SYLLABUS

1. **Course name:** PROGRAMMABLE LOGIC CONTROLLER

2. **Course code:** PLCS330846

3. **Credits:** 3 (3/0/6)

   Duration: 15 weeks (45h main course and 90h self-study)

4. **Instructors:**

   1- Assoc. Prof. PhD. Truong Dinh Nhon
   2- M.Eng. Nguyen Tan Doi
   3- M.Eng. Ta Van Phuong

5. **Course conditions**

   Prerequisites: Digital Systems
   Corequisites: N/A

6. **Course description**

   This course provides students the knowledge of the sensors, actuators, PLC hardware, PLC operation. In addition, students will learn the programming languages, PLC instructions, how to design a flowchart for a control system. Finally, the course provides students how to design the hardware and program the software for an industrial system.

7. **Course Goals**

Goals	Goal description *(This course provides students:)*	ELOs
G1	Basic knowledge of PLC, applications of PLC in industry.	1.1, 1.2
G2	An ability to read material in English.	2.3, 3.3
G3	An ability to work effectively as a member and leader in teams.	3.1
G4	An ability to identify and solve engineering problems and to design an industrial system using tools and methods for solving problems related to PLC systems.	2.2, 4.4

* Note: High: H; Medium: M; Low: L

8. **Course Learning Outcomes (CLOs)**

CLOs		Description *(After completing this course, students can have:)*	Outcome
G1	G1.1	The ability to present the structure and operation of PLC.	1.1, 1.2
	G1.2	The ability to draw the wiring diagram of PLC and sensors, actuators.	1.1, 1.2

	G1.3	The ability to select devices for PLC system.	1.1, 1.2
G2	G2.1	The ability to read manual of devices and lectures in English	2.3, 3.3
G3	G3.1	The ability to organize, work and present in team.	3.1
G4	G4.1	The ability to identify and solve engineering problems for PLC systems	2.2
	G4.2	The ability to use software to program and simulate for PLC.	4.4

9. Study materials

- Textbooks:

[1] Truong Dinh Nhon, Nguyen Tan Doi, Giao trinh Dieu Khien Lap Trinh, 2016.

- References:

[1] Hugh Jack, Automation Manufacturing Systems with PLCs, 2005.

[2] Phan Minh Xuan, Nguyen Doan Phuoc, Tu Dong Hoa Voi SIMATIC S7200, S7300, NXB Nong nghiep, 1999

[3] LA Bryan, Programmable Controller, Industrial Text Company Publication, 1997

10. Student Assessments

- Grading points: 10

- Planning for students assessment is followed:

Type	Contents	Linetime	Assessment techniques	CLOs	Rates (%)
Midterms					**50**
Exam 01	- Connect DI, DO to switch, push button and lamp in sinking and sourcing types.	Week 3	Team work Paper	G1.1, 1.2, G4.1	5
Exam 02	- Addressing Dis, Dos. - Creating Tags. - Select sensors, actuators. - Explain parameters of a device.	weeks 4, 6, 8, 10	Online Quizes	G1.1, G1.2, G3.1	5
Exam 03	- Design hardware for PLC system. - Design flowchart. - Program software.	week 11	Individual paper assessment in class	G1.2, G3.2, G4.1	30
Exam 04	- Applications of PLC in industry.	Week 14	Seminar	G3.1, G4.1, G5.1	10
Final exam					**50**
Final Exam	- The exam covers all contents related to the expected learning outcomes of the course.		Individual paper assessment in class	G1.1, G1.2 G1.3, G2.1 G2.2, G2.3	50

Weeks		Contents	CLOs

	G5.1	

11. Course details:

Weeks	Contents	CLOs
1, 2, 3	***Chaper 1:* <INTRODUCTION TO PLC>** *(9/0/18)*	
	A/* Contents and teaching methods: (9)* **Contents:** 　　1.1 Basic of PLC. 　　1.2 Structure of PLC. 　　1.3 Input and Output circuits of PLC. 　　1.4 Operation of PLC. 　　1.5 Comparation of hardwired system and PLC system. 　　1.6 Applications of PLC in industry. 　　1.7 PLC made by Siemens, AB, Mitsubishi, Omron. **Teaching methods**: 　　+ Presentation. 　　+ Theoretical lectures. 　　+ Video clips. 　　+ Training sofware. 　　+ Team work. 　　+ Online.	G1.1 G1.2 G2.1 G3.1 G4.1
	***B/* Self-study contents**: *(18)* 　+ PLC system. 　+ Drawing diagram of PLC system.	G4.1
4, 5	***Chaper 2:* <SENSORS AND ACTUATORS>** *(6/0/12)*	
	A/* Contents and teaching methods: (6)* **Contents:** 　　2.1 Digital sensors. 　　2.2 Analog sensors. 　　2.3 Relay and contactor. 　　2.4 Motors. 　　2.5 Valve and cylinder. 　　2.6 Inverter. **Teaching methods**: 　　+ Presentation. 　　+ Theoretical lectures. 　　+ Video clips. 　　+ Team work. 　　+ Online.	G1.3 G3.1 G4.1

