

Academic Year: 2023-2024	Semester: Spring	Starting Date: 20-2-2024
Course Name	Design of Feedback Control Systems	
Module Language	English	
Instructor	Asst. Prof. Dr. Fadhil T. Aula	
Teaching Assistance(s)	None	
College/University	College of Engineering – Salahaddin University-Erbil	
Department	Electrical	
Semester Duration	15 weeks	
Course Overview	<ul style="list-style-type: none"> • Feedback control systems are widely used in manufacturing, mining, automobile and other hardware applications. • In response to increased demands for increased efficiency and reliability, control systems are being required to deliver more accurate and better overall performance in difficult and changing operating conditions. • In order to design control systems to meet the needs of improved performance and robustness when controlling complicated processes, control engineers will require new design tools and better control theory. • This course develops the fundamentals of feedback control using linear transfer function system models. • It covers analysis in time and frequency domains; design in the s-plane (root locus) and in the frequency domain (loop shaping) • Describing functions for stability of certain non-linear systems; extension to state variable systems and multivariable control with observers; discrete and digital hybrid systems and the use of z-plane design. 	
Course Objectives	<ul style="list-style-type: none"> • Analyzing control systems in frequency domain • Analyzing control systems in time domain • Designing control systems using root-locus method • Designing control systems using bode, polar, and Nyquist methods • Designing PID Controller • Linearization of nonlinear control systems 	
Course Contents	<p>Week Lecture</p> <p>1st Introduction</p> <p>2nd Frequency Domain Modeling and Analyzing</p> <p>3rd Root-Locus Analysis</p> <p>4th Root-Locus Design Part 1</p> <p>5th Root-Locus Design Part 2</p> <p>6th Frequency-Response Analysis</p> <p>7th Frequency-Response Design</p> <p>8th State-Space Modeling and Analyzing</p>	

	9 th State-Space Design Part 1 10 th State-Space Design Part 2 11 th PID Controller 12 th Nonlinear Systems Part 1 13 th Nonlinear Systems Part 2 14 th Dead Week 15 th Final Exam
Textbooks and References	1. I. K. Ogata, Modern Control Engineering, 5th Edition, Prentices Hall, 2010 2. A. Mutambara, Design and Analysis of Control Systems, CRC Press, 1999
Teaching Style	3 hrs. in Class
Requirements for credit points	For the award of credit points, it is necessary to pass the module exam. It contains: An examination during the academic semester, Quizzes, Assignments, and Final examination. Student's attendance is required in all classes.
Credit ECTS	6
Grade Distribution	The following grade system is used for the evaluation of the module exam: The module exam is based on the summation of two categories of evaluations: First: (50%) of the mark is based on the academic semester effort which includes <ul style="list-style-type: none"> - Midterm Exam = 20%. - Quizzes = 5% - Seminar = 10% - Review Article = 15% Second: (50%) of the mark is based on the final examination that is comprehensive for the whole of the study materials reviewed during the academic semester.
Workload	Workload 10hrs/w (150hrs/s): Contact face-to-face 3hrs/w (45hrs/s) and Non-Contact Self learning 7hrs/w (105hrs/s)