UNIVERSITAS GADJAH MADA
Faculty of Mathematics and Natural Sciences
Department of Mathematics
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

Doctor in Mathematics

Telp : +62 274 552243
Email : maths3@ugm.ac.id; kaprodi-s3-matematika.mipa@ugm.ac.id
Website : http://s3math.fmipa.ugm.ac.id/

MODULE HANDBOOK

Module designation	Topics in Algebra 1
Code, if applicable	MMM 7209
Subtitle, if applicable	-
Courses, if applicable	Topics in Algebra 1
Semester(s) in which the module is taught	1st or 2nd Semester
Person responsible for the module	Head of Algebra Research Group
Language	Bahasa Indonesia
Relation to curriculum	Elective course
Teaching methods	Lecture, project
Workload (incl. contact hours, self-study hours)	The total workload is 232 hours per semester, which consists of 50 minutes lectures per week, 120 minutes of structured activities per week, and 120 minutes of individual study per week, in total is 16 weeks per semester, including mid and final exams.
Credit points in Credit Units	3
Required and recommended prerequisites for joining the module	Students should have prior knowledge such as group theory, ring theory and linear algebra.

Module objectives/intended learning outcomes	Upon successful completion, students are able to CO1 : analyze concepts, philosophy, definitions and important properties of advanced abstract algebra related to his/her research; CO2 : prove important properties of advanced abstract algebra related to his/her research; CO3 : make conjectures to further subjects related to his/her research; CO4 : expand or improve special prior knowledge related to his/her research.
Content	1. Coding theory 2. Advanced abstract algebra 3. Semigroup theory 4. Module theory 5. Advanced ring theory 6. Finite field 7. Capita selecta in abstract algebra
Examination forms	Oral presentation, essay, project.
Study and examination requirements	The final mark will be computed from a proportional weight of assignments, mid examination and final examination. The final mark will be weighted as follows: No — Assessment methods (components, activities) — Weight (percentage) 1 — Final Examination — 20 - 30% 2 — Mid-Term Examination — 20 - 30% 3 — Class Activities: Quiz, Homework, etc. — 50 - 55% Minimum final mark to pass : B
Media employed	Whiteboard, screen, laptop.
Reading list	1. Kurz, S., Advanced and current topics in coding theory, Lecture Notes, University of Bayreuth, 2020. 2. Richardson, T., Urbanke, R., Modern Coding Theory, Cambridge University Press, 2008.

CO-PLO Mapping

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6
CO 1	v	v				v
CO 2	v	v				v
CO 3		v				
CO 4		v				

Compilation Date : September 13th 2023

Modified Date : February 5th 2024

UNIVERSITAS GADJAH MADA
Faculty of Mathematics and Natural Sciences
Department of Mathematics
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

Doctor in Mathematics

MODULE HANDBOOK

Telp : +62 274 552243
Email : maths3@ugm.ac.id; kaprodi-s3-matematika.mipa@ugm.ac.id
Website : http://s3math.fmipa.ugm.ac.id/

Module designation	Topics in Algebra 1 : Advanced Abstract Algebra and Its Development
Code, if applicable	MMM 7209
Subtitle, if applicable	Coding Theory
Semester(s) in which the module is taught	1st or 2nd Semester
Person responsible for the module	Head of Algebra Research Group
Language	Bahasa Indonesia
Relation to curriculum	Elective course
Teaching methods	Lecture, project.
Workload (incl. contact hours, self-study hours)	The total workload is 232 hours per semester, which consists of 50 minutes of lectures per week, 120 minutes of structured activities per week, and 120 minutes of individual study per week, in total is 16 weeks per semester, including mid and final exams.
Credit points in Credit Units	3
Required and recommended prerequisites for joining the module	Students should have prior knowledge such as group theory, ring theory and linear algebra.
Module objectives/intended learning outcomes	Upon successful completion, students are able to CO1 : analyze concepts, philosophy, definitions and important properties of advanced algebra related to his/her research; CO2 : prove important properties of advanced algebra related to his/her research; CO3 : make conjectures to further subjects related to his/her research; CO4 : expand or improve special prior knowledge related to his/her research.
Content	Topics and syllabus depend on the research related to coding theory.

