Course code	Course name	L-T-P-Credits	Year of Introduction
AE431	CONTROL SYSTEM AND SIGNAL PROCESSING LAB	0-0-3-1	2016

Prerequisite : AE301 & AE306

Course objective

- To give hands on experience in various digital Signal Processing techniques using TMS 320C6X family processors and in control system analysis using MATLAB.

List of Experiments

CONTROL SYSTEM LAB using MATLAB

1. Familiarization of MATLAB commands used in control system design
2. Representation of system in MATLAB: state space representation & transfer function representation
3. Stability analysis using Bode plot, root locus & their pole-zero-gain representation.
4. Implementation of Ziegler- Nicholas/ Cohen-coon tuning method for 1st order system.
5. Analysis of a closed loop system.
6. Implementation of PID control using both m-file and Simulink.
7. Pole placement technique applied to stabilize a system.
8. Realization of a compensator design.
9. Modelling and analysis of a first order system.
10. Modelling of an unstable system (inverted pendulum, ball & plate system etc.)

PC Based Control

1. PLC programming: familiarization of instruction set.
2. PLC programming: simulation of process control.
3. SCADA interface.
4. Familiarization of Distributed Control System (DCS) with different process stations pressure, flow and level.

LabVIEW based Virtual Instrumentation

1. Getting started with LabVIEW: Basic operations, controls, indicators, and simple Programming structures.
2. Debugging a VI and sub-VI.
3. Familiarization of DAQ card.

SIGNAL PROCESSING LAB

1. Familiarization of signal processing commands used in MATLAB Software.
2. Developing elementary signal function modules (m-files) for unit impulse, step, exponent and ramp sequence.
3. Generating continuous and discrete time sequences.
4. Carrying out mathematical operations on signals.
5. Response of LTI system described by difference and differential equation.
6. Developing a program for computing inverse Z-Transform.
7. Developing program for finding magnitude & phase response of LTI System
8. Developing program for computing DFT & IDFT.
9. Developing a program for computing circular convolution.
10. Design of filter: FIR, IIR, ECG Signal filter (can be done as 3 separate experiments).

Expected outcome

- At the end of the semester students are expected to be familiar with the basic signal processing & control system techniques**.**