

Georgian American University

“Computer Science”

“Cyber and Information Security”

Guide to the Specialty Examination for master’s Programs

School of Informatics and Engineering



Introduction

This guide has been prepared for applicants wishing to be admitted to the Cyber and Information Security and Computer Science master's programs, who are required to pass an admission examination in the specialty before the admissions committee.

The purpose of the specialty examination is to assess the foundational knowledge and logical-analytical skills without which it is impossible to successfully master graduate-level material in these specializations.

Application and Examination Deadlines

- **Submission of applications:** Applicants must submit their applications to the School of Informatics and Engineering **from September 1 through September 13, 2026.**
- **Administration of examinations:** The examinations will be held **from September 17 through September 19, 2026.**

Examination Structure and Weighting

Component	Weight	Description
English Language Examination	30%	Assessment of English language proficiency (B2)
Specialty Examination	70%	Two stages: – Written examination (30%) – Interview (40%)

The English language examination consists of B2-level test assignments and is graded out of 100 points. Applicants who present a certificate confirming B2-level proficiency and/or a document confirming completion of an English-language bachelor's/master's program are exempt from the examination. **A sample English language exam paper is available [on the website](#).**

The written specialty examination paper consists of 5 questions assessing the applicant's theoretical and practical competencies in the ICT field.

The interview assesses comprehension of the written work, motivation, and professional interests regarding further academic development. **A sample specialty exam paper is provided in the Appendix.**

Topics of the Specialty Examination

The specialty examination may cover the following thematic areas:

- **Mathematical Foundations** - Linear algebra (matrices, vectors, solving systems of linear equations), probability theory (the concept of probability, events, distributions), calculus (derivatives, integrals, and related topics), descriptive statistics (mean, median, variance, standard deviation).
- **Algorithms and Data Structures** - Solving an algorithmic problem in one of the programming languages (C/C++, Java, Python, C#, JavaScript, PHP); fundamental data structures, graphs, shortest-path algorithms (e.g., Dijkstra), evaluating algorithm complexity.
- **Object-Oriented Programming** - Solving an object-oriented problem in one of the languages (C/C++, Java, Python, C#, JavaScript, PHP); OOP principles (encapsulation, inheritance, polymorphism), UML class diagrams.
- **Databases** - Designing and building a database using MS SQL, MySQL, or Oracle database management systems: the ER model, creating tables, relationships between tables, SQL queries (CREATE, INSERT, UPDATE, DELETE, JOIN), normalization.
- **Web Technologies** - Knowledge of markup (HTML, CSS); basic client-side technologies (JavaScript or a JavaScript-based framework/library); server-side technologies (PHP, Python, Java, C#, etc.).
- **Cybersecurity** - Principal threats to servers and web applications, authentication and authorization mechanisms, the purpose of firewalls and SSL/TLS.

Recommended Preparation Literature

Thematic Area	Recommended Literature / Resources
Linear Algebra	G. Strang, Introduction to Linear Algebra; Khan Academy - Linear Algebra (free video course)
Probability Theory and Statistics	OpenIntro Statistics (free, openintro.org); Khan Academy - Statistics and Probability
Calculus	J. Stewart, Calculus: Early Transcendentals; Khan Academy - Calculus
Algorithms and Data Structures	T. Cormen et al., Introduction to Algorithms (MIT Press); A. Bhargava, Grokking Algorithms; VisuAlgo.net (visualizations); LeetCode / HackerRank (practice)
OOP and Software Design	Head First Object-Oriented Analysis and Design (O'Reilly); M. Fowler, UML Distilled (3rd ed.); official documentation of the chosen language (docs.oracle.com , learn.microsoft.com , docs.python.org)
Databases	A. Silberschatz et al., Database System Concepts (7th ed.); R. Elmasri, S. Navathe, Fundamentals of Database Systems; W3Schools SQL Tutorial (practice); official MS SQL / MySQL / Oracle documentation
Web Technologies	MDN Web Docs (developer.mozilla.org) - HTML, CSS, JavaScript; J. Duckett, HTML & CSS + JavaScript & jQuery; W3Schools (PHP, JS, frameworks); freeCodeCamp (free hands-on courses)
Cybersecurity	OWASP Top 10 (owasp.org); W. Stallings, L. Brown, Computer Security: Principles and Practice; Linux Foundation - Linux Security Fundamentals (free course)

Practical Tips

- Practice solving problems - artificial intelligence is not permitted during the examination.
- Choose the one programming language you know best and prepare in it for both the algorithmic and the OOP problems.
- For every question, pay attention to the assessment criteria: points are awarded not only for the final answer, but also for analysis, justification, and interpretation.
- Prepare for the interview: make sure you can explain and justify your written answers orally.
- For the English component, review technical vocabulary and academic writing skills.

Appendix: Sample Exam Paper

Question 1 - Algorithms and Data Structures

A weighted directed graph is given. Find the shortest path between two vertices using Dijkstra's algorithm. Describe how the algorithm works and evaluate its complexity.

Assessment criteria (maximum 6 points):

Criterion	Points
Problem analysis	1
Selection of an appropriate algorithm	1
Correct application of the algorithm	2
Correctness of the obtained result	1
Evaluation of time complexity	1

Question 2 - Software Design and Object-Oriented Programming

Design a UML class diagram for a university information system (at least 3 classes). Describe the relationships between the classes and implement the main classes in Java, C#, or Python. Apply encapsulation, inheritance, and polymorphism.

Assessment criteria (maximum 6 points):

Criterion	Points
Correctness of the UML model	1
Class design	1
Application of OOP principles	2
Correctness of the implementation	1
Code structure and quality	1

Question 3 - Databases

Design a university database (at least 3 tables). Create an ER diagram, transform it into a relational model, and write SQL queries: creating tables, inserting data, updating data, a JOIN query, and deleting data.

Assessment criteria (maximum 6 points):

Criterion	Points
Construction of the ER model	1
Creation of the relational model	1
Correctness of the SQL queries	2
Application of normalization	1
Correctness of the solution	1

Question 4 - Cybersecurity and Server Security

An organization has a Linux-based web server hosting a database and a web application. Describe the principal cyber threats to the server, user authentication and authorization mechanisms, the purpose of firewalls and SSL/TLS, and the measures necessary to ensure security.

Assessment criteria (maximum 6 points):

Criterion	Points
Identification of threats	1
Description of security mechanisms	2
Explanation of authentication and authorization	1
Security recommendations	1
Justification of the answer	1

Question 5 - Statistical Analysis

The following execution times (in seconds) were obtained from testing a software system: 12, 15, 14, 18, 16, 13, 17, 15. Calculate the arithmetic mean, median, variance, and standard deviation. Based on the results, assess how stable the software system's performance is.

Assessment criteria (maximum 6 points):

Criterion	Points
Data analysis	1
Calculation of the mean and median	1
Calculation of the variance and standard deviation	2
Interpretation of the results	1
Justification of the conclusion	1

We wish you success!