Patrons

- **Shri Millind Torawane, IAS**
  Director General, IITRAM
- **Dr. A. U. Digraskar**
  Director, IITRAM
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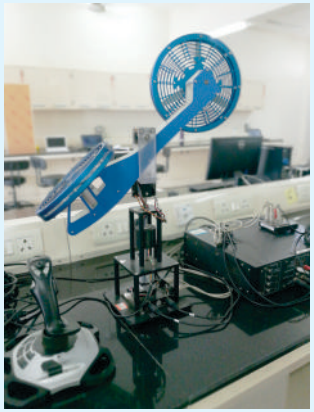

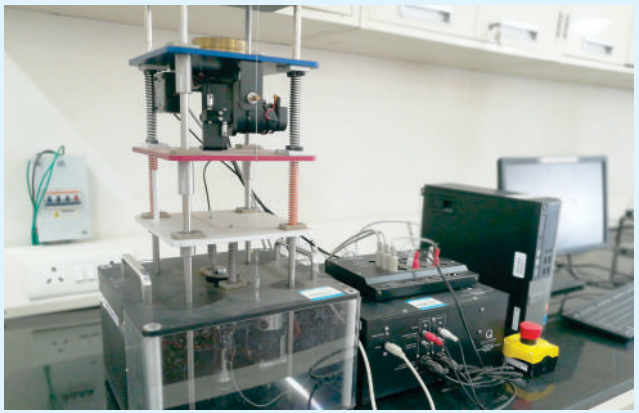

Who Can Participate?

Young teachers/research scholars/UG-PG students and professionals working in the field of Electrical / Electronics & Communication / Instrumentation and Control / Mechanical / Mechatronics / Robotics / Computer / IT engineering are eligible to participate.

Key Dates:

Dates of STTP	:	27th Nov. – 1st Dec. 2017
Last date of Registration	:	20th Nov. 2017
Announcement of Short listed candidates	:	22nd Nov. 2017

Registration and General Information

Interested candidates are requested for On-line registration at given link on IITRAM website. The hard copy of the Applications along with Demand draft/Cheque for the participation in the course should reach at the given address on or before the last date of registration. The candidates would be informed for their selection through e-mail and SMS. Working lunch will be provided to the participants.

Registration Fees

The registration fees is to be paid in the form of a demand draft/Cheque drawn in favor of **"The Registrar, IITRAM"** payable at Ahmedabad.

The registration fees:

For participants from industries	:	₹ 5,000/-
For faculty members	:	₹ 3,000/-
For PG/Research Scholars	:	₹ 2,000/-

Accommodation

Suitably furnished accommodation will be made available if requested in advance, in the hostels of the IITRAM for out stationed candidates on twin sharing basis.

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

SHORT TERM TRAINING PROGRAMME

ON

ADVANCED CONTROL TECHNIQUES AND THEIR APPLICATIONS

(27th November – 1st December 2017)

Organized by

Institute of infrastructure Technology Research and Management
(An Autonomous University established by Government of Gujarat)
Near Khokhara Circle, Maninagar East,
Ahmedabad, Gujarat 380026
Tel.: 079-67775488 / 6777 5499
www.iitram.ac.in

In Association with

QUANSER
INNOVATE · EDUCATE

The Institute

The Institute of Infrastructure Technology Research and Management (IITRAM), is an autonomous university established by Government of Gujarat in the year 2013 by enacting a state act to provide quality education in the field of Infrastructure Research and its Management. IITRAM provides Engineering Education with specialization in Infrastructure and Management of Infrastructure equipped with centers of excellence to organize advanced studies and to promote research in collaboration with industry leaders. Currently, the Institute is offering Under Graduate, Post Graduate and Ph.D program in Civil, Electrical and Mechanical Engineering. The Institute has state-of-the-art laboratories and the infrastructure in all the major areas/specialization of each branch to carry out experiments and research. The Institute has set up Siemens-Center of Excellence and Quanser-Centre of Excellence. The Institute has ambitious plans to expand its academic and research activities in collaboration with Industries.

The Course

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 applications. Beginning with a review of classical control, the course will progress towards the advanced control topics such as Sliding mode control, Adaptive control and intelligent control. Focus of the course will be on addressing the benefits of advanced control techniques. In the course, MATLAB Control System Toolbox and SIMULINK will be explored to demonstrate the topics along with the hands-on-practice. The lectures will be delivered by the eminent faculty members of IITRAM, IITs and NITs.

Course Objectives

- To impart adequate background on control system as well as to provide hands-on training to truly appreciate the various control engineering related concepts.
- To understand the advanced control techniques and its real time applications.
- To stimulate the research aptitude for mathematical approach for advance control systems.
- To provide hands-on-practice for advance controller design on Quanser control equipment.

Course Outcomes

After attending the STTP, the participants will be able to

- Explain the linear and nonlinear control systems with examples
- Analyze nonlinear control systems using various techniques
- Explain need for advanced control strategies like Sliding mode control, Adaptive Control and Intelligent control techniques
- Design and simulate nonlinear control systems using MATLAB/Simulink and associated hardware in the loop
- Design laboratory experiments using MATLAB/Simulink and associated hardware in the loop

Course Coverage

The following topics will be covered during the program

- **Review of 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, Anti-windup Control, 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.
- **State Space Control:** 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.
- **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. State Estimation: Optimal state estimator, Kalman filtering (Continuous and Discrete).
- **Non-Linear Control:** Analysis of non-linear system dynamics – Describing Function, Phase plane method, Singular perturbation, Stability: Lyapunov stability criterion, Lure's problem – Circle criterion, Popov criterion, Centre manifold theorem, Passivity analysis, Feedback controller design: Gain scheduling, Feedback linearization, Lyapunov redesign, Backstepping, Nonlinear damping.
- **Sliding Mode Control:** Fundamentals of Sliding mode control, Design of sliding surface and variable structure control, chattering analysis, Concepts of integral sliding mode control, Terminal sliding mode control, Applications of sliding mode control.
- **Adaptive Control:** Review of Lyapunov stability theory, Adaptive control architectures, Basic concepts, Design approach: Direct vs. Indirect, Certainty equivalence principle, Adaptive Backstepping Control, Adaptive Inverse Control, MRAC.
- **Matlab/Simulink Demonstrations:** General purpose tools for System Identification & modeling, Control system design & analysis, Real time hardware-in-loop control.

Faculty for the STTP

The faculty from IITRAM and other Institutes like IITs and NITs will deliver the lectures on the topics.