No	Course Information (2019-2020)	
1	Unit name:	Modeling and Control I (2019-2020)
2	Code:	EcE 31003
3	Classification:	Engineering subject
4	Credit value:	3(**2-1-1**)
5	Semester/ Year Offered:	1/3
6	Pre-requisite:	EcE 21001&21002 ,Electronics Engineering Circuit
7	Mode of delivery:	Lecture, Practical, Tutorial, Discussion, Presentation
8	Assessment system and breakdown of marks:	Tutorial, Practical, Examination, Lab report
9	Tutorial	10%
	Practical	20%
	Mid-term Examination	70%
10	Academic staff teaching unit:	Electronic Engineering
11	Course outcome of unit: In this course students will be able ❖ To explain the basic open loop and closed-loop system ❖ To know transfer function of electrical systems from mechanical systems ❖ To solve problems by using Laplace transform method, state differential equation and state variable models ❖ To solve problems in control system by using Matlab software	
12	Synopsis of unit:- The course covers the fundamental of process for designing a control system. The course introduces students to understand the purpose of a control systemwhich includes the use of control design strategies, the Laplace transform,the mathematical models of the systems, the transfer function of linear systems and signal flow graph models, the state variables of dynamic systems, the state differential equation, the	

	time response and the state transition matrix, open-loop and closed-loop systems, and sensitivity of control systems to parameter variations and control of the transient response of control systems. Disturbance signals in a feedback control system, steady-state error, test input signals, performance of a second- order system response, estimation relative stability of feedback control systems and the stability of state variable systems will also be learned.
13	Topic: **Chapter Title** **1 Introduction to Control Systems** 1.1 Introduction 1.2 Brief History of Automatic Control 1.3 Example of Control Systems 1.4 Engineering Design 1.5 Control Systems Design 1.6 Mechatronic Systems 1.7 Green Engineering 1.8 The Future Evolution of Control Systems 1.9 Design Examples 1.10 Sequential Design Example: Disk Drive Read System 1.11 Summary **2 Mathematical Models of Systems** 2.1 Introduction 2.2 Differential Equations of Physical Systems 2.3 Linear Approximations of Physical Systems 2.4 The Laplace Transform 2.5 The Transfer Function of Linear Systems 2.6 Block Diagram Models 2.7 Signal -Flow Graph Models 2.8 Design Examples 2.9 The Simulation of Systems Using Control Design Software 2.10 Sequential Design Example: Disk Drive Read System 2.11 Summary

	3	**State Variable Models**
		3.1 Introduction
		3.2 The State Variables of a Dynamic System
		3.3 The State Differential Equation
		3.4 Signal-Flow Graph and Block Diagram Models
		3.5 Alternative Signal-Flow Graph and Block Diagram Models
		3.6 The Transfer Function from the State Equation
		3.7 The Time Response and the State Transition Matrix
		3.8 Design Examples
		3.9 Analysis of State Variable Models Using Control Design Software
		3.10 Sequential Design Example: Disk Drive Read System
		3.11 Summary
	1	**Matlab Fundamentals**
		1.1 Matlab Basis Operations
		1.2 Matrix Operations
		1.3 Array Operations
		1.4 Complex Numbers
		1.5 The Colon Symbol (:)
		1.6 M-files
	2	**Plotting Commands**
		2.1 Graph Functions
		2.2 X-Y Plots and Annotations
		2.3 Logarithmic and Polar plots
		2.4 Screen Control
	3	**Control Statements**
		3.1 For Loops
		3.2 If statements
		3.3 While loop
		3.4 Input/Output Commands

14	Main references: Modern Control System, 11th Edition, Richard C. Dorf and Robert H. Bishop Electronics and Circuit Analysis using MATLAB
15	Additional references: Notes by Modern Control System(11stEdition),Richard C. Dorf and Robert H. Bishop, Prentice-Hall,Upper Saddle... (http://www. Mypearsonstore.com>bookstore)

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Information on Lab Practical (EcE-31003 Modeling and Control)

Lab	Activity
1	**Experiment 1**: **Evaluate the complex number by using MATLAB Software** **Objectives**: • To apply Matlab software as a calculation tools • To apply Matlab/Simulink Software **Equipment required:** • Matlab software, Personal computer
2	**Experiment 2**: **If-else if statement by using MATLAB Software** **Objectives**: • To apply Matlab software as a calculation tools • To apply Matlab/Simulink Software **Equipment required:** • Matlab software, Personal computer
3	**Experiment 3: To plot v(t) and i(t) versus time(t) by using MATLAB Software** **Objectives:** • To apply Matlab software as a calculation tools • To understand the voltage and power calculation • To apply Matlab/Simulink Software **Equipment required:** • Matlab software, Personal computer

4	**Experiment 4: If-else if statement and For loop repetition statement by using MATLAB Software** **Objectives**: • To apply Matlab software as a calculation tools • To generate the Fibonacci sequence up to the twelfth term • To convert analog signal x to digital signal y • To apply Matlab/Simulink Software **Equipment required:** • Matlab software, Personal computer
5	**Experiment 5: To draw a graph of gain versus frequency and x(t) versus y(t) by using MATLAB** **Objectives**: • To apply the Matlab software as a calculation tools • To build the Matlab program to draw Bode Plot of an amplifier using semilogx function • To determine the value of x(t) and y(t)(t = 0 to 10 ms) • To plot x(t) versus y(t) • To apply Matlab/Simulink Software **Equipment required:** • Matlab software, Personal computer

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