Scheme of Teaching and Examination for
5 th Semester of 3 Years Diploma in E.E.E.

Duration of Semester   :   **14 Weeks**
Student Contact Hours   :   **36 Hrs**
Total Marks   :   **800**
Effective from : 2017 -18 Session

Sl. No.	Name of Subject	Subject Code	Subject	Teaching Scheme			Examination Scheme					
				L	T	P	Hours of Exam	Full Marks of Subject	Final Exam / committee marks	Internal Assessment	Pass Marks Final / Ext. Exam	Pass Marks in Subjects
1.	Instrumentation System	ECE 503	Theory	3		-	3	100	80	20	26	40
2.	Electrical Machines II	ELE 504	Theory	3	-	-	3	100	80	20	26	40
3.	Electronics Sys. Design & Maintenance	EEE 503	Theory	3	-	-	3	100	80	20	26	40
4.	Elective I	ELE 506/CSE503/ECE505	Theory	3	-	-	3	100	80	20	26	40
5.	Elective II	ELE 507/ECE406/CSE506/ELE508	Theory	3	-	-	3	100	80	20	26	40
6.	Electrical Machines II Lab	ELE 509	Practical	-	-	2	4	50	40	10	-	20
7.	Instrumentation System Lab	ECE 512	Practical	-	-	2	4	50	40	10	-	20
8	Elective I lab	ELE 511/ELE512/ELE513	Sessional	-		2	-	50	30	20	-	25
9.	Elective II Lab	ELE 514/ECE410/CSE514/ELE515	Sessional	-	-	2	-	50	30	20	-	25
10	In Plant Training	502	sessional	-	-	-	-	50	30	20	-	25
11.	DLS	501	Sessional	-	-	4	-	50	30	20	-	25
	Total Hours of Teaching per week :			**15**		**12**						

Elective I (Illumination Engineering- ELE 506/ Micro. Processor & Micro. Controller- CSE503/ PLC- ECE505)

Elective II (Maintenance of Electrical Machines ELE507/Control System ECE406/Mobile Computing- CSE 506/ Robotics & Smart System-ELE508)

     Total Marks: Theory   :   Practical   :   Sessional   :
        L   :   Lecture,   T   :   Tutorial   P   :   Practical

Note: 1. Period of Class hours should be of 1 hrs duration as per AICTE norms.

     2. Remaining Hrs every week has been marked for students for Library and Student Centered Activities.

     3. Drawing / Graphics / Practical / Sessional examinations will be held at parent institution.

     4. Board will depute examiner for Practical examination.

     5. Regarding sessional examination the parent institution will form a three member committee and this committee will examine the sessional records and hold viva of the examinee for 60 % marks allotted to the subject. Marks for remaining 40 % will be provided by the Faculty concerned on the basis of evaluation of each job / work throughout the semester.

     6. Inplant Traning of 04 weeks duration to be undertaken after 4th semester Exam and before start of 5th semester classes.

Subject   : Instrumentation System /Electronics Measurements
Subject Code   : ECE503
Total Hours   : 42
Full Marks   : 80 + 20 = 100

Unit I Electronic Meters: 6 hrs

Electronic Analog voltmeter: DC voltmeters-Choppers type-DC amplifier, solid state voltmeter, Differential voltmeter, peak responding voltmeter, True RMS voltmeter, calibration of DC voltmeters. Digital Voltmeter:- Introduction, Ramp Techniques, dual slope, integrating type DVM, Successive approximation type DVM, Resolution and sensitivity of digital meters, general specification of a DVM. CRO's study of various stages in brief, measurement of voltage, current phase and frequency, special purpose oscilloscope.

Unit II Instrumentation for Generation and Analysis of Waveforms: 6 hrs

Signal generators: Fixed and variable AF oscillators, AF sine and square wave generator, Function generator: Square and pulse generator, Sweep generator, wave analyzer, harmonic distortion analyzer, spectrum analyzer, spectrum analysis.

Unit III Storage and Display Devices: 4 hrs

Necessity of recorders, recording requirements, graphic recorders, strip chart recorders, magnetic tape recorders, digital tape recorders. Electronic indicating instruments, seven segment display, fourteen segmental display Nixie tube.

Unit IV Transducers and DATA Acquisition Systems: 6 hrs

Strain gauge, LVDT, thermocouple, piezoelectric, crystal and photoelectric transducers and their applications. Data acquisition systems. Unit VII Telemetry: Introduction, method of data transmission, types of telemetry systems and applications.

UNIT V Instrumentation :   6 hrs

Types of Instrumentation systems, Data acquisition system (DAS) and its uses in intelligent Instrumentation system, Detailed study of each block involved in making of DAS, Signal Conditioners: as DA, IA, Signal Converters (ADC & DAC), Sample and hold, Designing of Pressure, Temperature measuring instrumentation system using DAS, Data logger.

UNIT VI AUTOMATION   4 hrs

Introduction about Automation system, Concepts of Control Schemes, Types of Controllers, Components involved in implementation of Automation system i.e., DAS, DOS, Converter (I to P) and Actuators: Pneumatic cylinder, Relay, Solenoid (Final Control Element), Computer Supervisory Control System (SCADA), Direct Digital Control's Structure and Software.

UNIT VII PLC & INTELLIGENT CONTROLLER :   10 Hrs

Introduction of Programmable logic controller, Principles of operation, Architecture of Programmable controllers, Programming the Programmable controller. Introduction to Intelligent Controllers, Model based controllers, Predictive control, Artificial Intelligent Based Systems, Experts Controller, Fuzzy Logic System and Controller, Artificial Neural Networks, Neuro-Fuzzy Controller system.

