Mandsaur University

Subject Code: - ELE240
Subject Name: - PLC & SCADA
Semester: - VI

L	T	P	C
2	1	2	4

Course Objectives:
- To learn the basic concept of PLC.
- To learn various terminology of PLC with the help of ladder logic diagrams.
- To learn the basic concept of DCS & SCADA systems.

Unit-I
PLC Basics: Introduction to PLC, Block diagram for PLC, Advantage of PLC, Chronological Evolution of a PLC, Types of PLC.

Unit-II
PLC Functions: PLC hardware, Timers & Counters, Relays, Ladder logic diagram, PLC Connection, Electrical wiring diagram, Advanced PLC functions like SKIP, MASTER CONTROL RELAY, JUMP with non return, jump with return.

Unit-III
PLC Programming and Applications: Introduction to Advance Instructions & Programming techniques of PLC. Discussions on Comparison Instruction i.e. "EQUAL", "NOT EQUAL" "LESS THEN", "LESS THEN OR EQUAL", "GRATER THEN", "MASKED OMPARISION FOR EQUAL", PLC applications like bottling filling plant, material handling elevator etc.

Unit-IV
DCS and SCADA: Distributed control system (DCS), Industrial control systems (ICS), Industrial safety systems, SCADA and its SCADA.

Unit-V
Industrial Automation: Introduction to industrial automation, Sample examples of automation and selection of PLC for different applications.

Course Outcome:
After going through this course the student gets a through knowledge on:
- Understand the concept of programmable logic controller and its working.
- Understand ladder logic programs and execute them on software editor.
- Ability to select the PLC on the basis of different industrial applications.

Reference Books:
1. PLCs & SCADA: Theory and Practice by Rajesh Mishra & Vikrant Vij, Laxmi
2. Publications, New Delhi, Latest edition.

3. Computer Based Industrial Control by Krishna Kant, PHI, New Delhi, Latest edition.
4. Programmable Logic Controllers Principles and applications by Webb John W. and Reis A. Ronald, PHI, New Delhi, Latest edition.

Practical List:
1. Identify intelligent, PID, Input, Output, Communication module.
2. Wire Inputs, Outputs via PLC input output modules.
3. Wire intelligent, PID, Communication module with PLC.
4. Develop ladder logic to realize all logic gates.
5. Develop ladder logic to realize multiplexer (4:1).
6. Develop ladder logic to realize demultiplexer (1:4).
7. Simulate Industrial application of PLC On Delay Timer.
8. Check the UP/DOWN counter operation using actual PLC.
9. Check the SUBTRACTION Function using actual PLC.
10. Simulate Bottle filing process on PLC simulator. Verify operation of the same process using actual PLC. Draw connection details for the same process.
11. Test the DCS.
12. Test the SCADA.
13. Set up a SCADA configuration.

List of Kit/ Software/Learning Websites:
1. PLC trainer.
2. DCS Trainer
3. PLC simulator (freeware)
4. DCS simulator.
5. www.control.com
6. www.plcs.net
7. www.pacontrol.com
8. www.seimens.com
9. www. ab.rockwellautomation.com
10. www.plcsimulator.net
11. http://scada.winsite.com

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Subject Code: - ELE220
Subject Name: - Power Electronics and Drives
Semester: - VI

L	T	P	C
2	1	2	4

Course Objectives:
- To understand and acquire knowledge about various power semiconductor devices.
- To gain knowledge of working of different switching devices with respect to their characteristics
- To prepare the students to analyze and design different power converter circuits.
- To analyze control strategies of converters with their applications.

Unit I: Introduction to Power Electronics Devices & Thyristors
Introduction to Power Electronics, construction and working principles of UJT, BJT, SCR, GTO, MOSFET, IGBT, Diac and Triac with their specifications, ratings and VI characteristics.
Two transistor analogy of SCR, SCR specifications and ratings, different methods of SCR triggering, series and parallel operations of SCRs, basic idea about the selection of heat sinks for thyristor.

Unit II: Phase Controlled Rectifiers
Principle of phase control, single-phase half wave and full wave converter with RL load and freewheeling diode, three-phase full converter, three-phase semi converter.

Unit III: Choppers
Principle of operation, control strategies, classification.

Unit IV: Inverters
Quality of inverter, single-phase and three-phase voltage source bridge inverter, single-phase current source inverter, series and parallel inverter.

Unit V: Electric Drives
Single-phase DC drives, braking, AC drives, different techniques of speed control of induction motors: stator voltage control, stator frequency control, stator voltage and frequency control, stator current control, rotor resistance control, slip power recovery schemes.

