Module Description/Course Syllabi

Study Programme: Mathematics (Master Degree)
Faculty of Mathematics and Natural Sciences
Universitas Andalas

1. *Course number and name*

MAT82141 Dynamic System

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

3/4,53 ECTS

3. *Instructors and course coordinator*

Dr. Arrival Rince Putri
Dr. Muhafzan
Dr. Susila Bahri

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

S. Lynch, *Dynamical Systems with Applications Using Mathematica*, 2nd ed., Springer 2017

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

D. W. Jordan and P. Smith, *Nonlinear Ordinary Differential Equation*, 4th ed., Oxford University Press, 2007

6. *Specific course information*

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

This lecture discusses the qualitative and dynamic aspects of systems of ordinary differential equations. Topics covered include classification of linear systems, existence and uniqueness of solutions to nonlinear initial value problems, continuous dependence on initial values, Hamiltonian systems, local stability, Lyapunov functions, bifurcation, higher order systems and several applications.

B. Prerequisites or corequisites

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C. Indicate whether a required or elective course in the program

Required

D. Level of course unit (according to EQF: first cycle Bachelor, second cycle Master)

Second cycle degree

E. Year of study when the course unit is delivered (if applicable)

1st year

F. Semester when the course unit is delivered

Even semester

G. Mode of delivery (face-to-face, distance learning)

Face to face

7. *Intended Learning Outcomes*

ILO-2: Mastering mathematical concepts and applications (real analysis, advanced linear algebra, and statistics) in solving complex mathematical problems.

PI-1. Possess academic ethics.

PI-2. Demonstrate academic integrity.

ILO-3: Able to master one or several mathematical problems in analysis, algebra, applied mathematics, statistics and combinatorics.

PI-1: Able to identify theories used in related mathematical problems.

PI-2: Able to apply theories for advancement in related fields (advanced theory).

PI-3: Able to use advanced theory to solve related mathematical problems.

ILO-4: Mastering scientific techniques and developing them in solving research problems through multidisciplinary or interdisciplinary approaches.

PI-1: Able to apply mathematical techniques in research problem-solving.

PI-2: Able to analyse research problems.

PI-3: Able to formulate theorems/models and prove their validity.

PI-4: Able to use various mathematical software to solve complex mathematical problems.

ILO-5: Able to work and conduct research in the field of mathematics and related fields of science by developing the latest issues independently or collaboratively and communicating them academically.

PI-1: Capable of formally and correctly proving mathematical statements.

PI-2: Able to employ relevant techniques for conducting research.

PI-3: Capable of communicating research findings in an academic manner.

8. *Course Learning Outcomes*

1. Students are able to analyze the qualitative behavior of linear and nonlinear dynamical systems, which include portraits of local phases, limit cycles, stability and bifurcation.
2. Students are able to use Maple or Matlab applications to describe the qualitative behavior of linear and nonlinear dynamical systems.
3. Students are able to explain physical aspects and interpret phase portraits of systems related to real problems.

9. *Brief list of topics to be covered*

Linear and nonlinear dynamical systems: planar systems and their applications, Cycle limits, Hamiltonian systems and Lyapunov stability, Bifurcation theory

10. Learning and teaching methods

1. Small group discussion
2. Directed learning

11. Language of instruction

Bahasa Indonesia

12. Assessment methods and criteria

Summative Assessment :

1. Tasks: 20%
2. Activeness: 10%
3. Quiz: 10%
4. Mid Test: 30%
5. Final Test: 30%