UNIVERSITAS ISLAM NEGERI MAULANA MALIK IBRAHIM MALANG
Faculty of Science and Technology
Mathematics Study Program
Jl. Gajayana No. 50 Malang 65144 Telp. / Fax. (0341) 558933, website : www.matematika.uin-malang.ac.id, e-mail : matematika@uin-malang.ac.id

Mathematics Study Program

Telp : (0341) 558933
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MODULE HANDBOOK

Module name	Analisis Kompleks *Complex Function*
Module level, if applicable	Sarjana /S1 *Bachelor*
Code, if applicable	22060111D18
Courses, if applicable	Analisis Kompleks *Complex Function*
Semester(s) in which the module is taught	5
Person responsible for the module	Head of Analysis Consortium
Lecturers	1. Dian Maharani, M.Si. 2. Dr. Hairur Rahman, M.Si. 3. Dr. Elly Susanti, M.Sc.
Language	Indonesian Language and English
Relation to curriculum	Compulsory course 5th semester
Type of teaching, contact hours	150 minutes lectures and 180 minutes structured activities per week
Workload	The total workload is 136 hours per semester, which consists of 150 minutes lectures per week for 14 weeks, 180 minutes structured activities per week, 180 minutes individual study per week, in total 16 weeks per semester, including mid and final exam.
Credit points	3
Requirements according to the examination regulations	Students have taken Complex Function course and attending minimum 80% of the course
Recommended prerequisites	Real Analysis I and II
Module objectives/intended learning outcomes	CO1 Students are able to explain the concept of complex fields and various basic functions in complex fields. CO2 Students are able to prove the properties and concepts related to complex functions and their continuity. CO3 Students are able to interpret concepts and prove the properties of elementary function.
Content	This course discusses the concept of complex numbers and their properties. There are several topics studied, including basic concepts of complex numbers, geometry of complex numbers, limits and continuity of complex functions, derivatives of complex functions, the Cauchy-Riemann equation, analytic functions and harmonic functions, elementary functions, and integrals of complex functions.

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<table>
<tr><td>Study and examination requirements and forms of examination</td><td>The final mark will be weighted as follows:
<table>
<tr><td>No</td><td>Assessment Methods</td><td>Weight (percentage)</td></tr>
<tr><td>1</td><td>Final examination</td><td>30%</td></tr>
<tr><td>2</td><td>Mid-Term Examination</td><td>30%</td></tr>
<tr><td>3</td><td>Quiz</td><td>15%</td></tr>
<tr><td>4</td><td>Homework</td><td>25%</td></tr>
</table>
Final grade will be determined as follows:
<table>
<tr><th>Range</th><th>Grade</th></tr>
<tr><td>[85 – 100]</td><td>A</td></tr>
<tr><td>[75 – 85)</td><td>B+</td></tr>
<tr><td>[70 – 75)</td><td>B</td></tr>
<tr><td>[65 – 70)</td><td>C+</td></tr>
<tr><td>[60 – 65)</td><td>C</td></tr>
<tr><td>[50 – 60)</td><td>D</td></tr>
</table></td></tr>
<tr><td>Media employed</td><td>Whiteboard, Projector, Laptop</td></tr>
<tr><td>Reading List</td><td>1. Fujiwara, Takeo. (2003). Complex Function Theory. World Scientific Maruzen.
2. Gamelin, Theodore W. (2001). Complex Analysis (Undergraduate Text in Mathematics). New York: Springer.
3. Saff, E.B & Snider, A.D. (2003). Fundamentals of Complex Analysis (with Application to Enginering and Science). New Jersey: Pearson Education, Inc.</td></tr>
</table>

PLO and CO Mapping (The PLO is available on https://s.id/PLOMatematika)

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11
CO 1			✓								
CO 2				✓							
CO 3										✓	

Date of Last Amendment:
November 29th, 2023

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MODULE HANDBOOK

Module name	Pengantar Topologi *Introduction to Topology*
Module level, if applicable	Sarjana /S1 *Bachelor*
Code, if applicable	22060112E24
Courses, if applicable	Pengantar Topologi *Introduction to Topology*
Semester(s) in which the module is taught	4
Person responsible for the module	Head of Analysis Consortium
Lecturers	1. Dian Maharani, M.Si. 2. Dr. Hairur Rahman, M.Si. 3. Dr. Elly Susanti, M.Sc.
Language	Indonesian Language and English
Relation to curriculum	Elective course 4th semester
Type of teaching, contact hours	150 minutes lectures and 180 minutes structured activities per week
Workload	The total workload is 136 hours per semester, which consists of 150 minutes lectures per week for 14 weeks, 180 minutes structured activities per week, 180 minutes individual study per week, in total 16 weeks per semester, including mid and final exam.
Credit points	3
Requirements according to the examination regulations	Students have taken Introduction to Topology course and attending minimum 80% of the course
Recommended prerequisites	Real Analysis I and II
Module objectives/intended learning outcomes	CO1. Students be able to analyze the definition, example, and properties of topological spaces. CO2. Students be able to evaluate the properties of the Euclidean topology and assess its relationship with the basis for a topology. CO3. Students be able to create examples and proofs to demonstrate the properties of limit points and homeomorphisms.
Content	This course discusses the concept of topological space, including open sets, closed sets, and clopen sets; the Euclidean topology and its basis; limit point and closure, neighbourhoods, connectedness; subspaces, homeomorphism, and non-homeomorphic space.

