**Course Specification**

**Course Code:** BMA 2405

**Course Title:**

 Introduction to Real Analysis

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

**Programs:** Mathematics

TQF. 3

 Bachelor’s Degree

 Master’s Degree

**Semester:**  1 **Academic Year:** 2024

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

**Section 1 - General Information**

**1. Course code and course title**

Course code: BMA2405

 Course title (English): Introduction to Real Analysis

**2. Credits**

3(3-0-6)

**3. Curriculum and course category**

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

Course Category:

 General Education  Required Course

 Elective Course  Others: …………….

**4. Lecturer**

Lecturer responsible for this course: Asst. Prof. Supotch Chaiyasang

Instructional course lecturers: Asst. Prof. Supotch Chaiyasang

**5. Contact**

Room Number: 305 Tel.: 081-480-0821 Email: supc5987@hotmail.com

**6. Semester/Academic year**

Semester: 1 Academic Year: 2024, Thursday 9:00 AM – 12.00 PM, Room# 301

Number of enrolled students: 19

**7. Pre-requisite course**

Calculus II

**8. Co-requisite course**

None

**9. Learning center**

CHM Building, Nakhon-Pathom Campus

**10. Last date for preparing and revising this course**

December 2022

**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**

**Learning outcomes to be developed**

1) Have acting with respect to rules of agreement in mathematics.

2) Have integrity, honesty, and teaching profession ethics.

3) Have discipline, self, and social responsibility.

**1.2 Knowledge**

**Learning outcomes to be developed**

1) Be able to comply knowledge accordance with the standards of Basic Education Core

Curriculum B.E.2008 (Revision 2017) in Mathematics.

2) Have strong mathematical content knowledge and pedagogical content knowledge

needed to support students’ learning.

3) Have knowledge and understanding principles and concepts of calculus.

**1.3 Cognitive skills**

**Learning outcomes to be developed**

1) Be able to provide solutions for problems involving types of models and operations.

2) Be able to develop and demonstrate critical thinking to connect between various calculus topics and between calculus and other application areas.

3) Be able to identify and use mathematical representations to model and interpret concepts and principles for problem solving and proof reasonably.

**1.4 Interpersonal skills and responsibility**

**Learning outcomes to be developed**

1) Have responsibility for building positive attitude towards calculus.

2) Be able to work collaboratively and demonstrate to be a good leader and a good follower.

3) Be able to strengthen teachers’ potentiality and capabilities in teaching calculus.

**1.5 Numerical analysis, communication, and information technology skills**

**Learning outcomes to be developed**

1) Have concepts, principles, and theories of technology and innovation that promote learning quality development.

2) Be able to apply mathematical processes and skills in solving problems.

3) Be able to design, create, implement, and evaluate innovation for improvement mathematics classroom environment.

**1.6 Learning Management Skills**

**Learning outcomes to be developed**

1) Be able to design learning activities and learning environments within the context of a unit of learning and real world.

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

3) Be able to develop the learning materials to engage students’ learning.

**2. Objectives for developing/revising course (Content/Learning Process/Assessment/ etc.)**

Using the Framework for the 21st Century Learning process, students learn to integrate supportive technologies (i.e., Online Learning), inquiry-and problem-based learning instructional approaches, and higher order thinking.

**Section 3 - Characteristics and Operations**

**1. Course description**

(English) The Real numbers, sequences and series, limits, continuous, differentiation and the riemann integral

**2. Time length per semester (Lecture/Practice/Self-study hours)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Lecture** | **Practice**/**Field Work**/**Internship** | **Self-Study** | **Remedial Class** |
| 3 hours/week | 6 hours/week | 1 hour/week(If any) |

**3. Individual consulting and guidance**

**Self-consulting at the lecturer’s office**:

Room Number 305, CHM Building, Nakhon-Pathom Campus

Mon., 9 AM – 4 PM

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

081-4800-821

**Consulting via email**:

Supc5987@hotmail.com

**Consulting via social media platform (Facebook/Twitter/Line)**: None

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

-

**Section 4 - Developing Students’ 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) Have acting with respect to rules of agreement in mathematics. |
| ○ | 2) Have integrity, honesty, and teaching profession ethics. |
| ○ | 3) Have discipline, self, and social responsibility. |

**1.2 Teaching strategies**

1) Train the students to have characteristics of good problem solvers with confidence, potential, and challenge.

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

**1.3 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**

**2**

|  |  |
| --- | --- |
| ○ | 1) Be able to comply knowledge accordance with the standards of Basic Education CoreCurriculum B.E.2008 (Revision 2017) in Mathematics |
| ● | 2) Have strong mathematical content knowledge and pedagogical content knowledgeneeded to support students’ learning. |
| ●**.2** | 3) Have knowledge and understanding principles and concepts of calculus.**Teaching strategies**1) Using brainstorming to encourage students generate many ideas and using higher order thinking. |

2) Using problem-based learning, research-based learning, and computer-based learning

to enhance students’ knowledge.

**2.3 Assessment & evaluation strategies**

1) Using rubrics for complex authentic task

2) Using formative and summative tests

3) Using mathematics tasks and presentation

**3. Cognitive skills**

**3.1 Learning outcomes to be developed**

|  |  |
| --- | --- |
| ○ | 1) Be able to provide solutions for problems involving types of models and operations. |
| ● | 2) Be able to develop and demonstrate critical thinking to connect between variouscalculus topics and between calculus and other application areas. |
| ● | 3) Be able to identify and use mathematical representations to model and interpretconcepts and principles for problem solving and proof reasonably. |

**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 students’ thinking skills.

**3.3 Assessment & evaluation strategies**

1) Using rubrics for complex authentic task

2) Using formative and summative tests

3) Using mathematics tasks and presentation

**4. Interpersonal skills and responsibilities**

**4.1 Learning outcomes to be developed**

|  |  |
| --- | --- |
| ○ | 1) Have responsibility for building positive attitude towards calculus. |
| ○ | 2) Be able to work collaboratively and demonstrate to be a good leader and a goodfollower. |
| ○ | 3) Be able to strengthen teachers’ potentiality and capabilities in teaching calculus. |

**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 environment.

3) Using problem-based learning, research-based learning to enhance students’

experiences for further development their learning.

