UNDERGRADUATE PROGRAM IN COMPUTER SCIENCE
DEPARTMENT OF COMPUTER SCIENCE AND ELECTRONICS
FACULTY OF MATHEMATICS AND NATURAL SCIENCES
UNIVERSITAS GADJAH MADA

Module name	**Model Checking**	
Module level	Undergraduate	
Code	MII-4205	
Courses (if applicable)	Model Checking	
Semester	Fall (Gasal)	
Contact person	Reza Pulungan, Dr.-Ing., M.Sc.	
Lecturer	Reza Pulungan, Dr.-Ing., M.Sc.	
Language	Bahasa Indonesia and English	
Relation to curriculum	1. Undergraduate degree program, elective, 5th or 7th semester. 2. International undergraduate program, elective, 5th or 7th semester. 3. Master degree program, compulsory for specialization Computation, elective for others, 2nd semester.	
Type of teaching, contact hours	1. Undergraduate degree program: lectures, < 60 students, Thursdays, 14.30-17.00. 2. International undergraduate program: lectures, < 30 student, Tuesdays, 10.30-13.00. 3. Master degree program: lectures, < 25 students.	
Workload	1. Lectures: 3 x 50 = 150 minutes (2.5 hours) per week. 2. Exercises and Assignments: 3 x 60 = 180 minutes (3 hours) per week. 3. Private study: 3 x 60 = 180 minutes (3 hours) per week.	
Credit points	3 credit points (sks).	
Requirements according to the examination regulations	A student must have attended at least 75% of the lectures to sit in the exams.	
Recommended prerequisites	Discrete Mathematics.	
Learning outcomes and their corresponding PLOs	After completing this module, a student is expected to: **CO1** master the basic concepts needed to follow this course, especially those related to automata and languages, complexity of algorithms, and programming. **CO2** be able to explain the basic concepts of reactive systems, how to model them, and how to verify their correctness. **CO3** be able to explain modelling language PROMELA and be able to use model checker SPIN. **CO4** be able to explain the concepts and types of linear-time properties and how to model check linear-time properties. **CO5** be able to explain regular and ω-regular properties, machines that accept them, and how to model check regular and ω- regular properties.	PLO2 PLO3 PLO3 PLO3 PLO3

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<tr><td></td><td>CO6 be able to explain the syntax, the semantics of linear-temporal logic (LTL) and the techniques to model check LTL as well as to apply them in practice.
CO7 be able to apply the concepts and techniques learnt in this course to verify a real problem found in the field of computer science.
CO8 be able to explain the state-of-the-art in the field of model checking, emerging and trending research topics, and to know the general direction of researches in this field.</td><td>PLO3

PLO4

PLO8</td></tr>
<tr><td>Content</td><td colspan="2">In this course, students will be introduced to a technique for the verification of reactive systems, called model checking. With model checking, the correctness of functional behaviors, as well as time and performance behaviors, of a reactive system of program can be determined. This course will focus on model checking functional behaviors based on linear-time properties by using model checker SPIN.</td></tr>
<tr><td>Study and examination requirements and forms of examination</td><td colspan="2">Mid-terms examination and Final examination.</td></tr>
<tr><td>Media employed</td><td colspan="2">LCD, blackboard, websites, and model checker tools.</td></tr>
<tr><td>Assessments and Evaluation</td><td colspan="2">
<table>
<tr><th>CO</th><th>Evaluation Method</th><th>Supported PLO</th><th>Type</th><th>Percentage</th><th>Total</th></tr>
<tr><td>CO1</td><td>Exercise 1</td><td>PLO2</td><td>Formative</td><td>5%</td><td>5%</td></tr>
<tr><td>CO2</td><td>Problem 1 in midterm</td><td>PLO3</td><td>Summative</td><td>5%</td><td>15%</td></tr>
<tr><td></td><td>Problem 2 in midterm</td><td>PLO3</td><td>Summative</td><td>5%</td><td></td></tr>
<tr><td></td><td>Exercise 2</td><td>PLO3</td><td>Formative</td><td>5%</td><td></td></tr>
<tr><td>CO3</td><td>Problem 3 in midterm</td><td>PLO3</td><td>Summative</td><td>5%</td><td>10%</td></tr>
<tr><td></td><td>Exercise 3</td><td>PLO3</td><td>Formative</td><td>5%</td><td></td></tr>
<tr><td>CO4</td><td>Problem 4 in midterm</td><td>PLO3</td><td>Summative</td><td>5%</td><td>15%</td></tr>
<tr><td></td><td>Problem 1 in final</td><td>PLO3</td><td>Summative</td><td>5%</td><td></td></tr>
<tr><td></td><td>Exercise 4</td><td>PLO3</td><td>Formative</td><td>5%</td><td></td></tr>
<tr><td>CO5</td><td>Problem 2 in final</td><td>PLO3</td><td>Summative</td><td>5%</td><td>10%</td></tr>
<tr><td></td><td>Exercise 5</td><td>PLO3</td><td>Formative</td><td>5%</td><td></td></tr>
<tr><td>CO6</td><td>Problem 3 in final</td><td>PLO3</td><td>Summative</td><td>5%</td><td>10%</td></tr>
<tr><td></td><td>Exercise 6</td><td>PLO3</td><td>Formative</td><td>5%</td><td></td></tr>
<tr><td>CO7</td><td>Assignment 1: Modelling and Verifying</td><td>PLO4</td><td>Summative</td><td>15%</td><td>30%</td></tr>
<tr><td></td><td>Assignment 2: Modelling and Verifying</td><td>PLO4</td><td>Summative</td><td>15%</td><td></td></tr>
<tr><td>CO8</td><td>Problem 4 in final</td><td>PLO8</td><td>Summative</td><td>5%</td><td>5%</td></tr>
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</td></tr>
<tr><td>Reading List</td><td colspan="2">Baier, C., and Katoen, J.-P., Principles of Model Checking, MIT Press, 2008.</td></tr>
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	Clarke, E.M., Jr., Grumberg, O., Peled, D.A., Model Checking, MIT Press, 1999. Aceto, L., Ingólfsdóttir, A., Larsen, K.G., and Srba, J., Reactive Systems: Modelling, Specification and Verification, Cambridge University Press, 2007.