

COMPUTER ENGINEERING BSC SPECIALIZATION

SOFTWARE ENGINEERING SPECIALIZATION



[HTTPS://SPEC.VIK.BME.HU](https://spec.vik.bme.hu)

The specialization provides a comprehensive curriculum that encompasses cutting-edge technologies and methodologies. Students gain expertise in applied cloud-based solutions, focusing on services and infrastructure for scalable and efficient deployment. Additionally, they delve into maintainable development practices, including DevOps methodologies, code quality assurance, and automated testing to ensure robust software solutions. The program emphasizes object-oriented design principles, design patterns, and techniques such as reengineering, reverse engineering, and refactoring for optimized codebases. Furthermore, students explore distributed systems, learning performance and service quality measurement techniques to ensure reliable and efficient operations. They also gain proficiency in modern software development environments, various programming languages, and tools, including .NET, Java, Spring Boot, and open-source technologies. Moreover, the specialization covers database systems and modern data management principles, alongside native and cross-platform mobile development, offering multiplatform solutions to address diverse user needs.

The specialization lectures present the theoretical foundations to the students. They can try it in practice in the specialization laboratory, project laboratory, and thesis work.

The specialization subjects are managed by the following three departments:

- [Department of Automation and Applied Informatics \(AUT\)](#)
- [Department of Control Engineering and Information Technology \(IIT\)](#)
- [Department of Measurement and Information Systems \(MIT\)](#)

MAIN TOPICS OF THE SPECIALIZATION:

- Modern software development environments, programming languages and tools
- Maintainable development, code quality, automated testing
- Object-oriented design, design patterns, reengineering, reverse engineering, refactoring
- FullStack development, Node.js
- Database systems and modern data management



Automatizálási és
Alkalmazott
Informatikai Tanszék



SUBJECTS

Data-Driven Systems (BMEVIAUAC15)

The course focuses on methods and procedures applied in the data layer and business logic layer. Students delve into various techniques and methodologies employed in these layers to develop robust and efficient systems. Architecture, operation, and programming of database servers such as Microsoft SQL Server and MongoDB are studied thus providing practical skills for database management and development. Implementation of systems built on databases, various three-tier architectures preparing students for real-world application scenarios. Contemporary technologies like Web Service, REST, and GraphQL for efficient data access and communication. Object-Relational Mapping (ORM), roles of class libraries and the structure of commonly used ORM frameworks like JPA and Entity Framework Core.

Object-Oriented Software Design (BMEVIIIAC09)

The course introduces the students into the field of advanced object-oriented software design covering the most widely accepted design principles of object-orientation. Clean-coding principles, SOLID, Tell Don't Ask, Design by Contract, Law of Demeter. Object-oriented design heuristics to minimize dependencies between classes. Refactoring techniques, principles, necessity, problems, and relationship with design and efficiency. Typical design flaws (code smells), their recognition and correction. API design principles, the process of API design. Distributed, concurrent and parallel software development. Advantages and disadvantages of immutable object-orientation. Immutable data structures.

Automated Software Engineering (BMEVIMAC20)

The course introduces the language engineering process and the automation features of intelligent development environments. This includes the design of context-free grammars, the process of parsing, the implementation of automated continuous integration processes, and the implementation and static analysis, testing and performance measurement techniques. The aim of the course is to familiarise students with state-of-the-art technologies available in the field and to give them experience in automating language design and development. Topics include the following. Software artifacts involved in the different phases of software development, development steps in each phase and their automation. Features of modern development tools, their extension and customization. Designing and executing performance tests and evaluating the measurement data.



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Data-Driven Software Development Laboratory (BMEVIAUAC16)

The goal of the course is to show how to apply the most commonly used techniques in developing data-driven and backend systems in practice. Practical mastery of the topics described in Data-Driven Systems:

- Introduction to PowerBI reporting
- Query optimization, use of indexes
- MSSQL and MongoDB
- Multi-tier applications based on Entity Framework Core and ASP.NET Core

Project Laboratory

Independent work carried out at the selected department, in the subject area determined by the student and the advisor. The subject provides an opportunity for an in-depth study of a topic, the development of independent knowledge acquisition and problem-solving skills, and through these direct preparation for the thesis.

BSc Thesis Project

Development of a task proving suitability for independent engineering in accordance with BSc requirements under the supervision of an advisor in the selected department.