Course Outcomes:
Upon successful completion of this subject, students should be able to:
- Acquire knowledge about fundamental concepts and techniques used in power electronics.
- Ability to analyze various single phase and three phase power converter circuits and understand their applications.
- To develop skills to build and troubleshoot power electronics circuits.
- Ability to understand the use of power converters in commercial and industrial applications.

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Reference Books:
1. M.H. Rashid, Power Electronics Circuits, Devices and Applications, Pearson 2 Education, Singapore, 1993.
2. M Ramsmoorthy, An Introduction to transistor and their application, Affiliated East-West Press.
3. P.C. Sen, Power Electonics, TMH.
4. M.D. Singh, K.B. Khanchandani, Power Electronics, TMH, Delhi, 2001.
5. Chakravarti A., Fundamental of Power Electronics and Drives, Dhanpat Ray & Co.
6. Dr. P.S. Bhimbhra, Power Electonics, Khanna Pub.
7. Vedam Subramanyam, Power Electronics New Age International Revised II ed. 2006
8. Mohan Undeland Robin, Power Electronics-Converters, Applications and Design, John Wiley & Sons, 2002.
9. Gopal K. Dubey, Fundamentals of Electrical Drives, Alpha Science International Limited, 2001

Suggested List of Experiment:
1. To study introduction to power electronics and its applications.
2. To study of power semiconductor devices.
3. To plot and verify SCR characteristics.
4. To plot and verify V-I characteristics of a Triac.
5. To plot V-I characteristics of UJT.
6. To plot V-I Characteristics of a DIAC.
7. To study and perform single-phase half-wave circuit with RL load.
8. To study 3Φ fully controlled converter.
9. To perform speed control of DC motor using SCR.
10. To study and perform DC-DC step-up converter.
11. To study of type A, B & C chopper circuit.
12. To study of different types of braking.
13. To study of single-phase dual converter drives.
14. To study of two quadrant and four quadrant chopper drives.
15. Fabrication of three phase bridge rectifier using two SCR and two diodes.
16. Fabrication of three phase bridge rectifier using diodes.

Mandsaur University

Subject Code: - ELE230
Subject Name: - Microprocessors & Microcontroller
Semester: - VI

L	T	P	C
2	1	2	4

Course Objectives:
- To learn the basic concept of microprocessors (8085 & 8086) architectures.
- To learn various decision making aspects in applications with help of microprocessors and its programming.
- To learn interfacing methods of various ICs with processors.
- To learn the basic concept of microcontroller architectures.

Unit-I
8085 Microprocessor: Introduction to 8085 microprocessor and its architecture. Microprocessor bus organization: data bus, address bus and control bus – instruction set of 8085 processor. Programming techniques of 8085.

Unit-II
8086 Microprocessor: Intel 8086 microprocessor – Architecture – Instruction set and assembler directives – Addressing modes – Assembly language programming. Interrupts and interrupt service routines.

Unit-III
I/O Interfacing: Memory Interfacing and I/O interfacing - Parallel communication interface – Serial communication interface. DMA controller – Programming and applications.

Unit-IV
Microcontrollers: Introduction to Atmel 8051 microcontrollers. Architecture of 8051. Memory and I/O port addressing. Interrupts. Instruction set and applications of microcontrollers.

Unit-V
Microcontroller 8051 interfacing: interfacing to I/O devices, stepper motor interfacing, 8051 serial communication and its basic modes, interfacing to LCD modules and its programming.

Course Outcomes:
 After going through this course the student gets a through knowledge on:
- Understand the concept of microprocessors (8085 & 8086) architectures and its working.
- Understand various assembly language programs and execute them on software.
- Ability to interface various ICs with microprocessors and microcontroller.

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Reference Books:
1. A.K. Ray &K. M. Bhurchandi, Advanced Microprocessors and peripherals- Architecture, Programming and Interfacing, Tata McGraw-Hill.
2. R. S. Gaonkar. Microprocessor Architecture, Programming, and Application with the 8085.
3. Kenneth J. Ayala, The 8086 microprocessor: programming and interfacing the PC.
4. Muhammad Ali Mazidi and Janice Gillespie Mazidi, The 8051 Microcontroller and Embedded Systems, Pearson education, 2005.
5. Udayashankara and M.S. Mallikarjunaswamy, 8051 Microcontroller: Hardware, Software & Applications, Tata McGraw-Hill, 2009.
6. McKinley, The 8051 Microcontroller and Embedded Systems-using assembly and C, PHI, 2006 / Pearson, 2006.

