

NON-COMMERCIAL JOINT-STOCK COMPANY  
"ALMATY UNIVERSITY OF POWER ENGINEERING AND  
TELECOMMUNICATIONS NAMED AFTER GUMARBEC DAUKEYEV"  
INSTITUTE OF COMMUNICATIONS AND SPACE ENGINEERING

Approved by  
Vice-Rector for Academic Affairs  
A. Zhupankhan  
\_\_\_\_\_ 2025



**ENTRANCE EXAM PROGRAM**

Postgraduate Education

Educational Program: "8D07105 – Space Engineering and Technology"  
(Doctoral Program – Scientific and Pedagogical Track)

Almaty 2025

The program has been developed in accordance with the Technical Specification for the Formation of the Examination Materials Database for Doctoral Entrance Examinations by Educational Program Groups (Ministry of Science and Higher Education of the Republic of Kazakhstan), taking into account the Modular Curriculum of the Educational Program “8D07105 – Space Engineering and Technology.”

This program establishes the requirements for the mandatory minimum knowledge necessary for admission to the doctoral program and the expected qualification level of applicants.

The program was reviewed and approved at the meeting of the Department of Space Engineering.

Minutes No. 9 dated “24” april 2025


Head of the Department of Space Engineering

 Tolendiuly S.

The program was approved at the meeting of the Academic and Methodological Committee of the Institute of Communications and Space Engineering.

Minutes No. 9 dated “29” may 2025

Director of ICSE


 Omarbekova A.O.

The Doctoral Entrance Examination Program for the educational program 8D07105 – Space Engineering and Technology has been approved by the Department of Science of AUPET named after G. Daukeyev.

Director of the Department of Science

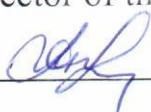
 - Kalieva N.B.

Vice-Rector for Science

  
\_\_\_\_\_ Alipbayev K.A.

The Doctoral Entrance Examination Program for the educational program  
8D07105 – Space Engineering and Technology has been approved by the  
Department for Academic Affairs of AUPET named after G. Daukeyev.

Director of the Department for Academic Affairs

  
\_\_\_\_\_ Bayzakova S.M.



## **1. Scientific and Technical Issues in Space Technology and Engineering**

### **1.1 Current State of the Space Industry in Kazakhstan**

Key infrastructure elements of the space economy within the implementation of the national program. Requirements for the quality and efficiency of space systems. Principles for creating favorable conditions for the development of the space technology and engineering market. The role and significance of the industry as an element of the infrastructure of the Republic of Kazakhstan.

### **1.2 Prospects for the Development of Space Flights**

Overview of current and future space missions. Technological challenges and innovations in space flights. The role and importance of manned and unmanned missions.

### **1.3 Issues in Telemetry and Control of Spacecraft**

Modern telemetry methods. Challenges of long-distance data transmission. Methods to improve the efficiency of spacecraft control.

### **1.4 Development and Use of Nanosatellites**

Advantages and challenges in nanosatellite development. Examples of successful missions. Prospects for the use of nanosatellites for scientific and commercial purposes.

### **1.5 The Role of Artificial Intelligence in Space Technology**

Application of AI in spacecraft. Tasks solved by AI in space. Problems and future directions in AI research for space missions.

### **1.6 Development and Testing of Space Propulsion Systems**

Modern methods for developing space propulsion systems. Challenges in testing and ensuring reliability. Prospects for propulsion system development for interplanetary flights.

### **1.7 Modern Methods of Planet and Satellite Exploration**

Technologies for studying planetary surfaces and atmospheres. Examples of current and planned missions. Challenges and opportunities in the study of planets and their moons.

## **1.8 Advantages and Disadvantages of Satellite Communication Systems**

Definition and principles of satellite communication systems. Classification, strengths and weaknesses. Methods for improving signal quality and maintaining continuous communication.

## **1.9 Challenges and Prospects in Orbital Mechanics**

Analysis of current issues and challenges in orbital mechanics. Methods for orbit calculation and correction. Prospects for the improvement of orbital mechanics for future missions.

## **1.10 Innovations in Heat Exchange and Thermal Insulation of Spacecraft**

Modern thermal control methods in spacecraft. Issues and solutions in thermal insulation. Future directions in technology development for reliable thermal regulation in space.

## **1.11 Development of Optical Systems in Space Technology**

Current state and development prospects of optical systems for data transmission in space. Advantages and disadvantages of optical communication lines for space missions. Major scientific and technological challenges in this field.

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### **Recommended Reading List**

1. Ivanov, A.V. *Fundamentals of Orbital Mechanics*. – Moscow: Nauka, 2020.
2. Petrov, S.B., Kuznetsov, V.N. *Heat Exchange and Thermal Insulation of Spacecraft*. – St. Petersburg: Piter, 2019.
3. Ivanov, A.V. *Fundamentals of Orbital Mechanics*. – Moscow: Nauka, 2020.
4. Petrov, S.B., Kuznetsov, V.N. *Heat Exchange and Thermal Insulation of Spacecraft*. – St. Petersburg: Piter, 2019.
5. Sidorov, I.G. *Modern Satellite Communication Technologies*. – Novosibirsk: Siberian University Press, 2018.
6. Vasiliev, R.D. *Cloud Computing and Its Applications in Space Technology*. – Kazan: Kazan University, 2021.
7. Chernov, A.P. *Innovations in the Space Industry*. – Yekaterinburg: Ural Branch of the Russian Academy of Sciences, 2017.
8. Smith, J. *Fundamentals of Space Technologies*. – London: SpaceTech Publishing, 2016.
9. Kim, E.N. *Automated Spacecraft Control Systems*. – Moscow: Mashinostroenie, 2020.
10. Petrov, L.M. *Latest Developments in Space Propulsion Systems*. – Minsk: Belarusian State University, 2019.