



UNIVERSITAS GADJAH MADA

Faculty of Mathematics and Natural Sciences

Department of Mathematics

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Master in Mathematics

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MODULE HANDBOOK

Module Name	Semigroups and Semirings
Module level, if applicable	Master
Code, if applicable	MMM 5217
Subtitle, if applicable	
Courses, if applicable	
Semester(s) in which the module is taught	Second year
Person responsible for the module	Chair of Algebra Research Group
Lecturer(s)	Dr. Budi Surodjo, MSi.
Language	Indonesia
Relation to curriculum	Elective courses
Teaching methods	Lecture, presentation
Workload (incl. contact hours, self-study hours)	3 hours lectures, 3 hours supervised activities, 3 hours individual learning per week, 14 weeks per semester, total 9 hours x 14 weeks = 126 hours per semester.
Credit points	3
Required and recommended prerequisites for joining the module	Before taking this course, students must master the basics of mathematical logic, set theory, and the basics of group theory and ring theory

Module objectives/intended learning outcomes	<p>Upon successful completion of this course, students are able to:</p> <p>CO1: formulate and prove in detail the properties of semigroups.</p> <p>CO2: connect and reconstructs the semigroup concepts in other fields including algebra, analysis and applications</p> <p>CO3: formulate and prove in detail the properties of semiring</p> <p>CO4: connect and reconstructs the concept of semiring in other fields of algebra, analysis, and applications.</p>															
Content	<p>Semigroup, monoid, subsemigroup, ideal, natural order. Green equivalence and semigroup homomorphism. Regular elements, idempotent elements, inverse elements, generalized inverses. Quotient semigroups, regular semigroups, and inverse semigroups. Application semigroup.</p> <p>Semiring, subsemiring, ideal. Regular elements, inverse elements, slanted regular. Semiring homomorphisms, the fundamental theorem of homomorphisms, special semirings include independent semirings, quotients, Euclid's, semifields, and dioids. Application</p>															
Examination forms	Oral presentation, essay, project															
Study and examination requirements	<p>The final mark will be weighted as follows:</p> <table border="1"> <thead> <tr> <th>No</th> <th>Assessment methods (components, activities)</th> <th>Weight(%)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Final Examination</td> <td>35%</td> </tr> <tr> <td>2</td> <td>Mid-Term Examination</td> <td>30%</td> </tr> <tr> <td>3</td> <td>Projects (Presentation)</td> <td>25%</td> </tr> <tr> <td>4</td> <td>Peer Assessment/Quiz</td> <td>10%</td> </tr> </tbody> </table>	No	Assessment methods (components, activities)	Weight(%)	1	Final Examination	35%	2	Mid-Term Examination	30%	3	Projects (Presentation)	25%	4	Peer Assessment/Quiz	10%
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1	Final Examination	35%														
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3	Projects (Presentation)	25%														
4	Peer Assessment/Quiz	10%														
Media employed	LCD, Laptop, Zoom media															
Reading list	<p>Clifford, A.H. and Preston, G.B., 1961, <i>The Algebraic Theory of Semigroups</i>, American Math. Society, Rhode Island</p> <p>Golan, J.S., 1999, <i>Semirings and their Applications</i>, Springer-Science+Business Media B.V.,</p> <p>Gondran, M., and Minoux, M., 2010, <i>Graph, Dioids, and Semirings: News Models and Algorithms</i>, Springer</p> <p>Howie, J. M., 1996, <i>Fundamentals of Semigroup Theory</i>, Oxford University Press.</p> <p>Okninski, J., 2020, <i>Semigroup Algebras</i>, CRC Press.</p> <p>Pietrich, M., 1984, <i>Inverse semigroups</i> (Pure and applied mathematics) (Canadian Mathematical Society Series of Monographs and Advan), John Wiley & Sons,</p>															

CO-PLO Mapping

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

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