MODULE HANDBOOK

REGRESSION ANALYSIS

BACHELOR DEGREE PROGRAM
DEPARTEMENT OF STATISTICS
FACULTY OF SCIENCE AND DATA ANALYTICS
INSTITUT TEKNOLOGI SEPULUH NOPEMBER

ENDORSEMENT PAGE

	MODULE HANDBOOK **REGRESSION ANALYSIS** **DEPARTMENT OF STATISTICS** **INSTITUT TEKNOLOGI SEPULUH NOPEMBER**

Proses ***Process***	**Penanggung Jawab** ***Person in Charge***			**Tanggal** ***Date***
	Nama ***Name***	**Jabatan** ***Position***	**Tandatangan** ***Signature***	
Perumus *Preparation*	Dra. Wiwiek Setya Winahju, M.S.	Dosen *Lecturer*		**March 28, 2019**
Pemeriksa dan Pengendalian *Review and Control*	Dra. Wiwiek Setya Winahju, M.S. ; Dr. Bambang Widjanarko Otok, M.Si. ; Muhammad Sjahid Akbar, S.Si, M.Si ; Santi Puteri Rahayu, M.Si., Ph.D ;	Tim kurikulum *Curriculum team*		**April 15, 2019**
Persetujuan *Approval*	Dr. Santi Wulan Purnami, M.Si	Koordinator RMK *Course Cluster Coordinator*		**July 17, 2019**
Penetapan *Determination*	Dr. Kartika Fithriasari, M.Si	Kepala Departemen *Head of Department*		**July 30, 2019**

MODULE HANDBOOK

REGRESSION ANALYSIS

Module name	**REGRESSION ANALYSIS**	
Module level	Undergraduate	
Code	KS184304	
Course (if applicable)	REGRESSION ANALYSIS	
Semester	Third Semester (Ganjil)	
Person responsible for the module	Dra. Wiwiek Setya Winahju, M.S.	
Lecturer	Dra. Wiwiek Setya Winahju, M.S. ; Dr. Bambang Widjanarko Otok, M.Si. ; Muhammad Sjahid Akbar, S.Si, M.Si ; Santi Puteri Rahayu, M.Si., Ph.D ;	
Language	Bahasa Indonesia and English	
Relation to curriculum	Undergradute degree program, **mandatory**, 3th semester.	
Type of teaching, contact hours	Lectures, <50 students	
Workload	1. Lectures : 3 x 50 = 150 minutes per week. 2. Exercises and Assignments : 3 x 60 = 180 minutes (3 hours) per week. 3. Private learning : 3 x 60 = 180 minutes (3 hours) per week.	
Credit points	3 credit points (sks)	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	Pengantar Metode Statistika/Introduction to Statistical Methods	
Learning outcomes and their corresponding PLOs	*CLO1 Able to make linear regression models between predictors and responses to various error conditions, using MINITAB and R* *CLO. 2 Able to make linear and nonlinear regression models* *CLO. 3 Able to formulate model interpretations of the relationship between a quantitative event with its various causes,both linear and nonlinear.* *CLO. 4 Able to make correct decisions on the various regression methods used, adjusted to the conditions of the predictors and error* *CLO .7 Able to communicate effectively and work together in interdisciplinary and multidisciplinary teams.*	PLO-01 PLO-03

	CLO. 8 Have professional responsibility and ethics *CLO. 9 Able to motivate oneself to think creatively and learn throughout life*	PLO-04
Content	*REGRESSION ANALYSIS is one subject in the field of theory, which aims to master the basic concepts of mathematics to understand the theory of vectors, basic operations of REGRESSION ANALYSIS, determinants, inverses, random vectors, systems of linear equations, vector spaces, values and eigenvectors. Besides that, students able to use this concept for processing random variables, formulating modeling and calculating univariate and multivariate calculations. To achieve this goal, the learning strategy used is discussion and practice both manually and with a computer program package*	
Study and examination requirements and forms of examination	• In-class exercises • Assignment 1, 2, 3 • Mid-term examination • Final examination	
Media employed	LCD, whiteboard, websites (myITS Classroom), zoom.	
Reading list	1. Draper, N. and H. Smith, 1998. Applied Regression Analysis. 2nd edition. 2. Engineering Statistics Handbook. 3. Montgomery, D.C. and Peck, E.A., 1982. Introduction to Linear Regression Analysis. New York: John Wiley and Sons Inc. 4. Myers, R. H. 1989. Classical and Modern Regression with Applications. Boston: PWS-Kent Publishing Company.	

