No.	Course Information (2019-2020)	
1	Unit Name:	Advanced Electronics
2	Code:	EcE-51001
3	Classification:	Engineering Subject
4	Credit Hour:	3 **(2-0-2)**
5	Semester and Year Taught:	1/**5**
6	Pre-requisite (if any):	Microelectronics and Integrated Electronics
7	Method of Delivery:	Lecture, Practical and Assignment
8.	Assessment System and Breakdown of Marks: Lab report , Assignment , Exam	
	Practical, Assignment	30% (20%+10%)
	Mid-Term Examination	70%
9	Teaching Staff:	
10.	Course Outcome of Unit: At the end of the unit, a student shall be able to: 1. To describe the working principles, operational characteristics, basic applications and the frequency response of bipolar junction transistor amplifier circuits and field effect transistor amplifier circuits. 2. To analyze bipolar junction transistor amplifier circuits and field effect transistor amplifier circuits using small signal models. 3. To design bipolar junction transistor amplifier circuits and field effect transistor amplifier circuits to meet a specific set of design specification with respect to voltage gain, input resistance, output resistance and low frequency cutoff. 4. To demonstrate the knowledge gained analyze of bipolar junction transistor amplifier circuits and field effect transistor amplifier circuits.	
11.	Synpsis: The analog circuit will teach the fundamentals of BJTs, FETs amplifier circuit, multistage amplifier, frequency response and amplifier noise. Analog circuit design techniques used in today's advanced power amplifier, active filter, multi-device circuits and small signal tuned amplifier.	

4.	**BJT Small Signal Models and Analysis**
	4.1 The h-Parameter and Hybrid π Models for a BJT
	4.1.1 The Common Emitter h Parameter and Hybrid π Model
	4.1.2 Gain and Resistance Relations for Two-port Network
	4.1.3 A Note About Frequency Dependence

Mode FET

6.5.2 Analysis of O Point when Self-Bias ls Used

6.5.3 Analysis of Q Point f or Voltage Divider biased Depletion-Mode FET circuits

6.6 Defining Relations for Small-Signal Amplifier Circuits Incorporating FETs

6.6.1 Source as Reference Terminal

6.6.2 Common-Drain (CD) circuit, or Source Follower (SF)

6.6.3 Common-Gate (CG) Configuration

6.7 Analysis and Design of Depletion-Mode FET Small-Signal Amplifier Circuits

6.7.1 CS and Split-Load Amplifier Circuits

6.7.2. CD (SF) Circuit

6.7.3 CG Configuration

6.8 Load Lines and Dynamic Range

6.8.2 Transfer Characteristic Curves

6.9 Stability Methods for FETs

6.9.1 Temperature Effect in FETs

6.10 Stabilized Amplifier Design

6.10.1 Example of a Gain-Stabilized JFET Amplifier

6.11 Analog Operation of Enhancement Mode MOSFETs

6.11.1 Q Point in Enhancement Mode MOSFETs

Main References:

Element of Electronics Design By Clifford D Ferris

Additional References:

http//www.learnabout-electronics.org/bipolar

http//www.seas.upenn.edu/../lec_9_....

Information on Lab Practical (Advanced Electronics)

	Activit
	Topic: **COMMON EMITTER AMPLIFIER** **Task**: • To demonstrate the common emitter amplifier using voltage-divider bias. • To measure the voltage gain of common-emitter amplifier using oscilloscope. **Resources**: **For hardware:** Transistors, Resistors, Capacitors, Printed circuit board, Connection wire, Regulated power supply, Function generator, Multi-meter, Oscilloscope
	Topic: **COMMON BASE AMPLIFIER** **Task**: • To demonstrate the common base amplifier using voltage-divider bias. • To measure the voltage gain of common base amplifier using oscilloscope. **Resources**: **For hardware:** Transistors, Resistors, Capacitors, Printed circuit board, Connection wire, Regulated power supply, Function generator, Multi-meter, Oscilloscope
	Topic: **COMMON COLLECTOR AMPLIFIER** **Task**: • To demonstrate the common collector amplifier using voltage-divider bias. • To measure the voltage gain of common collector amplifier using oscilloscope. **Resources**: **For hardware:** Transistors, Resistors, Capacitors, Printed circuit board, Connection wire, Regulated power supply, Function generator, Multi-meter, Oscilloscope
	Topic: **FET CHARACTERISTIC** **Task**: • To apply JFET characteristics (Drain and Transfer) **Resources**: **For hardware:** FET Transistors, Resistors, Printed circuit board, Connection wire, Regulated power supply, Multi-meter

