Module Description/Course Syllabi

Study Programme: Bachelor of Mathematics
Faculty of Mathematics and Natural Sciences
Universitas Andalas

1. *Course number and name*

MAT61214 Capita Selecta Algebra 2

2. *Credits and contact hours/Number of ECTS credits allocated*

3 sks / 4,53 ECTS

3. *Instructors and course coordinator*

1. Monika Rianti Helmi, M.Si

4. *Text book, title, author, and year*

1. Heidergott, B., Older, J. G and Woude, J. 2005. Max Plus at Work. Princeton University press
2. Related articles or publications

5. *Recommended reading and other learning resources/tools*

1. Butkovic, Peter. 2010. Max Linear System : Theory and Algorithm. Springer. New York

6. *Specific course information*

A. Brief description of the content of the course (catalog description)

This course will provide and discuss some basic and important concepts in max-plus algebra theory or
tropical linear algebra. Max-plus algebra or tropical linear algebra is the study of the set of real numbers that

expanded i.e. $R_{max} = \mathbb{R} \cup \{\infty\}$ with two operations defined with a$\oplus b = max\{a, b\}$ and a$\otimes b = a + b$. As for subjects studied include Max-Plus Algebra: definitions and properties. Then introduced the maxplus algebraic upper matrix and the Max-Plus Algebra top semimodule. Furthermore, given the theory of the Max Plus Algebraic set related to solving System of Linear Equations over Max-Plus Algebra, the relation of Matrix Algebra over max-plus algebra with graph theory, and values and eigenvector max-plus. Next, students dissected several articles related to the application of max-plus algebra in network analysis, scheduling and queue analysis.
B. Prerequisites or co-requisites
Elementary Linear Algebra, Algebras Structure, Graph Theory
C. Indicate whether a required or elective course in the program
Elective
D. Level of course unit (according to EQF: first cycle Bachelor, second cycle Master)
First Cycle Bachelor
E. Year of study when the course unit is delivered (if applicable)
4th Year
F. Semester when the course unit is delivered
Odd Semester
G. Mode of delivery (face-to-face, distance learning)
Face to face and distance

7. *Intended Learning Outcomes*
ILO-3 An ability to identify, explain, and generalise simple mathematical **PI-1**: An ability to identify simple mathematical problems **PI-2**: An ability to explain simple mathematical problems
ILO-4 An ability to use concepts and fundamental techniques of mathematics in solving simple mathematical problems **PI-1**: An ability to illustrate simple mathematical problems based on appropriate basic mathematical concepts and techniques
ILO-5 An ability to formally and correctly prove a simple mathematical statements using facts and methods that have been studied **PI-1**: An ability to identify the formal structures and analogy forms in mathematics
ILO-6 Have ability to data literacy and technology and can apply them in solving simple mathematical problems or other relevant fields **PI-1**: Able to identify the right data and technology to solve simple mathematical problems or other fields
ILO-7 An ability to communicate effectively especially in the area of mathematics in with diverse communities **PI-1**: Able to convey ideas or study results orally, especially in the field of mathematics **PI-2**: Able to present ideas or study results in writing, especially in the field of mathematics **PI-3**: Able to respond to feedback given
ILO-8 An ability to work in a team **PI-1**: Able to actively participate in a team with full responsibility **PI-2**: Able to respond well to any feedback within the team **PI-3**: Able to complete tasks according to the set schedule **PI-4**: Able to adapt in a team

8. *Course Learning Outcomes*
1. Students are able to explain matrices, modules, and systems of linear equations over algebra max-plus
2. Students are able to determining the eigenvalues and vectors of a matrix over a max plus algebra
3. Students are able to identify real problems related to vector spaces, inner product spaces, values and eigenvectors, and linear transformations
4. Students are able to choose methods, data, data collection techniques, and basic techniques to solve problems related to vector spaces, inner product spaces, values and eigenvectors, and linear transformations
5. Students are able to use the concepts of vector space, inner product space, value and eigenvector, and linear transformation to solve real problems
6. Students are able to analyze and evaluate research results
7. Students are able to communicate the results of their research orally and in writing according to scientific principles.
8. Students are able to work in teams
9. *Brief list of topics to be covered*
1. Max-Plus Algebra as Semiring, Semi Module 2. Max-Plus Linear Equation System 3. Eigen Max-Plus Values and Vectors 4. Application of Max-Plus Systems of Linear Equations, Matrix Algebra and Graph Theory and Max-Plus Eigenvalues and Vectors on scheduling issues,/queue/transportation
10. Learning and teaching methods
Project Based Learning

11. Language of instruction
Bahasa and English

12. Assessment methods and criteria
1. Mid-test term : 20% 2. Proposal (progress and report) : 20% 3. Presentation : 10% 4. Project (progress and report) : 50%