

**BULGARIAN ACADEMY OF SCIENCES  
INSTITUTE OF MATHEMATICS AND INFORMATICS**

Approved:

(Prof. P. Boyvalenkov, Director of IMI-BAS)

**QUALIFICATION PROFILE**

**Higher Education Area:**

4. Natural Sciences, Mathematics, and Informatics

**Professional Field:**

4.6. Informatics and Computer Science

**PhD Programme:**

Methods for Data Processing and Protection

The PhD programme in Methods for Data Processing and Protection provides the third degree of higher education for acquiring the educational and scientific degree of Doctor of Philosophy.

This Qualification Profile determines the knowledge, skills, personal and professional competences of PhD students who have pursued and completed the PhD programme in Informatics.

**Requirements for admission and training**

The admission and training of PhD students are in accordance with the legal requirements of:

- the Act on Higher Education;
- the Act on Development of the Academic Staff in the Republic of Bulgaria;
- the Regulations on the Implementation of the Act on Development of the Academic Staff in the Republic of Bulgaria;
- the Regulations on the Conditions and Order for Acquiring Scientific Degrees and Occupying Academic Positions at the Bulgarian Academy of Sciences;
- the Regulations on the Conditions and Order for Acquiring Scientific Degrees and Occupying Academic Positions at the Institute of Mathematics and Informatics at the Bulgarian Academy of Sciences;

- the Rules for the Activity of the Training Centre (TC) and the Academic Council (AC) of BAS.

The duration of the programme is:

- 3 years in case of full-time training;
- 4 years in case of part-time training;
- up to 3 years in case of self-study.

The PhD programme in Methods for Data Processing and Protection provides the opportunity to obtain the educational and scientific degree of Doctor of Philosophy in professional field 4.6. Informatics and Computer Science upon:

- successful completion of all stages of the PhD student's individual plan;
- successful defence of the thesis.

## **Aim**

The PhD programme in Methods for Data Processing and Protection aims to train highly qualified specialists with in-depth competence on both applied and theoretical level for research and development in the fields of cryptography, coding theory, data science, and cybersecurity. It also strives to equip the PhD candidates with the management and teaching skills for an independent researcher/developer or educator in related fields.

The training in the PhD programme in Methods for Data Processing and Protection is in full compliance with the mission and objectives of IMI-BAS, set out in the Research Development Strategy of the Institute of Mathematics and Informatics, and in particular with its priority area Mathematical Informatics: mathematical foundations of informatics, development of mathematical methods for development and implementation of cryptographic schemes for information protection, development of mathematical approaches for construction of combinatorial structures connected to coding theory, cryptography and network theory, application of algebraic and combinatorial coding theory for the development of cryptographic primitives, analysis of the behaviour of error-correcting codes in various implementations, choice of particular codes for various applications in specific communication and data storage use cases, development and support of information systems for modeling and simulations of natural disasters etc.

## **Competences**

Holders of the educational and scientific degree of Doctor of Philosophy, awarded by IMI-BAS, shall have acquired intellectual qualities, knowledge, practical skills and habits for:

- independent study;
- teamwork;
- planning and carrying out scientific and practical tasks in time;
- setting problems, proposing solutions, justifying choices of approaches and methods;
- formulating, expressing, and defending scholar arguments, ideas, and concepts;

- conducting comprehensive scientific studies;
- presenting scientific results orally and in writing, with different target audiences;
- doing all of the above fluently in English – the leading language for research communication in mathematics and informatics on a global level.

More particularly, the successful PhD graduates in Methods for Data Processing and Protection at IMI-BAS shall:

- have mastered methods and tools for research – collection, synthesis, analysis, and summarisation of scientific information on achievements, good practices, developments, policies, and problems related to a specific case study;
- have understanding of the mathematical foundations of informatics, including, algebra, combinatorics, graph theory and mathematical fields relevant to cryptography;
- be capable of using and developing methods and algorithms for construction of algebraic and combinatorial structures with application in cryptography, coding theory, data science, and cybersecurity;
- be capable of using and developing methods for obtaining bounds for the parameters of theoretically possible structures of the abovementioned type;
- have understanding of the main principles of cybersecurity and resilience, as well as the application of specific methods, tools and architectural approaches (i.e. security-by-design) for the achievement of these principles;
- be capable of developing and support of models and simulations for fires and other natural disasters;

## Careers

PhD Graduates in Informatics are highly qualified specialists, who can work as:

- lecturers in universities, colleges, etc.;
- researchers in scientific institutes and laboratories;
- leaders or members of teams working on national or international projects in fundamental or applied sciences;
- evaluators of projects in the field of informatics, communication technologies, and computer science;
- experts in governmental and public structures on issues related to communication, information security, and computer science;
- consultants on issues of informatics, communication technologies, and computer science;
- specialists in cybersecurity and resilience;
- analysts in modeling and prevention of crises related to cybersecurity or natural disasters
- heads of cyber security departments, penetration testing teams, etc.

A PhD graduate can:

- participate in various forms of continuing qualification (postdoctoral programmes);
- apply for academic positions and obtain scientific degrees.

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The Qualification Profile was approved by the Scientific Council of IMI-BAS on .....  
(Minutes No. ....).