

MODULE HANDBOOK
MATHEMATICS I



**BACHELOR DEGREE PROGRAM
DEPARTMENT OF
MATHEMATICS
FACULTY OF SCIENCE AND DATA ANALYTICS
INSTITUT TEKNOLOGI SEPULUH NOPEMBER**

ENDORSEMENT PAGE



MODULE HANDBOOK MATHEMATICS I DEPARTMENT OF MATHEMATICS INSTITUT TEKNOLOGI SEPULUH NOPEMBER

Proses <i>Process</i>	Penanggung Jawab <i>Person in Charge</i>			Tanggal <i>Date</i>
	Nama <i>Name</i>	Jabatan <i>Position</i>	Tandatangan <i>Signature</i>	
Perumus <i>Preparation</i>	Drs. Kamiran, M.Si	Dosen <i>Lecturer</i>		March 28, 2019
Pemeriksa dan Pengendalian <i>Review and Control</i>	Drs. Kamiran, M.Si; Alvida Mustika Rukmi, S.Si, M.Si; Amirul Hakam, S.Si, M.Si; Dr. Didik Khusnul Arif, S.Si, M.Si; Dr. Valeriana Lukitosari, M.T.; Dra. Wahyu Fistia Doctorina, M.Si; Drs. IGN Rai Usadha, M.Si; Drs. Iis Herisman, M.Si; Drs. Komar Baihaqi, M.Si; Drs. Soetrisno, M.I.Komp.; Drs. Suhud Wahyudi, M.Si; Muhammad Luthfi Shahab, S.Si, M.Si	Tim kurikulum <i>Curriculum team</i>		April 15, 2019
Persetujuan <i>Approval</i>		Koordinator RMK <i>Course Cluster Coordinator</i>		July 17, 2019
Penetapan <i>Determination</i>	Subchan, S.Si, M.Sc, Ph.D	Kepala Departemen <i>Head of Department</i>		July 30, 2019

MODULE HANDBOOK

MATHEMATICS I

Module name	Mathematics I	
Module level	Undergraduate	
Code	KM184101	
Course (if applicable)	Mathematics I	
Semester	1 st semester	
Person responsible for the module	Dr. Tahiyatul Asfihani, M.Si	
Lecturer	Drs. Kamiran, M.Si; Alvida Mustika Rukmi, S.Si, M.Si; Amirul Hakam, S.Si, M.Si; Dr. Didik Khusnul Arif, S.Si, M.Si; Dr. Valeriana Lukitosari, M.T.; Dra. Wahyu Fistia Doctorina, M.Si; Drs. IGN Rai Usadha, M.Si.; Drs. Iis Herisman, M.Si; Drs. Komar Baihaqi, M.Si; Drs. Soetrisno, M.I.Komp.; Drs. Suhud Wahyudi, M.Si; Muhammad Luthfi Shahab, S.Si, M.Si	
Language	Bahasa Indonesia and English	
Relation to curriculum	Undergraduate degree program, mandatory , 1 st 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	-	
Learning outcomes and their corresponding PLOs	CLO.1 Able to understand the matrix and determinant including its properties and able to solve the system of linear equations, define the eigenvalue and eigenvector. CLO.2 Able to understand the definition of the real number system, the decimal form of the real number, the coordinate of the real number, the properties of sequence, the definition of absolute value, inequalities, the coordinate of the plane, line, the distance of two points, circle, and parabola CLO.3 Able to understand the complex number including the algebraic operations, the polar form of the complex number, and the root of the complex number system.	PLO.1

