BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI
INSTRUCTION DIVISION
FIRST SEMESTER 2015-2016
<u>**Course Handout (Part II)**</u>

Date: 03/08/2015

In addition to part-I (General Handout for all courses appended to the timetable) this portion gives further specific details regarding the course.

Course No.   **: EEE F422**
Course Title   **: Modern Control Systems**
Instructor-in-charge   **: HARI OM BANSAL**

1.   Scope & Objective of the Course:

Feedback automatic control systems are indispensible in industrial processes, scientific instruments and even commercial, social and management situations. Most of these systems are non linear in nature. Analysis and design of these non linear systems is very important task that an engineer has to carry out. This course mainly focuses on various advanced control techniques.

2.   Text Book: Nagrath I. J. and M. Gopal, Control Systems Engineering, New Age International (P) Ltd, 5th ed, 2007.

3.   Reference Book:

M. Gopal, Modern Control System Theory, New Age International (P) Ltd, 2nd ed.

4.   Course Plan:

Lect. No.	Topic	Learning object(s)	Ref. to Text Book/ Class Notes
1.	Introduction	General overview of the course	
2.	State variable analysis;	Understanding of concept of state, state variable and state model	12.1,12.2
3-5.	State model for LTC system	Determination of state model for LTC systems	12.3,12.4
6.	Diagnalization	To understand the transformation of state model into a canonical form	12.5
7-8.	State equation, transition matrix	To solve state eqs and computation of transition matrix	12.6
9-10.	Controllability and observability	To understand the concept of controllable and observable system	12.7
11.	Pole placement	Understanding the effects of pole placement and pole zero cancellation	12.8
12.	Digital Control System; Spectrum analysis of sampling process ; signal reconstruction	Understanding of basics of digital control system	11.1,11.2,11.3
13-14.	Difference equations; Z Transform; Inverse Z Transform	Determination of Z, inverse Z transform and DE	11.4,11.5,11.7
15-16.	Z transform analysis of sampled data control system	Analysis of sampler and hold circuits	11.6,11.8
17-19	z and s domain relationship, stability analysis	Investigation of stability using various methods	11.9-11.10
20.	Compensation Techniques	Application of compensation techniques for Sampled data control systems.	11.11
21-23.	Closed loop frequency response, Constant M and N circles	Investigation of closed loop system stability using their closed loop frequency plots.	9.5,9.6

24-26.	Liapunov's stability analysis	Understanding of Liapunov's method of stability analysis and its applications	13.1-13.4
27.	Nonlinear systems; common physical nonlinearities	Understanding of behavior of non linear systems	15.1, 15.2
28.	Phase Plane Method, singular points	Basic understanding Phase Plane Method, singular points	15.3,15.4
29.	Stability of nonlinear systems, Limit Cycles	Investigation of stability of non linear systems	15.5
30-31.	Phase Plane Trajectories	Construction of phase plane trajectories and its application to stability analysis	15.6
32-34.	Describing functions;	Derivations of describing functions and its application to stability analysis	15.7-15.9
35.	Adaptive control	Basics of Adaptive control	16.2, class notes
36-40.	Application of Modern Control Techniques	Intelligent Control using ANN, Fuzzy, Genetic Algorithm in various fields	Class notes

5.   Evaluation Scheme:

Component	Duration	Weightage	Date & Time	Remarks
Midsem Test	90 min	30 (30%)	10/10 2:00 - 3:30 PM	CB
Assignment/Quiz		25 (25%)	To be announced	OB/CB
Comprehensive Exam.	3 hours	45 (45%)	14/12 FN	CB

6.   Chamber Consultation Hours: to be announced in the class.

7.   Notices: All notices will be displayed on EEE Notice Board only.

(Instructor In-Charge, EEE F422)