Topic: **HOW TO MAKE SWITCH ON/OFF AND AMPLIFIER (MOSFET)**

Task:

- To apply the characteristics of MOSFET

• To demonstrate how to make switch on/off and amplifier (MOSFET)

Resources:

For hardware:

Transistors, Resistors, Capacitors, Printed circuit board, Connection wire, Regulated power supply, Function generator, Multi-meter, Oscilloscope

	Course Information (2019-2020)	
1	Unit name:	Digital Control System I
2	Code:	EcE -51003
3	Classification:	Engineering subject
4	Credit value:	3 (2-0-2)
5	Semester/ Year Offered:	1/5
6	Pre-requisite:	Digital Electronics, Technical Programming, Modeling and control, Modern Control System
7	Mode of delivery:	Lecture, Practical, tutorial
8	Assessment system and breakdown of marks: **Practical and lab report, tutorial, Examination**	
	Practical	20%
	Tutorial	10%
	Mid-term/ final Examination	70%
9	Academic staff teaching unit:	Department of Electronic Engineering
10	Course outcome of unit: In this course students will be able ➢ To design and analyze the stability and transient response of a system by using root locus method ➢ **To apply MATLAB in solving problems in digital control system** ➢ To explain the specifications of the PIC xx microcontroller	
11	Synopsis of unit: The course covers the techniques of analysis of linear control system and control design. The course introduces students to apply the root locus in the s-plane can be determined by a graphical method, the roots of the characteristics equation move around the s-plane by changing one parameter. In addition course introduces students to familiar terms and specifications of the PIC microcontrollers, PIC16 series, the 16F84A, parallel ports, power supply, the clock oscillator, assembler programming language by using MPLAB IDE software will be learned.	

Topic:

Chapter Title

13. Digital Control System

13.1 Introduction

13.2 Digital Computer Control System Application

13.3 Sampled-Data System

13.4 The Z-Transform

13.5 Closed loop feedback sampled data systems

13.6 Performance of a sampled data, second order system

13.7 Closed-Loop Systems with Digital Computer Compensation

13.8 The root-locus of digital control systems

1. The PIC Microcontroller Family

1.1 12-bit Instruction Word

1.2 14-bit Instruction Word

1.3 16-bit Instruction Word

1.4 Inside a PIC Microcontroller

2. Introducing the PIC® 16 Series and the 16F84A

2.1 The Main Idea—The Pic 16 Series Family

2.2 An Architecture Overview Of The 16f84a

2.3 A Review Of Memory Technologies

2.4 The 16f84a Memory

2.5 Some Issues Of Timing

2.6 Power-Up And Reset

2.7 What Others Do—The Atmel At89c2051

2.8 Taking Things Further—The 16f84a On-Chip Reset Circuit

3. Parallel Ports, Power Supply and the Clock Oscillator

3.1 The Main Idea—Parallel Input/output

3.2 The Technical Challenge Of Parallel Input/output

3.3 Connecting To The Parallel Port

3.4 The PIC 16F84A Parallel Ports

3.5 The Clock Oscillator

3.6 Power Supply

3.7 The Hardware Design Of The Electronic Ping-Pong

	4. Starting to Program An Introduction to Assembler 4.1 The Main Idea—What Programs Do and How We Develop Them 4.2 The PIC 16 Series Instruction Set, with a Little More on the ALU 4.3 Assemblers and Assembler Format 4.4 Creating Simple Programs 4.5 Adopting a Development Environment 4.6 An Introductory MPLAB Tutorial 4.7 An Introduction to Simulation 4.8 Downloading the Program to a Microcontroller 4.9 What Others Do A Brief Comparison of CISC, RISC Instruction Sets 4.10 Taking Things Further The 16 Series Instruction Set Format
14	Main references: Modern Control Systems(11th Edition)by Richard C.Dorf and Robert H.Bishop PIC microcontrollers: know it all / Lucio Di Jasio … [et al.].p. cm. – (The Newnes know it all series) ISBN-13: 978-0-7506-8615-0. www.books.elsevier.com
15	Additional references: Note by Modern Control Systems, 11st Edition, Richard C. Dorf, Robert H. Bishop, Prentice-Hall, Upper Saddle…., (http://www.Mypearsonstore.com>bookstore) PIC16F84 to PIC16F84A Migrati on (2001). Microchip Technology Inc.DS30072A and B; www.microchip.com Atmel 8051 Microcontrollers Hardware Manual (2004). Atmel Corporation, Ref. 4316C-8051-05/04; http://www.atmel.com/ Design Tips and Troubleshooting of the PICmicroTM Microcontroller Oscillator (2001). Kingbright Elec. Co. Ltd. Taiwan; http://www.kingbright.com.tw