	CLO.4 Able to understand and calculate the limit function and define the continuity of the simple equations CLO.5 Able to solve the differential of the explicit and implicit function, and apply the chain rule. CLO.6 Able to make a graph, perform the derivative test to determine the extreme point, increasing/decreasing function, the concavity, and able to apply these materials to the optimization function, Taylor/Maclaurin series, and calculate the indefinite integral. CLO.7 Able to solve the integral task using the fundamental calculus theorem	
Content	In this course, the students will learn the matrix concept, determinant, and system of linear equations, the concept of mathematical thinking in solving the artificial problems, modeling, etc in the technique that related to the differential application. The materials in this course are emphasized on the problem solving of real cases that can be formulated in the one dependent variable function. The materials include: matrix and determinant, system of linear equations, real number system (ordered, absolute value), complex number and algebraic operations, functions and limits in the polar form of the complex number, derivatives including its applications, and indefinite integrals.	
Study and examination requirements and forms of examination	• In-class exercises • Assignment • Mid-term exam • Final exam	
Media employed	LCD, whiteboard, websites (myITS Classroom), zoom.	
Reading list	1. Kreyzig, E, Advanced Engineering Mathematics, 10-th edition, John Wiley & Sons, Singapore, 2011 2. Purcell, J, E, Rigdon, S., E., Calculus, 9-th edition, Prentice-Hall, New Jersey, 2006 3. James Stewart , Calculus, ed.7, Brooks/cole-Cengage Learning, Canada,2012	

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RP-S1	Dosen Pengampu	

Bahan Kajian <i>Study Materials</i>	Matrik dan determinan, penyelesaian sistem persamaan linier, Eigen value, Eigen vector, sistem bilangan real (keterurutan, nilai mutlak), Bilangan kompleks, bentuk polar bilangan kompleks fungsi dan limit fungsi, derivatif dan aplikasinya, integral tak tentu. <i>Matrix and determinant, solving systems of linear equations, eigen value, eigen vector, real number systems (sequences, absolute value), complex number, the polar form of the complex number function and limit function, derivative and its application, indefinite integral.</i>
CPL yang dibebankan MK <i>PLO</i>	CPL 1. Mahasiswa mampu mengidentifikasi dan menjelaskan pondasi matematika yang meliputi murni, terapan dan dasar-dasar komputasi <i>PLO1. Students are able to identify and explain foundations of mathematics that include pure, applied, and the basic of computing</i>
CP-IMK <i>CLO</i>	1. Mampu memahami matrik dan determinan serta sifat-sifatnya dan mampu menyelesaikan sistem persamaan linier, , menentukan nilai Eigen dan vector Eigen. 2. Mampu memahami pengertian sistem bilangan real, bentuk desimal bilangan real, koordinat real, sifat keterurutan, pengertian nilai mutlak, pertidaksamaan, koordinat bidang, garis, jarak dua titik, lingkaran, parabola. 3. Mampu memahami bilangan kompleks dan operasi aljabar, bentuk polar dan penarikan akar persamaan bilangan kompleks. 4. Mampu memahami fungsi dan konsep limit, menghitung limit fungsi dan menentukan kontinuitas fungsi fungsi sederhana. 5. Mampu memahami konsep turunan fungsi, dapat menurunkan fungsi eksplisit maupun implisit, dan dapat menerapkan aturan rantai. 6. Mampu menghitung laju-laju perubahan, menggambar grafik fungsi dengan menentukan titik ekstrim, interval fungsi naik/turun, interval kecekungan dan menerapkannya pada masalah optimasi fungsi, dan mampu menghitung limit bentuk tak tentu. 7. Mampu memahami konsep integral dan mampu menyelesaikan integral menggunakan teorema fundamental kalkulus. <i>1. Able to understand the matrix and determinant including its properties and able to solve the system of linear equations, define the eigenvalue and eigenvector.</i> <i>2. Able to understand the definition of the real number system, the decimal form of the real number, the coordinate of the real number, the properties of sequence, the definition of absolute value, inequalities, the coordinate of the plane, line, the distance of two points, circle, and parabola</i> <i>3. Able to understand the complex number including the algebraic operations, the polar form of the complex number, and the root of the complex number system.</i> <i>4. Able to understand and calculate the limit function and define the continuity of the simple equations</i> <i>5. Able to solve the differential of the explicit and implicit function, and apply the chain rule.</i> <i>6. Able to make a graph, perform the derivative test to determine the extreme point, increasing/decreasing function, the concavity, and able to apply these materials to the optimization function, Taylor/Maclaurin series, and calculate the indefinite integral.</i> <i>7. Able to solve the integral task using the fundamental calculus theorem</i>

