

COURSE SYLLABUS
(Training level: Undergraduate)

Vietnamese Course Title: Lập trình C trong kỹ thuật.

English Course Title: C Programming for engineering.

Course Code: PGC233.

Major: Electronics and Telecommunications Engineering Technology, Automation 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: General Informatics, Advanced Mathematics.
- 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: Department of Computer Engineering - Faculty of Electronics and Communications Technology.

4. Lecturer's Information

No.	Lecturer name	Phone number	Email	Note
1	MSc. Nguyen Thi Thu Hang	0399.831.287	ntthang@ictu.edu.vn	Leader
2	MSc. Pham Xuan Kien	0976.044.868	pxkien@ictu.edu.vn	Member
3	MSc. Doan Ngoc Phuong	0979.479.940	dnphuong@ictu.edu.vn	Member

5. Facility Requirements: Having a projector in the classroom, having computers in the labs.

6. Course Description:

This subject belongs to the specialized group knowledge block. It provides students with basic knowledge about programming, C programming language and the application of C programming language in electronic engineering, control and automation engineering, computer engineering. Thereby, students are able to solve basic computer problems and technical problems using C programming language, and students also have basic knowledge about programming in engineering such as embedded systems, programming with microcontrollers, microprocessors.

7. Objectives

Objectives	Description	PLOs	Proficiency level
G1	Basic knowledge of programming languages in general and C language in particular, how to install problems in C programming language.	1.4.2	3
G2	Thinking skills to analyze and solve problems related to programming embedded systems, microcontrollers, microprocessors.	2.1	4
G3	Ability to deploy technical solutions related to learned knowledge in solving problems in embedded systems, programming with microcontrollers, microprocessors.	2.2.2	3

8. Learning Outcomes

Objectives	CLOs	Description of CLOs	PLOs	Proficiency level
G1	G1.1	Apply basic computer knowledge, knowledge of variables, control flow, and data structures to build basic computer problems and specific problems in engineering disciplines in C programming language.	1.4.2	3
	G1.2	Apply knowledge of functions, structures, pointers, files of C language to build programs for microcontrollers and microprocessors.	1.4.2	3

Objectives	CLOs	Description of CLOs	PLOs	Proficiency level
	G1.3	Apply basic technical problems commonly encountered in programming to build programs and detect and correct errors.	1.4.2	3
G2	G2.1	Analyze technical problems using the C programming language.	2.1.1	4
	G2.2	Synthesize knowledge about C programming to execute and test technical problems.	2.1.2	4
G3	G3.1	Practice basic C programming language as required of technical problems.	2.2.2	3

9. Scientific ethics

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

10. Detailed Contents

Period	Contents	References	CLOs	Proficiency level	Teaching Methodology	Assessment Methodology
1,2,3	Chapter 1: Basics of Embedded C Programming					
	A/ Classroom learning content: 1.1. Introduction to embedded Systems 1.2. Software development process 1.3. Structure of a C program 1.4. C programming for embedded system 1.4.1. Advantages of C language 1.4.2. Disadvantages of C language 1.4.3. Some notes for embedded software development 1.5. Development environment and compiler 1.5.1. Keil C Compiler 1.5.2. CSS Compiler 1.5.3. IAR Compiler	[2]	G1.1 G1.2 G1.3	3 3 3	Presentation; State and solve the problem	Assessment by comments
	B/ Self-study: • Install Dev-C	[2]	G1.1 G1.2 G1.3	3 3 3	Self-study with guidance	Motivational Assessment/ Combined with attendant Assessments
4,5,6	Chapter 2: The basic concepts of the C language					
	A/ Classroom learning content: 2.1. Character set in C 2.2. Keywords 2.3. Names	[1] [2] [4] [5]	G1.1 G1.2 G1.3	3 3 3	Presentation; State and solve the problem	Assessment by comments