Subject   : Instrumentation System Lab /Electronics Measurements
Subject Code   : ECE512

1   To determine output characteristic of a LVDT and determine its sensitivity.

2   Study characteristics of temperature transducer like Thermocouple, Thermistor and RTD with implementation of small project using signal conditioning circuit.

3   Study characteristics of Light transducer like Photovoltaic cell, Phototransistor and Pin Photodiode with implementation of small project using signal conditioning circuit.

4   To study input- output characteristics of a potentiometer and to use two potentiometers as an error detector.

5   To study transmitter- receiver characteristics of a synchro set to use the set as control component.

6   To study the operation of a d-c positional servo system and to investigate the effect of damping and supply voltage on its response.

7   To study the operation of an a.c. position servo-system and to obtain effects of supply voltage and system parameter on its transient response.

8   To study a stepper motor and control its direction speed and number of steps with the help of a microprocessor

9.   ADC Converter

10.   DAC converter

11.   Study of Automation system

12.   Intelligent controller

Suggested Readings / Books:

1   Electrical and Electronic Measurements and Instrumentation, by K. SAWHNEY.
2   Electronic Instrumentation and Measurement Techniques, by D Cooper.
3   Electronic Instrumentation, by H.S. Kalsi, Tata McGraw Hill
4   Applied Electronics Instrumentation and measurement, David Buchla, Wayne Melachlan:
5   Electronics Measurement and Instrumentation, Oliver by B.H and Cag J.M. McGrawHill.
6   Element of Electronic Instrumentation & Measurement, by Carr, Pearson Education.
7   Electronic Measurements & Instrumentation, by Kishore, Pearson Education.
8   Process Control Systems and Instrumentation, Bartelt, Cengage Learning
9   Process Control Instrumentation Technology‖ 6/e, by Curtis D Johnson, Pearson Ed.
10 Computer-Based Industrial Control‖, by Krishna Kant, PHI.

Subject   : Electrical Machine -II
Subject Code   : ELE504
Total Hours   : 42
Full Marks   : 80 + 20 = 100

Contents: Theory

Chapter	Name of the Topic	Hours
01	**Three phase induction motor** 1.1 Construction of three phase induction motor 1.2 Production of rotating magnetic field 1.3 Principle of working/operation 1.4 Concept of slip 1.5 Equation of rotor induced emf, current, frequency, reactance, and impedance under steady and running condition 1.6 Torque equation of three phase induction motor 1.7 Starting and running torque of squirrel cage and slip ring induction motor 1.8 Condition for maximum and starting torque 1.9 Torque slip characteristics of three phase induction motor 1.10 Effect of change in rotor circuit resistance on torque-slip characteristics 1.11 Effect of change in supply voltage on torque-slip characteristics	08
	1.12 measurement of slip by a) Tachometer method b) Comparing rotor frequency and stator frequency 1.13 Speed control of three phase induction motor by a) Pole changing method b) Frequency control method c) By stator voltage control d) Rotor resistance control 1.14 Comparison between squirrel-cage and slip-ring induction motor. 1.15 Applications of three phase induction motor. 1.16 Power stages of three phase induction motor. (Numerical on all above) 1.17 Double cage IM a) Construction b) Characteristic of outer, inner cage & combined characteristic c) Industrial Applications 1.18 I.M. as a generalized transformer 1.19 Vector diagram of IM	08
	1.20 Equivalent circuit of 3-phase IM (No numerical) 1.21 Starting of 3-phase IM (No numerical) a) Stator resistance starter b) Star-Delta starter c) Auto transformer starter d) Rotor resistance starter	02

02	**Three Phase Alternator**
	2.1 Definition and construction of three phase Alternator
	  a) Armature
	  b) Rotor- smooth cylindrical & projecting type
	2.2 Derivation of e.m.f. equation of Alternator which includes
	  a) Chording factor
	  b) Distribution factor
		04

	2.3 Factors affecting the terminal voltage of Alternator
	  a) Armature resistive drop
	  b) Leakage reactance drop
	  c) Armature reaction at various power factors & concept of Synchronous impedance
	2.4 Regulation of three phase Alternator by
	  a) Synchronous impedance method
	  b) mmf method
	  (Numerical on all above)
		04

03	**Synchronous Motor** 3.1 Principle of working/operation 3.2 Synchronous Motor on load with constant excitation 3.3 Effect of excitation at constant load 3.4 V curve & inverted V curve 3.5 Hunting & phase swinging 3.6 Applications 3.7 Starting of Synchronous Motor 3.8 Comparison between IM & Synchronous Motor (Numerical on all above)	06

04	**Single phase Motors**
	4.1 Double field revolving theory
	4.2 Types of Single phase IM
	4.3 Split phasing principle of starting
	  a) Resistance start induction run
	  b) Capacitor start induction run
	  c) Capacitor start Capacitor run
	  d) Double value Capacitor applications motor
	4.4 Shaded pole IM
	4.5 Applications
		06

05	**Special machines** 5.1 Induction Generator: Principle of operation, Construction and Applications 5.2 Linear Induction Motor Principle of operation, Construction and Applications 5.3 AC series motor Principle of operation, Construction and Applications	04
	Total	**42**

Subject   : Electrical Machine -II Lab

Subject Code   : ELE509

Practical:

Intellectual Skills: 1. Analytical Skills   2. Identification Skills

Motor Skills   :   1. Measuring Skills   2. Connecting instruments

List of Practical:

1) a) To measure the slip of 3-phase IM by

     i) Tachometer

    ii) Comparing rotor & stator frequency

    iii) Stroboscopic method.

   b) To reverse the direction of rotation of 3-phase IM.

