**MODULE HANDBOOK**
**Master Program in Computer Science**
**Department of Computer Science and Electronics**
**Faculty of Mathematics and Natural Sciences**
**Universitas Gadjah Mada**

## Verification and Validation

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| Module name | **Verifikasi dan Validasi** | |
| Module level | Master | |
| Code | MII-6817 | |
| Courses (if applicable) | Verification and Validation | |
| 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 | Master degree program, elective, 1st semester. | |
| Type of teaching, contact hours | Master degree program: lectures, < 25 students, Fridays, 7.30-10.00. | |
| Workload | 1. Lectures: 3 x 50 = 150 minutes (2.5 hours) per week.<br>2. Exercises and Assignments: 3 x 60 = 180 minutes (3 hours) per week.<br>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 | None. | |
| Learning outcomes and their corresponding PLOs | After completing this module, a student is expected to:<br>**CO1** master the basic concepts needed to follow this course, especially those related to automata and languages, complexity of algorithms, and programming.<br>**CO2** be able to explain the basic concepts of reactive systems, how to model them, and how to verify their | PLO2<br><br>PLO3 |
| | correctness.<br>**CO3** be able to explain modelling language PROMELA and be able to use model checker SPIN.<br>**CO4** be able to explain the concepts and types of linear-time properties and how to model check lineartime properties.<br>**CO5** be able to explain regular and ω-regular properties, machines that accept them, and how to model check regular and ω- regular properties. **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. | PLO3<br>PLO3<br>PLO3<br>PLO3<br>PLO4 |

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| | **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. | PLO8 |
| Content | 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. | |
| Study and examination requirements and forms of examination | Mid-terms examination and Final examination. | |
| Media employed | LCD, blackboard, websites, and model checker tools. | |

Assessments and Evaluation

| CO | Evaluation Method | Supported PLO | Type | Percentage | Total |
|---|---|---|---|---|---|
| CO1 | Exercise 1 | PLO2 | Formative | 5% | **5%** |
| CO2 | Problem 1 in midterm | PLO3 | Summative | 5% | **15%** |
| | Problem 2 in midterm | PLO3 | Summative | 5% | |
| | Exercise 2 | PLO3 | Formative | 5% | |
| CO3 | Problem 3 in midterm | PLO3 | Summative | 5% | **10%** |
| | Exercise 3 | PLO3 | Formative | 5% | |
| CO4 | Problem 4 in midterm | PLO3 | Summative | 5% | **15%** |
| | Problem 1 in final | PLO3 | Summative | 5% | |
| | Exercise 4 | PLO3 | Formative | 5% | |
| CO5 | Problem 2 in final | PLO3 | Summative | 5% | **10%** |
| | Exercise 5 | PLO3 | Formative | 5% | |
| CO6 | Problem 3 in final | PLO3 | Summative | 5% | **10%** |
| | Exercise 6 | PLO3 | Formative | 5% | |
| CO7 | Assignment 1: Modelling and Verifying | PLO4 | Summative | 15% | **30%** |
| | Assignment 2: Modelling and Verifying | PLO4 | Summative | 15% | |
| CO8 | Problem 4 in final | PLO8 | Summative | 5% | **5%** |

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| Reading List | Baier, C., and Katoen, J.-P., Principles of Model Checking, MIT Press, 2008.<br>Clarke, E.M., Jr., Grumberg, O., Peled, D.A., Model Checking, MIT Press, 1999.<br>Aceto, L., Ingólfsdóttir, A., Larsen, K.G., and Srba, J., Reactive Systems: Modelling, Specification and Verification, Cambridge University Press, 2007. |