

MODULE HANDBOOK
MATRICES



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

ENDORSEMENT PAGE



MODULE HANDBOOK MATRICES DEPARTMENT OF STATISTICS INSTITUT TEKNOLOGI SEPULUH NOPEMBER

Proses Process	Penanggung Jawab Person in Charge			Tanggal Date
	Nama Name	Jabatan Position	Tandatangan Signature	
Perumus <i>Preparation</i>	Dra. Wiwiek Setya Winahju, M.S.	Dosen <i>Lecturer</i>		March 28, 2019
Pemeriksa dan Pengendalian <i>Review and Control</i>	Dra. Wiwiek Setya Winahju, M.S. ; Dra. Madu Ratna, M.Si ; Wibawati, S.Si, M.Si	Tim kurikulum <i>Curriculum team</i>		April 15, 2019
Persetujuan <i>Approval</i>	Dr. Santi Wulan Purnami, M.Si	Koordinator RMK <i>Course Cluster Coordinator</i>		July 17, 2019
Penetapan <i>Determination</i>	Dr. Kartika Fithriasari, M.Si	Kepala Departemen <i>Head of Department</i>		July 30, 2019

MODULE HANDBOOK

MATRICES

Module name	MATRICES	
Module level	Undergraduate	
Code	KS184305	
Course (if applicable)	MATRICES	
Semester	Third Semester (Ganjil)	
Person responsible for the module	Dra. Wiwiek Setya Winahju, M.S.	
Lecturer	Dra. Wiwiek Setya Winahju, M.S. ; Dra. Madu Ratna, M.Si ; Wibawati, S.Si, M.Si	
Language	Bahasa Indonesia and English	
Relation to curriculum	Undergraduate degree program, mandatory , 3 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. 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	-	
Learning outcomes and their corresponding PLOs	<p><i>CLO. 1 Mastering the concept of Vector, Basic Matrix Operations, Determinants, Inverse, Random Vector, Systems Linear Equations, Vector Space, Value and Eigenvectors,</i></p> <p><i>CLO. 2 Can formulate problems of Vector, Basic Matrix Operations, Determinants, Inverse, Vector Random, Linear Equation Systems, Vector Space, Value and Eigenvectors</i></p> <p><i>CLO. 3 Can solve problems related to Differential matrix, matrix factorization, and matrix norm.</i></p> <p><i>CLO. 4 Can choose a method in solving the System of Linear Equations related to Moore Penrose's Inverse, Inverse Generalization and Least Square Inverse</i></p> <p><i>CLO. 5 Can select a special matrix and its operations and quadratic form</i></p>	<p>PLO-01</p> <p>PLO-04</p>

	<p><i>CLO. 7 Able to communicate effectively and cooperate in an interdisciplinary team and multidisciplinary teams.</i></p> <p><i>CLO. 8 Have professional responsibility and ethics</i></p> <p><i>CLO. 9 Able to motivate oneself to think creatively and learn throughout life</i></p>	PLO-05
Content	<p><i>Matrices 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 matrices, 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</i></p>	
Study and examination requirements and forms of examination	<ul style="list-style-type: none"> • In-class exercises • Assignment 1, 2, 3 • Mid-term examination • Final examination 	
Media employed	LCD, whiteboard, websites (myITS Classroom), zoom.	
Reading list	<ol style="list-style-type: none"> 1. Anton, H. R., 1994. Elementary Linear Algebra. New York: John Wiley dan Son. 2. Basilevsky, A., 1983. Applied Matrix Algebra in statistical Science. New York: Elsevier Science Publising Co. Inc. 3. Schott, R. J., 1997. Matrix Analysis for Statistics. New York: John wiley dan Sons, Inc. 4. Searle., S.R., 1971. Linear Models. Canada: John Wiley dan Sons. 	