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<tr><td>[60 – 65)</td><td>C</td></tr>
<tr><td>[50 – 60)</td><td>D</td></tr>
</table></td></tr>
<tr><td>Media employed</td><td>Whiteboard, Projector, Laptop</td></tr>
<tr><td>Reading List</td><td>1. Morris, S.A. (2011). Topology without tears.
2. Joshi, K.D. (1983). Introduction to General Topology. Delhi: Wiley Eastern Limited.</td></tr>
</table>

Date of Last Amendment:
February 15th, 2024

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MODULE HANDBOOK

Module name	Geometri *Geometry*
Module level, if applicable	Sarjana /S1 *Bachelor*
Code, if applicable	22060111D05
Courses, if applicable	Geometri *Geometry*
Semester(s) in which the module is taught	1
Person responsible for the module	Head of Analysis Consortium
Lecturers	1. Dian Maharani, M.Si. 2. Dr. Hairur Rahman, M.Si. 3. Dr. Elly Susanti, M.Sc.
Language	Indonesian and English Language
Relation to curriculum	Compulsory course 1st semester
Type of teaching, contact hours	150 minutes lectures and 180 minutes structured activities per week
Workload	The total workload is 136 hours per semester, which consists of 150 minutes lectures per week for 14 weeks, 180 minutes structured activities per week, 180 minutes individual study per week, in total 16 weeks per semester, including mid and final exam.
Credit points	3
Requirements according to the examination regulations	Students have taken Geometry course and attending minimum 80% of the course.
Recommended prerequisites	-
Module objectives/intended learning outcomes	After completing this course, the students: CO 1. Interpreting Cartesian coordinate CO 2. Identify the equations of line, circle, and conics sections CO 3. Examining parameter function, coordinate transformation, and vectors on plane CO 4. Identify space equations, area equations, intersections of two areas, ball equations, and coordinate system on space
Content	Cartesian coordinate, equations of line, circle, and conics sections, parameter function, coordinate transformation, and vectors on plane, space equations, area equations, intersections of two areas, ball equations, and coordinate system on space

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<tr><td>[70 – 75)</td><td>B</td></tr>
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<tr><td>[60 – 65)</td><td>C</td></tr>
<tr><td>[50 – 60)</td><td>D</td></tr>
</table></td></tr>
<tr><td>Media employed</td><td>Whiteboard, Projector, Laptop, Paper, Stationery</td></tr>
<tr><td>Reading List</td><td>1. Purcell, E., Verberg, D., and Rigdon, S. (2006). Calculus (9th edition). Prentice Hall.
2. Suryani, M. (2017). Buku Ajar Geometri Analitik. Deepublish Publisher.
3. Snyder, V. and Sisam, C.H. (1914). Analytic Geometry of Space. Henry Holt and Company.
4. Brannan, D.A., Esplen, M.F., and Gray J.J. (2012). Geometry (2nd edition). Cambridge University Press.
5. Moise, E.E. (1990). Elementary Geometry from An Advanced Standpoint. Addison Wesley.</td></tr>
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Date of Last Amendment:
July 27th, 2023

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MODULE HANDBOOK

Module name	Kalkulus I *Calculus I*
Module level, if applicable	Sarjana /S1 *Bachelor*
Code, if applicable	22060111D01
Courses, if applicable	Kalkulus I *Calculus I*
Semester(s) in which the module is taught	1
Person responsible for the module	Ketua konsorsium Analisis
Lecturers	1. Prof. Dr. H. Turmudi, M.Si, Ph.D 2. Intan Nisfulaila, M.Si 3. M. Nafie Jauhari, M.Si
Language	Bahasa Indonesia
Relation to curriculum	Mata kuliah wajib semester 1
Type of teaching, contact hours	200 menit tatap muka dan 240 menit aktivitas terstruktur per minggu.
Workload	Total beban perkuliahan adalah 181.33 jam per semester, yang terdiri atas 200 menit perkuliahan per minggu selama 14 minggu, 240 menit aktivitas terstruktur per minggu, 240 menit belajar mandiri per minggu, dengan total 16 minggu per semester termasuk UTS dan UAS.
Credit points	4
Requirements according to the examination regulations	Mahasiswa telah mengikuti mata kuliah Kalkulus I sekurang-kurangnya 80% dari pertemuan.
Recommended prerequisites	-
Module objectives/intended learning outcomes	Setelah menempuh mata kuliah ini mahasiswa diharapkan mempunyai: CO 1. kemampuan untuk memahami konsep dasar kalkulus satu variabel seperti fungsi, limit, turunan, diferensial, dan interpretasi geometrinya. CO 2. kemampuan untuk menyelesaikan permasalahan standard pada kalkulus seperti sifat-sifat bilangan riil, fungsi, limit, dan turunan. CO 3. kemampuan untuk mengaplikasikan konsep-konsep kalkulus untuk menyelesaikan permasalahan matematika dan sains khususnya yang berhubungan dengan masalah optimasi. CO 4. kemampuan untuk menggunakan konsep limit dan turunan untuk mendapatkan informasi mengenai suatu fungsi seperti fungsi naik, fungsi turun, kecekungan, titik ekstrim, titik infleksi, termasuk membuat sketsa grafiknya.

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<table>
<tr><td>Content</td><td>Mata kuliah ini membahas mengenai sistem bilangan riil, fungsi dan grafiknya, limit fungsi, kekontinuan, turunan, interpretasi geometri dari suatu turunan, Teorema Nilai Rata-Rata, Aturan L'Hospital's, nilai ekstrim dan aplikasinya, fungsi naik dan turun, titik infleksi, menggambar grafik fungsi.</td></tr>
<tr><td>Study and examination requirements and forms of examination</td><td>Nilai akhir akan diberi bobot sebagai berikut:

No. Metode Penilaian Bobot
1 UAS 30%
2 UTS 30%
3 Kuis, Tugas 20%
4 Mini Project 20%

Nilai akhir ditentukan dengan kriteria berikut:

<table><tr><th>Range</th><th>Grade</th></tr><tr><td>[85 – 100]</td><td>A</td></tr><tr><td>[75 – 85)</td><td>B+</td></tr><tr><td>[70 – 75)</td><td>B</td></tr><tr><td>[65 – 70)</td><td>C+</td></tr><tr><td>[60 – 65)</td><td>C</td></tr><tr><td>[50 – 60)</td><td>D</td></tr></table></td></tr>
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<tr><td>Reading List</td><td>1. Varberg, Dale, et.al. (2006). Calculus (9th edition). Pearson.
2. Robert A. Adam and Christopher Essex. (2018). Calculus, A Complete Course 9th Edition. Pearson.
3. James Stewart. (2008). Calculus Early Transcendentals, 6th edition. Brooks / Cole Pub. Comp.</td></tr>
</table>

