

NATIONAL INSTITUTE OF TECHNOLOGY KURUKSHETRA

Online GIAN course on “Precision Positioning Systems: Dynamics and Control”

January 31 to February 04, 2022 (One Week)

Overview

Precision positioning systems design deals with the design of controlled motion systems by the integration of functional elements from a multitude of disciplines. It starts with thinking how the required function can be realised by the combination of different subsystems according to a Systems Engineering approach (V-model).

It should be noted that the control principles used in this course place a strong emphasis on frequency domain methods by linearising the system at its working point with the use of Bode and Nyquist plots. The main reason for this emphasis is the strong focus in other control related courses on (non-linear) time domain related methods while linearised frequency domain related methods are still dominantly applied in the industry.

Modules	<p>The course covers the following two main subjects:</p> <p>A: Dynamics of motion systems in the time and frequency domain, including analytical frequency transfer functions that are represented in Bode and Nyquist plots.</p> <p>B: Motion control in the frequency domain with PID and advanced fractional order PID-feedback and model-based feed forward control- principles that effectively deal with the mechanical dynamic anomalies (resonances and eigen modes) of the plant.</p> <p>Number of participants for the course will be limited to 100</p>	<p>31 January – 04 February, 2022</p>
You Should Attend If...	<ul style="list-style-type: none"> ▪ Faculty and Students at all levels (BTech/MSc/MTech/PhD) from reputed technical/academic institutions. ▪ Executives, engineers, Scientists, and researchers from manufacturing, service and government organizations including R&D laboratories. 	
Fees	<p>The participation fees for taking the course is as follows:</p> <p>Participants from abroad: US \$100</p> <p>Industry/ Research Organizations: INR 5000</p> <p>Faculty Members: INR 1000</p> <p>Students/Research Scholars: INR 500</p> <p>The course will be conducted in online mode</p>	
How to register?	<p>Interested candidates should send an email to the course coordinators (sathans@nitkr.ac.in, amitkumar357@nitkr.ac.in) and register on the following link: https://gian.iitkgp.ac.in/GREGN/index after paying the requisite participation fees through SBI i- collect: P2SDC-2022</p>	

The Faculty



Hassan HosseinNia received his PhD degree with honors "cum laude" in electrical engineering specializing in automatic control: application in mechatronics, from the University of Extremadura, Spain in 2013. His main research interests are in precision mechatronic system design, precision motion control and mechatronic system with distributed actuation and sensing. He has an industrial background working at ABB, Sweden. He is currently an associate professor at the department of precision and microsystem engineering at TU Delft, The Netherlands. Hassan (co-)authored over 100 publications in high-impact journals, conference proceedings, and book chapters. He was general chair of 7th IEEE international Conference in Control, mechatronics and Automation (ICCA 2019). He is an IEEE senior member and editorial board of following four journals: "Fractional Calculus and Applied Analysis", "Frontiers in Control Engineering", "International Journal of Advanced Robotic Systems (SAGE)" and "Mathematical Problems in Engineering.

URL: <https://www.tudelft.nl/3me/over/afdelingen/precision-and-microsystems-engineering-pme/people/associate-professors/hassan-hosseinnia>



Sathans received his PhD degree in the area of intelligent control and its applications to power systems from the National Institute of Technology Kurukshetra, Haryana, India, in 2012 where, he is currently serving as Professor in the Department of Electrical Engineering. His research interests include intelligent control techniques, control issues in hybrid energy systems, evolutionary algorithms and their applications in power systems.



Amit Kumar received his PhD degree in the area of load frequency control and modern heuristic optimization techniques in hybrid power system from the National Institute of Technology Kurukshetra, Haryana, India, in 2018 where he is currently serving as Assistant Professor in the Department of Electrical Engineering. His research interests include bio-inspired computing methods, evolutionary optimization algorithms etc. and their applications in power system.

Course Coordinators

Prof. Sathans

Phone: +91-9416334934

E-mail: sathans@nitkkr.ac.in

Dr. Amit Kumar

Phone: +91-8950213417

E-mail: amitkumar357@nitkkr.ac.in

National Institute of Technology Kurukshetra

.....
<http://www.gian.iitkgp.ac.in/GREGN>

Tentative Lecture Schedule:

Day, Time (IST)	Content	Duration
31 Jan, 13:00-15:00	Introduction to Precision positioning systems, Signals,dynamic responses.	2 hours
31 Jan, 15:30-17:30	Dynamics of precision motion systems, (dynamic) stiffness,relation to motion control	2 hours
1 Feb, 13:00-15:00	Dynamics of motion systems, resonance, TF and FRF-responses, mechanical FRF	2 hours
1 Feb, 15:30-17:30	Precision Motion Control: Feedforward	2 hours
2 Feb, 13:00-15:00	Precision Motion Control PD-control	2 hours
2 Feb, 15:30-17:30	Precision Motion Control PID-control tuning, robustness	2 hours
3 Feb, 13:00-15:00	Tutorial: Loopshaping toolbox	2 hours
3 Feb, 15:30-17:30	Fractional order PID-control (Approximation, codes, PID,Example)	2 hours
4 Feb, 14:30-16:30	Tutorial: Loop shaping toolbox advanced control	2 hours