



**INSTITUT TEKNOLOGI SEPULUH NOPEMBER  
FACULTY OF SCIENCE AND DATA ANALYTICS  
DEPARTMENT OF STATISTICS  
STATISTICS UNDERGRADUATE PROGRAM**

Course	Course Name	:	<b>Introduction to Time Series Analysis</b>
	Course Code	:	SS234525
	Credit	:	3 SKS
	Semester	:	V

**COURSE DESCRIPTION**

Time series analysis is a proficiency course that is a part of the statistical modeling courses. The objectives in learning time series analysis are the students can understand the statistical concept in univariate time series (particularly in Exponential Smoothing, Time Series Regression, Decomposition, ARIMA), bivariate time series (particularly in Intervention Analysis, Outlier Detection, Calendar Variation Model, and Transfer Function with Single Input), and able to apply the methods in a real dataset. Through this course, the students are expected to have learning experiences with critical thinking and provide the appropriate decision relating to the suitable time series model on particular cases and its solution. The learning strategies used in this course are discussion, exercise, and assignment.

**PROGRAM LEARNING OUTCOME**

- PLO-2 Able to study and utilize science and technology in order to apply it to certain areas of expertise, and be able to make appropriate decisions from the results of their own work or group work in the form of final project reports or other forms of learning activities whose output is equivalent to the Final Project through logical, critical thinking, systematic and innovative
- PLO-9 Able to apply statistical methods to analyze theoretical and real problems

**COURSE LEARNING OUTCOME**

- CLO.1 Explains the use of the concepts of Time Series Analysis which includes identification, parameter estimation, diagnostic checks, and forecasting
- CLO.2 Explains each stage of the model building procedure in Time Series Analysis on a real problem
- CLO.3 Able to apply Time Series Analysis to get the right forecast on a real problem
- CLO.4 Able to utilize applications and software to calculate statistical quantities for the formation of Time Series Analysis models
- CLO.5 Able to adapt to the situation at hand
- CLO.6 Able to make the right decisions based on forecast results from a time series model and able to communicate the results of the analysis both orally and in writing
- CLO.7 Able to communicate effectively and work together in interdisciplinary and multidisciplinary teams
- CLO.8 Have professional responsibilities and ethics
- CLO.9 Able to motivate yourself to think creatively and learn throughout life

<b>MAIN SUBJECT</b>
<ol style="list-style-type: none"> <li>1. Introduction to time series. (concept of time series, data pattern, and decomposition)</li> <li>2. Introduction to Quantitative Forecasting with a time series approach. Exponential Smoothing Model, Time Series Regression.</li> <li>3. Definition of stationarity, weak stationarity, and strict stationarity, and the Box-Cox transformation, and the Dickey-Fuller test.</li> <li>4. Theoretical ACF and PACF of the ARMA process.</li> <li>5. LS and MLE Estimation.</li> <li>6. ARIMA model diagnostic check (Ljung – Box, Normality)</li> <li>7. Point and interval forecasting for k future stages</li> <li>8. ARIMA Seasonal Model: Identification, estimation and forecasting</li> <li>9. Intervention model and outlier detection: Identification, estimation, diagnostic check and forecasting</li> <li>10. Calendar variation model: Identification, estimation, diagnostic check and forecasting</li> <li>11. Single input transfer function model: Identification, estimation, diagnostic check and forecasting</li> </ol>
<b>PREREQUISITE</b>
Regression Analysis, Stochastic Process
<b>REFERENCES</b>
<ol style="list-style-type: none"> <li>1. Bowerman, B.L, O'Connell, R.T. and Koehler, A.B. 2005. Forecasting, Time Series, and Regression: An Applied Approach, 4th edition. USA: Duxbury Press.</li> <li>2. Box, G.E.P., Jenkins, G.M., and Reinsel, D., 1994. Time Series Analysis: Forecasting and Control. 2nd edition. San Fransisco: Holden Day.</li> <li>3. Cryer, J.D. and Chan, K-S., 2008. Time Series Analysis: with Application in R. Boston: PWS-KENT Publishing Company.</li> <li>4. Hanke, J.E. and Wichern, D.W., 2008. Business Forecasting. 9th edition. Prentice Hall.</li> <li>5. Wei, W.W.S., 2006. Time Series Analysis: Univariate and Multivariate Methods. USA: Addison-Wesley Publishing Co.</li> </ol>