

# Introduction to Programming in C

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(IS-FEE-10061S)

Białystok University of Technology  
Faculty of Electrical Engineering  
Academic year 2023/2024

**Workshop no. 01 (29.02.2024)**

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## Basic information

- Jarosław Forenc, PhD
- Białystok University of Technology, Faculty of Electrical Engineering  
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- e-mail: [j.forenc@pb.edu.pl](mailto:j.forenc@pb.edu.pl)
- phone: (+48-85) 746-93-97
- <http://jforenc.prv.pl/progc.html>
  - course materials
- Office hours (consultations) :
  - Tuesday, 10:30-12:00, room WE-204
  - Thursday, 12:00-13:30, room WE-204

# Module content

Week	Date	Topic
1.	29.02.2024	IDE for creating, analyzing and running C programs. The general structure of the program in C. Comments.
2.	07.03.2024	Input/output operations in language C. Variables, declarations, types and names of variables. Numerical constants. Operators and arithmetic expressions. Precedence of operators. Mathematical functions.
3.	14.03.2024	Relational (comparison) and logic operators. Logical expressions. Conditional if statement. Conditional operator?. Switch instruction.
4.	21.03.2024	Loops: for, while and do..while. Break, goto and continue statements.
5.	28.03.2024	One-dimensional arrays: declaration, initialization of array elements, operations.
6.	04.04.2024	Two- and multi-dimensional arrays, operations on arrays.

# Module content

Week	Date	Topic
7.	11.04.2024	Strings of characters. Header file string.h.
8.	18.04.2024	Practical test no 1.
9.	25.04.2024	Structures.
10.	09.05.2024	Pointers. Dynamic memory allocation.
11.	16.05.2024	Functions, general structure of the function. Recursive function call.
12.	23.05.2024	Text files.
13.	06.06.2024	Binary files.
14.	13.06.2024	Practical test no 2.
15.	20.06.2024	(will be used as needed)

## Literature

- Prata S., C Primer Plus (6th Edition) (Developer's Library). Addison-Wesley Professional, 2013.
- Kernighan B.W., Ritchie D.M., The C Programming Language. 2nd Edition, Prentice Hall, 1988.
- Online resources
  - <https://www.youtube.com/watch?v=-CpG3oATGIs> - C Programming Tutorial, Learn C Programming
  - <https://www.youtube.com/watch?v=vl794HKeXug> - C Programming, Full Course, 101 Programs explanations in detail
  - <https://www.youtube.com/watch?v=KJgsSFOSQv0> - C Programming Tutorial for Beginners

# Method of assessing

- Practical test no 1:
  - writing a computer program
  - 40% of the final grade a multiple-choice test
- Practical test no 2:
  - writing a computer program
  - 40% of the final grade a multiple-choice test
- Programs (workshops/homework):
  - programs written in class or at home
  - 20% of the final grade

# Method of assessing

- The final grade:

Result %	ECTS grade	Local grade	Definition
91 - 100	A	5	EXCELLENT - outstanding performance with only minor errors
81 - 90	B	4,5	VERY GOOD - above the average standard but with some errors
71 - 80	C	4	GOOD - generally sound work with a number of notable errors
61 - 70	D	3,5	SATISFACTORY - fair but significant shortcomings
51 - 60	E	3	SUFFICIENT - performance meets the minimum criteria
0 - 50	F	2	FAIL - some more work required before the credit can be awarded

# Topics

- A short history of C language
- First program, program structure
- Escape sequences
- Special characters
- Comments



## A short history

- **1972** - language NB (New B), later named C - Dennis Ritchie, Bell Laboratories, New Jersey
- **1978** - book "The C Programming Language" (Kernighan, Ritchie), first textbook, informal standard definition (**K&R**)
- **1989** - ANSI X3.159-1989 standard „Programming Language C” (**ANSI C, C89**)
- **1990** - adaptation of the ANSI C standard in the form of ISO/IEC 9899:1990 (**C90**)
- **1999** - ISO/IEC 9899:1999 standard (**C99**)
- **2011** - ISO/IEC 9899:2011 standard (**C11**)
- **2018** - ISO/IEC 9899:2018 standard (**C18** or **C17**)

## First program

- An unformatted text file with proper syntax and `.c` extension
- The simplest program code:

```
#include <stdio.h>

int main(void)
{
    printf("Hello world\n");
    return 0;
}
```

- **Console application** - prints the text **Hello world** in the console window

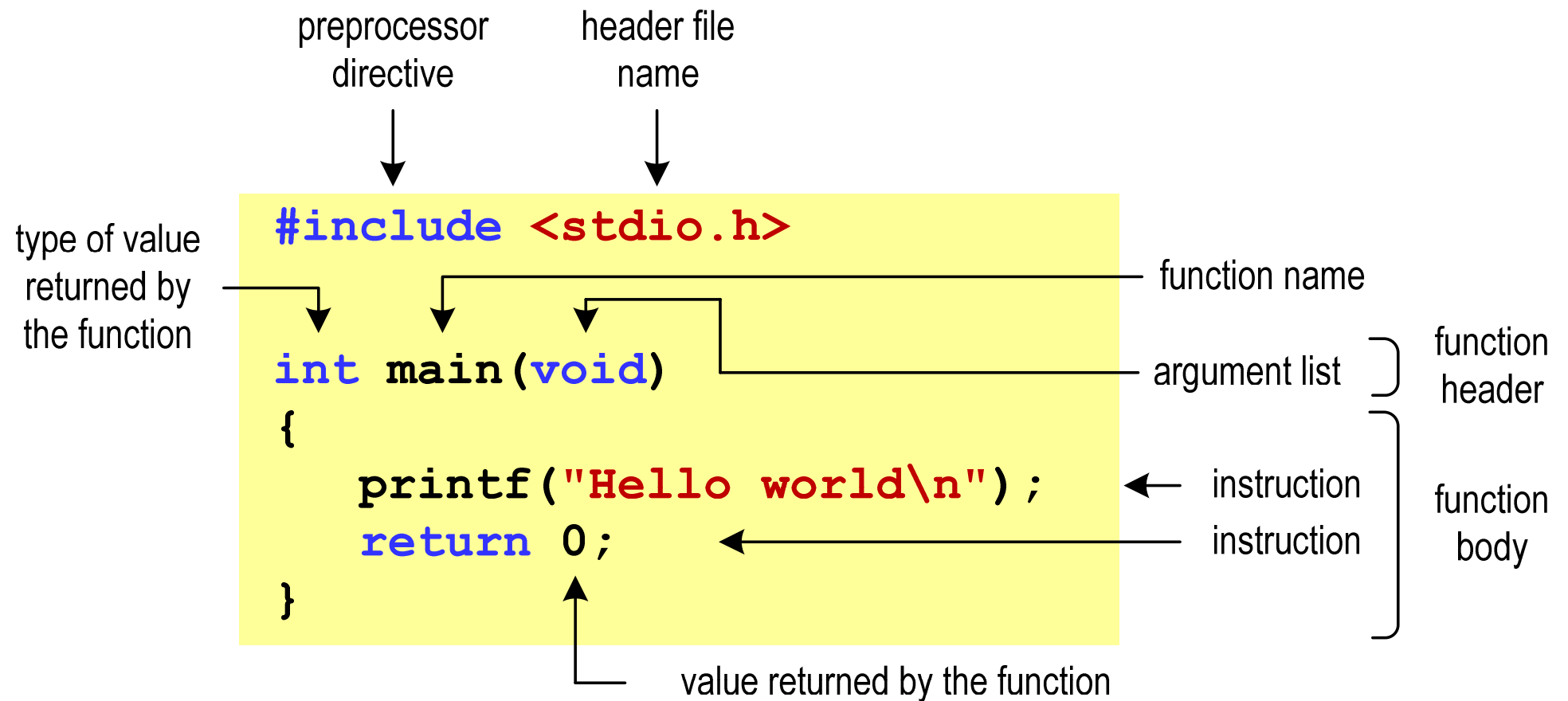
# First program

- Program execution result:

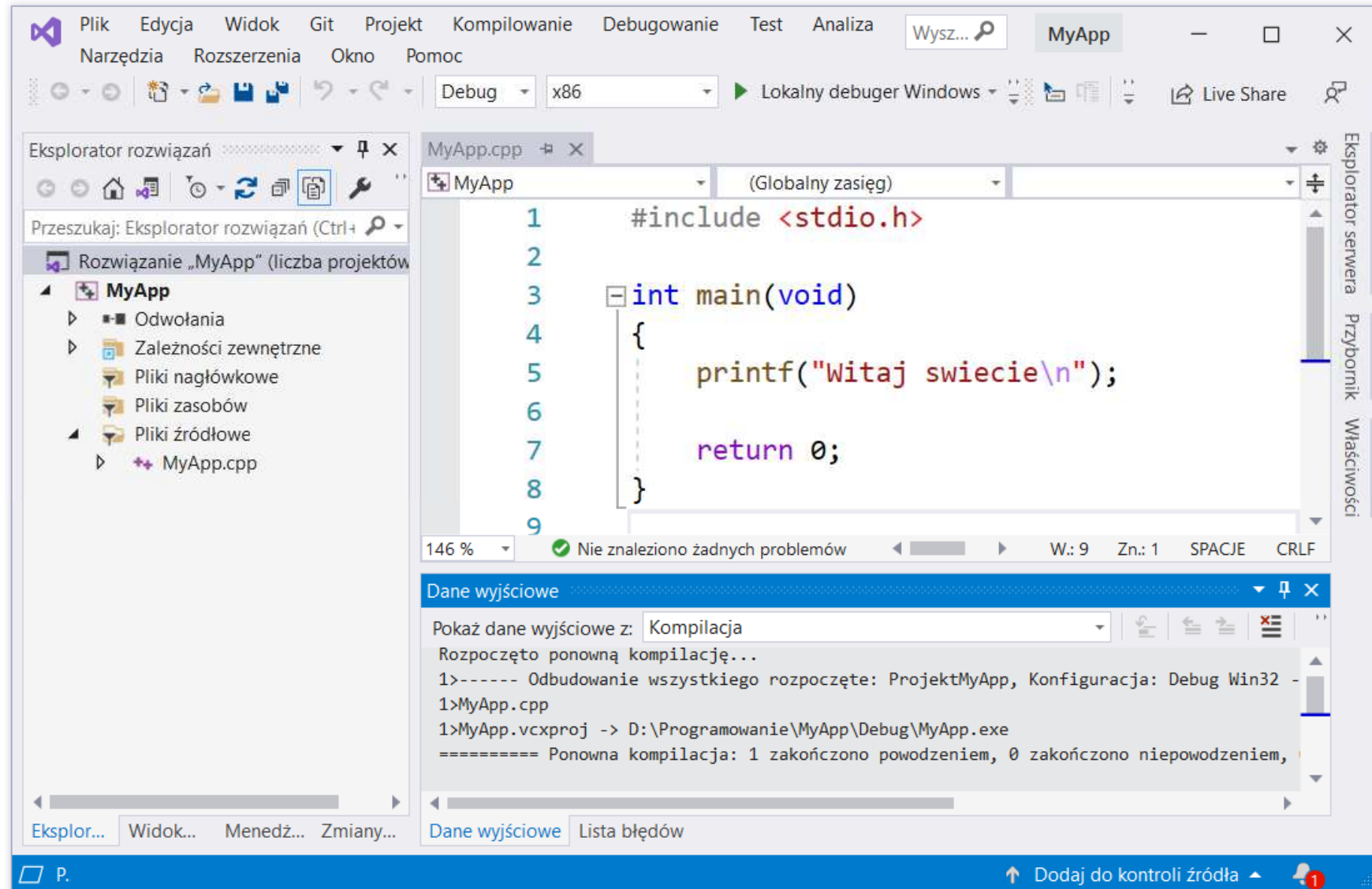


```
C:\Windows\system32\cmd.exe
Witaj swiecie
Aby kontynuować, naciśnij dowolny klawisz . . . █
```

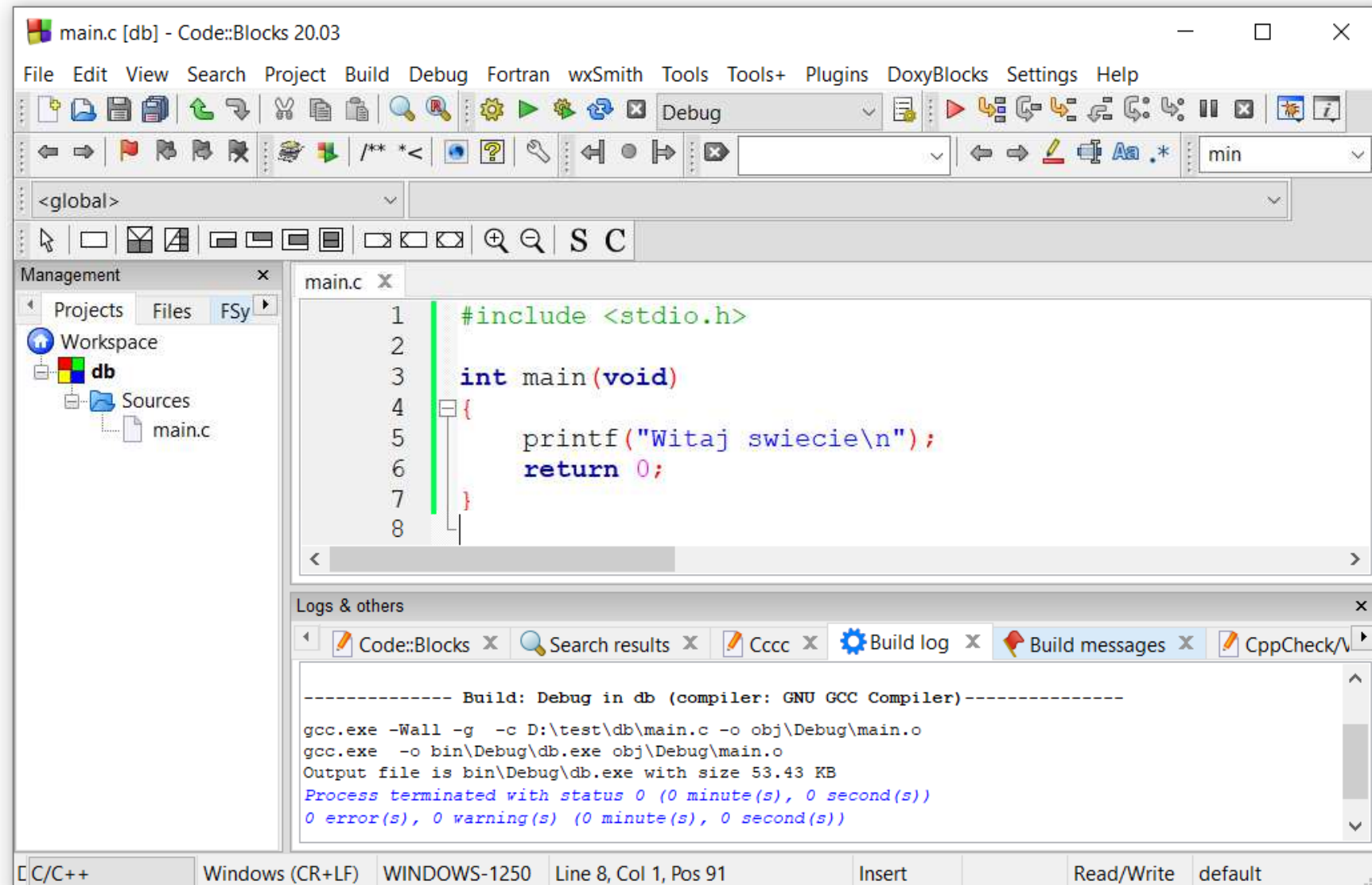
# Program structure



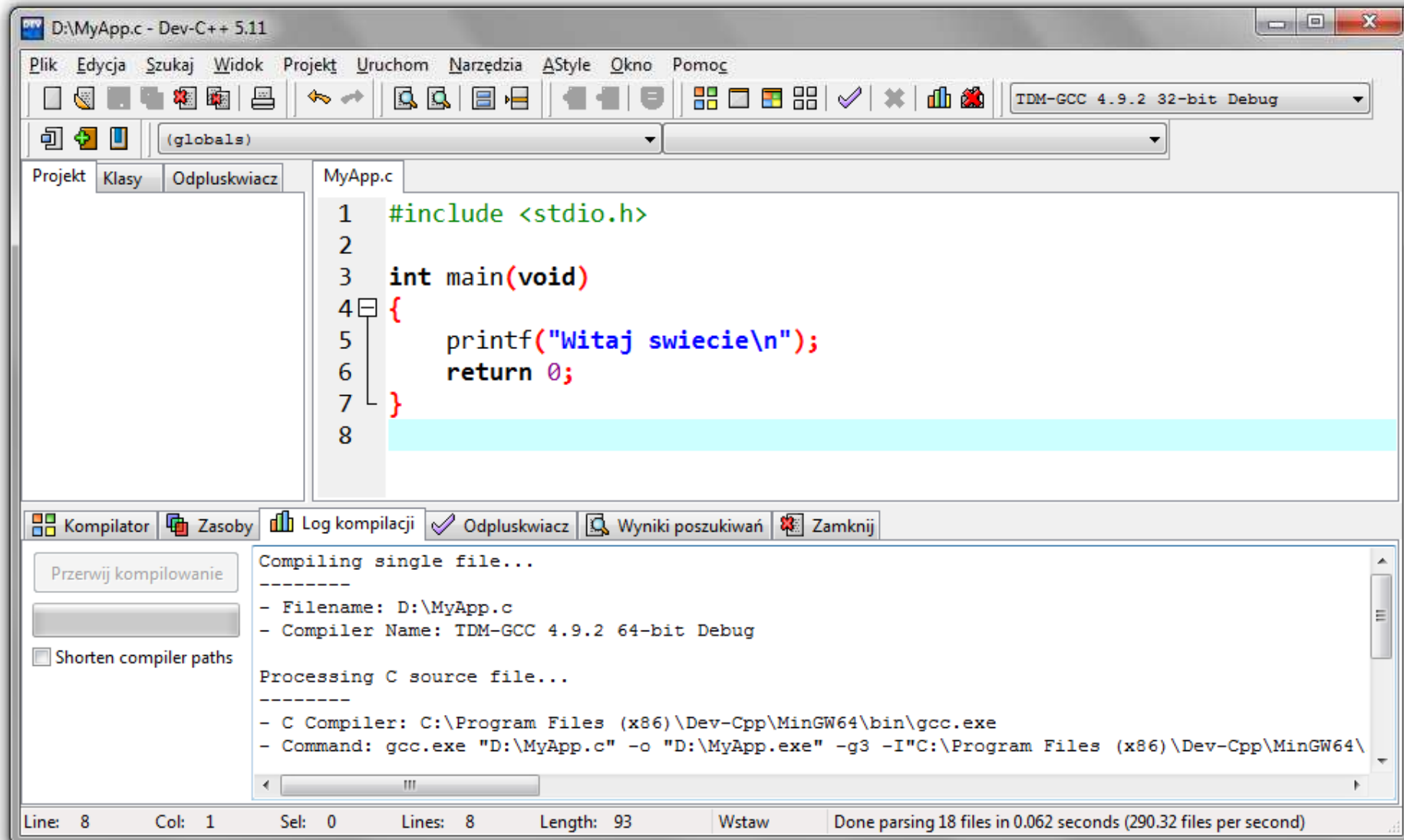
# Microsoft Visual Studio 2019



# Code::Blocks 20.03

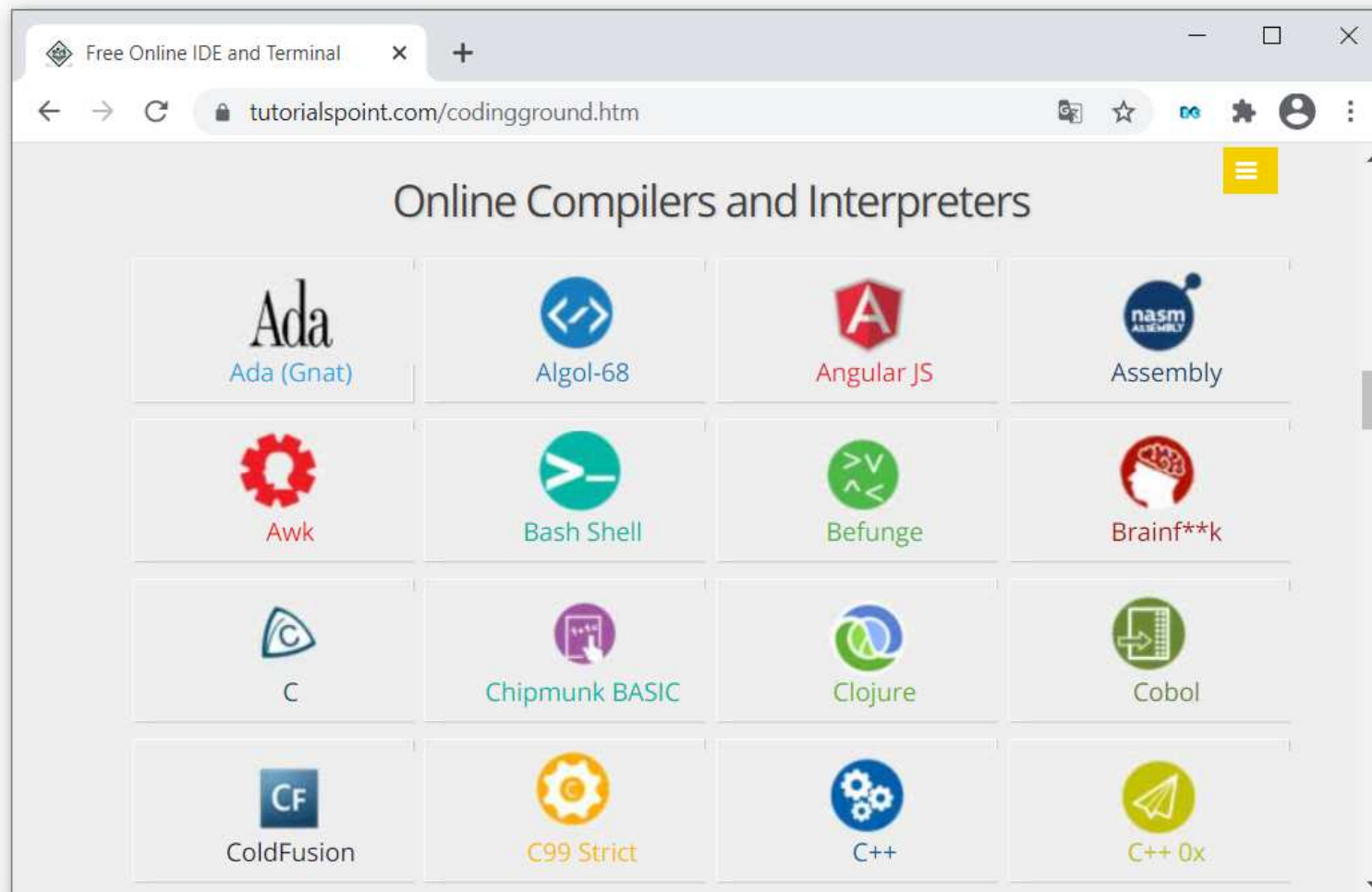


# Dev-C++ 5.11



# Online compilers

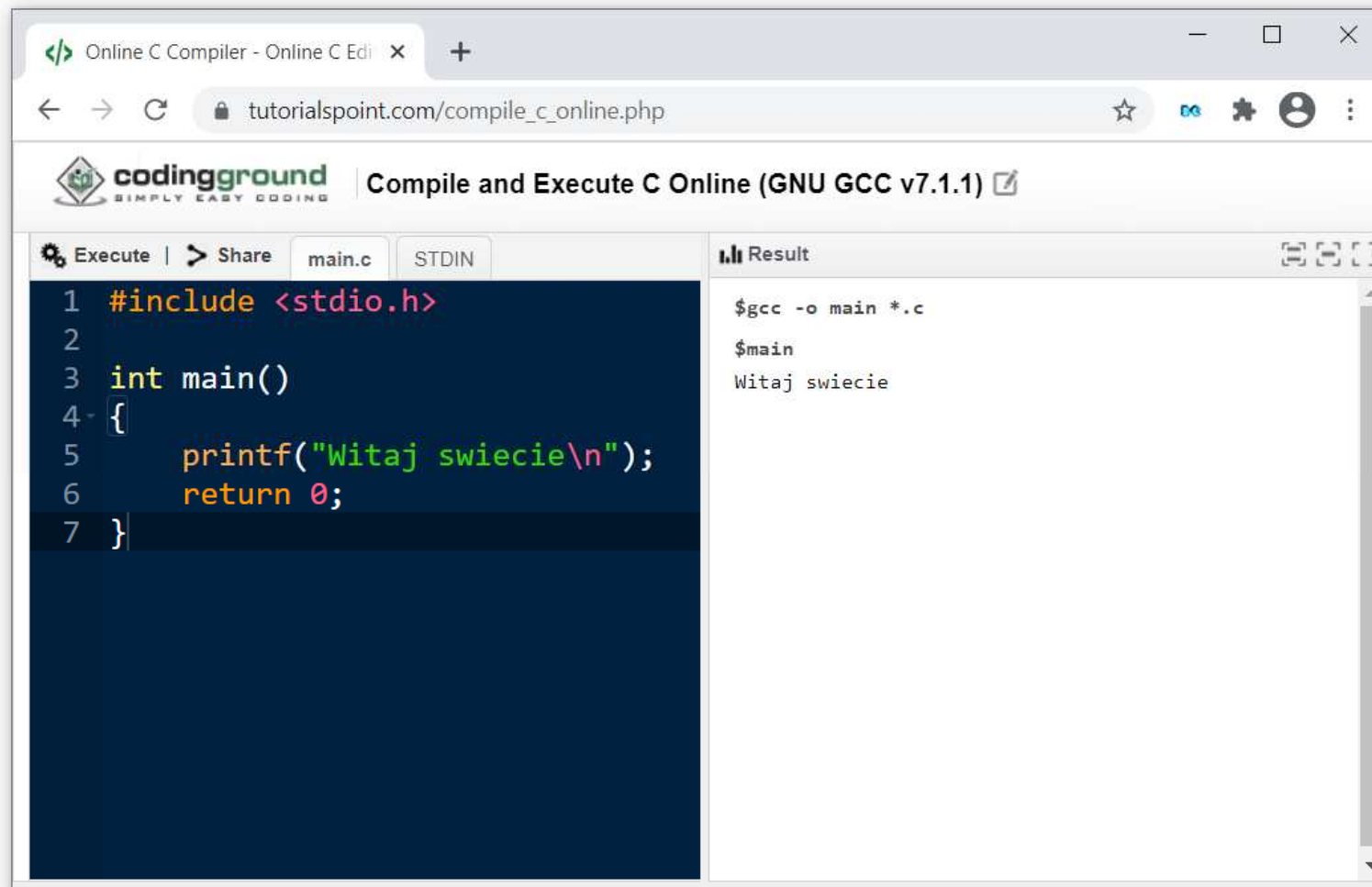
- <https://www.tutorialspoint.com/codingground.htm>