2)   To measure the performance of 3-phase IM by direct loading

3)   To list different types of starters used for 3-phase IM .Identify & use the same to start & run 3-phase IM

4)   Using an MG set (DC motor-Alternator) observe the effect of excitation & speed on induced e.m.f. & plot O.C.C. of the given alternator.

5)   To find the percentage regulation of 3-phase alternator by synchronous impedance method at various power factors.

6)   To find the percentage regulation of 3-phase alternator by direct loading method at various power factors.

7)   To list & explain various starting methods of synchronous motor & applying one of them to start the synchronous motor. Plot V & inverted V curve of the same.

8)   To list the various types of 1-phase IM, Collect the literature for them from dealers/manufacturers of local places & compare on the following pts.

   i) Method of starting   ii) Cost   iii) Performance   iv) Starting torque etc. Prepare a report

Learning Resources: Books:

Sr. No.	Author	Title	Publisher
01	S. K. Bhattacharya	Electrical Machines	TTTI, Chandigarh
02	B. L. Theraja	Electrical Technology Vol. II	S Chand & Co.
03	C. L. Dawes	Electrical Technology	--
04	P. S Bhimbra	Electrical Machines	
05	D.P. Khothari	Electrical Machines	
06	J. B. Gupta	Electrical Machines	
07	Ashfaq Hussain	Electrical Machines	
08	G. K Dubey	Electrical Drives	
09	A. Chakraborty	Electrical Machines	
10	M. G. Say	Electrical Machines & Design	

Subject　　　　　: Electronic System Design & Maintenance
Subject Code　　: EEE503
Total Hours　　　: 42
Full Marks　　　 : 80 + 20 = 100

Content

1. **Data Transfer Equipments**　　　　　　　　　　　　**4 Hrs**
   Modems – Internal Modem, External Modem and Cable Modems set top boxes, line amplifiers, reverse path amplifiers, Distributions amplifiers – their working principle, operation, Installation, maintenance and repairing.

2. **Switches**　　　　　　　　　　　　　　　　　　　**6 Hrs**
   ATM Switch, Ethernet Switch, Fast Ethernet Switch, FDDI Switch, FDDI/Ethernet Switch, Fiber Channel Switch, Multi service Switch and Routing Switch – their working principle, operation, Installation, maintenance and repairing.

3. **Hubs**　　　　　　　　　　　　　　　　　　　　**6 Hrs**
   100ZVG Hub, ATM Hub, Ethernet Hub, FDDI Hub, Fiber Channel Hub, Repeater Hub, USB Hub, Wireless Hub – their working principle, operation, Installation, maintenance and repairing.

4. **Router**　　　　　　　　　　　　　　　　　　　**6 Hrs**
   ISDN Router, Cable/DSL Routers, Ethernet and ATM WAN Routers, Power supplies for Router with IP- Voice software, Board Band Router their working principal, operation, High Data Rate Terminal – their working principal, operation, Installation, maintenance and repairing.

5. **Earth Station**　　　　　　　　　　　　　　　　　**4 Hrs**
   Fixed and Mobile earth Station, BBP mode/MSM mode of Operations, High Data Rate Terminal – their working principle, operation Installation, maintenance and repairing.

6. **ISDN**　　　　　　　　　　　　　　　　　　　　**3 Hrs**
   NT, Terminal Adopter their working principle, operation, Installation, maintenance and repairing.

7. **UPS**　　　　　　　　　　　　　　　　　　　　**3 Hrs**
   On-Line, Off- Line interactive UPS – their working principle, operation, Installation, maintenance and repairing.

8. **ATM**　　　　　　　　　　　　　　　　　　　　**6 Hrs**
   Fundamentals of ATM, ATM adaptation layer, virtual paths and virtual channels, ATM signaling, addressing, NNI, LAN emulation, MPOA, ATM in WAN, Switch designs, traffic management, voice over ATM and ATM's relationship to DSL.

9. **Cell Phone**　　　　　　　　　　　　　　　　　　**4 Hrs**
   Study of the front panel & identification and function of different buttons. Disassembling & assembling of different units & Servicing of Cell Phone, Identification of problems, troubleshooting & repairing.

Subject   : Illumination Engineering (Elective-I)
Subject Code   : ELE506
Total Hours   : 42
Full Marks   : 80 + 20 = 100

Contents: Theory

Chapter	Name of the Topic	Hours
1	**Fundamentals of Illumination** 1.1 Illumination Terminology 1.2 Laws of Illumination 1.3 Featuring of good Illumination scheme 1.4 Advantages of good Illumination scheme 1.5 Measurement of level of Illumination (simple illumination)	06
2	**Lamps & Lighting Accessories** 2.1 Types of lamps: ARC lamps, HPMV lamps, Sodium Lamps, CFL Lamps, Metal halides, LED lamps 2.2 Neon Sign Tubes. 2.3 Neon Lamps. 2.4 Halogen Lamps. 2.5 Construction, working principle, advantages, disadvantages & Application of incandescent & Flurocent 2.6 Lighting accessories. (All fittings, switches, enclosers) 2.7 Illumination Auditing	08
3	**Illumination Control & Control Circuits** 3.1 Purpose of lighting control 3.2 Dimmer & Dimmer Transformer & their types 3.3 Electronic Dimmer 3.4 Enhancing Lighting control. 3.5 Control circuits for lamps (refer) : ON/OFF control & Illumination control.	06
4	**Illumination for Interior Applications** 4.1 Standard for various situations of Interior Illumination 4.2 Design Techniques 4.3 Design considerations for Interior location of Residential, Commercial, Industrial premises 4.4 Design Illumination scheme for different Interior locations of Residential, Commercial, Industrial unit.	08
5	**Illumination for Outdoor Applications** 5.1 Factory Lighting 5.2 Street Lighting (Latest Technology) 5.3 Flood Lighting 5.4 Railway Lighting 5.5 Lighting for Advertisement/Hoardings 5.6 Sports Lighting	08
6	**Lighting for Special Applications** 6.1 Agriculture & Horticulture 6.2 Health Care Centers / Hospitals 6.3 Decorating Purposes 6.4 Stage Lighting 6.5 Aquariums & Shipyards 6.6 Special purpose lamps used in photography video films.	06
	Total	**42**

