Module Description/Course Syllabi

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

1. *Course number and name*

MAT61245 Optimal Control

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

3 sks / 4,53 ECTS

3. *Instructors and course coordinator*

1. Prof. Dr. Muhafzan; 2. Budi Rudianto, M.Si

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

1. Naidu, D. S., Optimal Control Systems, CRC Press, 2003.
2. Lewis, F. L., Vrabie, D. L. dan Syrmos, V. L., Optimal Control, 3rd ed. John Wiley & Sons, Inc., New Jersey, 2012

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

S. Anita, V. Arnautu, V. Capasso, An Introduction Optimal Control Problems in Life Sciences and Economics, Birkhauser, London, 2011.

6. *Specific course information*

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

The core of this lecture is to discussion is about the solution of continuous optimal control problems with various forms of boundary conditions, as well as formulating some real problems into continuous optimal control problems. In addition, the linear quadratic optimal control problem is also discussed. Finally, we discuss the Pontryagin principle with respect to problems with control or finite states.

B. Prerequisites or co-requisites
1. MAT61142 Ordinary Differential Equation 2. MAT61122 Calculus III
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

7. *Intended Learning Outcomes*
ILO-1: Possesses a good ethics and integrity PI-2: Able to act in accordance with academic ethics PI-3: Able to act in accordance with academic integrity ILO-2: Possesses profound knowledge of the basic concept mathematics PI-1: An ability to explain the basic concept mathematics PI-3: An ability to determine solution of the simple problems

using the basic concept mathematics

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
- PI-3: An ability to generalise simple mathematical problems

ILO-4: An ability to use concept and fundamental technique of mathematics in solving simple mathematical problems
- PI-1: An ability to illustrate simple mathematical problems based on appropriate basic mathematical concepts and techniques
- PI-3: An ability to solve simple mathematical problems using the proper concept and mathematical fundamental techniques

ILO-5: An ability formally and correctly proves 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
- PI-2: An ability to use fact and apply methods in proving simple mathematical statement
- PI-3: An ability to present simple mathematical statement proof rigorously (sequentially and conscientious)
- PI-4: An ability to conclude or interpret result of the proving simple mathematical statement

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 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 identify optimal control problems and understand the basic concepts, definitions, and classification of optimal control problems.
2. Students are able to identify the existence of optimal control problem solutions and skillfully solve optimal control problems with appropriate methods.
3. Students understand the physical aspects and are able to interpret the solution of optimal control problems

4. Students are able to formulate some real problems into optimal control problems.
5. Students are able to use Matlab application in obtaining optimal control problem solutions
9. *Brief list of topics to be covered*
Optimal control problems in some real phenomena, variational calculus, the ptimal control problems with various forms of boundary conditions, existence of the solution for the optimal control problem, the linear quadratic optimal control problem, use of Matlab software to solve the optimal control problem
10. Learning and teaching methods
Directed Learning, Project-Based Learning
11. Language of instruction
Indonesia and English

12. Assessment methods and criteria
Summative Assessment : 1. Mid-term exam: 20% 2. Final exam: 20% 3. Assignment (home work): 10% 4. Project : 50%