

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

| | | | | | | | | | | | | | | | | | |
|---|---|--------------|-------------|--|--------------|-------------|---|--------------|-------------|--------------------------------------|--------------|-------------|---|--------------|-------------|---|--------------|
| Module name | Introduction of Control System | | | | | | | | | | | | | | | | |
| Module level | Undergraduate | | | | | | | | | | | | | | | | |
| Code | MII-2816 | | | | | | | | | | | | | | | | |
| Courses (if applicable) | Introduction of Control System | | | | | | | | | | | | | | | | |
| Semester | Even | | | | | | | | | | | | | | | | |
| Contact person | Dr. Andi Dharmawan, S.Si., M.Cs. | | | | | | | | | | | | | | | | |
| Lecturer | Dr. Andi Dharmawan, S.Si., M.Cs. | | | | | | | | | | | | | | | | |
| Language | Bahasa Indonesia | | | | | | | | | | | | | | | | |
| Relation to curriculum | Undergraduate program, compulsory, 4 th semester. | | | | | | | | | | | | | | | | |
| Type of teaching, contact hours | Undergraduate program: lectures, 410 students, Thursday, 14:30 – 17:00 | | | | | | | | | | | | | | | | |
| Workload | <ol style="list-style-type: none"> 1. Lectures: $3 \times 50 = 150$ minutes (2.5 hours) per week. 2. Exercises and Assignments: $3 \times 60 = 180$ minutes (3 hours) per week. 3. Private study: $3 \times 60 = 180$ minutes (3 hours) per week. | | | | | | | | | | | | | | | | |
| Credit points | 3 credit points. | | | | | | | | | | | | | | | | |
| Requirements according to the examination regulations | A student must have attended at least 75% of the lectures to sit in the exams. | | | | | | | | | | | | | | | | |
| Recommended prerequisites | - | | | | | | | | | | | | | | | | |
| Learning outcomes and their corresponding PLOs | <p>After completing this module, a student is expected to:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center;">CO-1</td> <td>Know the basics of the control system.</td> <td style="text-align: center;">PLO-2</td> </tr> <tr> <td style="text-align: center;">CO-2</td> <td>Understand the formulation and application of the transfer function</td> <td style="text-align: center;">PLO-3</td> </tr> <tr> <td style="text-align: center;">CO-3</td> <td>Understand physical system modeling.</td> <td style="text-align: center;">PLO-3</td> </tr> <tr> <td style="text-align: center;">CO-4</td> <td>Understand and can use state space as a model representation.</td> <td style="text-align: center;">PLO-4</td> </tr> <tr> <td style="text-align: center;">CO-5</td> <td>Understand and can utilize Kalman Filter as a support for the control system.</td> <td style="text-align: center;">PLO-4</td> </tr> </table> | | CO-1 | Know the basics of the control system. | PLO-2 | CO-2 | Understand the formulation and application of the transfer function | PLO-3 | CO-3 | Understand physical system modeling. | PLO-3 | CO-4 | Understand and can use state space as a model representation. | PLO-4 | CO-5 | Understand and can utilize Kalman Filter as a support for the control system. | PLO-4 |
| CO-1 | Know the basics of the control system. | PLO-2 | | | | | | | | | | | | | | | |
| CO-2 | Understand the formulation and application of the transfer function | PLO-3 | | | | | | | | | | | | | | | |
| CO-3 | Understand physical system modeling. | PLO-3 | | | | | | | | | | | | | | | |
| CO-4 | Understand and can use state space as a model representation. | PLO-4 | | | | | | | | | | | | | | | |
| CO-5 | Understand and can utilize Kalman Filter as a support for the control system. | PLO-4 | | | | | | | | | | | | | | | |
| Content | The control system has developed since humans recognize automated equipment. Knowledge of the control system thus has a comprehensive framework. Starting from the use of Laplace transforms, modelling, State Space representation, control design, filters for control, and so on from Single Input Single Output | | | | | | | | | | | | | | | | |