PLO and CO Mapping

	PLO 1	**PLO 2**	**PLO 3**	**PLO 4**	**PLO 5**	**PLO 6**	**PLO 7**	**PLO 8**	**PLO 9**	**PLO 10**	**PLO 11**
CO 1		V				V					
CO 2						V				V	
CO 3	V										
CO 4						V					

Date of Last Amendment:
July 27th, 2023

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MODULE HANDBOOK

Module name	Kalkulus II *Calculus II*
Module level, if applicable	Sarjana /S1 *Bachelor*
Code, if applicable	22060111D02
Courses, if applicable	Kalkulus II *Calculus II*
Semester(s) in which the module is taught	4
Person responsible for the module	Head of Analysis Consortium
Lecturers	1. Dian Maharani, M.Si. 2. Dr. Hairur Rahman, M.Si. 3. Dr. Elly Susanti, M.Sc.
Language	Indonesian and English Language
Relation to curriculum	Compulsory course 2nd semester
Type of teaching, contact hours	150 minutes lectures and 180 minutes structured activities per week
Workload	The total workload is 136 hours per semester, which consists of 150 minutes lectures per week for 14 weeks, 180 minutes structured activities per week, 180 minutes individual study per week, in total 16 weeks per semester, including mid and final exam.
Credit points	3
Requirements according to the examination regulations	Students have taken Calculus II course and attending minimum 80% of the course.
Recommended prerequisites	Calculus I
Module objectives/intended learning outcomes	CO 1. Students will analyze different methods of integration, such as substitution and integration by parts, to compute definite integrals. CO 2. Students will evaluate the use of integrals in practical scenarios, such as finding areas under curves and volumes of solids, and apply knowledge of transcendental functions like exponential and trigonometric functions in integration. CO 3. Students will create strategies to handle indeterminate forms and improper integrals, including the use of L'Hôpital's Rule and comparison tests, to determine convergence or divergence and solve challenging integration problems.

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<table>
<tr><td>Content</td><td>This course discuss about definite integral, application of integral, transcendental functions, techniques of integration, indeterminate forms and impropoer integrals.</td></tr>
<tr><td>Study and examination requirements and forms of examination</td><td>The final mark will be weighted as follows:
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CO 1		V				V					
CO 2						V				V	
CO 3	V										
CO 4						V					

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MODULE HANDBOOK

Module name	Kalkulus Peubah Banyak *Multivariate Calculus*
Module level, if applicable	Sarjana /S1 *Bachelor*
Code, if applicable	22060111D09
Courses, if applicable	Kalkulus Peubah Banyak *Multivariate Calculus*
Semester(s) in which the module is taught	3
Person responsible for the module	Ketua konsorsium Analisis
Lecturers	[?]Nama lengkap dosen beserta gelar 1. Mohammad Nafie Jauhari, M.Si 2. Muhammad Khudzaifah, M.Si
Language	Bahasa Indonesia
Relation to curriculum	Mata kuliah wajib semester 3
Type of teaching, contact hours	200 menit tatap muka dan 240 menit aktivitas terstruktur per minggu.
Workload	Total beban perkuliahan adalah 181.33 jam per semester, yang terdiri atas 200 menit perkuliahan per minggu selama 14 minggu, 240 menit aktivitas terstruktur per minggu, 240 menit belajar mandiri per minggu, dengan total 16 minggu per semester termasuk UTS dan UAS.
Credit points	4
Requirements according to the examination regulations	Mahasiswa telah mengikuti mata kuliah Kalkulus Peubah Banyak sekurang-kurangnya 80% dari pertemuan.
Recommended prerequisites	[?]MK prasyarat
Module objectives/intended learning outcomes	
Content	Pada mata kuliah ini mahasiswa belajar mengenai fungsi dua atau lebih peubah bebas, limit dan kekontinuan, turunan parsial, maksimum dan minimum, integral rangkap dua dan tiga, aplikasi integral rangkap, integral garis dan permukaan.

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No. Metode Penilaian Bobot
1 UAS 40%
2 UTS 40%
3 Kuis, Tugas 20%

Nilai akhir ditentukan dengan kriteria berikut:

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<tr><td>Reading List</td><td>[?]Gunakan style APA</td></tr>
</table>

PLO and CO Mapping

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6
CO 1						
CO 2						
CO 3						

Date of Last Amendment :
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MODULE HANDBOOK

Module name	Pengantar Analisis Real I *Introduction to Real Analysis I*
Module level, if applicable	Sarjana /S1 *Bachelor*
Code, if applicable	22060111D13
Courses, if applicable	Pengantar Analisis Real I *Introduction to Real Analysis I*
Semester(s) in which the module is taught	3
Person responsible for the module	Head of Analysis Consortium
Lecturers	Team teaching: 1. Dr. Elly Susanti, M.Sc. 2. Dr. Hairur Rahman, M.Si. 3. Dian Maharani, M.Si.
Language	Indonesian Language and English
Relation to curriculum	Compulsory course 3rd semester
Type of teaching, contact hours	150 minutes lectures and 180 minutes structured activities per week
Workload	The total workload is 136 hours per semester, which consists of 150 minutes lectures per week for 14 weeks, 180 minutes structured activities per week, 180 minutes individual study per week, in total 16 weeks per semester, including mid and final exam.
Credit points	3
Requirements according to the examination regulations	Students have taken Introduction to Real Analysis I course and attending minimum 80% of the course.
Recommended prerequisites	Calculus II (22060111D02)
Module objectives/intended learning outcomes	After completing this course, the students: CO 1. Determine and prove the algebraic properties of real numbers and absolute value CO 2. Give examples and prove the properties of sequence and series of real numbers CO 3. Use limit theorems to prove the limit of some sequence, series, and functions
Content	Set and function, finite and infinite set, ordering properties of real analysis, absolute value and real numbers, completeness property of real number, supremum and infimum, sequence and its limit, divergent sequence, infinite series, function limit, limit theorems.

