

ENGT 1300 – INTRO TO MOTORS, CONTROLS, & PLC's

UNITS OF INSTRUCTION

WEEK	UNIT OF INSTRUCTION	LEARNING OBJECTIVES / GOALS	ASSESSMENT METHODS	ASSIGNMENTS	ASSIG. DUE DATE
Week 1	<ul style="list-style-type: none"> - Introductions / Syllabus / Purpose of the course - “English” video / “Fabulous 5” concepts / part of Chapter 1 – Magnetism (pg. 25-28) - First day Electrical Safety <ul style="list-style-type: none"> - Lock-out / Tag out - PPE - safety videos - fire extinguishers and proper fire extinguisher use - Chapter 4 (Electrical Safety) - Chapter 3 (Test instruments) <ul style="list-style-type: none"> - digital multi-meters <ul style="list-style-type: none"> - voltage measurement - current measurement - resistance measurement - add-on attachments - megometers <p>* Lab 1 (check voltage level of de-</p>	<ul style="list-style-type: none"> -Orient students to the course. - Introduce magnetic and electrical principles that explain the workings of the components we will be using in the coming weeks. - Introduce and establish safety protocols to be used as we work with electricity the rest of the semester. <p>Familiarize students with using digital multi-meters to make various electrical measurements.</p>	<p>Midterm Exam</p> <p>Successful completion of the</p>	<p>Read chapters and pages shown under Units of Instruction for this week.</p> <p>Read chapters and pages shown under Units of Instruction for week 2.</p>	<p>Will be announced in class</p>

Week 3	<p>Symbols and Diagrams (Chapter 2)</p> <ul style="list-style-type: none"> - electrical symbols and abbreviations - N.O. vs N.C. - ladder diagrams - wiring diagrams - manual circuits - automatic circuits - basic components - print reading & troubleshooting using prints <p><i>* Lab 4 (wire and test 2 simple circuits)</i></p> <p><i>* Lab 5 (troubleshoot another group's circuit based on their ladder and wiring diagram)</i></p>	<p>Familiarize students with common electrical terms, diagrams, and prints they will see in industry.</p> <p>Give students hands-on experience wiring and testing various electrical circuits.</p>	<p>Midterm Exam</p> <p>Successful completion of the labs</p>	<p>Read chapters and pages shown under Units of Instruction for week 4.</p>	<p>Will be announced in class</p>
Week 4	<p>Control Logic (Chapter 5)</p> <ul style="list-style-type: none"> - line diagram rules - numerical cross-referencing (*page 122) - Signals/Decisions/Actions - AND / OR / NOT / Memory Lock-in ("holding" contacts) - Common Control Circuits <ul style="list-style-type: none"> - multiple start/ stop - common E-stop - simultaneous sequenced control 	<p>Familiarize students with standard control logic principles and common control circuits.</p>	<p>Midterm Exam</p>	<p>Read chapters and pages shown under Units of Instruction for week 5.</p>	<p>Will be announced in class</p>

	<p>- jog and run</p> <p>- Troubleshooting common control circuits</p> <p><i>* Lab 6 (wire common control circuits)</i></p> <p><i>* Lab 7 (troubleshoot another group's common control circuits based on their ladder and wiring diagram)</i></p>	Give students hands-on experience wiring and testing various 120 volt control circuits.	Successful completion of the labs		
Week 5	<p>- Mechanical Control Devices (Chap. 6)</p> <ul style="list-style-type: none"> - pushbuttons / selector switches / joy sticks / limit switches / foot switches - pressure switches / temperature switches / flow switches / level switches <p>- Solid State Control Devices (Chapter 24 pages: 505–507 and 511-521)</p> <ul style="list-style-type: none"> - prox. switches <ul style="list-style-type: none"> - inductive - capacitive - photoeyes <ul style="list-style-type: none"> - light operated - dark operated <p><i>* Lab 8 (wire control circuits with prox. switch and photoeye in them)</i></p>	<p>Familiarize students with common mechanical and solid state control devices.</p> <p>Give students hands-on experience wiring various mechanical and solid state control devices.</p>	<p>Midterm Exam</p> <p>Successful completion of the lab</p>	Read chapters and pages shown under Units of Instruction for week 6.	Will be announced in class

Week 6	<ul style="list-style-type: none"> - Overview of Pneumatic trainer <ul style="list-style-type: none"> - single and double acting cylinders - air motor - solenoid operated valves <ul style="list-style-type: none"> - Chapter 7: pages 179-187 and supplemental handout - wiring <i>* Lab 9 (actuating the various components on the pneumatic trainer)</i> 	<p>Familiarize students with common pneumatic components used in industry.</p> <p>Give students hands-on experience wiring various pneumatic components.</p>	<p>Midterm Exam</p> <p>Successful completion of the lab</p>	<p>Read chapters and pages shown under Units of Instruction for week 7.</p>	<p>Will be announced in class</p>
Week 7	<p>Timers and counters (Chapter 16)</p> <ul style="list-style-type: none"> -timer types: <ul style="list-style-type: none"> - dashpot - synchronous clock - solid state - timer functions and example circuits: <ul style="list-style-type: none"> - on delay - off delay - one shot (interval) - recycling -counters types - <ul style="list-style-type: none"> - count up - count down <p><i>*Lab 10 A (wire and test dashpot and solid state timer)</i></p>	<p>Familiarize students with common timers and counters used in industrial circuits.</p> <p>Give students hands-on experience wiring timers and counters in industrial circuits.</p>	<p>Midterm Exam</p> <p>Successful completion of the lab</p>	<p>Study for midterm exam.</p>	<p>Will be announced in class</p>