# Online compilers

- <https://www.tutorialspoint.com/codingground.htm>



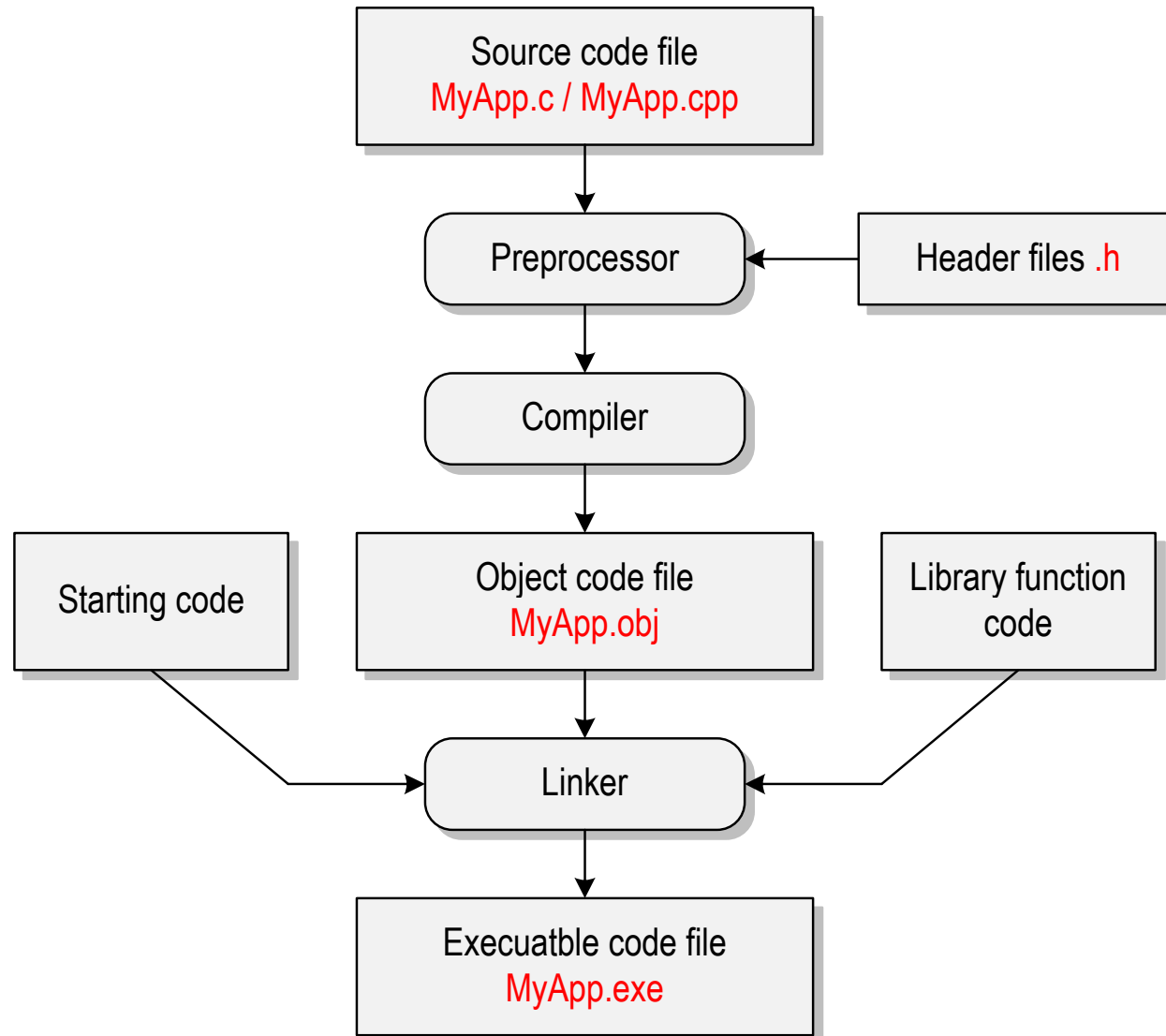
The screenshot shows a web browser window with the URL `tutorialspoint.com/compile_c_online.php`. The page title is "Compile and Execute C Online (GNU GCC v7.1.1)". The interface includes a "codingground" logo and a navigation bar with "Execute", "Share", "main.c", and "STDIN" buttons. The main area is split into two panes: a code editor on the left and a "Result" pane on the right. The code editor contains the following C code:

```
1 #include <stdio.h>
2
3 int main()
4 {
5     printf("Witaj swiecie\n");
6     return 0;
7 }
```

The "Result" pane shows the output of the compilation and execution:

```
$gcc -o main *.c
$main
Witaj swiecie
```

# Program compilation



## Program code

- The way the program code is written only affects its clarity, not its compilation and execution
- This program will also compile:

```
#include <stdio.h>
int main(void) {printf("Hello world\n");return 0;}
```

- The C language is **case sensitive** - the following code will not compile:

```
#include <stdio.h>
int Main(void) {printf("Hello world\n");return 0;}
```

## Text printing (printf)

- The new line character `\n` can be inserted anywhere in the string

```
printf("Hello world\n");
```

```
Hello world
```

```
—
```

```
printf("Hello\nworld\n");
```

```
Hello  
world
```

```
—
```

```
printf("Hello ");  
printf("world");  
printf("\n");
```

```
Hello world
```

```
—
```

# Escape sequences

- Other escape sequences

<b>Description</b>	<b>printf()</b>
Alert (beep)	<code>\a</code>
Backspace	<code>\b</code>
Form feed	<code>\f</code>
New line	<code>\n</code>
CR - carriage return	<code>\r</code>
Horizontal tab	<code>\t</code>
Vertical tab	<code>\v</code>

## Printing special characters

- Some characters have a special function and cannot be printed in the traditional way

Description	Char	printf()
Quotation marks	"	\"
Apostrophe	'	\'
Backslash	\	\\
Percent	%	%%

```
Path: "C:\data\file.txt"
```

```
printf("Path: \\\"C:\\data\\file.txt\\\"\\n");
```

# Text printing

```
#include <stdio.h>

int main(void)
{
    printf("-----\n");
    printf("| Points | Grade |\n");
    printf("-----\n");
    printf("| 91-100 | 5.0 |\n");
    printf("| 81-90  | 4.5 |\n");
    printf("| 71-80  | 4.0 |\n");
    printf("| 61-70  | 3.5 |\n");
    printf("| 51-60  | 3.0 |\n");
    printf("| 0-50   | 2.0 |\n");
    printf("-----\n");

    return 0;
}
```

Points	Grade
91-100	5.0
81-90	4.5
71-80	4.0
61-70	3.5
51-60	3.0
0-50	2.0

# Comments

- Comments are skipped during compilation

```
/*  
  Name:   MyApp.c  
  Author: J. Forenc, Faculty of Electrical Engineering  
  Date:   13-02-2023  
  Desc.:  Program that prints the text "Hello world"  
*/  
  
#include <stdio.h>    // contains a printf() declaration  
  
int main(void)        // main() function header  
{  
    printf/* function */("Hello world\n");  
  
    return 0;  
}
```



End of lecture no. 01

Thank you for your attention!