Examination forms	Oral presentation, essay.
Study and examination requirements	The final mark will be computed from a proportional weight of assignments, mid examination and final examination. The final mark will be weighted as follows: No Assessment methods (components, activities) Weight (percentage) 1 Final Examination 20 - 30% 2 Mid-Term Examination 20 - 30% 3 Class Activities: Quiz, Homework, etc 50 - 55% Minimum final mark to pass : B
Media employed	Whiteboard, screen, laptop
Reading list	1. Kurz, S., Advanced and current topics in coding theory, Lecture Notes, University of Bayreuth, 2020. 2. Richardson, T., Urbanke, R., Modern Coding Theory, Cambridge University Press, 2008.

CO-PLO Mapping

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6
CO 1	v	v	v		v	v
CO 2	v	v	v		v	v
CO 3	v	v	v		v	v
CO 4	v	v	v		v	v

Compilation Date : September 13th 2023

Modified Date : February 5th 2024

UNIVERSITAS GADJAH MADA
Faculty of Mathematics and Natural Sciences
Department of Mathematics
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

Doctor in Mathematics

Telp : +62 274 552243
Email : maths3@ugm.ac.id; kaprodi-s3-matematika.mipa@ugm.ac.id
Website : http://s3math.fmipa.ugm.ac.id/

MODULE HANDBOOK

Module designation	Topic in Algebra 1 (Advance Abstract Algebra and Its Developments)
Code, if applicable	MMM 7209
Subtitle, if applicable	Semigroup Theory
Semester(s) in which the module is taught	1st or 2nd semester
Person responsible for the module	Head of Algebra Laboratory
Language	Bahasa Indonesia
Relation to curriculum	Elective course
Teaching methods	Lecture, presentation, project
Workload (incl. contact hours, self-study hours)	Total workload is 232 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 Credits Points
Required and recommended prerequisites for joining the module	Students master the concepts of logic and sets, algebraic structure theory and liner algebra
Module objectives/intended learning outcomes	After taking this course, students will be able to CO 1. clarify the concept, definitions of the lattice theory CO 2. prove properties related to the lattice theory and lattice algebraic CO 3. formulate conjectures related to the advance lattice theory. CO 4. generalize the concepts of lattice into his research topics and validates them

Content	Semigroup, monoid, ideal, natural order. Green equivalence and semigroup homomorphism. Regular elements, idempotent elements, generalized inverses. Special semigroups, inverse semigroups. Semigroup Algebras, Graph, Application semigroup.
Examination forms	Oral presentation, essay, paper
Study and examination requirements	The final mark will be computed from a proportional weight of assignments, mid examination and final examination. The final mark will be weighted as follows: No — Assessment methods (components, activities) — Weight (percentage) 1 — Final Examination — 20 - 30% 2 — Mid-Term Examination — 20 - 30% 3 — Class Activities: Quiz, Project, etc. — 50 - 60% Minimum final mark to pass : B
Media employed	Whiteboard, LCD screen, laptop
Reading list	1. Clifford, A.H. and Preston, G.B., 1961, *The Algebraic Theory of Semigroups*, American Math. Society, Rhode Island 2. Gondran, M., and Minoux, M., 2010, *Graph, Dioids, and Semirings*: News Models and Algoritms, Springer 3. Howie, J. M., 1996, *Fundamentals of Semigroup Theory*, Oxford University Press. 4. Okninski, J, 2020, *Semigroup Algebras,* CRC Press. 5. Pietrich, M., 1984*, Inverse semigroups* (Pure and applied mathematics) (Canadian Mathematical Society Series of Monographs and Advan), John Wiley & Sons,

z

CO-PLO Mapping

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6
CO 1		v	v			
CO 2		v	v			
CO 3	v	v	v	v	v	v
CO 4				v	v	

Compilation Date : August 19, 2022

First Update : September 12, 2023

Last Update : February 1, 2024

UNIVERSITAS GADJAH MADA
Faculty of Mathematics and Natural Sciences
Department of Mathematics
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

Doctor in Mathematics

Telp : +62 274 552243
Email : maths3@ugm.ac.id; kaprodi-s3-matematika.mipa@ugm.ac.id
Website : http://s3math.fmipa.ugm.ac.id/

