Course Name : **Diploma in Electronics Engineering**
Course Code : **DElnE**
Semester : **Fifth**
Subject Title : **Analog Communication**
Subject Code : **133EX51**

Teaching and Examination Scheme:–

Teaching Scheme			Paper Hours	Examination Scheme											Total Marks
L	T	P		Theory		Test	Total		P		OR		TW		
				Max	Min		Max	Min	Max	Min	Max	Min	Max	Min	
3	-	3	3	80	32	20	100	40	25	10			25	10	150

Rationale:–

Communication plays vital role in our lives. Development in communication technology have increased its applications in allied fields of electronics including satellite, mobile, RADAR, telephony, telegraphy, industrial controls, etc. It is the technology subject which expert the student to understand the operation and faultfinding of AM & FM transmitter, AM & FM radio receiver & identifying different antennas.

Objectives:–

The student should able to
1. Classify different types of communication system.
2. Explain electromagnetic spectrum.
3. Describe amplitude modulation & its types.
4. Identify different section in radio receiver.
5. Troubleshooting AM / FM radio receivers
6. To describe FM.
7. Compare AM & FM.
8. Describe different parameter of transmission line and their radiation pattern.
9. Describe different types of wave propagation and their application.

Learning Structure:-

Syllabus

Sr. No	Contents	L	M
	Section I		
1	Introduction to electronic communication 1.1 Importance 1.2 Block diagram of communication system 1.3 Modulation 1.3.1 Need for modulation 1.4 Types of Electronics communications 1.4.1 Simplex 1.4.2 Duplex – Full & Half 1.4.3 Digital	03	05

	1.4.4 Analog 1.5 Applications of communication 1.6 The electromagnetic spectrum (different bands & their frequencies) 1.7 Concept of Transmission bandwidth.		
2	Amplitude modulation & Frequency modulation 2.1 Definition 2.2 Modulation index – definition, its effect on modulated signal, simple numerical. 2.3 Mathematical representation of amplitude modulated wave & its meaning (concept of sidebands) 2.4 Bandwidth requirement 2.5 Representation of AM signal in time & frequency domain. 2.6 Power relation in AM wave, simple numerical. 2.7 Frequency modulation (definition) 2.8 Definition – Deviation ratio, max. Deviation ratio. 2.8 Mathematical representation of frequency modulation and its meaning. 2.9 Representation of frequency modulated signal in time domain and frequency domain. 2.10 Bandwidth requirement – simple numerical 2.11 FM signal generation using reactance modulator circuit (transistorized). 2.12 Concept with graph-pre emphasis and de-emphasis. 2.13 Block diagram of FM transmitter explanation with waveform (Armstrong frequency modulation system)	09	15
3	Radio receivers (AM & FM) 3.1 Principle of heterodyne 3.2 Block diagram of super heterodyne receiver and its working with waveforms. 3.3 Characteristics of AM radio receiver- Sensitivity, Selectivity, and Fidelity. 3.4 Demodulation of AM signal. 3.5 Need of AGC and its type – simple, delayed (with graph) 3.6 Block diagram of FM receiver explanation with waveform. 3.7 FM Detector – slope detection, transformer action at above & below resonance ratio detector (diode circuit), PLL (block diagram and operation) explanation with vector diagram.	12	20
Section II			
4	Transmission lines 4.1 Fundamentals of transmission line. 4.2 Equivalent circuit of transmission line 4.2.1 General equivalent circuit 4.2.2 RF equivalent circuit 4.3 Characteristics impedance, methods of calculations & simple numerical. 4.4 Losses in transmission line. 4.5 Standing wave – SWR, VSWR, Reflection coefficient, simple numerical.	09	15

	4.6 Quarter wave & half wavelength line 4.6.1 Impedance inversion by quarter wavelength line 4.6.2 Quarter wave transformer & impedance matching 4.6.3 Properties of line of various lengths. 4.7 Impedance matching 4.7.1 Stubs – single & double 4.7.2 Baluns		
5	Antennas 5.1 Antennas fundamentals. 5.1.1 Radiation mechanism. 5.1.2 Concept & definition of polarization, bandwidth, beam width, antenna resistance, directivity, antenna gain, power density. 5.2 Dipole antenna 5.2.1 Half wave dipole antenna 5.2.2 Radiation pattern 5.3 Folded dipole antenna & its radiation pattern.	09	15
6	Wave Propagation 6.1 Fundamental of electromagnetic wave. 6.2 Transverse electromagnetic wave, polarization. 6.3 Ground wave 6.4 Ionosphere 6.5 Sky wave propagation 6.6 Concept of actual height and virtual height. 6.7 Definition – critical frequency, max. useable frequency, skip distance, fading 6.8 Space wave propagation. 6.9 Duct propagation 6.10 Troposphere scatter propagation	06	10
	Total	**48**	**80**

