: 20

7. Prerequisite Course

     None

8. Co-requisite Course

     None

9. Learning Location

     College of Hospitality Industry Management Building, Nakorn Pathom Campus

     Room No. 308 and 211

     Thursday   1.00 – 4.00   pm

10. Last Date for Preparing and Revising this Course:

     April 29, 2024

Section 2 Aims and Objectives

1. Course Aims

At the end of this course students will reach the desired learning outcomes based on six domains, as mentioned in the curriculum specification (TQF2), as follows:

1.1 Morals and Ethics

(1) Have integrity, honesty, and teaching profession ethics.

(2) Have discipline, self, and social responsibility.

(3) Have knowledge and understanding of educational law.

1.2 Knowledge

(1) Be able to use the basic knowledge of mathematical concept, theory, and technology that promote the learning quality development in mathematics;

(2) Be able to apply factual knowledge, conceptual knowledge, procedural knowledge, and metacognitive knowledge to solve mathematics problems.

(3) Be able to use accurate content and demonstrate the new ways of learning in mathematics.

1.3 Cognitive Skills

(1) Be able to organize activities that promote learning and using creativity and thinking tools in mathematics.

(2) Be able to use multiple learning resources and network in mathematics.

(3) Be able to prepare innovation design, creation, implementation, evaluation, and improvement in mathematics.

1.4 Interpersonal Skills and Responsibility

(1) Have responsibility for building positive attitude towards using technology in mathematics.

(2) Have knowledge and understanding of human relations to work in a team both as a leader and follower;

(3) Be able to identify problems and seek the best solutions to strengthen teachers' potentiality and capabilities in academic and professional careers.

1.5 Numerical Analysis, Communication, and Information Technology Skills

(1) Be able to apply numerical analysis in problem-solving.

(2) Have concepts, principles, and theories of information communication technology that promote the learning quality.

(3) Be able to design, create, implement, and evaluate information technology for the improvement learning environment based on education quality.

1.6 Learning Management Skills

(1) Be able to design learning activities and learning environments for learner development.

(2) Be able to provide the learners with essential opportunities to enhance learning concepts and motivate active engagement in the mathematical process for problem solving through technology.

(3) Be able to locate a variety of learning resources to promote the learning by learners.

2. Course Objectives

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

(1) Able to apply digital technology and AI application in STEM Education.

(2) Able to use Dynamic geometry software; Simulations; Virtual/augmented reality software in the classroom;

(3) Able to apply Python basics for data science; and

(4) Able to create projects in STEM Education, multimedia presentations, and games.

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

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

(1) To provide additional opportunities for learners to see and interact with mathematical concepts.

(2) To explore and make discoveries with simulations, digital tools and web-based graphing calculator.

(3) Analysis of problems arising from the use of technology and information innovation.

Section 3 Course Structure

1. Course Outline

Introduction to STEM Education; Interdisciplinary approach to integrate STEM into practice; Tools for creating multimedia presentations and games; Python basics for data science; Dynamic geometry software; Simulations; Virtual/augmented reality software; Learning management systems and other teaching software.

ความรู้เบื้องต้นเกี่ยวกับสะเต็มศึกษา วิธีบูรณาการแบบสหวิทยาการในการบูรณาการสะเต็ม
กับการปฏิบัติ เครื่องมือในการสร้างสรรค์การนำเสนอสื่อผสมและเกม โปรแกรมภาษาไพธอนพื้นฐาน
ของวิทยาการข้อมูล ซอฟต์แวร์เรขาคณิตพลวัต สถานการณ์จำลอง ซอฟต์แวร์สำหรับภาพเสมือนจริง
ระบบการจัดการเรียนรู้และซอฟต์แวร์การสอนอื่น ๆ

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

Lecture	Practice/ Field Work/Internship	Self-Study	Remedial Class
32 hours	32 hours	80 hours	3+ (if any)

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

3.1 Self consulting at the lecturer's office: Room Number 305

3.2 Consulting via office telephone: Tel. 034-964946 Ext. 321 or lecturer's mobile phone: Mr. Luechai Tiprungsri Tel. 081-972-5793

