

MODULE HANDBOOK
**COMPUTATIONAL
STATISTICS**



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

ENDORSEMENT PAGE




MODULE HANDBOOK COMPUTATIONAL STATISTICS DEPARTMENT OF STATISTICS INSTITUT TEKNOLOGI SEPULUH NOPEMBER

Proses Process	Penanggung Jawab Person in Charge			Tanggal Date
	Nama Name	Jabatan Position	Tandatangan Signature	
<i>Perumus Preparation</i>	Dr.rer pol. Dedy Dwi Prastyo	Dosen <i>Lecturer</i>		March 28, 2019
<i>Pemeriksa dan Pengendalian Review and Control</i>	Dr.rer pol. Dedy Dwi Prastyo, S.Si, M.Si ; Dr.rer pol. Heri Kuswanto, S.Si, M.Si ; Irhamah, S.Si, M.Si, Ph.D	Tim kurikulum <i>Curriculum team</i>		April 15, 2019
<i>Persetujuan Approval</i>	Prof. NUR Iriawan	Koordinator RMK <i>Course Cluster Coordinator</i>		July 17, 2019
<i>Penetapan Determination</i>	Dr. Kartika Fithriasari, M.Si	Kepala Departemen <i>Head of Department</i>		July 30, 2019


MODULE HANDBOOK

COMPUTATIONAL STATISTICS

Module name	Computational Statistics	
Module level	Undergraduate	
Code	KS184443	
Course (if applicable)	Computational Statistics	
Semester	Fourth Semester (Genap)	
Person responsible for the module	Dr.rer pol. Dedy Dwi Prastyo	
Lecturer	Dr.rer pol. Dedy Dwi Prastyo, S.Si, M.Si ; Dr.rer pol. Heri Kuswanto, S.Si, M.Si ; Irhamah, S.Si, M.Si, Ph.D	
Language	Bahasa Indonesia and English	
Relation to curriculum	Undergraduate degree program, mandatory , 4 th semester.	
Type of teaching, contact hours	Lectures, <50 students	
Workload	<ol style="list-style-type: none"> 1. Lectures : 3 x 50 = 150 minutes per week. 2. Practicum : 135 minutes per week. 3. Exercises and Assignments : 3 x 60 = 180 minutes (3 hours) perweek. 4. 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	Pemrograman Komputer/ <i>Computer Programming</i> Analisis Regresi/ <i>Regression Analysis</i>	
Learning outcomes and their corresponding PLOs	<p><i>CLO. 1 Able to explain R programming structure</i></p> <p><i>CLO. 2 Able to explain minitab programming structure</i></p> <p><i>CLO. 3 Able to formulate problem solving using the basics of computational algorithms for statistical methods</i></p> <p><i>CLO. 4 Able to explain the basics of descriptive statistics program algorithms and implement them in the Statistics package program</i></p> <p><i>CLO. 5 Able to explain the basics of computational program algorithms estimating parameters one, two and k populations and implementing them in the Statistics package program</i></p> <p><i>CLO. 6 Able to explain the basic algorithms of linear and non-linear regression analysis computing programs as well as check error assumptions and implement them in</i></p>	<p>PLO – 1</p> <p>PLO – 3</p>

	Program Studi	Sarjana, Departemen Statistika, FMKSD-ITS
	Mata Kuliah	Komputasi Statistika
	Kode Mata Kuliah	KS184443
	Semester/SKS	IV/3
	MK Prasyarat	Pemrograman Komputer, Analisis Regresi
RP-S1	Dosen Pengampu	Dr.rer pol. Dedy Dwi Prastyo, S.Si, M.Si ; Dr.rer pol. Heri Kuswanto, S.Si, M.Si ; Irhamah, S.Si, M.Si, Ph.D