Practical list:

(Any Ten)

1. Observe AM the AM Signal on Spectrum Analyzer
2. Observe FM wave & calculate modulation index.
3. Visit to transmitter station & prepare a report.
4. Draw the circuit diagram & layout of AM radio receiver.
5. Voltage waveform analysis at various points in AM radio receiver.
6. Observe input & output waveforms of AM detector.
7. Plot graph of sensitivity of receiver.
8. Plot graph of selectivity of receiver.
9. Plot graph of fidelity of receiver.
10. Fault finding of AM radio receiver.
11. Create two faults in each section OR fault finding in FM radio receiver, Createtwo faults in each section
12. Prepare a report on different types of radio receivers available in market. Find out their specifications, IC used etc
13. FM detector characteristics.

14. Measure the length of directors, reflectors, dipoles and spacing between them of Yagi uda antenna and compare with the theoretical value.
15. Plot the directional pattern of given antenna.

Learning Resources:-
Industrial visit for different companies related with AM and FM transmission, Transmission line manufacturer, Smart Antenna manufacturer etc.

Recommended Books:-
Text Books: -
1) Electronic Communication Systems, 4th Edition by George Kennedy, and Davis, Tata McGraw-Hill
2) Communication Electronics, 4th Edition by Louis E. Frenzel, Tata McGraw-Hill

Reference Books:-
1) Electronic Communications, 4th Edition by Roddy & Collen , Prentice Hall India Pvt. Ltd.
2) Electronic Communication Systems, 2nd Edition by Blake, Delmar Cengage Learning.
3) Analog & Digital Communication, 1st Edition by Hsu & Mitra, Tata McGraw-Hill.
4) Electronic Communication Systems Fundamental Through Advanced, 5th Edition, by Wayne Tomasi, Pearson Education.

Course Name : **Diploma in Electronics Engineering**
Course Code : **DElnE**
Semester : **Fifth**
Subject Title : **Microprocessor**
Subject Code : **133EX52**

Teaching and Examination Scheme:–

Teaching Scheme			Paper Hours	Examination Scheme											Total Marks
L	T	P		Theory		Test	Total		P		OR		TW		
				Max	Min		Max	Min	Max	Min	Max	Min	Max	Min	
3	-	3	3	80	32	20	100	40	50	20	25	10	25	10	175

Rationale:–

Microprocessors have a wide range of applications in most of the consumer, industrial and computer industries. 8085 is the 8-bit CPU and 8086 is the 16-bit CPU. 8085 and 8086 is the base of all upward developed processors.
This subject covers basics, architecture, instruction set and programming of 8085. It Also covers interfacing with memory devices & Introduction & Architecture of 8086.

Objectives:–

Students will be able to:
1) Draw block diagram for architecture of 8085.
2) Write syntax of given instructions along with their timing diagram.
3) Describe concepts of Stack, Subroutine, Interrupts and Control signal.
4) Write the Assembly Language Program for given problem statements.
5) Interface of microprocessor with memory chips and Interfacing Devices.
6) Introduction of 8086 Microprocessor.
7) Able to compare 8086 with 8085.

Learning Structure:-

Syllabus

Part I:- Theory

Sr. No	Contents	L	M
	Section I		
1	**Introduction to 8085 Microprocessor:** 1.1 Hardware, software, Bus, Address Bus, Data Bus, control Bus, Comparison of machine language, assembly language and high-level language. Microprocessor, Microcomputer and Micro controller comparison and their application areas. 1.2 Schematic diagram of microcomputer.General function of microprocessor and interfacing devices like latches, buffers, decoders, encoders. 1.3 Evolution of microprocessors. 1.4 Silent features of 8085 Microprocessor,	12	20

