CHƯƠNG 3: MikroC For PIC

Lập trình hệ thống nhúng

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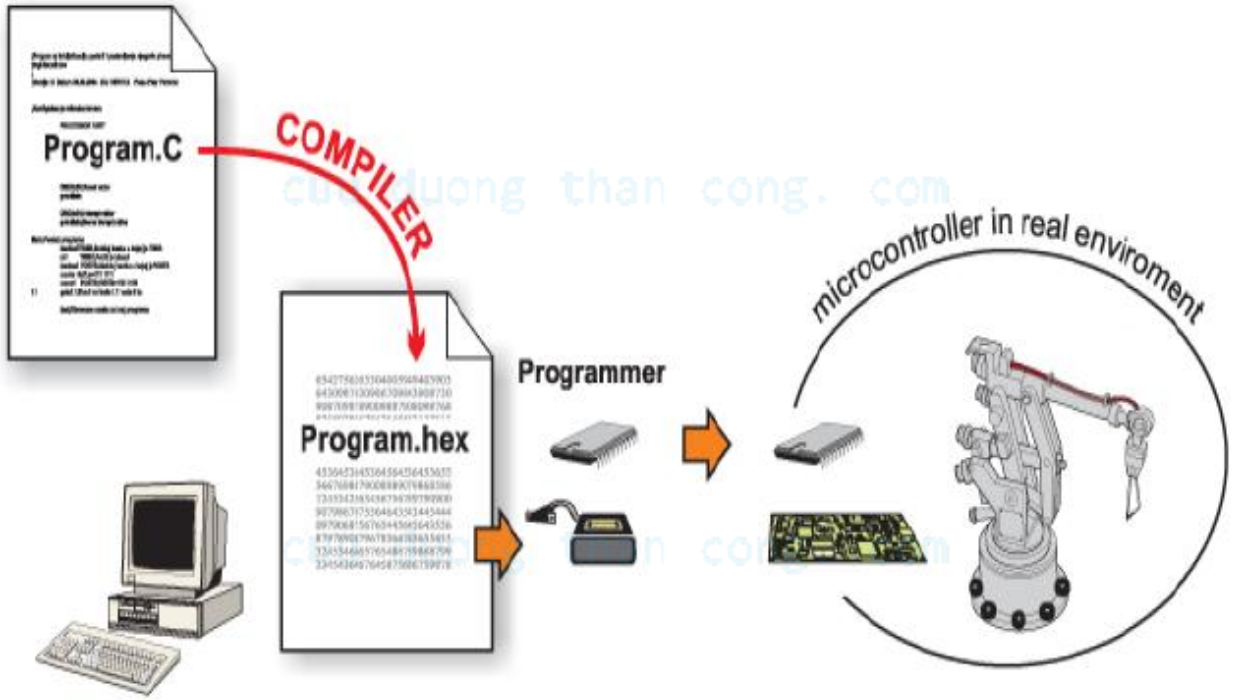
Tổng quan

- Giới thiệu MikroC



Tổng quan

- Giới thiệu MikroC

```
void main() {

  TRISB = 0;              // All port B pins are configured as
                          // outputs
  PORTB = 0b01010101;     // Logic state on port B pins
}
```

Program written in C

```
; ADDRESS     OPCODE        ASM
; ------------------------------------------------
$0000         $2804         GOTO   _main
$0004         $             _main:
;Test.c,1 :: void main() {
;Test.c,3 :: TRISB = 0;              // All port B pins
$0004         $1303         BCF    STATUS, RP1
$0005         $1683         BSF    STATUS, RP0
$0006         $0186         CLRF   TRISB, 1
;Test.c,4 :: PORTB = 0b01010101; // Logic state
$0007         $3055         MOVLW  85
$0008         $1283         BCF    STATUS, RP0
$0009         $0086         MOVWF  PORTB
;Test.c,5 :: }
$000A         $280A         GOTO   $
```

Compiled Program

```
:100000000428FF3FFF3FFF3F031383168601553 04F
:10001000831286000A28FF3FFF3FFF3FFF3FFF5D
:04400E00F22FFFFF8F
:00000001FF
```

Executable Code of the program (HEX code)

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- Kiểu Biến

Data type	Description	Size (# of bits)	Range of values
char	Character	8	0 to 255
int	Integer	16	-32768 to 32767
float	Floating point	32	$\pm 1.17549435082 \cdot 10^{-38}$ to $\pm 6.80564774407 \cdot 10^{38}$
double	Double precision floating point	32	from $\pm 1.17549435082 \cdot 10^{-38}$ to $\pm 6.80564774407 \cdot 10^{38}$

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- Kiểu Biến

Data type	Data Type With Prefix	Size (# of bits)	Range
char	signed char	8	-128 to 128
int	unsigned int	16	0 to 65535
	short int	8	0 to 255
	signed short int	8	-128 to 127
	long int	32	0 to 4294967295
	signed long int	32	-2147483648 to 2147483647

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- Từ khóa

mikroC - keywords				
absolute	data	if	return	typedef
asm	default	inline	rx	typeid
at	delete	int	sfr	typename
auto	do	io	short	union
bit	double	long	signed	unsigned
bool	else	mutable	sizeof	using
break	enum	namespace	static	virtual
case	explicit	operator	struct	void
catch	extern	org	switch	volatile
char	false	pascal	template	while
class	float	private	this	
code	for	protected	throw	
const	friend	public	true	
continue	goto	register	try	

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- Hằng số

Format	Prefix	Example
Decimal		const MAX = 100
Hexadecimal	0x or 0X	const MAX = 0xFF
Octal	0	const MAX = 016
Binary	0b or 0B	const MAX = 0b11011101

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- Toán tử :

Operator	Operation
+	Addition
-	Subtraction
*	Multiplication
/	Division
%	Reminder

