SYLLABUS

1. **Coure Name:** Programmable Logic Controller Lab
2. **Course Code:** PPLC321346
3. **Credits:** 2 (0/2/4)
   Duration: 15 weeks (6h main course and 12h self-study)

4. **Instructors:**

   1- Nguyen Tan Doi, MEng
   2- Nguyen Tran Minh Nguyet, MEng
   3- Truong Đinh Nhon, PhD
   4- Ta Van Phuong, MEng
   5-Nguyen Thi Yen Tuyet, MEng

5. **Course conditions**

   Prerequisites: Basic Electronic Lab, Basic Electrical Lab, Digital Lab
   Corequisites: Basic Electronic Lab, Digital Lab

6. **Course description**

This course provides students the knowledge of PLC, sensors and actuators. The students have selection and design ability hardware and software for PLC based industrial systems.

7. **Course Goals**

Goals	***Goal description***	**ELOs**
G1	An ability to understand and represent sensor and actuator characteristics	**01 (M)**
G2	An ability to select suitable PLCs, sensors and actuators. Connecting and checking control diagram for PLC based systems	**02 (H)**
G3	An ability to program for PLC based industrial applications	**03 (H)**
G4	An ability to read and analyse datasheet of sensors and actuators in English.	**05 (M)**
G5	An ability to analyse, design and program for PLC based industrial systems.	**11 (H)**

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

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

CLOs		Description	ELOs
G1	G1.1	Represent structure, function and application areas of industrial sensors	01
	G1.2	Represent structure, function and application areas of actuators	01
G2	G2.1	Selecting sensors and actuators for industrial applications	02
	G2.2	Connecting sensors and actuators	02
	G2.3	Selecting PLC and DI, DO, AI, AO modules for industrial applications	02 07
	G2.4	Connecting, programming to control PLC based basic industrial applications	02 07
G3	G3.1	Drawing flow chart for control systems	03 07
	G3.2	Understand and apply instruction sets of PLCs	03
	G3.3	Using effectively Simulink and program PLC softwares	03 07
G4	G4.1	An ability to read, understand structure and function of PLC modules in English	05
G5	G5.1	Represent steps to design PLC and SCADA systems	11 07
	G5.2	Defining components of SCADA systems	11
	G5.3	Designing hardware and software for basic SCADA systems	11

9. Study materials

- Text book:

[1] Ngo Van Thuyen, *PLC Lab*, UTE, 2016

- Reference:

[2] Hugh Jack, *Automation Manufacturing Systems with PLCs*, April 14 2005

[3] Phan Minh Xuan, Nguyen Doan Phuong, *Automation using SIMATIC S7200, S7300*, Ariculture Ha Noi Puplisher, 1999

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

10. Student Assessments

- Grading points: 10

- Planning for students assessment is followed:

Type	Content	Linetime	Assessment techniques	CLOs	Rates (%)

Exam01	- Selecting suitable sensors and actuators - Connecting sensors and actuators - Connecting sensors, actuators and PLC modules for basic applications - Configuring and programming for PLC	Week 5	-Working in Group -Discussion	G1.1 G1.2 G2.1 G2.2 G2.3 G2.4 G4.1	30
Exam02	- Drawing flow chart and programming for industrial applications	Week 9	-Working in Group -Discussion	G3.1 G3.2	30
Exam03	- Drawing flow chart and programming for industrial applications with analog sensors - Using simulink and program software for different PLC	Week 12	-Working in Group -Discussion	G3.2 G3.3	20
Exam04	- Steps to design PLC and SCADA systems - Designing basic SCADA systems	Week 15	-Working in Group -Discussion	G5.1 G5.2 G5.3	20