Period	Contents	References	CLOs	Proficiency level	Teaching Methodology	Assessment Methodology
	2.4. Data types, Basic data types 2.5. Some notes for declare constants and variables in embedded systems 2.6. C - Input and Output - Input and Output in embedded systems					
	B/ Self-study: • Declare keywords, names, data types in Dev-C.	[1] [2] [4] [5]	G1.1 G1.2 G1.3	3 3 3	Self-study with guidance	Motivational Assessment/ Combined with attendant Assessments
	Chapter 2:					
7,8,9	A/ Classroom learning content: 2.7. Expressions 2.8. Assignment operators 2.9. Arithmetic operators 2.9.1. Relational and bitwise operators. 2.9.2. Increment and decrement operators, move operators. 2.9.3. Type Conversions 2.9.4. Bitwise operators and applications engineering 2.10. Examples 2.10.1. Calculate the equivalent resistance 2.10.2. Capacitive Reactance Calculator 2.10.3. Series RL Circuit Impedance Calculator 2.11. Common operations in embedded systems	[1] [2] [4] [5]	G1.1 G1.2 G1.3	3 3 3	Presentation; State and solve the problem	Assessment by comments
	B/ Self-study: • Read the content about the processor	[1] [2] [4] [5]	G1.1 G1.2 G1.3	3 3 3	Self-study with guidance	Motivational Assessment/ Combined with attendant Assessments
	Chapter 3: Control Flow					
10,11,12	A/ Classroom learning content: 3.1. Selection statements 3.2. Looping statements 3.3. Examples (in engineering) 3.3.1. Transient Response of RC Circuits 3.3.2. The current passing through the diode 3.4. Notes on how to use loops and jumps in embedded systems	[1] [2] [4] [5]	G2.1 G2.2	4 4	Presentation; State and solve the problem	Assessment by comments
	B/ Self-study: • Research false cases, lack of structure, infinite loops.	[1] [2] [4] [5]	G2.1 G2.2	4 4	Self-study with guidance	Motivational Assessment/ Combined with attendant Assessments

Period	Contents	References	CLOs	Proficiency level	Teaching Methodology	Assessment Methodology
13,14,15	Chapter 4: Functions and Pointers					
	A/ Classroom learning content: 4.1. The concept of functions 4.2. Passing arguments 4.3. Return value	[1] [2] [4] [5]	G2.1 G2.2	4 4	Presentation; State and solve the problem	Assessment by comments
	Periodic Test No.1	[1] [2] [4] [5]	G1.1 G1.2	3 3 3	Written test	Score test assessment.
	B/ Self-study: • Practice problems again in class to distinguish parameter types.	[1] [2] [4] [5]	G2.1 G2.2	4 4	Self-study with guidance	Motivational Assessment/ Combined with attendant Assessments
16,17,18	Chapter 4: Functions and Pointers					
	A/ Classroom learning content: 4.4. Types of functions 4.5. Pointers and dynamic allocation 4.6. How to exploit functions in libraries in embedded systems.	[1] [2] [4] [5]	G2.1 G2.2	4 4	Presentation; State and solve the problem	Assessment by comments
	B/ Self-study: • Read the function documentation available to learned microcontrollers.	[1] [2] [4] [5]	G2.1 G2.2	4 4	Self-study with guidance	Motivational Assessment/ Combined with attendant Assessments
	Chapter 5: Arrays and strings					
19,20,21	A/ Classroom learning content: 5.1. The concept of array 5.2. Declaring and using arrays	[1] [2] [5]	G2.1 G2.2	4 4	Presentation; State and solve the problem	Assessment by comments
	B/ Self-study: • Comparing string and array usage	[1] [2] [5]	G2.1 G2.2	4 4	Self-study with guidance	Motivational Assessment/ Combined with attendant Assessments
	Chapter 5: Arrays and strings					
22,23,24	A/ Classroom learning content: 5.3. Declaring and using strings 5.4. Commonly used String functions in strings 5.5. Examples 5.5.1. DC circuit Analysis 5.5.2. Logic simulation 5.6. Some problems when using arrays and strings on microcontrollers.	[1] [2] [5]	G2.1 G2.2	4 4	Presentation; State and solve the problem	Assessment by comments
	Periodic Test No.2	[1]			Written test	Score test assessment.