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Faculty of Science and Technology
Mathematics Study Program
Jl. Gajayana No. 50 Malang 65144 Telp. / Fax. (0341) 558933, website : www.matematika.uin-malang.ac.id, e-mail : matematika@uin-malang.ac.id

<table>
<tr><td>Study and examination requirements and forms of examination</td><td>The final mark will be weighted as follows:
<table>
<tr><td>No</td><td>Assessment Methods</td><td>Weight (percentage)</td></tr>
<tr><td>1</td><td>Final examination</td><td>40%</td></tr>
<tr><td>2</td><td>Mid-Term Examination</td><td>30%</td></tr>
<tr><td>3</td><td>Quiz, Homework</td><td>30%</td></tr>
</table>
Final grade will be determined as follows:
<table>
<tr><th>Range</th><th>Grade</th></tr>
<tr><td>[85 – 100]</td><td>A</td></tr>
<tr><td>[75 – 85)</td><td>B+</td></tr>
<tr><td>[70 – 75)</td><td>B</td></tr>
<tr><td>[65 – 70)</td><td>C+</td></tr>
<tr><td>[60 – 65)</td><td>C</td></tr>
<tr><td>[50 – 60)</td><td>D</td></tr>
</table></td></tr>
<tr><td>Media employed</td><td>Whiteboard, Projector, Laptop</td></tr>
<tr><td>Reading List</td><td>1. Bartle, R.G. and Sherbert, D.R. (2011). Introduction to Real Analysis (4th edition). JohnWiley & Sons, Inc.
2. Rudin, W. (1976). Principles of Mathematical Analysis. McGraw-Hill Kogakusha, Ltd.</td></tr>
</table>

PLO and CO Mapping

	PLO 1	**PLO 2**	**PLO 3**	**PLO 4**	**PLO 5**	**PLO 6**	**PLO 7**	**PLO 8**	**PLO 9**	**PLO 10**	**PLO 11**
CO 1	v					v	v			v	
CO 2	v					v	v			v	
CO 3	v					v	v			v	

Date of Last Amendment :
July 27th, 2023

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MODULE HANDBOOK

Module name	Pengantar Analisis Real II *Introduction to Real Analysis II*
Module level, if applicable	Sarjana /S1 *Bachelor*
Code, if applicable	22060111D14
Courses, if applicable	Pengantar Analisis Real II *Introduction to Real Analysis II*
Semester(s) in which the module is taught	4
Person responsible for the module	Head of Analysis Consortium
Lecturers	Team teaching: 1. Dr. Elly Susanti, M.Sc. 2. Dr. Hairur Rahman, M.Si. 3. Dian Maharani, M.Si.
Language	Indonesian Language
Relation to curriculum	Compulsory course 4th semester
Type of teaching, contact hours	150 minutes lectures and 180 minutes structured activities per week
Workload	The total workload is 136 hours per semester, which consists of 150 minutes lectures per week for 14 weeks, 180 minutes structured activities per week, 180 minutes individual study per week, in total 16 weeks per semester, including mid and final exam.
Credit points	3
Requirements according to the examination regulations	Students have taken Introduction to Real Analysis II course and attending minimum 80% of the course.
Recommended prerequisites	Introduction to Real Analysis I (22060111D13)
Module objectives/intended learning outcomes	After completing this course, the students: CO 1. Use the concept of limit function to prove continuous function CO 2. Identify the derivative of functions using definition and its properties or theorems CO 3. Give examples and prove the integral of some functions
Content	Continuous function and its combination, continuous function on interval, continuous uniform, monotone fuction and invers function, derivative, mean value theorem, L'hopital rule, Taylor's theorem, Riemann integral and some theorems about Riemann integral, pointwise convergence, uniform convergence, exponential function, logarithm function, trigonometric function.

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<tr><td>3</td><td>Quiz, Homework</td><td>30%</td></tr>
</table>
Final grade will be determined as follows:
<table>
<tr><th>Range</th><th>Grade</th></tr>
<tr><td>[85 – 100]</td><td>A</td></tr>
<tr><td>[75 – 85)</td><td>B+</td></tr>
<tr><td>[70 – 75)</td><td>B</td></tr>
<tr><td>[65 – 70)</td><td>C+</td></tr>
<tr><td>[60 – 65)</td><td>C</td></tr>
<tr><td>[50 – 60)</td><td>D</td></tr>
</table></td></tr>
<tr><td>Media employed</td><td>Whiteboard, Projector / smart TV, Laptop</td></tr>
<tr><td>Reading List</td><td>1. Bartle, R.G. and Sherbert, D.R. (2011). Introduction to Real Analysis (4th edition). JohnWiley & Sons, Inc.
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</table>

PLO and CO Mapping

	PLO 1	**PLO 2**	**PLO 3**	**PLO 4**	**PLO 5**	**PLO 6**	**PLO 7**	**PLO 8**	**PLO 9**	**PLO 10**	**PLO 11**
CO 1	v					v	v			v	
CO 2	v					v	v			v	
CO 3	v					v	v			v	

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MODULE HANDBOOK

Module name	Capita Selecta in Analysis
Module level, if applicable	Sarjana /S1 *Bachelor*
Code, if applicable	22060112E21
Courses, if applicable	Capita Selecta in Analysis
Semester(s) in which the module is taught	5
Person responsible for the module	Head of Analysis Consortium
Lecturers	Team teaching: 1. Dr. Elly Susanti, M.Sc. 2. Dr. Hairur Rahman, M.Si. 3. Dian Maharani, M.Si.
Language	Indonesian Language
Relation to curriculum	Elective course 5th semester
Type of teaching, contact hours	100 minutes lectures and 120 minutes structured activities per week
Workload	Total workload is 90 hours per semester, which consists of 100 minutes lectures per week for 14 weeks, 120 minutes structured activities per week, 120 minutes individual study per week, in total is 16 weeks per semester, including mid exam and final exam.
Credit points	2
Requirements according to the examination regulations	Students have taken Capita Selecta in Analysis course and attending minimum 80% of the course.
Recommended prerequisites	Introduction to Real Analysis II (22060111D14) and Complex Function (22060111D18)
Module objectives/intended learning outcomes	After completing this course, the students: CO 1. Analyze the newest research topic in mathematical analysis CO 2. Designing new research based on the reference articles CO 3. Presenting his / her research in write and orally
Content	Newest research topic in mathematical analysis
Study and examination requirements and forms of examination	The final mark will be weighted as follows:

No	Assessment Methods	Weight (percentage)
1	Final examination	40%
2	Mid-Term Examination	30%
3	Homework (project)	30%

Final grade will be determined as follows:

Range	Grade
[85 – 100]	A

		[75 – 85)	B+	
		[70 – 75)	B	
		[65 – 70)	C+	
		[60 – 65)	C	
		[50 – 60)	D	
Media employed	Whiteboard, Projector / smart TV, Laptop			
Reading List	Related books and articles			

PLO and CO Mapping

	PLO 1	**PLO 2**	**PLO 3**	**PLO 4**	**PLO 5**	**PLO 6**	**PLO 7**	**PLO 8**	**PLO 9**	**PLO 10**	**PLO 11**
CO 1	v					v	v			v	
CO 2	v					v				v	
CO 3	v					v				v	

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MODULE HANDBOOK

Module name	Pengantar Analisis Fungsional *Introduction of Functional Analysis*
Module level, if applicable	Sarjana /S1 *Bachelor*
Code, if applicable	22060112E25
Courses, if applicable	Pengantar Analisis Fungsional *Introduction of Functional Analysis*
Semester(s) in which the module is taught	5
Person responsible for the module	Head of Analysis Consortium
Lecturers	Team teaching: 1. Dian Maharani, M.Si. 2. Dr. Elly Susanti, M.Sc. 3. Dr. Hairur Rahman, M.Si.
Language	Indonesian Language
Relation to curriculum	Elective course 5th semester
Type of teaching, contact hours	150 minutes lectures and 180 minutes structured activities per week
Workload	The total workload is 136 hours per semester, which consists of 150 minutes lectures per week for 14 weeks, 180 minutes structured activities per week, 180 minutes individual study per week, in total 16 weeks per semester, including mid and final exam.
Credit points	3
Requirements according to the examination regulations	Students have taken Introduction to Functional Analysis course and attending minimum 80% of the course
Recommended prerequisites	Introduction to Real Analysis II (22060111D14) and Complex Function (22060111D18)
Module objectives/intended learning outcomes	After completing this course, the students have ability to: CO1. Give examples and prove the properties of metric space and norm space CO2. Use properties of metric space and norm space to prove statements about metric and norm space CO3. Prove properties of linear operator and linear functional CO4. Identify the properties of inner product space
Content	Metric space and its examples, properties of metric space, open set, closed set, neighborhood in metric space, sequence, convergence of sequence in metric space, complete metric space, vector space and its examples, norm space and its examples, properties of norm space, Banach space and its examples, compactness, linear operator, functional operator, dual space,

<table>
<tr><td></td><td>Hilbert space and its examples, inner product space, orthogonal complement.</td></tr>
<tr><td>Study and examination requirements and forms of examination</td><td>The final mark will be weighted as follows:
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<tr><td>[70 – 75)</td><td>B</td></tr>
<tr><td>[65 – 70)</td><td>C+</td></tr>
<tr><td>[60 – 65)</td><td>C</td></tr>
<tr><td>[50 – 60)</td><td>D</td></tr>
</table></td></tr>
<tr><td>Media employed</td><td>Whiteboard, Projector / smart TV, Laptop</td></tr>
<tr><td>Reading List</td><td>1. Kreyszig, Erwin. (1978). Introductory Functional Analysis with Applications. John Wiley & Sons. Inc.
2. Eidelman, Yuli dkk. (1955). Functional Analysis, An Introduction. American Mathematical Society.</td></tr>
</table>

PLO and CO Mapping

	PLO 1	**PLO 2**	**PLO 3**	**PLO 4**	**PLO 5**	**PLO 6**	**PLO 7**	**PLO 8**	**PLO 9**	**PLO 10**	**PLO 11**
CO 1	v					v	v			v	
CO 2	v					v	v			v	
CO 3	v					v	v			v	
CO 4	v					v	v			v	

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MODULE HANDBOOK

Module name	Pengantar Teori Operator *Introduction to Operator Theory*
Module level, if applicable	Sarjana /S1 *Bachelor*
Code, if applicable	22060112E26
Courses, if applicable	Pengantar Teori Operator *Introduction to Operator Theory*
Semester(s) in which the module is taught	6
Person responsible for the module	Head of Analysis Consortium
Lecturers	Khoirunnisa, S. Si., M. Mat.
Language	Indonesian Language
Relation to curriculum	Elective course 6th semester
Type of teaching, contact hours	150 minutes lectures and 180 minutes structured activities per week
Workload	Total workload is 136 hours per semester, which consists of 150 minutes lectures per week for 14 weeks, 180 minutes structured activities per week, 180 minutes individual study per week, in total is 16 weeks per semester, including mid exam and final exam.
Credit points	3
Requirements according to the examination regulations	Students have taken Introduction to Operator Theory course and attending minimum 80% of the course.
Recommended prerequisites	Introduction of Functional Analysis
Module objectives/intended learning outcomes	After completing this course, the students have ability to: CO1. give examples and prove the properties of Banach space and Hilbert space CO2. prove the properties of Lp spaces CO3. use some properties of linear operator to prove related problems
Content	1. Banach space and Hilbert space 2. Lp spaces 3. Linear operator and its properties
Study and examination requirements and forms of examination	The final mark will be weighted as follows:

No	Assessment Methods	Weight (percentage)
1	Final examination	40%
2	Mid-Term Examination	30%

<table>
<tr><td></td><td>
<table>
<tr><td>3</td><td>Quiz, Homework</td><td>30%</td></tr>
</table>

Final grade will be determined as follows:
<table>
<tr><th>Range</th><th>Grade</th></tr>
<tr><td>[85 – 100]</td><td>A</td></tr>
<tr><td>[75 – 85)</td><td>B+</td></tr>
<tr><td>[70 – 75)</td><td>B</td></tr>
<tr><td>[65 – 70)</td><td>C+</td></tr>
<tr><td>[60 – 65)</td><td>C</td></tr>
<tr><td>[50 – 60)</td><td>D</td></tr>
</table>
</td></tr>
<tr><td>Media employed</td><td>Whiteboard, Projector / smart TV, Laptop</td></tr>
<tr><td>Reading List</td><td>
1. Hutson, V., Pym, J.S., and Cloud, M.J. (2005). Application of Functional Analysis and Operator Theory. Elsevier.