Information on Lab Practical

Lab	Activity
1	**Experiment 1: Step response for a first order unity feedback system by using MATLAB** **Objectives**: • To apply step response of 1st order system • To apply Matlab/Simulink Software **Equipment required:** • Matlab software, Personal computer
2	**Experiment 2**: **Continuous-time system to discrete-time system by using MATLAB** **Objectives**: • To convert continuous-time system to discrete-time system with c2d function • To apply Matlab/Simulink Software **Equipment required:** • Matlab software, Personal computer
3	**Experiment 3: Discrete-time system to continuous-time system by using MATLAB** **Objectives:** • To convert continuous-time system to discrete-time system with d2c function • To apply Matlab/Simulink Software **Equipment required:** • Matlab software, Personal computer

4	**Experiment 4**: **The response of the system by using MATLAB** **Objectives**: • To determine the discrete response, y(kT) of close-loop system using step ,impulse and arbitrary input. • To determine the continuous response y(t) using a unit step for the system. • To apply Matlab/Simulink Software **Equipment required:** • Matlab software, Personal computer
5	**Experiment 5: Root locus of digital control system by using MATLAB** **Objectives**: • To plot the root locus of digital control system • To determine K for stability • To apply Matlab/Simulink Software **Equipment required:** • Matlab software, Personal computer

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Prepared by

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No	Course Information (2019-2020)	
1	Unit name:	Digital Signal Processing I
2	Code:	EcE – 51005
3	Classification:	Engineering subject
4	Credit value:	3 (2-0-2)
5	Semester/ Year Offered:	1/5
6	Pre-requisite:	EcE – 21021 & 22021 Digital Electronics
7	Mode of delivery:	Lecture, Demonstration for Experiment
8	Assessment system and breakdown of marks:	Tutorial, Lab Report, Exam
	Assignment/Home work /Tutorial	10%
	Lab Report	20 %
	Q & A	70%
9	Academic staff teaching unit:	Department of Electronic Engineering
10	Course outcome of unit: After completion of this course, students will be able to 1. Recognize signal processing, configurations, applications, operations, advantages and disadvantages of digital system 2. Apply various theorems to determine Fourier Series, Fourier Transform, Z Transform, Transfer Functions, Convolution of the signals 3. Apply time-domain and frequency-domain signals, z transform, FFT, DTFT, Convolution, Filters using MATLAB to test the signal operations (LAB)	
11	Synopsis of unit: This course provides a systematic introduction to signal, signal processing and digital system. It emphasizes the time-domain, frequency-domain and signal filtering techniques. It also presents the theorem and properties of the z transform and convergence. Transfer Functions, Time-domain and Frequency-domain Analysis are also described in this course. In addition, it includes the process of Interrelation, Sampling, Aliasing, A/D & D/A Converter. This course describes the realization and implementation of digital filters.	