Practical List:
1. Demonstration of kit/simulator of 8085.
2. Programs for 16 bit arithmetic operations for 8086 (using Various Addressing Modes).
3. Write a program to mask the lower four bits of content of the memory location.
4. Program for sorting an array for 8086.
5. Write a program to copy content of one memory location to another memory location.
6. Write a program to find the smallest and the largest number from an array of n number.
7. Write a program to sum integers from 0 to 9.
8. Write a program to check whether given no is odd or even.
9. Parallel communication between two microprocessors using 8255.
10. Serial communication between two microprocessor kits using 8251.
11. Interfacing to 8086 and programming to control stepper motor.
12. Programming using arithmetic, logical and bit manipulation instructions of 8051.
13. Communication between 8051 kit and input devices.
14. Interfacing LCD to 8051.

List of Software/Learning Websites:
1. Simulator such as: http://8085simulator.codeplex.com/ http://gnusim8085.org.
2. Latest up configuration: http://www.intel.com/pressroom/kits/quickreffam.html.
3. Intel 8085 microprocessor architecture: http://www.cpu-world.com/Arch/8085.html.
4. 8085 sample programs :http://www.8085projects.info/page/free-programs-for-8085.
5. Intel 8086 microprocessor architecture: http://www.cpu-world.com/Arch/8086.html.

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Subject Code: - ELE211
Subject Name: - Electrical Estimating & Costing
Semester:-VI

L	T	P	C
4	-	-	4

Course Objective:
Emphasize the estimating and costing aspects of all electrical equipment, installation and designs to analyze the cost viability. Exposure to design and estimation of wiring, design of overhead and underground distribution lines, substations and illuminations design. These techniques should help the students to successfully estimate costing of the products / projects that are part of our every day usage.

UNIT-I: Design Considerations of Electrical Installations:
Electric Supply System, Three phase four wire distribution system, Protection of Electric Installation against over load, short circuit and Earth fault, Earthing, General requirements of electrical installations, testing of installations, Indian Electricity rules, Neutral and Earth wire, Types of loads, Systems of wiring, Service connections, Service Mains, Sub-Circuits, Location of Outlets, Location of Control Switches, Location of Main Board and Distribution board, Guide lines for Installation of Fittings, Load Assessment, Permissible voltage drops and sizes of wires, estimating and costing of Electric installations.

UNIT-II: Electrical Installation for Different Types of Buildings and Small Industries:
Electrical installations for residential buildings — estimating and costing of material, Electrical installations for commercial buildings, Electrical installations for small industries.

UNIT-III: Overhead and Underground Transmission and Distribution Lines:
Introduction, Supports for transmission lines, Distribution lines — Materials used, Underground cables, Mechanical Design of overhead lines, Design of underground cables.

UNIT-IV: Substations:
Introduction, Types of substations, Outdoor substation — Pole mounted type, Indoor substations — Floor mounted type.

UNIT-V: Design of Illumination Schemes:
Introduction, Terminology in illumination, laws of illumination, various types of light sources, Practical lighting schemes.

Course Outcome:
After going through this course the student gets a thorough knowledge on, estimating and costing aspects of all electrical equipment, installation and designs to analyze the cost viability, exposure to design and estimation of wiring, design of overhead and underground distribution lines, substations and illuminations, with which he/she can able to apply the above conceptual things to real-world electrical and electronics problems and applications.

Text Books:
1. Electrical Design Estimating and Costing, K. B. Raina, S. K. Bhatt Acharya, New Age International Publisher.
2. Design of Electrical Installations, Er. V. K. Jam, Er. Amitabh Bajaj, University Science Press.
3. Electricity Pricing Engineering Principles and Methodologies, Lawrence J. Vogt, P. E., CRC Press.

Reference Books:
1. Code of practice for Electrical wiring installations,(System voltage not exceeding 650 volts), Indian Standard Institution, IS: 732-1983.
2. Guide for Electrical layout in residential buildings, Indian Standard Institution, IS: 4648-1968.
3. Electrical Installation buildings Indian Standard Institution, IS: 2032.
4. Code of Practice for selection, Installation of Maintenance of fuse (voltage not exceeding 650V), Indian Standard Institution, IS: 3106- 1966.
5. Code of Practice for earthling, Indian Standard Institution, lS:3043- 1966.
6. Code of Practice for Installation and Maintenance of induction motors, Indian Standard Institution, IS: 900-1965.
7. Code of Practice for electrical wiring, Installations (system voltage not exceeding 650 Volts), Indian Standard Institution, IS: 2274-1963.
8. Electrical Installation, estimating and costing, Gupta J. B., Katson, Ludhiana.