Bahan Kajian <i>Study Materials</i>	<p>Dasar Sains, Teori Statistika, Pengumpulan Data, Deskripsi dan Eksplorasi, Komputasi dan Data Processing, Pemodelan, Industri dan Bisnis, Pemerintahan dan Kependudukan, Ekonomi dan Manajemen, Kesehatan dan Lingkungan</p> <p><i>Basic Science, Statistical Theory, Data Collection, Description and Exploration, Computing and Data Processing, Modeling, Industry and Business, Government and Population, Economics and Management, Health and Environment</i></p>
CPL yang dibebankan MK <i>PLO</i>	<p>CPL-1 Mampu menerapkan pengetahuan teori statistika, matematika, dan komputasi</p> <p>CPL-3 Mampu menganalisis data dengan metode statistika yang tepat dan menginterpretasikannya</p> <p>CPL-4 Mampu mengidentifikasi, memformulasi, dan menyelesaikan masalah statistika di berbagai bidang terapan</p> <p>CPL-5 Mampu menggunakan teknik komputasi dan perangkat komputer modern yang diperlukan dalam bidang statistika dan sains data</p> <p><i>CPL-1 Able to apply statistical, mathematical, and computational theory knowledge</i></p> <p><i>CPL-3 Able to analyze data with the right statistical methods and interpret it</i></p> <p><i>CPL-4 Able to identify, formulate, and solve statistical problems in various applied fields</i></p> <p><i>CPL-5 Able to use the computing techniques and modern computer devices required in the field of statistics and data science</i></p>
CP-MK <i>CLO</i>	<p>CPMK.1 Mampu menjelaskan struktur pemrograman R</p> <p>CPMK.2 Mampu menjelaskan struktur pemrograman Minitab</p> <p>CPMK.3 Mampu memformulasikan penyelesaian masalah menggunakan dasar-dasar algoritma komputasi untuk metode Statistika</p> <p>CPMK.4 Mampu menjelaskan dasar-dasar algoritma program statistika deskriptif dan mengimplementasikannya dalam program paket Statistika</p> <p>CPMK.5 Mampu menjelaskan dasar-dasar algoritma program komputasi pendugaan parameter satu, dua dan k populasi serta mengimplementasikannya dalam program paket Statistika</p> <p>CPMK.6 Mampu menjelaskan dasar algoritma program komputasi analisis regresi linier dan non linier serta pemeriksaan asumsi error dan mengimplementasikannya dalam program paket Statistika</p> <p>CPMK.7 Mampu memahami dasar algoritma program untuk komputasi regresi bootstrap dan jackknife dan mengimplementasikannya dalam program paket Statistika</p> <p>CPMK.8 Mampu memahami dasar algoritma pembangkitan bilangan acak dan mengimplementasikannya dalam program paket Statistika</p> <p>CPMK.9 Mampu berkomunikasi secara efektif dan bekerjasama dalam tim yang interdisiplin dan multidisiplin</p> <p>CPMK.10 Memiliki tanggung jawab dan etika profesi</p> <p>CPMK.11 Mampu memotivasi diri untuk berpikir kreatif dan belajar sepanjang hayat</p> <p><i>CPMK.1 Able to explain R programming structure</i></p> <p><i>CPMK. 2 Able to explain minitab programming structure</i></p>

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<p><i>CPMK. 3 Able to formulate problem solving using the basics of computational algorithms for statistical methods</i></p> <p><i>CPMK. 4 Able to explain the basics of descriptive statistics program algorithms and implement them in the Statistics package program</i></p> <p><i>CPMK. 5 Able to explain the basics of computational program algorithms estimating parameters one, two and k populations and implementing them in the Statistics package program</i></p> <p><i>CPMK. 6 Able to explain the basic algorithms of linear and non-linear regression analysis computing programs as well as check error assumptions and implement them in the Statistics package program</i></p> <p><i>CPMK. 7 Able to understand the basic algorithms of programs for bootstrap and jacknife regression computing and implement them in the Statistics package program</i></p> <p><i>CPMK. 8 Able to understand the basis of random number generation algorithms and implement them in the Statistics package program</i></p> <p><i>CPMK.9 Able to communicate effectively and cooperate in interdisciplinary and multidisciplinary teams</i></p> <p><i>CPMK.10 Has professional responsibilities and ethics</i></p> <p><i>CPMK.11 Able to motivate yourself to think creatively and learn throughout life</i></p>