Bahan Kajian <i>Study Materials</i>	Dasar Sains, Teori Statistika, Komputasi dan Data Processing, dan Pemodelan <i>Basic of Science, Statistical Theory, Computing and Data Processing, and Modeling</i>
CPL yang dibebankan MK <i>PLO</i>	<p>CPL-1 Mampu menerapkan pengetahuan teori statistika, matematika, dan komputasi</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>PLO-1 Able to apply knowledge of statistical theory, mathematics, and computation</i></p> <p><i>PLO-4 Able to identify, formulate, and solve statistical problems in various applied fields</i></p> <p><i>PLO-5 Able to use computational techniques and modern computer equipment needed in the fields of statistics and data science</i></p>
CP-MK <i>CLO</i>	<p>CPMK.1 Menguasai konsep Vektor, Operasi Dasar Matriks, Determinan, Invers, Vektor Random, Sistem Persamaan linier, Ruang Vektor, Nilai dan Vektor Eigen,</p> <p>CPMK.2 Dapat memformulasikan masalah Vektor, Operasi Dasar Matriks, Determinan, Invers, Vektor Random, Sistem Persamaan Linier, Ruang Vektor, Nilai dan Vektor Eigen</p> <p>CPMK.3 Dapat menyelesaikan permasalahan yang berkaitan dengan Diferensial matriks, Faktorisasi matriks, dan Norm matriks.</p> <p>CPMK.4 Dapat memilih metode dalam penyelesaian Sistem Persamaan Linear yang berkaitan dengan Invers Moore Penrose, Generalisasi Invers dan Least Square Invers</p> <p>CPMK.5 Dapat memilih matriks khusus dan operasinya serta bentuk kuadrat</p> <p>CPMK.7 Mampu berkomunikasi secara efektif dan bekerjasama dalam tim yang interdisiplin dan multidisiplin</p> <p>CPMK.8 Memiliki tanggung jawab dan etika profesi</p> <p>CPMK.9 Mampu memotivasi diri untuk berpikir kreatif dan belajar sepanjang hayat</p> <p><i>CLO. 1 Mastering the concept of Vector, Basic Matrix Operations, Determinants, Inverse, Random Vector, Systems Linear Equations, Vector Space, Value and Eigenvectors,</i></p> <p><i>CLO. 2 Can formulate problems of Vector, Basic Matrix Operations, Determinants, Inverse, Vector Random, Linear Equation Systems, Vector Space, Value and Eigenvectors</i></p> <p><i>CLO. 3 Can solve problems related to Differential matrix, matrix factorization, and matrix norm.</i></p> <p><i>CLO. 4 Can choose a method in solving the System of Linear Equations related to Moore Penrose's Inverse, Inverse Generalization and Least Square Inverse</i></p> <p><i>CLO. 5 Can select a special matrix and its operations and quadratic form of the</i></p> <p><i>CLO. 7 Able to communicate effectively and cooperate in an interdisciplinary team and multidisciplinary teams.</i></p> <p><i>CLO. 8 Have professional responsibility and ethics</i></p> <p><i>CLO. 9 Able to motivate oneself to think creatively and learn throughout life</i></p>

Pertemuan <i>Meeting</i>	Kemampuan Akhir Sub CP-MK <i>Final Ability</i>	Keluasan (materi pembelajaran) <i>Extent (learning material)</i>	Metode Pembelajaran <i>Learning methods</i>	Estimasi Waktu <i>Duration</i>	Bentuk Evaluasi <i>Evaluation Type</i>	Kriteria dan Indikator Penilaian <i>Assessment Criteria and Indicators</i>	Bobot Penilaian <i>Scoring</i>
1,2 1	1. Mampu menjelaskan konsep vektor, dan operasi matriks <i>Able to explain vector concepts, and matrix operations</i>	Vektor dan Matriks <i>Vector and matrices</i>	Ceramah Interaktif- Diskusi-Latihan Soal (CIDLS) <i>Interactive Lecture Matrix-Discussion-Exercise Questions (CIDLS)</i>	300 menit <i>300 minutes</i>	Tes Tulis (TT) Tugas Tulis (T) Observasi di kelas (O) <i>Writing Test (TT) Writing Assignment (T) Observation in class (O)</i>	1.1. Dapat menjelaskan : a. Konsep vektor b. Operasi matriks dan macam-macam matriks <i>1.1. Can explain: a. Vector concept b. Matrix operations and the kinds of matrix</i>	10%/ 10% <i>10% / 10%</i>
3	2. Mampu menjelaskan konsep, determinan dan invers matriks	Determinan dan Invers	CIDLS	150 menit	TT T O	2.1. Dapat menjelaskan tentang : Determinan dan invers matriks 2.2. Dapat menyelesaikan operasi matriks, determinan dan invers suatu matriks.	15%/15%
3	1. <i>Able to explain the concept, determinant and inverse matrix</i>	<i>Determinant and Inverse</i>	<i>CIDLS</i>	<i>150 minutes</i>	<i>TT T O</i>	<i>2.1. Can explain about: Matrix determinant and inverse 2.2. Can solve matrix operations, determinants and inverse of a matrix.</i>	<i>15% / 15%</i>
4,5 4.5	3. Mampu menjelaskan konsep vektor random 2. <i>Able to explain the concept of random</i>	Vektor Random dan aplikasinya <i>vector Random and its application</i>	CIDLS <i>CIDLS</i>	300 menit <i>300 minutes</i>	TT T O <i>TT T O</i>	3.1. Dapat menjelaskan konsep vektor random 3.2. Dapat mengaplikasikan vektor random dalam ukuran statistika (vektor mean, matriks varian covarian dan matriks korelasi). <i>2.1. Can explain random vector concept 3.3. Can apply random vector in statistical measure (mean vector, covariance variant matrix and correlation matrix).</i>	15%/ 30% <i>15% / 30%</i>