Subject   : Illumination Engineering Lab (Elective-I)
Subject Code   : ELE511

Practical:

Skill to be developed:

     Intellectual

Skills**:**

1. Apply different Designing Skills.
2. Select proper

equipment. Motor Skills**:**

1. Measurement of Illumination.
2. Drawing skills.

List of Practicals:

1. To Measure Illumination by luxmeter.
2. Visit to nearby lamp manufacturing industry.
3. Prepare a report of different luminaries available in the market & collect the technical data

   (Visit local market / Use internet for data collection).
4. Study the different lighting accessories required for varies types of lamps.
5. Design an Illumination scheme for a garden of medium size.
6. Design an Illumination scheme for a conference room of medium size.
7. Design an Illumination scheme for a workshop for fine work of medium size.
8. Design an Illumination scheme for a medium size Hotel / Hospital /Shopping complex.

Learning Resources:

1. Books:

Sr. No.	Author	Name of Book	Publisher & Address
1.	Jack L. Lindsey	Applied Illumination Engineering	The Fairmont Press Inc.
2.	R. H. Simons, Robert Bean	Lighting Engineering: Applied Calculations	Architectural Press (ISBN 0750650516)
3.	Casimer M Decusatis	Handbook of Applied Photometry	Springer (ISBN 1563964163)

Subject   : Microprocessor & Microcontroller (Elective-I)
Subject Code   : CSE503
Total Hours   : 42
Full Marks   : 80 + 20 = 100

OBJECTIVES:

The student should be made to:

 Study the Architecture of 8085 and 8086 microprocessor.

 Learn the design aspects of I/O and Memory Interfacing circuits.

 Study about communication and bus interfacing.

 Study the Architecture of 8051 microcontroller.

UNIT I   THE 8085 MICROPROCESSOR   4 Hrs
Introduction to 8085 – Microprocessor architecture , pin out diagram, – Addressing modes - Instruction set, Interrupts and interrupt service routines.

UNIT II   THE 8086 MICROPROCESSOR   8 Hrs
Introduction to 8086 – Microprocessor architecture – Addressing modes - Instruction set and assembler directives – concept of pipelining, Assembly language programming – Modular Programming - Linking and Relocation - Stacks - Procedures – Macros – Interrupts and interrupt service routines – Byte and String Manipulation.

UNIT III 8086 SYSTEM BUS STRUCTURE   6 Hrs

8086 signals – Basic configurations – System bus timing –System design using 8086 – IO programming – Introduction to Multiprogramming – System Bus Structure - Multiprocessor configurations – Coprocessor, Closely coupled and loosely Coupled configurations.

UNIT IV   I/O INTERFACING   6 Hrs

 Memory Interfacing and I/O interfacing - Parallel communication interface – Serial communication interface – D/A and A/D Interface - Timer – Keyboard /display controller – Interrupt controller – DMA controller – Programming and applications Case studies: Traffic Light control, LED display , LCD display, Keyboard display interface and Alarm Controller.

UNIT V   MICROCONTROLLER   6 Hrs
Architecture of 8051 – Special Function Registers(SFRs) - I/O Pins Ports and Circuits - Instruction set - Addressing modes - Assembly language programming.

UNIT VI   INTERFACING MICROCONTROLLER   9 Hrs
Programming 8051 Timers - Serial Port Programming - Interrupts Programming – LCD & Keyboard Interfacing - ADC, DAC & Sensor Interfacing - External Memory Interface- Stepper Motor and Waveform generation.

TEXT BOOKS:

1   Microprocessor Architechture, Programming and Applications with 8085 by Ramesh K
        Goankar, Galgotia Pub
2   Digital Computer System by Malvino (2nd Ed) TMH

3.   Yu-Cheng Liu, Glenn A.Gibson, "Microcomputer Systems: The 8086 / 8088 Family -
        Architecture, Programming and Design", Second Edition, Prentice Hall of India, 2007.

4.   Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, "The 8051 Microcontroller
        and   Embedded Systems: Using Assembly and C", Second Edition, Pearson education, 2011.