	1.5 Architecture of 8085 microprocessor. 1.6 Pin definition of 8085 microprocessor.		
2	**8085 Instructions Set, Programming and Timing Diagrams:** 2.1 Instruction Format (one byte, two byte and three byte instruction), Addressing modes of 8085, 8085 Instruction set (Arithmetic, logical, data transfer, program control transfer, Machine control, I/O control), Instructions related with interrupts. 2.2 8085 programming with examples. 2.3 Definition of machine cycle (Fetch Cycle and Execution Cycle), T state and Instruction cycle, calculation of time delay. Timing diagram of opcode fetch cycle or Memory read cycle, Memory write, I/O read and I/O write cycle, MVI A, 8 bit data, LXI rp, 16 bit data, STA, 16 bit address.	12	20
	Section II		
3	**8085 Stack, Subroutine, Interrupts and Control signal:** 3.2 Concept of stack, subroutine and interrupts. CALL and RET instruction Hardware and software interrupts, maskable and non-maskable interrupts, vectored interrupts. Hardware structure of the interrupts of 8085. 3.3 Demultiplexing of address and data bus by ALE signal. 3.4 Generation of system control signals (MEMR, MEMWR, IOR,IOW) using SSI and MSI	10	20
4	**8085 Interfacing with Memory and Interfacing Devices:** 4.1 Address decoding techniques 4.2 Simple example of RAM/ROM memory interfacing with microprocessor 4.3 Comparison of I/O mapped I/O & memory mapped I/O system 4.4 Block diagram, function of each block and interfacing of following peripheral chips with the 8085 Microprocessor. 8155 - Multi-purpose programmable device, 8255 - Programmable peripheral interface. 4.5 Interfacing example: - Traffic Light Controller. - Temperature Controller. - Speed control of Stepper Motor. - Level Controller. 4.5 Introduction of 8086 Microprocessor. 4.6 Comparison of 8085 with 8086 Microprocessor.	14	20
	Total	**48**	**80**

Part II:- Practicals

Skills to be developed –

Intellectual skills–

Ability to understand how the Microprocessor logically works.
To be able to apply different logics to solve given problem.
To be able to write program using different logic for the same problem

Motor skills –

To load the program in microprocessor kit.
To observe the result in register stacks.

List of Laboratory Experiments:-

Write an Assembly Language Program to
1) Add / Sub two 8 bit numbers.
2) Add/ Sub of two Multibyte numbers. e.g. Two 3 Byte Numbers.
3) Find sum of series of 8 bit numbers.
4) Multiply two 8 bit numbers.
5) Divide two 8 bit numbers.
6) Add / Sub two BCD numbers.
7) Find No. of 0's and 1's from 8 bit Binary number.
8) Transfer block of data from Source memory location to Destination memory location.
9) Find smallest/ largest number from array of n numbers.
10) Arrange numbers in array in ascending/ descending order.
11) Find one's and two's complement of a given number.
12) Write Assembly Language Programme to exchange the lower & upper nibble of a byte.
13) Sort odd and even byte from given 10 bytes.

Learning Resources:-

Text Books: -

1) Microprocessor Architecture, Programming, and Applications with the 8085, 5th Edition by Ramesh S. Gaonkar, Penram Internation Publisher.
2) Microprocessors & Interfacing, 2nd Edition by Douglas V Hall, Tata McGraw – Hill Publications.

Reference Books:-

1) 8085 Microprocessor Programming & Interfacing, 1st Edition by N K Srinath, Prentice Hall of India Pvt. Ltd.
2) Fundamentals of Microprocessor and Microcomputers, 1st Edition by B Ram, Dhanpat Rai and Sons.

Course Name : **Diploma in Electronics Engineering**
Course Code : **DElnE**
Semester : **Fifth**
Subject Title : **Control System**
Subject Code : **133EX53**

Teaching and Examination Scheme:-

Teaching Scheme			Paper Hours	Examination Scheme											Total Marks
L	T	P		Theory		Test	Total		P		OR		TW		
				Max	Min		Max	Min	Max	Min	Max	Min	Max	Min	
3	-	2	3	80	32	20	100	40	50	20	-	-	25	10	175

Rationale:-

The advancement of both knowledge and technique has resulted in the development of controls in process industry. The progression of human existence from a primitive state to the present complex technological world was paced by learning new and improved methods to control the environment.

Objectives:-

The student will be able to:

1. Learn and understand about open loop and closed loop systems.
2. Feedback control and Modeling of Systems (Transfer Function).
3. Steady state, time response, and frequency response analysis.
4. Concept of stability

Syllabus

Part I:- Theory

Sr. No.	Contents	L	M
	Section I		
1	**Overview of Control Systems** - Introduction - Types of Control Systems with examples Open Loop & Closed Loop Control Systems: Definition, Block Diagram, Linear & Nonlinear Systems Time Varying & Invariant Systems Discrete and Analog Systems	04	06

2	**Mathematical Modeling of Dynamic Systems** - Introduction - Modeling in Frequency Domain (Transfer Function Approach for RLC circuits) - Block Diagram Reduction Algebra, Signal Flow Graphs and Mason's GainFormula	8	14
3	**Time Domain Analysis** - Laplace Transforms of Standard Test Signals: unit step, unit ramp, unit parabolic and unit impulse. - Transient response of first order system to standard test inputs - Transient response of Second order system to unit step input. - Time Domain Performance Specifications.(no derivation) - Steady-state Error Analysis "Type" of the systems, Static Error Coefficients and Steady-State Errors.	12	20
	Section II		
4	**Root locus method** - Root locus concept, rules and construction of approximate (without scale) root loci.	05	08
5	**Stability Analysis** - Concept of Stability, Routh-Hurwitz stability criterion, Relative stability	05	08
6	**Frequency Domain Analysis** - Frequency domain specifications(no derivation) - Relationship between Time and Frequency domain specifications. - Bode Plots, Polar Plots, Gain margin and phase margin - Nyquist Stability criterion	14	24
	Total	**48**	**80**