Pertemuan Meeting	Kemampuan Akhir Sub CP-MK/ Final Capability	Keluasan (materi pembelajaran)/ Extent (Study Materials)	Metode Pembelajaran/ Learning Methods	Estimasi Waktu/ Estimated Time	Bentuk Evaluasi/Evaluation Form	Kriteria dan Indikator Penilaian/Criteria and Score Indicator	Bobot Penilaian/Score Weight
1	CPMK.1 Mampu menjelaskan struktur pemrograman R <i>CPMK.1 Able to explain R programming structure</i>	Pengantar Pemrograman R - Menjalankan R - Struktur data R - Membaca data - Manajemen data <i>Introduction to R Programming</i>	1. Ceramah interaktif 2. Diskusi 3. Latihan 4. Praktikum <i>1. Interactive lectures</i> <i>2. Discussion</i>	150 menit <i>150 minutes</i>	- Tugas - Observasi di kelas - <i>Assignment</i> - <i>Observation in class</i>	1.1 Mampu membaca data dari berbagai tipe file 1.2 Dapat menjelaskan struktur pemrograman R <i>1.1 Able to read data from various file types</i> <i>1.2 Can explain the programming structure of R</i>	5%/5%




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		<ul style="list-style-type: none"> - Running R - R data structure - Read data <i>Data management</i>	<ol style="list-style-type: none"> 3. Exercise 4. Practicum 				
2	CPMK.4 Mampu menjelaskan dasar-dasar algoritma program statistika deskriptif dan mengimplementasikannya dalam program paket Statistika <i>CPMK.4 Able to explain the basics of descriptive statistics program algorithms and implement them in the Statistics package program</i>	Komputasi Statistika Deskriptif menggunakan R, a.l: <ul style="list-style-type: none"> - kovarian/ korelasi - determinan <i>Descriptive Statistical Computing using R, a. l:</i> <ul style="list-style-type: none"> - covariance / correlation - determinants 	<ol style="list-style-type: none"> 1. Ceramah interaktif 2. PBL 3. Praktikum <ol style="list-style-type: none"> 1. Interactive lectures 2. PBL 3. Practicum 	150 menit <i>150 minutes</i>	<ul style="list-style-type: none"> - Tugas - Observasi di kelas - Tes - Presentasi dan makalah - Assignment - Observation in class - Test - Presentations and papers 	Mampu membuat program untuk komputasi statistika deskriptif menggunakan program R <i>Able to create programs for descriptive statistical computing using R programs</i>	10%/15%
3, 4	CPMK.5 Mampu menjelaskan dasar-dasar algoritma	Komputasi Pendugaan dan Pengujian Parameter Satu,	<ol style="list-style-type: none"> 1. Ceramah interaktif 2. PBL 	300 menit <i>300 minutes</i>	<ul style="list-style-type: none"> - Tugas - Observasi di kelas - Tes 	Mampu membuat program untuk komputasi pendugaan dan	10%/25%

