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

WEEK	UNIT OF INSTRUCTION	LEARNING OBJECTIVES /	ASSESSMENT	ASSIGNMENTS	ASSIG.
		GOALS	METHODS		DUE DATE
Week 1	- Introductions / Syllabus / Purpose of	-Orient students to the		Read chapters	Will be
	the course	course.		and pages shown	announced
				under Units of	in class
	- "English" video / "Fabulous 5"	- Introduce magnetic and	Midterm Exam	Instruction for	
	concepts / part of Chapter 1 –	electrical principles that		this week.	
	Magnetism (pg. 25-28)	explain the workings of the			
		components we will be using		Read chapters	
	- First day Electrical Safety	in the coming weeks.		and pages shown	
	- Lock-out / Tag out			under Units of	
	- PPE	- Introduce and establish		Instruction for	
	- safety videos	safety protocols to be used as		week 2.	
	- fire extinguishers and proper	we work with electricity the			
	fire extinguisher use	rest of the semester.			
	- Chapter 4 (Electrical Safety)				
	- Chapter 3 (Test instruments)	Familiarize students with			
	- digital multi-meters	using digital multi-meters to			
	 voltage measurement 	make various electrical			
	- current measurement	measurements.			
	- resistance measurement				
	- add-on attachments				
	- megometers				
			Successful		
	* Lab 1 (check voltage level of de-		completion of the		

	energized and energized trainer)		lab		
Week 2	- Overview of Electricity (Chapter 1: pages 8-14) - voltage, current, & resistance - AC vs DC - measuring voltage, current, and resistance in series and parallel circuits (pg. 18-21)	- Introduce and explain foundational electrical principles.	Midterm Exam	Read chapters and pages shown under Units of Instruction for week 3.	Will be announced in class
	- Single phase and three phase generators - Chapter 10: pages 211-214) - Transformers (Chapter 11: pages 225-227)	Explain how generators, transformers, solenoids, relays, and contactors work.			
	* 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)	Give students the opportunity to de-construct components to see how they work.	Successful completion of the labs		

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 & troubleshooting using prints	Familiarize students with common electrical terms, diagrams, and prints they will see in industry.	Midterm Exam	Read chapters and pages shown under Units of Instruction for week 4.	Will be announced in class
	* Lab 4 (wire and test 2 simple circuits) * Lab 5 (troubleshoot another group's circuit based on their ladder and wiring diagram)	Give students hands-on experience wiring and testing various electrical circuits.	Successful completion of the labs		
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	Familiarize students with standard control logic principles and common control circuits.	Midterm Exam	Read chapters and pages shown under Units of Instruction for week 5.	Will be announced in class

	- 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	Give students hands-on experience wiring and testing various 120 volt control circuits.	Successful completion of the labs		
	ladder and wiring diagram)	circuits.			
Week 5	- Mechanical Control Devices (Chap. 6) - pushbuttons / selector switches / joy sticks / limit switches / foot switches - pressure switches / temperature switches / flow switches / level switches - Solid State Control Devices (Chapter	Familiarize students with common mechanical and solid state control devices.	Midterm Exam	Read chapters and pages shown under Units of Instruction for week 6.	Will be announced in class
	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)	Give students hands-on experience wiring various mechanical and solid state control devices.	Successful completion of the lab		

Week 6	- Overview of Pneumatic trainer	Familiarize students with	Midterm Exam	Read chapters	Will be
	- single and double acting	common pneumatic		and pages shown	announced
	cylinders	components used in industry.		under Units of	in class
	- air motor			Instruction for	
	- solenoid operated valves			week 7.	
	- Chapter 7: pages 179-				
	187 and supplemental				
	handout				
	- wiring				
		Give students hands-on	Successful		
	* Lab 9 (actuating the various	experience wiring various	completion of the		
	components on the pneumatic trainer)	pneumatic components.	lab		
Week 7	Timers and counters (Chapter 16)	Familiarize students with	Midterm Exam	Study for	Will be
	-timer types:	common timers and counters		midterm exam.	announced
	- dashpot	used in industrial circuits.			in class
	- synchronous clock				
	- solid state				
	- timer functions and example				
	circuits:				
	- on delay				
	- off delay				
	- one shot (interval)				
	- recycling				
	-counters types -				
	- count up				
	- count down				
			Successful		
	*Lab 10 A (wire and test dashpot and	Give students hands-on	completion of the		
	solid state timer)	experience wiring timers and	lab		
		counters in industrial circuits.			

	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	Read chapters and pages shown under Units of Instruction for week 9.	Will be announced in class
Week 9	* Midterm Exam -Single Phase AC 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	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).	Final Exam	Read chapters and pages shown under Units of Instruction for week 10.	Will be announced in class
	NEC requirements for motor starters, fuses, and overloadsVendor Catalog examples	Familiarize students with NEC requirements related to single phase motors.			

	- Popular Science article				
	* Lab 12 A & B (wire Split Phase &	Give students hands-on	Successful		
	Capacitor Start motors and measure	experience wiring 120 volt	completion of the		
Week	their voltage and current draws)	single phase motors. Familiarize students with	labs Final Exam		Will be
week	- Three Phase AC Motors (Chapter 14: pages 301 – 306)	three phase AC motors (how	Final Exam		announced
10	- how they work	they work, how to wire them,			in class
	now they work	how to troubleshoot them,			III class
		and how to reverse them).			
	- Three Phase Motor Starters & over-	Familiarize students with NEC			
	current protection (fuses, overloads, &	requirements related to three			
	circuit breakers) - page 52-55, Chapter 12, pages	phase AC motors.			
	544-552, and pg. 555-564)				
	344 332, and pg. 333 304)				
	- Motor Maintenance & trouble -				
	shooting (Chapter 14: pages 306-314)				
	- Reversing Motor Starters (Chapter 15:				
100	pages 331-334)		6 61	D 1 1 1	NACH I
Week 11	Various 3 phase motor labs:		Successful completion of the	Read chapters and pages shown	Will be announced
11	* Lab 13 (wire 3 phase motor and	Give students hands-on	labs	under Units of	in class
	measure its voltage and current draw)	experience wiring 230 volt	1003	Instruction for	III class
	and the second carrier and the second carrier,	three phase motors.		week 12.	
	* 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	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	 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

	- B3's (internal relays)				
	- Configuring				
	- Timers and counters				
	* Lab 16(related to PLC functions covered)	Give students hands-on experience writing a simple PLC program.	Successful completion of the lab		
Week 14	- PLC programing practice			Read chapters and pages shown	Will be announced
	* Lab 17 (write and test 3 simple programs to meet 3 given sets of criteria)	Give students hands-on experience writing, downloading, and testing simple PLC programs.	Successful completion of the lab	under Units of Instruction for week 15.	in class
Week 15	- Plant / Warehouse Preventative Maintenance (Chapter 29) - principles - alignment	Expose students to general plant / warehouse preventative and predictive	Final Exam	Study for final exam.	Will be announced in class
	- bearings - belt and chain drives - test	maintenance principles and procedures.			
	 - Plant Warehouse Predictive Maintenance (Chapter 30) - monitoring - resources 				
	- Review for final exam				
Week 16	Finals Week		Final Exam		