



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

Course	Course Name	:	<b>Nonparametric Regression</b>
	Course Code	:	SS234636
	Credit	:	3 SKS
	Semester	:	VI

**COURSE DESCRIPTION**

Nonparametric Regression is a method in regression analysis to model data patterns that do not follow certain patterns. The material of this course begins with an introduction to parametric regression, distinguishing Parametric Regression, Spline Truncated Nonparametric Regression and Spline Truncated Semiparametric Regression. Furthermore, it is discussed in depth data modeling using Spline Truncated Regression in univariable, multivariable nonparametric regression and selecting the best model, along with its application. In addition, a Spline Truncated semiparametric regression model is presented and the best model selection accompanied by its application is presented. Furthermore, the generalization of the Spline Truncated model in nonparametric and semiparametric regression for longitudinal data is discussed, and its application in various fields.

**PROGRAM LEARNING OUTCOME**

- PLO-7 Able to use modern computing devices to solve statistical problems
- PLO-9 Able to apply statistical methods to analyze theoretical and real problems.
- PLO-10 Able to apply business, industrial, economic, social, environmental or health statistical methods to real problems.

**COURSE LEARNING OUTCOME**

- CLO.1 Able to understand the basic concepts of parametric regression, nonparametric regression (Spline, Kernel, Fourier Series and Local Polynomials)
- CLO.2 Able to distinguish between parametric regression and nonparametric regression, as well as their use in modeling.
- CLO.3 Able to model paired data using models nonparametric regression that fits the data pattern, and is able to choose the best model.
- CLO.4 Able to make the right decisions using various nonparametric regression methods according to the data pattern.
- CLO.5 Able to use computational techniques and modern computer equipment required in the non-parametric regression field
- CLO.6 Having knowledge of current and future issues related to the field of non-parametric regression
- CLO.7 Able to communicate effectively and work together in interdisciplinary and multidisciplinary teams
- CLO.8 Have the responsibility and professional ethics
- CLO.9 Able to motivate oneself to think creatively and learn throughout life

<b>MAIN SUBJECT</b>
<ol style="list-style-type: none"> <li>1. Basic concepts of parametric and nonparametric regression, as well as differences with parametric regression</li> <li>2. Nonparametric regression curve estimation using the Spline approach.</li> <li>3. Kernel nonparametric regression curve estimation using Kernel approach.</li> <li>4. Nonparametric regression curve estimation using the Fourier Series approach.</li> <li>5. Nonparametric regression curve estimation using Local Polynomial Approach</li> <li>6. Basic concept of knot point and smoothing parameter (bandwidth) in the nonparametric regression of the spline, kernel, Fourier series and local polynomials.</li> <li>7. Selection of optimal knot points and smoothing parameters (bandwidth) in nonparametric regression with various methods</li> <li>8. Application of nonparametric regression models of Spline, Kernel, Fourier Series and Local Polynomials.</li> <li>9. Nonparametric regression model. Multivariable nonparametric regression model, multiresponse and longitudinal data, and semiparametric regression.</li> </ol>
<b>PREREQUISITE</b>
Regression Analysis
<b>REFERENCES</b>
<ol style="list-style-type: none"> <li>1. Bilodeau, M., 1992, Fourier Smoother and Additive Models, The Canadian Journal of Statistics, 3, 257-269.</li> <li>2. Eubank, R. L., 1988, Spline Smoothing and Nonparametric Regression, Marcel Dekker, New York.</li> <li>3. Green, P. J., and Silverman, B. W., 1994, Nonparametric Regression and Generalized Linear Models, Chapman and Hall, London.</li> <li>4. Hardle, W., 1990, Applied Nonparametric Regression, Cambridge University Press, New York</li> <li>5. Hardle, W., 1991, Smoothing Techniques With Implementation in S, Springer Verlag, New York.</li> <li>6. Rupert, D., Wand, M.P, and Carrol, R.J., 2003, Semiparametric Regression, Cambridge University Press, New York</li> <li>7. Wahba, G., 1990, Spline Models for Observational Data, SIAM, Pennsylvania.</li> <li>8. Wu, H. and Zhang, J. T., 2006, Nonparametric Regression Method for Longitudinal Data Analysis : Mixed Effects Modeling Approaches, John Wiley and Sons, New York.</li> </ol>