Part II:- Practicals

List of Laboratory Experiments:-

1. Time response of First order systems.
2. Time response of Second order systems (Over damped).
3. Time response of Second order systems (Critically damped).
4. Time response of Second order systems (under damped).
5. Bode Plot of First order systems.
6. Bode Plot of Second order systems (Over damped).
7. Bode Plot of Second order systems (Critically damped).
8. Bode Plot of Second order systems (under damped).
9. Determination of Transfer Function by Drawing Bode Plot

Learning Resources:-

Text Books:-

1) Modern Control Engineering, 4th Edition by Katsuhiko Ogata, Prentice Hall Of India Ltd.
2) Control Systems Engineering, 5th Edition by I J Nagrath and M Gopal, New Age International.

Reference Books:-

1) Control Systems Engineering, 5th Edition by Norman S Nise, Wiley India Pvt.Ltd.
2) Automatic Control System, 8th Edition by B C Kuo and F Golnaraghi, Wiley India Pvt. Ltd.

Course Name : **Diploma in Electronics Engineering**
Course Code : **DElnE**
Semester : **Fifth**
Subject Title : **Power Electronics**
Subject Code : **133EX54**

Teaching and Examination Scheme:-

Teaching Scheme			Paper Hours	Examination Scheme											Total Marks
				Theory		Test	Total		P		OR		TW		
L	T	P		Max	Min		Max	Min	Max	Min	Max	Min	Max	Min	
3	-	2	3	80	32	20	100	20	25	10	-	-	25	10	150

Rationale:-

This subject is classified under technology group. It intends to teach operating principles and applications of power electronic devices like diac, triac, power transistor, power MOSFET, IGBT. It also teaches polyphase rectifiers, and controlled rectifiers. This subject knowledge is required in power electronics and drives. Understanding of this subject will provide skills to control drives and understand various power devices.

Objectives:-

The students should be able to:
1. Draw V/I characteristics of power electronic devices.
2. Describe the turn on / off methods of Thyristor.
3. Draw polyphase controlled rectifiers and their waveforms.
4. Explain working principle of controlled rectifiers.

Syllabus

Part I:- Theory

Sr. No	Contents	L	M
	Section I		
1	**Power Electronics Devices :** 1.1 Power transistor(BJT), power MOSFETS, SCR, TRIAC, SUS, SCS, SBS, LASCR, DIAC, PUT, IGBT 1.2 Construction, working and static V/I characteristics of above devices. 1.3 Two transistor analogy of SCR.	07	12
2	**Turn ON & Turn OFF methods of Thyristor:** 2.1 Line synchronization of gate pulses. 2.2 Turn on methods – Forward Voltage triggering, Gate triggering, dv/dt triggering, thermal triggering, pulse triggering. 2.3 Gate trigger circuits – Resistance firing circuit, SCR triggering using UJT/PUT, Pulse Transformer and Diac. 2.4 Thyristor Protection: Introduction to Snubber Circuit. 2.5 Class A,B,C,D,E & F turn off (commutation) methods of thyristor	07	12

3	**Phase controlled Rectifiers (Converters):** Circuit diagram and waveforms of: 3.1 Single phase half wave controlled rectifier (one quadrant) with R, RL load. Effect of free wheeling 3.2 Single phase full wave fully controlled rectifier (two –quadrant converters) 3.3 Bridge configuration. 3.4 Need and Use of Polyphase Rectifiers. 3.5 Circuit diagram & waveforms of 3Ø half wave Delta – Wye rectifier. 3.6 Applications.	10	16			
	Section II					
4	**Choppers:** 4.1 Introduction 4.2 Principle of Chopper, Step down and Step up chopper 4.3 Control Techniques: Constant & Variable Frequency method 4.4 Choppers Classifications: Class A, Class B, Class C, Class D, Class E (Quadrant operations) 4.5 Voltage Commutated chopper with waveforms. 4.6 Applications of chopper	10	16			
5	**Inverters:** 5.1 Introduction 5.2 Classifications: 1 & 3 Phase, Line & Forced commutated Inverters, Series Parallel and Bridge Inverters 5.3 Series Inverter: Operation of Basic Series Inverter, Modified Series Inverter. 5.4 Parallel Inverter: Operation of Basic Parallel Inverter with waveforms. 5.5 Single Phase Bridge Inverter: Half and Full Bridge. 5.6 Output Voltage Control by Sinusoidal Pulse Width Modulation. 5.7 Applications	10	16		06	10
6	**Cyclo converters:** 6.1 1Φ & 3Ø, Principle of Operation of step up and step down Cyclo converters with Input / Output Waveforms. 6.2 Applications.	04	08			
	Total	**48**	**80**			