 REFERENCE: 1. Doughlas V.Hall, "Microprocessors and Interfacing, Programming and
Hardware",TMH,2012

Subject   : Microprocessor & Microcontroller Lab (Elective-I)
Subject Code   : ELE512

 LIST OF EXPERIMENTS:

 8086 Programs using kits and MASM

 1. Basic arithmetic and Logical operations

2. Move a data block without overlap

 3. Code conversion, decimal arithmetic and Matrix operations.

 4. Floating point operations, string manipulations, sorting and searching

 5. Password checking, Print RAM size and system date

6. Counters and Time Delay

 7. Traffic light control

8. Stepper motor control

9. Digital clock

 Key board and Display

11. Printer status

12. Serial interface and Parallel interface

 13. A/D and D/A interface and Waveform Generation using 8051

 14. Basic arithmetic and Logical operations

15. Square and Cube program, Find 2"s complement of a number

 16. Unpacked BCD to ASCII

Subject   : Programmable Logic Controller (Elective-I)
Subject Code   : ECE505
Total Hours   : 42
Full Marks   : 80 + 20 = 100

Content

1. **PLC Basics :**   **6 hrs**
   An Overall Look at Programmable Logic Controllers - Introduction, definition & history of the PLC, manufacturing & assembly process, PLC advantage & disadvantage, overall PLC system, CPU & programmer/monitors, PLC input & output modules, printing PLC information. The PLC: A Look Inside - Introduction, the PLC as a computer, the central processing unit, solid state memory, the processor, I/O modules, power supplies. General PLC Programming Procedures - Introduction, programming equipment, programming formats, proper construction of PLC ladder diagrams, process scanning consideration, PLC operational faults. Devices to Which PLC Input and Output Modules Are Connected - Introduction, input ON/OFF switching device, input analog device, output ON/OFF device, output analog devices

2. **PLC Programming :**   **6 hrs**
   Programming On/Off Inputs to Produce On-Off Outputs - Introduction, PLC input instruction, output: coils, inductors & others, operational procedures, contact & coil input/output programming examples, a look at fail safe circuit, industrial process examples. Relation of Digital Gate Logic to Contact/Coil Logic - Digital logic gates, Boolean algebra PLC programming, conversion examples. Creating Ladder Diagrams from Process Control Descriptions - Ladder diagram & sequence listing, large process ladder diagram construction, flow charting as programming method

3. **PLC Functions :**   **6 hrs**
   Register - Introduction, general characteristics of registers, module addressing, holding registers, input registers: single & group, output registers: single & group. PLC Timer Functions - Introduction, PLC timer functions, examples of timer function industrial application, industrial process timing application. PLC Counter Functions - Introduction, PLC counters examples of counter function industrial application

4. **Intermediate Functions :**   **6 hrs**
   PLC Arithmetic Functions - Introduction, PLC addition & subtraction, the PLC repetitive clock, PLC multiplication, division & square-root: PLC trigonometric & log function, other PLC arithmetic functions. PLC Number Comparison Functions - Introduction, PLC basic comparison function, PLC basic comparison function application, PLC advanced comparison function. Numbering Systems and PLC Number Conversion Functions - Introduction, numbering system: decimal, binary & BCD, PLC conversion between decimal & BCD, OCTAL & HEX DECIMAL numbering system, other numbering & code system

5. **Date Handling Functions**   **6 hrs**
   The PLC SKIP and MASTER CONTROL RELAY Functions - Introduction, the SKIP function & application, the MASTER CNTROL RELAY function & application. Jump Functions - Introduction, jump with non-return, jump with return. PLC Data Move Systems - Introduction, PLC MOVE function & application, moving large blocks of PLC data, PLC table & registers moves, other PLC MOVE functions.

Other PLC Data Handling Functions - Introduction, PLC FIFO functions, the FAL function, the one shot (ONS), clear (CLR) & SWEEP functions

6. **Working with Bits**   **8hrs**

PLC Digital Bit Functions and Applications - Introduction, bit pattern in a register, changing a register bit status, shift register function, shift register application. PLC Sequencer Functions - Introduction, electromechanical sequencing, the basic PLC sequencer function, a basic PLC sequencer application with timing, other PLC sequencer function, cascading sequencer. Controlling a Robot with a PLC - Introduction, basic two axis ROBOT with PLC sequencer control, industrial three axis ROBOT with PLC control. PLC Matrix Functions - Introduction, applying matrix functions to reduce program length, the PLC AND & OR matrix function, the PLC COMPLEMENT & OMPARE matrix function, combination PLC matrix operation

7. **Advanced PLC Functions :**   **4 hrs**

Analog PLC Operation - Introduction, types of PLC, analog modules & systems, PLC analog signal processing, BCD or multi-bit data processing, PLC analog output application examples.

Subject   : Programmable Logic Controller Lab (Elective-I)
Subject Code   : ELE513

List of Experiments:

Based on the theoretical paper, faculty will be decide minimum 10 Experiments to be performed by the Students.

Books :

1. Programmable Logic Controllers : Principles & Applications, John W. Webb and Ronald A.Reis, Prentice Hall India

2. Programmable Logic Controllers by Bolton, Elsever N Publication
3. Programmable Logic Controllers by FD Prestrusela, TMH
4. Programmable Logic Controllers: Programming Methods and Applications by John R. Hackworth and Frederick D. Hackworth Jr, Pearson

Subject   : Maintenance of Electrical Machines (Elective-II)
Subject Code   : ELE507
Full Marks   : 80+20=100
Hours   : 42

1. **Safety and Accidents** -   **6 Hrs**
   Definition of terminology used in safety: Safety, hazard, accident, major accident hazard, responsibility, authority, accountability, monitoring.
   I.E. Act & statutory regulations for safety of persons and equipment working with electrical installation, causes of electrical accidents, preventive measures, electrical shocks, precaution to be taken against electrical shock, treatment for electrical shock. Causes of electrical fires, precaution to be taken to avoid fire, action to be taken in case of fire, fire fighting equipments.

2. **General Introduction** -   **7 Hrs**
   Concept of routine, preventive and breakdown maintenance, Advantages of preventive maintenance, procedure for developing preventive maintenance schedule, factors affecting preventive maintenance schedule. Introductionto total productive maintenance.