12	**Topic:** Chapter 1. Introduction to Digital Signal Processing 1.1 Introduction 1.2 Signals 1.3 Frequency-Domain Representation 1.4 Notation 1.5 Signal Processing 1.6 Analog Filters 1.7 Applications of Analog Filters 1.8 Digital Filters 1.9 Two DSP Applications Chapter 2. The Fourier Series and Fourier Transform 2.1 Introduction 2.2 Fourier Series 2.3 Fourier Transform Chapter 3. The z Transform 3.1 Introduction 3.2 Definition of z Transform 3.3 Convergence Properties 3.4 The z Transform as a Laurent Series 3.5 Inverse z Transform 3.6 Theorems and Properties 3.7 Elementary Discrete-Time Signals 3.8 z-Transform Inversion Techniques 3.9 Spectral Representation of Discrete-Time Signals Chapter 4. Discrete-Time Systems 4.1 Introduction 4.2 Basic System Properties 4.3 Characterization of Discrete-Time Systems 4.4 Discrete-Time System Networks 4.5 Introduction to Time-Domain Analysis 4.6 Convolution Summation 4.7 Stability 4.8 State-Space Representation
14	**Main reference:** 1. Digital Signal Processing : Signals, Systems, and Filters, Andreas Antonious, University of Vitoria, British Columbia, Canada 2. Digital Signal Processing : Principles, Algorithms and Applications, Third Edition, John G. Proakis , Dimitris G. Manolakis
15	Additional references: 1. Digital signal processing using MATLAB, Third Edition, Vinary K. Ingle, John G. Proakis, Northeastern University 2. DIGITAL SIGNAL PROCESSING USING MATLAB FOR STUDENTS AND RESEARCHERS, JOHN W. LEIS, University of Southern Queensland

Information on Practical (Digital Signal Processing)

Lab	Activity
1	**Topic**: **Generation of Basic Signals** **Objectives:** • To distinguish different signals • To write MATLAB code for signal generation • To apply MATLAB Software **Resources**: i. Computer with MATLAB Software
2	**Topic**: **Magnitude and Phase of Fourier Transform** **Objectives:** • To determine the Fourier transform of the non-periodic signal • To write MATLAB code for signal generation of Fourier transform, its magnitude and phase • To be familiar with MATLAB Software **Resources**: i. Computer with MATLAB Software
3	**Topic**: **Real and Imaginary Parts of Fourier Transform** **Objectives:** • To write MATLAB code for signal generation of the magnitude, phase, real and imaginary parts of the Fourier transform for the discrete-time signal • To distinguish the magnitude, phase, real and imaginary parts of the Fourier transform for the discrete-time signals • To be familiar with MATLAB Software **Resources**: i. Computer with MATLAB Software

4	**Topic**: **Sampling The Amplitude Modulated Discrete-Time Signal** **Objectives:** i. To write MATLAB code for signal generation of the modulating signal, carrier signal and amplitude modulated signal ii. To get the relation of theory and practical concepts iii. To be familiar with MATLAB Software **Resources**: i. Computer with MATLAB Software
5	**Topic**: **Convolution and Graphical Convolution** **Objectives:** i. To write MATLAB code for finding the convolution values ii. To generate the graphical convolution signals iii. To get the relation of theory and practical concepts **iv.** To be familiar with MATLAB Software **Resources**: i. Computer with MATLAB Software

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Department of Electronic Engineering

No	Course Information (2019-2020)	
1	Unit name:	Industrial Management I (2019-2020)
2	Code:	EcE 51006
3	Classification:	Engineering Subject
4	Credit value:	2.5 (2-1-0)
5	Semester/ Year Offered:	1/5
6	Pre-requisite:	-
7	Mode of delivery:	Lecture, Discussion, Teamwork
8	Assessment system and breakdown of marks:	Tutorial , Assignment Activity Exam
	Tutorial	10%
	Assignment	10%
	Activity (classwork)	10%
	Mid-term Examination	70%
9	Academic staff teaching unit:	Department of Electronic Engineering
10	Course outcome of unit: In this course students will be able • To demonstrate knowledge and understanding of engineering management principles. • To analyze the cash flow and the financial process by using business tools. • To apply engineering management principles in implementing systems, processes and projects that meet specific requirements • To apply professional engineering management practice in assessing and solving societal and cultural issues and evaluating sustainability of the solution. • To practise team work and communicate effectively.	
11	Synopsis of unit: The course introduces engineering and technology management, management characteristics and functions, engineering and technology management challenges and skill needs, useful information on engineering and technology management. Engineering management is devoted to organization, the human element and method of	

