- Competitive Advantage: Creating and Sustaining Superior, Performance, Michael E. Porter, The Free Press, New York, 1985.
- E-Learning Tools and Technologies, Horton and Horton, Wiley Publishing, 2003

GENERIC ELECTIVES (GE-6)
VI. 4.2. Control Systems

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)	Department offering the course
		Lecture	Tutorial	Practical/ Practice			
Control Systems GE-6, VI. 4.2	4	2	0	2	12th Pass with Mathematics	Linear Algebra, Differential equations	Physics/ Electronics Faculty of CIC

Learning Objectives

This interactive learning module intends to provide capabilities and basic understanding of functionality and control of a system or a device. It will emphasize on the conceptual know-how of the behavioral aspects and mechanism of different machines, equipment or a system, their manageability, efficiency and performance as per controlled parameters.

Learning outcomes

After completing this course, student should be able to;

- Understand the building blocks of basic and modern control systems.
- Understand the concept of stability analysis of control systems in both time and frequency domain.
- Understand the concept of MATLAB and SIMULINK toolbox to simulate the control systems.
- Perform comparative study of electrical systems using simulation software - Multisim, Eagle, LTSpice and experimental set-up.
- Understand the complex mathematical operations associated with building blocks of various control systems.

SYLLABUS

Unit I: Introduction to Control Systems - Analysis and design objectives - The design process - Classification and modeling of control systems **(6 Hours)**

Unit II: Modeling in the frequency domain - Modeling in the time domain - Time response - Reduction of multiple subsystems **(6 Hours)**

Unit III: Signal flow graphs - Mason's rule - Routh Hurwitz Criterion - Steady state errors - Root locus techniques - Frequency Response Techniques **(8 Hours)**

Unit IV: Root Locus and its Applications -– Design via state space -– Non-linear analysis – Controller and its applications -– Case Studies **(10 Hours)**

Practicals – (60 Hours)

The following explorations would be carried out on matrix based numerical mathematics software:

- Designing the model of a DC motor
- Design of controllers for speed and position control
- Compensator design
- Realization of logic gates through diodes and resistors
- Verification of Boolean algebraic functions through digital IC gates
- Design of half/full adder and sub tractor circuits
- Design of shift registers using flip-flops
- Circuit simulation
- State space model design
- Design of temperature controller
- Hands on experiments with PID controller
- Innovation Project

Essential/recommended readings

- Control Systems Engineering, 6th Edition, Norman S Nise, Wiley, 2011.
- Linear Control Systems with MATLAB Applications, 11th Edition, B. S. Manke, Khanna Publishers, 2013
- Discrete-Time Control Systems, K. Ogata, Prentice Hall, 1995.
- Control Tutorials for MATLAB and Simulink, W. Messner and D. Tilbury, Addison-Wesley, 1998.