MODULE HANDBOOK

MATHEMATICS I

BACHELOR DEGREE PROGRAM
DEPARTMENT OF STATISTICS
FACULTY OF SCIENCE AND DATA ANALYTICS
INSTITUT TEKNOLOGI SEPULUH NOPEMBER
SURABAYA, INDONESIA

ENDORSEMENT PAGE

MODULE HANDBOOK
MATHEMATICS I
DEPARTMENT OF STATISTICS
INSTITUT TEKNOLOGI SEPULUH NOPEMBER

Proses ***Process***	**Penanggung Jawab** ***Person in Charge***			**Tanggal** ***Date***
	Nama ***Name***	**Jabatan** ***Position***	**Tandatangan** ***Signature***	
Perumus *Preparation*	Drs. Kamiran, M.Si	Dosen *Lecturer*		**March 28, 2019**
Pemeriksa dan Pengendalian *Review and Control*	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 *Curriculum team*		**April 15, 2019**
Persetujuan *Approval*		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

MATHEMATICS I

Module name	**Mathematics I**	
Module level	Undergraduate	
Code	KM184101	
Course (if applicable)	Mathematics I	
Semester	1st semester	
Person responsible for the module	Drs. Kamiran, 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**, 1st 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) perweek. 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	PLO.4
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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Bahan Kajian ***Study Materials***	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 tantu. *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.*
CPL yang dibebankan MK ***PLO***	CPL-1 Mampu menerapkan pengetahuan teori statistika, matematika, dan komputasi CPL-6 Memiliki pengetahuan tentang isu terkini dan mendatang yang berkaitan dengan bidang statistika dan sains data *PLO-1 Able to apply knowledge of science, statistical theory, mathematics, and computing to problems in various applied fields* *PLO-6 Having knowledge of current and upcoming issues using statistical and data science*
CP-MK ***CLO***	1. Mampu memahami matrik dan determinan serta sifat-sifatnya dan mampu menyelesaikan sistem persamaan linier, , menetukan nilai Eigen dan vector Eigen. 2. Mampu memaham 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 explisit 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 taktentu. 7. Mampu memahami konsep integral dan mampu menyelesaikan integral menggunakan teorema fundamental kalkulus. *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.* *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* *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.* *4. Able to understand and calculate the limit function and define the continuity of the simple equations* *5. Able to solve the differential of the explicit and implicit function, and apply the chain rule.* *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.* *7. Able to solve the integral task using the fundamental calculus theorem*

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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	Mampu memahami matrik dan determinan serta sifat-sifatnya *Able to understand the matrix and determinant including its properties*	Matrik dan Determinan *Matrix and Determinant*	Ceramah dan Latihan *Lecture and Exercises*	**2x3x50'**	faham matrik dan determinan *Understand the matrix and determinant*	Ketajaman memahami sifat-sifat matrik , determinan dan menghitung nilai determinan *The ability in understanding the properties of matrix, determinant and the calculation of determinant value*	5
3	Mampu menyelesaikan sistem persamaan linier. *Able to solve the linear equation systems*	Penyelesaian SPL *The solution of the linear equation systems*	Ceramah dan Latihan *Lecture and Exercises*	**3x50'**	Penyelesaian SPL *The solution of the linear equation systems*	Ketajaman dan kemampuan menyelesaikan SPL *The ability in solving the linear equation systems*	5
4	**Asistensi ke_1**						
5	Mampu menetukan nilai Eigen dan vector Eigen *Able to determine the eigenvalue and eigenvector*	Nilai Eigen dan Vektor Eigen *The eigenvalue and eige vector*	Ceramah dan Latihan *Lecture and Exercises*	**3x50'**	Menentukan nilai/vektor Eigen *Determine the eigenvalue and eigenvector*	Ketajaman menentukan nilai Eigen dan Vektor Eigen *The ability in defining the eigenvalue and eigenvector*	5
6	Mampu memahami pengertian sistem bilangan real, sifat keterurutan, sifat logaritma dan pengertian nilai mutlak. *Able to understand the definition of the real*	Sistem Bilangan Real, logaritma, nilai mutlak *The real number system, logarithmic, and the absolute value*	Ceramah dan Latihan *Lecture and Exercises*	**3x50'**	memahami sifat-Bilangan Real, keterurutan, sifat logaritma dan nilai mutlak *Understand the real number*	○ Ketajaman memahami sifat-sifat Bilangan Real, Selang, Keterurutan, sifat logaritma dan nilai mutlak ○ *The ability in understanding the real number properties, interval,*	5