3. **Maintenance of Rotating machines**   **7 Hrs**
   Routine, preventive and breakdown maintenance of 1& 3 phase induction motors, Synchronous machines and D.C machines

4. **Maintenance of transformer**   **6 Hrs**
   Preventive and routine maintenance of distribution transformers, Periodic checks for replacement of oil, Silica gel, properties of a good transformer oil.

5. **Maintenance of insulation**   **6 Hrs**
   Classification of insulating, factors affecting life of insulating materials, measurement of insulation resistance, interpretation of conditions, agents that contaminate insulating oil, tests on insulating oil (a) Acidity test (b) Sludge test (c) Crackle test (d) flash point test
   Filtration of insulating oil for protection of electrical equipments (insulation) during period of inactivity.
   Procedure for cleaning, washing and drying insulation and revarnishing
   Methods of internal heating & vaccum impregnation.

6. **Troubleshooting of electrical machine & switchgear.**   **10 Hrs**
   Significance of trouble shooting of various electrical machines and describes the procedure for the same. Internal and external causes of failure of equipment, various types of faults (mechanical, electrical of magnetic) in electrical machines, Reason for their occurrences, use of following tools: Bearing puller, Filler gauge, dial indicator, spirit level, megger, earth tester, growler,
   Trouble shooting charts for 1 & 3 phase induction motor, 1 & 3 Phase transformer.
   List the common trouble in electrical installation and cables.

Maintenance and trouble shooting of LVS switchgear like MCCB, ELCB, Contactors & Batteries.

Subject   : Maintenance of Electrical Machines Lab (Elective-II)
Subject Code   : ELE514

List of Practical's

1	Safety precautions in lab while doing electrical work
2	Safety equipments study
3	Winding of Fan coil
4	Winding of single motor
5	Winding of three phase motor
6	Repairing of single phase transformer
7	Repairing of wiring system
8	Installation of machine
9	Repairing of starter
10	Repairing of mains
11	Study of various types of MCB and other circuit breakers

Books :-

1. Electricals Protection & Switchgear   by S.S. Rao
2. Maintenance of Electrical Machine   by J.B. Gupta
3. Testing Commisioning Operation & Maintenance Of Electrical Equipment   by S. Rao
4. Installation Maintenance And Repair Of Electrical Machines And Equipments   by Madhvi Gupta
5. Testing And Maintenance Of Electrical Machines   by B.P. Patil

Subject   : Control System Lab
Subject Lab   : ECE406
Total Hours   : 42
Full Marks   : 100 (80+20)

L   T   P
3   2

1. **Introduction:**   **04 hrs**
   Elements of control systems, concept of open loop and closed loop systems, Examples and application of open loop and closed loop systems, brief idea of multivariable control systems.

2. **Mathematical Modeling of Physical Systems**:   **06 hrs**
   Representation of physical system (Electro Mechanical) by differential equations, Determination of transfer function by block diagram reduction techniques and signal flow method, Laplace transformation function, inverse Laplace transformation

3. **Time Response Analysis of First Order and Second Order System:**   **08 hrs**
   Characteristic Equations, response to step, pulse , impulse, ramp and parabolic inputs. Transient response analysis, steady state errors and error constants, Transient & steady state analysis of LTI systems

4. **Frequency Response Analysis:**   **06 hrs**
   Frequency response, correlation between time and frequency responses, polar and inverse polar plots, Bode plots

5. **Control System Components:**   **04 hrs**
   Constructional and working concept of ac servomotor, synchronous and stepper motor

6. **Stability and Algebraic Criteria:**   **04 hrs**
   concept of stability and necessary conditions, Routh-Hurwitz criteria and limitations. Root Locus Technique: The root locus
   concepts, construction of root loci.

7. **Stability in Frequency Domain:**   **04 hrs**
   Nyquist stability criterion, assessment of relative stability: gain margin and phase margin, M and N Loci, Nichols chart.

8. **Study of preliminary considerations of lead, lag and lead-lag networks, closed loop systems using compensation techniques in time domain and frequency domain.**   **04 hrs**

9. **Controllers :**   **02 hrs**
   Brief idea of proportional, derivative and integral controllers.

Subject   : Control System Lab
Subject Lab   : ECE410

L   T   P

       2

1. Transfer function of first and second order system
2. Sensors system control system study
3. AC position servo system study
4. DC position servo system study
5. Control through magnetic amplifier
6. Measurement of passive elements R , L and C using Bridge Networks
7. Study of transducers and characterization
8. Digital simulation of linear systems
9. Stability Analysis of Linear system using MATLAB or equivalent Software
10. Study the effect of P, PI, PID controllers using MATLAB or equivalent Software or with conventional methods.
11. Study of Lead and Lag compensator

BOOKS:

1. J.Nagrath and M.Gopal, "Control System Engineering", New Age International Publishers, 5th Edition, 2007.
2. Benjamin. C. Kuo, "Automatic control systems", Prentice Hall of India, 7th Edition,1995.
3. M.Gopal, "Control System – Principles and Design", Tata McGraw Hill, 2nd Edition, 2002.
4. Schaum's Outline Series, "Feedback and Control Systems" Tata Mc Graw-Hill, 2007.
5. John J.D'Azzo & Constantine H.Houpis, "Linear Control System Analysis and Design'", Tata Mc Graw-Hill, Inc., 1995.
6. Richard C. Dorf and Robert H. Bishop, "Modern Control Systems", Addison – Wesley, 1999.