	organization, span of control, functions of engineering departments, qualities and activities of engineering managers, and committees and staff meetings. Important tools for making effective engineering and technology management decisions, including decision trees, optimization techniques, discounted cash flow analysis, learning curve analysis, depreciation analysis, fault tree analysis, and forecasting methods. Some of these topics are project selection methods and models, project management techniques, and project manager's responsibilities, qualifications, selection, and reporting.
	Topic: **Chapter Title** **1 Introduction** **1–1** Introduction **1–2** History of Management **1–3** Terms of Definitions **1–4** Management characteristics and functions and traditional management vs modern management **1–5** Engineering and technology management challenges and skill requirements **1–6** Useful information and engineering and technology management **1–7** Problem **2 Organizing and the Human Element** **2–1** Introduction **2–2** The components of organizing and guidelines for planning an organizations **2–3** Organizational charts and basic relationships in organizational structures **2–4** Centralization and decentralization of organizations, span of control and delegation **2–5** Method of organization **2–6** Functions of an engineering department and guidelines for organizing a new engineering department **2-7** Characteristics and needs of an engineering, route for an engineer to obtain management positions and transition of an engineer to a managerial position **2-8** An engineering manager's qualities and activities **2-9** Motivating others and analyzing team characteristics **2-10** Committees and staff meetings **2-11** Displacing manager and an organization size-efficiency model **2–12** Problem

	3	**Tools for Marking Effective Engineering and Technology Management Decisions** **3–1** Introduction **3–2** Discounted cash flow **3–3** Depreciation analysis **3–4** Decision trees **3–5** Optimization techniques **3–6** Learning curve analysis **3–7** Fault tree analysis **3–8** Forecasting **3–9** Problem
	4	**Project Selection and Management** **4–1** Introduction **4–2** Terms and definitions **4–3** Type of information required for evaluating a project **4–4** Project selection models **4–5** Need for project Management, Project organization life cycle phase, and project management functions and procedure characteristics **4–6** Project manager responsibilities, qualifications, selection and reporting **4–7** Project management methods **4–8** Project management benefits and project management failure Factors **4–9** Problem
	7	**Creativity and Innovation** **7–1** Introduction **7–2** Creativity and innovation definitions, classifications of inventions, and factors in creativity **7–3** Creativity climate, ways and guidelines to develop creativity and creative problem solving process **7–4** Types of barriers to creative thinking, management barriers to creativity and innovation prevention reasons **7–5** Individual creative person engineer and manager characteristics; attributes of manager of creative people; and a noncreative person's characteristics **7–6** New idea generation, presentation, evaluation and elimination **7–7** Creativity methods **7–8** Problem

14	Main references: B. S. DHILLON, ENGINEERING AND TECHNOLOGY MANAGEMENT TOOLS AND APPLICATIONS
15	Additional references: 1:Project Management for Business, Engineering and Technology , John M. Nicholas and Herman Steyn, 3th Edition. 2: Engineering Economic Analysis, Donald G. Newnan, 9th Edition.

No	Course Information (2019-20)	
1	Unit name:	Modern Electronic Communication Systems I
2	Code:	EcE 51012
3	Classification:	Engineering subject
4	Credit value:	2.5 (2-1-0)
5	Semester/ Year Offered:	1/5
6	Pre-requisite:	Communication Principle, Computer Communication, Digital Communication
7	Mode of delivery:	Lecture, Tutorial, Assignment
8	Assessment system and breakdown of marks:	
	Tutorial	15%
	Assignment	15%
	Examination	70%
9	Academic staff teaching unit:	Department of Electronic Engineering
10	Course outcome of unit: In this course, students will be able to: (a) Discuss principles and operation of several modern electronic communication systems: (fiber optics communications, digital multiplexing, satellite communications, radar systems) (b) Apply the appropriate principles and techniques to determine parameters for several modern electronic communication systems. (c) Design the link budget for the satellite communication and fiber optics communication systems.	
11	Synopsis of unit: The course covers the Principle of Electronic Communication Systems. The course also introduces to the types of digital multiplexing, satellite communication, radar systems and fiber optics communications.	
12	Topics: o Optical Fiber Communications ▪ Block diagram of optical fiber communications system ▪ Optical fiber types ▪ Light propagation ▪ Losses in fiber cables	

