

Course Number & Name	MIME 4440/5440 - Mechatronics
Credits & Contact hours	3 Credits 8:00-9:20 – T, R, NE 2131, Labs – NE 2350/ NE 2390
Coordinator	Wm Ted Evans, PhD, PE
Textbook	Hybrid Text, Hybrid Lab Text, youtube videos found on website: hybridplc.org
Course Information	This course will give students hands-on experience with mechatronic systems and components. The primary tool is the PLC but vision systems will be introduced as well. Topics vary from simple combinational logic/sequential logic design to state diagram design of control systems. Topics also include HMI, communication of various devices, PID, Single axis speed control and safety PLC design. Prerequisites: MIME 3380 with a minimum grade of D-
Topics	Term Offered: Spring <ol style="list-style-type: none"> 1. Introduction to Programmable Logic Controllers (PLCs) and its architecture 2. Input/output modules, power supplies, opto isolation and memory map 3. Allen-Bradley Compact Logix Instruction Set 4. Siemens Instruction Set 5. Addressing considerations for both PLC processors 6. IEC 61131-3 programming language standard 7. Ladder logic programming including combinational logic, branching and other rung conditions 8. Start/stop circuits, special contacts, transitional contacts, latching instructions, memory circuit constructs 9. Timers, timing diagrams and examples for timer applications 10. Counter basic programming, Arithmetic 11. Control Panel Construction Standards 12. Control standards external to the Control Panel 13. Analog module-programming examples, Fault and interrupt service routines 14. Sequential Programming Concepts 15. Process control PLC programming including Faceplate 16. HMI Programming Organization 17. Siemens Function/Function Blocks 18. Motion Control of single axis motion systems 19. PID implementation including HMI

Class will be graded:

Labs	30 %
Midterm exam	25 %
Final Exam	25 %
Quizzes/Projects	20 %
(A >= 90, B >= 80, C >= 70, D >= 60)	
Midterm	Class Period
Final	Finals Week

There are no make-up exams for this course. If you have a problem or conflict and cannot attend an exam, let me know beforehand and we will try to work something out. No credit will be given for a missed exam that we haven't made arrangements about beforehand unless you have a *really excusable* emergency. Cell phone use will not be allowed. If you do not have a calculator, buy one and bring it to class.

Cheating is not allowed and will be punished by rules of U of Toledo Student Handbook.

For this course, lab points listed are by schedule pg. 3.

You must have 14 points of labs submitted prior to March 15, 2025.

Half of the labs must be from Lab 8.2 or higher. Also, starting with lab 7.2, HMI may be used but you cannot get credit for both the 7.2 HMI and 15.1 HMI lab using the same platform. You will only get credit for the Cash Register lab for both if you use the 7.2 lab as a wired lab and 15.1 as an HMI lab for each platform.

Credit for labs consists of presentation of a finished lab (signed) and a summary statement. Alternatively, if no one is present to sign your lab, you may submit as many screen shots of your lab as you deem sufficient to prove that you in fact performed the lab in a run-time situation. Also, submit a summary of your lab with this option.

Quizzes may be sent via email or in-class, usually on Thursdays. You are responsible for submission of a paper copy of the quiz. Email submission will not be accepted.