2. Istratescu, V.I. (1981). Introduction to Linear Operator Theory. Marcel Dekker, Inc.
</td></tr>
</table>

PLO and CO Mapping

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11
CO 1	v					v	v			v	
CO 2	v					v	v			v	
CO 3	v					v	v			v	

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MODULE HANDBOOK

Module name	Teori Integral *Integral Theory*
Module level, if applicable	Sarjana /S1 *Bachelor*
Code, if applicable	22060112E28
Courses, if applicable	Teori Integral *Integral Theory*
Semester(s) in which the module is taught	5
Person responsible for the module	Ketua konsorsium Analisis
Lecturers	[?]Nama lengkap dosen beserta gelar 1. Mohammad Nafie Jauhari, M.Si 2. Muhammad Khudzaifah, M.Si
Language	Bahasa Indonesia
Relation to curriculum	Mata kuliah pilihan semester 5
Type of teaching, contact hours	150 menit tatap muka dan 180 menit aktivitas terstruktur per minggu.
Workload	Total beban perkuliahan adalah 136 jam per semester, yang terdiri atas 150 menit perkuliahan per minggu selama 14 minggu, 180 menit aktivitas terstruktur per minggu, 180 menit belajar mandiri per minggu, dengan total 16 minggu per semester termasuk UTS dan UAS.
Credit points	3
Requirements according to the examination regulations	Mahasiswa telah mengikuti mata kuliah Teori Integral sekurang-kurangnya 80% dari pertemuan.
Recommended prerequisites	[?]MK prasyarat
Module objectives/intended learning outcomes	
Content	Mata kuliah ini membahas mengenai beberapa integral yang seringkali digunakan di dalam kalkulus dan teori ukuran, seperti integral Riemann - Darboux, integral Lebesgue, dan integral Denjoy - Perron.
Study and examination requirements and forms of examination	Nilai akhir akan diberi bobot sebagai berikut: No. Metode Penilaian Bobot 1 UAS 40%

<table>
<tr><td></td><td>2 UTS 40%
3 Kuis, Tugas 20%

Nilai akhir ditentukan dengan kriteria berikut:
<table><tr><th>Range</th><th>Grade</th></tr><tr><td>[85 – 100]</td><td>A</td></tr><tr><td>[75 – 85)</td><td>B+</td></tr><tr><td>[70 – 75)</td><td>B</td></tr><tr><td>[65 – 70)</td><td>C+</td></tr><tr><td>[60 – 65)</td><td>C</td></tr><tr><td>[50 – 60)</td><td>D</td></tr></table></td></tr>
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<tr><td>Reading List</td><td>[?]Gunakan style APA</td></tr>
</table>

PLO and CO Mapping

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6
CO 1						
CO 2						
CO 3						

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MODULE HANDBOOK

Module name	Introduction to Fractal Theory
Module level, if applicable	Sarjana /S1 *Bachelor*
Code, if applicable	22060112E29
Courses, if applicable	Introduction to Fractal Theory
Semester(s) in which the module is taught	6
Person responsible for the module	Head of Analysis Consortium
Lecturers	1. Dian Maharani, M.Si. 2. Dr. Elly Susanti, M.Sc. 3. Dr. Hairur Rahman, M.Si.
Language	Indonesian Language
Relation to curriculum	Elective course 6th semester
Type of teaching, contact hours	150 minutes lectures and 180 minutes structured activities per week
Workload	Total workload is 136 hours per semester, which consists of 150 minutes lectures per week for 14 weeks, 180 minutes structured activities per week, 180 minutes individual study per week, in total is 16 weeks per semester, including mid exam and final exam.
Credit points	3
Requirements according to the examination regulations	Students have taken Introduction to Operator Theory course and attending minimum 80% of the course.
Recommended prerequisites	Introduction to Measure Theory
Module objectives/intended learning outcomes	After completing this course, the students have ability to: CO1. Analyze the foundational principles of measure theory and their relevance to understanding fractal geometry. CO2. Evaluate the concept of Hausdorff Measure as a metric for quantifying the complexity and self-similarity of fractals. CO3. Create fractal structures and analyze their dimensional characteristics using deterministic iteration algorithms and dimension calculation methods.
Content	Learn the concept of fractal definitions, types of fractals, Hauddorff dimensions, Hausdorff dimensions, and applications that can be used to create fractals.
Study and examination requirements and forms of examination	The final mark will be weighted as follows:

No	Assessment Methods	Weight (percentage)
1	Final examination	40%

<table>
<tr>
<td></td>
<td>
<table>
<tr><td>2</td><td>Mid-Term Examination</td><td>30%</td></tr>
<tr><td>3</td><td>Quiz, Homework</td><td>30%</td></tr>
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<tr><th>Range</th><th>Grade</th></tr>
<tr><td>[85 – 100]</td><td>A</td></tr>
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<tr><td>[70 – 75)</td><td>B</td></tr>
<tr><td>[65 – 70)</td><td>C+</td></tr>
<tr><td>[60 – 65)</td><td>C</td></tr>
<tr><td>[50 – 60)</td><td>D</td></tr>
</table>
</td>
</tr>
<tr><td>Media employed</td><td>Whiteboard, Projector / smart TV, Laptop, matlab, and other fractals maker software.</td></tr>
<tr><td>Reading List</td><td>
1. Cattani, Carlo, et.al. (2022). FRACTAL ANALYSIS: Basic Concepts and Applications. World Scientific Publishing Co. Pte. Ltd.
2. Falconer, Kenneth. (2003). FRACTAL GEOMETRY: Mathematical Foundations and Applications (Second edition). John Wiley & Sons Ltd.
3. Banerjee, Santo, et.al. (2023). Fractal Patterns with MATLAB. Springer Nature Switzerland.
</td></tr>
</table>