Part II:- Practicals

Practical: Skills to be developed:

Intellectual skills:

1. Able to select proper instruments
2. Compare the characteristics under various conditions

Motor skills:

1. Make accurate measurements
2. Adjust the meters to read zero at start
3. Draw graphs

A) List of Laboratory Experiments:-

1) To study and plot the characteristics of SCR.
2) To study and plot the characteristics of DIAC.
3) To study and plot the characteristics of TRIAC.
4) To study and plot the characteristics of PUT.
5) PUT relaxation oscillator.
6) SCR firing circuit using PUT relaxation oscillator.
7) Single Phase Filament Lamp Light Dimmer using TRIAC.
8) Single Phase Half & Full wave converter (with R, RL and RL with FWD load).
9) Three Phase Converter with R & RL load.
10) Parallel Inverter
11) Modified Series Inverter
12) Half and Full Bridge Inverters (with R, RL, underdamped and overdamped loads)
13) Step down and Step up variable dc power supply using chopper.
14) Speed control of separately excited dc motor by using type A chopper circuit.

B) Mini project:

Develop single phase light dimmer circuit using Diac and Triac.

Learning Resources:

Text Books:

Power Electronics, by Dr. P S Bimbhra, 6th Edition, Khanna Publishers.

Reference Books:

1) Power Electronics, by M D Singh & K B Khanchandani 2nd Edition, Tata McGraw-Hill Publishing Company Limited.
2) Power Electronics: Circuits, Devices and Applications, 3rd Edition, by M H Rashid, Pearson.
3) GEC SCR Manual, 6th Edition.
4) Power Control Circuits Manual, 1st Edition by R M Marston, BPB Publications.

Websites:

Laboratory Experiments Manual:

1) http://www.ssit.edu.in/dept/assignment/pelabmanual.pdf
2) http://www.ee.iitgp.ernet.in/faci_pe.php
3) http://www.ece.umn.edu/groups/power/labs/pe/pe_manual.pdf

Course Name : **Diploma in Electronics Engineering**
Course Code : **DElnE**
Semester : **Fifth**
Subject Title : **Biomedical Engineering**
Subject Code : **133EX55E1**

Teaching and Examination Scheme:-

Teaching Scheme			Paper Hours	Examination Scheme											Total Marks
L	T	P		Theory		Test	Total		P		OR		TW		
				Max	Min		Max	Min	Max	Min	Max	Min	Max	Min	
3	-	2	3	80	32	20	100	40	-	-	25	10	25	10	**150**

Rationale:

The main objective of introducing this subject in the diploma course of Electronics is to expose the student with fundamental knowledge on Modern Engineering practices that require adequately precise and fast measurement. Recent advances in medical field have been fuelled by the instruments developed by the Electronics and Instrumentation Engineers.

This subject will enable the students to learn the basic principles of different instruments/equipment used in the health care industry. The practical work done in this area will impart skill in the use, servicing and maintenance of these instruments/equipment. Proficiency in this area will widen the knowledge and skill of diploma holders in the field of biomedical instrumentation.

Objectives:

Student will be able to:

1. Understand the Basic Principle of Measurement.
2. Understand the basic principles of sensors and transducers
3. Exploit sensors & transducers for measurement of large number of variables.
4. Select the most suitable transducer based on its performance characteristics, for specific measuring tasks.
5. Select the appropriate transducers/sensor for various applications of Measurement of non-electrical quantity in Industrial process
6. Understand the process of Data acquisition.
7. Compare different types of transducer on their performance characteristics and applications

Syllabus

Part I:- Theory

Sr. No.	Contents	L	M
	Section I		
01	**Biopotential Measurement:** Electrode-Electrolyte interface, half-cell potential, Polarization- polarizable and nonpolarizable electrodes, Ag/AgCl electrodes, Electrode circuit model; motion artifact.	09	15