Lab Assn 1	Lab 2.1	Explained in Ch. 2, pg 28-33	Results with report – 2 pts	
Lab Assn 2	Lab 4.1	Ch. 4, Hot Dog Counter	Siemens – no sign off – 2 pts A-B – no sign off – 2 pts	
Lab Assn 3	Lab 5.1	Ch. 5, Coin Changer (35-cent option)	Siemens – sign-off – 2 pts A-B – sign-off – 2 pts	Hybrid Lab Text Ch. 2 – 2 pts Hybrid Lab Text Ch. 3 – 2 pts
Lab Assn 4	Ch. 7	7.1 Traffic Intersection (7.1F)	Siemens – sign-off – 2 pts A-B – sign-off – 2 pts	Hybrid Lab Text Ch. 4 – 2 pts
Lab Assn 5	Ch. 7	7.2 Cash Register (7.2D &E)	Siemens – sign-off – 2 pts A-B – sign-off – 2 pts	Hybrid Lab Text Ch. 5 – 2 pts Hybrid Lab Text Ch. 6 – 4 pts
Lab Assn 6a	Ch. 8.1	8.1b (subtract only)	Siemens – sign-off – 2 pts A-B – sign-off – 2 pts	Hybrid Lab Text Ch. 7 – 2 pts
Lab Assn 6b	Ch. 8.2	Lab 8.2A or B	Siemens – sign-off – 4 pts	Hybrid Lab Text Ch. 8 – 4 pts
Lab Assn 7a	Ch. 10.1	10.1 (MUX)	Siemens – sign-off – 4 pts A-B – sign-off – 4 pts	Hybrid Lab Text Ch. 9 – 4 pts
Lab Assn 7b	Ch. 10.3	10.3 Calories from Bike	Siemens – sign-off – 4 pts	Hybrid Lab Text Ch. 10 – 4 pts
Lab Assn 8a	Ch. 11.1	11.1 Pumps	Siemens – sign-off – 4 pts A-B – sign-off – 4 pts	Hybrid Lab Text Ch. 11 – 4 pts
Lab Assn 8b	Ch. 11	Any Festo 1 max	Siemens – Hybrid Lab Txt Ch. 28 – 4 pts	
Lab Assn 9a	Ch. 13.1	13.1C Simon Says	Siemens – sign-off – 4 pts A-B – sign-off – 4 pts	Hybrid Lab Text Ch. 12 – 4 pts
Lab Assn 9b	Ch. 13.2b	13.2b Whack-a-mole	Siemens – sign-off – 4 pts	Hybrid Lab Text Ch. 13 – 4 pts
Lab Assn 9c	Ch. 13.2c	13.2C1	Siemens – sign-off – 4 pts	
Lab Assn 9d	Ch. 13.3	13.3	Siemens – sign-off – 4 pts	Hybrid Lab Text Ch. 14 – 4 pts
Lab Assn 10	Ch. 14.1 Ch. 14.2 Ch. 14.3	Function	Siemens – sign-off – 4 pts/each	Hybrid Lab Text Ch. 15 – 4 pts
Lab Assn 11	Ch. 15.1	Cash Register HMI	Siemens – sign-off – 2 pts A-B – sign-off – 2 pts A-B – sign-off – 2 pts	Hybrid Lab Text Ch. 16 – 2 pts/ea
Lab Assn 12	Ch. 15.2	Animation	Siemens – sign-off – 2 pts A-B – sign-off – 2 pts A-B – sign-off – 2 pts	Hybrid Lab Text Ch. 16 – 2 pts/ea
Lab Assn 13	Ch. 15.3 Ch. 15.4 Ch. 15.5 Ch. 15.6		Siemens – Sign-off – 4 pts/each	Hybrid Lab Text Ch. 16 – 4 pts/ea
Lab Assn 14	Ch. 16.1 Ch. 16.2 Ch. 16.3 Ch. 16.4 Ch. 16.5	RFID Peer to Peer Peer to Ascii Device Cyber Report Cognex-PLC Xmit	Siemens – sign-off – 4 pts A-B – sign-off – 4 pts	Hybrid Lab Text Ch. 17 – 4 pts/ea
Lab Assn 15	Ch. 17.1 Ch. 17.2	Siemens Motion A-B Motion	Siemens – sign-off – 4 pts A-B – sign-off – 4 pts	Hybrid Lab Text Ch. 18 – 4 pts Hybrid Lab Text Ch. 19 – 4 pts
Lab Assn 16	Ch. 19	PID	Ball-in-Tube Hybrid Text Ch. 22 – 4 pts Tank over Tank Hybrid Text Ch. 25 – 4 pts	Hybrid Lab Text Ch. 22 – 4 pts Hybrid Lab Text Ch. 25 – 4 pts
Lab Assn 17	Ch. 20	20.1	Safety Lab Hybrid Text Ch. 26 – 4 pts	Hybrid Lab Text Ch. 26 – 4 pts
Lab Assn 18	Cognex	Cognex Labs in EET 4450 Folder		
Lab Assn 19				
Lab Assn 20				