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	number system, sequences properties, logarithmic properties, and the definition of absolute value				*properties, sequences, logarithmic properties, and the absolute value*	*properties, logarithmic properties, and the absolute value*	
7	Pertidaksamaan, koordinat bidang, garis, jarak dua titik, lingkaran, parabola. *Inequalities, the coordinate of the plane, line, the distance of two points, circle, and parabola.*	Pertaksamaan, koordinat bidang, garis, jarak dua titik, lingkaran, parabola *Inequalities, the coordinate of the plane, line, the distance of two points, circle, and parabola*	Ceramah dan Latihan *Lecture and Exercises*	**3x50'**	Memahami garis, jarak, parabola dan lingkaran *Understand the line, the distance, parabola, and circle*	○ Ketajaman pemahaman koordinat bidang, garis, jarak dua titik, lingkaran dan parabola ○ *The ability in understanding the coordinate of the plane, line, the distance of two points, circle, and parabola*	5
8	**Asistensi ke_2**						
9	Mampu memahami bilangan kompleks dan operasi aljabar, bentuk polar dan penarikan akar persamaan bilangan kompleks. *Able to understand the complex number including the algebraic operations, the polar form and the root*	Sistem Bilangan Kompleks *Complex number system*	Ceramah dan Latihan *Lecture and Exercises*	**3x50'**	Memahami bilangan komplek termasuk bentuk polarnya *Understand the complex number including the polar form*	Ketajaman mengoperasikan bilangan komplek dan penarikan akar persamaan dalam sistem bilangan kompleks termasuk bentuk polarnya *The ability in operating complex number and solve the root of equation in complex number including the polar form*	5
10		Sistem Bilangan Kompleks *Complex number system*	Ceramah dan Latihan *Lecture and Exercises*	**3x50'**			

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	of the complex number system.						
11	Mampu memahami fungsi dan operasi fungsi *Able to understand the function and function operation*	Fungsi *Function*	Ceramah dan Latihan *Lecture and Exercises*	**3x50'**	memahami sifat fungsi dan operasi fungsi *Understand the function properties and the function operation*	Ketajaman pemahaman sifat fungsi dan operasi fungsi *The ability in understanding the function properties and the function operation*	5
12	**Asistensi ke_3**						
13	Mampu memahami invers fungsi (fungsi Polinomial, rasional, transenden dan trigonometri) *Able to understand the inverse function (Polynomial function, rational, transcendent, and trigonometry)*	Fungsi *Function*	Ceramah dan Latihan *Lecture and Exercises*	**3x50'**	Memahami invers fungsi *Understand the inverse function*	Ketajaman menentukan invers fungsi dan sifat sifatnya *The ability in defining the inverse function and its properties*	15
14	Mampu memahami konsep limit fungsi, menghitung limit fungsi (fungsi Polinomial,	Limit Fungsi *Limit function*	Ceramah dan Latihan *Lecture and Exercises*	**3x50'**	Memahami konsep limit dan perhitungan limit fungsi	○ Ketajaman penguasaan konsep Limit fungsi ○ Ketajaman penguasaan Teknik Perhitungan Limit	

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	rasional, transenden dan trigonometri) *Able to understand the concept of limit function and the calculation of the limit function (Polynomial function, rational, transcendent, and trigonometry)*				*Understand the concept of the limit and the calculation of limit function*	○ *The ability in understanding the concept of the limit function* ○ *The ability in understanding the calculation technique of limit*	
15	Mampu menentukan kontinuitas fungsi *Able to determine the continuity of a function*	Limit Fungsi *Limit function*	Ceramah dan Latihan *Lecture and Exercises*	**3x50'**	Mengetahui fungsi diskontinu *Understand the discontinuity function*	Ketajaman mengetahui Kontinuitas suatu fungsi *The ability in understanding the continuity of a function*	
16	ETS						
17							
18	Mampu memahami konsep turunan fungsi *Able to understand the concept of the derivative function*	Turunan *Derivative*	Ceramah dan Latihan *Lecture and Exercises*	**3x50'**	Memahami defisi turunan *Understand the definition of the derivative*	Ketajaman dalam merumuskan perhitungan Garis Singgung dan Laju Perubahan, definisi turunan *The ability to formulate the calculation of tangent and rate of change, the definition of the derivative*	10