MODULE HANDBOOK

Module designation	Topics in Algebra 1 : Advanced Abstract Algebra and Its Development
Code, if applicable	MMM 7209
Subtitle, if applicable	Algebraic Structure
Semester(s) in which the module is taught	1st or 2nd Semester
Person responsible for the module	Head of Algebra Research Group
Language	Bahasa Indonesia
Relation to curriculum	Elective course
Teaching methods	Lecture, project.
Workload (incl. contact hours, self-study hours)	The total workload is 232 hours per semester, which consists of 50 minutes of lectures per week, 120 minutes of structured activities per week, and 120 minutes of individual study per week, in total is 16 weeks per semester, including mid and final exams.
Credit points in Credit Units	3
Required and recommended prerequisites for joining the module	Students should have prior knowledge such as group theory, ring theory and linear algebra.
Module objectives/intended learning outcomes	Upon successful completion, students are able to CO1: analyze concepts, philosophy, definitions and important properties of advanced algebra related to his/her research; CO 2: prove important properties of advanced algebra related to his/her research; CO 3: make conjectures to further subjects related to his/her research; CO 4: expand or improve special prior knowledge related to his/her research.

Content	This course gives material about advanced abstract algebra, such as tensor products, comodules, semigroups, etc. which support his/her research. Topics and syllabus depend on the research.
Examination forms	Oral presentation and/or essay.
Study and examination requirements	The final mark will be computed from a proportional weight of assignments, and mid and final examinations. The final mark will be weighted as follows: No Assessment methods (components, activities) Weight (percentage) 1 Final Examination 20 - 30% 2 Mid-Term Examination 20 - 30% 3 Class Activities: Quiz, Homework, etc. 50 - 55% The minimum final mark to pass is B.
Media employed	Whiteboard, screen, laptop.
Reading list	1. Wisbauer, R., Foundations of Module and Ring Theory, Gordon and Breach Science Publisher, Philadelphia, 1991. 2. Wisbauer, R., Modules and Algebras : Bimodule Structure on Group Actions and Algebras, Addison Wesley Longman, Essex, 1996. 3. Karpilovsky, G., Induced Modules over Group Algebras, North Holland, Amsterdam, 2012. 4. Brezinski, T., Wisbauer, R., Corings and Comodules, Cambridge University Press, 2003.

CO-PLO Mapping

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6
CO 1	v	v	v		v	v
CO 2	v	v	v		v	v
CO 3	v	v	v		v	v
CO 4	v	v	v		v	v

Compilation Date : September 13th 2023

Modified Date : February 6th 2024

UNIVERSITAS GADJAH MADA
Faculty of Mathematics and Natural Sciences
Department of Mathematics
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

Doctor in Mathematics

Telp : +62 274 552243
Email : maths3@ugm.ac.id; kaprodi-s3-matematika.mipa@ugm.ac.id
Website : http://s3math.fmipa.ugm.ac.id/

MODULE HANDBOOK

Module designation	Topics in Algebra 1 : Advanced Abstract Algebra and Its Development
Code, if applicable	MMM 7209
Subtitle, if applicable	Module Theory
Semester(s) in which the module is taught	1st or 2nd Semester
Person responsible for the module	Head of Algebra Research Group
Language	Bahasa Indonesia
Relation to curriculum	Elective course
Teaching methods	Lecture, project.
Workload (incl. contact hours, self-study hours)	Total workload is 232 hours per semester, which consists of 50 minutes lectures per week, 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 in Credit Units	3
Required and recommended prerequisites for joining the module	Students should have prior knowledge such as group theory, ring theory and linear algebra.
Module objectives/intended learning outcomes	Upon successful completion, students are able to CO1 : analyze concepts, philosophy, definitions and important properties of advanced algebra related to his/her research; CO2 : prove important properties of advanced algebra related to his/her research; CO3 : make conjectures to further subjects related to his/her research; CO4 :expand or improve special prior knowledge related to his/her research.

