GIAN
GLOBAL INITIATIVE OF ACADEMIC NETWORKS

Course On

Robustness, Fragility, Optimality and Modern PID Control
Course Code: 171031D02
(December 11-20, 2017)

By

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Host Faculty & Course coordinator
Dr. Manas Kumar Bera

Organized by
Department of Electronics and Instrumentation Engineering

National Institute of Technology Silchar
(An Institute of National Importance)
Silchar, Cachar, Assam, India, PIN-788010
www.nits.ac.in

COURSE OVERVIEW

Control in the presence of uncertainty is one of the main topics of modern control theory. In the formulation of any control problem there is always a discrepancy between the actual plant dynamics and its mathematical model used for the controller design. These discrepancies (or mismatches) mostly come from external disturbances, unknown plant parameters, and parasitic dynamics. Designing control laws that provide the desired closed-loop system performance in the presence of these disturbances/uncertainties is a very challenging task for a control engineer. This has led to intense interest in the development of the so-called robust control methods, which are supposed to solve this problem. This course will provide an introduction to the analysis and design of robust feedback control systems covering the major developments in the field from 1860 to 2017. The course is directed at researchers and graduate students and therefore insightful proofs of most of the results will be provided. This course will give a balanced coverage of elegant mathematical theory and useful engineering oriented results that can serve the needs of a diverse group of students/researchers from Electrical, Instrumentation, Mechanical, Chemical, Aerospace, and Civil Engineering as well as Computer Science and Mathematics.

Course participants will learn these topics through lectures and computer aided simulations. Also case studies and assignments will be shared to stimulate research motivation of participants. Current research issues and applications will be described at the end of the course.

The primary objectives of the course are as follows:

- To introduce a coherent and unified framework for studying robust control theory.
- To present the main ideas and to demonstrate the major results of robust control theory.
- To present the recent results on PID control that describes a new approach to the design.
- To introduce computer-aided tools for both system analysis and robust controller design.

TOPICS TO BE COVERED

- Historical overview of major developments in Control Theory in the period of 1860 to 2017.
- The Kalman Linear Quadratic Regulator.
- Robust control through H∞ optimization.
- Kharitonov's Theorem and its generalization.
- Fragility of high order controllers.
- Design and analysis of modern PID controllers.
- Computer Aided Multiobjective Design.
- Current and future research issues.

WHO SHOULD ATTEND?

Scholars, pursuing their PhD/M.Phil/Masters program in the area of Control Systems/Physics/Mathematics/Engineering, Faculty members, Members of Research Organizations such as DRDO, ISRO, etc., Members of Industrial Organizations having interest in the course topic

REGISTRATION/COURSE FEE (NON- REFUNDABLE)

Participants	Programme Fee
Participants from abroad	USD 500
Industry/ Research Organizations:	Rs. 10000/-
Academic Institutions:	
Faculty	Rs. 5000/-
External Students	Rs. 1000/-
Internal PG & PhD Students	Rs.500/-
Internal UG Students	NIL

The above registration fee is towards instructional materials, computer use for tutorials, 24 hr free internet facility, light refreshments etc. The outstation participants will be provided twin sharing accommodation on payment basis in Institute Guest House based on avalibility.

MODE OF PAYMENT

On registration in the course through GIAN web portal, selected candidates will be intimated through e-mail. They have to remit the required course fee **online** in favour of the Director, NIT Silchar as per the details given below before the deadline.

A/C No: 10521277057, IFSC Code: SBIN0007061, MICR Code: 788002004. Please retain the receipt for on-spot submission.

In addition to the above fee, one-time online fee of Rs. 500/- is to be paid for registration in the GIAN web portal. (See registration process)

REGISTRATION PROCESS

Registration for any GIAN course is a two-step process.

Step 1: Web Portal Registration

One Time Registration with the GIAN web portal of IIT Kharagpur using the following steps:

- o Create login and password at: http://www.gian.iitkgp.ac.in/GREGN/index
- o Complete the personal details and pay Rs. 500/- (non- refundable) through the online payment gateway. If you're already registered, skip this step.
- o Next, log into the GIAN portal and click 'Course Registration' tab on the GIAN Portal, and 'check box' to select this course (#171031D02) from the list. Click 'save' to register, and 'Confirm Course(s)' to confirm.

