# EUROPEAN UNIVERSITY OF LEFKE

## Electrical and Electronics Engineering, Faculty of Engineering

## SYLLABUS

## 2020-2021 Spring Semester

| Course Code | Course Name | Course Type | Weekly Course Hours | | | Credits | ECTS | Weekly Time Schedule |
|---|---|---|---|---|---|---|---|---|
| | | | T | A | L | | | |
| EE322 | Control Systems | Major | 3 | 0 | 0 | 3 | 6 | Wednesday, 15:00-17:50. ONLINE |
| Prerequisite | | Prerequisite to | | | | | | |

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|---|---|---|---|
| Course Lecturer | Soydan Redif | Office Hours Schedule | |
| E-mail | | | |
| Phone | | Office / Room No | |
| Teaching Assistant | Ahmet Yasli | Phone | |
| E-mail | ayasli@eul.edu.tr | Office / Room No | |

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|---|---|
| Catalogue Descriptions | Open loop and closed loop control. Transfer function, block diagram, signal flow graph, state equations. Sensitivity, disturbance rejection, steady-state error. Second- and first-order system performance, dominant roots, steady-state error of feedback systems. Routh-Hurwitz criterion, relative stability. Root locus method. Bode diagram, Nyquist stability criterion, gain margin and phase margin. PI, PD and PID controller design. |
| Course Objectives | To establish the concept of the general processes involved in the design and analysis of linear control systems. Having successfully completed the module, the student will be able to: (i) Obtain the mathematical model and/or transfer function of linear control systems; (ii) Apply time and frequency domain techniques for the analysis of linear systems; (iii) Use the control point of view to analyse problems arising in other disciplines. Course material will be complemented with in-class MATLAB demonstrations. |
| Learning Outcomes | On successful completion of the course, students should understand:<br>(1) mathematical modelling of linear control systems, e.g. transfer functions,<br>(2) the theoretical tools required for basic control system analysis,<br>(3) techniques for stability analysis of control systems,<br>(4) frequency domain techniques for the analysis of linear systems. |
| Textbooks | 1 R. C. Dorf and R. H. Bishop, Modern Control Systems 13th Ed, Pearson - Prentice Hall 2016. ISBN: 0134407628 |
| | 2 N. S. Nise, Control Systems Engineering, 3rd Ed., John Wiley & Sons, 2014. ISBN: 1118170512 |

| WEEK | Date | TOPICS | Reference No - Section |
|---|---|---|---|
| Week 1 | 01-05/03/21 | Open loop and closed loop control | 1: 1.1-1.8 |
| Week 2 | 08-12/03/21 | Modeling: integro-differential equations | 1: 2.1-2.4 |
| Week 3 | 15-19/03/21 | System block diagram description | 1: 2.5-2.9 |
| Week 4 | 22-26/03/21 | Signal flow graphs, state space equations | 1: 3.1-3.4 |
| Week 5 | 29-02/03-04/21 | Laplace transforms | 1: 3.3; 3.5-3.7 |
| Week 6 | 05-09/03/21 | Laplace transform and transfer functions | 1: 4.1-4.4;4.6 |
| Week 7 | 10-18/04/21 | **Midterm Exam** | - |
| Week 8 | 19-23/04/21 | Feedback control system performance | 1: 5.1-5.4 |
| Week 9 | 26-30/04/21 | Feedback control system characteristics: steady-state, type. | 1: 5.2; 5.5-5.6; 5.9 |
| Week 10 | 03-07/05/21 | Root locus method - introduction | 1: 6.4-6.6 |
| Week 11 | 10-14/05/21 | Root locus method - system stability analysis | 1: 7.1-7.3 |
| Week 12 | 17-21/05/21 | Frequency response methods: Bode diagrams I | 1: 7.3; 7.6-7.8 |
| Week 13 | 24-28/05/21 | Frequency response methods: Bode diagram II | 1: 8.1-8.3 |
| Week 14 | 31-04/05-06/21 | Frequency response methods: Nyquist stability criterion I | 1: 8.1-8.3 |
| Week 15 | 07-11/06/21 | Frequency response methods: Nyquist stability criterion II | 1: 8.1-8.3 |
| Week 16 | 12-21/06/21 | **Final Exam** | - |

**Evaluation Tools**

| Evaluation Tool | Quantity | Date | Weight in Total (%) | Weight in Semester Evaluation (%) |
|---|---|---|---|---|
| Final Exam | 1 | 12-21/06/21 | 50 | |
| Semester Evaluation | | | 50 | |
| Midterm(s) | 1 | 10-18/04/21 | 25 | 50.0 |
| Quiz(zes) | | | | |
| Project(s) | | | | |
| Homework(s) | | | | |
| Laboratory works | 1 | | 25 | 100.0 |