Content	Topics and syllabus depend on the research related to module theory.
Examination forms	Oral presentation, essay.
Study and examination requirements	The final mark will be computed from a proportional weight of assignments, mid examination and final examination. The final mark will be weighted as follows: No Assessment methods (components, activities) Weight (percentage) 1 Final Examination 20 - 30% 2 Mid-Term Examination 20 - 30% 3 Class Activities: Quiz, Homework, etc. 50 - 55% Minimum final mark to pass : B
Media employed	Whiteboard, screen, laptop.
Reading list	1. Wisbauer, R., Foundations of Module and Ring Theory, Gordon and Breach Science Publisher, Philadelphia, 1991. 2. Wisbauer, R., Modules and Algebras : Bimodule Structure on Group Actions and Algebras, Addison Wesley Longman, Essex, 1996. 3. Karpilovsky, G., Induced Modules over Group Algebras, North Holland, Amsterdam, 2012. 4. Brezinski, T., Wisbauer, R., Corings and Comodules, Cambridge University Press, 2003.

CO-PLO Mapping

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6
CO 1	v	v	v		v	v
CO 2	v	v	v		v	v
CO 3	v	v	v		v	v
CO 4	v	v	v		v	v

Compilation Date : September 13th 2023

Modified Date : February 6th 2024

UNIVERSITAS GADJAH MADA
Faculty of Mathematics and Natural Sciences
Department of Mathematics
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

Doctor in Mathematics

Telp : +62 274 552243
Email : maths3@ugm.ac.id; kaprodi-s3-matematika.mipa@ugm.ac.id
Website : http://s3math.fmipa.ugm.ac.id/

MODULE HANDBOOK

Module designation	Topics in Algebra 1 : Advanced Abstract Algebra and Its Development
Code, if applicable	MMM 7209
Subtitle, if applicable	Advanced Ring Theory
Semester(s) in which the module is taught	1st or 2nd Semester
Person responsible for the module	Head of Algebra Research Group
Language	Bahasa Indonesia
Relation to curriculum	Elective course
Teaching methods	Lecture, project.
Workload (incl. contact hours, self-study hours)	Total workload is 232 hours per semester, which consists of 50 minutes lectures per week, 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 in Credit Units	3
Required and recommended prerequisites for joining the module	Students should have prior knowledge such as group theory, ring theory and linear algebra.
Module objectives/intended learning outcomes	Upon successful completion, students are able to CO1 : analyze concepts, philosophy, definitions and important properties of advanced algebra related to his/her research; CO2 : prove important properties of advanced algebra related to his/her research; CO3 : make conjectures to further subjects related to his/her research; CO4 : expand or improve special prior knowledge related to his/her research.
Content	Topics and syllabus depend on the research related to advanced ring theory.

Examination forms	Oral presentation, essay.
Study and examination requirements	The final mark will be computed from a proportional weight of assignments, mid examination and final examination. The final mark will be weighted as follows: No Assessment methods (components, activities) Weight (percentage) 1 Final Examination 20 - 30% 2 Mid-Term Examination 20 - 30% 3 Class Activities: Quiz, Homework, etc. 50 - 55% Minimum final mark to pass : B
Media employed	Whiteboard, screen, laptop.
Reading list	1. Lam, T.Y., Lectures on Modules and Rings, Springer, New York, 1999. 2. Lam, T.Y., A First Course in Noncommutative Rings, Springer Verlag, Heidelberg, 1991. 3. Wisbauer, R., Foundations of Module and Ring Theory, Gordon and Breach Science Publisher, Philadelphia, 1991. 4. Wisbauer, R., Modules and Algebras : Bimodule Structure on Group Actions and Algebras, Addison Wesley Longman, Essex, 1996. 5. Karpilovsky, G., Induced Modules over Group Algebras, North Holland, Amsterdam, 2012. 6. Brezinski, T., Wisbauer, R., Corings and Comodules, Cambridge University Press, 2003.

CO-PLO Mapping

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6
CO 1	v	v	v		v	v
CO 2	v	v	v		v	v
CO 3	v	v	v		v	v
CO 4	v	v	v		v	v

Compilation Date : September 13th 2023

Modified Date : February 6th 2024

UNIVERSITAS GADJAH MADA
Faculty of Mathematics and Natural Sciences
Department of Mathematics
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

Doctor in Mathematics

Telp : +62 274 552243
Email : maths3@ugm.ac.id; kaprodi-s3-matematika.mipa@ugm.ac.id
Website : http://s3math.fmipa.ugm.ac.id/