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Perte- muan <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	Mampu memahami matrik dan determinan serta sifat-sifatnya <i>Able to understand the matrix and determinant including its properties</i>	Matrik dan Determinan <i>Matrix and Determinant</i>	Ceramah dan Latihan <i>Lecture and Exercises</i>	2x3x50'	faham matrik dan determinan <i>Understand the matrix and determinant</i>	Ketajaman memahami sifat-sifat matrik , determinan dan menghitung nilai determinan <i>The ability in understanding the properties of matrix, determinant and the calculation of determinant value</i>	5
2							
3	Mampu menyelesaikan sistem persamaan linier. <i>Able to solve the linear equation systems</i>	Penyelesaian SPL <i>The solution of the linear equation systems</i>	Ceramah dan Latihan <i>Lecture and Exercises</i>	3x50'	Penyelesaian SPL <i>The solution of the linear equation systems</i>	Ketajaman dan kemampuan menyelesaikan SPL <i>The ability in solving the linear equation systems</i>	5
4	Asistensi ke_1						
5	Mampu menentukan nilai Eigen dan vector Eigen <i>Able to determine the eigenvalue and eigenvector</i>	Nilai Eigen dan Vektor Eigen <i>The eigenvalue and eige vector</i>	Ceramah dan Latihan <i>Lecture and Exercises</i>	3x50'	Menentukan nilai/vektor Eigen <i>Determine the eigenvalue and eigenvector</i>	Ketajaman menentukan nilai Eigen dan Vektor Eigen <i>The ability in defining the eigenvalue and eigenvector</i>	5

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6	Mampu memahami pengertian sistem bilangan real, sifat keterurutan, sifat logaritma dan pengertian nilai mutlak. <i>Able to understand the definition of the real number system, sequences properties, logarithmic properties, and the definition of absolute value</i>	Sistem Bilangan Real, logaritma, nilai mutlak <i>The real number system, logarithmic, and the absolute value</i>	Ceramah dan Latihan <i>Lecture and Exercises</i>	3x50'	memahami sifat-Bilangan Real, keterurutan, sifat logaritma dan nilai mutlak <i>Understand the real number properties, sequences, logarithmic properties, and the absolute value</i>	- o Ketajaman memahami sifat-sifat Bilangan Real, Selang, Keterurutan, sifat logaritma dan nilai mutlak - o <i>The ability in understanding the real number properties, interval, properties, logarithmic properties, and the absolute value</i>	5
7	Pertidaksamaan, koordinat bidang, garis, jarak dua titik, lingkaran, parabola. <i>Inequalities, the coordinate of the plane, line, the distance of two points, circle, and parabola.</i>	Pertaksamaan, koordinat bidang, garis, jarak dua titik, lingkaran, parabola <i>Inequalities, the coordinate of the plane, line, the distance of two points, circle, and parabola</i>	Ceramah dan Latihan <i>Lecture and Exercises</i>	3x50'	Memahami garis, jarak, parabola dan lingkaran <i>Understand the line, the distance, parabola, and circle</i>	- o Ketajaman pemahaman koordinat bidang, garis, jarak dua titik, lingkaran dan parabola - o <i>The ability in understanding the coordinate of the plane, line, the distance of two points, circle, and parabola</i>	5
8	Asistensi ke_2						
9	Mampu memahami bilangan kompleks dan operasi aljabar, bentuk	Sistem Bilangan Kompleks <i>Complex number system</i>	Ceramah dan Latihan	3x50'	Memahami bilangan kompleks	Ketajaman mengoperasikan bilangan kompleks dan penarikan akar	5

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10	polar dan penarikan akar persamaan bilangan kompleks. <i>Able to understand the complex number including the algebraic operations, the polar form and the root of the complex number system.</i>	Sistem Bilangan Kompleks <i>Complex number system</i>	<i>Lecture and Exercises</i>	3x50'	termasuk bentuk polarnya <i>Understand the complex number including the polar form</i>	persamaan dalam sistem bilangan kompleks termasuk bentuk polarnya <i>The ability in operating complex number and solve the root of equation in complex number including the polar form</i>	
			Ceramah dan Latihan <i>Lecture and Exercises</i>				
11	Mampu memahami fungsi dan operasi fungsi <i>Able to understand the function and function operation</i>	Fungsi <i>Function</i>	Ceramah dan Latihan <i>Lecture and Exercises</i>	3x50'	memahami sifat fungsi dan operasi fungsi <i>Understand the function properties and the function operation</i>	Ketajaman pemahaman sifat fungsi dan operasi fungsi <i>The ability in understanding the function properties and the function operation</i>	5
12	Asistensi ke_3						
13	Mampu memahami invers fungsi (fungsi Polinomial, rasional, transenden dan trigonometri) <i>Able to understand the inverse function (Polynomial function,</i>	Fungsi <i>Function</i>	Ceramah dan Latihan <i>Lecture and Exercises</i>	3x50'	Memahami invers fungsi <i>Understand the inverse function</i>	Ketajaman menentukan invers fungsi dan sifat sifatnya <i>The ability in defining the inverse function and its properties</i>	15