Period	Contents	References	CLOs	Proficiency level	Teaching Methodology	Assessment Methodology
		[2] [5]	G2.1 G2.2	4 4		
	B/ Self-study: • Comparing string and array usage	[1] [2] [5]	G2.1 G2.2	4 4	Self-study with guidance	Motivational Assessment/ Combined with attendant Assessments
	Chapter 6. Structures and file					
25,26,27	A/ Classroom learning content: 6.1. Structure types 6.1.1. The concept of structures 6.1.2. Defining Structure Types 6.1.3. Declare the type of the defined structure 6.1.4. Accessing elements of structures 6.2. Arrays of structures 6.2.1. Declare structure variables 6.2.2. Accessing elements of structure array. 6.2.3. Initialize the elements of the structure array.	[1] [2]	G2.1 G2.2	4 4	Presentation; State and solve the problem	Assessment by comments
	B/ Self-study: - Read documentation about structures and pointers, linked lists.	[1] [2]	G2.1 G2.2	4 4	Self-study with guidance	Motivational Assessment/ Combined with attendant Assessments
	Chapter 6. Structures and file					
28,29,30	A/ Classroom learning content: 6.3. The concept of file. 6.4. Manipulating text files 6.5. Manipulating binary files 6.5.1. Write functions 6.5.2. Read functions 6.5.3. Moves the file pointer	[1] [2]	G2.1 G2.2	4 4	Presentation; State and solve the problem	Assessment by comments
	B/ Self-study: - Read the document and make an example of a text file	[1] [2]	G2.1 G2.2	4 4	Self-study with guidance	Motivational Assessment/ Combined with attendant Assessments
	Practice #1: Building a simple C program and Control Flow					
31,32,33, 34,35	A/ Classroom learning content: - Use support tools - Create a simple C application. - Create a C application that allows data input/output - Using expressions in C	[1] [2] [3]	G3.1	3	Presentation; Practical instructions	Motivational Assessment/ Combined with attendant Assessments

Period	Contents	References	CLOs	Proficiency level	Teaching Methodology	Assessment Methodology
	<ul style="list-style-type: none"> - Using the selection statements - Using the loops statements - Problems with loops statements 					
	B/ Self-study: <ul style="list-style-type: none"> • Install Dev C, Turbo C. 	[1] [2] [3]	G3.1	3	Self-study with guidance	Motivational Assessment/ Combined with attendant Assessments
	Practice #2: Working with functions					
36,37,38, 39,40	A/ Classroom learning content: <ul style="list-style-type: none"> - Practice creating user functions - Practice calling the user function - Building functions with parameters - Practice with the return value of the function 	[1] [2] [3]	G3.1	3	Presentation; Practical instructions	Motivational Assessment/ Combined with attendant Assessments
	B/ Self-study: <ul style="list-style-type: none"> • Do the exercises according to the instructions. 	[1] [2] [3]	G3.1	3	Self-study with guidance	Motivational Assessment/ Combined with attendant Assessments
	Practice #3: Working with pointers					
41,42,43, 44,45	A/ Classroom learning content: <ul style="list-style-type: none"> - Declare pointer variable. - Allocating memory for pointers. - Perform arithmetic operations on pointers - Do the exercises in the practice list. 	[1] [2] [3] [5]	G3.1	3	Presentation; Practical instructions	Motivational Assessment/ Combined with attendant Assessments
	B/ Self-study: <ul style="list-style-type: none"> • Do the exercises about pointers and functions. 	[1] [2] [3] [5]	G3.1	3	Self-study with guidance	Motivational Assessment/ Combined with attendant Assessments
	Practice #4: Working with array					
46,47,48, 49,50	A/ Classroom learning content: <ul style="list-style-type: none"> - Practice problems related to arrays: input/output array, sum, sort, min/max,... - Do the exercises in the practice list. 	[1] [2] [3]	G3.1	3	Presentation; Practical instructions	Motivational Assessment/ Combined with attendant Assessments
	B/ Self-study: <ul style="list-style-type: none"> • Do the exercises in the practice list. 	[1] [2] [3]	G3.1	3	Self-study with guidance	Motivational Assessment/ Combined with attendant Assessments
	Practice #5. Working with string					
51,52,53, 54,55	A/ Classroom learning content: <ul style="list-style-type: none"> - Do string exercises: input string, reverse string, cut substring, standardize,... 	[1] [2] [5]	G3.1	3	Presentation; Practical instructions	Motivational Assessment/ Combined with attendant Assessments