MODULE HANDBOOK

Module designation	Topics in Algebra 1 : Advanced Abstract Algebra and Its Development
Code, if applicable	MMM 7209
Subtitle, if applicable	Finite Field
Semester(s) in which the module is taught	1st or 2nd Semester
Person responsible for the module	Head of Algebra Research Group
Language	Bahasa Indonesia
Relation to curriculum	Elective course
Teaching methods	Lecture, project.
Workload (incl. contact hours, self-study hours)	Total workload is 232 hours per semester, which consists of 50 minutes lectures per week, 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 in Credit Units	3
Required and recommended prerequisites for joining the module	Students should have prior knowledge such as group theory, ring theory and linear algebra.
Module objectives/intended learning outcomes	Upon successful completion, students are able to CO1 : describe concepts, philosophy, definitions and important properties of advanced algebra related to his/her research; CO2 : to prove important properties of advanced algebra related to his/her research; CO3 : make conjectures to further subjects related to his/her research; CO4 : expand or improve special prior knowledge related to his/her research.
Content	Topics and syllabus depend on the research related to finite field.

Examination forms	Oral presentation, essay.
Study and examination requirements	The final mark will be computed from a proportional weight of assignments, mid examination and final examination. The final mark will be weighted as follows: No Assessment methods (components, activities) Weight (percentage) 1 Final Examination 20 - 30% 2 Mid-Term Examination 20 - 30% 3 Class Activities: Quiz, Homework, etc. 50 - 55% Minimum final mark to pass : B
Media employed	Whiteboard, screen, laptop.
Reading list	1. Fraleigh, J.B., A First Course in Abstract Algebra, 7th Edition, 2003, Pearson New International. 2. Dummit, D.S., Foote, R.M., 2002, Abstract Algebra, 2nd Edition, John Wiley and Sons. 3. Lidl, R., Niederreiter, H., 2008, Finite Field, Cambridge University Press.

CO-PLO Mapping

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6
CO 1	v	v	v		v	v
CO 2	v	v	v		v	v
CO 3	v	v	v		v	v
CO 4	v	v	v		v	v

Compilation Date : September 13th 2023

Modified Date : February 6th 2024

UNIVERSITAS GADJAH MADA
Faculty of Mathematics and Natural Sciences
Department of Mathematics
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

Doctor in Mathematics

Telp : +62 274 552243
Email : maths3@ugm.ac.id; kaprodi-s3-matematika.mipa@ugm.ac.id
Website : http://s3math.fmipa.ugm.ac.id/

MODULE HANDBOOK

Module designation	Topics in Algebra 1 : Advanced Abstract Algebra and Its Development
Code, if applicable	MMM 7209
Subtitle, if applicable	Capita Selecta
Semester(s) in which the module is taught	1st or 2nd Semester
Person responsible for the module	Head of Algebra Research Group
Language	Bahasa Indonesia
Relation to curriculum	Elective course
Teaching methods	Lecture, project.
Workload (incl. contact hours, self-study hours)	Total workload is 232 hours per semester, which consists of 50 minutes lectures per week, 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 in Credit Units	3
Required and recommended prerequisites for joining the module	Students should have prior knowledge such as group theory, ring theory and linear algebra.
Module objectives/intended learning outcomes	Upon successful completion, students are able to CO1 : analyze concepts, philosophy, definitions and important properties of advanced algebra related to his/her research; CO2 : prove important properties of advanced algebra related to his/her research; CO3 : make conjectures to further subjects related to his/her research; CO4 : expand or improve special prior knowledge related to his/her research.
Content	Topics and syllabus depend on the research.

Examination forms	Oral presentation, essay.
Study and examination requirements	The final mark will be computed from a proportional weight of assignments, mid examination and final examination. The final mark will be weighted as follows: No — Assessment methods (components, activities) — Weight (percentage) 1 — Final Examination — 20 - 30% 2 — Mid-Term Examination — 20 - 30% 3 — Class Activities: Quiz, Homework, etc. — 50 - 55% Minimum final mark to pass : B
Media employed	Whiteboard, screen, laptop.
Reading list	Papers and references related to the research.

CO-PLO Mapping

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6
CO 1	v	v	v		v	v
CO 2	v	v	v		v	v
CO 3	v	v	v		v	v
CO 4	v	v	v		v	v

Compilation Date : September 13th 2023

Modified Date : February 6th 2024