



UNIVERSITAS GADJAH MADA

Faculty of Mathematics and Natural Sciences

Mathematics Department

Sekip Utara Bulaksumur Yogyakarta 55281 Telp: +62 274 552243 Fax: +62 274 555131 Email: math@ugm.ac.id Website: <http://math.fmipa.ugm.ac.id>

Undergraduate Programme in Mathematics

Telp : +62 274 552243

Email : maths1@ugm.ac.id; kaprodi-s1-matematika.mipa@ugm.ac.id

sekprodi-s1-matematika.mipa@ugm.ac.id

Website : <http://s1math.fmipa.ugm.ac.id/>

MODULE HANDBOOK

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| Module name | Introduction to Functional Analysis |
| Module level, if applicable | Bachelor |
| Code, if applicable | MMM- 4102 |
| Subtitle, if applicable | - |
| Courses, if applicable | Introduction to Functional Analysis |
| Semester(s) in which the module is taught | 7 th (seventh) |
| Person responsible for the module | Chair of Lab. of Analysis |
| Lecture(s) | Prof. Dr. Soeparna Darmawijaya |
| Language | Bahasa Indonesia |
| Relation to curriculum | Bachelor Degree, Elective Course, 7 th 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 Functional Analysis course (MMM-4102) and have an examination card where the course is stated on. |
| Recommended prerequisites | Students have taken the course of Introduction to Analysis I course (MMM-3101) and have participated in the final exam of the course. Students should take Introduction to Analysis II (MMM-3102) at least in the same semester. |
| Module objectives/intended learning outcomes | After completing this course the students have ability to: CO 1. analyze the vector spaces of finite and infinite dimension, pre-Hilbert spaces, and norm-spaces. CO 2. analyze the orthogonality of two vectors, orthogonal system, and orthonormal system. CO 3. analyze the subspaces, orthogonally complement, direct sum. CO 4. analyze the properties of linear operator, the spaces $L(V,W)$ and $B(V,W)$, and dual spaces. CO 5. analyze self-adjoint operators and projections. |
| Content | <ul style="list-style-type: none"> • Vector spaces of finite and infinite dimension. • Pre-Hilbert spaces and norm spaces. • Orthogonal and orthonormal. • Subspaces, orthogonally complement, direct sum. • Transformation, linear operator. • The spaces $L(V,W)$ and $B(V,W)$ and dual spaces. • Self adjoint operator and projection.. |

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| Study and examination requirements and forms of examination | The final mark will be weighted as follows: | |
| | No | Assessment methods (components, activities) Weight (percentage) |
| | 1 | Final Examination 45% |
| | 2 | Mid-Term Examination 30% |
| | 3 | Class Activities: Quiz, Homework, etc. 25% |
| | The initial cut off points for grades A, B, C, and D should not be less than 80%, 70%, 50%, and 40%, respectively. | |
| Media employed | White-board | |
| Reading List | <ol style="list-style-type: none"> 1. Sterling Khazag Berberian, 1976, <i>Introduction to Hilbert Space</i>, Oxford University Press, New York. 2. Orlicz, 1992, <i>Linear Functional Analysis</i>, world Scientific, Singapore. | |

PLO and CO Mapping

| | PLO 1 | PLO 2 | PLO 3 | PLO 4 | PLO 5 | PLO 6 | PLO 7 | PLO 8 | PLO 9 |
|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| CO 1 | | | v | | | v | v | | |
| CO 2 | | | v | | | v | v | | v |
| CO 3 | | | | | | v | v | | v |
| CO 4 | | | | | | v | v | | v |
| CO 5 | | | | | | v | v | | v |