



Robust Control

Syllabus

Postgraduate Studies/ PhD Courses
Electrical Engineering Department
College of Engineering
Salahaddin University - Erbil

October 2023

Course Name : **Robust Control**
Course Number :
Type of Study : **PhD Course**
One Semester - Fall
15 weeks - 3h/w
Specialist : **Computer and Control Engineering**
Schedule : **Thursday 13:00 – 16:00**
Academic Year : **2023-2024**
Instructor : **Assist. Prof. Dr. Fadhil T. Aula**

Course Description

- **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.**
- **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.**
- **It is a requirement for any modern feedback control system design methodology that it be able to handle the case of multiple actuators and sensors.**
- **Robust means durable, hardy, and resilient**

Course Objectives

- **Provide students with an understanding of the important problems associated with multivariable feedback control.**
- **Use of advanced mathematics in a control-engineering framework, having as final goal in the design and analysis of robust multivariable controllers.**
- **Overview of the existing approaches and tools available to a working control engineer when faced with a multivariable control problem.**

Course Requirements

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.**

Prerequisites:

Mathematics, Circuits, Engineering Analysis, MATLAB.

Tentative Course Outline

Week	Subject
1 st	Introduction
2 nd	Classical feedback control Part One
3 rd	Classical feedback control Part Two
4 th	Linear Multivariable System Theory
5 th	H_2 , H_∞ Spaces
6 th	Performance Specifications and Limitations
7 th	Uncertainty and Robustness
8 th	μ Analysis and Synthesis
9 th	Midterm Exam
10 th	PID Controller
11 th	LQR, Kalman Filter, and LQG
12 th	Seminar Presentation
13 th	Dead Week
14 th	Final Exam
15 th	Final Exam

Course Requirements

- **Assignments**
- **Presenting Seminars**
- **Midterm and Final Exams**

Attendance

- **Positive attitude is a key to success.**

Grading Policy

➤	Annual	50 %
	<i>Midterm Exam</i>	<i>20%</i>
	<i>Quizzes</i>	<i>5%</i>
	<i>Seminar</i>	<i>10%</i>
	<i>Article Review</i>	<i>15%</i>
➤	Final Exam	50%
➤	Total	100%

Workload 10hrs/w (150hrs/s): Contact face-to-face 3hrs/w (45hrs/s) and Non-Contact Self learning 7hrs/w (105hrs/s)

Academic Honesty and Plagiarism

- **Plagiarism is using the words or ideas of others and presenting them as your own. Plagiarism is a type of intellectual theft. It can take many forms, from deliberate cheating to accidentally copying from a source without acknowledgement.**
- **You are also reminded that careful time management is an important part of study and one of the identified causes of plagiarism is poor time management. Student should allow sufficient time for research, drafting and the proper referencing of sources in preparing all assessment tasks.**
- **If plagiarism is found in your work when you are in first year, your lecturers will offer you assistance to improve your academic skills. They may ask you to look at some online resources or resubmit your work with the problem fixed. However, more serious instances in first year, such as stealing another student's work or paying someone to do your work, may be investigated under the Student Misconduct Procedures.**
- **Repeating plagiarism (even in first year), plagiarism after first year, or serious instances, may also be investigated under the Student Misconduct Procedures. The penalties under the procedures can include a reduction in marks, failing a course or for the most serious matter (like plagiarism in an honors thesis) even suspension from the university.**

End of Robust Control Syllabus!