3.3 Consulting via E-Mail: luechai.ti@ssru.ac.th   and krongthong.kh@ssru.ac.th

Section 4 Developing Student's Learning Outcomes

Learning Standards/Outcomes	Learning Activities	Learning Assessment
1. Morals and Ethics (1) Have integrity, honesty, and teaching professional ethics. (2) Have discipline, self, and social responsibility. (3) Have knowledge and understanding of educational law	- Demonstration - Group Work	Group discussion Report
2. Knowledge (1) Be able to use the basic knowledge of mathematical concept, theory, and technology that promote the learning quality development in mathematics. (2) Be able to apply factual knowledge, conceptual knowledge, procedural knowledge, and metacognitive knowledge to solve mathematics problems. (3) Be able to use accurate content and demonstrate the	1. Introduce the technology in learning matrice 2. Have the students develop their plans to establish vectors using technology	1. Term papers 2. Group report presentation

Learning Standards/Outcomes	Learning Activities	Learning Assessment
new ways of learning in mathematics.		
3. Cognitive Skills (1) Be able to organize activities that promote learning and using creativity and thinking tools in mathematics. (2) Be able to use multiple learning resources and network in mathematics. (3) Be able to prepare innovation design, creation, implementation, evaluation, and improvement in mathematics.	1. Use problem-based learning and internet-based learning to construct cognitive skills in solving applied System of Linear Equation 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	1. Individual portfolio 2. Term papers 3. Group report presentation
4. Interpersonal Skills and Responsibilities (1) Have responsibility for building positive attitude towards using technology in mathematics. (2) Have knowledge and understanding of human	1. Use research-based learning and internet-based learning on issues in using technology impact on students' achievement in learning Linear Algebra 2. Students work in small group. They plan	1. Term papers 2. Group report presentation

Learning Standards/Outcomes	Learning Activities	Learning Assessment
relations to work in team both as leader or follower; (3) Be able to identify problems and seek best solutions to strengthen teachers' potentiality and capabilities in academic and professional career.	to use innovation and technology ethically.	
5. Numerical Analysis, Communication and Information Technology Skills (1) Be able to apply numerical analysis in problem solving. (2) Have concepts, principles, and theories of technology and innovation that promote the learning quality. (3) Be able to design, create, implement, and evaluate innovation for improvement learning environment based on education quality.	1. Use research-based learning and internet-based learning to analyze contents about using technology in learning Linear Algebra 2. Students work in small group. They plan to use technology to learn Linear Algebra topics and present their report both in oral and written.	1. Individual portfolio 2. Term papers 3. Group report presentation

Learning Standards/Outcomes	Learning Activities	Learning Assessment
6. Learning Management Skills (1) Be able to design learning activities and learning environments for learner's development. (2) Be able to provide the learners with essential opportunities to enhance learning concepts and motivate active engagement in mathematical process for problem solving through technology. (3) Be able to locate a variety of learning resources to promote the learning by learners.	Discussion and presentation of learning and teaching with technology and research on development of mathematical thinking and knowledge in math class	1. Individual portfolio 2. Term papers 3. Group report presentation

Section 5 Lesson Plan and Assessment

1. Lesson Plan (Summer Course)

Week	Topic/Outline	Hours	Learning Activities and Medias
1	**Course Introduction** - Course outlines - Grading criteria Pretest **Chapter 1**: Introduction to Digital for STEM Learning and Introduction to STEM Education	4	1. Introduce course description 2. Pre-test 3. Students work with a small group to discuss about the importance of. Digital for STEM Learning and Introduction to STEM Education.
2 - 3	**Chapter 2** STEM and STEM Education	8	1. Introduce the concepts of STEM 2. Students work with a small group to discuss about the importance of STEM and STEM Education.
4 - 5	**Chapter 3**: Interdisciplinary approach to integrating STEM into practice	8	1. Introduce concepts and principles of Interdisciplinary approach to integrate STEM into practice 2. Students work with a small group to discuss and create an Interdisciplinary approach to integrate STEM into practice using the GSP software.