PLO and CO Mapping

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11
CO 1	v					v	v			v	
CO 2	v					v	v			v	
CO 3	v					v	v			v	

Date of Last Amendment:
February 13th, 2024

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MODULE HANDBOOK

Module name	Introduction to Metric Space
Module level, if applicable	Sarjana /S1 *Bachelor*
Code, if applicable	22060112E32
Courses, if applicable	Introduction to Metric Space
Semester(s) in which the module is taught	4
Person responsible for the module	Head of Analysis Consortium
Lecturers	1. Dian Maharani, M.Si. 2. Dr. Hairur Rahman, M.Si. 3. Dr. Elly Susanti, M.Sc.
Language	Indonesian Language and English
Relation to curriculum	Elective course 4th semester
Type of teaching, contact hours	150 minutes lectures and 180 minutes structured activities per week
Workload	The total workload is 136 hours per semester, which consists of 150 minutes lectures per week for 14 weeks, 180 minutes structured activities per week, 180 minutes individual study per week, in total 16 weeks per semester, including mid and final exam.
Credit points	3
Requirements according to the examination regulations	Students have taken Introduction to Metric Space course and attending minimum 80% of the course
Recommended prerequisites	Real Analysis I and II
Module objectives/intended learning outcomes	CO 1. Analyze the foundational concepts of metric spaces and their implications in topology and analysis. CO 2. Evaluate the principles of limit, completeness, and continuity in metric spaces and their relevance in mathematical analysis. CO 3. Create innovative approaches for studying and analyzing connectedness in metric spaces, including designing experiments and proposing research questions.
Content	This course discussing definition of metric space, limit and continuity, connectedness, and research related to metric spaces.
Study and examination requirements and forms of examination	The final mark will be weighted as follows:

No	Assessment Methods	Weight (percentage)
1	Final examination	20%
2	Mid-Term Examination	20%
3	Quiz, Homework	30%
4	Homework	30%

Final grade will be determined as follows:

		Range / **Grade** [85 – 100] A [75 – 85) B+ [70 – 75) B [65 – 70) C+ [60 – 65) C [50 – 60) D
Media employed	Whiteboard, Projector, Laptop	
Reading List	1. Cheung, Wing Sum. (2023). *Metric Space Topology: Examples, Exercises and Solutions.* Singapore: World Scientific Publishing Co. Pte. Ltd. 2. Bryant, Victor. (1985). *Metric Space: Iteration and Application*. Cambridge: Cambridge University Press. 3. Articles about metric spaces.	

PLO and CO Mapping

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11
CO 1	v					v	v			v	
CO 2	v					v	v			v	
CO 3	v					v	v			v	

Date of Last Amendment:
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MODULE HANDBOOK

Module name	Kalkulus Beda Hingga
Module level, if applicable	Sarjana /S1 *Bachelor*
Code, if applicable	22060112E30
Courses, if applicable	Kalkulus Beda Hingga
Semester(s) in which the module is taught	6
Person responsible for the module	Ketua konsorsium Analisis
Lecturers	[?]Nama lengkap dosen beserta gelar 1. Mohammad Nafie Jauhari, M.Si 2. Muhammad Khudzaifah, M.Si
Language	Bahasa Indonesia
Relation to curriculum	Mata kuliah pilihan semester 6
Type of teaching, contact hours	150 menit tatap muka dan 180 menit aktivitas terstruktur per minggu.
Workload	Total beban perkuliahan adalah 136 jam per semester, yang terdiri atas 150 menit perkuliahan per minggu selama 14 minggu, 180 menit aktivitas terstruktur per minggu, 180 menit belajar mandiri per minggu, dengan total 16 minggu per semester termasuk UTS dan UAS.
Credit points	3
Requirements according to the examination regulations	Mahasiswa telah mengikuti mata kuliah Kalkulus Beda Hingga sekurang-kurangnya 80% dari pertemuan.
Recommended prerequisites	[?]MK prasyarat
Module objectives/intended learning outcomes	
Content	Mata kuliah ini mempelajari beragam topik dalam kalkulus beda, seperi operator, aljabar operator, operator beda, deret Taylor, dll. Selain itu, dibahas pula mengenai penggunaan kalkulus beda, serta kalkulus jumlah dan penggunaannya.
Study and examination requirements and forms of examination	Nilai akhir akan diberi bobot sebagai berikut: No. Metode Penilaian Bobot 1 UAS 40% 2 UTS 40% 3 Kuis, Tugas 20%

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<tr><th>Range</th><th>Grade</th></tr>
<tr><td>[85 – 100]</td><td>A</td></tr>
<tr><td>[75 – 85)</td><td>B+</td></tr>
<tr><td>[70 – 75)</td><td>B</td></tr>
<tr><td>[65 – 70)</td><td>C+</td></tr>
<tr><td>[60 – 65)</td><td>C</td></tr>
<tr><td>[50 – 60)</td><td>D</td></tr>
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PLO and CO Mapping

