ABOUT THE COURSE

Beginning with a review of classical control, the course will progress towards the advanced control topics such as adaptive control and intelligent control. It will introduce advanced control concepts with emphasis on current industrial applications. Focus of the course will be on addressing the benefits of advanced control techniques. This course is expected to provide a good understanding of the fundamentals of control system technology which will enable the participants to develop controllers for many real-world problems. The participant will have the opportunity of gaining exposure with control system toolboxes. In the course, MATLAB Control System Toolbox and SIMULINK will be used to demonstrate the topics. Lectures will be delivered by faculty members of the NIT, Rourkela and experts from IIT Kharagpur/Jadavpur Univ..

DEPT. OF ELECTRICAL ENGINEERING

Department of Electrical Engineering, NIT Rourkela was established in 1961. Since its inception, the Department is under dynamic progress and is reputed for imparting quality education both at B.Tech, M.Tech levels. The Department currently runs two M.Tech programme with the specializations in (i) Power Control and Drives, (ii) Electronic Systems and Communication. It also plans to add two more new specializations to the existing Masters programme namely, Robotics & Mechatronics and System & Control Engg. Besides the undergraduate and postgraduate teaching, a good number of research scholars are working on different areas of electrical engineering towards the award of PhD degrees. The Department has well equipped modern laboratories such as Signal Processing & Communication, Image Processing & Computer Vision, Power Electronics & Drives, Control & Robotics, Embedded Systems & Real-Time and Soft Computing Labs for pursuing research keeping in view of the technological advancements.

CO-ORDINATOR:

The course will be handled by Dr. Bidyadhar Subudhi, Assistant Professor, Dept. of Electrical Engineering. Dr.Subudhi has been awarded a PhD degree in Control System Engineering from the University of Sheffield, U.K. in 2002 and M.Tech in Control and Instrumentation from IIT Delhi. He graduated in Electrical Engineering from REC Rourkela. Most recently Dr. Subudhi worked as a Post Doctoral Research Fellow in NUS, Singapore. His areas of research and teaching involvements include Adaptive Control, System Identification, Intelligent Control, Robotics and Networked Control System.

COURSE COVERAGE:

1. REVIEW CLASSICAL CONTROLS:

- Introduction to control theory and control systems
- Performance specifications and time response analysis of control systems
- Characteristics of closed-loop systems
- PID control and system stability
- Root locus methods for control system analysis
- Frequency response methods for control system analysis
- Design of feedback control systems using frequency response methods
- Brief introduction to digital control systems and summary to the classic control theory

2. STATE SPACE CONTROL DESIGN:

- State Variables and the State Space Description of Dynamic systems
- Eigenvalues and Eigenvectors
- Analysis of Continuous- and Discrete-Time Linear State Equations
- Stability Theory
- Controllability and Observability for Linear Systems
- Relationship between State-Variable and Transfer-Function Models
- Design of Linear Feedback Control Systems
- State feedback : Pole placement
- Observers
- Introduction to Optimal Control

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3. SYSTEM IDENTIFICATION & PARAMETER ESTIMATION:

Signals and Models, Parametric and Nonparametric System Identification, Estimator properties, least squares techniques, recursive lest squares algorithms, Maximum Likelihood, MMSE, minimum variance method.

4. STATE ESTIMATION:

Optimal State Estimator, Kalman Filtering(Continuous and Discrete)

5. ADAPTIVE CONTROL

- Review of Lyapunov Stability Theory
- Adaptive control architectures
- Basic concepts
- Design approach: Direct vs. indirect
- Certainty Equivalence Principle
- MRAC – STC- minimum variance controller
- Predictive control

6. INTELLIGENT CONTROL

Fuzzy Logic Control and Modelling, Neural Networks Applications in Control, Genetic Algorithms in System Identification and Control, Optimization.

7. MATLAB, SIMULINK DEMONSTRATIONS:

General purpose tools for System identification & modeling, Control design & analysis

ELIGIBILITY AND APPLICATION PROCEDURE:

Young teachers working in the department of Electrical, and Electronics Communication/Instrumentation are eligible to participate. The participants will be provided boarding, lodging along with TA as per the AICTE rules.

This course is sponsored by AICTE. There is no course fee for the participants. However as a matter of confirmation for participation in the course, a caution money of Rs.300/- is to be sent along with the registration form. The caution money is to be sent in the form of a demand draft drawn in favour of "Coordinator ACSTA, NIT, Rourkela" payable at SBI, NIT Branch, Rourkela (code- 2109) on or before 15th June 2007.

Certificate will be awarded to the participants after successful completion of the course.

CORRESPONDENCE:

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AICTE Sponsored Staff Development Programme
on

ADVANCED CONTROL SYSTEM TECHNIQUES AND THEIR APPLICATIONS

25th June-6th July 2007

Organized by

Co-ordinator
Dr. Bidyadhar Subudhi

DEPARTMENT OF ELECTRICAL ENGINEERING
NATIONAL INSTITUTE OF TECHNOLOGY
ROURKELA – 769008, ORISSA