	Body Surface recording electrodes for ECG, EMG, and EEG. Internal Electrodes: needle and wire electrodes. **Micro electrodes-** metal microelectrodes, Electrodes for electric stimulation of tissue Selection & specifications for the bio transducers to measure parameters, Biosensors Ergonomic Design: Ergonomic science and its importance in medical Instrument Design		
02	**Cardiovascular System:** Heart Structure, Cardiac Cycle, ECG Theory, ECG Electrodes, Electrocardiograph, Vectorcardiograph Analog Signal Processing of Biosignals, Interference Reduction, Rate Measurement, Introduction to pacemakers	06	10
03	**Cardiovascular Measurements:** Heart Sounds, Phonocardiography, Blood Pressure Measurement (Invasive and Noninvasive), Blood Flow meters: Magnetic, Ultrasonic, Cardiac Output Measurement (dye dilution method) **Classification of muscles:** Muscle contraction mechanism, Myoelectric voltages, Electromyography (EMG)	09	15
	Section II		
04	**Central Nervous System:** Brain & its parts, different waves from different parts of the brain, brain stem, cranium nerves, structure of neuron, Neuro muscular transmission, Electroencephalography, Evoked Response, EEG amplifier	06	10
05	**Special Senses:** Ear: Mechanism of Hearing, Sound Conduction System, Basic Audiometer; Pure tone audiometer; Evoked response Audiometer system, Hearing Aid. Vision: Anatomy of Eye, Visual acuity, (Errors in Vision,) Slit Lamp, Tonometer, ophthalmoscope, Perimeter.	07	12
06	**Respiratory Instrumentation:** Natural Process of Breathing, O2 and CO2 Transport, Regulation of Breathing, Spirometers, airflow measurement, Ventilators	07	12
07	**Safety Aspect of Medical** Gross current, Micro Current shock, safety standards rays and considerations, safety testing instruments, biological effects of X-rays and precautions	04	06
	Total	**48**	**80**

Part II:- Practicals

List of Laboratory Experiments:

1. To Study and Check Specifications of an ECG Recorder.
2. Concept of ECG system and placement of electrodes
3. Use of sphygrmanometer for measurement of blood pressure
4. Calibration of BP apparatus
5. Study of Audiometer

6. To record/monitor heart sounds using Electronic Stethoscope
7. To Develop a Photo-plethysmography Sensor for Pulse Rate Measurement
8. To Develop a Flow Type Sensor Using Thermistor for Expiratory Volume Measurement
9. To Design and Implement an ECG Amplifier
10. To Implement a Heart Rate Meter
11. To Study EEG/EMG 12
12. To Study Ophthalmic instruments

Learning Resources:

Text Books:

1. Leslie Cromwell, Biomedical Instrumentation and Measurements, 2nd Edition, Pearson Education, 1980.
2. Joseph J. Carr and John M. Brown, Introduction to Biomedical Equipment7 Technology, PHI/Pearson Education, 4th edition, 2001.
3. M.Arumugam, 'Bio-Medical Instrumentation', Anuradha Agencies, 2003.
4. L.A. Geddes and L.E.Baker, 'Principles of Applied Bio-Medical Instrumentation', John Wiley & Sons, 1975.

Reference Books:

1. J.Webster, 'Medical Instrumentation', John Wiley & Sons, 1995.
2. Richard Aston, ìPrinciples of Biomedical Instrumentation and Instrumentsî, 1991.
3. R. S. Khandpur, ìBiomedical Instrumentationî, TMH, 1994

Course Name : **Diploma in Electronics Engineering**
Course Code : **DElnE**
Semester : **Fifth**
Subject Title : **PLC & SCADA**
Subject Code : **133 EX55E2**

Teaching and Examination Scheme:–

Teaching Scheme			Paper Hours	Examination Scheme											Total Marks
				Theory		Test	Total		P		OR		TW		
L	T	P		Max	Min		Max	Min	Max	Min	Max	Min	Max	Min	
3	-	2	3	80	32	20	100	40	-	-	25	10	25	10	150

Rationale:–

The advancement of both knowledge and technique has resulted in the development of PLC's in process industry. The progression of human existence from a primitive state to the present complex technological world was paced by learning new and improved methods to control the industrial processes.

Objectives:-

Student will be able to:

1. Explain the operation of relays, pushbuttons, limit switches, and other basic control devices. Using ladder diagrams, design basic motor control circuits.
2. Describe the hardware of a PLC, identifying the functions of the main components.
3. Read and interpret ladder logic diagrams for specified control jobs.
4. Properly configure a PLC, including choosing appropriate addressing for I/O for a specified application.