**4.3 Assessment & evaluation strategies**

1) Performance Assessment (on-site)

2) System log (online/on-demand)

3) 360-degree assessment

**5. Numerical analysis, communication, and information technology skills**

**5.1 Learning outcomes to be developed**

|  |  |
| --- | --- |
| ○ | 1) Have concepts, principles, and theories of technology and innovation that promotelearning quality development. |
| ● | 2) Be able to apply mathematical processes and skills in solving problems. |
| ○ | 3) Be able to design, create, implement, and evaluate innovation for improvementmathematics classroom environment. |

**5.2 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 students’ thinking skills.

**5.3 Assessment & evaluation strategies**

1) Using rubrics for complex authentic task

2) Using formative and summative tests

3) Using mathematics tasks and presentation

**6. Learning Management Skills**

**6.1 Learning outcomes to be developed**

|  |  |
| --- | --- |
| ○ | 1) Be able to design learning activities and learning environments within the context ofa unit of learning and real world. |
| ○ | 2) Be able to provide the learners with essential opportunities to enhance learningconcepts and motivate active learning in mathematical process for problem solving. |
| ○ | 3) Be able to develop the learning materials to engage students’ learning. |

**6.2 Teaching Strategies**

1) Using real world problems within the mathematics classroom.

2) Using dynamic mathematics tools to reduce mathematics anxiety and negativity attitude.

**6.3 Assessment & evaluation strategies**

1) Using rubric for group work

2) Using assignment task and presentation **Remark:** Symbol ● means “major responsibility” Symbol ○ means “minor responsibility”

No symbol means “no responsibility”

During of outbreak of COVID-19, teaching strategies may be changed by using Massive

Open Online Courses prepared by lecturers and/or other educational organization.

**Section 5 - Lesson Plan and Assessment**

**1. Lesson plan**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Week** | **Topic/Outline** | **Teaching- Learning Model** | **Program/Teaching****Strategies** | **Content****Management** | **Assessment** |
| 1 | **Course Introduction**- Course outlines- Grading criteria**Chapter 1**: Field and ordered property of R | On site |  | - PowerPoint- YouTube VDO | - AttendanceRecord- System log |
| 2 | **Chapter 1 (Cont.)**: Axon of Completeness and applications | On site |  | - PowerPoint- YouTube VDO- Lecture Notes- Worksheet | - AttendanceRecord- System log- Quiz |
| 3 - 4 | **Chapter 2**: sequences and series, convergent and divergent of infinite series | On site |  | - PowerPoint- YouTube VDO- Lecture Notes- Worksheet | - AttendanceRecord- System log- Quiz |
| 5 - 7 | **Chapter 3**: limits of functions and limit theorems | On site |  | - PowerPoint- YouTube VDO- Lecture Notes- Worksheet | - AttendanceRecord- System log- Quiz |
| 8 | **Mid-term examination (On-site)** |
| 9 - 11 | **Chapter 4**: continuous functions uniform continuity, monotone functions | On site |  | - PowerPoint- YouTube VDO- Lecture Notes- Worksheet | - AttendanceRecord- System log- Quiz |
| 12 - 14 | **Chapter 5**: differentiation, derivative, mean-value theorem, Taylors’s theorem | On site |  | - PowerPoint- YouTube VDO- Lecture Notes | - AttendanceRecord- System log |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Week** | **Topic/Outline** | **Teaching- Learning Model** | **Program/Teaching****Strategies** | **Content****Management** | **Assessment** |
|  |  |  |  | - Worksheet- GSP | - Assignment |
| 15 - 16 | **Chapter 6**: Riemann integral, the fundamental theorem, the darboux integral  | On site |  | - PowerPoint- YouTube VDO- Lecture Notes- Worksheet- GSP | - AttendanceRecord- System log- Assignment |
| 17 | **Final Examination** |

**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, 1.32.1, 2.2, 2.3,4.1, 4.2, 4.35.1, 5.36.1, 6.2, 6.3 | 1) Attendance record2) Performance Assessment (on- site/online)3) System log (online/on-demand)4) Quiz | 1, 3, 5, 7, 9,11, 13, 15 | 40 |
| 2.2, 2.3, 5.2 | Examination | 17 | 30 |
| 3.1, 3.2, 3.34.1, 4.2, 4.3,5.1, 5.2, 5.36.1, 6.2, 6.3 | 1) Criteria for assignment2) Self-and peer assessments3) 360-degree assessment | 2, 4, 6, 10,12, 14 | 30 |

**Section 6 - Learning and Teaching Resources**

**1. Textbook and main documents**

• Bartle R.G. and Sherbert D.R. (2010) Introduce to Real Analysis, Jhon Wiley & Sons, Inc.

• 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 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.

Vision: Smart Archetype University of the Society

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

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Courses | 1. Morals andEthics |  | 2. Knowledge | 3. CognitiveSkills | 4. InterpersonalSkills and Responsibility | 5. Numerical Analysis, Communication and Information Technology Skills | 6. Learning Management Skills |  |
| Course Category: Requirement Course— | **1** | **2** |  **Major Responsibility**  **Minor Responsibility****3 1 2 3 1 2 3 1 2 3 1 2 3 1** | **2** | **3** |
| Major Required Course |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Course Code: MMA2301Course Title: Calculus I |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

**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.

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