SYLLABUS

1. **Course name:** Microprocessor Laboratory
2. **Course code:** PRMI320463
3. **Credits:** 3 (0/6/12)

   Duration: 15 weeks (90h main course and 180h self-study)
4. **Instructors:**

   1- Nguyen Dinh Phu, MEng
   2- Truong Ngoc Anh, MEng
   3- Nguyen Van Hiep, MEng
   4- Phan Van Hoan, MEng
   5- Pham Ty Phu, MEng
5. **Course conditions**

   Prerequisites: Microprocessor

   Corequisites: Microprocessor
6. **Course Description**

This course gives students hands-on programming the microcontroller used to control objects to display information such as LED, LED 7-segment, LCD, GLCD, matrix LED; the input objects such as buttons, keyboard matrix, temperature sensors, distance measurement sensor, motion sensor; communication devices such as standard I2C real-time clock, serial EEPROM memory, ADC/DAC; counting pulses use counter, timing control use timer; step motor and DC motors control use PWM modulation.

7. **Course Goals**

Goals	***Goal description*** *(This course provides students:)*	**ELOs**
G1	Basic knowledge and assembly techniques of microcontroller circuits.	01 (M)
G2	The ability to analyze and solve problems when programming the microcontroller.	02 (H)
G3	The ability to use the tools of modern technology to perform the exercise.	03 (H)
G4	The ability to read and understand the English documents on microcontrollers and IC.	05 (L)
G5	The ability to use the methods and procedures to carry out practical exercises.	07 (M)
G6	Advanced programming capabilities for control system microcontroller synthetic.	11 (H)

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

8. Course Learning Outcomes (CLOs)

CLOs		*Description* (*After completing this course, students can have:*)	Outcome
G1	**G 1.1**	Experimental use of microcontrollers kit and programming software for the experiment.	01
	G 1.2	Presenting operating principle of extended port 74HC595 and 74HC573 port.	02
	G1.3	Presenting operating principle of IC used in the experiments.	02
G2	**G 2.1**	Analyze and fix the errors occur with the programming software for microcontrollers.	02
G3	**G 3.1**	Simulation applications microcontroller communicates with single LED, 7-segment LED, LCD, LED matrix, pressing buttons, temperature sensors, IC Realtime, using software Proteus.	03
G4	**G4.1**	Reading the datasheet of microcontroller and others IC.	05
G5	**G5.1**	Implementation LED, 7-segment LED, LCD, temperature sensor, the other components on testboard and write program.	07
G6	**G6.1**	Application programming combines multiple modules together.	11

9. Study materials

- Textbooks:

[1] Nguyen Đinh Phu, *Giao trinh thuc hanh vi dieu khien*, NXB Đại học Quốc gia 2012.

- References:

[2] Nguyen Đinh Phu, *Giao trinh Vi xu ly*, NXB Đại học Quốc gia 2012.

10. Student Assessments

- Grading points: 10
- Planning for students assessment is followed:

Type	Contents	Linetime	Assessment techniques	CLOs	Rates (%)
Midterms					**70**
Quiz	Chapter 1, 2, 3, 4, 5	Week 3	Online	G1.1 G1.2 G1.3	5
Quiz	Chapter 6, 7, 8	Week 6	Online	G1.3 G4.1	5
Quiz	Chapter 9, 10	Week 11	Online	G1.3 G4.1	5
Exam01	Students draw a microcontroller circuit using simulation software – Proteus and the implementation of the actual components on testboard, writing	Week 4-10	PC and KIT	G2.1 G3.1 G5.1	15

	control program (The application proposed by the teacher).				
Exam01	Programming for LED modules, buttons, 7-segment LED.	Week 5	PC and KIT	G2.1 G6.1	20
Exam01	Programming for LCD modules, sensors.	Week 10	PC and KIT	G2.1 G6.1	20
Final exam					**30**
Exam	Programming for GLCD modules, buttons, 7-segment LED, sensors, step motor, DC motor, matrix led.	Tuần 16	Máy tính và bộ thí nghiệm	G2.1 G6.1	

11. Course details:

Weeks	Contents	CLOs
1	***Chapter 1:*** **< HOW TO USE THE MICROCONTROLLERS KIT>** *(0/3/6)*	
	A/ **Contents and teaching methods***: (3)* **Contents:** 1.1. Introduction microprocessors, microcontrollers kit. 1.2. Examine each module in the microcontrollers kit. **Teaching methods**: + Presentations + Instruction implementation	G1.1
	B/ **Self-study contents**: *(6)* + Review the basic knowledge of microprocessor / microcontroller. + Install simulation, programming software.	G1.2 G1.3
2	***Chapter 2:*** **< HOW TO USE THE SOFTWARE PROGRAMMING>** *(0/3/6)*	
	A/ Contents and teaching methods: **(3)** **Contents:** 2.1. Software manual: writing code, compile, edit errors. 2.2. Software manual: programming for microcontroller. **Teaching methods**: + Presentations. + Instruction implementation. + Monitoring students to practice and to answer questions.	G2.1
	B/ Self-study contents: *(6)* + Do the exercises, questions, quizzes. + Simulation and testing program..	G3.1 G4.1
2, 3	***Chapter 3:*** **<MODULE 32 LEDs, BUTTONS, MATRIX KEYBOARD >** *(0/12/24)*	

	A/ Contents and teaching methods: *(12)* **Contents:** 3.1 Purpose requirements. 3.2 The exercises control 32 LED module. 3.3 The exercises single button. 3.4 The exercises keyboard matrix. **Teaching methods:** + Presentations: 32 LED module. + Instruction implementation. + Monitoring students to practice and to answer questions.	G1.2 G1.3 G2.1
	B/ Self-study contents: *(24)* + Do the exercises, questions, quizzes. + Simulation and testing program..	G3.1
4	***Chapter 4:*** **<7-SEGMENT LED>** *(0/6/12)*	
	A/ Contents and teaching methods: *(6)* **Contents:** 4.1 Purpose requirements. 4.2 The exercises control 4 7-segment LED module. 4.3 The exercises control counter of external pulse. 4.4 The exercises control the combination of modules. **Teaching methods:** + Presentations: 7-segment LED module, buttons, keyboard matrix + Instruction implementation. + Monitoring students to practice and to answer questions.	G1.2 G1.3 G2.1 G6.1
	B/ Self-study contents: *(12)* + Do the exercises, questions, quizzes. + Simulation and testing program..	G3.1
5, 6	***Chapter 5:*** **<MULTIPLEXER 7-SEGMENT LED >** *(0/12/24)*	
	A/ Contents and teaching methods: *(12)* **Contents:** 5.1 Purpose requirements. 5.2 The exercises control multiplexed 7-segment LED module. 5.3 The exercises control the combination of modules. **Teaching methods:** + Presentations: multiplexed 7-segment LED module. + Instruction implementation. + Monitoring students to practice and to answer questions.	G1.2 G1.3 G2.1 G6.1
	B/ Self-study contents: *(24)* + Do the exercises, questions, quizzes. + Simulation and testing program..	G3.1

7, 8	***Chapter 6:*** **<LCD – LIQUID CRYSTAL DISPLAY>** *(0/12/24)*	
	A/ Contents and teaching methods: *(12)* **Contents:** 6.1 Purpose requirements. 6.2 The exercises control the LCD controller. 6.3 The exercises control the GLCD controller. 6.4 The exercises control the combination of modules. **Teaching methods:** + Presentations: nội dung giao tiếp LCD, GLCD, các bài thực hành. + Instruction implementation: lập trình thao tác 1 bài mẫu. + Monitoring students to practice and to answer questions.	G1.2 G1.3 G2.1 G6.1
	B/ Self-study contents: *(24)* + Do the exercises, questions, quizzes. + Simulation and testing program..	G3.1
9, 10	***Chapter 7:*** **<ANALOG TO DIGITAL CONVERTER AND SENSORS>** *(0/12/24)*	
	A/ Contents and teaching methods: *(12)* **Contents:** 7.1 Purpose requirements. 7.2 The exercises use the LM35 temperature sensor. 7.3 The exercises used GP2D12 proximity sensor. 7.4 The exercises use 1 wire temperature sensor DS18B20. 7.5 The exercises control the combination of modules. **Teaching methods:** + Presentations: ADC. + Instruction implementation. + Monitoring students to practice and to answer questions.	G1.2 G1.3 G2.1 G4.1 G6.1
	B/ Self-study contents: *(24)* + Do the exercises, questions, quizzes. + Simulation and testing program..	G3.1 G4.1
12, 12	***Chapter 8:*** **<COMMUNICATION USE I2C>** *(0/12/24)*	
	A/ Contents and teaching methods: *(12)* **Contents:** 8.1 Purpose requirements. 8.2 The exercises use protocol I2C. 8.3 The exercises use ADC/DAC protocol I2C. 8.4 The exercises use EEPROM protocol I2C. 8.5 The exercises control the combination of modules. **Teaching methods:** + Presentations: Protocol I2C.	G1.2 G1.3 G2.1 G4.1 G6.1

	+ Instruction implementation. + Monitoring students to practice and to answer questions.	
	B/ Self-study contents: *(24)* + Do the exercises, questions, quizzes. + Simulation and testing program..	G3.1 G4.1
13, 14	***Chapter 9:*** **<STEP MOTOR AND DC MOTOR>** *(0/12/24)*	
	A/ Contents and teaching methods: *(12)* **Contents:** 9.1 Purpose requirements. 9.2 The exercises control step motor. 9.3 The exercises control DC motor. 9.4 The exercises control speed of DC motor. 9.5 The exercises control the combination of modules. **Teaching methods:** + Presentations: step motor, DC motor, PWM. + Instruction implementation. + Monitoring students to practice and to answer questions.	G1.2 G1.3 G2.1 G4.1 G6.1
	B/ Self-study contents: *(24)* + Do the exercises, questions, quizzes. + Simulation and testing program..	G3.1 G4.1
15	***Chapter 10:*** **<MATRIX LED>** *(0/6/12)*	
	A/ Contents and teaching methods: *(6)* **Contents:** 10.1 Purpose requirements. 10.2 The exercises control matrix led. **Teaching methods:** + Presentations: matrix led. + Instruction implementation. + Monitoring students to practice and to answer questions.	G1.2 G1.3 G2.1 G4.1 G6.1
	B/ Self-study contents: *(12)* + Do the exercises, questions, quizzes. + Simulation and testing program..	G3.1 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

13. First approved date: August 01 2012

14. Approval level:

Dean **Department** **Instructor**

15. Syllabus updated process

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