Syllabus

Part I:- Theory

Sr. No	Contents	L	M
	Section I		
1	**Ladder Diagram Fundamentals** Basic Components and Their Symbols: Control transformers, Fuses, Switches, Indicator lamps, Relays, Timers. Fundamentals of Ladder Diagrams. Machine Control Terminology.	04	08
2	**Programmable logic controller** Basic history PLC Configurations Programmable Controller Input / output Modules Power supply Programming unit System Block Diagram	04	08

3	**Fundamental PLC programming** Physical Components vs. Program Components PLC wiring diagram Ladder diagram for basic logic circuits and their hardware connections(AND,OR, XOR--etc) Oscillator Holding (also called Sealed, or Latched) Contacts Ladder Diagrams Having More Than One Rung	08	12
4	**Advanced Programming Techniques** Introduction Ladder program Execution sequence RS Flip Flop One shot D Flip Flop, T Flip Flop, JK Flip Flop Timers and Counters Sequences Data Transfer Instructions	08	12
	Section II		
5	**Mnemonic Programming Code** Introduction AND Ladder Rung Handling Normally Closed Contacts OR Ladder Rung Simple Branches Complex Branch	05	08
6	**Wiring Techniques** PLC Power Connection Input Wiring Inputs Having a Single Common Output Wiring Relay Outputs Solid State Outputs	05	08
7	**Analog I/O** Introduction Analog (A/D) Input Analog (D/A) Output Analog Data Handling Analog I/O Potential Problems	05	08
8	**Discrete Position Sensors** Sensor Output Classification Connecting Discrete Sensors to PLC Inputs Proximity Sensors Optical Proximity Sensors	05	08
9	**Definition of SCADA** Functional Block Diagram Function of SCADA Communication between PLC and SCADA SCADA Applications	04	08
	Total	**48**	**80**

Part II:- Practicals

1) List of Laboratory Experiments:-

1. Introduction to PLC Components
2. Introduction to Ladder Diagram
3. Ladder Diagram for Logic Gates: AND, OR, NOT, NAND, NOR, Ex-NOR, Ex-OR
4. Flipflops using Ladder logic
5. Timer using Ladder logic
6. Counters using Ladder logic
7. Introduction to Logic Gates for following Applications
8. Adder and Subtractor

2) Perform Exercises on NI Multisim 11 Software Package like:

i) Creating a Ladder Diagram.
ii) AND Rungs and OR Rungs.
iii) Sample circuits: Holding Tank, Conveyor Belt, Traffic Light.

Learning Resources:-

Text Book:
"Programmable Logic Controllers: Programming Methods and Applications", 1st Edition, by John R. Hackworth & Frederick D. Hackworth, Jr., Pearson Education.

Reference Books:
1. Industrial Control Electronics: Devices, Systems and Applications, 2nd Edition, by Terry L. M. Bartelt , Thomson Delmar Learning.
2. Introduction to Programmable Logic Controllers, 2nd Edition, by Gary Dunning, Delmar Thomson Learning.
3. NIIT-Programmable Logic control-Principles and applications Prentice Hall India
4. Madhuchand A Mitra & Samarjit Sen Gupta-Programmable logic controllers and Industrial automation Penram International
5. C D Johnson-Process Control InstrumentationTechnology Prentice Hall India
6. Petruzella- Programmable Logic Controller McGraw Hill

Course Name : **Diploma in Electronics Engineering**
Course Code : **DElnE**
Semester : **Fifth**
Subject Title : **Software Skills**
Subject Code : **133EX56**

Teaching and Examination Scheme:–

Teaching Scheme			Paper Hours	Examination Scheme											Total Marks
L	T	P		Theory		Test	Total		P		OR		TW		
				Max	Min		Max	Min	Max	Min	Max	Min	Max	Min	
1	-	2	-	-	-	-	-	-	-	-	25	10	25	10	50

Rationale:–

This subject will help the students to implement the circuit design and PCB layout before actually fabricating the hardware circuit. Simulation software can also allow the students to change the component values and observe the change in results.

Objectives:–

The students should be able to:

1) Draw the circuit layout on NI Circuit Design Suite (Multisim) software, Proteus Design Suite 8 software & Tina – TI software.
2) Perform simulation and obtain the required observations and results.
3) Compare the results obtained by software simulation with the actual Hardware circuit.
4) Prepare Printed Circuit Board artwork design on NI Ultiboard & Proteus (Advanced Routing and Editing Software) ARES.

