MODULE HANDBOOK

MATHEMATICS III

BACHELOR DEGREE PROGRAM

DEPARTEMENT OF STATISTICS

FACULTY OF SCIENCE AND DATA ANALYTICS

INSTITUT TEKNOLOGI SEPULUH NOPEMBER

ENDORSEMENT PAGE

MODULE HANDBOOK
MATHEMATICS III
DEPARTMENT OF STATISTICS
INSTITUT TEKNOLOGI SEPULUH NOPEMBER

Proses ***Process***	**Penanggung Jawab** ***Person in Charge***			**Tanggal** ***Date***
	Nama ***Name***	**Jabatan** ***Position***	**Tandatangan** ***Signature***	
Perumus *Preparation*	Dr. Drs. Purhadi, M.Sc	Dosen *Lecturer*		**March 28, 2019**
Pemeriksa dan Pengendalian *Review and Control*	Dr. Drs. Purhadi, M.Sc ; Dra. Wiwiek Setya Winahju, M.S. ; Erma Oktania Permatasari, S.Si., M.Si.	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

MATRICES

Module name	**MATHEMATICS III**	
Module level	Undergraduate	
Code	KS184306	
Course (if applicable)	MATHEMATICS III	
Semester	Third Semester (Ganjil)	
Person responsible for the module	Dra. Wiwiek Setya Winahju, M.S.	
Lecturer	Dr. Drs. Purhadi, M.Sc ; Dra. Wiwiek Setya Winahju, M.S. ; Erma Oktania Permatasari, S.Si., M.Si.	
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	Matematika II / Mathematics II	
Learning outcomes and their corresponding PLOs	*CLO. 1 Understanding mathematical concepts which consist of: Sets of complex numbers, Ordinary Differential Equations, Multivariable Functions (including Cylindrical and Spherical Coordinates) with Partial Differentials and Multiple Integral, Variable Transformations, and Optimization of Closed Form Functions.* *CLO.2 Able to analyze the relationship between mathematical concepts and mathematical statistical theory and suitable statistical methods* *CLO. 3 Can solve problems related to sets of complex number systems, ordinary differential equations (PDB), separate variables, homogeneous PD, PD extract, factors integrator, linear PD level one, PD Bernoulli, multiple variable function, gradient computation, total differential, implicit, maximum, minimum function, coordinate system and fold integral and its application*	PLO-01

	CLO.4 Able to determine solutions of ordinary differential equations; *CLO.5 Able to determine gradients, total differentials, implicit functions, applications in statistics;* *CLO.7 Able to communicate effectively and collaborate in interdisciplinary and multidisciplinary teams.* *CLO.8 Have responsibility and professional ethics* *CLO.9 Able to motivate oneself to think creatively and have longlife learning*	PLO-04
Content	*Mathematics III is one of the basic courses that are the part of the field of study in mathematics. The purpose of studying Mathematics III is to learn the Concept of Complex Number Systems, Ordinary Differential Equations, Multiple Variable Functions, Maximum, Minimum, Folded Integral and Coordinate Systems and applications in statistical methods so that students will have learning experience to think critically and be able to make the right decisions about the concept. The learning strategy used is discussion and exercises and assignments.*	
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. Anton, H., 1999. Calculus, with analytic Geomery. 6th edition. Singapore: Jhon Wiley dan Sons, Inc. 2. Erwin KreysZigh, 1983. Advanced Engineering Mathematics. 7th edition. 3. Purcell., 2000. Kalkulus dan Geometri Analsis. jilid I dan II. 4. Purcell, J.E. and Rignon., 2000. Calculus. 8th edition. Prentice Hall. 5. Salas SL, Hille e, 1982. Calculus of One and Several Variables. 4th edition. New York: Jhon Wiley.	