Bahan Kajian *Study Materials*	Dasar Saint, Teori Statistika, Pengumpulan Data, Deskripsi dan Eksplorasi, Komputasi dan data Prosesing, Pemodelan, Industri Bisnis, Pemerintahan dan Kependudukan, Ekonomi dan Manajemen, Kesehatan dan Lingkungan, dan Sosial Humaniora
CPL yang dibebankan MK *PLO*	CPL-1 Mampu menerapkan pengetahuan teori statistika, matematika, dan komputasi CPL-3 Mampu menganalisis data dengan metode statistika yang tepat dan mengintepretasikannya CPL-4 Mampu mengindentifikasi,memformulasi, dan menyelesaikan masalah statistika di berbagai bidang terapan *PLO-1 Able to apply knowledge of statistical theory, mathematics, and computation* *PLO-3 Able to analyze data with appropriate statistical methods and interpret it* *PLO-4 Able to identify, formulate, and solve statistical problems in various applied fields*
CP-MK *CLO*	CPMK.1 Mampu membuat model regresi linier antara predictor dengan respon pada berbagai kondisi error, menggunakan MINITAB dan R CPMK.2 Mampu membuat model regresi linier dan nonlinier CPMK.3 Mampu merumuskan interpretasi model hubungan antara suatu kejadian kuantitatif dengan berbagai penyebabnya, baik linier, maupun nonlinier CPMK.4 Mampu mengambil keputusan yang tepat atas berbagai metode regresi yang digunakan, disesuaikan dengan kondisi predictor dan error CPMK.7 Mampu berkomunikasi secara efektif dan bekerjasama dalam tim yang interdisiplin dan multidisiplin CPMK.8 Memiliki tanggung jawab dan etika profesi CPMK.9 Mampu memotivasi diri untuk berpikir kreatif dan belajar sepanjang hayat *CPMK1 Able to make linear regression models between predictors and responses to various error conditions, using MINITAB and R* *CPMK. 2 Able to make linear and nonlinear regression models* *CPMK. 3 Able to formulate model interpretations of the relationship between a quantitative event with its various causes,both linear and nonlinear.* *CPMK. 4 Able to make correct decisions on the various regression methods used, adjusted to the conditions of thepredictors and* *CPMK .7 Able to communicate effectively and work together in interdisciplinary and multidisciplinary teams.* *CPMK . 8 Have professional responsibility and ethics* *CPMK . 9 Capable motivate yourself to think creatively and learn throughout your life*

Perte-muan *Meeting*	**Kemampuan Akhir Sub CP-MK** *Final Ability*	**Keluasan (materi pembelajaran)** *Extent (learning material)*	**Metode Pembelajaran** *Learning methods*	**Estimasi Waktu** *Duration*	**Bentuk Evaluasi** *Evaluation Type*	**Kriteria dan Indikator Penilaian** *Assessment Criteria and Indicators*	**Bobot Penilaian** *Scoring*
1,2	1. Mampu membuat model regresi linier pada berbagai kondisi error atau galat menggunakan MINITAB atau R	Demonstrasi pemodelan regresi berbagai kasus, unsur regresi, dan interpre-tasinya. CPMK.1 dan CPMK.2	Ceramah Interaksi, Diskusi, Latihan, Seminar	300 menit	Tugas, Latihan Soal, Laporan Praktikum	1. Mampu membentuk model berdasarkan data dengan menggunakan MINITAB dan R serta menginterpretasikan. 2. Mampu menganalisis error secara visual.	10% /10%

