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| THE UNIVERISITY OF DA NANG | **SOCIALIS REBUBLIC OF VIETNAM** |
| **VIETNAM-KOREA UNIVERSITY OF INFORMATION AND COMMUNICATION TECHNOLOGY** | **Independence - Freedom - Happiness** |

**UNDERGRADUATE PROGRAM**

Final award: Degree of Bachelor/ Engineering

Major:

Program Code:

Minor:

**COURSE SYLLABUS**

|  |  |  |
| --- | --- | --- |
| 1. **Course Information** | | |
| **1.1.** | **Course code:MCO301** |  |
| **1.2.** | **Course title:** | Microcontrollers |
| **1.3.** | **Course name in Vietnamese:** | Vi điều khiển |
| **1.4.** | **Credits:** | **03** |
| **1.5.** | **Course plan:** | 03 credits (03 TC) |
| **-** | Lecture | 2 |
| **-** | Tutorial |  |
| **-** | Laboratory/Project | 1 |
| **-** | Self-learning: |  |
| **1.6.** | **Coordinator and committees:** |  |
| **-** | Coordinator: | PhD. Phan Thi Lan Anh |
| **-** | Committee: | PhD. Nguyen Vu Anh Quang  MS. Tran Thi Tra Vinh  MS. Nguyen Thi Huyen Trang  MS. Phan Thi Quynh Hương |
| **-** | Teaching faculty: |  |
| **1.7.** | **Prerequisite requirements:** |  |
| **-** | Enforced prerequisites: |  |
| **-** | Prerequisites: | Computer architecture |
| **-** | Corequisites: |  |
| **1.8** | **Course type:** | ⮽ Required ⬜ Elective |
| **1.9** | **Knowledge Cluster** | ⮽ General education  ⬜ Major education  ⬜ Internship  ⬜ Graduation Thesis |

1. **Course Description**

The course provides basic knowledge of the 8051 microcontrollers and Arduino kit; hardware structure, instruction set, and typical operations. From there, the course content delves into application design and some control algorithms, and programming examples using the C programming language for microcontrollers.

1. **Course Objectives**

After finishing this course, students can draw block diagrams and circuit diagrams in specific applications using the 8051 microcontroller; Understand the structure of the Arduino kit, the characteristics and functions of the components on the kit; Can write basic programs, control functional blocks of microcontrollers: input and output, registers, timers, interrupts, etc. for 8051 and Arduino kits on hardware programming languages such as Assembly, C.

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

At the end of this course, students should be able to:

***Table 4.1 Course Learning Outcome***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No | CLO | Knowledge | Skills | Attitudes |
| 1 | Present general knowledge about microcontrollers. | X |  |  |
| 2 | Present basic knowledge about 8051 microcontrollers | X | X |  |
| 3 | Program control circuits using timers, interrupts, and connection protocols |  | X | X |
| 4 | Design and program smart applications as required. |  |  |  |
| 5 | Perform professional working skill |  | X | X |

1. **Outcome Coverage: mapping to Program Learning Outcome (PLO) and Performance Indicator (PI)**

***Table 5.1. Outcome Coverage: mapping to Program Learning Outcome (PLO) and Performance Indicator (PI)***

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **CLOs** | **PLOs** | | | | | | | |
| **PLO1** | **PLO2** | **PLO3** | **PLO4** | **PLO5** | **PLO6** | **PLO7** | **PLO8** |
| CLO 1 |  |  |  |  | **I** |  |  |  |
| CLO 2 |  |  |  |  | **I** |  |  |  |
| CLO 3 |  |  |  |  | **I** | **I** |  |  |
| CLO 4 |  |  |  |  | **I** | **M,A** | **I** | **R** |
| CLO 5 |  | **I** |  |  |  |  |  |  |

1. **Assessment of students’ CLO achievement**

***Table 6.1. Assessment of students’ CLO achievement***

| **CLO** | **CLO’s**  **content** | **Purposes of CLO assessment** | **Whether supporting CLO assessment or not?** | | **Sources of data for CLO assessment** | **Goals of CLO assessment** |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  | **PI** | **PI’s content** |  |  |
| **CLO1** | Presents general knowledge about microcontrollers. |  |  |  |  |  |
| **CLO2** | Present basic knowledge about 8051 microcontrollers |  |  |  |  |  |
| **CLO3** | Program control circuits using timers, interrupts, and connection protocols. |  |  |  |  |  |
| **CLO4** | Design and program smart applications as required. |  | PLO6 |  | A4 |  |
| **CLO5** | Professional working skill |  |  |  |  |  |

1. **Course assessment**

**7.1 Assessment methods**

Student learning outcomes are assessed through the following measures/ components:

***Table 7.1. Student learning outcomes***

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Assessment Component** | **Percentages** | **CLO** | **Assessment types** | **Assessment tool** | **Percentages of CLO in Assessment Component**  **(%)** |
| **(1)** | **(2)** | **(3)** | **(4)** | **(5)** | (6) |
| A1. Attendance | 10 | CLO4 | Taking Attendance |  | 10 |
| A2.  Practice | 20 | CLO1,2,3,4 | Labs | Labs | 20 |
| A3.  Mid term | 20 | CLO1,2,4 | Written test | Written questions | 20 |
| A4.  Final Exam | 50 | CLO1, 2, 3,4 | Project | Project | 50 |