Subject Code: - ELE212
Subject Name: - Entrepreneurship development & Project
Semester:-VI

L	T	P	C
4	-	-	4

Course Objective:
To develop and strengthen entrepreneurial quality and motivation in students and to impart basic entrepreneurial skills and understanding to run a business efficiently and effectively.

UNIT-I: ENTREPRENEURSHIP
Concept of Entrepreneurship: Meaning–Entrepreneur, Types of Entrepreneurs, Difference between Entrepreneur and Intrapreneur, Functions of Entrepreneurs. Factors influencing Entrepreneurship.

UNIT-II: INDUSTRIES AND BUSINESS ORGANIZATION
Concept of Industry or Enterprise, Classification of Industries-(a) On the basis of capital investment: - Tiny (Micro) Industry, Small Scale, Medium Scale, Large Scale, (b) Others: - Rural Industry, Cottage Industry, (c) Forms of Business Organization: - Proprietorship, Board & Co., Partnership, public Ltd., Private Ltd., Jt. Sector, Government Co-operative / Undertakings.

UNIT-III: IDEA GENERATION AND FEASIBILITY ANALYSIS
Idea Generation: Creativity and Innovation, Identification of Business Opportunities, Market Entry Strategies, Marketing Feasibility, Financial Feasibilities, Political Feasibilities, Economic Feasibility, Social and Legal Feasibilities, Technical Feasibilities, Managerial Feasibility, Location and Other Utilities Feasibility.

UNIT-IV: BUSINESS MODEL AND PLAN IN RESPECTIVE INDUSTRY
Business model–Meaning, designing, analyzing and improvising; Business Plan–Meaning, Scope and Need; Financial, Marketing, Human Resource and Production/Service Plan; Business plan Formats; Project report preparation and presentation; Why some Business Plan fails?

UNIT-V: FINANCING AND HOW TO START UP BUSINESS?
Financial opportunity identification; Banking sources, Non banking Institutions and Agencies; Venture Capital–Meaning and Role in Entrepreneurship, Government Schemes for funding business, Pre launch, Launch and Post launch requirements, Procedure for getting License and Registration; Challenges and Difficulties in Starting an Enterprise.

Course Outcome:
Upon completion of the course, students will be aware about entrepreneurship, learn about idea generation, creative and innovative skills and learn how to start an enterprise and design business plans.

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Text Books:

1. Khanka. S.S., "Entrepreneurial Development" S. Chand & Co. Ltd., Ram Nagar, New Delhi, 2013.
2. Donald F Kuratko, "Entrepreneurship – Theory, Process and Practice", 9th Edition, Cengage Learning 2014.
3. Jayshree Suresh, "Entrepreneurial Development", Margham Publishers, Chennai , 2011
4. Poornima M Charantimath, "Entrepreneurship development small business enterprises", Pearson, 2013.
5. Entrepreneurial Development Vol. I,II,III by Vasant Desai Himalaya Publication.

Subject Code: - ELE213
Subject Name: - Flexible AC Transmission System
Semester:-VI

L	T	P	C
4	-	-	4

Course Objectives:
- To enable the students acquire a comprehensive ideas on various aspects of FACTS systems
- To acquire the knowledge on Flexible AC Transmission System and its importance for FACTS devices.
- To understand the various FACTS controllers operation on FACTS systems.
- To Gain Knowledge about STATCOM

Unit-I
FACTS Concept and General System Consideration: Transmission Interconnection, Flow of Power in an AC System, factors affecting the Loading Capability, Power Flow and Dynamic Stability Consideration of Transmission interconnection, Importance of controllable Parameters, FACTS Controller.

Unit-II
Voltage-Sourced and Current-Sourced Converters: Basic Concept of Voltage-Sourced Converters, Single-Phase Full-Wave Bridge Converter Operation, Single Phase Leg Operation, Square-Wave Voltage Harmonics for Single Phase Bridge, Three Phase Full-Wave Bridge Converter. Sequence of Valve Conduction, Process in Each Phase-Leg, Transformer connection for 12-Pluse Operation, Three Level Voltage Sourced Converter, Pulse-Width Modulation Converter, Generalized Technique of Harmonic Elimination and Voltage Control. Basic Concepts of Current-Sourced Converters, Thruster-Based Converters (with Gate Turn-On), Current Sourced Converter with Turn-Off Devices, Current Sourced Versus Voltage Sourced Converters.

Unit-III
Static Shunt Compensators: SVC and STATCOM. Objectives of shunt Compensation, Methods of Controllable VAR Generation, Static VAR Compensators SVC and STATCOM, Comparison Between STATCOM and SVC, Static VAR System.

