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 Faculty of Mathematics and Natural Sciences
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MODULE HANDBOOK

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| Module designation | <i>Functional Analysis</i> |
| Semester(s) in which the module is taught | 7 |
| Person responsible for the module | <i>Nora Hariadi, M.Si.</i> |
| Language | <i>Indonesia</i> |
| Relation to curriculum | <i>Elective</i> |
| Teaching methods | <i>Flipped Class and Problem based learning using E-learning</i> |
| Workload (incl. contact hours, self-study hours) | <i>Total workload: 170 minutes/credit point Contact hours: 50 minutes synchronous and 120 minutes asynchronous (independent study/ reading, doing homework, discussion with peers)</i> |
| Credit points | <i>3 SKS (4.77 ECTS)</i> |
| Required and recommended prerequisites for joining the module | <i>Analysis 1, Algebra</i> |
| Module objectives/intended learning outcomes | <p><i>After completing Analysis 1 and Algebra courses, students are</i></p> <ol style="list-style-type: none"> <i>1. able to apply the basic theories of mathematical thinking in functional analysis (C4).</i> <i>2. Able to explain the basic concept of topology and compactness property in metric space (C4, A3)</i> <i>3. Able to explain the nature of normed space and Hilbert space (C4, A3)</i> <i>4. Able to analyze the properties of linear operator and it's dual in norm space and inner product space (C4)</i> <i>5. Able to analyze the properties of linear functional and it's dual in norm space and inner product space (C4)</i> <i>6. Able to dissect proofs in functional analysis (C4)</i> <i>7. Able to apply the functional analysis concept in mathematics problem (C4) and formulate opinions to solve the problem (A4)</i> |

| Content | <i>Metric space, compact set, norm space, linear operator, The Uniform Boundedness Principle, functional linear, weak convergence, adjoint operator, reflexivity, the spectrum, inner product space, Riesz Representation Theorem, spectral decomposition in Banach space</i> | | | | | | | | | | | | | | | | | | | | |
|------------------------------------|--|-------------|--------------|--------|---|--------|----|--------|----|--------|---|--------|----|--------|----|--------|---|--------|---|-----|---|
| Examination forms | <i>Essay and poster</i> | | | | | | | | | | | | | | | | | | | | |
| Study and examination requirements | <p><i>The final score is the composition of mid-test scores, quizzes, and assignments with the following weight:</i></p> <p><i>Quiz : 15 %</i> <i>Assignment : 20 %</i> <i>Poster : 10 %</i> <i>Mid-test : 25 %</i> <i>Paper : 30 %</i> <i>Total : 100 %</i></p> <table style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th style="text-align: center;">Mark</th> <th style="text-align: center;">Grade</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">85—100</td> <td style="text-align: center;">A</td> </tr> <tr> <td style="text-align: center;">80—<85</td> <td style="text-align: center;">A-</td> </tr> <tr> <td style="text-align: center;">75—<80</td> <td style="text-align: center;">B+</td> </tr> <tr> <td style="text-align: center;">70—<75</td> <td style="text-align: center;">B</td> </tr> <tr> <td style="text-align: center;">65—<70</td> <td style="text-align: center;">B-</td> </tr> <tr> <td style="text-align: center;">60—<65</td> <td style="text-align: center;">C+</td> </tr> <tr> <td style="text-align: center;">55—<60</td> <td style="text-align: center;">C</td> </tr> <tr> <td style="text-align: center;">40—<55</td> <td style="text-align: center;">D</td> </tr> <tr> <td style="text-align: center;"><40</td> <td style="text-align: center;">E</td> </tr> </tbody> </table> | Mark | Grade | 85—100 | A | 80—<85 | A- | 75—<80 | B+ | 70—<75 | B | 65—<70 | B- | 60—<65 | C+ | 55—<60 | C | 40—<55 | D | <40 | E |
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| 40—<55 | D | | | | | | | | | | | | | | | | | | | | |
| <40 | E | | | | | | | | | | | | | | | | | | | | |
| Reading list | <ol style="list-style-type: none"> 1. <i>Clason, C., 2020, Introduction to Functional Analysis, Springer Nature Switzerland.</i> 2. <i>Kreyszig, E., 1978, Introductory Functional Analysis with Applications, John Wiley & Sons.</i> | | | | | | | | | | | | | | | | | | | | |