	▪ Light sources ▪ Optical sources ▪ Light detectors ▪ Optical Link Budget o Digital Multiplexing ▪ TDM ▪ T1 Digital carrier ▪ Digital carrier line encoding ▪ T carrier systems ▪ Digital carrier frame synchronization ▪ Interleaving ▪ FDM ▪ WDM o Satellite Communications ▪ Kepler's laws ▪ Satellite orbits ▪ Geosynchronous satellites ▪ Antenna look angles ▪ Satellite antenna radiation pattern ▪ Satellite system link model ▪ Satellite system parameters ▪ Satellite system link equations ▪ Satellite system link budget o Radar Systems ▪ Radar classifications ▪ Radar Equation ▪ Radar cross section ▪ Pulsed radar ▪ CW or Doppler radar ▪ FM CW radar ▪ Direction finding and tracking ▪ MTI radar ▪ SAR radar
13	Main references: 1. Advanced Electronic Communication Systems, 6th Edition, Wayne Tomasi 2. RF and Microwave Wireless Systems, Kai Chang
14	Additional references: 1. Kennedy's Electronic Communication Systems, 5th Edition, George Kennedy Bernard Davis SRM Prasanna

No	Course Information (2019-2020)	
1	Unit name:	Microwave Engineering I
2	Code:	EcE-51013
3	Classification:	Engineering subject
4	Credit value:	3 (2-1-1)
5	Semester/ Year Offered:	1/5
6	Pre-requisite:	Engineering Electromagnetic
7	Mode of delivery:	Lecture, Practical
8	Assessment system and breakdown of marks:	Tutorial, Assignment, Lab Report, Exam
	Tutorial and Assignment	10%
	Practical	20%
	Mid-term/ final Examination	70%
9	Academic staff teaching unit:	Department of Electronic Engineering
10	Course outcomes of unit: In this course students will be able to 1. Derive the wave equations and find the parameters and the fields of plane waves 2. Solve the transmission line problems 3. Design impedance matching networks 4. Simulate smith chart operation and impedance matching using MATLAB	
11	**Synopsis of unit:** This course covers the fundamental concepts of electromagnetic fields and transmission lines. This course includes electromagnetic theory, transmission line theory, impedance matching and tuning. Successful completion of this course will allow students to study more advanced topics in the area of microwave engineering.	
	Topic: **Chapter** **Title** **1** **Electromagnetic Theory** 1.1 Introduction to Microwave Engineering 1.2 Maxwell's Equations 1.3 Fields in Media and Boundary Conditions 1.4 The Wave Equation and Basic Plane Wave Solutions 1.5 General Plane Wave Solutions 1.6 Energy and Power 1.7 Plane Wave Reflection from a Media Interface **2** **Transmission Line Theory** 2.1 The Lumped-Element Circuit Model for a Transmission Line 2.2 Field Analysis of Transmission Lines 2.3 The Terminated Lossless Transmission Line 2.4 The Smith Chart	

	2.5 The Quarter-Wave Transformer 2.6 Generator and Load Mismatches **5 Impedance Matching and Tuning** 5.1 Matching with Lumped Elements (L Networks) 5.2 Single-Stub Tuning 5.3 Double-Stub Tuning 5.4 The Quarter-Wave Transformer 5.5 The Theory of Small Reflections
14	**Main references:** 1. Antenna Theory Analysis and Design, Third Edition, Hoboken, New Jersey. 2. Digital Microwave Communication, John Anderson.
15	Additional references: J. W. Crispin and K. M. Siegel, Eds., Methods of Radar Cross-Section Analysis, Academic Press, New York and London, 1968.

Information on Lab Practical (EcE-51013 Microwave Engineering) 2019-2020

Lab	Activity
1	**Experiment I: Short-circuited and Open-circuited Transmission Line** **Objective:** ➢ To plot voltage, current and impedance characteristics of short-circuited and open-circuited transmission line using MATLAB **Equipment Required:** Computer, MATLAB Software
2	**Experiment II: Basic Smith Chart Operation using MATLAB** **Objective:** ➢ To be able to apply MATLAB scripts ➢ To plot the VSWR circle, load impedance and input impedance on smith chart **Equipment Required:** ➢ Computer, MATLAB Software
3	**Experiment III: Basic Smith Chart Operation (Admittance) using MATLAB** **Objective:** ➢ To be able to apply MATLAB scripts ➢ To plot the VSWR circle, load impedance and input impedance on smith chart **Equipment Required:** ➢ Computer, MATLAB Software
4	**Experiment IV: Single-Stub Series Tuning** **Objective:** ➢ To perform impedance matching **Equipment Required:** ➢ Computer, MATLAB Software
5	**Experiment V: Single-Stub Shunt Tuning** **Objective:** ➢ To perform impedance matching **Equipment Required:** ➢ Computer, MATLAB Software

