



Robust Control

Course Description

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Professor, University of Kurdistan

Fall 2023

Contents

- 1. Self-Introduction**
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Instructor

Hassan Bevrani
حسن بيوراني

Academic Activities Locations

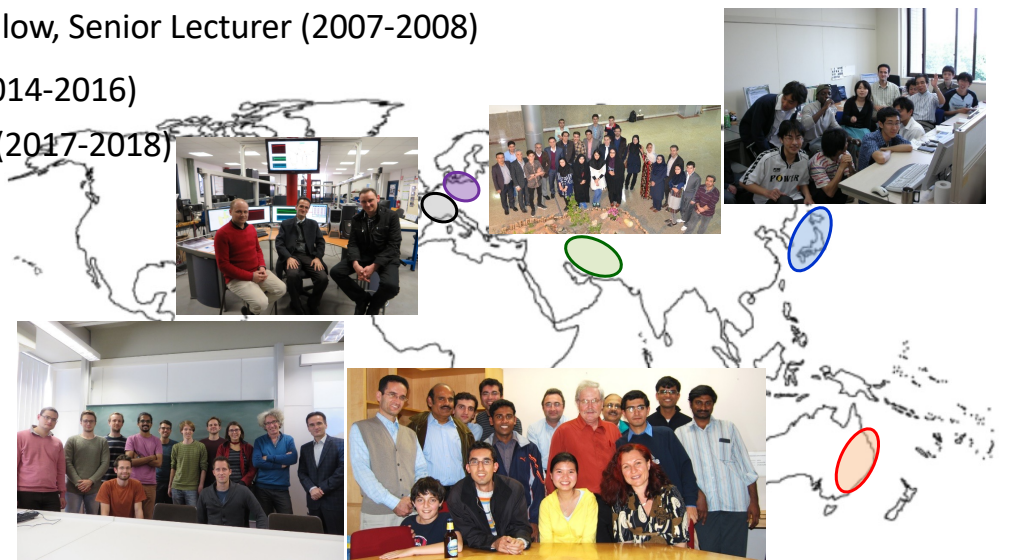
Iran: Bachelor and Master, Lecturer, Professor (1995-Up to now)

Japan: PhD, Postdoc, Visiting Professor (2002-2023)

Australia: Senior research fellow, Senior Lecturer (2007-2008)

France: Visiting Professor (2014-2016)

Germany: Visiting Professor (2017-2018)



Publications

450 Papers

15 Book Chapters

9 Books



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Google Scholar Citations

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Hassan Bevrani

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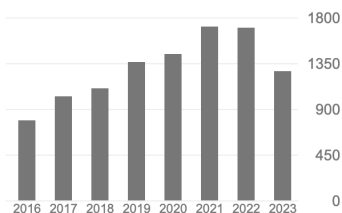
[Frequency control](#) [Automatic generation control](#) [Microgrid control](#) [Power system control](#) [AGC](#)

Cited by

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	All	Since 2018
Citations	12892	8619
h-index	47	39
i10-index	132	103

<input type="checkbox"/>	TITLE	CITED BY	YEAR
<input type="checkbox"/>	Robust power system frequency control H Bevrani springer	1674	2014
<input type="checkbox"/>	Virtual synchronous generators: A survey and new perspectives H Bevrani, T Ise, Y Miura International Journal of Electrical Power & Energy Systems 54, 244-254	815	2014
<input type="checkbox"/>	Renewable energy sources and frequency regulation: survey and new perspectives H Bevrani, A Ghosh, G Ledwich IET Renewable Power Generation 4 (5), 438-457	634	2010



H. Bevrani

University of Kurdistan

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Course Description

What Does it Cover?

- Basic concepts and methods in robust control theorems.
- Bridging the fundamental knowledge of linear control systems and robust control theorems.
- Uncertainty modeling and important robust control methods.

What will you learn?

- Learning the main topics and differences with other control theorems.
- Learning some robust control analysis/synthesis methods .

Course Outline

1	Introduction
2	Frequency Response Analysis: A Review
3	Kharitonov Theorem-based Control Design
4	Uncertainty, Robust Stability/Performance
5	Loop Shaping Control Design
6	H_∞ Control Design
7	H_2 and Mixed H_2/H_∞ Control Design
8	Structured Singular Value (μ) Control Design

Grading

- | | |
|------------------------------|------------|
| 1. Pre-tasks/Homework | 30% |
| 2. Project | 40% |
| 3. Final Exam | 30% |

Free Attendances

Must do all:

- 1. Pre-tasks/Homework**
- 2. Project**

Course Project

❖ Select a dynamic system;

- 1- Analysis system stability and performance **(Sec. 1)**;
- 2- Design a Kharitonov-based PI controller **(Sec. 2)**;
- 3- Design a loop-shaping based controller **(Sec. 3)**;
- 4- Analyze the robust stability/performance **(Sec. 4)**;

Course Project

- 5- Design a H^∞ -based robust controller **(Sec. 5)**;
- 6- Design a μ -based robust controller **(Sec. 6)**;
- 7- Do a comparison study **(Sec. 7)**.

❖ Final Presentation

❖ Date:

❖ Time: 10 minutes

Course Objectives

1. A **deep knowledge** on the main concepts, frameworks, and components of Robust Control systems,
2. Design a **Kharitonov** theorem-based controller,
3. Design a robust controller based on **loop shaping** method,
4. Design an **H_∞** -based robust controller,
5. Application of **structured singular value** (μ) theorem for robust stability analysis,
6. Design a **μ** -based robust controller,
7. Making an enough strong background for **self-learning** of other robust control approaches and tools.