	B/ **Self-study contents**: *(12)*		G3.1
	+ PLC system.		
	+ Wiring PNP, NPN sensors and PLC Inputs.		
	+ Wiring PLC outputs and relay, contactor.		
	+ Wiring PLC and step mptor, servo motor, inverter.		
6, 7	*Chapter 3:* **<PROGRAMMING PLC>** *(6/0/12)*		
	A/ **Contents and teaching methods**: *(6)*		G2.3 G4.2
	Contents:		
	3.1 Design flowchart.		
	3.2 Programming.		
	3.3 PLC programming languages.		
	3.4 Subroutine and interrupt programe.		
	Teaching methods:		
	+ Presentation.		
	+ Theoretical lectures.		
	+ Team work.		
	+ Online.		
	B/ **Self-study contents**: *(12)*		G4.2
	+ Prgramming software.		
	+ Using subroutine and interrupt in a PLC programe.		
8, 9, 10	*Chapter 4:* **<PLC INSTRUCTIONS>** *(9/0/18)*		
	A/ **Contents and teaching methods**: *(9)*		G2.2, 2.3 G4.1, 4.2
	Contents:		
	4.1 Bit instructions.		
	4.2 Move instructions.		
	4.3 Math instructions.		
	4.4 CMP instructions.		
	4.5 Timer instructions.		
	4.6 Counter instructions.		
	4.7 Realtime instructions.		
	Teaching methods:		
	+ Presentation.		
	+ Theoretical lectures.		
	+ Simulation.		
	+ Team work.		
	+ Online.		
	B/ **Self-study contents**: *(18)*		G4.2
	+ Data memory.		
	+ The Instructions Help in programming sofware.		

11, 12	*Chapter 5:* **\<ACCESSING ANALOG SIGNAL IN PLC\>** *(6/0/12)*	

	A/ **Contents and teaching methods**: *(6)*
	 Contents:
	     5.1 Accessing Analog Signal.
	     5.2 AI Modules and AO Modules.
	     5.3 Configure AI and AO Modules.
	     5.4 Scale and Unscale functions.
	 Teaching methods:
	     + Presentation.
	     + Theoretical lectures.
	     + Simulation.
	     + Team work.
	     + Online.
		G2.2, 2.3
		 G4.1, 4.2

	B/ **Self-study contents**: *(12)*
	   + Analog to Digital Converter and Digital to Analog Converter.
	   + Wiring analog sensos and AI modules.
	   + Wiring analog actuators and AO modules.
		G4.1, 4.2

13, 14, 15	*Chương 6:* **\<HIGH SPEED COUNTER AND PULSE TRAIN OUPUT\>** *(9/0/12)*	

	A/ **Contents and teaching methods**: *(9)*
	 Contents:
	     6.1 Introduction to HSC, PTO and PWM.
	     6.2 High speed counter.
	     6.3 Pulse train ouput.
	     6.4 Applications of HSC and PTO, PWM.
	     6.5 PLC Communication.
	 Teaching methods:
	     + Presentation.
	     + Theoretical lectures.
	     + Team work.
	     + Online.
		G2.2, 2.3
		 G4.1, 4.2

	B/ **Self-study contents**: *(18)*
	   + Connect PLC to Encoder and step motor, servo motor.
	   + Interface PLC with devices in RS232, RS485, Ethernet protocol.
	   + PLC networks overview.
		G4.1, 4.2

12. Learning ethics:

    Home assignments and projects must be done by the students themselves. Plagiarism found in the assessments will get zero point.

13. First approved date: August 1st 2012

14. Approval level:

Dean	Department	Instructor
Assoc. Prof. PhD. **Nguyen Minh Tam**	**Assoc. Prof. PhD.** **Truong Dinh Nhon**	**Assoc. Prof. PhD.** **Truong Dinh Nhon**

15. Syllabus updated process

1st time: Updated content dated	Instructors
2st time: Updated content dated	Head of department