Undergraduate Programme in Mathematics

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MODULE HANDBOOK

Module name	**Applied Linear Algebra II**
Module level, if applicable	Bachelor
Code, if applicable	MMM-3209
Subtitle, if applicable	-
Courses, if applicable	Applied Linear Algebra II
Semester(s) in which the module is taught	6th (sixth)
Person responsible for the module	Chair of the Lab. of Algebra
Lecturer(s)	**Prof. Dr. Sri Wahyuni**
Language	Bahasa Indonesia
Relation to curriculum	Elective Course
Type of teaching, contact hours	150 minutes lecture, 180 minutes supervised activities
Workload	Total workload is 90.67 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 Applied Linear Algebra II course (MMM-3209) and have an examination card where the course is stated on.
Recommended prerequisites	Students have taken "**Linear Algebra (MMM-2202)**" course and have participated in the final examination of the course.
Module objectives/intended learning outcomes	**Upon successful completion, students have ability to apply linear algebra:** CO 1. **to minimization problems (concepts, advantages, applications and computation of orthogonality on inner product spaces and their associated norms);** CO 2. **to dynamical systems and data analysis (concepts, advantages, applications and computation of Eigenvalues and Singular Values)** CO 3. **to geometry and linear dynamical systems (concepts, advantages, applications and computation of Invariant Subspaces and matrix exponentials)** CO 4. **to Krylov Subspace Methods (concepts, advantages, applications and computation)**
Content	**Exploration of the application of the properties of vector spaces and inner product spaces (which have been studied on Linear Algebra courses) based project consisting:** • Minimization Problems: ❑ Equilibrium Mechanics, ❑ Solution of Equations, ❑ The Closest Point, ❑ Least Squares, ❑ Data Fitting. • Eigenvalues and Eigenvectors: ❑ Dynamical Systems ❑ Data Analysis • Matrix Exponentials : ❑ Applications in Geometry, ❑ Invariant Subspaces and Linear Dynamical Systems. • Krylov Subspace Methods

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	35% − 45%
2	Mid-Term Examination	30% − 35%
3	Class Activities: Quiz, Homework, etc.	25% − 30%

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	Boards, projectors.
Reading List	1. Shores, T.S. 2018, *Applied Linear Algebra and Matrix Analysis*, Springer (Second Edition) 2. Peter J. Olver and Chehrzad Shakiban, *Applied Linear Algebra*, second edition by Undergraduate Texts in Mathematics, Springer, New York, 2018 3. Steven Roman, 2008, Advanced Linear Algebra, Springer, New York. 4. John T. Scheick, 1997, Linear Algebra with Applications, McGraw-Hill International Editions.

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		v		
CO 2		V		v	v		v		
CO 3		V		v	v		v		
CO 4		V		v	v		v		

Description of The PLOs:

CP Lulusan (PLO)-1	Bertakwa kepada Tuhan Yang Maha Esa, berjiwa Pancasila dan memiliki kesadaran akan kepentingan bangsa. (devote to God Almighty, Pancasila minded, and aware of the interest of the nation.)
CP Lulusan (PLO)-2	Mampu mengidentifikasi dan menyelesaikan permasalahan terkait matematika. (are able to recognize mathematics-related problems, assess their solvability and solve them within a specified time frame.)
CP Lulusan (PLO)-3	Mampu mengembangkan cara berpikir matematis dan logis dan mampu membuat dugaan-dugaan serta penyelidikan benar tidaknya beberapa dugaan (*conjecture*). (are able to develop their logic and mathematical thinking. They are in particular able to formulate mathematical hypotheses and have an understanding of how such hypotheses can be verified or falsified using mathematical methods.)
CP Lulusan (PLO)-4	Memiliki pengetahuan yang cukup dalam bidang teknologi informasi dan terampil menggunakannya untuk mendukung pembelajaran dan penelitian matematika. (have sufficient knowledge in information technology and have ability it to support the teaching-learning and research process.)
CP Lulusan (PLO)-5	Memiliki pengetahuan yang komprehensif di bidang pemodelan matematika serta mampu menyusun model matematika berbagai permasalahan, baik di matematika maupun di bidang lain seperti sains atau kehidupan sehari-hari serta mampu menentukan strategi pemecahannya. (have comprehensive knowledge in mathematical modelling and able to create mathematical models, both in mathematics, in other fields, and in real problems. They are in particular able to solve and determine the strategy how to solve the problems.)
CP Lulusan (PLO)-6	Mampu mengidentifikasi pola-pola dasar dan bentuk-bentuk analogi serta mampu melakukan generalisasi dan abstraksi. (have generalization and abstraction abilities and are able to recognize analogies and basic patterns.)
CP Lulusan (PLO)-7	Mampu mengkomunikasikan bahasa matematika baik secara lisan maupun tulisan dengan tepat, jelas dan terorganisasi. (are able to communicate in mathematical language, oral and writing, concisely, clearly, and well-organized.)
CP Lulusan (PLO)-8	Memiliki tanggung-jawab, kepercayaan diri, kematangan emosional, etika dan kesadaran menjadi pembelajar sepanjang hayat. (have responsibility, confidence, emotional mature, ethics, and lifelong learner principle.)
CP Lulusan (PLO)-9	Mampu mengaplikasikan pengetahuan matematis dalam karier yang terkait dengan bidang matematika atau untuk melanjutkan studi pada program pasca sarjana. (have ability to apply their mathematics ability in their carrier related to mathematics and to continue their programme in master and doctoral programme.)