

"GHEORGHE ASACHI" TECHNICAL UNIVERSITY OF IAȘI
Faculty of Automatic Control and Computer Engineering
Department of Computer Engineering
Competition for academic position of associate professor: no. 12
Courses: Source code security, Data visualization, Computer Programming

Thematic area
related to the the lecture from the thematic area
for the competition for the academic position of associate professor: no. 12
from the posts of the staff of the Department of Computer Engineering
for the academic year 2023-2024

Source code security

- Buffer overflow attacks.
- Memory management in C/C++. Source code security issues.
- Vulnerabilities specific to C/C++ languages: arithmetic limits, type conversions, etc.
- Application design methods from the security point of view. Microsoft Security Development Lifecycle.
- Static and dynamic source code analysis.
- Source code writing standards (MISRA, SEI-CERT).
- Ways to implement a software application from a security perspective: risks and vulnerabilities.
- Defensive / offensive techniques of writing the source code (defensive / offensive programming).

Data visualization

- Data abstraction from the point of view of scientific visualization.
- Abstraction of tasks from the point of view of scientific visualization.
- Indicators and visual communication channels.
- Tables visualization.
- Interactive visualization.
- Multiple visualization.
- Spatial data visualization.
- Visualization of networks and trees.
- Composite data visualization.
- Medical data visualization.

Computer programming

- The basics of the C language
 - identifiers
 - data types (basic and derived, predefined and user-defined)
 - variables and constants, functions
 - declarations and definitions
 - memory classes

- o input - output operations
- o expressions and operators: arithmetic, relational, logical, increment-decrement, assignment. Logical operators on bits. Conditional expression. Operator Precedence Table.
- o working with files
- o C language instructions
- o lifetime and scope of variables
- o complex data types: structures, unions, enumerations, bit fields
- Pointers
 - o definitions and declaration of pointers
 - o pointers and arrays
 - o pointers and functions. Function calls by value and by using pointers
 - o pointer arithmetic
 - o memory allocation/deallocation
 - o multidimensional arrays
 - o pointers to functions
- Command line arguments

Bibliography:

- 1) CERT C Coding Standard: 98 Rules for Developing Safe, Reliable, and Secure Systems - Rules for Developing Safe, Reliable, and Secure Systems, 2016 Edition
- 2) Robert C. Seacord. Secure Coding in C and C++ (SEI Series in Software Engineering). Addison-Wesley Professional, 2 edition (April 12, 2013).
- 3) Daniel Deogun, Dan Bergh Johnsson, Daniel Sawano. Secure By Design 1st Edition. Manning Publications; 1st edition (September 10, 2019).
- 4) Tamara Munzner. Visualization Analysis and Design. A K Peters Visualization Series, CRC Press, 2014.
- 5) Alexandru C. Telea. Data Visualization: Principles and Practice, Second Edition. CRC Press, 2014.
- 6) Andy Kirk. Data Visualisation: A Handbook for Data Driven Design. SAGE Publications, 2016.
- 7) Kernighan, B.W., Ritchie, D.M., The C Programming Language, Prentice Hall. 1988.
- 8) Botez, C., Șerban, E., Maftai, L., Gospodaru, M., Șova, I., Programarea calculatoarelor în limbajul C/C++. Lucrări practice, Editura Gh. Asachi, Iași, 2002.
- 9) Schildt, H., C – The Complete Reference, 4th Edition, McGraw-Hill, 2000
- 10) Harbison, S. P. and Steele, G.L., C A Reference Manual, 5th Edition, Prentice Hall Inc., 2002

Decan,
Prof. Vasile-Ion Manta

Director de departament,
Conf. Andrei Stan