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19	Dapat menurunkan fungsi explisit dan dapat menerapkan aturan rantai. (fungsi Polinomial, rasional, transenden dan trigonometri) *Able to differentiate the explicit function and apply the chain rule*	Teknik diferensiasi dan aturan rantai *Differentiate technique and the chain rule*	Ceramah dan Latihan *Lecture and Exercises*	**3x50'**	Dapat menentukan diferensiai fungsi *Able to determine the differentiate of a function*	Ketepatan dalam mendapatkan Turunan Fungsi, penerapan Aturan rantai *The appropriateness in defining the derivative of a function and the application of the chain rule*	5
20	Dapat menurunkan fungsi implisit *Able to differentiate the implicit function*	Turunan fungsi implisit *The derivative of an implicit function*	Ceramah dan Latihan *Lecture and Exercises*	**3x50'**		Ketepatan menentukan diferensiasi fungsi Implisit. *The appropriateness in defining the derivative of an implicit function*	5
21	**Asistensi ke_4**						
22	Mampu menghitung laju-laju perubahan *Able to calculate the rate of change*	Aplikasi Turunan: Laju laju *The application of derivative: Rate of change*	Ceramah dan Latihan *Lecture and Exercises*	**3x50'**	Memahami laju perubahan *Understand the rate of change*	Ketepatan mengaplikasikan konsep Laju-laju yang berkaitan *The appropriateness in applying the concept of rate of change*	5
23	Mampu menentukan titik ekstrim, interval fungsi naik/turun, interval kecekungan dan	Titik Ekstrim, Interval fungsi naik/turun, Kecekungan dan Grafik fungsi	Ceramah dan Latihan *Lecture and Exercises*	**3x50'**	Dapat menggambar grafik fungsi dan Menghitung nilai optimum fungsi	○ Ketepatan menentukan titik ekstrim, Selang naik, selang turun & kecekungan. ○ Ketepatan mengaplikasikan turunan untuk menentukan	5

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	menerapkannya untuk menggambar grafik fungsi *Able to determine the extreme point, increasing/decreasing of interval function, concavity interval, and perform a graph function*	*Extreme point, increasing/decreasing of interval function, concavity, and graph function*			dan masalah optimasi lainnya *Able to perform the graph function and calculate the optimum function and other optimization problem*	Ekstrim relatif , mensketsa Grafik Polinomial & Fungsi rasional serta Masalah Grafik Lain ○ *The appropriateness of defining the extreme point, increasing and decreasing interval, concavity.* ○ *The appropriateness in applying the derivative to determine the relative extreme point, perform a polynomial graph, rational function, and another graph*	
24	Mampu mengaplikasikan turunan pada masalah optimasi suatu permasalahan. *Able to apply the derivative on the optimization problem.*	Optimasi suatu permasalahan nyata *Optimization of a real cases*	Ceramah dan Latihan *Lecture and Exercises*	**3x50'**		mengaplikasikan masalah maksimum & minimum *Applying the maximum and minimum problems*	5
25	**Asistensi ke_5**						
26	mampu menghitung limit bentuk taktentu *Able to calculate the indefinite limit function*	Limit bentuk tak tentu *Indefinite limit function*	Ceramah dan Latihan *Lecture and Exercises*	**3x50'**	Dapat menghitung limit bentuk tak tentu	Ketepatan menghitung limit bentuk taktentu *The appropriateness in calculating indefinite limit function*	5

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27		Limit bentuk tak tentu *Indefinite limit function*	Ceramah dan Latihan *Lecture and Exercises*	**3x50'**	*Able to calculate the indefinite limit function*		
28	Mampu memahami anti turunan, integral tak tentu, sifat linear integral tak tentu, rumus-rumus dasar integral tak tentu *Able to understand the anti-derivative, indefinite integral, the linear properties of indefinite integral, the basic formula of indefinite integral*	Integral tak tentu dan rumus rumus dasar integrasi, integral dengan subtitusi *Indefinite integral, the basic formula of integration, integral using substitution*	Ceramah dan Latihan *Lecture and Exercises*	**3x50'**	Dapat menyelesaikan integral tak tentu *Able to solve the Indefinite integral*	Ketepatan memahami anti turunan, integral tak tentu , sifat linear integral tak tentu, dan rumus-rumus dasar integral tak tentu *The appropriateness in understanding the anti-derivative, indefinite integral, the linear properties of indefinite integral, and the basic formula of indefinite integral*	5
29	**Asistensi ke_6**						
30	mampu menyelesai kan integral menggunakan teorema fundamental kalkulus. *Able to solve the integral task using the fundamental calculus theorem*	Teorema Fundamental: Kalkulus_1 dan Kalkulus_2 *Fundamental theorem: Calculus I Calculus II*	Ceramah dan Latihan *Lecture and Exercises*	**3x50'**	Dapat menghitung inteegral tertentu *Able to calculate the definite integral*	Ketajaman dalam merumuskan perhitungan integrasi dengan rumus fundamental. *The ability in formulating the integration calculation using the fundamental formula.*	5
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PUSTAKA UTAMA /*MAIN REFERENCES*:

1. Tim Dosen Jurusan Matematika ITS, *Buku Ajar Kalkulus I* , Edisi ke-4 Jurusan Matematika ITS, 2012
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