	Review for midterm exam.				
Week 8	<p><i>*Lab 10B (wire a counter)</i></p> <p><i>*Lab 11 (wire a control circuit that utilizes a timer, counter, and other components we've learned about up to this point.)</i></p> <p>* Midterm Exam</p>		Midterm Exam	Read chapters and pages shown under Units of Instruction for week 9.	Will be announced in class
Week 9	<p>-Single Phase AC Motors (Chapter 14: pages 297-301)</p> <ul style="list-style-type: none"> - how they work <ul style="list-style-type: none"> - start winding/run winding / centrifugal switch - manual motor starter (page 48 & 49) - types <ul style="list-style-type: none"> - Split Phase - Capacitor Type <ul style="list-style-type: none"> - Capacitor Start - Capacitor Start/ Capacitor Run - Permanent Split Capacitor - Shaded Pole <p>- NEC requirements for motor starters, fuses, and overloads</p> <p>- Vendor Catalog examples</p>	<p>Familiarize students with the three types of single phase motors (how they work, how to wire them, how to troubleshoot them, and how to reverse them).</p> <p>Familiarize students with NEC requirements related to single phase motors.</p>	Final Exam	Read chapters and pages shown under Units of Instruction for week 10.	Will be announced in class

	<p>- Popular Science article</p> <p><i>* Lab 12 A & B (wire Split Phase & Capacitor Start motors and measure their voltage and current draws)</i></p>	Give students hands-on experience wiring 120 volt single phase motors.	Successful completion of the labs		
Week 10	<p>- Three Phase AC Motors (Chapter 14: pages 301 – 306) - how they work</p> <p>- Three Phase Motor Starters & over-current protection (fuses, overloads, & circuit breakers) - page 52-55, Chapter 12, pages 544-552, and pg. 555-564)</p> <p>- Motor Maintenance & trouble - shooting (Chapter 14: pages 306-314)</p> <p>- Reversing Motor Starters (Chapter 15: pages 331-334)</p>	<p>Familiarize students with three phase AC motors (how they work, how to wire them, how to troubleshoot them, and how to reverse them).</p> <p>Familiarize students with NEC requirements related to three phase AC motors.</p>	Final Exam		Will be announced in class
Week 11	<p>Various 3 phase motor labs:</p> <p><i>* Lab 13 (wire 3 phase motor and measure its voltage and current draw)</i></p> <p><i>* Lab 14 (wire 3 phase motor through a variable frequency drive) (IST lab)</i></p>	Give students hands-on experience wiring 230 volt three phase motors.	Successful completion of the labs	Read chapters and pages shown under Units of Instruction for week 12.	Will be announced in class

	<i>* 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)</i>				
Week 12	<ul style="list-style-type: none"> - 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) <ul style="list-style-type: none"> - applications and examples - stoplight (pg. 622) - industrial door (pg. 631) - department Jeopardy game 	Introduce students to Programmable Logic Controllers (PLC's)	Final Exam	Read chapters and pages shown under Units of Instruction for week 13.	Will be announced in class
Week 13	<ul style="list-style-type: none"> - PLC programming rules and basic logic functions (pg. 612) - addressing and memory organization - XIC vs XIO contacts 	Familiarize students with basic PLC contacts, addressing, memory organization, configuring, and timing & counting function.	Final Exam	Read chapters and pages shown under Units of Instruction for week 14.	Will be announced in class

	<ul style="list-style-type: none"> - B3's (internal relays) - Configuring - Timers and counters <p><i>* Lab 16(related to PLC functions covered)</i></p>	Give students hands-on experience writing a simple PLC program.	Successful completion of the lab		
Week 14	<ul style="list-style-type: none"> - PLC programing practice <p><i>* Lab 17 (write and test 3 simple programs to meet 3 given sets of criteria)</i></p>	Give students hands-on experience writing, downloading, and testing simple PLC programs.	Successful completion of the lab	Read chapters and pages shown under Units of Instruction for week 15.	Will be announced in class
Week 15	<ul style="list-style-type: none"> - Plant / Warehouse Preventative Maintenance (Chapter 29) <ul style="list-style-type: none"> - principles - alignment - bearings - belt and chain drives - test - Plant Warehouse Predictive Maintenance (Chapter 30) <ul style="list-style-type: none"> - monitoring - resources - Review for final exam 	Expose students to general plant / warehouse preventative and predictive maintenance principles and procedures.	Final Exam	Study for final exam.	Will be announced in class
Week 16	Finals Week		Final Exam		



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