| | (SISO) to Multiple Input Multiple Output (MIMO) systems. This lecture is intended to provide a foundation around the introduction of the control system for undergraduate students. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|--|-------------------|-----------|-------------------|-------|------------|-------|------|---------------------------|-------|-----------|----|-----|--------|-------|-----------|----|------|---------------------------|-------|-----------|----|-----|---------------------------|-------|-----------|----|--------|-------|-----------|----|------|---------------------------|-------|-----------|----|-----|--------|-------|-----------|----|-------------------------|-------|-----------|----|-------------------------|-------|-----------|----|------|-------------------------|-------|-----------|----|-----|--------|-------|-----------|----|--------|-------|-----------|----|------|-------------------------|-------|-----------|----|----|
| Study and examination requirements and forms of examination | Middle Examination and Final Examination | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Media employed | Projector, glass board, and e-learning websites. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Assessments and Evaluation | <table border="1"> <thead> <tr> <th>CO</th> <th>Methods</th> <th>The supported PLO</th> <th>Type</th> <th>Percentage</th> <th>Total</th> </tr> </thead> <tbody> <tr> <td rowspan="2">CO-1</td> <td>Problem 1 in Midterm Exam</td> <td>PLO-2</td> <td>Summative</td> <td>9%</td> <td rowspan="2">13%</td> </tr> <tr> <td>Quiz 1</td> <td>PLO-2</td> <td>Formative</td> <td>4%</td> </tr> <tr> <td rowspan="3">CO-2</td> <td>Problem 2 in Midterm Exam</td> <td>PLO-3</td> <td>Summative</td> <td>9%</td> <td rowspan="3">24%</td> </tr> <tr> <td>Problem 3 in Midterm Exam</td> <td>PLO-3</td> <td>Summative</td> <td>9%</td> </tr> <tr> <td>Task-1</td> <td>PLO-3</td> <td>Formative</td> <td>6%</td> </tr> <tr> <td rowspan="4">CO-3</td> <td>Problem 4 in Midterm Exam</td> <td>PLO-3</td> <td>Summative</td> <td>9%</td> <td rowspan="4">33%</td> </tr> <tr> <td>Task-2</td> <td>PLO-3</td> <td>Formative</td> <td>6%</td> </tr> <tr> <td>Problem 1 in Final Exam</td> <td>PLO-3</td> <td>Summative</td> <td>9%</td> </tr> <tr> <td>Problem 2 in Final Exam</td> <td>PLO-3</td> <td>Summative</td> <td>9%</td> </tr> <tr> <td rowspan="3">CO-4</td> <td>Problem 3 in Final Exam</td> <td>PLO-4</td> <td>Summative</td> <td>9%</td> <td rowspan="3">21%</td> </tr> <tr> <td>Task-3</td> <td>PLO-4</td> <td>Formative</td> <td>6%</td> </tr> <tr> <td>Task-4</td> <td>PLO-4</td> <td>Formative</td> <td>6%</td> </tr> <tr> <td>CO-5</td> <td>Problem 4 in Final Exam</td> <td>PLO-4</td> <td>Summative</td> <td>9%</td> <td>9%</td> </tr> </tbody> </table> | CO | Methods | The supported PLO | Type | Percentage | Total | CO-1 | Problem 1 in Midterm Exam | PLO-2 | Summative | 9% | 13% | Quiz 1 | PLO-2 | Formative | 4% | CO-2 | Problem 2 in Midterm Exam | PLO-3 | Summative | 9% | 24% | Problem 3 in Midterm Exam | PLO-3 | Summative | 9% | Task-1 | PLO-3 | Formative | 6% | CO-3 | Problem 4 in Midterm Exam | PLO-3 | Summative | 9% | 33% | Task-2 | PLO-3 | Formative | 6% | Problem 1 in Final Exam | PLO-3 | Summative | 9% | Problem 2 in Final Exam | PLO-3 | Summative | 9% | CO-4 | Problem 3 in Final Exam | PLO-4 | Summative | 9% | 21% | Task-3 | PLO-4 | Formative | 6% | Task-4 | PLO-4 | Formative | 6% | CO-5 | Problem 4 in Final Exam | PLO-4 | Summative | 9% | 9% |
| CO | Methods | The supported PLO | Type | Percentage | Total | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CO-1 | Problem 1 in Midterm Exam | PLO-2 | Summative | 9% | 13% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Quiz 1 | PLO-2 | Formative | 4% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CO-2 | Problem 2 in Midterm Exam | PLO-3 | Summative | 9% | 24% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Problem 3 in Midterm Exam | PLO-3 | Summative | 9% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Task-1 | PLO-3 | Formative | 6% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CO-3 | Problem 4 in Midterm Exam | PLO-3 | Summative | 9% | 33% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Task-2 | PLO-3 | Formative | 6% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Problem 1 in Final Exam | PLO-3 | Summative | 9% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Problem 2 in Final Exam | PLO-3 | Summative | 9% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CO-4 | Problem 3 in Final Exam | PLO-4 | Summative | 9% | 21% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Task-3 | PLO-4 | Formative | 6% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Task-4 | PLO-4 | Formative | 6% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CO-5 | Problem 4 in Final Exam | PLO-4 | Summative | 9% | 9% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Reading List | <ol style="list-style-type: none"> Ogata, K., 2010, Modern Control Engineering, 5th edition, New Jersey, USA, Prentice Hall. Hibbeler, R. C., 2016, Dynamics, Fourteenth Edition, New Jersey, USA, Pearson Prentice Hall. Grewal, M. S. dan Andrews, A. P., 2001, Kalman Filtering, 2nd edition, New York, USA, John Wiley and Sons Inc. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |