

COURSE SYLLABUS

(Training level: Undergraduate)

Vietnamese Course Title: Kỹ thuật vi xử lý và vi điều khiển

English Course Title: Microprocessor and Microcontroller Engineering

Course Code: MAN131

Major: Electronic and telecommunications engineering technology, Automation technology, Computer engineering technology

Training program: Bachelor; Engineer.

Version: 2021

1. General information

- Number of credits: 03 (Theory: 02; Practice: 01).

- Type of knowledge:

General Education		Base core courses		Major core courses		Concentration courses		Others
Required <input type="checkbox"/>	Optional <input type="checkbox"/>	Required <input checked="" type="checkbox"/>	Optional <input type="checkbox"/>	Required <input type="checkbox"/>	Optional <input type="checkbox"/>	Required <input type="checkbox"/>	Optional <input type="checkbox"/>	

- Required course: None.

- Pre-requisite: C Programming for engineering.

- Co-requisite: None.

2. Time Allocated

Total: 60 periods	Theory: 28 periods
	Group Discussion/Presentation: 0
	Assignments/Essays/Practices: 29 periods.
	Tests: 03 + <i>Theory: Number of Tests: 02 Periods: 01</i> + <i>Practice: Number of Tests: 01 Periods: 01</i>
	Self-study: 105 periods Other activities: 0

3. Departments in Charge: Faculty of Electronic and Communication Technology

4. Lecturer's Information

No.	Lecturer name	Phone number	Email	Note
1	MSc. Ho Mau Viet	0982852638	hmviet@ictu.edu.vn	Leader
2	PhD. Vu Chien Thang	0911238956	vcthang@ictu.edu.vn	Member
3	MSc. Nguyen Thanh Tung	0923238958	nttung@ictu.edu.vn	Member

5. Facility Requirements: Classrooms have projectors, practice rooms have 8051 practice hardware systems and computers with Keil C, Proteus software installed.

6. Course Description:

The course provides students with knowledge related to microcontrollers, microprocessors and microprocessor systems, knowledge of 8086 microprocessors, interrupts and interrupt handling, application programming techniques with the microcontroller family. control 8051. From the above knowledge, students have the skills to build products that are applied in practice.

7. Objectives

Objectives	Description	PLOs	Proficiency level
G1	Basic knowledge of microprocessors and applied microcontrollers to build measurement and control systems	1.4.2	3
G2	Critical thinking skills to analyze and solve problems in the field of microprocessors and microcontrollers	2.1	4
G3	Practical skills for 8086 microprocessor and 8051 control	2.2.1	4
G4	Ability to work independently and in a team	3.1	3

8. Learning Outcomes

Objectives	CLOs	Description of CLOs	PLOs	Proficiency level
G1	G1.1	Basic knowledge of microprocessors and microcontrollers	1.4.2	2
	G1.2	Apply knowledge of programming on microprocessors and controls to solve specific problems	1.4.2	3
G2	G2.1	Analyze the basics of microprocessors and microcontrollers	2.1.1	4
	G2.2	Synthesize professional knowledge and skills to solve basic problems in microprocessors and microcontrollers	2.1.2	4
G3	G3.1	Evaluation of practical exercises with microprocessors and microcontrollers	2.2.1	4
G4	G4.1	Develop individual plans, group plans to carry out tasks	3.1.1	3
	G4.2	Implement individual plans, group plans	3.1.2	3

9. Scientific ethics

Actively attend theoretical classes in class, do exercises assigned by the lecturer, fully participate in discussion hours in the spirit of improving self-discipline, self-control and completing regular tests. All acts of cheating in learning and assessment will be handled according to regulations.