Subject   : Mobile Computing (Elective-II)
Subject Code   : CSE506
Total Hours   : 42
Full Marks   : 80 + 20 = 100

Unit-I
Introduction   10 hrs

Issues in mobile computing, overview of wireless telephony: cellular concept, GSM: air-interface, channel structure, location management: HLR-VLR, hierarchical, handoffs, channel allocation in cellular systems

Unit II

Mobile Network & Transport Layer   12 hrs

 Mobile IP Goals, assumptions, entities and terminology, IP packet delivery, agent advertisement and discovery, registration, tunnelling and encapsulation, Dynamic Host Configuration Protocol (DHCP), Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/fast recovery, Transmission /time-out freezing, Selective retransmission, Transaction oriented TCP.

Unit III

Wireless Networking   10 hrs

Wireless LAN Overview: MAC issues, IEEE 802.11, Blue Tooth, Wireless multiple access protocols, TCP over wireless, Wireless applications, data broadcasting, Mobile IP, WAP: Architecture, protocol stack, application environment, applications.

Unit IV

 Mobile Ad hoc Networks   10 hrs

 Mobile Agents computing, security and fault tolerance, transaction processing in mobile computing environment, Mobile Ad hoc Networks (MANETs): Overview, Properties of a MANET, spectrum of MANET applications, routing and various routing algorithms, security in MANETs.

Subject   : Mobile Computing Lab (Elective-II)
Subject Code   : CSE514

List of Experiments

1. Baseband communication
2. Adaptive Linear equalizer
3. CDMA multi path
4. CDMA Multiuser
5. Global System for Mobile Communication
6. GSM Wireless digital communication on digital SDR platform
7. GSM spread spectrum DSSS Modulation and demodulation
8. Free space propagation using path loss model
9. Link budget equation for sat communication
10. Carrier to noise ratio of wireless signal
11. Outdoor propagation Okumura model
12. Outdoor propagation Hata model
13. Selective retransmission
14. Tunneling and encapsulation,
15. Data broadcasting MANETs

Reference Books:

1. J. Schiller, Mobile Communications, Addison-Wesley, second edition, 2004.

2. Raj Pandya, Mobile & Personal Communication Systems and Service, PHI.

3. Asoke k Talukder , Roopa R Yavagal, Mobile Computing , Technology, Application & Service Creation. Tata Mc Graw Hill

4. Stojmenovic and Cacute, ―Handbook of Wireless Networks and Mobile Computing‖, Wiley,

Subject   : Robotics & Smart System (Elective-II)
Subject Code   : ELE508
Full Marks   : 80+20=100
Hours   : 42

Module-I   [4Hrs]

Fundamentals: Define Robot, Classification of Robots, Define Robotics, History of Robotics, Advantage and Disadvantages of Robots, Robot Components, Robot Sensing, Robot Degree of Freedom, Robot Joints, Robot Coordinates, Robot Reference Frames, Programming Modes, Robot Programming Language, Robot Applications.

Module-II   [4 Hrs]

Robot Arm Kinematics: Robots as Mechanisms, Conventions, Matrix Representation: Representation of a Point in Space; Representation of a Vector in Space, Representation of Rigid Body, The Direct Kinematics Problem, The Inverse Kinematics Solution

Module-III   [3 Hrs]

Robot Arm Dynamics: Lagrange-Euler Formulation, Newton-Euler Formation, Effective Moments of Inertia, Generalized D'Alembert Equation of Motion.

Module-IV   [4 Hrs]

Panning of Manipulator Trajectories: Path versus Trajectory, Basics of Trajectory Planning, General Consideration on Trajectory Planning, Joint-interpolated Trajectories, Planning of Manipulator Cartesian Path Trajectories.

Module-V   [8 Hrs]

Control of Robot Manipulators: Characteristics of Actuating Systems, Comparison of Actuating Systems, Hydraulic Actuators, Pneumatic Devices, Electric Motors: AC Motors; DC Motors; Servomotors; Stepper Motors, Microprocessor Control of Electric Motors, Magneto strictive Actuators, Speed Reduction.

Module-VI   [8 Hrs]

Sensors: Sensor Characteristics, Sensor Utilization, Position Sensors: Potentiometers; Encoders; LVDT; Resolves; LMDT; Hall-effect Sensors, Velocity Sensors: Encoders; Tachometers; Differentiation of Position Signals, Acceleration Sensors, Force and Pressure Sensors: Piezoelectric; Force Sensing Resistor; Strain Gauge, Torque Sensors, Micro switches, Visible Light and Infrared Sensors, Touch Sensors, Proximity Sensors, Range Finder, Sniff Sensors,.

Module-VII   [5 Hrs]

Robot Programming Languages: Characteristics of Robot Level Languages, A brief about AL and AML robot programming languages, Position Specification, Motion Specification, Sensing and Flow of Control, Programming Support, Characteristics of Task Level Languages, World Modelling, Task Specification, Robot Program Synthesis, Concluding Remarks.

Subject   : Robotics & Smart System Lab (Elective-II)
Subject Code   : ELE515

List of Experiments:

1. Configure the working of robots
2. Demonstrate the different types of sensor in robotics
3. Interface sensors using Microprocessor or Microcontroller
4. Measure various parameters of Electro-Mechanical Instruments Pressure, Flow, Speed and Moisture
5. Interface Actuators using Microprocessor or Microcontroller
6. Interface Drives using Microprocessor or Microcontroller
7. Interface Stepper Motor using Microprocessor or Microcontroller
8. Use robot trainer to perform different tasks
9. Develop a Program for Line Follower Configuration.
10. Develop a Program for coffee maker configuration

