	Course name: EE302 Control Systems	**Department:** Electrical and Electronics Engineering	Semester
			5
		Methods of Education	Credit (ECTS)
	Lecture	Study Time	Quiz	Project	Exam (incl. Prep.)	Total	5
	42	38	20	20	30	150	

Language	English
Compulsory/Elective	Compulsory
Prerequisites	None
Course Contents	Definition of the system, and feedback systems. Transfer function of the systems; electrical and mechanical systems. The general state-space representation of the system. Transient response analysis. Stability and steady-state errors. Routh-Hurwitz criterion. Midterm exam. Sketch a root locus. Stability analysis with bode and nyquist diagrams. Ziegler-Nicholes rules for controller tuning. Case studies in electrical and electronics engineering.
Course Objective	The aim of this course is to provide the use of transfer function for defining the systems. To provide a stability criterion for the systems with Root-locus, Bode diagram and Nyquist diagram. The students will design a classical controller (P, PI, PD and PID) for the system. The students will also become proficient in the simulation and analysis of linear systems.
Learning Outcomes and Competences	**Students who pass the course will be able to:** − Find a mathematical model, called a transfer function, for linear time-invariant electrical and mechanical systems. − Perform the time domain responses of first and second-order systems. − Apply root-locus analysis of control systems. − Use frequency domain response for analyzing linear systems. − Apply the knowledge of control systems to other courses of the program.
Textbook and /or References	**Main Textbooks:** 1. Norman S. Nise, "Control Systems Engineering", 8th Edition, Wiley 2019 2. Richard C. Dorf, and Robert H. Bishop, "Modern Control Systems", Eight Edition, Pearson, 2017 3. Katsuhiko Ogata, "Modern Control Engineering", 5th Edition, Pearson, 2009. **Supplementary Textbooks:** 4. Farid Golnaraghi, and Benjamin C. Kuo, "Automatic Control Systems", John Wiley and Sons, 2010. 5. Carles M. Close, Dean K. Frederick, Jonathan C. Newell, "Modelling and Analysis of Dynamic Systems", John Wiley and Sons, 2002. 6. Ken Dutton, Steve Thompson, Bill Barraclough, "The Art of Control Engineering", Addison Wesley Publishers, 1997. 7. John J. D'Azzo, and Constantine H. Houpis, "Linear Control System Analysis and Design – Conventional and Modern", Fourth Edition, McGraw – Hill, 1995. 8. Katsuhiko Ogata, "Solving Control Engineering Problems With MATLAB", Prentice Hall, 1994. 9. Nagrath I. J., and Gopal M., "Control Systems Engineering", Second Edition, Wiley Eastern Limited, 1986. 10. Joseph J. DiStefano III, Allen R. Stubberud, and Ivan J. Williams, "Schaum's Outline Series of Theory and Problems of Feedback and Control Systems", McGraw – Hill Book Company, 1976. 11. Rao V. Dukkipati, "Analysis and Design of Controller Systems Using MATLAB", New Age International (P) Ltd., Publishers, New Delhi,2006. 12. Mehmet Önder Efe, "Otomatik Kontrol Sistemleri – Matlab Destekli Analiz ve Tasarım ile", Seçkin Yayıncılık, Ankara, 2014. 13. İbrahim Yüksel, "Otomatik Kontrol – Sistem Dinamiği ve Denetim Sistemleri", Nobel Yayın Dağıtım, Ankara, 2011. 14. İbrahim Yüksel, Mesut Şengirgin, Gürsel Şefkat "Çözümlü Otomatik Kontrol Problemleri Sistem Dinamiği ve Denetim Sistemleri", Dora Yayıncılık, Bursa, 2011.

| | | 15. Benjamin C. Kuo, "Otomatik Kontrol Sistemleri", Çeviren ve Uyarlayan Atilla Bir, Literatür Yayıncılık, İstanbul, 2009. |
| | | |

15. Benjamin C. Kuo, "Otomatik Kontrol Sistemleri", Çeviren ve Uyarlayan Atilla Bir, Literatür Yayıncılık, İstanbul, 2009.
16. Zafer Bingöl, "Matlab ve Simulink'le Modelleme / Kontrol", Birsen Yayınevi, 2004.
17. Fikret Çalışkan, "Otomatik Kontrol Sistemleri", Birsen Yayınevi, İstanbul, 2000.
18. M. Kemal Sarıoğlu, "Otomatik Kontrol", Birsen Yayınevi - İstanbul, 1999.
19. Muammer Gökbulut, "Otomatik Kontrol Sistemleri", Seçkin Yayıncılık San. ve Tic. A.Ş., Ankara, Ağustos 2016.

Assessment Criteria		If any, mark as (X)	Percentage (%)
	Midterm Exams	X	25
	Quizzes	X	20
	Homework		
	Projects	X	20
	Laboratory work		
	Other		
	Final Exam	X	35
Instructors	Dr. Gökhan Koray Gültekin		

Weekly Schedule

Week	Subject
1	An introduction to control systems.
2	Transfer function of the systems; electrical and mechanical.
3	Block diagram representation and manipulation.
4	Signal-flow graphs, Mason's rule.
5	The general state-space representation of the system.
6	Time domain criterions (first and second order systems).
7	Stability and Steady-state errors.
8	Routh-Hurwitz criterion.
9	**Mid-term Exam**
10	Root locus analysis.
11	Sketch a root locus.
12	Frequency domain analysis with bode diagram.
13	Frequency domain analysis with nyquist diagram.
14	Controller structures and PID controller.
15	Revision