Period	Contents	References	CLOs	Proficiency level	Teaching Methodology	Assessment Methodology
	B/ Self-study: • Do the exercises in the practice list.	[1] [2] [5]	G3.1	3	Self-study with guidance	Motivational Assessment/ Combined with attendant Assessments
56,57,58, 59,60	Practice #6. Working with structures and file					
	A/ Classroom learning content: - Create a structure, perform the following operations: input, display, search, etc. information of an object. - Create input file, perform input/output data from file. - Do the exercises in the practice list.	[1] [2] [5]	G3.1	3	Presentation; Practical instructions	Motivational Assessment/ Combined with attendant Assessments
	Periodic Test No.3	[1] [2] [5]	G1.3 G2.2 G3.1	3 4 3	Practice test	Assessment by score
	B/ Self-study: • Do the exercises in the practice list.	[1] [2] [5]	G3.1	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	15	G1.1 G1.2	3 3 3	Written	Rubric 2	7.5
2	Chapter 3,4,5,6	24	G2.1 G2.2	4 4	Written	Rubric 3	7.5
3	Practice	56	G1.3 G2.2 G3.1	3 4 3	Practice	Rubric 4	7.5
Final exam							70
	Chapter 1, 2,3,4,5,6		G1.1 G1.2 G1.3 G2.1 G2.2	3 3 3 4 4	Practice	Rubric 5	70

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

CLOs	Contents			Test Method			
	Periods 1-12	Periods 13-30	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
G1.3	X					X	X
G2.1		X			X		X
G2.2		X			X	X	X
G3.1			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 (8,5-10 point)	Good (7,0-8,4 point)	Average (5,5-6,9 point)	Below Average (4,0-5,4 point)	Poor (0-3.9 point)
1		50	Beautiful and clear	Clearly presented.	The presentation is relatively	The presentation is not clear.	The presentation is

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)
	G1.1		presentation. Content that solves 90-100% of the knowledge of variables and control Flow.	Content that addresses 70 to less than 90% of the knowledge of variables and control Flow.	clear. Content that addresses between 50 and less than 70% of the knowledge of variables and control Flow.	Content that addresses between 40 and less than 50% of the knowledge of variables and control Flow.	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 electric circuit problem.	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 electric circuit problem.	The presentation is not clear. Content that addresses between 40 and less than 50% of the types of electric circuit problem.	The presentation is not clear. Content that resolves less than 40% of the types of 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 requirement.	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)	G2.2	40	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)	G1.3	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

***Rubric 5: Final Examination** (Allotted time: 60 minutes; 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)	G1.1 G1.2 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	Build and execute the program, the correct algorithm. Solves between 50 and less than	Build and execute the program, the correct algorithm. Solves between 40 and less than	Build and execute the program, the correct algorithm. Content that resolves less than 40% 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)
				90% of the requirements	70% of the requirement.	50% of the requirement.	of the requirements
2 (Presentation skills)	G2.2	40	Good programming thinking, clear code presentation. Solve 90-100% of the requirements	Present the code clearly. Solve 70 to less than 90% of the requirements	Present the code clearly. Solve 50 to less than 70% of the requirements	Present the code clearly. Solve 40 to less than 50% of the requirements	The presentation is not clear. Resolve less than 40% of the requirements
3 (Examiner's questions)	G1.3 G2.1	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

12. Reading List

A. Main Syllabus

[1]. Pham Van At (2006), *“Programming Techniques in C”*, Thong ke publisher.

B. References

[2]. Nguyen Thi Thu Hang (2022), *“C Programming for engineering”*, Faculty Electronic and Communication technology.

[3] Noel Kalicharan (2015), *“Learn to program with C”*, Frist MIT-Createspace Inc, O-D-Publishing.

[4]. Harry H. Chaudhary (2014), *“C programming”*, Prentice-Hall.

[5]. Lê Đăng Hưng (2003), *“Introductory C Programming”*, Science and Technics publisher.

C. Software

[1] Dev-C.

13. First approval date: August 30th, 2021

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

Vice Rector



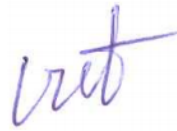
PhD. Do Dinh Cuong

Dean



PhD. Vu Chien Thang


Vice of Department



MSc. Ho Mau Viet

Composer Team

Nguyen Thi Thu Hang: 

Doan Ngoc Phuong: 

Pham Xuan Kien: 