Unit-IV
Static Series Compensators: GCS, TSSC, TCSC and SSSC. Objectives of series Compensation, Variable Impedance Type Series Compensators, Switching Converter Type Series Compensators, External (System) Control for Series Reactive Compensators.

Unit-V
Static Voltage and Phase Angle Regulators; TCVR and TCPAR. Objectives of Voltage and Phase Angle regulators, Approaches to Thyristor Controlled Voltage and Phase Angle

Regulators (TCVR and TCP ARS), Switching Converter-Based Voltage and Phase Angle regulator, Hybrid Phase Angle Regulators.

Unit-VI

Combine Compensators (UPFC, IPFC) and Special Purpose FACTS Controllers' : The Unified Power Flow Controller (UPFC), Interline Power Flow Controllers Generalized and Multifunctional FACTS Controllers, Sub synchronous Resonance, NGH-SSR Damping Scheme, Thyristor-Controlled Braking Resistor (TCBR), Recent trends in low rating & distributed FACTS devices.

Course Outcomes:

The students will be able to

- Understand the importance of controllable parameters and benefits of FACTS controllers.
- Know the significance of shunt, series compensation and role of FACTS devices on system control.
- Analyze the functional operation and control of GCSC, TSSC and TCSC.
- Describe the principles, operation and control of UPFC and IPFC.

Reference Books:

1. Understanding FACTS by Narayan G. Hingorani and Laszlo Gyugi (Standard Publishers)
2. Flexible AC Transmission System (FACTS) Edited by Yong Hua Song and Johns (IEEE Publishers)

Mandsaur University

Subject Code: - ELE250
Subject Name: - Project Work
Semester:-VI

L	T	P	C
-	-	8	8

Course Objectives:
- To provide students with a comprehensive experience for applying the knowledge gained so far by studying various courses.
- To develop an inquiring aptitude and build confidence among students by working on solutions of small industrial problems.
- To provide students an opportunity to do some thing creative and to assimilate real life work situation in institution.
- To adapt students for latest developments and to handle independently new situations.
- To develop good experiences, power and presentation abilities in students

The faculty and student should work according to following schedule:
- Each student undertakes substantial and individual project in an approved area of the subject and supervised by member of staff.
- The student must submit outline and action plan for the project execution (time schedule) and the same be approved by the concerned faculty.
- The project development must be carried out according to following steps and final write-up should have the same sequence.
  1. Project objectives.
  2. Collecting Requisite.
  3. Modeling of project should be done in any well- known modeling tools.
  4. Analysis of Project.
  5. Design of Project.
  6. Implementation of project.
  7. Testing on project.
  8. Quality consideration of project.
  9. Designing a small user manual.
  10. Estimating the cost of the project.
  11. Future scope and suggestions.

Mandsaur University

Subject Code: -
Subject Name: - Electrical CAD Lab
Semester:-VI

L	T	P	C
-	-	4	2

Course Objective:
CAD lab includes the drawing, design, installation & machines, including computer awareness. Different drawings are done using computer. This subject helps the students to analyze the drawings. The knowledge gained in this subject is help full to the students in future as well as job opportunities.

Introduction to Computer Aided Drafting
Drawing using CAD, Advantages of using CAD, Three dimensional geometry, Solid modeling CAD systems components, Computer hard ware and soft ware, Functions of a computer, CAD work station, Application of CAD, Development of Auto CAD system requirements, Drafting by Auto CAD, Programme operations, Auto CAD basics – start up dialog box, use a template, open a drawing, accessing, Commands – DATA entry, Settings limits, Drawing lines, Using grid and snap, Saving work, Exit and quit commands, Editing drawings using various modified command, Add dimensions and texts on drawing

Course Outcomes:
At the end of course, students will be able to:
- Simulate design of electrical network.
- Draw single line diagram of power transmission in Auto CAD software.
- Draw electrical house wiring in Auto CAD software.

Reference Books:
1. LP Editorial Board, Electrical AUTO 2007.
2. AutoCAD Manual, Publication.
3. AutoCAD by A problem solving Approach
4. Rubenstein, AutoCAD, Publication

Suggested List of Experiment:
1. To understanding of Auto CAD Software.
2. To draw electrical symbols in Auto CAD software.
3. To simulate electrical circuit in circuit maker AutoCAD software.
4. To draw single line diagram of power transmission and distribution system AutoCAD software.
5. To draw electrical house wiring in Auto CAD software.
6. To draw the Double circuit 66 KV Steel tower using AutoCAD software.
7. To draw the Single circuit 66 KV Steel tower using AutoCAD software.
8. To draw the Pin Insulator using auto cad.