Week	Topic/Outline	Hours	Learning Activities and Medias
6-7	**Chapter 4**: Tools for creating multimedia presentations and games	4	Introduce concepts and principles of the Interdisciplinary approach to integrate Tools for creating multimedia presentations and games 2. Students work with a small group to discuss and create Interdisciplinary approach to Tools for creating multimedia presentations and games into practice using the GSP software.
8	**Mid-Term Examination,** **Project Works assignment**	3	**Paper-Test**
9-11	**Chapter 5**: Python basics for data science	12	1. Introduce concepts and principles of Python basics for data science 2. Students work with a small group to discuss and create Python basics for data science.
12- 14	**Chapter 6**: Dynamic geometry software; Simulations; Virtual/augmented reality software	12	1. Introduce concepts and principles of Dynamic geometry software; Simulations; Virtual/augmented reality software

Week	Topic/Outline	Hours	Learning Activities and Medias
			2. Students work with a small group to discuss and create Dynamic geometry software; Simulations; Virtual/augmented reality software
15 - 16	**Chapter 7**: Learning management systems and other teaching software	8	1. Introduce concepts and principles of Learning management systems and other teaching software 2. Students work with a small group to discuss and create Learning management systems and other teaching software
17	**Final Examination**	3	**Paper-Test**
	Total of Hours	64+	**Extra hours for independence study**

2. Learning Assessment Plan

Learning Outcomes	Assessment Activities	Time Schedule (Week)	Proportion for Assessment (%)
1. Morals and Ethics (1) Have integrity, honesty and teaching profession ethics; (2) Have discipline, self and social responsibility; (3) Have knowledge and understanding of educational law.	1. Individual portfolio 2. Group discussion	Throughout semester	5 %
2. Knowledge (1) Be able to use the basic knowledge of mathematical concept, theory, and technology that promote the learning quality development in mathematics; (2) Be able to apply factual knowledge, conceptual knowledge, procedural knowledge	1. Assignments 2. Group activities and presentation	Throughout semester	40 %

Learning Outcomes	Assessment Activities	Time Schedule (Week)	Proportion for Assessment (%)
and metacognitive knowledge to solve mathematics problems; (3) Be able to use accurate content and demonstrate the new ways of learning in mathematics.			
3. Cognitive Skills (1) Be able to organize activities that promote learning and using creativity and thinking tools in mathematics; (2) Be able to use multiple learning resources and network in mathematics; (3) Be able to prepare innovation design, creation, implementation, evaluation, and	1. Individual portfolio 2. Assignments 3. Group presentation	Throughout semester	30 %

Learning Outcomes	Assessment Activities	Time Schedule (Week)	Proportion for Assessment (%)
improvement in mathematics.			
4. Interpersonal Skills and Responsibilities (1) Have responsibility for building positive attitude towards using technology in mathematics; (2) Have knowledge and understanding of human relations to work in team both as leader or follower; (3) Be able to identify problems and seek best solutions to strengthen teachers' potentiality and capabilities in academic and professional career.	1. Checklists 2. Interviews	Throughout semester	5 %

Learning Outcomes	Assessment Activities	Time Schedule (Week)	Proportion for Assessment (%)
5. Numerical Analysis, Communication and Information Technology Skills (1) Be able to apply numerical analysis in problem solving; (2) Have concepts, principles, and theories of technology and innovation that promote the learning quality; (3) Be able to design, create, implement, and evaluate innovation for improvement learning environment based on education quality.	1. Individual portfolio 2. Assignments 3. Group presentation	Throughout semester	10 %
6. Learning Management Skills (1) Be able to design learning activities and learning environments	1. Individual portfolio 2. Assignments 3. Group presentation	Throughout semester	10 %

Learning Outcomes	Assessment Activities	Time Schedule (Week)	Proportion for Assessment (%)
for learner's development; (2) Be able to provide the learners with essential opportunities to enhance learning concepts and motivate active engagement in mathematical process for problem solving through technology; (3) Be able to locate a variety of learning resources to promote the learning by learners.			

Section 6 Learning and Teaching Resources

1. Textbook and Main Documents

2. Important Documents for Extra Study

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

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 effective.

(6) The learning methods appropriate assessed the students' understanding of the content.

(7) Overall, Students are satisfied with the quality of this course.

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.

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

College of Hospitality Industry Management Administrator Committee monitors 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 to 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:	● **Major Responsibility**									○ **Minor Responsibility**								
Elective Course	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Course Code: BMA3303 Course Title: Digital for STEM Education	●	○	○	○	●	●	○	●	○	●	●	○	●	○	○	○	○	○

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.