1.2	*1. Able to make linear regression models in various error or error conditions using MINITAB or R*	*Demonstration of regression modeling of various cases, elements of regression, and interpretation -taste. CPMK.1 and CPMK.2*	*Interaction Lectures, Discussions, Exercises, Seminar*	*300 minutes*	*Assignments, Exercise Questions, Practical Reports*	*1. Able to form data-based models using MINITAB and R and interpret them.* *2. Be able to visually analyze errors.*	*10% / 10%*
3,4	2. Mampu merumuskan interpretasi model hubungan antara suatu kejadian atau respon kuantitatif dengan berbagai penyebabnya.	Penaksiran parameter dan prediksi respon. CPMK.1 dan CPMK.2	Ceramah Interaksi, Diskusi, Latihan, Seminar	300 menit	Tugas, Latihan Soal, Laporan Praktikum	1. Mampu menghitung penaksir parameter dan penaksir respon secara titik dan interval, menggunakan metode OLS. 2. Mampu membuat Tabel ANOVA. 3. Mampu melakukan pengujian hipotesis.	15% /25%
	2. Able to formulate a model interpretation of the relationship between an event or a quantitative response with various causes.	*Parameter assessment and response prediction. CLO.1 and CLO.2*	*Interaction Lectures, Discussions, Exercises, Seminar*	*300 minutes*	*Assignments, Exercise Questions, Practical Reports*	*1. Able to calculate parameter estimators and response estimators by point and interval, using the OLS method.* *2. Able to make ANOVA table.* *4. Able to perform hypothesis testing.*	*15% / 25%*
5,6		Penaksiran parameter dan prediksi respon dengan pendekatan matrik serta regresi dengan prediktor kategori. CPMK.1 dan CPMK.2	Ceramah Interaksi, Diskusi, Latihan, Seminar	300 menit	Tugas, Latihan Soal, Laporan Praktikum	1. Mampu melakukan ketiga aktifitas di atas dengan pendekatan matrik. 2. Mampu menganalisis error melalui pengujian. 3. Mampu menganalisis residual secara visual menggunakan MINITAB. 4. Mampu menghitung Jumlah kuadrat Sequential dan Partial.	10% /35%
		Parameter estimation and response prediction using a matrix approach and regression with categorical predictors CLO.1 and CLO.2	*Interaction Lectures, Discussions, Exercises, Seminar*	*300 minutes*	*Assignments, Exercise Questions, Practicum Reports*	*1. Able to carry out the three activities above with a matrix approach.* *2. Able to analyze errors through testing.*	*10% / 35%*

						3. *Able to visually analyze residuals using MINITAB.* 5. *Able to calculate Sequential and Partial Sum of squares.*	
7 *7*	3. Mampu mengambil keputusan yang tepat atas berbagai metode regresi yang digunakan, disesuai-kan dengan kondisi predik tor, respon, dan error. 3. *Able to make the right decisions on the various regression methods used, according to the conditions of the predictors, responses, and errors.*	Mampu menghitung penaksir parameter dan memprediksi respon, menggunakan metode WLS dan IRWLS untuk Pem-bobot dan Robust. CPMK.1 dan CPMK.2 *Able to calculate parameter estimators and predict responses, using the WLS and IRWLS methods for Weighting and Robust.* *CLO.1 and CLO.2*	Ceramah Interaksi, Diskusi, Latihan, Seminar *Interaction Lectures, Discussions, Exercises, Seminar*	150 menit *150 minutes*	Tugas, Latihan Soal, Laporan Praktikum *Assignments, Exercise Questions, Practical Reports*	1. Mampu menggunakan WLS untuk : 2. Menghitung penaksir parameter dan simpangan bakunya. 3. Membuat Tabel ANOVA. 4. Menghitung prediksi respon. 1. *Able to use WLS to:* 2. *Calculate parameter estimators and their standard deviation.* 3. *Create ANOVA Table.* 4. *Calculates response predictions.*	10% /45% *10% / 45%*
8	**ETS** *Mid Term Examination*						
9	4. Mampu membuat model regresi nonlinier. *Able to make nonlinear regression models.*	IRWLS untuk Pembobot dan Robust. CPMK.1 dan CPMK.2 *IRWLS for Weight and Robust.* *CLO.1 and CLO.2*	Ceramah Interaksi, Diskusi, Latihan, Seminar *Interaction Lectures, Discussions, Exercises, Seminar*	150 menit *150 minutes*	Tugas, Latihan Soal, Laporan Praktikum *Assignments, Exercise Questions, Practicum Reports*	Mampu menggunakan metode IRWLS untuk membentuk regresi Robust. *Able to use the IRWLS method to form a Robust regression.*	10% /55% *10% / 55%*
10		Model regresi polinomial orthogonal serta model yang melibatkan interaksi prediktor dan kuadrat prediktor.	Ceramah Interaksi, Diskusi, Latihan, Seminar	150 menit	Tugas, Latihan Soal, Laporan Praktikum	1. Mampu membentuk Model Regresi Polinomial Ortogonal. 2. Mampu membuat model regresi dengan predictor berupa interaksi dan order tinggi.	5% /60%

