Course Specification

Name of institution Mahidol University

Campus/faculty/department Salaya Campus/International College/Science Division

Section 1 General Information

1. Course code and course title

Thai ICMA 321 พีชคณิตเชิงเส้น

English ICMA 321 Linear Algebra

2. Number of credit 4(4-0-8)

(Lecture 4 hours/laboratory 0 hour/self study 8 hours/week)

3. Curriculum and type of subject

3.1 Curriculum Offered in Bachelor of Science Program in Applied Mathematics

3.2 Type of subject Required Major Course

4. Responsible faculty member Dr. Pornrat Ruengrot

5. Trimester / year of study

5.1 Trimester 2^{nd} Trimester of every academic year.

5.2 Number of students 5-30 students

6. Pre-requisites -

7. Co-requisites -

8. Venue of study Mahidol University, Salaya campus

9. Date of latest revision December 2014

Section 2 Goals and Objectives

1. Goals

After successful completion of this course, students will be able to:

- solve system of linear equations by using matrices and determinants
- understand the concept of vector spaces, subspaces, basis, rank, etc
- apply knowledge of linear algebra to related disciplines

2. Objectives of development/revision

To revise course in order to be up-to-date and relevant to the current situation

Section 3 Course Management

1. Course descriptions

เมทริกซ์ ดีเทอร์มิแนนต์ สมการเชิงเส้น ระบบสมการเชิงเส้น ปริภูมิเวกเตอร์ การแปลงเชิงเส้น ค่าลักษณะเฉพาะ และเวกเตอร์ลักษณะเฉพาะ ปริภูมิผลคูณภายใน

Matrices, determinants, linear equations, system of linear equations, vector spaces, linear transformations, eigenvalues and eigenvectors, inner product spaces.

2. Credit hours / trimester

Lecture	Additional class	Laboratory / field trip/ internship	Self study
44 hours (4 hours x 11 weeks)	-	-	88 hours (8 hours x 11 weeks)

3. Number of hours that the lecture provides individual counseling and guidance

2 hours/week

Section 4 Development of Students' Learning Outcome

1. Expected outcome on students' skill and knowledge

- The ability to solve system of linear equations by using matrices and determinants
- The ability to explain the concept of vector spaces, subspaces, basis, rank, etc
- The ability to apply knowledge of linear algebra to related disciplines

2. Teaching methods

1. Lecture
2. Worksheets
3. Homework
4. Self-study

3. Evaluation methods

1. Morality and Ethics

1.1 Expected outcome on morality and ethics

- - To posses morality and ethics.
- - To have self-discipline, honesty, kindness, self- responsible and social responsibility
- - To demonstrate academic ethical behavior
- - To respect others' rights and be a good listener
- - To respect rules and regulations
- - To have good attitude toward professors/career
- - To demonstrate Leadership, team player

1.2 Teaching methods

Learning Centered Education: Emphasis on knowledge development, important skills in career development and living, encourage students to use their full potentials

- Lecture
- Case studies with past experiences and current events
- Emphasis on morality and ethics
- Group discussion
- Group assignment

1.3Evaluation methods

- Written examination
- Presentation
- Class attendance, class participation and behavior in class
- On-time submission of reports and assignments and their quality

2.Knowledge development

2.1Expected outcome on knowledge development

- - To posses basic knowledge, theories and concepts towards the understanding of self, society, surrounding in order to be well-rounded person
- - To process the knowledge related to principles, theories and practice in the course
- - To integrate the knowledge to other related subjects
- - To remain current in research and new knowledge

2.2 Teaching methods

Learning Centered Education: Emphasis on knowledge development, important skills in career development and living, encourage students to use their full potentials

- Lecture
- Group discussion
- Group assignment

2.3 Evaluation methods

- Written examination
- Presentation
- Class attendance, class participation and behavior in class
- On-time submission of reports and assignments and their quality