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	<p>program komputasi pendugaan parameter satu, dua dan k populasi serta mengimplementasi kannya dalam program paket Statistika</p> <p><i>CPMK. 5 Able to explain the basics of computational program algorithms estimating parameters one, two and k populations as well as implementing them in the Statistics package program</i></p>	<p>Dua dan k Populasi menggunakan R</p> <p><i>Computational Estimation and Testing of Parameters One, Two and k Populations using R</i></p>	<p>3. Praktikum</p> <ol style="list-style-type: none"> 1. Interactive lectures 2. PBL 3. Practicum 		<ul style="list-style-type: none"> - Presentasi dan makalah - Assignment - Observation in class - Test <p><i>Presentations and papers</i></p>	<p>pengujian parameter satu, dua dan k populasi menggunakan R</p> <p><i>Able to create programs for computational estimation and testing of parameter one, two, and k populations using R</i></p>	
5, 6	<p>CPMK.6 Mampu menjelaskan dasar algoritma program komputasi analisis regresi linier dan non</p>	<p>Komputasi analisis regresi linear dan non linear serta pemeriksaan asumsi error menggunakan R</p>	<ol style="list-style-type: none"> 1. Ceramah interaktif 2. PBL 3. Praktikum 	<p>300 menit</p> <p><i>300 minutes</i></p>	<ul style="list-style-type: none"> - Tugas - Observasi di kelas - Tes - Presentasi dan makalah 	<p>Mampu membuat program untuk komputasi analisis regresi linear dan non linier serta pemeriksaan asumsi error menggunakan R</p>	<p>12,5%/37,5%</p>

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	<p>linier serta pemeriksaan asumsi error dan mengimplementasikannya dalam program paket Statistika</p> <p><i>CPMK.6 Able to explain the basic algorithms of linear and non-linear regression analysis computing programs as well as check error assumptions and implement them in the Statistics package program</i></p>	<p><i>Computational linear and non-linear regression analysis and error asumsi checking using R</i></p>	<p>1. Interactive lectures</p> <p>2. PBL</p> <p>3. Practicum</p>		<ul style="list-style-type: none"> - Assignment - Observation in class - Test <p><i>Presentations and papers</i></p>	<p><i>Able to create programs for computational analysis of linear and non linier regression as well as error assumption checks using R</i></p>	
7	<p>CPMK.7 Mampu memahami dasar algoritma program untuk komputasi regresi bootstrap dan jackknife dan meng-</p>	<p>Komputasi Regresi bootstrap dan jackknife:</p> <ul style="list-style-type: none"> - Berbasis pengamatan - Berbasis residual menggunakan R <p><i>Bootstrap and jackknife Regression Computing:</i></p>	<p>1. Ceramah interaktif</p> <p>2. PBL</p> <p>3. Praktikum</p> <p>1. <i>Interactive lectures</i></p> <p>2. <i>PBL</i></p>	<p>150 menit</p> <p><i>150 minutes</i></p>	<ul style="list-style-type: none"> - Tugas - Observasi di kelas - Tes <ul style="list-style-type: none"> - <i>Assignment</i> - <i>Observation in class</i> - <i>Test</i> 	<p>Mampu membuat program untuk komputasiregresi bootstrap dan jackknife menggunakan R</p> <p><i>Able to create programs forbootstrap and jackknife regression computing using R</i></p>	12,5%/50%


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	implementasikannya dalam program paket Statistika <i>CPMK. 7 Able to understand the basic algorithms of programs for bootstrap and jackknife regression computing and implement them in the Statistics package program</i>	- <i>Observation-based</i> - <i>Residual-based using R</i>	3. <i>Practicum</i>		- <i>Presentations and papers</i>		
8	ETS/Midterm						
9	CPMK.2 Mampu menjelaskan struktur pemrograman Minitab <i>CPMK.2 Able to explain minitab programming structure</i>	Pengantar Pemrograman Macro Minitab - Global Macro - Local Macro <i>Introduction to Macro Minitab Programming</i> - <i>Global Macro</i> - <i>Local Macro</i>	1. Ceramah interaktif 2. Diskusi 3. Latihan 4. Praktikum <i>1. Interactive lectures</i> <i>2. Discussion</i> <i>3. Exercises</i> <i>4. Practicum</i>	150 menit <i>150 minutes</i>	- Tugas - <i>Assignment</i> - <i>Observation in class</i>	a. Dapat menjelaskan struktur pemrograman macro MINITAB. b. Mampu membedakan antara global dan local macro. <i>a. Can describe the macro programming structure of MINITAB.</i> <i>b. Able to distinguish between global and local macros.</i>	5%/55%