Reference

1. H. Bevrani, **Lecture Notes on Robust Control Theory**, University of Kurdistan, Revised version, 2023.
2. S. Skogestad and I. Postlethwaite, **Multivariable Feedback Control; Analysis and Design**, Second Edition, Wiley, 2005.
3. K. Zhou, **Essentials of Robust Control**, Prentice Hall, 1999.
4. M. Fujita, **Lecture Notes on Robust Control Systems**, Tokyo Institute of Technology, 2019.

Contact e-mail for this Course

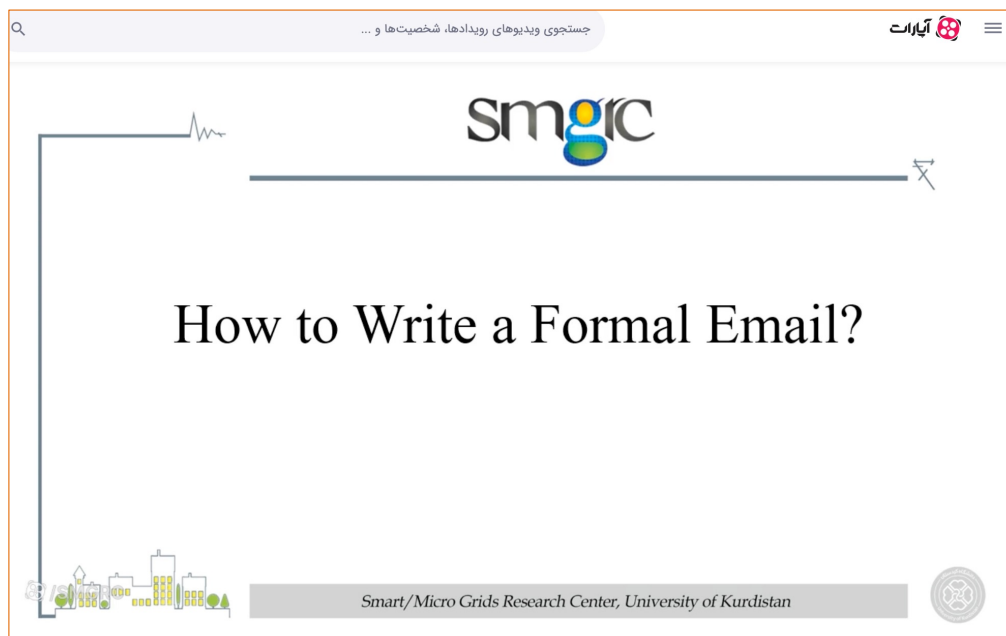
- Please only submit your pre-tasks/homework and project reports to the following email address:

bevranih18@gmail.com

- Please use the following term as subject of your email:
 - Family Name_RC_HW3 (for HWs)
 - Family Name_RC_PT3 (for Pre-Tasks)
 - Family Name_RC_PSec3 (for Project Sections)

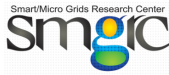
Writing a Formal Email

<https://www.aparat.com/v/8iXW9>



Course Website

<https://smgrc.uok.ac.ir/robust-control-fall-2023-university-of-kurdistan/>



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Robust Control-Fall 2023 University of Kurdistan

Here, enrolled students can access relevant course materials via the provided links.
Explore and enhance your learning experience with the resources available.

Course ID: 7012120-01

Course Name: Robust Control

Academic Year: Fall 2023

Lecturer(s): Dr. Hassan Bevrani

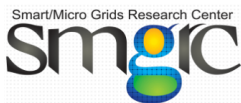
Pre-Tasks Section:

Please click [HERE](#) to access the pre-tasks and upload the filled forms.

PDF of the Lectures:

Num.	Lecture Name	Download Section
–	Sylabus and Description_Fall 2023	Click Here
00	L00-Course Description	Click Here
01	L01-An Introduction on Feedback Control Systems.pdf	Click Here
02	L02-Frequency Response Analysis-A Review	Click Here

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Robust Control Fall 2023 Pre-tasks

Pre-Tasks: Download Section

Pre-tasks will be uploading here week-by-week.

After each pre-task deadline, it will be removed from this page.

You can upload your files each week before deadline using the “Upload Section” (End of this page).

Upload section will be closed by the mentioned deadline (Automatically).

Good Luck 👍

Num.	Pre-task (Lecture Name)	Download Section
01	L02-Frequency Response Analysis-A Review	Click Here
02	L03-Kharitonov Theorem	Click Here
03	L04-Loop Shaping Control Design	Click Here

Course Website

Provided Videos

Num.	Lecture Name	Download Section
01	L01-An Introduction on Feedback Control Systems.pdf	Click Here
02	L02-Frequency Response Analysis-A Review	Click Here
03	L03-Kharitonov Theorem	Click Here
04	L04-Loop Shaping Control Design	Click Here
05	L05-Multivariable Control-An Introduction	Click Here
06	L06-Uncertainty and Robust Stability	Click Here
07	L07-Uncertainty and Robust Performance	Click Here
08	L08-Structured and Unstructured Uncertainties	Click Here
09	L09-Weighted Sensitivity and Performance	Click Here
10	L10-Robust Stability and Mixed Sensitivity	Click Here
11	L11- H^∞ Control Design and Order Reduction	Click Here

Thank you!