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22	Mampu menghitung laju- laju perubahan <i>Able to calculate the rate of change</i>	Aplikasi Turunan: Laju laju <i>The application of derivative: Rate of change</i>	Ceramah dan Latihan <i>Lecture and Exercises</i>	3x50'	Memahami laju perubahan <i>Understand the rate of change</i>	Ketepatan mengaplikasikan konsep Laju-laju yang berkaitan <i>The appropriateness in applying the concept of rate of change</i>	5
23	Mampu menentukan titik ekstrim, interval fungsi naik/turun, interval kecekungan dan menerapkannya untuk menggambar grafik fungsi <i>Able to determine the extreme point, increasing/decreasing of interval function, concavity interval, and perform a graph function</i>	Titik Ekstrim, Interval fungsi naik/turun, Kecekungan dan Grafik fungsi <i>Extreme point, increasing/decreasing of interval function, concavity, and graph function</i>	Ceramah dan Latihan <i>Lecture and Exercises</i>	3x50'	Dapat menggambar grafik fungsi dan Menghitung nilai optimum fungsi dan masalah optimasi lainnya <i>Able to perform the graph function and calculate the optimum function and other optimization problem</i>	○ Ketepatan menentukan titik ekstrim, Selang naik, selang turun & kecekungan. ○ Ketepatan mengaplikasikan turunan untuk menentukan Ekstrim relatif, mensketsa Grafik Polinomial & Fungsi rasional serta Masalah Grafik Lain ○ <i>The appropriateness of defining the extreme point, increasing and decreasing interval, concavity.</i> ○ <i>The appropriateness in applying the derivative to determine the relative extreme point, perform a polynomial graph, rational function, and another graph</i>	5
24	Mampu mengaplikasikan turunan pada masalah optimasi suatu permasalahan.	Optimasi suatu permasalahan nyata <i>Optimization of a real cases</i>	Ceramah dan Latihan <i>Lecture and Exercises</i>	3x50'		mengaplikasikan masalah maksimum & minimum <i>Applying the maximum and minimum problems</i>	5

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30	mampu menyelesaikan kan integral menggunakan teorema fundamental kalkulus. <i>Able to solve the integral task using the fundamental calculus theorem</i>	Teorema Fundamental: Kalkulus_1 dan Kalkulus_2 <i>Fundamental theorem: Calculus I Calculus II</i>	Ceramah dan Latihan <i>Lecture and Exercises</i>	3x50'	Dapat menghitung inteegral tertentu <i>Able to calculate the definite integral</i>	Ketajaman dalam merumuskan perhitungan integrasi dengan rumus fundamental. <i>The ability in formulating the integration calculation using the fundamental formula.</i>	5
31	EAS						
32							

PUSTAKA UTAMA /*MAIN REFERENCES:*

1. Tim Dosen Jurusan Matematika ITS, *Buku Ajar Kalkulus I*, Edisi ke-1 Jurusan Matematika ITS, 2020
2. Anton, H. dkk, *Calculus*, 10-th edition, John Wiley & Sons, New York, 2012

PUSTAKA PENDUKUNG/*SUPPORTING REFERENCES:*

1. Kreyzig, E, *Advanced Engineering Mathematics*, 10-th edition, John Wiley & Sons, Singapore, 2011
2. Purcell, J, E, Rigdon, S., E., *Calculus*, 9-th edition, Prentice-Hall, New Jersey, 2006
3. James Stewart , *Calculus*, ed.7, Brooks/cole-Cengage Learning, Canada,2012