

# Selected topics in Control System Theory – Fundamentals, Advances and Future Directions

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Electronics & ICT academy, MNIT Jaipur

and

Technical Education Quality Improvement Programme III



MNIT Jaipur

TEQIP-III



Department of Electronics & Information Technology  
Ministry of Communications & Information Technology  
Government of India

## Chairman, Advisory board & Director MNIT Jaipur

**Prof. Uday Kumar R. Yaragatti**

## Academic Chair, E & ICT Academy

**Prof. Viswanath Sinha**

## Chief Investigator, E & ICT Academy

**Prof. Vineet Sahula**

## About E & ICT Academy

Government of India had announced a National Policy on Skill Development, which has set a target of skilling 500 million people by 2022 in the domain of Electronics & IT. Under the plan scheme of Digital India Manpower Development, DeitY has set up seven (07) Electronics and ICT Academies as a unit in 03 IITs, 03 NITs and 01 IIIT with an objective of faculty/mentor development/up gradation in the areas related to Electronics & ICT leading ultimately to improved employability of graduates/diploma holders. MNIT Jaipur has set up such an academy for providing specialized training to faculty and industry persons in the states/UTs of Rajasthan, Gujarat, Daman & Diu, Dadra Nagar Haveli.

## Issues

- IT Hardware and Electronics Manufacturing industry- availability of properly trained, skilled and qualified manpower.
- Number of quality PhDs in IT / Computer Science is very low.
- In E&ICT domain – there is a very high degree of obsolescence of existing technologies and faster emergence of newer technologies.

## Approach

- A focused faculty training/updation programme for IT, Electronics and related sectors.
- Spreading and continuous updation in Emerging Technology.
- Training and consultancy services for Industry. Design, Develop and Deliver specialized modules for specific research areas and Industry.
- Providing advice and support for technical incubation and entrepreneurial activities

## About MNIT Jaipur

The college was established in 1963 with the name as Malaviya Regional Engineering College, Jaipur as a joint venture of the Government of India and the Government of Rajasthan, Subsequently; on June 26, 2002 the college has been given the status of National Institute of Technology and on 15 August 2007, Proclaimed Institute of National Importance through Act of Parliament. The Institute is fully funded by Ministry of Human

Resource Development (MHRD), Government of India. The institute offers various UG, PG (M.Tech/MSc., & PhD) courses in almost all fields of Engineering, technology, management and sciences in addition to research, consultancy, and development.

## Introduction to Course

**let me begin with quote, "...Nonlinear interactions almost always make the behavior of the aggregate more complicated than would be predicted by summing or averaging." -John Henry Holland.** As more complex systems are emerging, new challenges are unfolding in the field of control system theory. The course on **Selected topics in Control System Theory - Fundamentals, Advances, and Future Directions** is intended to address these recent developments in some of the selected topics in control theory from fundamentals and give future directions to the scholars working in control systems, power systems, power electronics and mechatronics. The initiation of the course is from the state space modeling, state based design techniques, design of full and reduced order observers and its impact on closed loop systems. Furthermore, the design of functional observers is also included. Due to increased use of digital devices, all most all control algorithms are implemented digitally. A detailed discussion of discretization of deterministic,  $\dot{x}(t) = Ax(t) + Bu(t)$  time delay,  $\dot{x}(t) = Ax(t) + A_d x(t - \tau_x) + Bu(t - \tau_d)$  and uncertain  $\dot{x}(t) = Ax(t) + Bu(t) + Dd(t)$  systems and its control based on multirate sampling is included.

Most of the realistic systems work under uncertainty, hence controlling of these systems is one of the major research area. These issues can be effectively addressed by introducing the concepts of variable structure control, sliding mode and robust controller design using the concept of sliding mode in presented. Newer ideas of higher order

sliding mode and terminal sliding mode would also be introduced. The introduction to fundamentals of non-linear systems  $\dot{x}(t) = f(t, x(t), u(t))$ , its linearization and control and future directions will be discussed. The controllers have been best judged by performance index and adaptive to variations. As systems complexity are further increasing, introducing intelligent control algorithms is needed at the hour. The course also introduces the fundamental concepts of intelligent control techniques by discussing varieties of problems to recent developments in this field.

## Confirmed Speakers

- **Prof. Ravi N. Banavar, Professor in System & Control Engineering, IIT Bombay, Mumbai.**
- **Dr. S. Janardhanan, Associate Professor, Department of Electrical Engineering, IIT Delhi, New Delhi**
- **Dr. Rajesh Kumar, Associate Professor, Department of Electrical Engineering, MNIT Jaipur, Jaipur.**
- **Dr. Shubhendu Bhasin, Associate Professor, Department of Electrical Engineering, IIT Delhi, New Delhi.**
- **Dr. N. Satyanarayana, Asst. Professor, Department of Electrical Engineering, MNIT Jaipur, Jaipur.**

## Who can attend

Teachers, Scholars, UG, PG students and professionals, working in the field of Electrical, Electronics & Communication, Instrumentation and Control, Power Systems, Power Electronics, Mechatronics and Robotics are eligible. Seats are limited and confirmed on first come first basis.

## Details of Course Registration & Fee

- (a) Registration is done online at <http://online.mnit.ac.in/eict/>
- (b) One-time registration fee of Rs. 500/- is to be paid by each participant attending first time. This fee is not applicable for those participants, who have already attended Academy training programme earlier.
- (c) Along with one time registration participants from academia/ research scholars/ PhD students are required to pay a further fee of Rs. 2000/-
- (d) Along with one time registration participants from industries would pay a further fee of Rs. 5000/-.
- (e) Relaxation/rebate of 50% and 25% course fee in (c) and (d) for SC/ST and OBC candidates respectively.
- (h) The registration fee covers the participation in the programme, course material, breakfast and working lunch on all the days of the workshop.
- (i) Registration amount is received through online payment/NEFT/IMPS/DD.
- (j) Visit us at <http://www.mnit.ac.in/eict>

Account Name	Account Number
Electronics and ICT Academy MNIT Jaipur	676801700483
Bank address	IFSC Code
ICICI Bank, MNIT Campus Branch	ICIC0006768

## Accommodation

Suitably accommodation will be made available, if requested in advance, on payment basis.