		CPMK.1 dan CPMK.2 *Orthogonal polynomial regression models as well as models involving the interaction of predictors and predictors' squares. CLO.1 and CLO.2*	*Interaction Lectures, Discussions, Exercises, Seminar*	*150 minutes*	*Assignments, Exercise Questions, Practicum Reports*	*1. Able to form Orthogonal Polynomial Regression Models.* *2. Able to make regression models with predictors in the form of interactions and high orders.*	*5% / 60%*
11,12		Model untuk menanggula-ngi multikolinieritas. CPMK.1 dan CPMK.2 *Models for tackling multicollinearity. CLO.1 and CLO.2*	Ceramah Interaksi, Diskusi, Latihan, Seminar *Interaction Lectures, Discussions, Exercises, Seminar*	300 menit *300 minutes*	Tugas, Latihan Soal, Laporan Praktikum *Assignments, Exercise Questions, Practical Reports*	Mampu membuat model regresi menggunakan metode Regresi : Gulud, Stepwise, dan Komponen Utama , serta transformasi Box Cox. *Able to make regression models using the Regression method: Ridge, Stepwise, and Main Components, as well as Box Cox transformation.*	15% /75% *15% / 75%*
13		Penaksiran parameter dan simpangan bakunya, meng-gunakan metode maksimum likelihood. CPMK.1 dan CPMK.2	Ceramah Interaksi, Diskusi, Latihan.	150 menit		Mampu menghitung penaksir parameter dan simpangan bakunya, menggunakan metode maksimum likelihood.	5% /80%
		Assessment of parameters and standard deviations, using the maximum likelihood method. CLO.1 and CLO.2	*Interaction Lectures, Discussions, Exercises.*	*150 minutes*		*Able to calculate parameter estimator and standard deviation, using the maximum likelihood method.*	*5% / 80%*
14		Penaksiran parameter model regresi non linier dengan metode least square dan pengujian hipo-tesis, satu dan beberapa prediktor. CPMK.4 *Estimation of non-linear regression model parameters using the least square method and hypo-thesis testing, one and several predictors.*	Ceramah Interaksi, Diskusi, Latihan, Seminar *Interaction Lecture, Discussion, Exercise, Seminar*	150 menit *150 minutes*	Tugas, Latihan Soal, Laporan Praktikum *Assignments, Exercise Questions, Practical Reports*	Mampu membuat model nonlinier dengan perhitungan penaksir parameter secara nume-ric, yaitu: Gauss Newton dan Levenburg Marquad dan memanfaatkan MINITAB *Able to make nonlinear models with numerical parameter estimation calculations, namely: Gauss Newton and Levenburg Marquad and utilize MINITAB*	15% /95% *15% / 95%*

		CLO.4					
15		Perbandingan kebaikan model. CPMK.3 *Comparison kindness model.* *CLO.3*	Ceramah Interaksi, Diskusi, Latihan, Seminar *Interaction Lecture, Discussion, Exercises, Seminar*	150 menit *150 minutes*	Tugas, Latihan Soal, Laporan Praktikum *Assignments, Exercise Questions, Practical Report*	Mampu membandingkan kebai-kan antar model, dan menentu-kan yang terbaik sesuai cri-teria. *Able to compare significance between models and determine the best according to the criteria.*	5% /100% *5% / 100%*
16	**EAS**						

PUSTAKA/*REFERENCES* **:**

1. Draper, N. dan H. Smith, Applied Regression Analysis, Second Edition, 1998.
2. Myers, R. H. Classical And Modern Regression With Applications, PWS-Kent Publishing Company, Boston, 1989
3. Engineering Statistics Handbook.
4. Montgomery, D.C. dan Peck,E.A. (1982) Introduction to Linear Regression Analysis, John Wiley and Sons Inc, New York.