

Course Schedule (we meet twice a week for 2 hrs. and 50 mins. each time)

Week 1

- Introductions / Syllabus / Purpose of the course
- English video / "Fabulous 5" concepts / part of Chapter 1 – Magnetism (pg. 25-28)
- First day Electrical Safety
 - Lock-out / Tag out
 - PPE
 - safety videos
 - fire extinguishers / fire extinguisher use
- Chapter 4 (Electrical Safety continued)
- Chapter 3 (Test instruments)
 - multi-meters
 - voltage measurement
 - current measurement
 - resistance measurement
 - megometers
 - add-on attachments

** Lab 1 (check voltage level of de-energized and energized trainer)*

Week 2

- Overview of Electricity (Chapter 1: pages 8-14)
 - voltage, current, and resistance
 - AC vs DC
 - measuring voltage, current, and resistance in series and parallel circuits (pg. 18-21)
- Single phase and three phase generators - Chapter 10: pages 211-214)
- Transformers (Chapter 11: pages 225-227)
- * Lab 2(test the input and output of the transformer on the electrical trainer)*
- Solenoids (Chapter 7: pages 173-178 and page 50
- Relays and Contactors (pages 51 & 52, Chapter 8, and Chapter 12: pages 237-239, 247-251

** Lab 3 (take apart a contactor)*

Week 3

Symbols and Diagrams (Chapter 2)

- electrical symbols and abbreviations
 - N.O. vs N.C.
- ladder diagrams
- wiring diagrams
- manual circuits
- automatic circuits
- basic components
- print reading and troubleshooting using prints
- * Lab 4 (wire and test 2 simple circuits)*
- * Lab 5 (troubleshoot another group's circuit based on their ladder and wiring diagram)*

Week 4

Control Logic (Chapter 5)

- line diagram rules
- numerical cross-referencing (*page 122)

- Signals/Decisions/Actions
- AND / OR / NOT / Memory Lock-in ("holding" contacts)
- Common Control Circuits
 - multiple start/ stop
 - common E-stop
 - simultaneous sequenced control
 - jog and run
- Troubleshooting common control circuits

** Lab 6 (wire common control circuits)*

** Lab 7 (troubleshoot another group's common control circuits based on their ladder and wiring diagram)*

Week 5

- Mechanical Control Devices (Chapter 6)

- pushbuttons / selector switches / joy sticks / limit switches / foot switches
- pressure switches / temperature switches / flow switches / level switches

- Solid State Control Devices (Chapter 24 pages: 505–507 and 511-521)

- prox. switches
 - inductive
 - capacitive
- photoeyes
 - light operated
 - dark operated

** Lab 8 (wire control circuits with prox. switch and photoeye in them)*

Week 6

- Overview of Pneumatic trainer

- single and double acting cylinders
- air motor
- solenoid operated valves (Chapter 7: pages 179-187)
- wiring

** Lab 9 (actuating the various components on the pneumatic trainer)*

Week 7

- Timers and counters (Chapter 16)

- timer types - dashpot / synchronous clock / solid state
- timer Functions and example circuits
 - on delay
 - off delay
 - one shot (interval)
 - recycling

Counters

- count up
- count down

**Lab 10 A (wire and test dashpot and solid state timer)*

- review for midterm exam

Week 8

**Lab 10B (wire a counter)*

**Lab 11 (wire a control circuit that utilizes a timer, counter, and other components we've learned about up to this point.)*

*** Midterm exam**

Week 9

-Single Phase Motors (Chapter 14: pages 297-301)

- how they work
 - start winding / run winding / centrifugal switch
 - manual motor starter (page 48 & 49)
- types
 - Split Phase
 - Capacitor Type
 - Capacitor Start
 - Capacitor Start/Capacitor Run
 - Permanent Split Capacitor
 - Shaded Pole

- NEC requirements for motor starters, fuses, and overloads

- Vendor Catalog examples

- Popular Science article

** Lab 12 A & B (wire Split Phase & Capacitor Start motors and measure their voltage and current draws)*

Week 10

- Three Phase Motors (Chapter 14: pages 301 – 306)

- how they work

- Three Phase Motor Starters & over-current protection (fuses, overloads, & circuit breakers)
(pages 52-55, Chapter 12, pages 544-552, and pages 555-564)

- Motor Maintenance & Troubleshooting (Chapter 14: pages 306 – 314)

- Reversing Motor Starters (Chapter 15: pages 331-334)

Week 11

Various 3 phase motor labs

** Lab 13 (wire 3 phase motor and measure its voltage and current draw)*

** Lab 14 (wire 3 phase motor through a variable frequency drive) (IST lab)*

** Lab 15 (wire power and control circuit (with a 3 phase motor) to meet a given set of criteria / demo to instructor / put bugs in / trade groups/ troubleshoot and get back)*

Week 12

- Introduction to PLC's (chapter 27)
 - history
 - overview
 - fixed vs modular
 - the five parts / what each part does
 - opto-isolation
 - basic field wiring
 - safety circuit (external MCR)
 - applications and examples
 - stoplight (pg. 622)
 - industrial door (pg. 631)
 - department jeopardy game

Week 13

- PLC programming rules and basic logic functions (pg. 612)
- addressing and memory organization
- XIC vs XIO contacts
- B3's (internal relays)
- Configuring
- Timers and counters
- * *Lab 16 (related to PLC functions covered)*

Week 14

- PLC programming practice
- * *Lab 17 (write and test 3 simple programs to meet 3 given sets of criteria)*

Week 15

- Plant / Warehouse Preventative Maintenance (Chapter 29)
 - principles
 - alignment
 - bearings
 - belt and chain drives
 - test
 - Plant Warehouse Predictive Maintenance (Chapter 30)
 - monitoring
 - resources
 - *Review for final exam*
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Week 16

- * **Final Exam**