Whom will the course benefit?
Faculty members and practicing scientists/engineers in the disciplines of Aerospace Engineering, Control and Instrumentation, Chemical Engineering, Electrical & Electronic Engineering, Mechanical Engineering, Systems and Control, Robotics etc.

Course Objective:
To provide basic theoretical background on optimal control and state estimation topics (including examples and assignments) as well as to give a good exposure about a few selected research topics through discussion of recent publications.

Course Contents:
- **Introduction and Motivation**
- **Static Optimization**: Unconstrained optimization; Optimization with equality and inequality constraints; Basic Philosophy of Numerical Optimization.
- **Calculus of Variations**: Concepts; Fixed-End Point Problem; First & second Variations; Free-End point problem; Connection to Optimal Control.
- **Linear Quadratic Regulator (LQT)**: Finite & Infinite Time and Riccati equations; Extensions of LQR: With Cross-product term minimization, state rate minimization, etc.
- **Linear Quadratic Tracker (LQT)**: Free & Fixed Endpoints; Robustness of LQR, LQR Solution via State Transition Approach. SDRE & 0-D Designs.
- ** Pontryagin’s Principle and Dynamic Programming**
- **Transcription Technique**: Classical Concepts, Pseudo-spectral Transcription; HJB equation and LQR.
- **Brief Exposure to Artificial Neural Networks**
- **Discrete-Time Optimal Control**: Regulator & Tracker; Discrete Riccati Equation; Approximate Dynamic Programming & Adaptive Critic Design; Dynamically Re-optimized SNAC (DR-SNAC) Design; SNAC for Artificial Pancreas Development.
- **Constrained Optimal Control**: Time Optimal Problem; Constrained Fuel Optimal Problem; Constrained Energy Optimal Problem.
- **Applications to Biomedical and Wind Energy**
- **Model Predictive Static Programming (MPSP)**: Basic Principle; Extensions of MPSP; P-MPSP, I-MPSP and G-MPSP; Applications of MPSP for Optimal Guidance of Aerospace Vehicles.
- **State Estimation**: An Overview; LQ Observer Design; Review of Probability Theory & Random Variables; Continuous-Discrete Kalman Filter; Extended Kalman Filter (EKF) ; Overview of Unscented Kalman Filter (UKF) & Particle Filter; Application of Kalman Filter in Selected Aerospace Problems.
- **Tutorial & Lab Demo**: MATLAB implementation of LQR Control; LQT Control; Pseudo-spectral Transcription; SNAC & DR-SNAC; Time & Fuel Optimal Closed Loop Control via SIMULINK; Kalman Filter Design.

Faculty:
- Radhakant Padhi, Professor, Indian Institute of Science.
- D. S. Naidu, Visiting Professor, Indian Institute of Science.

Eligibility:
The course is meant for faculty of engineering colleges recognized by All India Council for Technical Education (AICTE), National Institutes of Technology (NIT’s) and National Institute of Technical Teachers’ Training & Research (NITTTRs) at free of cost. Selected teachers will also be paid TA at actual subject to the limit of Three tier AC train/bus fare by the shortest route from the place of work to Bengaluru and back. However, the maximum TA payable is Rs.3000/-. They will be provided with a daily allowance of Rs.500/- towards boarding and lodging as per the QIP rules, and will be supplied with the course materials. The lodging charges will be Rs.300/- per day. Local participants will be paid DA @ Rs.150/- per day for 10 days.

Course Fee and Accommodation:
A few seats are available for non-sponsored (self-support) teachers, scientists from research labs, practicing engineers from industries and other interested persons, the fee for them will be as follows:
- Academic Institutes, Govt: R&D Labs : 20,000 INR
- Private Industries : 30,000 INR

Single room accommodation is available on the Institute campus at the Hoysala House subject to availability. The participants have to request in advance along with the registration form for such accommodation. The lodging charges will be Rs.1500/- per day for Industry participants and Rs.1000/- per day for self-support college teachers and scientists from national R&D labs.

Registration Form
(Please mail to reach before 15 April 2017)
1. Name.................................................................
2. Age:.......................... Sex: Male/Female
3. Office address........................................................................................
   ...................................................................................................
   ...................................................................................................
4. Landline No. with STD code:..............................
5. Mobile No. ..............................................................
6. Email ID:............................................................... 
7. Academic Qualifications
   Degree ................................................................. subject year University
   Diploma/B.Sc./B.A.................................................................
   B.E/B.Tech/M.Sc.................................................................
   M.E/M.Tech/M.Phil.................................................................
   Ph.D. Completed/Pursuing/Intend pursuing:............................
   Thesis title/ Proposed Research Area:...........................................
   .............................................................................................................
   .............................................................................................................
8. Teaching Experience............................(Years)
9. Industry Experience .................................(Years)
10. Course taught/professional responsibilities ……………
……………………………………………………………….
……………………………………………………………….

11. Accommodation required Yes / No
12. Self-support candidate:
  Academic Institutes, Govt. R&D Labs: 20,000 INR
  Private Industries: 30,000 INR

Demand Draft No………………… dated………………

I agree to abide by the rules of the QIP courses. If selected, I shall participate in the course for the entire duration.

Date:………………………………………………...
Place:………………………………………………..

The applicant Mr/Ms……………………………..
…………………………………………………………
…………………………………………………………
from our institution will be permitted to attend the QIP Short Term Course on “Applied Optimal Control and State Estimation” to be held during 8-19 May 2017 at the Indian Institute of Science, Bengaluru. If selected, he/she will be granted necessary leave of absence.

It is certified that our college is recognized by AICTE Order No:………………………Date:………………

Place:………………………………………………..
Date:………………………………………………..

The Officer-in-charge
Centre for Continuing Education
Indian Institute of Science
Bengaluru - 560 012
Telephone: 080-23600911, 22932055
Email: so@cce.iisc.ernet.in/
   office@cce.iisc.ernet.in

To reach on or before: 15th April 2017

Intending participants may use the attached application form or a xerox copy of the same. Applicants from AICTE recognized colleges, NIT’s and NITTTRs are required to submit their applications sponsored by their colleges. Non-sponsored (self-support) applicants should send their application along with a DD for the course fee drawn in favor of “Registrar, Indian Institute of Science, Bengaluru – 560012” payable at Bengaluru. The course fee will be Rs.20,000 for participants from academic institutions and government R&D labs and Rs.30,000 for participants from other organizations.

Deadlines:

Receiving completed applications: 15 April 2017
Intimation of selection: 20 April 2017