	Program Studi	Sarjana, Departemen Statistika, FMKSD-ITS
	Mata Kuliah	Matematika III
	Kode Mata Kuliah	KS184306
	Semester/SKS	III/3
	MK Prasyarat	Matematika II
RP-S1	Dosen Pengampu	Dr. Drs. Purhadi, M.Sc ; Dra. Wiwiek Setya Winahju, M.S. ; Erma Oktania Permatasari, S.Si., M.Si.

Bahan Kajian *Study Materials*	Dasar Sains, Teori Statistika, Komputasi dan Data Processing, dan Pemodelan *Basic of Science, Statistical Theory, Computing and Data Processing, and Modeling*
CPL yang dibebankan MK *PLO*	CPL-1 Mampu menerapkan pengetahuan teori statistika, matematika, dan komputasi 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-4 Able to identify, formulate, and solve statistical problems in various applied fields*
CP-MK *CLO*	CPMK.1 Menguasai konsep matematika yang terdiri dari : Himpunan bilangan kompleks, Persamaan Diferensial (Ordinary Differential Equation), Fungsi Multivariabel (termasuk Koordinat Silinder dan dan Koordinat Bola) dengan Diferensial Parsial dan Integral Rangkap, Transformasi Variable, serta Optimasi Fungsi Closed Form. CPMK.2 Mampu menganalisis hubungan antara konsep matematika tersebut dengan teori statistik matematika dan metode statistika yang bersesuaian CPMK.3 Dapat menyelesaikan permasalahan yang berkaitan dengan Himpunan Sistem bilangan kompleks, Persamaan differensial biasa (PDB), variabel terpisah, PD homogen, PD ekstrak, faktor pengintegral, PD linear tingkat satu, PD Bernoulli, fungsi beberapa variabel, perhitungan gradien, differensial total, fungsi implisit, maximum, minimum, sistem koordinat dan integral lipat dan aplikasinya CPMK.4 Mampu menentukan solusi Persamaan differensial biasa; CPMK.5 Mampu menentukan gradien, differensial total, fungsi implisit, aplikasi dalam statistika; 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 *CLO.1 Mastering mathematical concepts consisting of: Complex number sets, Ordinary Differential Equations, Multivariable Functions (including Cylindrical Coordinates and and Spherical Coordinates) with Partial Differentials and Double Integral, Variable Transformations, and Optimization of Closed Form Functions.* *CLO.2 Able to analyze the relationship between mathematical concepts and mathematical statistical theory and statistical methods* *CLO.3 Can solve problems related to sets of complex number systems, ordinary differential equations (PDB), separate variables, homogeneous PD, PD extract, factors integrator, linear PD level one, PD Bernoulli, multiple variable function, gradient computation, total differential, implicit, maximum, minimum function, coordinate system and fold integral and its application*

	Program Studi	Sarjana, Departemen Statistika, FMKSD-ITS
	Mata Kuliah	Matematika III
	Kode Mata Kuliah	KS184306
	Semester/SKS	III/3
	MK Prasyarat	Matematika II
RP-S1	Dosen Pengampu	Dr. Drs. Purhadi, M.Sc ; Dra. Wiwiek Setya Winahju, M.S. ; Erma Oktania Permatasari, S.Si., M.Si.

	CLO.4 Able to determine solutions of ordinary differential equations; *CLO.5 Able to determine gradients, total differentials, implicit functions, applications in statistics;* *CLO.7 Ability to communicate effectively and work together in interdisciplinary and multidisciplinary team* *CLO.8 Have responsibility and professional ethics* *CLO.9 Able to motivate yourself to creative thinking and lifelong learning*

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 menjelaskan konsep Himpunan Sistem bilangan kompleks dan aplikasi dalam statistika.	Himpunan Sistem bilangan kompleks dan aplikasi dalam statistika	Ceramah, diskusi dan latihan soal	**300 menit**	Tugas 1 Test tulis Observasi di kelas	1. Dapat menjelaskan tentang himpunan Sistem bilangan kompleks 2. Dapat menjelaskan tentang operasi pada bilangan kompleks 3. Dapat menjelaskan tentang bilangan kompleks dalam bentuk polar dan gambar 4. Dapat menjelaskan tentang akar-akar pertidaksamaan bilangan kompleks. 5. Dapat menjelaskan tentang fungsi dari bilangan Kompleks. 6. Dapat menjelaskan tentang aplikasi bilangan kompleks dalam statistika misal fungsi karakteristik dari variabel random.	10%/10%