No	Course Information (2019-2020)	
1	Unit name:	PLC Programming Methods and Techniques
2	Code:	EcE-51033
3	Classification:	Engineering subject
4	Credit value:	3 (2-0-2)
5	Semester/ Year Offered:	1/5
6	Pre-requisite:	Digital Control System, Industrial Electronic & Control, Modern Control System, Modeling and Control, Digital Electronics, Fundamental of Electronic Circuit, Technical programming
7	Mode of delivery:	Lecture, Computer application, Demonstration
8	Assessment system and breakdown of marks:	Practical and Lab report, Tutorial/Assignment Exam
	Practical and lab report	20%
	Tutorial/Assignment	10%
	Examination	70%
9	Academic staff teaching unit:	Department of Electronic Engineering
10	Course outcome of unit: In this course, students will be able to (1) Apply the PLC information and techniques (2) Design the system using PLC programming methods and techniques (3) Follow the simulation using TIA portal including PLCSIM, by building the logical programs for the Industrial Automation System	
11	Synopsis of unit: The course introduces students to the study of the control system, its methods and logical programming. Course covers the designing program with the programmable logic controller. This course can be applied in automation and any other various applications.	
12	Topic: 1 Programmable Logic Controller 2 Input – output devices 3 Digital systems 4 I/O processing 5 Ladder and functional block programming 6 IL, FSC and ST programming methods 6.1 Instruction lists 6.1.1 Ladder programs and instruction lists 6.1.2 Branch codes 6.1.3 More than one rung 6.1.4 Programming examples 6.2 Sequential function charts 6.2.1 Branching and convergence 6.2.2 Actions 6.3 Structured text 6.3.1 Conditional statements	

	6.3.2 Iteration statements 6.3.3 Structured text program 7 Internal relays 7.1 Internal relays 7.2 Ladder programs 7.2.1 Programs with multiple input conditions 7.2.2 Latching programs 7.3 Battery-backed relays 7.4 One-shot operation 7.5 Set and reset 7.5.1 Program examples 7.6 Master control relay 7.6.1 Examples of programs 8 Jump and call 8.1 Jump 8.1.1 Jumps within jumps 8.2 Subroutines 9 Timers 9.1 Types of timers 9.2 Programming timers 9.2.1 Sequencing 9.2.2 Cascaded timers 9.2.3 On-off cycle timer 9.3 Off-delay timers 9.4 Pulse timers 9.5 Programming examples 10 Counters 10.1 Forms of counter 10.2 Programming 10.2.1 Counter application 10.3 Up and down counting 10.4 Timers with counters 10.5 Sequencer
	Main references: Programmable Logic Controller, 4th edition, W. Bolton, Jordan Hill, 2006
15	Additional references: 1. S7-1200 Easy Book Manual, Siemen 2. S7 -1200 Programmable Controller, System Manual, Siemen 3. Sysmac CP1L/CP1E Introduction Manual, Omron

Lab	Information on Practical (PLC Programming Methods and Techniques)
1	Topic: How to use **TIA Portal** Task: ❖ To use the TIA Portal software Resource: **Computer, TIA Portal v13 Software**
2	Topic: How to use TIA Portal including **PLCSIM** Task: ❖ To use the TIA Portal including PLCSIM software ❖ To follow the simulation to use the ladder programming language with the PLC software (TIA Portal) Resource: **Computer, TIA Portal software, PLCSIM**
3	Topic: Siemens TIA Portal Tutorial (AND & OR Program) (Logic gates) Task: ❖ To follow the simulation to use the ladder programming language with the PLC software (TIA Portal) Resource: **TIA Portal v13, PLCSIM, S7-1200 CPU module**
4	Topic: Siemens TIA Portal Tutorial (TON & TOF Program) Task: ❖ To get the concept of the timer ❖ To follow the simulation to use the ladder programming language with the PLC software (TIA Portal) Resource: **TIA Portal v13, PLCSIM**
5	Topic: Siemens TIA Portal Tutorial (CTU & CTD Program) Task: ❖ To get the concept of the counter ❖ To follow the simulation to use the ladder programming language with the PLC software (TIA Portal) Resource: **TIA Portal v13, PLCSIM**

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