6,7	4. Mampu menyelesaikan Sistem Persamaan Linier	Sistem Persamaan Linier	CIDLS	300 menit	TT T O	4.1 Dapat menjelaskan tentang : a. Sistem Persamaan Linier Homogen dan Non homogen b. Beberapa metode penyelesaian sistem Persamaan Linier 4.2. Dapat menyelesaikan SPL dan menginterpretasikan dengan berbagai metode : Gaussian, Gauss Jordan, Cramer dan Invers	20%/ 50%
6.7	3. <i>Able to solve linear</i>	<i>equation systemlinear equation system</i>	<i>CIDLS</i>	<i>300 minutes</i>	<i>TT T O</i>	<i>4.1 Can explain about: a. Homogeneous and Non-homogeneous Linear Equation Systems b. Several methods of solving the system of Liner Equation 4.2. Can solve SPL and interpret by various methods: Gaussian, Gauss Jordan, Cramer and Inverse</i>	<i>20% / 50%</i>
8	ETS						
9-11	5. Mampu menjelaskan konsep Ruang Vektor	Ruang Vektor	CIDLS	450 menit	TT T O	5.1. Mampu menjelaskan konsep Ruang Vektor, Kombinasi Linier, Bebas Linier, Basis, Dimensi, Span, Rank, dan Orth. Gram-Schmidt 5.2. Dapat menyelesaikan permasalahan Ruang Vektor, Kombinasi Linier, bebas linier, basis, dimensi, span, Rank, dan Orth. Gram-Schmidt	25%/ 75%
9-11	4. <i>Able to explain the concept of vector space</i>	<i>Vector Space</i>	<i>CIDLSS</i>	<i>450 minutes</i>	<i>TT T O</i>	<i>5.1. Be able to explain the concepts of Vector Space, Linear Combination, Linear Free, Base, Dimension, Span, Rank, and Orth. Gram- Schmidt 5.2. Can solve problems of Vector Space, Linear Combination, Linear Free, Base, Dimension,</i>	<i>25% / 75%</i>

						<i>Span, Rank, and Orth. Gram-Schmidt</i>	
12-15	6. Mampu menerapkan akar dan vektor karakteristik untuk diagonalisasi dari suatu matriks dan secara manual maupun dengan paket program	- Nilai dan vektor eigen - Diagonalisasi	CIDLS	600 menit	TT T O	6.1 Mampu menentukan nilai dan vektor eigen, ruang eigen dan diagonalisasi	25%/ 100%
12-15	7. <i>Able to apply root and characteristic vectors to diagonalization of a matrix and manually or with a program package</i>	- <i>Eigenvalues and eigenvectors</i> - <i>diagonalization</i> -	<i>CIDLS</i>	<i>600 minutes</i>	<i>TT</i> <i>T</i> <i>O</i>	<i>6.1 Able to determine values and eigenvectors, eigen spaces and diagonalization</i>	<i>25% / 100%</i>
EAS							

PUSTAKA/REFERENCES :

1. Schott, R. J., Matrix Analysis for Statistics. John Wiley & Sons, Inc. New York . ,1997
2. Anton, H. R., Elementary Linear Algebra. John Wiley & Son, New York., .1994
3. Basilevsky, A., Applied Matrix algebra in statistical Science. Elsevier Science Publishing Co. Inc. New York.,1983