	Program Studi	Sarjana, Departemen Statistika, FMKSD-ITS
	Mata Kuliah	Matematika III
	Kode Mata Kuliah	KS184306
	Semester/SKS	III/3
	MK Prasyarat	Matematika II
RP-S1	Dosen Pengampu	Dr. Drs. Purhadi, M.Sc ; Dra. Wiwiek Setya Winahju, M.S. ; Erma Oktania Permatasari, S.Si., M.Si.

1-2	*1. Able to explain the concept of the set of complex number systems and applications in statistics.*	*Sets Complex number systems andapplications in statistics*	*Lecture, discussion and practice questions*	*300 minutes*	*Task 1 Written test Observations in class*	*1. Can explain sets Complex number systems 2. Can explain operations on complex numbers 3. Can explain complex numbers in polar form and pictures 4. Can explain about the roots of the complex number inequality. 5. Can explain the function of the Complex number. 6. Can explain the application of complex numbers in statistics, for example, the characteristic function of random variables.*	*10% / 10%*
3-4	2. Mampu menentukan solusi Persamaan differensial biasa (PDB),	Persamaan differensial biasa (PDB), variabel terpisah, PD homogen, PD ekstrak, faktor pengintegral, PD linear tingkat satu, PD Bernoulli, aplikasidalamstatistika	Ceramah, diskusi dan latihan soal	**200 menit**	Tugas 2 Test tulis Observasi di kelas	1. Dapat menerangkan konsep persamaan differensial biasa (PDB) pada masalah riel . 2. Dapat menerangkan konsep untuk mendapatklan solusi PDB dengan variabel terpisah. 3. Dapat menerangkan konsep PD homogen, PD eksak, faktor pengintegral. 4. Dapat menerangkan dann mendapatkan solusi PD linear tingkat satu, PD Bernoulli, PD linear tingkat dua. **5.** Dapat mengaplikasikan bebagai fungsi dalam statistika	15%/25%

	Program Studi	Sarjana, Departemen Statistika, FMKSD-ITS
	Mata Kuliah	Matematika III
	Kode Mata Kuliah	KS184306
	Semester/SKS	III/3
	MK Prasyarat	Matematika II
RP-S1	Dosen Pengampu	Dr. Drs. Purhadi, M.Sc ; Dra. Wiwiek Setya Winahju, M.S. ; Erma Oktania Permatasari, S.Si., M.Si.

3-4	*2. Able to determine solutions of ordinary differential equations (PDB),*	*ordinary differential equations (PDB), separate variables, homogeneous PD, PD extracts, integrating factors, linear PD level one, PD Bernoulli, applications in*	*Lecture statistics, Discussion and practice questions*	*200 minutes*	*Task 2 Written test Observations in class*	*1. Can explain the concept of ordinary differential equations (PDB) in real problems. 2. Can explain the concept to get a GDP solution advertisement with separate variables. 3. Can explain the concept of homogeneous PD, exact PD, neutralizing factors. 4. Can explain and get a solution of linear PD level one, PD Bernoulli, linear PD level two. 5. Can apply various functions in statistics*	*15% / 25%*
4-5	3. Mampu menentukangradien, differensial total, fungsi implisit,aplikasi dalam statistika	Fungsi beberapa variabel : perhitungan gradien, differensial total, fungsi implisit,aplikasi dalam statistika	Ceramah, diskusi dan latihan soal	**250 menit**	Test tulis Tugas 3 Observasi di kelas	1. Dapat menjelaskan tentang definisi Fungsi beberapa variabel dan mengambar. 2. Dapat menjelaskan tentang perhitungan gradien dan differensial total 3. 3.3. Dapat menjelaskan tentang persamaan bidang. 4. 3.4. Dapat mengetahui perbedaan turunan fungsi eksplisit dan fungsi implisit 5. 3.5. Dapat menjelaskan aplikasi dalam statistika Misal fungsi distribusi peluang gabungan, fungsi likelihood.	10%/35%

