

Academic Year: 2023-2024	Semester: Fall	Starting Date: 15-10-2023
Course Name	Robust Control	
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	<p>Feedback control systems are widely used in manufacturing, mining, automobile, and other hardware applications. In response to increased demands for increased efficiency and reliability, these control systems are being required to deliver more accurate and better overall performance in the face of difficult and changing operating conditions.</p> <p>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. A standard technique of improving the performance of a control system is to add extra sensors and actuators. This necessarily leads to a multi-input multi-output (MIMO) control system. Accordingly, it is a requirement for any modern feedback control system design methodology that it is able to handle the case of multiple actuators and sensors.</p> <p>Robust means durable, hardy, and resilient</p>	
Course Objectives	<p>The objective of this course is to provide students with an understanding of the important problems associated with multivariable feedback control. The use of advanced mathematics will be introduced in a control-engineering framework, having as the final goal the design and analysis of robust multivariable controllers. The interlocking nature of theory and application is a central theme, and this course contains an overview of the existing approaches and tools available to a working control engineer when faced with a multivariable control problem</p>	
Course Contents	<p>Week Lecture</p> <p>1st Introduction</p> <p>2nd Classical Feedback Control Part One</p> <p>3rd Classical Feedback Control Part Two</p> <p>4th Linear Multivariable System Theory</p> <p>5th H_2, H_∞ Spaces</p> <p>6th Performance Specifications and Limitations</p> <p>7th Uncertainty and Robustness</p> <p>8th μ Analysis and Synthesis</p> <p>9th Midterm Exam</p> <p>10th PID Controller</p> <p>11th LQR</p>	

	12th Kalman Filter 13th LQG 14th Seminar Presentation 15th Final Exam
Textbooks and References	1. Gu, Da-Wei, Petkov, Petko, Konstantinov, Mihail M, Robust Control Design with MATLAB, Second Edition, Springer, 2013 2. Michael Green, David Limebeer, Linear Robust Control, Dover Edition, 2012 3. Kemin Zhou, with John Doyle, Essentials of Robust Control, Prentice-Hall, 1998.
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% - Article Review = 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)