Step 2: Course Registration

Course registration with the course coordinator.

- o Individuals then may proceed for the course registration by paying the registration course fee through online transfer.
- o Post payment, fill up the "Registration Form" included here.
- o Next, email the followings (i) Registration form, (ii) Payment proof, (iii) Scan copy of valid Identity card/bonafide letter (in case you are a student), to the course coordinator, at: manas.bera@gmail.com. This is for the Course Coordinator's record. Now, await the Course Coordinator's confirmation.

IMPORTANT NOTE

Registering on the GIAN portal does not guarantee participation in the course. Please do not confuse web registration with course registration. You might have been 'shortlisted' after paying the 500/-, but your selection is subject to paying the requisite course fee to NIT Silchar. For successful enrolment, make sure you've made both the payments (Rs. 500+ registration course fee)**.**

IMPORTANT DATES

- • **Last date for course registration: 15.11.2017**
- • Last date for receipt of Registration form by email: 15.11.2017
- • Last date for Intimation to Participants: 17.11.2017
- • Course Dates: December 11-20, 2017

ABOUT THE INSTITUTE:

National Institute of Technology Silchar is one of the 30 National Institutes of Technology of India and was established in 1967 as a Regional Engineering College in Assam. In 2002 it was upgraded to the status of National Institute of Technology and was declared as Institute of National Importance under the National Institutes of Technology Act, 2007.

The climate of Silchar during December is very pleasant with average temperature around 20-25°C and little cloudy. NIT Silchar is a fully residential institution with nine hostels for boys and three hostels for girls. It has six engineering degree offering branches and five non-engineering branches.

ABOUT THE DEPARTMENT:

The Department of Electronics & Instrumentation Engineering was established in 2009. The department has intake capacity of 60 and 10 students in B. Tech. in Electronics & Instrumentation and M. Tech. in Instrumentation Engg. specialization programme respectively. The department has several well equipped laboratories for the regular course as well as research. It has a library containing basic books needed for students and faculty members. The department is well known inside the institute for its close bonding between students and faculty members.

ABOUT THE FACULTY

Prof. S.P. Bhattacharyya is the Robert M. Kennedy

Professor of Electrical Engineering at Texas A & M University. He received the B.Tech degree in Electrical Engineering from IIT, Bombay in 1967, and the MS and PhD degrees in Electrical Engineering from Rice University, Houston, Texas in 1969 and 1971 respectively. He is an IEEE Fellow, an IFAC Fellow and a member of the Brazilian Academy of Sciences. He has coauthored 7 books, over 100 journal publications and 250 conference publications in the field of Control Theory.

Host Faculty & Course coordinator

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[Supported by MHRD under the program of Global Initiative of Academic Network (GIAN)]

REGISTRATION FORM

Name (Block Letters)   :

Gender   :   M / F

Participant category   :   From abroad / Industry/ Research Organizations / Academic
Institutions / Students (UG/PG/PhD from India)

Affiliation   :

Address   :

:

:

Mobile No.: ………….............................., **Email:** ……..…………………………………..

Application ID (Generated during one time registration at GIAN portal of IIT Kharagpur):
……………………………………………………………………………

[Kindly visit: http://www.gian.iitkgp.ac.in/]

Accommodation Required.   ☐ Yes   ☐ No

Payment Details:
Online Registration for GIAN and Payment made   ☐ Yes   ☐ No
Course Registration and Course fee paid   ☐ Yes   ☐ No
[If yes, give details below]
Amount: ……………   NEFT No. ……………………   Drawn on: ……….

Issuing Bank: ……………………………………………………………………………….

Note:
1. Scanned copy of filled "Registration Form" and scanned copy of receipt of NEFT must be sent to course coordinator via email: manas.bera@gmail.com
2. Original "Registration form" and receipt of NEFT is required to produce for on-spot submission/verification.

Date: …………………   **Signature of Candidate**