Module Description of Functional Analysis

Module Name	:	Introduction to Functional Analysis
Module Level	:	Bachelor
Code, if applicable	:	23H01131203
Subtitle, if applicable	:	-
Courses, if applicable	:	Introduction to Functional Analysis
Semester(s) in which the module is taught	:	5 (Fifth Semester)
Module coordinator(s)	:	Prof. Budi Nurwahyu, M.Si.
Lecturer(s)	:	Prof. Budi Nurwahyu, M.Si.; Jusmawati Massalesse, S.Si, M.Si; Dr. M. Nur S.Si, M.Si; Naimah Aris, S.Si, M. Math.
Language	:	Bahasa (Indonesian language)
Relation to curriculum	:	Elective course in third year for Bachelor degree in Mathematics
Type of teaching/teaching method	:	Lecturing, Small Group Discussion, Cooperative Learning, Self-Directed Learning
Contact hours	:	150 minutes lectures per week, 180 minutes structured activities per week, and 180 minutes independent study per week
Workload	:	Total workload is 135 hours per semester which consists of 40 hours for Learning and Teaching, 47.5 hours for Self Study, and 47.5 hours for Structured Works.
Credit points	:	3 (4.8 ECTS)
Requirements according to the examination regulations	:	Students are required to attend at least 80% of the total meetings which is recorded via the attendance menu at https://sikola-v2.unhas.ac.id/, complete all mandatory assignments, and obtain permission from the lecturer to participate in the examination.
Recommended prerequisites	:	Introduction to Real Analysis & Real Analysis.
Module objectives/intended learning outcomes	:	After the completion of this module, the student will be able to: CLO 1. Students are able to understand the definition of metric space and determine its completeness.; CLO 2. Students are able to demonstrate the properties of linear normed spaces and Banach spaces; CLO 3. Students are able to prove basic theorems for normed spaces and Banach spaces as well as transformations between the them. CLO 3. Developing students' ability to find information through the world wide web, and present concepts in written and oral skills both independently and in groups The following is the mapping of the ILO and the CLO of this course: ILO 2 ILO 4 ILO 7

<table>
<tr><td></td><td></td><td>
<table>
<tr><td>CLO 1</td><td>X</td><td></td><td></td></tr>
<tr><td>CLO 2</td><td>X</td><td></td><td></td></tr>
<tr><td>CLO 3</td><td></td><td>X</td><td></td></tr>
<tr><td>CLO 4</td><td></td><td></td><td>X</td></tr>
</table>
</td></tr>
<tr><td>Content</td><td>:</td><td>The course gives an introduction to functional analysis, which is a branch of analysis in which one develops analysis in infinite dimensional vector spaces. The central concepts which are studied, are metric spaces, normed spaces with emphasis on Banach and continuous linear maps (operators and functional) between such spaces.</td></tr>
<tr><td>Study and examination requirements</td><td>:</td><td>Study and examination requirements:
● Students must attend 15 minutes before the class starts.
● Students must switch off all electronic devices.
● Students must inform the lecturer if they will not attend the class due to sickness, etc.
● Students must submit all class assignments before the deadline.
● Students must attend the exam to get final grade.</td></tr>
<tr><td>Exams and assessment formats</td><td>:</td><td>Participants are marked based on their performance in: Report (50%), Assignments (25%), and Written Exam (25%).

Assignments assess student's ability to apply concepts independently, while Reports measure analytical and writing skills. The Written Exam assesses comprehension and synthesis of all materials discussed during the semester. Altogether, these components account for 100% of the final grade.

Students are marked based on their percentage of points obtained and based on the following grade scale:

<table>
<tr><th>Percentage of Achievement</th><th>Grade</th><th>Conversion Value</th></tr>
<tr><td>85 – 100</td><td>A</td><td>4.00</td></tr>
<tr><td>80 - <85</td><td>A-</td><td>3.75</td></tr>
<tr><td>75 - < 80</td><td>B+</td><td>3.5</td></tr>
<tr><td>70 - < 75</td><td>B</td><td>3.0</td></tr>
<tr><td>65 - < 70</td><td>B-</td><td>2.75</td></tr>
<tr><td>60 - < 65</td><td>C+</td><td>2.5</td></tr>
<tr><td>50 - < 60</td><td>C</td><td>2.00</td></tr>
<tr><td>40 - < 50</td><td>D</td><td>1.00</td></tr>
<tr><td>< 40</td><td>E</td><td>0.00</td></tr>
</table>
</td></tr>
<tr><td>Reading list</td><td>:</td><td>1. Introductory Functional Analysis With Applications, Kreyszig. E, John Wiley & Sons. Inc. New York 1978.
2. Principles of Fungsional Analysis second edition, Martin Schechter.American Mathematical Society, 2002
3. Sumanang. M, Pengantar Analisis Fungsional, UPI, Bandung 2010.</td></tr>
</table>

		4. Principles of Fungsional Analysis second edition, Martin Schechter.American Mathematical Society, 2002 5. Nur, M., Bahri, M., & Islamiyati, A. (2024). A new 2-norm in normed spaces. In AIP Conference Proceedings (Vol. 3161, p. 060006). Proceedings Of 5th International Conference On Sustainable Innovation In Engineering And Technology 2023. Aip Publishing. https://doi.org/10.1063/5.0164441
Last revision date	:	July 28th, 2025