Reference Books:
1. K.S. Fu, R.C. Gonzalez, C.S.G. Lee, "Robotics: Control, Sensing, Vision and Intelligence", McGraw Hill Education (India Ed.)
2. Saeed B. Niku, "Introduction to Robotics: Analysis, Control, Application 2/E", Wiley India Edition
3. S.K. Saha, "Introduction to Robotics 2/E", McGraw Hill Education (India Ed.)
4. R.K. Mittle, I.J. Nagrath, "Robotics and Control", McGraw Hill Education (India Ed.)
5. Thomas R. Kurfess, "Robotics and Automation Handbook", CRC Press
6. Ashitava Ghosal, "Robotics: Fundamental Concepts and Analysis 1/E", Oxford University Press

Subject Title : Development of Life Skills (Common Paper)
Subject Code : 502
Full Marks : 50

Rationale:

In today's competitive world, the nature of individual and organizations is changing at very rapid speed. In this situation the responsibility of diploma holder is not unique. After completing his course work he has to face the world and seek meaningful employment also. Merely having knowledge is not sufficient these days. He has to show his communicative skill also. As such the individual skills with capability to show his strength and communicate his willingness new skills for further advancement with to impart his ability and acquiring has to be displayed and learned.

This subject will develop the student as an effective individual to grab the available situation and be member of the unseen team in which he may be put in . It will develop the abilities and skills to perform at highest degree of quality as an individual as well as a member of core group or team. Such skills will enhance his capabilities in the field of searching, assimilating information, managing the given task, handling people effectively, solving challenging problems.

Objectives: The students will be able to:

1. Develop acumen to face interview.
2. Lead in the group discussion and set goals and targets for others
3. Develop team spirit i.e. concept of working in teams
2. Apply problem solving skills for a given situation
3. Use effective presentation techniques
4. Apply techniques of effective time management
5. Apply task management techniques for given projects
6. Enhance leadership traits
7. Resolve conflict by appropriate method
8. Survive self in today's competitive world
9. Follow moral and ethics
11. Convince people to avoid frustration

CONTENTS:

SOCIAL SKILLS

1. Social understanding for group discussion, imaginative thinking and develop free ideas .
2. SWOT Analysis – Concept, and know himself in details. Learn how to make use of SWOT.
3. **Inter personal Relation:-** How to effectively counter arguments of others without hearting their feeling Sources of conflict and conflict resolution, Ways to enhance interpersonal dependence and relations.

4. **Problem Solving**

I) **STEPS IN PROBLEM SOLVING,**
   1) Identify and clarify the problem,
   2) Information gathering related to problem,

3)   Evaluate the evidence,
4)   Consider alternative solutions and their implications,
5)   Choose and implement the best alternative,
6)   Review

II)   **Problem solving technique**.(any one technique may be considered)
1) Trial and error
2) 2) Brain storming
3) 3) Lateral thinking

5. Presentation Skills

Body language --
Dress like the audience, Posture, Gestures, Eye contact and facial expression. STAGE FRIGHT,
Voice and language – Volume, Pitch, Inflection, Speed, Pause, Pronunciation, Articulation, Language, Practice of speech. Use of presentation aids, Summarizing the facts

6. Group discussion –

Introduction to group discussion, Ways to carry out group discussion, Parameters—Contact, body language, analytical and logical thinking, decision making

7. INTERVIEW TECHNIQUE
Necessity, Techniques to influence interviews and giving directions, Tips for handling common questions.

8. Working in Teams
Understand and work within the dynamics of a groups.
Tips to work effectively in teams,
Establish good rapport, interest with others and work effectively with them to meet common objectives,
Tips to provide and accept feedback in a constructive and considerate way ,
Leadership in teams, Handling frustrations in group.

9. Task Management
Introduction, Task identification, Task planning ,organizing and execution, Closing the task

BOOKS:

Sr. No	Title of the book	Author	Publisher
1	Adams Time management	Marshall Cooks	Viva Books
2	Basic Managerial Skills for All	E.H. Mc Grath , S.J.	Pretice Hall of India
3	Body Language	Allen Pease	Sudha Publications Pvt.
4	Creativity and problem solving	Lowe and Phil	Kogan Page (I) P Ltd
5	Decision making & Problem Solving	by Adair, J	Orient Longman
6	Develop Your Assertiveness	Bishop , Sue	Kogan Page India
7	Make Every Minute Count	Marion E Haynes	Kogan page India
8	Organizational Behavior	Steven L McShane and Mary Ann Glinow	Tata McGraw Hill
9	Organizational Behavior	Stephen P. Robbins	Pretice Hall of India, Pvt Ltd
10	Presentation Skills	Michael Hatton (Canada – India Project)	ISTE New Delhi
11	Stress Management Through Yoga and Meditation	--	Sterling Publisher Pvt Ltd
12	Target setting and Goal Achievement	Richard Hale ,Peter Whilom	Kogan page India
13	Time management	Chakravarty, Ajanta	Rupa and Company
14	Working in Teams	Harding ham .A	Orient Longman

INTERNET ASSISTANCE
1. http://www.mindtools.com
2. http://www.stress.org
3. http://www.ethics.com
4. http://www.coopcomm.org/workbook.htm
5. http://www.mapfornonprofits.org/
6. http://www.learningmeditition.com http://bbc.co.uk/learning/courses/
7. http://eqi.org/
8. http://www.abacon.com/commstudies/interpersonal/indisclosure.html
9. http://www.mapnp.org/library/ethics/ethxgde.htm
10. http://www.mapnp.org/library/grp_cnfl/grp_cnfl.htm
11. http://members.aol.com/nonverbal2/diction1.htm
12. http://www.thomasarmstron.com/multiple_intelligences.htm
13. http://snow.utoronto.ca/Learn2/modules.html
14. http://www.quickmba.com/strategy/swot/