COURSE OUTLINE : ECT 210
D Credit – Degree Applicable
COURSE ID 001454
Cyclical Review: May 2021
Revision: October 2021

COURSE DISCIPLINE : ECT

COURSE NUMBER : 210

COURSE TITLE (FULL) : Programmable Logic Controllers (PLC)

COURSE TITLE (SHORT) : Programmable Logic Controllers (PLC)

ACADEMIC SENATE DISCIPLINE: Electronics Technology

CATALOG DESCRIPTION

ECT 210 covers Programmable Logic Controller (PLC) operations, including PLC installation and programming techniques. It emphasizes the methods of using the programming interface to troubleshoot applications in industry. The lab activities give the student practical programming and operating skills used in the maintenance of automated systems.

Total Lecture Units:2.00

Total Laboratory Units: 1.00

Total Course Units: 3.00

Total Lecture Hours:36.00

Total Laboratory Hours: 54.00

Total Laboratory Hours To Be Arranged: 0.00

Total Contact Hours: 90.00

Total Out-of-Class Hours: 72.00

Prerequisite: ECT 110. Recommended Preparation: ENGL 100 or ESL 141.

ENTRY STANDARDS

	Subject	Number	Title	Description	Include
1	ECT	110	Electricity and Electronics Principles	describe basic laboratory equipment and components;	Yes
2	ECT	110	Electricity and Electronics Principles	determine the value of resistors from their color code, measure DC (Direct Current) and AC (Alternating Current) voltage;	Yes
3	ECT	110	Electricity and Electronics Principles	identify conductors and insulators, and test common types of switches;	Yes
4	ECT	110	Electricity and Electronics Principles	measure current in a circuit, verify ohms law, investigate errors in measurement;	Yes
5	ECT	110	Electricity and Electronics Principles	design a series and parallel circuit that will meet specified resistance requirements;	Yes
6	ECT	110	Electricity and Electronics Principles	develop a general rule for calculating the voltage across each resister in an unloaded and loaded resistive voltage divider;	Yes
7	ECT	110	Electricity and Electronics Principles	develop methods of troubleshooting circuits using voltage, current, capacitor and resistance measurements;	Yes
8	ECT	110	Electricity and Electronics Principles	identify the operating controls of an oscilloscope;	Yes
9	ECT	110	Electricity and Electronics Principles	identify the controls and features of an audio frequency generator;	Yes
10	ECT	110	Electricity and Electronics Principles	describe the effect of AC and DC electrical motors and inductance;	Yes
11	ECT	110	Electricity and Electronics Principles	identify and measure affect transformers and magnetic relays and contactors.	Yes
12	ESL	141	Grammar And Writing IV	compose a 400 to 450-word thesis-based essay which:	Yes
13	ESL	141	Grammar And Writing IV	a. summarizes and cites appropriately a reading passage provided as a prompt;	Yes
14	ESL	141	Grammar And Writing IV	b. includes a clear thesis statement;	Yes
15	ESL	141	Grammar And Writing IV	c. uses evidence to support the thesis;	Yes
16	ESL	141	Grammar And Writing IV	d. shows clear organization into an introduction, body and conclusion;	Yes

17	ESL	141	Grammar And Writing IV	e. uses appropriate rhetorical modes such as comparison/contrast, cause/effect and persuasion in order to support a thesis;	Yes
18	ESL	141	Grammar And Writing IV	demonstrate control of verb tenses in active and passive voice, gerunds and infinitives, conditionals real and unreal, adjective, noun, and adverb clauses, and transitional expressions;	Yes
19	ESL	141	Grammar And Writing IV	comprehend multi-paragraph reading passages in textbooks.	Yes
20	ENGL	100	Writing Workshop	Read, analyze, and evaluate contemporary articles and stories to identify topic, thesis, support, transitions, conclusion, audience, and tone;	Yes
21	ENGL	100	Writing Workshop	write a summary of a contemporary article or story with correct citation techniques;	Yes
22	ENGL	100	Writing Workshop	write an argumentative essay that integrates the ideas of others (i.e., authors) through paraphrasing, summarizing, and quoting with correct citation techniques;	Yes
23	ENGL	100	Writing Workshop	write compositions (e.g., summaries and argumentative essays) that are easy to read and follow, though some errors in grammar, mechanics, spelling, or diction may exist;	Yes