3. Intellectual development

3.1 Expected outcome on intellectual development

- - To have systematic and analytical thinking
- - To be able to search, consolidate and evaluate ideas and evidence for problem solving
- - To be able to apply knowledge and experience to analyze and creatively solve problems both in general and academic

3.2 Teaching methods

- Real experience teaching and encourage on skill development besides the professional skill
- Project assignment and presentation
- Analysis of case studies

3.3 Evaluation methods

- Presentation of knowledge synthesis
- Class attendance, class participation and behavior in class
- On-time submission of reports and assignment and their quality

4. Interpersonal relationship and responsibility

4.1 Expected outcome on Interpersonal relationship and responsibility

- - To posses good interpersonal relationship skills (self esteem and dignity) and have respect for the rights and value of others
- - To possess leadership and initiative in problem solving
- - To be constructive team member (in various roles) and be responsible for assignment tasks, professional and society

4.2 Teaching methods

- Group participation in case studies
- Assignment of group and individual reports
- Encourage real-life experience and current events in teaching

4.3 Evaluation methods

- Written examination
- Presentation
- Class attendance, class participation and behavior in class
- On-time submission of reports and assignments and their quality

5. Mathematical analytical thinking, communication skills, and information technology skills

5.1 Expected outcome on mathematical analytical thinking, communication skills, and information technology skills

- -To be able to select and apply appropriate statistical and mathematical methods to research problems
- - To be able to apply information technology for data gathering, processing, interpreting and presenting information/results
- - To have the ability to communicate effectively and select appropriate methods of presentation

5.2 Teaching methods

- Lecture and group discussion of cases studies
- Activity in class
- Assignment for searching from website, e-learning and report with emphasis on mathematical numbers and statistics from reliable source

5.3 Evaluation methods

- Group discussion
- Practical presentation in class
- Reports and presentation using information technology
- Practical in group discussion

Section 5 Teaching and Evaluation Plans

1. Teaching plan

Week	Topic	Hours	Teaching methods/ multimedia	Instructor
1-2	Matrices, determinants	8	Interactive lecture and activity	
3-4	Linear equations and system of linear equations, augmented matrices, elementary row	8	Interactive lecture and activity	

	operations.			
5-6	Vector spaces, subspaces, bases and dimension, rank, nullity Test 1	8	Interactive lecture and activity	
7-8	Linear transformations, kernel and range, matrix of a linear transformation	8	Interactive lecture and activity	
9	Eigen values, eigenvectors, diagonalizationTest 2	4	Interactive lecture and activity	
10-11	Inner product spaces, Gram-Schmidt Process.	6	Interactive lecture and activity	
12	Final examination			

2. Evaluation plan

Expected outcomes	Methods / activities	Week	Percentage
(1) to (4)	Attendance	1-11	10
(1) to (5)	Group assignment	1-11	10
(2) to (3)	Examination	12	80 (Midterm: 40; Final: 40)

Section 6 Teaching Materials and Resources

1. Texts and main documents

(1) Kieth Nicholson W. Linear algebra with applications, 7th ed. McGraw-Hill, 2013

(2) Kolman B. Elementary linear algebra. 6 th ed. USA: Prentice Hall; 1996.

(3) Anton H. Elementary linear algebra. 7th ed. USA: John Wiley & Sons Inc; 1994.

2. Documents and important information

Handouts

3. Documents and recommended information

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Section 7 Evaluation and Improvement of Course Management

1 Strategies for effective course evaluation by students

1.1 Evaluation of peers by students

1.2 Student evaluation

- Course content
- Course management

- Suggestions
- Overall opinion

2 Evaluation strategies in teaching methods

2.1 Student evaluation

2.2 Presentation

3 Improvement of teaching methods

Workshop on course improvement with the participation of all lecturers in this course.

4 Evaluation of students' learning outcome

Analysis of students' learning outcomes using scores from class attendance, group activity and presentation of project and poster presentation including quiz and examination.

5 Review and improvement for better outcome

Meeting of lecturers to review the course before semester starts and before each period of teaching.