	Program Studi	Sarjana, Departemen Statistika, FMKSD-ITS
	Mata Kuliah	Matematika III
	Kode Mata Kuliah	KS184306
	Semester/SKS	III/3
	MK Prasyarat	Matematika II
RP-S1	Dosen Pengampu	Dr. Drs. Purhadi, M.Sc ; Dra. Wiwiek Setya Winahju, M.S. ; Erma Oktania Permatasari, S.Si., M.Si.

4-5	*3. Able to determinegradients, total differentials, implicit functions,applications in statistics*	*Functions of several variables: gradient computation, total differentials, implicit functions,applications in statistics*	*Lectures, discussions and exercises questions*	*250 minutes*	*Written test Task 3 Observations in class*	*1. Can explain the definition of the function of several variables and draw.* *2. Can explain the calculation of gradients and total differentials* *3. 3.3. Can explain about field equations.* *4. 3.4. Can know the difference between explicit and implicit function derivatives* *6. 3.5. Can explain applications in statistics. For example, the joint probability distribution function, the likelihood function.*	*10% / 35%*
6-7	4. Mampu menentukanmaximum, minimum,aplikasi dalam statistika	Fungsi beberapa variabel : maximum, minimum,aplikasi dalam statistika	Ceramah, diskusi dan latihan soal	**300 menit**	ETS Test tulis Tugas 4 Observasi di kelas	1. Dapat menerangkan konsep maximum, Minimum fungsi beberapa variabel. 2. Dapat menerangkan konsep Maximum – Minimum fungsi beberapa variabel dengan pengganda lagrange 3. Dapat menjelaskan aplikasi dalam statistika misal penaksiran parameter pada model regresi linier berganda. 4. Dapat menjelaskan aplikasi dalam statistika misal penaksiran dua parameter atau lebih.	15%/50%

	Program Studi	Sarjana, Departemen Statistika, FMKSD-ITS
	Mata Kuliah	Matematika III
	Kode Mata Kuliah	KS184306
	Semester/SKS	III/3
	MK Prasyarat	Matematika II
RP-S1	Dosen Pengampu	Dr. Drs. Purhadi, M.Sc ; Dra. Wiwiek Setya Winahju, M.S. ; Erma Oktania Permatasari, S.Si., M.Si.

6-7	*4. Able to determinemaximum, minimum,application in statistics*	*Function of several variables: maximum, minimum,application in statistics*	*Lectures, discussions and exercises*	*300 minutes*	*ETS* *Written test* *Task 4* *Observations in class*	*1. Can explain the concept of maximum , Minimum function of multiple variables.* *2. Can explain the concept of Maximum - Minimum function of several variables with lagrange multipliers.* *3. Can explain applications in statistics such as parameter estimation in multiple linear regression models.* *5. Can describe applications in statistics eg estimation of two or more parameters.*	*15% / 50%*
8	**ETS/***MID TERM TEST*						
9-10	6. Dapat menentukanintegral lipat dalam sistem koordinat cartesius dan aplikasi dalam statistika	Integral lipat dalam sistem koordinat cartesius dan aplikasi dalam statistika	Ceramah, diskusi dan latihan soal	**300 menit**	Tes tulis Tugas 5 Observasi di kelas	1. Dapat menerangkan konsep Integral lipat dalam sistem koordinat cartesius 2. Dapat menentukan volume benda 3. Dapat menggambar grafik fungsi distribusi Bivariat Normal dan sifat-sifatnya 4. Dapat menentukan fungsi pembangkit moment dari distribusi Bivariat Normal	15%/65%

	Program Studi	Sarjana, Departemen Statistika, FMKSD-ITS
	Mata Kuliah	Matematika III
	Kode Mata Kuliah	KS184306
	Semester/SKS	III/3
	MK Prasyarat	Matematika II
RP-S1	Dosen Pengampu	Dr. Drs. Purhadi, M.Sc ; Dra. Wiwiek Setya Winahju, M.S. ; Erma Oktania Permatasari, S.Si., M.Si.

