

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

| | | |
|---|--|---|
| Module name | Languages and Automata (Bahasa dan Otomata) | |
| Module level | Undergraduate | |
| Code | MII-2205 | |
| Courses (if applicable) | Languages and Automata (Bahasa dan Otomata) | |
| Semester | Fall (Gasal) | |
| Contact person | Reza Pulungan, Dr.-Ing., M.Sc. | |
| Lecturer | Retantyo Wardoyo, M.Sc., Ph.D., Suprpto, Dr., M.Ikom., Reza Pulungan, Dr.-Ing., M.Sc. | |
| Language | Bahasa Indonesia and English | |
| Relation to curriculum | <ol style="list-style-type: none"> Undergraduate degree program, mandatory, 3rd semester. International undergraduate program, mandatory, 3rd semester. | |
| Type of teaching, contact hours | <ol style="list-style-type: none"> Undergraduate degree program: lectures, < 60 students, Thursdays, 9.30-12.00. International undergraduate program: lectures, < 30 student, Tuesdays, 9.30-12.00. | |
| Workload | <ol style="list-style-type: none"> Lectures: 3 x 50 = 150 minutes (2.5 hours) per week. Exercises and Assignments: 3 x 60 = 180 minutes (3 hours) per week. 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 | <p>After completing this module, a student is expected to:</p> <p>CO1 be able to explain and distinguish basic finite automata forms: DFA, NFA, and epsilon-NFA.</p> <p>CO2 be able to explain the concepts of regular expressions and regular languages.</p> <p>CO3 be able to explain the relationship between finite automata and regular languages.</p> <p>CO4 be able to explain the concepts of grammar and context-free languages.</p> <p>CO5 be able to explain the concepts of push-down automata.</p> <p>CO6 be able to explain the relationship between push-down automata and context-free languages.</p> <p>CO7 be able to master the concepts of Turing machines and their relationship with computability.</p> <p>CO8 be able to master the limits of computability and languages involved in the frontier.</p> | <p>PLO3</p> <p>PLO3, PLO4</p> <p>PLO3</p> <p>PLO3, PLO4</p> <p>PLO3</p> <p>PLO3</p> <p>PLO3, PLO5</p> <p>PLO3, PLO5</p> |