10. Detailed Contents

Period	Contents	References	CLOs	Proficiency level	Teaching Methodology	Assessment Methodology
1,2,3	Chapter 1: Microprocessor family 80x86					
	A/ Classroom learning content: 1.1. Architecture of the 8086 . microprocessor 1.1.1. overview 1.1.2. Internal structure and operation of 8086 . microprocessor 1.1.3. Describe the pinout function of the 8086 . microprocessor 1.1.4. Memory organization of the 8086 . processor	[1] [2] [4]	G1.1 G1.2	2 3	Presentat ion; State and solve the problem	Assessment by comments
	B/ Self-study: - Advanced Intel microprocessors	[1] [2]	G1.1 G1.2	2 3	Self-study with guidance	Motivational Assessment/ Combined with attendant Assessments
4,5,6	Chapter 1: Microprocessor family 80x86					
	A/ Classroom learning content: 1.2. Addressing modes 8086 1.2.1. Register address mode 1.2.2. Instant addressing mode 1.2.3. Direct address mode 1.2.4. Register indirect addressing mode 1.2.5. Port addressing mode	[1] [2] [4]	G1.1 G1.2	2 3	Presentat ion; State and solve the problem	Assessment by comments
	B/ Self-study: - Relative base addressing mode - String addressing mode	[1] [2]	G1.1 G1.2	2 3	Self-study with guidance	Motivational Assessment/ Combined with attendant Assessments
7,8,9	Chapter 1: Microprocessor family 80x86					
	A/ Classroom learning content: 1.3. Instruction set of 8086 . microprocessor 1.4. Microprocessor working modes	[1] [2] [4]	G1.1 G1.2	2 3	Presentat ion; State and solve the problem	Assessment by comments
	B/ Self-study: - Microprocessor read and write time graph	[1] [2]	G1.1 G1.2	2 3	Self-study with guidance	Motivational Assessment/ Combined with

Period	Contents	References	CLOs	Proficiency level	Teaching Methodology	Assessment Methodology
						attendant Assessments
10,11,12	Chapter 2: Assembly Language Programming for the 8086. Microprocessor					
	A/ Classroom learning content: 2.1. General introduction 2.2. Syntax of assembly program 2.3. Format of Assembly Language Program	[1] [2] [4]	G1.1 G1.2	2 3	Presentat ion; State and solve the problem	Assessment by comments
	Periodic Test No.1	[1] [2] [4]	G1.1 G1.2	2 3	Written test	Score test assessment.
	B/ Self-study: - Some functions of the 21H interrupt - Branching command group	[1] [2] [4]	G1.1 G1.2	2 3	Self-study with guidance	Motivational Assessment/ Combined with attendant Assessments
13,14,15	Chapter 2: Assembly Language Programming for the 8086. Microprocessor					
	A/ Classroom learning content: 2.4. Basic programming structure in assembly language 2.5. Programming on 8086 . microprocessor	[1] [2] [4]	G1.1 G1.2	2 3	Presentat ion; State and solve the problem	Assessment by comments
	B/ Self-study: - Application of bit manipulation instructions - Control processing command group	[1] [2]	G1.1 G1.2	2 3	Self-study with guidance	Motivational Assessment/ Combined with attendant Assessments
16,17,18	Chapter 3: Introduction to the 8051 family of microcontrollers					
	A/ Classroom learning content: 3.1. Introduce 3.2. General architecture of a microcontroller 3.3. Introduction to some microcontroller families 3.4. Applications of microcontrollers	[1] [3] [5] [6]	G2.1 G2.2	4 4	Presentat ion; State and solve the problem	Assessment by comments
	B/ Self-study: - Learn the structure of some typical microcontroller families	[1] [3]	G2.1 G2.2	4 4	Self-study with guidance	Motivational Assessment/ Combined with attendant Assessments
19,20,21	Chapter 3: Introduction to the 8051 family of microcontrollers					

Period	Contents	References	CLOs	Proficiency level	Teaching Methodology	Assessment Methodology
	A/ Classroom learning content: 3.5. Microcontroller AT89C51 3.5.1. General introduction 3.5.2. Structure and function of AT89C51 . pins 3.6. Introduction to C language for AT89C51 . microcontroller 3.6.1. General introduction 3.6.2. C++ programming language 3.6.3. Math 3.6.4. C program structure for microcontrollers	[1] [3] [5] [6]	G2.1 G2.2	4 4	Presentat ion; State and solve the problem	Assessment by comments
	B/ Self-study: • Learn the structure of some typical microcontroller families	[1] [3]	G2.1 G2.2	4 4	Self-study with guidance	Motivational Assessment/ Combined with attendant Assessments
22,23,24	Chapter 4: Programming with 8051 . Microcontroller					
	A/ Classroom learning content: 4.1. Programmable GPIO 4.1.1. Single LED interface 4.1.2. 7 bar LED interface 4.1.3. Single key communication 4.1.4. Key communication 4x4	[1] [3] [5] [6]	G2.1 G2.2	4 4	Presentat ion; State and solve the problem	Assessment by comments
	B/ Self-study: - Exercises in communication programming with 8051	[1] [3] [5] [6]	G2.1 G2.2	4 4	Self-study with guidance	Motivational Assessment/ Combined with attendant Assessments
25,26,27	Chapter 4: Programming with 8051 . Microcontroller					
	A/ Classroom learning content: 4.2. Programming with Timer 4.3. Programming counter function 4.4. Interrupt control programming	[1] [3] [5] [6]	G2.1 G2.2	4 4	Presentat ion; State and solve the problem	Assessment by comments
	B/ Self-study: - Programming interrupt by flank	[1] [3] [5] [6]	G2.1 G2.2	4 4	Self-study with guidance	Motivational Assessment/ Combined with attendant Assessments
28,29,30	Chapter 4: Programming with 8051 . Microcontroller					
	A/ Classroom learning content: 4.5. Serial communication programming 4.6. Programmatically convert ADC . value	[1] [3] [5]	G2.1 G2.2	4 4	Presentat ion;	Assessment by comments

Period	Contents	References	CLOs	Proficiency level	Teaching Methodology	Assessment Methodology
	4.7. Programmable DAC value conversion	[6]			State and solve the problem	
	Periodic Test No.2	[1] [3] [5] [6]	G2.1 G2.2	4 4	Written test	Score test assessment.
	B/ Self-study: - Programmable with LM35 sensor	[1] [3] [5] [6]	G2.1 G2.2	4 4	Self-study with guidance	Motivational Assessment/ Combined with attendant Assessments
31,32,33,34,35	Practice 1					
	A/ Classroom learning content: - Practice program .EXE - Practice program .COM - Practice branching structure	[1] [2] [4]	G3.1 G4.1 G4.2	4 3 3	Presentat ion; Practical instructio ns	Motivational Assessment/ Combined with attendant Assessments
	B/ Self-study: - Practice branching structure of many blocks of instructions	[1] [2]	G3.1 G4.1 G4.2	4 3 3	Self-study with guidance	Motivational Assessment/ Combined with attendant Assessments
36,37,38,39,40	Practice 2					
	A/ Classroom learning content: - Practice with bit manipulation instructions - Practice with control processing commands	[1] [2] [4]	G3.1 G4.1 G4.2	4 3 3	Presentat ion; Practical instructio ns	Motivational Assessment/ Combined with attendant Assessments
	B/ Self-study: - Practice jump commands	[1] [2]	G3.1 G4.1 G4.2	4 3 3	Self-study with guidance	Motivational Assessment/ Combined with attendant Assessments
41,42,43,44,45	Practice 3					
	A/ Classroom learning content: + Programming GPIO on 8051: - Engine control - 7 bar LED control - Interface with LCD - Key matrix communication	[1] [3] [5] [6]	G3.1 G4.1 G4.2	4 3 3	Presentat ion; Practical instructio ns	Motivational Assessment/ Combined with attendant Assessments

Period	Contents	References	CLOs	Proficiency level	Teaching Methodology	Assessment Methodology
	Periodic Test No.3	[1] [3] [5] [6]	G3.1 G4.1 G4.2	4 3 3	Practice test	Score test assessment.
	B/ Self-study: • Practice how to control multiple 7-segment LEDs • Practice controlling LED matrix to run text on demand	[1] [2] [3] [5]	[1] [3] [5] [6]	G3.1 G4.1 G4.2	Self-study with guidance	Motivational Assessment/ Combined with attendant Assessments
	Practice 4					
46,47,48, 49,50	A/ Classroom learning content: + Tạo tần số NE555 + Giao tiếp bộ nhớ EEPROM AT24C04 + Thời gian đọc DS1307	[1] [3] [5] [6]	G3.1 G4.1 G4.2	4 3 3	Presentat ion; Practical instructio ns	Motivational Assessment/ Combined with attendant Assessments
	B/ Self-study: - Practice adjusting the engine speed up and down as required	[1] [3] [5] [6]	G3.1 G4.1 G4.2	4 3 3	Self-study with guidance	Motivational Assessment/ Combined with attendant Assessments
	Practice 5					
51,52,53, 54,55	A/ Classroom learning content: + Programming with DAC . + Programming with ADC + IR infrared control	[1] [3] [5] [6]	G3.1 G4.1 G4.2	4 3 3	Presentat ion; Practical instructio ns	Motivational Assessment/ Combined with attendant Assessments
	B/ Self-study: Programming exercises for ADC/DAC and PWM	[1] [3] [5] [6]	G3.1 G4.1 G4.2	4 3 3	Self-study with guidance	Motivational Assessment/ Combined with attendant Assessments
	Practice 6					
56,57,58, 59,60	A/ Classroom learning content: + Programming serial communication with 8051: + Calculate baud rate + Programmable UART transmission and reception at a given baud rate + Measure temperature using sensor	[1] [3] [5] [6]	G3.1 G4.1 G4.2	4 3 3	Presentat ion; Practical instructio ns	Motivational Assessment/ Combined with attendant Assessments

Period	Contents	References	CLOs	Proficiency level	Teaching Methodology	Assessment Methodology
	B/ Self-study: - Serial communication programming exercises	[1] [3] [5] [6]	G3.1 G4.1 G4.2	4 3 3	Self-study with guidance	Motivational Assessment/ Combined with attendant Assessments

11. Student Assessment: 10 Score Scale.

11.1 . Test plan:

No.	Content	Time (Period)	CLOs	Proficiency level	Assessment methods	Assessment tools	Weight %
Attendance					Assessment by comments	Rubric 1	7.5
Regular Test Score							22.5
1	Chapter 1,2	12	G1.1 G1.2	2 3	Written	Rubric 2	7.5
2	Chapter 3,4	30	G2.1 G2.2	4 4	Written	Rubric 3	7.5
3	Practice	45	G3.1 G4.1 G4.2	4 3 3	Practice	Rubric 4	7.5
Final exam							70
	Chapter 1, 2,3,4		G1.1 G1.2 G2.1	2 3 4	Essay report	Rubric 5	70

No.	Content	Time (Period)	CLOs	Proficiency level	Assessment methods	Assessment tools	Weight %
			G2.2	4			
			G3.1	4			
			G4.1	3			
			G4.2	3			

CLOs	Contents			Test Method			
	Periods 1-15	Periods 16-30	Periods 31-60	Written Assessment I	Written Assessment II	Practice and Answer question III	Final exam
G1.1	X			X			X
G1.2	X			X			X
G2.1		X			X		X
G2.2		X			X	X	X
G3.1			X			X	X
G4.1			X			X	X
G4.2			X			X	X

11.2 Assessment Rubrics

* Rubric 1: Attendance

Criteria assessment	Weight (%)	Very good (8.5-10)	Good (7.0-8.4)	Average (5.5-6.9)	Below average (4.0-5.4)	Poor (0-3.9)
Level of participation in classes.	70	Full attendance	Absent from 1-9% of the periods	Absent from 10-15% of the periods	Absent from 16-20% of the periods	Missing 20% of periods (banned)
Activeness in lessons, self-study, homework	30	Actively participate in questions, discussions, Complete practice exercises	Quite actively participate in asking questions, discussing, doing homework	Less actively participating in asking questions, discussing, doing homework.	The teacher's influence is required to ask questions, discuss, and do exercises.	Only attend classes but do not actively participate in asking questions, discussing, doing homework