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9	CPMK.4 Mampu menjelaskan dasar-dasar algoritma program statistika deskriptif dan mengimplementasikannya dalam program paket Statistika <i>CPMK.4 Able to explain the basics of descriptive statistics program algorithms and implement them in the Statistics package program</i>	Komputasi Statistika Deskriptif menggunakan macro Minitab, a.l: - kovarian/ korelasi - determinan <i>Descriptive Statistical Computing using minitab macros, a. l:</i> - covariance / correlation - determinants	1. Ceramah interaktif 2. PBL 3. Praktikum <i>1. Interactive lectures</i> <i>2. PBL</i> <i>3. Practicum</i>	150 menit <i>150 minutes</i>	- Tugas - Observasi di kelas - Tes - Presentasi dan makalah - Assignment - Observation in class - Test <i>Presentations and papers</i>	Mampu membuat program untuk komputasi statistika deskriptif menggunakan macro Minitab <i>Able to create programs for descriptive statistical computing using Minitab macros</i>	10%/65%
10, 11	CPMK.5 Mampu menjelaskan dasar-dasar algoritma program komputasi pendugaan parameter satu, dua dan k populasi serta mengimplementasi	Komputasi Pendugaan dan Pengujian Parameter Satu, Dua dan k Populasi menggunakan macro Mintab <i>Computational Estimation and Testing ParametersOne, Two</i>	1. Ceramah interaktif 2. PBL 3. Praktikum <i>1. Interactive lectures</i> <i>2. PBL</i> <i>3. Practicum</i>	300 menit <i>300 minutes</i>	- Tugas - Observasi di kelas - Tes - Presentasi dan makalah - Assignment - Observation in class	Mampu membuat program untuk komputasi pendugaan dan pengujian parameter satu, dua dan k populasi menggunakan macro Minitab <i>Able to create programs for computational estimation and testing of parametersone, two</i>	10%/75%

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	kannya dalam program paket Statistika <i>CPMK.5 Able to explain the basics of computational program algorithms estimating parameters one, two and k populations and implement them in the Statistics package program</i>	<i>and k Populations using Minitab macros</i>			- Test <i>Presentations and papers</i>	<i>and k populations using minitab macros</i>	
12, 13	CPMK.6 Mampu menjelaskan dasar algoritma program komputasi analisis regresi linier dan non linier serta pemeriksaan asumsi error dan mengimplementasikannya dalam program paket Statistika	Komputasi analisis regresi linear dan non linear serta pemeriksaan asumsi error menggunakan macro Minitab <i>Computational analysis of linear and non-linear regression and error asumsi checks using Minitab macros</i>	1. Ceramah interaktif 2. PBL 3. Praktikum <i>1. Interactive lectures 2. PBL 3. Practicum</i>	300 menit <i>300 minutes</i>	- Tugas - Observasi di kelas - Tes - Presentasi dan makalah - Assignment - Observation in class - Test <i>Presentations and papers</i>	Mampu membuat program untuk komputasi analisis regresi linear dan non linier serta pemeriksaan asumsi error menggunakan macro Minitab <i>Able to create programs for computational analysis of linear and non linier regression as well as error assumption check using Minitab macros</i>	10%/85%

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	CPMK.6 Able to explain the basic algorithms of linear and non-linear regression analysis computing programs as well as check error assumptions and implement them in the Statistics package program						
14	CPMK.7 Mampu memahami dasar algoritma program untuk komputasi regresi bootstrap dan jacknife dan mengimplementasikannya dalam program paket Statistika CPMK.7 Able to understand the basic algorithms of	Komputasi Regresi bootstrap dan jacknife: - Berbasis pengamatan - Berbasis residual menggunakan macro Minitab <i>Bootstrap and jacknife Regression Computing:</i> - <i>Observation-based</i> - <i>Residual-based using minitab macros</i>	1. Ceramah interaktif 2. PBL 3. Praktikum <i>1. Interactive lectures</i> <i>2. PBL</i> <i>3. Practicum</i>	150 menit <i>150 minutes</i>	- Tugas - Observasi di kelas - Tes - Presentasi dan makalah - <i>Assignment</i> - <i>Observation in class</i> - <i>Test</i> - <i>Presentations and papers</i>	Mampu membuat program untuk komputasi regresi bootstrap dan jacknife menggunakan macro Minitab <i>Able to create programs for bootstrap and jacknife regression computing using Minitab macros</i>	10%/95%