	PLO 1	**PLO 2**	**PLO 3**	**PLO 4**	**PLO 5**	**PLO 6**
CO 1						
CO 2						
CO 3						

Date of Last Amendment :
July 27th, 2023

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MODULE HANDBOOK

Module name	Pengantar Ruang Barisan
Module level, if applicable	Sarjana /S1 *Bachelor*
Code, if applicable	22060112E23
Courses, if applicable	Pengantar Ruang Barisan
Semester(s) in which the module is taught	4
Person responsible for the module	Ketua konsorsium Analisis
Lecturers	[?]Nama lengkap dosen beserta gelar 1. Mohammad Nafie Jauhari, M.Si 2. Muhammad Khudzaifah, M.Si
Language	Bahasa Indonesia
Relation to curriculum	Mata kuliah pilihan semester 4
Type of teaching, contact hours	150 menit tatap muka dan 180 menit aktivitas terstruktur per minggu.
Workload	Total beban perkuliahan adalah 136 jam per semester, yang terdiri atas 150 menit perkuliahan per minggu selama 14 minggu, 180 menit aktivitas terstruktur per minggu, 180 menit belajar mandiri per minggu, dengan total 16 minggu per semester termasuk UTS dan UAS.
Credit points	3
Requirements according to the examination regulations	Mahasiswa telah mengikuti mata kuliah Pengantar Ruang Barisan sekurang-kurangnya 80% dari pertemuan.
Recommended prerequisites	[?]MK prasyarat
Module objectives/intended learning outcomes	
Content	Membahas berbagai ruang barisan di ruang metrik dan ruang bernorma, seperti ruang l^p, ruang c, c_0, c_(00), dan banyak ruang barisan lainnya. Dibahas pula sifat-sifat dari ruang-ruang barisan itu, seperti kekonvergenan, kepadatan, dll.
Study and examination requirements and forms of examination	Nilai akhir akan diberi bobot sebagai berikut: No. Metode Penilaian Bobot 1 UAS 40% 2 UTS 40% 3 Kuis, Tugas 20%

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<tr><td>Reading List</td><td>[?]Gunakan style APA</td></tr>
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PLO and CO Mapping

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6
CO 1						
CO 2						
CO 3						

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MODULE HANDBOOK

Module name	Vector Analysis
Module level, if applicable	Sarjana /S1 *Bachelor*
Code, if applicable	22060112E22
Courses, if applicable	Vector Analysis
Semester(s) in which the module is taught	4
Person responsible for the module	Chief of Analysis Consortium
Lecturers	Khoirunisa, S.Si., M. Mat.
Language	Bahasa Indonesia
Relation to curriculum	Elective course in the second year (4^{th} semester) bachelor's degree
Type of teaching, contact hours	100 minutes of lectures and 120 minutes of structured activities per week.
Workload	Total workload is 90 hours per semester, which consists of 100 minutes lectures per week for 14 weeks, 120 minutes structured activities per week, 120 minutes individual study per week, in total is 16 weeks per semester, including mid exam and final exam.
Credit points	2
Requirements according to the examination regulations	Students have taken Analysis Vector course and attending minimum 80% of the course.
Recommended prerequisites	
Module objectives/intended learning outcomes	After completing this course, the students have ability to: CO1. apply operations between vectors CO2. solve vector differentiation problems CO3. differentiate gradient, divergence, and curl CO4. solve vector integration problems
Content	1. Vectors in 2-space and 3-space 2. Vector Differentiation 3. Gradient, Divergence, and Curl 4. Vector Integration
Study and examination requirements and forms of examination	The final mark will be weighted as follows:

No.	Assessment Methods	Weight (percentage)
1	Final examination	40%
2	Mid-Term Examination	30%
3	Quiz, Homework	30%

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	The final grade will be determined as follows: **Range** / **Grade** [85 – 100] : A [75 – 85) : B+ [70 – 75) : B [65 – 70) : C+ [60 – 65) : C [50 – 60) : D
Media employed	Whiteboard, Projector, Laptop
Reading List	1. Purcell, E. J., Varberg, D., & Rigdon, S. E. (2003). Kalkulus Jilid 1. Jakarta: Erlangga. 2. Anton, H., & Chris, R. (1973). Elementary Linear Algebra 5th edition. New York: John Wiley & Sons. 3. Spiegel, M. R., & Lipschutz, S. (2009). Schaum's outline of vector analysis. McGraw Hill Professional.

PLO and CO Mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11
CO 1	v					v	v			v	
CO 2	v					v	v			v	
CO 3	v					v	v			v	
CO 4	v					v	v			v	

Date of Last Amendment:
July 27th, 2023

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MODULE HANDBOOK

Module name	Measure Theorey
Module level, if applicable	Sarjana /S1 *Bachelor*
Code, if applicable	22060112E27
Courses, if applicable	Measure Theory
Semester(s) in which the module is taught	5
Person responsible for the module	Head of Analysis Consortium
Lecturers	1. Dian Maharani, M.Si. 2. Dr. Hairur Rahman, M.Si. 3. Dr. Elly Susanti, M.Sc.
Language	Indonesian Language and English
Relation to curriculum	Elective course 4th semester
Type of teaching, contact hours	150 minutes lectures and 180 minutes structured activities per week
Workload	The total workload is 136 hours per semester, which consists of 150 minutes lectures per week for 14 weeks, 180 minutes structured activities per week, 180 minutes individual study per week, in total 16 weeks per semester, including mid and final exam.
Credit points	3
Requirements according to the examination regulations	Students have taken Introduction to Metric Space course and attending minimum 80% of the course
Recommended prerequisites	Real Analysis I and II
Module objectives/intended learning outcomes	CO 1. Analyze the foundational concepts of Lebesgue measure and its applications in measure theory. CO 2. Evaluate the principles of Lebesgue integration and its significance in mathematical analysis. CO 3. Evaluate the properties and applications of Lp spaces in functional analysis
Content	This course discusses Lebesgue measures, Lebesgue integrals, Lebesgue integral functions, and Lebesgue spaces and their properties.
Study and examination requirements and forms of examination	The final mark will be weighted as follows: No | Assessment Methods | Weight (percentage) 1 | Final examination | 20% 2 | Mid-Term Examination | 20% 3 | Quiz, Homework | 30% 4 | Homework | 30% Final grade will be determined as follows:

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		Range	**Grade**
		[85 – 100]	A
		[75 – 85)	B+
		[70 – 75)	B
		[65 – 70)	C+
		[60 – 65)	C
		[50 – 60)	D
Media employed	Whiteboard, Projector / smart TV, Laptop		
Reading List	[?]Gunakan style APA		

PLO and CO Mapping

	PLO 1	**PLO 2**	**PLO 3**	**PLO 4**	**PLO 5**	**PLO 6**	**PLO 7**	**PLO 8**	**PLO 9**	**PLO 10**	**PLO 11**
CO 1	v					v	v			v	
CO 2	v					v	v			v	
CO 3	v					v	v			v	

Date of Last Amendment:
February 15th, 2024