* **Rubric 2: Periodic Test No.1** (Allotted time: 1 period; Form: Written; Total of questions:02; Score Scale: 10)

Evaluation criteria		Weight (%)	Quality Level Description				
Question	CLOs		Very Good	Good	Average	Below Average	Poor
			(8,5-10 point)	(7,0-8,4 point)	(5,5-6,9 point)	(4,0-5,4 point)	(0-3.9 point)
1	G1.1	50	Beautiful and clear presentation. Content that solves 90-100% of the knowledge of variables and control Flow.	Clearly presented. Content that addresses 70 to less than 90% of the knowledge of variables and control Flow.	The presentation is relatively clear. Content that addresses between 50 and less than 70% of the knowledge of variables and control Flow.	The presentation is not clear. Content that addresses between 40 and less than 50% of the knowledge of variables and control Flow.	The presentation is not clear. Content that resolves less than 40% of the knowledge of variables and control Flow.
2	G1.2	50	Beautiful and clear presentation. Content that solves 90-100% of the knowledge of function.	Clearly presented. Content that addresses 70 to less than 90% of the knowledge of function.	The presentation is relatively clear. Content that addresses between 50 and less than 70% of the knowledge of function.	The presentation is not clear. Content that addresses between 40 and less than 50% of the knowledge of function.	The presentation is not clear. Content that resolves less than 40% of the knowledge of function.

*** Rubric 3: Periodic Test No.2** (Allotted time: 1 period; Form: Written; Total of questions: 02; Score Scale: 10)

Evaluation criteria		Weight (%)	Quality Level Description				
Question	CLOs		Very Good	Good	Average	Below Average	Poor
			(8,5-10 point)	(7,0-8,4 point)	(5,5-6,9 point)	(4,0-5,4 point)	(0-3.9 point)
1	G2.1	50	Beautiful and clear presentation. Content that solves 90-100% of the data structure problems in C.	Clearly presented. Content that addresses 70 to less than 90% of the data structure problems in C.	The presentation is relatively clear. Content that addresses between 50 and less than 70% of the data structure problems in C.	The presentation is not clear. Content that addresses between 40 and less than 50% of the data structure problems in C.	The presentation is not clear. Content that resolves less than 40% of the data structure problems in C.
2	G2.2	50	Beautiful and clear presentation. Content that solves 90-100% of the types of	Clearly presented. Content that addresses 70 to less than 90% of the types of electric circuit problem.	The presentation is relatively clear. Content that addresses between 50 and less than 70% of the types of	The presentation is not clear. Content that addresses between 40 and less than 50% of the types of	The presentation is not clear. Content that resolves less than 40% of the types of

Evaluation criteria		Weight (%)	Quality Level Description				
Question	CLOs		Very Good	Good	Average	Below Average	Poor
			(8,5-10 point)	(7,0-8,4 point)	(5,5-6,9 point)	(4,0-5,4 point)	(0-3.9 point)
			electric circuit problem.		electric circuit problem.	electric circuit problem.	electric circuit problem.

