Alanya Alaaddin Keykubat University | Rafet Kayış Faculty of Engineering
**Mechanical Engineering Department**
2021-2022 Fall Semester

| **Syllabus** | |
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| **Code/Name** | MEC 405 / Control Systems |
| **Type** | Required |
| **Credit/ECTS** | 5/5 |
| **Hour per Week** | 3 (3+0+0) |
| **Level/Year** | Undergraduate/4 |
| **Semester** | Fall |
| **Classroom** | Th F F \| D202 B303 B303 |
| **Content** | This course introduces the basic concepts of control theory. Review of Laplace transforms. Dynamic models. System response. Feedback control. Root-locus design. Frequency response design. Introduction to state-space control theory. |
| **Prerequisites** | MEC 203 Dynamics |
| **Textbooks** | ***Primary***<br>G Franklin, JD Powell, A Emami-Naeni, Feedback Control of Dynamic Systems, Pearson, 7th Ed., 2015.<br>***Supplementary***<br>K Ogata, System Dynamics, Pearson, 4th Ed., 2004.<br>RC Dorf, Modern Control Systems, 12th Ed., 2011. |
| **Objectives** | • To design response analysis of a dynamic system<br>• To calculate Laplace transforms for modeling and analyzing linear systems<br>• To formulate dynamic systems using transfer functions |
| **Course Outcomes** | In this course you will be able to:<br>CO1 Apply Laplace transform method in analyzing linear systems<br>CO2 Analyze response of various mechanical systems<br>CO3 Assemble block diagrams of mechanical systems<br>CO4 Solve transient response analysis problems<br>CO5 Propose automatic controllers<br>C06 Compute response of dynamic systems in the frequency domain |

**Weekly Schedule of Topics**

| W | Topic |
|---|---|
| 1 | Introduction to analysis and design of dynamic systems |
| 2 | Review of Laplace transform, LTI differential equations |
| 3 | Mathematical modeling of mechanical systems |
| 4 | Dynamic models |
| 5 | Transfer functions, block diagrams |
| 6 | Transfer functions, response analysis |
| 7 | Electromechanical systems |
| 8 | Transient response analysis of first and second order systems |
| 9 | Time-domain design |
| 10 | Automatic controllers |
| 11 | Automatic controllers |
| 12 | Stability, root-locus |

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| 13 | Frequency response design |
| 14 | Introduction to state-space approach |

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| **Professional Contribution** | Ability to model, analyze, and control of mechanical systems |

**Contribution to Program Outcomes***

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 5 | 3 | 0 | 2 | 0 | 3 | 0 | 2 | 0 | 2 | 0 |
| CO2 | 4 | 4 | 4 | 3 | 2 | 5 | 3 | 3 | 3 | 4 | 3 |
| CO3 | 4 | 5 | 4 | 4 | 2 | 4 | 3 | 3 | 2 | 4 | 2 |
| CO4 | 5 | 5 | 5 | 4 | 2 | 5 | 5 | 4 | 3 | 4 | 2 |
| CO5 | 5 | 5 | 5 | 4 | 3 | 5 | 5 | 4 | 3 | 5 | 2 |
| CO6 | 5 | 4 | 5 | 4 | 2 | 4 | 4 | 4 | 2 | 4 | 2 |

* Contribution Level | 0: None | 1: Very Low | 2: Low | 3: Medium | 4: High | 5: Very High

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| **Special Conditions** | • Students work in groups for the presentations.<br>• The consequence of violation of the attendance rule is to receive a grade of **NA.** |
| **Requirements** | Intermediate knowledge of Matlab |
| **Course Policy** | 1. You must attend at least 70% of the sessions including add-drop period.<br>2. Be in the class on time.<br>3. English should always be used to communicate with one another.<br>4. Mobile phone should be switched off and put away during the class.<br>5. You cannot talk to your friends during class no matter what the subject is. |
| **Cheating & Plagiarism** | • Copying or letting someone to copy your work on exams, assignments, or reports is cheating.<br>• Cutting and pasting text, figures and tables from the web sources or any other electronic source is plagiarism.<br>• The consequence of academic dishonesty is to receive a grade of **F** for the course. |
| **Evaluation** | Presentation 1 10%<br>Midterm Exam 30%<br>Presentation 2 10%<br>Final Exam 50%<br>Total 100% |
| **Rubric** | A rubric will be announced prior to presentation sessions. The rubric has 2 main parts for the grading: technical assessment (50%) and writing or presentation performance (50%) |

**Instructor**



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| Name/Surname | Akın Oktav | Email | akin.oktav@alanya.edu.tr |
| Room | 209 | Office Hours | Th 16.00-17.00 \| F 16.00-17.00 |



Prepared by Akın Oktav on August 25, 2021