1. **Lecture plan and activities**

***Table 8.1. Lecture plan and activities***

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Tuần /**  **Buổi**  Week/  Session  (3 hours/ session) | **Contents** | **Hours** | | | **CLO**  **(Table 5.1)** | **Teaching Activities** | **Student Activities** | Assessment Types |
| **Lecture** | **Laboratory** | **Experiment** |
| **(1)** | **(2)** | **(3)** | | | **(5)** | **(6)** | **(7)** | **(8)** |
| 1 | Chapter 1. Introduction to microcontrollers | 3 | 0 |  | CLO5 | Introduce | Listen, ask | A1 |
| 2 | Lab 1. Setup software and instructions | 2 | 1 |  | CLO 1, 2, 3, 4,5 | Present | Listen, ask | A1, A2, A3, A4 |
| 3 | Chapter 2. 8051 microcontroller architecture | 2 | 1 |  | CLO 1, 2, 3, 4,5 | Present | Listen, ask | A1, A2, A3, A4 |
| 4 | Chapter 3. C programming for 8051  Lab 2. 8051 microcontrollers controls the blink LED | 2 | 1 |  | CLO 1, 2, 3, 4,5 | Present | Listen, ask | A1, A2, A3, A4 |
| 5 | Lab 3. 8051 connects with button | 2 | 1 |  | CLO 1, 2, 3, 4,5 | Present | Listen, ask | A1, A2, A3, A4 |
| 6 | Lab 4. Programming for I/O operations | 2 | 1 |  | CLO 1, 2, 3, 4,5 | Present | Listen, ask | A1, A2, A3, A4 |
| 7 | Lab 5. Programming for Timers/Counters | 2 | 1 |  | CLO 1, 2, 3, 4,5 | Present | Listen, ask | A1, A2, A3, A4 |
| 8 | Mid exame | 2 | 1 |  | CLO 1, 2, 3, 4,5 | Present | Listen, ask | A1, A2, A4 |
| 9 | Chapter 4. Arduino | 2 | 1 |  | CLO 1, 2, 3, 4,5 | Present | Listen, ask | A1, A2, A4 |
| 10 | Lab 6. Arduino controls the blink LEDs | 2 | 1 |  | CLO 1, 2, 3, 4,5 | Present | Listen, ask | A1, A2, A4 |
| 11 | Lab 7. Arduino controls the on/off status of LEDs with the button | 2 | 1 |  | CLO 1, 2, 3, 4,5 | Present | Listen, ask | A1, A2, A4 |
| 12 | Lab 8. Arduino controls motor by PWM. | 2 | 1 |  | CLO 1, 2, 3, 4,5 | Present | Listen, ask | A1, A2, A4 |
| 13 | Lab 9. Arduino controls motors by L293D | 2 | 1 |  | CLO 1, 2, 3, 4,5 | Present | Listen, ask | A1, A2, A4 |
| 14 | Lab 10. Arduino interface with LCD 16x2 | 2 | 1 |  | CLO 1, 2, 3, 4,5 | Present | Listen, ask | A1, A2, A4 |
| 15 | Lab 11.Adruino controls servo motor | 2 | 1 |  | CLO 1, 2, 3, 4,5 | Present | Listen, ask | A1, A2, A4 |
| 16 | Project | 1 | 2 |  | CLO 1, 2, 3, 4,5 | Present | Listen, ask | A1, A2, A4 |
| Examination Schedule | Final Exam |  |  |  |  |  |  |  |

1. **References**
   1. Textbooks, course books, references

***Table 9.1.*** *Textbooks, course books, references*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **TT**  **No** | Author name | Year of publication | Book title, textbooks,  article title | Publisher, journal name |
|  | **Textbook, course books** | | | |
| 1 | I. Scott Mackenzie, Raphael C |  | The 8051 Microcontroller | Prentice Hall |
| 2 | James A. Langbridge |  | Arduino sketches – Tools and techniques for programming | Wiley |
|  | **Reference books** | | | |
| 3 | Tống Văn On, Hoàng Đức Hải | 2001 | Họ vi điều khiển 8051 | NXB lao động xã hội |
| 4 | Nguyễn Tăng Cường | 2003 | Cấu trúc và lập trình họ VĐK 8051 |  |
|  |  |  |  |  |

* 1. Reference websites

***Table 9.2.*** *Reference websites*

|  |  |  |  |
| --- | --- | --- | --- |
| **No** | **Reference contents** | **Website link** | **Date of update** |
| 1 | Laboratory about arduino | https://arduinogetstarted.com/tutorials/arduino-led-blink |  |
| 2 |  |  |  |
|  |  |  |  |

*Danang, December 25th 2023*

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| **Dean of Faculty** |  | **Lecturer in charge**  **Phan Thi Lan Anh** |