Module Description/Course Syllabi

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

1. *Course number and name*

MAT 62253 Introduction to Time Series Anlysis

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

3 SKS / 4,53 ECTS

3. *Instructors and course coordinator*

1. Dr. Dodi Devianto, M.Sc
2. Dr. Maiyastri, M.Sc

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

1. Peter J. Brockwell and Richard A. Davis. *Time Series: Theory and Methods*. SpringerVerlag, New York, second edition, 1991. ISBN 0-387-97429-6.

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

1. Christopher Chatfifield. *The Analysis of Time Series: An Introduction*. Chapman and Hall Ltd, London, third edition, 1984. ISBN 0-412-26030-1.
2. Genshiro Kitagawa. *Introduction to Time Series Modeling*. Chapman & Hall/CRC, Boca Raton, 2010.
3. Wei, W.S., 2006. Time Series.Analysis. Univariate and Multivariate Method. Second Edition Pearson Addison-Wesley. Pub. Company, New York.
4. Box, G.E.P. dan Jenkin, G.M. 1976. Time Series Anlysis. Forecasting and Control. Holden- Day.san Francisco .
5. Cryer, J.D. dan SikChan, K. 2008. Time Series Analysis with Application in R. Springer. Iowa .
6. Makridakis, Wheelwright and Hydiman. 2008. Forecasting: Methods and Application. 3rd Edition. John Wiley & Sons

6. *Specific course information*

A. Brief description of the content of the course (catalog description)
This course applies Case Based Learning (Case Based Method; CBM), namely a learning method that uses cases as a medium for learning development. Students carry out exploration, assessment, interpretation, synthesis and case-based information to produce an analysis and develop a solution plan. This CBM-based learning provides knowledge about the concept of time series models which includes the basic concepts of deterministic and stochastic time series models, smoothing models and exponential models, stationary models, autoregressive models and moving average models, combined and differencing models, seasonal models, models with heteroscedasticity effects , long memory, calendar variations, as well as multivariate models and soft computing approaches.
B. Prerequisites or co-requisites
MAT 61151 Data Analysis MAT 62152 Mathematical Statistics I
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)
4^{th} 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-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-6: 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

8. *Course Learning Outcomes*

1. Students are able to explain the concepts of deterministic and stochastic time series data modeling, as well as models with smoothing and exponentials (ILO-4, ILO-5).
2. Students are able to explain the concept of stationary time series data models (ILO-4, ILO-5).
3. Students are able to explain the concept of time series models with the effects of heteroscedasticity, seasonality, long memory and calendar variations (ILO-5, ILO-6).
4. Students are able to develop models of multivariate time series data and time series data using a soft computing approach (ILO-5, ILO-6).

5. Students are able to reason intuitively and analytically and are able to express the results of their reasoning in writing, systematically and rigorously both individually and in groups in the form of scientific reports (ILO-6).

9. *Brief list of topics to be covered*

1. Basic concepts of time series models.
2. Deterministic and stochastic time series models.
3. Smoothing and exponential time series models.
4. Stationary autoregressive (AR) and moving average (MA) time series models.
5. Combined and differencing models (ARIMA models).
6. ARIMA model with seasonal effects (SARIMA model).
7. ARIMA model with heteroscedasticity effects (ARIMA-GARCH model).
8. Selected Models (MSAR models, Long memory, calendar variations, VAR models, fuzzy time series models, neural networks time series models)

10. Learning and teaching methods

Directed Learning, Teacher Center Learning, Presentation, Group Discussion, Project facilitator.

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%