GOVERNMENT POLYTECHNIC KORAPUT
DEPARTMENT OF ELECTRICAL ENGINEERING

Th3.CONTROL SYSTEM ENGINEERING

Name of the Course: Diploma in Electrical Engineering			
Faculty: S Bichiballi	Semester - 10/3/22 - 10/6/22		
Course code:	Th.3	**Semester:**	6th
Total Period:	75 Periods	**Examination:**	3 Hrs
Theory periods:	4P / Week	**Internal Assessment:**	20
Tutorial:	1P	**End Semester Examination:**	80
Maximum marks:	100		

VISION:

To create competent & industry ready Electrical Diploma Engineers with professional and social values to meet future challenges.

MISSION:

- To prepare diploma holders through "qualitative competency based education system" to compete with national requirement along with core values.
- To produce dynamic Electrical Engineers to serve the society and industry.
- To develop leadership qualities, communication skills, critical thinking and attitude for lifelong learning.

PROGRAM EDUCATIONAL OBJECTIVES:

PEO1	Apply technical knowledge and skills learned in the field of Electrical Engineering to excel in Professional and/or higher education.
PEO2	To provide students an excellent academic environment and make them aware the needs of Society and Industry to become a successful Professional/Entrepreneur.
PEO3	To engage in lifelong learning, career enhancement to adopt emerging technologies.

COURSE OUTCOMES:

CO1	Understand fundamentals of control system, effect of feedback and mathematical modeling.
CO2	Explain block diagram algebra and signal flow graph.
CO3	Analyze time response and frequency response of a system.
CO4	Determine stability of a system using root locus technique and Nyquist stability criteria.

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TOPIC WISE DISTRIBUTION OF PERIODS

Sl. No.	Topics	Periods
1.	Fundamental of control system	04
2.	Mathematical model of a system	04
3.	Control system components	04
4.	Block diagram algebra & signal flow graphs	08
5.	Time response analysis	10
6.	Analysis of stability by root locus technique	10
7.	Frequency response of system	10
8.	Nyquist plot	10
Total		**60**

LESSON PLAN

Week	Day	Theory topic
1st	1st	**Fundamental of control system:** Classification of Control system
	2nd	Open loop system & Closed loop system and its comparison
	3rd	Effects of Feed back
	4th	Standard test Signals(Step, Ramp, Parabolic, Impulse Functions) Servomechanism
	5th	Tutorial
2nd	1st	**Mathematical model of a system:** Transfer Function & Impulse response,
	2nd	Properties, Advantages & Disadvantages of Transfer Function
	3rd	Poles & Zeroes of transfer Function
	4th	Simple problems of transfer function of network. Mathematical modeling of Electrical Systems(R, L, C, Analogous systems)
	5th	Tutorial
3rd	1st	**Control system components:** Components of Control System Tachometer, DC,
	2nd	Gyroscope, Synchros
	3rd	servomotors
	4th	Ac Servomotors
	5th	Tutorial
4th	1st	**Block diagram algebra & signal flow graphs:** Definition: Basic Elements of Block Diagram, Procedure for of Reduction of Block
	2nd	Canonical Form of Closed loop Systems
	3rd	Rules for Block diagram reduction
	4th	Simple Problem for equivalent transfer function
	5th	Tutorial
5th	1st	Basic Definition in Signal Flow Graph & properties
	2nd	Construction of Signal Flow graph from Block diagram
	3rd	Mason's Gain formula
	4th	Simple problems in Signal flow graph for network
	5th	Tutorial
6th	1st	**Time response analysis:** Time response of control ,

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	2nd	Standard Test signal.
	3rd	Ramp Signal
	4th	Step signal
	5th	Tutorial
7th	1st	Parabolic Signal
	2nd	Impulse Signal
	3rd	Time Response of first order system with:
	4th	Unit impulse response
	5th	Tutorial
8th	1st	Time response of second order system to the unit step input.
	2nd	Derivation of expression for rise time,
	3rd	Steady state error and error constants
	4th	Types of control system [Steady state errors in Type-0, Type-1, Type-2 system]
	5th	Tutorial
9th	1st	Effect of adding poles and zero to transfer function
	2nd	Time response specification
	3rd	Response with P, PI, PD and PID controller
	4th	peak time, peak overshoot, settling time and steady state error.
	5th	Tutorial
10th	1st	Problem solving
	2nd	Problem solving
	3rd	Problem solving
	4th	**Analysis of stability by root locus technique**: Root locus concept.
	5th	Tutorial
11th	1st	Construction of root loci.
	2nd	Rules for construction of the root locus
	3rd	Effect of adding poles and zeros to G(s) and H(s).
	4th	Problem solving
	5th	Tutorial
12th	1st	**Frequency response analysis:** Correlation between time response
	2nd	frequency response
	3rd	Polar plots
	4th	Bode plots
	5th	Tutorial
13th	1st	Computation of Gain margin and phase margin
	2nd	Log magnitude versus phase plot
	3rd	Closed loop frequency response
	4th	Problem solving
	5th	Tutorial
14th	1st	**Nyquist plot**: Principle of argument.
	2nd	Nyquist stability criterion
	3rd	Nyquist stability criterion applied to inverse polar plot
	4th	Effect of addition of poles and zeros to G(S) H(S) on the shape of Nyquist plot
	5th	Tutorial
15th	1st	Assessment of relative stability.
	2nd	Constant M and N circle
	3rd	Nicholas chart.
	4th	Previous year question discussion
	5th	Tutorial

Signature of faculty concerned

10/3/22

H.O.D. Electrical

15/3/22