EXIT STANDARDS

1 apply safety considerations when working on PLC systems;
2 demonstrate the electrical properties associated with PLCs;
3 identify the use of symbols in PLC's software for programing the PLCs;
4 predict the functions and different variation of the PLC sections;
5 identify the installation consideration regarding electrical properties and PLCs;
6 operate the maintenance process for PLC's hardware and software;
7 employ troubleshooting principles and test instruments for PLCs.

STUDENT LEARNING OUTCOMES

1 describe the overall function of programmable logic controllers (PLC's) and their uses in automation applications in industry;
2 implement a programmable logic controller system that performs an automatic physical task or set of tasks;
3 operate and troubleshoot programmable logic controller hardware and software autonomous functions.

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COURSE CONTENT WITH INSTRUCTIONAL HOURS

	Description	Lecture	Lab	Total Hours
1	PLC and Electrical Safety • PLC definition • Electrical properties • Grounding system • Safety consideration • Personal protection • Inspecting a PLC system	4	0	4
2	Electrical Principles and PLCs • PLC power supply • Input/output voltage rating • Input/output current rating • Input switches • PLC series circuit properties • PLC parallel circuit properties	3	4	7
3	Electrical Circuits and PLCs • Electrical symbols and diagrams • Logic functions • Logic gate circuits • PLC wiring methods	3	4	7
4	PLC Hardware • PLC input/output sections • PLC central processing units • PLC programming devices • PLC operating cycle	3	5	8
5	PLC Programming Instructions • Programming diagrams • File addresses • Scan execution	3	4	7
6	Programming PLC Timers and Counters • Timer and Counter instructions • Special applications	2	4	6

7	PLC and System Interfacing • Primary systems • System interfacing • Electromechanical relays • Solid-state relays • Motor starter interfaces • Electric motor drive interfacing	3	5	8
8	PLC Installations and Startup • PLC installation safety • Input/output checks • Program checks	2	4	6
9	PLC and System Maintenance • Visual inspection • Energized PLC maintenance • Software and program verification	3	4	7
10	Troubleshooting Principles and Test Instruments • Troubleshooting methods • Measurement precautions • Tester measurement procedures	2	4	6
11	Troubleshooting PLC Hardware • Troubleshooting input/output modules	2	4	6
12	Troubleshooting with PLC Software • Viewing PLC programs • Debugging PLC programs • Temporary end instruction • Software help features	2	4	6
13	Analog Principles • Analog and digital circuits • Variable frequency drive circuits • Analog input/output devices	2	4	6
14	Analog Device Installation and PLC Programming • Wiring analog input/output devices • Analog device programming setup • PLC actuator installation • Troubleshooting PLC actuators and actuator wiring	2	4	6
				90

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OUT OF CLASS ASSIGNMENTS

1 calculations (e.g. given logic ladder input and output current of controlled system, calculate time delay of sequential processing).
2 individual project (e.g. create a relay ladder logic, output for controlling a motor);
3 group project (e.g. create an automation process using PLC for power consumption).

METHODS OF EVALUATION

1 regular quizzes;
2 mid-term examination;
3 final examination;
4 laboratory practical examination;
5 evaluation of final project.

METHODS OF INSTRUCTION

- [x] Lecture
- [x] Laboratory
- [ ] Studio
- [ ] Discussion
- [x] Multimedia
- [ ] Tutorial
- [ ] Independent Study
- [x] Collaboratory Learning
- [x] Demonstration
- [ ] Field Activities (Trips)
- [ ] Guest Speakers
- [x] Presentations

TEXTBOOKS

Title	Type	Publisher	Edition	Medium	Author	IBSN	Date
Programmable Logic Controllers	Required	Delmar Cengage	3	Print	Gary Dunning	978-1401884260	2006