Learning Structure:-

Syllabus

Sr. No	Contents	L
1	**NI Circuit Design Suite 13 (Multisim 13):** Selection of component from the master data base, placement of the component in the workbench area, completing the circuit layout, connecting required instruments like power supplies, signal generators, voltmeter, ammeter, Digital Storage Oscillocope etc. Observing and noting the simulation results. Exporting the circuit to the Ultiboard extension and preparing the PCB layout artwork on ultiboard.	5
2	**Proteus 8 Professional Design Suite 8:** Generate schematic capture, develop PCB & simulate microprocessors. Virtual System Modelling (VSM**)** for real time design simulation	5
3	**Tina –TI (The complete Electronic Lab) by Texas Instruments:**	

	Selection of component from the master data base, placement of the component in the workbench area, completing the circuit layout, connecting required instruments like power supplies, signal generators, voltmeter, ammeter, Digital Storage Oscillocope etc. Observing and noting the simulation results	3
4	**PowerEsim software. (Free on line tool for SMPS design)** SMPS circuit and transformer design, input component analysis, input harmonic analysis, essential waveforms, MTBF prediction.	3
	Total	**16**

Practical list:

Simulation of following experiments in Multisim/Proteus/Tina – TI software:

1) 555 IC monostable timer projects.
2) 555 IC astable multivibrator flashing LED projects.
3) Design of fixed regulated power supply using 78XX & 79XX series IC's.
4) Design of adjustable poer supply using LM317 IC.
5) Projects based on Quad comparator IC LM339.
6) Sensors simulation in Proteus.
7) DC transients in RC and RL circuits.
8) Time response of second order RLC underdamped system when subjected to step voltage signal.
9) Time response of RLC undamped system to step input voltage.
10) Modelling & simulation of buck and boost SMPS.
11) Speed torque characteristics and control of separately excited dc motor
12) Speed torque characteristics and control of induction motor.

Course Name : **Diploma in Electronics Engineering**
Course Code : **DElnE**
Semester : **Fifth**
Subject Title : **Project**
Subject Code : **133EX57**

Teaching and Examination Scheme:-

Teaching Scheme			Paper Hours	Examination Scheme											Total Marks
L	T	P		Theory		Test	Total		P		OR		TW		
				Max	Min		Max	Min	Max	Min	Max	Min	Max	Min	
-	-	3	-	-	-	-	-	-	-	-	50	20	50	20	100

Rationale:-

Diploma holders need to be capable of doing self study throughout their life as the technology is developing with fast rate. Student will be able to find out various sources of technical information and develop self-study techniques to prepare a project and write a project report.

This subject is intended to teach students to understand facts, concepts and techniques of electrical equipments, its repairs, fault finding and testing, estimation of cost and procurement of material, fabrication and manufacturing of various items used in electrical field. This will help the students to acquire skills and attitudes so as to discharge the function of supervisor in industry and can start his own small-scale enterprise.

Objectives:-

The students will be able to:

1. Work in Groups, Plan the work, and Coordinate the work.
2. Develop leadership qualities.
3. Analyse the different types of Case Studies.
4. Develop innovative ideas.
5. Develop basic technical skills by hands on experience.
6. Write project report.
7. Develop skills to use latest technology in Electrical field.

Course Contents:

Following activities related to project are required to be dealt with, during this semester

1. Form project batches & allot project guide to each batch. (Maximum 5 students per batch)
2. Each project batch should select topic / problem / work by consulting the guide Topic / Problem / Work should be approved by Head of Department.

3. Each project batch should prepare action plan of project activities & submit the same to respective guide.
4. At the end of semester, each project batch should submit the action plan and abstract of the project along with list of materials required if project involves fabrication or other facilities required in other kinds of project.
5. Action Plan should be part of the project report.

NOTE:

The students may select different project for Semester V and Semester VI

OR

This project may be the continued (2nd Part) in Semester VI

Learning Resources:
Books/Magazines:
1. IEEE Transactions/Journals
2. Electrical India
3. IEEMA Journal
4. Elecrama
5. Technorama
6. Urja
7. Industrial Automation
8. Electronics for You
9. Electronics Projects
10. Computer World
11. Chip
13 Computer Active
12. Any Journal Related to Electrical Engg./Electronics/Computer/Information Technology.

Course Name : Diploma in Electronics Engineering
Course Code : DElnE
Semester : Fifth
Subject Title : Student Centered Activity/Test

Teaching Scheme			Paper Hours	Examination Scheme												Total Marks
L	T	P		Theory		Test	Total		P		O		TW			
				Max	Min		Max	Min	Max	Min	Max	Min	Max	Min		
-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Rationale:–

Most of the diploma holders join industries. Due to globalization and competition in the industrial and service sectors the selection for the job is based on campus interviews or competitive tests.

While selecting candidates a normal practice adopted is to see general confidence, ability to communicate and attitude, in addition to basic technological concepts.

The purpose of introducing professional practices is to provide opportunity to students to undergo activities which will enable them to develop confidence. Expert lectures, E-learning sources, E-library, Internet, seminars on technical topics and group discussion are planned in a semester so that there will be increased participation of students in learning process.

Objectives:

The Student will be able to:

1. Acquire information from different sources
2. Prepare notes for given topic
3. Present given topic in a seminar
4. Interact with peers to share thoughts
5. Take the advantages of E-learning sources