9-10	*Can determine Folding integrals in the Cartesian coordinate system and applications in statistics*	*Folding integrals in the Cartesian coordinate system and applications in statistics*	*Lectures, discussions and exercises*	*300 minutes*	*Written test Task 5 Observations in class*	*1. Can explain the concept of Integral Fold in a cartesian coordinate system* *2. Can determine the volume of an object* *3. Can draw a graph of the Bivariate Normal distribution function and its properties* *5. Can determine the moment generator function from the Bivariate Normal distribution*	*15% / 65%*
11-13	7. Dapat menerapkan Integral lipat dengan menggunakan perubahan variabel dan aplikasi dalam statistika	Integral lipat dengan menggunakan perubahan variabel dan aplikasi dalam statistika	Ceramah, diskusi dan latihan soal	**300 menit**	Test tulis Tugas 6 Observasi di kelas	1. Dapat menerangkan konsep Integral lipat dengan menggunakan perubahan variable 2. Dapat menentukan volume benda dengan menggunakan perubahan variable 3. Dapat menentukan fungsi distribusi dari Fungsi variabel random.	20%/85%
11-13	*Can apply folding integrals by using changes variable and applications instatistics*	*Folding integrals using changes variable and applications in statistics*	*Lectures, discussions and exercises*	*300 minutes*	*Written test Task 6 Observations in class*	*1. Can explain the concept of folding integral using variable changes* *2. Can determine the volume of objects using variable changes* *4. Can determine the distribution function of the function va variable random.*	*20% / 85%*

	Program Studi	Sarjana, Departemen Statistika, FMKSD-ITS
	Mata Kuliah	Matematika III
	Kode Mata Kuliah	KS184306
	Semester/SKS	III/3
	MK Prasyarat	Matematika II
RP-S1	Dosen Pengampu	Dr. Drs. Purhadi, M.Sc ; Dra. Wiwiek Setya Winahju, M.S. ; Erma Oktania Permatasari, S.Si., M.Si.

14-15 *14-15*	8. Mampu mengaplikasikan integral lipat dalam koordinat kutub dan aplikasi dalam statistika *Able to apply fold integrals in polar coordinates and applications in statistics*	Integral lipat dalam koordinat kutub dan aplikasi dalam statistika *Fold integrals in polar coordinates and applications in statistics*	Ceramah, diskusi dan latihan soal *Lectures, discussions and practice questions*	**300 menit** *300 minutes*	Tes tulis Tugas 7 Observasi di kelas *Written test* *Task 7* *Observations in class*	1. Dapat menerangkan konsep Integral lipat dalam koordinat kutub 2. Dapat menentukan volume benda dengan integral lipat dalam koordinat kutub. 1. *Can explain the concept of folding integrals in coordinates Polar* 2. *Can determine the volume of an object with a fold integral in polar coordinates.*	15%/100% *15% / 100%*
16	**EAS** *FINAL EXAMINATION*						

PUSTAKA*/REFERENCES*:

1. Anton, H., (1999).,Calculus,with analitic Geomery., 6ed, Jhon Wiley & Sons, Inc, Singapore.
2. Purcell., (2000)., Kalkulus da Geometri Analsis"., jilid I dan II.
3. Erwin Kreys Zigh, (1983).,"Advanced Engineering Mathematics", 7th edi.
4. Purcell, J.E. and Rignon., (2000)., "Calculus", 8th ed., Prentice Hall.
5. Salas SL, Hille e,(1982)., "Calculus of One and Several Variables", 4th ed, John Wiley, New York