| Content | This course introduces the concepts and the basic theories of computation: automata, languages, computability and complexity. These concepts provide a foundation to a formal consideration of computers and computability; make clear the limits of computability and put computational problems and algorithms on a firm and precise mathematical foundation. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---------------|-------------------|---------------|--------------|------------|-------|-----|------------|------|-----------|----|--------------|----------------------|------|-----------|------|-----|------------|------|-----------|----|--------------|----------------------|------|-----------|------|-----|------------|------|-----------|----|--------------|----------------------|------|-----------|------|-----|------------|------|-----------|----|--------------|----------------------|------|-----------|------|-----|------------|------|-----------|----|--------------|--------------------|------|-----------|------|-----|------------|------|-----------|----|--------------|--------------------|------|-----------|------|-----|------------|------|-----------|----|--------------|--------------------|------|-----------|------|-----|------------|------|-----------|----|--------------|--------------------|------|-----------|------|
| 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 | <table border="1"> <thead> <tr> <th>CO</th> <th>Evaluation Method</th> <th>Supported PLO</th> <th>Type</th> <th>Percentage</th> <th>Total</th> </tr> </thead> <tbody> <tr> <td rowspan="2">CO1</td> <td>Exercise 1</td> <td>PLO3</td> <td>Formative</td> <td>5%</td> <td rowspan="2">12,5%</td> </tr> <tr> <td>Problem 1 in midterm</td> <td>PLO3</td> <td>Summative</td> <td>7,5%</td> </tr> <tr> <td rowspan="2">CO2</td> <td>Exercise 2</td> <td>PLO4</td> <td>Formative</td> <td>5%</td> <td rowspan="2">12,5%</td> </tr> <tr> <td>Problem 2 in midterm</td> <td>PLO3</td> <td>Summative</td> <td>7,5%</td> </tr> <tr> <td rowspan="2">CO3</td> <td>Exercise 3</td> <td>PLO3</td> <td>Formative</td> <td>5%</td> <td rowspan="2">12,5%</td> </tr> <tr> <td>Problem 3 in midterm</td> <td>PLO3</td> <td>Summative</td> <td>7,5%</td> </tr> <tr> <td rowspan="2">CO4</td> <td>Exercise 4</td> <td>PLO4</td> <td>Formative</td> <td>5%</td> <td rowspan="2">12,5%</td> </tr> <tr> <td>Problem 4 in midterm</td> <td>PLO3</td> <td>Summative</td> <td>7,5%</td> </tr> <tr> <td rowspan="2">CO5</td> <td>Exercise 5</td> <td>PLO3</td> <td>Formative</td> <td>5%</td> <td rowspan="2">12,5%</td> </tr> <tr> <td>Problem 1 in final</td> <td>PLO3</td> <td>Summative</td> <td>7,5%</td> </tr> <tr> <td rowspan="2">CO6</td> <td>Exercise 6</td> <td>PLO3</td> <td>Formative</td> <td>5%</td> <td rowspan="2">12,5%</td> </tr> <tr> <td>Problem 2 in final</td> <td>PLO3</td> <td>Summative</td> <td>7,5%</td> </tr> <tr> <td rowspan="2">CO7</td> <td>Exercise 7</td> <td>PLO5</td> <td>Formative</td> <td>5%</td> <td rowspan="2">12,5%</td> </tr> <tr> <td>Problem 3 in final</td> <td>PLO3</td> <td>Summative</td> <td>7,5%</td> </tr> <tr> <td rowspan="2">CO8</td> <td>Exercise 8</td> <td>PLO5</td> <td>Formative</td> <td>5%</td> <td rowspan="2">12,5%</td> </tr> <tr> <td>Problem 4 in final</td> <td>PLO3</td> <td>Summative</td> <td>7,5%</td> </tr> </tbody> </table> | CO | Evaluation Method | Supported PLO | Type | Percentage | Total | CO1 | Exercise 1 | PLO3 | Formative | 5% | 12,5% | Problem 1 in midterm | PLO3 | Summative | 7,5% | CO2 | Exercise 2 | PLO4 | Formative | 5% | 12,5% | Problem 2 in midterm | PLO3 | Summative | 7,5% | CO3 | Exercise 3 | PLO3 | Formative | 5% | 12,5% | Problem 3 in midterm | PLO3 | Summative | 7,5% | CO4 | Exercise 4 | PLO4 | Formative | 5% | 12,5% | Problem 4 in midterm | PLO3 | Summative | 7,5% | CO5 | Exercise 5 | PLO3 | Formative | 5% | 12,5% | Problem 1 in final | PLO3 | Summative | 7,5% | CO6 | Exercise 6 | PLO3 | Formative | 5% | 12,5% | Problem 2 in final | PLO3 | Summative | 7,5% | CO7 | Exercise 7 | PLO5 | Formative | 5% | 12,5% | Problem 3 in final | PLO3 | Summative | 7,5% | CO8 | Exercise 8 | PLO5 | Formative | 5% | 12,5% | Problem 4 in final | PLO3 | Summative | 7,5% |
| CO | Evaluation Method | Supported PLO | Type | Percentage | Total | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CO1 | Exercise 1 | PLO3 | Formative | 5% | 12,5% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Problem 1 in midterm | PLO3 | Summative | 7,5% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CO2 | Exercise 2 | PLO4 | Formative | 5% | 12,5% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Problem 2 in midterm | PLO3 | Summative | 7,5% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CO3 | Exercise 3 | PLO3 | Formative | 5% | 12,5% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Problem 3 in midterm | PLO3 | Summative | 7,5% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CO4 | Exercise 4 | PLO4 | Formative | 5% | 12,5% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Problem 4 in midterm | PLO3 | Summative | 7,5% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CO5 | Exercise 5 | PLO3 | Formative | 5% | 12,5% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Problem 1 in final | PLO3 | Summative | 7,5% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CO6 | Exercise 6 | PLO3 | Formative | 5% | 12,5% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Problem 2 in final | PLO3 | Summative | 7,5% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CO7 | Exercise 7 | PLO5 | Formative | 5% | 12,5% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Problem 3 in final | PLO3 | Summative | 7,5% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CO8 | Exercise 8 | PLO5 | Formative | 5% | 12,5% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Problem 4 in final | PLO3 | Summative | 7,5% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Reading List | <p>Hopcroft, J.E., Motwani, R., and Ullman, J.D., <i>Introduction to Automata Theory, Languages, and Computation</i>, 3rd Edition, Addison Wesley, 2006.</p> <p>Sipser, M., <i>Introduction to the Theory of Computation</i>, 2nd Edition, Course Technology, 2005.</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |