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Master in Mathematics

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MODULE HANDBOOK

Module Name	Algebraic Structure
Module level, if applicable	Master Programme
Code, if applicable	MMM 5203
Subtitle, if applicable	-
Courses, if applicable	Algebraic Structure
Semester(s) in which the module is taught	3st Semester
Person responsible for the module	Chair of the Algebra Laboratory
Lecturer(s)	Prof. Dr. rer.nat. Indah Emilia Wijayanti, M.Si Dr. rer.nat. Yeni Susanti, S.Si., M.Si.
Language	Bahasa Indonesia
Relation to curriculum	compulsory subject of interest for Master of Mathematics
Teaching methods	lecture, case based learning
Workload (incl. contact hours, self-study hours)	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
Required and recommended prerequisites for joining the module	Students should be familiar to linear algebra

Module objectives/intended leaning outcomes	After taking this course, students will be able to: CO 1. Clarifies the various concepts, definitions and properties of groups, subgroups, normal groups, quotient groups, symmetry groups, cyclic groups, and direct product groups. CO 2. Clarifies various concepts, definitions and properties of group homomorphisms, action groups on a set and Sylow's Theorem. CO 3. Clarifies various concepts, definitions and properties of ring, subring, ideal, ring quotient, and ring homomorphism. CO 4. Clarifies various concepts, definitions and properties of special elements in rings as well as properties related to special rings and extension fields. CO 5. Clarifies concepts related to Zorn's Lemma and the Axiom of Choice in groups and rings.
Content	**Part 1: Group Theory** Review of the basic ideas of group theory: Background and Motivation. Groups and subgroups, examples and their properties. Cosets and Lagrange's Theorem. Finite groups: Symmetry groups, and permutation groups. Abelian group, Quotient Group, Direct product groups, Factor groups from normal subgrups and cyclical groups. Group Homomorphism, Kernel and Image. The Fundamental Homomorphism Theorem. Isomorphism, Inner Automorphism and Outer Automorphism. The first, second, third isomorphism theorems on groups. Group action on a set, orbit, stabilizer. Applications in the conjugate class, centralizer, normalizer. Sylow's theorem and its applications. **Part 2: Ring Theory** A review of the basic ideas of ring theory: Background and Motivation. Rings, subrings and ideals, examples and their properties. Ideal and Quotient Ring. Direct product. Ring polynomial and its properties. Special elements: zero divisor, unit element, prime element, and irreducible element. Prime Ideal and Maximum Ideal. Some special rings: integral Domain, field, Principle Ideal Domain, Euclidean Domain, and Unique Factorization Domain. Multiplicative Closed and localization. Lemma Zorn, The Axiom of Choice and its application. Ring Homomorphism, Kernel and Image. The Fundamental Homomorphism Theorem on Rings. The first, second, third isomorphism theorems on rings. Extension Field, characteristics of a field, algebraic extension
Examination forms	written task, oral presentation, mid and final exam

Study and examination requirements	The final mark will be weighted as follows: No Assessment methods (components, activities) Weight (percentage) 1. Final Examination 25-40% 2. Mid-Term Examination 25-40% 3. Quiz/Presentation 20-30% 4. Homework 10-20% Minimum final mark to pass : 60 (grade C)
Media employed	Board, LCD Projector, Laptop/Computer
Reading list	1. Dummit, D.S, Foote, R.M, 2004, *Abstract Algebra*, Third Edition, John Wiley & Son, Inc. 2. Grillet, P.A, 1999, *Algebra*, John Wiley & Son, Inc. 3. Fraleigh, J. B., 2014, *A First Course in Abstract Algebra*, 7^{th}, Ed., Pearson Education Limited, Edinburgh Gate, Harlow. 4. Hungerford, T.W, Algebra, 1974, (*Graduate Texts in Mathematics, 73*) 8th Edition, Springer Verlag. 5. Malik, D.S, Mordeson, J.N, Sen, M.K, 1997, *Fundamentals of Abstract Algebra*, The McGraw-Hill Companies, Inc. 6. Nicholson, W. K., 2012, *Introduction to Abstract Algebra*, 4^{th}, Ed., John-Wiley \& Sons, Inc., Hoboken, New Jersey. 7. Rotman, J.J. 2003, *Advanced Modern Algebra* Prentice Hall; 1st edition (2002); 2nd printing (2003). 8. Smith, J. D. W., 2016, *Introduction to Abstract Algebra*, 2^{nd}, Ed., Taylor & Francis Group, Boca Raton, Florida

CO-PLO Mapping

	PLO – 1 **S2 Mat**	**PLO – 2** **S2 Mat**	**PLO – 3** **S2 Mat**	**PLO – 4** **S2 Mat**	**PLO – 5** **S2 Mat**	**PLO –6** **S2 Mat**
CO 1		v	v	v		
CO 2		v	v	v		
CO 3		v	v	v		
CO 4		v	v	v		
CO 5		v	v	v		

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