11. Course details:

Week	Contents	CLOs
1, 2	***Lesson 1: <SENSOR, ACTUATOR AND APPLICATIONS>*** *(0 / 12 / 24)*	
	A/* Contents and teaching methods: **(12)*** **Contents:** 1.1 Investigating, definding, checking parameters of buttons, switchs, sensors. 1.2 Investigating, definding,checking parameters of Vavle, Cylinders, Relays, Contactors, Motors and Inverters. **Teaching methods**: + Presentation. + Simulink + Group discussion.	**G1.1** **G1.2** **G2.1** **G2.2**
	***B/* Self-Study contents**: *(24)* + Download datasheets of sensors and actuators + Read and analyse parameters of sensors and acutuators. + Defining application areas of sensors and actuators.	**G1.1** **G1.2** **G4.1**
3,	**Lesson 2: <HARDWARE STRUCTURE OF PLC>** *(0 / 18 / 36)*	

4, 5	***A/* Contents and teaching methods***: (18)* **Contents:** 2.1 Investigating, definding, checking parameters of PLC: Power, CPU, DI, DO, AI, AO Modules and Communication Process Modules. 2.2 Connecting sensors, actuators and PLC modules. 2.3 Programming for PLC basic applications. **Teaching methods**: + Presentation. + Simulink + Group discussion.	G2.3 G2.4 G4.1
	***B/* Self-Study contents**: *(36)* + Download datasheet of PLC modules. + Read and analyse structure and parameters of PLC modules. + Install simulink and programming software	G2.1 G2.2 G2.3 G4.1
6, 7, 8, 9	**Lesson 3: <PLC PROGRAMMING>** *(0 / 24 / 48)*	
	A/* Contents and teaching methods: (24)* **Contents:** 3.1 Investigating instruction sets: bit, mov, convert, compare, math, Timer, Counter, sub-routine and interrupt routine 3.2 Drawing flow chart for basic applications: Start_Stop Motor, Forward and Reverse Motor Control, Sequential Motor Control, Star and Triangle Motor Control, Automatic Door Control. 3.3 Flowchart based Programming. 3.4 Programming and simulink for different PLC **Teaching methods**: + Presentation. + Simulink + Group discussion.	G3.1 G3.2 G3.3
	***B/* Self-Study contents**: *(48)* + Download manual of instruction PLC set. + Read and analyse instruction set. + Investigate symbols which are used in flowchart	G3.1 G3.2 G4.1
10,	**Lesson 4: <ANALOG PROCESSING IN PLC>** *(0 / 18 /36)*	

11, 12	***A/* Contents and teaching methods***: (18)* **Contents:** 4.1 Investigating and definding parameters of analog sensors: Temperature, pressure, ultrasonic sensors. 4.2 Connecting, drawing flowchart and programming for industrial applications: Temperature control, Pressure control and Level control.. **Teaching methods**: + Presentation. + Simulink + Group discussion.	G3.2 G3.3
	***B/* Self-Study contents**: *(36)* + Download manual of analog sensors. + Read and analyse parameters and functions of sensors + Draw flowchart for basic control systems.	G3.2 G3.3 G4.1
13, 14, 15	**Lesson 5: <SCADA SYSTEM>** *(0 / 18 / 36)*	
	A/* Contents and teaching methods: (18)* **Contents:** 5.1 Studing SCADA software:: Wincc, Intouch, Labview, Factory Talk. 5.2 Investigating hardware devices of SCADA systems: Sensors, actuators, PLC, HMI, Networks, PC. 5.3 Communicating between software and hardware in SCADA systems. 5.4 Designing basic SCADA systems. **Teaching methods**: + Presentation. + Simulink + Group discussion.	G5.1 G5.2 G5.3
	***B/* Self-Study contents**: *(36)* + Installing SCADA software. + Downloading manual of SCADA software. + Designing application graphics for Temperature, pressure and level systems.	G5.1 G5.2 G4.1

12. Learning ethics:

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

13. First approved date: August 01 2012

14. Approval level:

Dean	Department	Instructor
Nguyen Minh Tam, PhD	**Nguyen Thanh Hai, PhD**	**Tan Doi Nguyen, MEng**

15. Syllabus updated process

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