Educational plan

PhD program "Application of the principles and methods of cybernetics in various fields of science"

First year (1-2 semester)

1. **Language Preparation Course**

2. **Computer Skills Course – Choice of** IT Courses
   - LaTeX Basics
   - Data Analysis with R
   - Presentation skills
   - Photoshop
   - GIMP
   - MATLAB
   - Statistical data analysis
   - MS Excel
   - Transfer of scientific knowledge to the public through the free electronic encyclopedia Wikipedia

3. **Specialized courses – selection of at least 2 courses from Specialized courses at the Central Office of the Bulgarian Academy of Sciences**

   - Cloud technologies
   - Design of Internet applications
   - Contemporary reprogrammable devices
   - Advanced sensor information processing
   - Internet technologies for system management
   - Introduction to the process of knowledge discovery
   - VHDL - Digital Design Language
   - Embedded processors

4. **Individual Research Plan 1**

   - Formulation of a research topic
   - Literature review and methodological preparation
   - Initial results and analyses

5. **Seminar on Robotics and Autonomous Systems**
    - Presentation and discussion of current research and projects
    - Critical analysis of scientific articles and reports
    - Modern trends in industrial and service robotics.
    - Discussion on motion planning algorithms and autonomy.
    - Demonstration and analysis of real-world applications of robotic systems and their control.
6. **General basic preparation according to the synopsis for an exam in a basic specialized subject**
    - Preparation of a synopsis on the topic of the dissertation
    - Synopsis exam: 2 written questions and 2 - 4 oral questions

Second year (3-4 semester)

7. **Individual Research Plan 2**
    - Research and experiments
    - Analysis and interpretation of results
    - Planning the content and structure of a dissertation
8. **Ethics and professional development**
    - Scientific ethics and integrity
    - Publication of scientific papers
    - Participation in conferences and seminars
    - Career development and academic opportunities
9. **Workshop on Artificial Intelligence and Cyber-Physical Systems**
    - Presentation and discussion of individual research plans
    - Interdisciplinary discussions and collaboration
    - Analysis of the role of artificial intelligence in the management of cyber-physical systems.
    - Discussion on the integration of IoT, machine learning and autonomous technologies.

- Consideration and analysis of real examples of cyber-physical systems with artificial intelligence.

Third year (5-6 semester) (for PhD students part-time and self-study until the end of the doctoral period)

10. Individual Research Plan 3

- Finalizing research and experiments
- Analysis and interpretation of results
- Preparation of a dissertation

11. Publications and presentations

- Preparation of scientific articles for publication
- Presentation of the results of international conferences

12. Presentation of the work done on the dissertation

- Presentation of published results
- Further specification of the topic of the dissertation (no later than 3 months before the date of the meeting of the section for the preliminary discussion)

13. Defense of the dissertation (up to 5 years after the expiration of the doctoral degree)

- Preparation and presentation of the dissertation to a scientific jury.
- Answers to questions and criticism from committee members

This program provides PhD students with the necessary knowledge and skills to conduct independent research in the field of cybernetics and their successful application in various scientific and practical contexts.