Operator	Example	Description
++	++a	Variable "a" is incremented by 1
	a++	
--	--b	Variable "b" is incremented by 1
	b--	

Operator	Example	
	Expression	Equivalent
+=	a += 8	a = a + 8
-=	a -= 8	a = a - 8
*=	a *= 8	a = a * 8
/=	a /= 8	a = a / 8
%=	a %= 8	a = a % 8

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- Toán tử :

Operator	Meaning	Example	Truth condition
>	is greater than	b > a	if **b** is greater than a
>=	is greater than or equal to	a >= 5	If a is greater than or equal to 5
<	is less than	a < b	if **a** Is less than **b**
<=	is less than or equal to	a <= b	if a Is less than or equal to **b**
==	is equal to	a == 6	if a Is equal to 6
!=	is not equal to	a != b	if a Is not equal to **b**

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- Toán tử :

Operator	Logical NOT	
	Operand1	Result
!	0	1
	1	0

Operator	Logical AND		
	Operand1	Operand2	Result
&&	0	0	0
	0	1	0
	1	0	0
	1	1	1

Operator	Logical OR		
	Operand1	Operand2	Result
||	0	0	0
	0	1	1
	1	0	1
	1	1	1

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- Toán tử :

Operand	Meaning	Example	Result	
~	Bitwise complement	a = ~b	b = 5	a = -5
<<	Shift left	a = b << 2	b = 11110011	a = 11001100
>>	Shift right	a = b >> 2	b = 11110011	a = 00011110
&	Bitwise AND	c = a & b	a = 11100011 b = 11001100	c = 11000000
|	Bitwise OR	c = a | b	a = 11100011 b = 11001100	c = 11101111
^	Bitwise EXOR	c = a ^ b	a = 11100011 b = 11001100	c = 00101111

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- Cấu trúc điều khiển :

```
if(expression)
operation1
else
operation2
```



```
(expression1)? expression2 : expression3
```

```
maximum = (a > b)? a : b // Variable maximum is assigned the value of
                         // larger variable (a or b)
```

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- Cấu trúc điều khiển :

```
switch (number) // number represents one day in a week. It is
                // necessary to determine whether it is a week-
{               // day or not.
    case1:case2:case3:case4:case5: LCD message = 'Weekday'; break;
    case6:case7: LCD message = 'Weekend'; break;
    default:
    LCD message 1 = 'Choose one day in a week'; break;
}
```

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- Cấu trúc điều khiển :

```
while(expression){
    commands
    ...
}
```



```
do
operation
while (check_condition);
```

```
for(initial expression; condition expression; change expression) {
    operations
    ...
}
```

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- Hàm thư viện ANSI C:

```
<assert.h>   <complex.h> <ctype.h>

<errno.h>    <fenv.h>    <float.h>

<inttypes.h> <iso646.h>  <limits.h>

<locale.h>   <math.h>    <setjmp.h>

<signal.h>   <stdarg.h>  <stdbool.h>

<stdint.h>   <stddef.h>  <stdio.h>

<stdlib.h>   <string.h>  <tgmath.h>

<time.h>     <wchar.h>   <wctype.h>
```

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- Hàm thư viện ngoại vi :

Library	Description
ADC Library	Used for A/D converter operation
CAN Library	Used for operation with CAN module
CANSPI Library	Used for operation with external CAN module (MCP2515 or MCP2510)
Compact Flash Library	Used for operation with *Compact Flash memory cards*
EEPROM Library	Used for operation with built-in EEPROM memory
EthernetPIC18FxxJ60 Library	Used for operation with built-in Ethernet module
Flash Memory Library	Used for operation with built-in Flash memory
Graphic Lcd Library	Used for operation with graphic LCD module with 128x64 resolution
I2C Library	Used for operation with built-in serial communication module I2C
Keypad Library	Used for operation with keyboard (4x4 push buttons)
Lcd Library	Used for operation with LCD display (2x16 characters)

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- Hàm thư viện ngoại vi :

Manchester Code Library	Used for communication using *Manchester code*
Multi Media Card Library	Used for operation with multimedia MMC flash cards
One Wire Library	Used for operation with circuits using *One Wire* serial communication
Port Expander Library	Used for operation with port expander MCP23S17
PS/2 Library	Used for operation with standard keyboard PS/2
PWM Library	Used for operation with built-in PWM module
RS-485 Library	Used for operation with modules using RS485 serial communication
Software I2C Library	Used for I2C software simulation
Software SPI Library	Used for SPI software simulation
Software UART Library	Used for UART software simulation
Sound Library	Used for audio signal generation

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- Hàm thư viện ngoại vi :

SPI Library	Used for operation with built-in SPI module
SPI Ethernet Library	Used for SPI communication with ETHERNET module (ENC28J60)
SPI Graphic Lcd Library	Used for 4-bit SPI communication with graphic LCD display
SPI Lcd Library	Used for 4-bit SPI communication with LCD display (2x16 characters)
SPI Lcd8 Library	Used for 8-bit SPI communication with LCD display
SPI 6963C Graphic Lcd Library	Used for SPI communication with graphic LCD display
UART Library	Used for operation with built-in UART module
USB Hid Library	Used for operation with built-in USB module

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- Cấu trúc Hàm người dùng:

```
void function name (type argument1, type argument2,...)
{
Commands;
}
```

```
void interrupt() {
    cnt++ ;          // Interrupt causes cnt to be incremented by 1
    PIR1.TMR1IF = 0; // Reset bit TMR1IF
}
```

```
const double PI = 3.14159; // Declare constant PI

float volume (float r, float h) // Declare type float for
{                  // formal parameters r and h
    float v;       // Declare type of result v
    v = PI*r*r*h; // Declare function volume
    return v;
}
```