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	MK Prasyarat	Pemrograman Komputer, Analisis Regresi
RP-S1	Dosen Pengampu	Dr.rer pol. Dedy Dwi Prastyo, S.Si, M.Si ; Dr.rer pol. Heri Kuswanto, S.Si, M.Si ; Irhamah, S.Si, M.Si, Ph.D

Pertemuan Meeting	Kemampuan Akhir Sub CP-MK/ Final Capability	Keluasan (materi pembelajaran)/ Extent (Study Materials)	Metode Pembelajaran/ Learning Methods	Estimasi Waktu/ Estimated Time	Bentuk Evaluasi/Evaluation Form	Kriteria dan Indikator Penilaian/Criteria and Score Indicator	Bobot Penilaian/Score Weight
	<i>programs for bootstrap and jackknife regression computing and implement them in the Statistics package program</i>						
15	CPMK.8 Mampu memahami dasar algoritma pembangkitan bilangan acak dan mengimplementasikannya dalam program paket Statistika <i>CPMK.8 Able to understand the basis of random number generation algorithms and implement them in the Statistics package program</i>	Pembangkitan bilangan acak - Metode Invers - Metode Acceptance Rejection - Metode Composition - Metode Convolution <i>Random number generation</i> - Inverse Method - Acceptance Rejection Method - Composition Method - Convolution Method	1. Ceramah interaktif 2. Diskusi 3. Latihan 4. Praktikum 5. PBL <i>1. Interactive lectures 2. Discussion 3. Exercises 4. Practicum 5. PBL</i>	150 menit <i>150 minutes</i>	- Tugas - Observasi di kelas - Tes - Presentasi dan makalah - <i>Assignment</i> - <i>Observation in class</i> - <i>Test</i> - <i>Presentations and papers</i>	a. Mampu menjelaskan algoritma pembangkitan bilangan acak dan mengimplementasikannya dalam program R dan Minitab b. Mampumembedakanantaram etode Invers, Acceptance Rejection, Composition dan Convolution. <i>a. Able to explain random number generation algorithms and implement them in R and Minitab programs b. Able to distinguish between Inverse, Acceptance Rejection Composition and Convolution methods</i>	5%/100%

	Program Studi	Sarjana, Departemen Statistika, FMKSD-ITS
	Mata Kuliah	Komputasi Statistika
	Kode Mata Kuliah	KS184443
	Semester/SKS	IV/3
	MK Prasyarat	Pemrograman Komputer, Analisis Regresi
RP-S1	Dosen Pengampu	Dr.rer pol. Dedy Dwi Prastyo, S.Si, M.Si ; Dr.rer pol. Heri Kuswanto, S.Si, M.Si ; Irhamah, S.Si, M.Si, Ph.D

Pertemuan Meeting	Kemampuan Akhir Sub CP-MK/ Final Capability	Keluasan (materi pembelajaran)/ Extent (Study Materials)	Metode Pembelajaran/ Learning Methods	Estimasi Waktu/ Estimated Time	Bentuk Evaluasi/Evaluation Form	Kriteria dan Indikator Penilaian/Criteria and Score Indicator	Bobot Penilaian/Score Weight
16	EAS/Finalterm						

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6. Minitab, Inc. (2017) Minitab 18: Minitab Macros Help, <http://support.minitab.com/en-us/minitab/18/macros-help/>