"GHEORGHE ASACHI" TECHNICAL UNIVERSITY OF IAȘI
Faculty of Automatic Control and Computers
Department of Computer Science and Engineering
Competition for the position of Associate Professor, position no. 12
Subjects of the position: Web Programming, Web Security, Algorithm Design

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 2024-2025

Web programming

- Web architecture. Web resource identification. Principles of web architecture.
- HTTP protocol.
- Creating web pages. HTML language.
- Formatting web pages. CSS language.
- Interaction on web pages. JavaScript language. DOM. BOM. Ajax.
- Other concepts used on the internet:
    - Proxy, gateway, tunnel
    - Cache, cookies, sessions
    - Connecting a web server to a database
    - Web services
    - Web APIs

Web Security

- Web security – general concepts: TCP/IP model, client-server model, server-side languages, security context, types of web attacks.
- Architecture of a web application. Types of attacks on a web application.
- Attacks such as SQL injection, Cross-Origin Resource Sharing (CORS), Cross-Site Scripting (XSS), Cross-Site Request Forgery (CSRF).
- Access security: Authentication, password storage and attacks, two-factor authentication. Session management – types of session attacks. JSON Web Token (JWT), Single Sign-On (SSO) – SAML 2.0, OAuth 2.0, OpenID Connect 1.0.
- Web fraud – types of user-targeted attacks, concepts: spam, phishing, spoofing, social engineering, identity theft, spam detection.
- Online advertisements – ad fraud, vulnerabilities related to ads, AdBlocker.
- Public Key Infrastructure (PKI). HTTPS protocol – digital certificates and fake digital certificates (man-in-the-middle). PKI and HTTPS vulnerabilities.
- Honeypot. Honeynet. Canary trap.
- Legislation – cookie policy, GDPR, Digital Services Act.

- Web anonymity – methods to improve anonymity, Surface/Deep/Dark Web. Anonymous communication platforms. Tor. Online payment security.
- Web 1.0 vs. 2.0 vs. 3.0. Blockchain technology. Sybil attack.

Proiectarea algoritmilor

- Algorithms and problems, algorithm evaluation.
- Divide-and-conquer method:
  - Case studies: merge sort, bitonic sort, quicksort, large integer multiplication.
- Greedy method:
  - Case studies: weighted frontier binary trees, the knapsack problem (continuous variant).
- Dynamic programming method:
  - Case study: the knapsack problem (discrete variant).
- Backtracking method:
  - Case studies: n-queens problem, subset-sum problem.
- Branch-and-bound method:
  - Case study: Perspico.
- Graph algorithms:
  - Topological sorting, shortest paths.

Bibliography:

1) John Dean. Web Programming with HTML5, CSS, and JavaScript. Jones & Bartlett Learning, 2018.

2) Hoffman, Andrew. Web Application Security: Exploitation and Countermeasures for Modern Web Applications. O'Reilly Media, Inc., 2020.

3) McDonald, Malcom. Web Security for Developers: Real Threats, Practical Defense. No Starch Press; 2020.

4) Khawaja, Gus. Practical Web Penetration Testing: Secure web applications using Burp Suite, Nmap, Metasploit, and more. Packt, 2018

5) Baloch, Rafay. Ethical hacking and penetration testing guide. CRC Press, 2017.

6) Zalewski, Michal. The tangled Web: A guide to securing modern web applications. No Starch Press, 2012.

7) Stuttard, Dafydd, and Marcus Pinto. The web application hacker's handbook: Finding and exploiting security flaws. John Wiley & Sons, 2011.

8) Sullivan, Bryan, and Vincent Liu. Web application security, a beginner's guide. McGraw-Hill Education Group, 2011.

9) Garfinkel, Simson, and Gene Spafford. Web security, privacy & commerce. " O'Reilly Media, Inc.", 2002.

10) D. Lucanu, M. Craus. Proiectarea algoritmilor. Editura Polirom, 2008.

11) T. Cormen, C. Leiserson, R. Rivest. Introducere în algoritmi, Computer Libris Agora, Cluj, 2000.

Dean,   Head of Department,

Prof. Dr. Eng. Adrian Burlacu   Assoc. Prof. Dr. Eng. Andrei Stan