*** Rubric 4: Periodic Test No.3** (Allotted time: 1 period; Form: Practice; Total of questions: 03; Score Scale: 10)

Evaluation criteria		Weight (%)	Quality Level Description				
Question	CLOs		Very Good	Good	Average	Below Average	Poor
			(8,5-10 point)	(7,0-8,4 point)	(5,5-6,9 point)	(4,0-5,4 point)	(0-3.9 point)
1 (Content)	G3.1	40%	Build and execute the program, the correct algorithm. Solves 90-100% of the requirements.	Build and execute the program, the correct algorithm. Solves 70 to less than 90% of the requirements.	Build and execute the program, the correct algorithm. Solves between 50 and less than 70% of the requirement.	Build and execute the program, the correct algorithm. Solves between 40 and less than 50% of the requirement.	Build and execute the program, the correct algorithm. Content that resolves less than 40% of the requirements.
2 (Presentation skills)	G4.1	20%	Beautiful and clear presentation, concise structure. Content that addresses 90-100% of the knowledge of function.	Clearly presented, concise structure. Content that addresses 70 to less than 90% of the knowledge of function.	The presentation is relatively clear. Content that addresses between 50 and less than 70% of the knowledge of function.	The presentation is not clear. Content that addresses between 40 and less than 50% of the knowledge of function.	The presentation is not clear. Content that resolves less than 40% of the knowledge of function.
3 (Examiner's questions)	G2.2	20%	Build the program according to the teacher's request or answer 90-100% of the teacher's requirements	Build the program according to the teacher's request or answer 70 to less than 90% of the teacher's requirements	Build the program according to the teacher's request or answer 50 to less than 70% of the teacher's requirements	Build the program according to the teacher's request or answer 40 to less than 50% of the teacher's requirements	Build the program according to the teacher's request or answer less than 40% of the teacher's requirements
Join perform	G4.2	20%	Complete 85 to 100% personal plan	Complete 70 to 84% of personal plan	Complete 55 to 69% of personal plan	Complete 40 to 54 percent of personal plan	Complete 0 to 39% of personal plan

Evaluation criteria		Weight (%)	Quality Level Description				
Question	CLOs		Very Good	Good	Average	Below Average	Poor
			(8,5-10 point)	(7,0-8,4 point)	(5,5-6,9 point)	(4,0-5,4 point)	(0-3.9 point)

***Rubric 5:** Final Examination (Allotted time: 60 minutes; Form: Essay report; Total of questions: 01; Score Scale: 10)

Evaluation criteria		Weight (%)	Quality Level Description				
Criteria	CLOs		Very Good	Good	Average	Below Average	Poor
			(8,5-10 point)	(7,0-8,4 point)	(5,5-6,9 point)	(4,0-5,4 point)	(0-3.9 point)
Report presentation format	G4.1 G4.2	30	Nice and clear presentation. Content solves 85 to 100% of the requirements well.	Nice and clear presentation. Content solves 70 to 84% of the requirements well.	Nice and clear presentation. Content solves 55 to 69% of the requirements well.	Nice and clear presentation. Content solves 40-54% of the requirements well.	Presentation is not clear. Content that solves less than 40% of requests
Product or simulation program	G1.1 G1.2 G2.1 G2.2 G3.1	50	The product or simulation solves 85 to 100% of the requirements well	The product or simulation solves 70 to 84% of the requirements well	The product or simulation solves 55 to 69% of the requirements well	The product or simulation solves 40 to 54% of the requirements well	Product or simulation solves less than 40% of requirements
Examiner's questions	G2.1 G2.2	20	Right answer 85 to 100% questions	Right answer 70 to 84% questions	Right answer 55 to 69% questions	Right answer 40 to 54% questions	Right answer less than 39% of questions

12. Reading List

A. Main Syllabus

- [1]. Ho Mau Viet (2022), Lecture on microprocessor and microcontroller engineering, University of Information and Communication Technology
- [2]. Ngo Dien Tap (2010), Textbook of microprocessors and computer structure, Education publishing house.
- [3]. Nguyen Tang Cuong (2004), Structure and programming of the 8051 family of microcontrollers, scientific and technical publisher.

B. References

- [4]. Eighth Edition (2009),The Intel Microprocessors, Upper Saddle River, New Jersey Columbus.
- [5]. Tong Van On (2009), 8051 family of microcontrollers, Labor and Social Publishing House.
- [6]. Van The Minh (2001), Microprocessor Technology, Education Publishing House.

C. Software

[1] Embedded Software (2021/ Keil C51). *Keil C51*.

[2] Labcenter Electronics Ltd (2020/ Proteus 8.9). *Proteus 8.9*.

13. First approval date: August 30th, 2021

14. Competent Authority Approval: University of Information and Communication Technology

Vice Rector



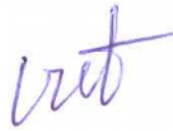
PhD. Do Dinh Cuong

Dean



PhD. Vu Chien Thang

Vice of Department



MSc. Ho Mau Viet

Composer Team



Ho Mau Viet



Vu Chien Thang



Nguyen Thanh Tung