

MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE  
Educational & Research Institute of Information and Diagnostic Systems  
Department of Aviation Computer-Integrated Complexes

APPROVED  
Head of Professional Certification Board

\_\_\_\_\_ S. Filonenko  
« \_\_\_\_ » \_\_\_\_\_ 2016




## Quality management system

### SYLLABUS

of Additional Admission Test  
(Professional Admission Test)  
for Curriculum of Specialists Training  
of Master Academic Degree

for Speciality «Automatization and Computer-Integrated Technologies»  
of Specialization «Computer-Integrated Technological Processes and Production»

**QMS NAU S 14.01.06(2)-01-2016**

	Quality Management System <b>SYLLABUS</b> of Additional Admission Test (Professional Admission Test) for Curriculum of Specialists Training of Master Academic Degree	Document code	QMS NAU S 14.01.06(2)-01-2016
		Page 2 of 7	

## INTRODUCTION

**The purpose** of the additional (professional) admission test is to determine the level of knowledge in the major of professional activity and the formation of students contingent who are the most successful in mastering disciplines of relevant curriculums. Applicants must demonstrate a fundamental, professionally oriented knowledge and skills, the ability to solve typical professional tasks set out in the entrance syllabus.

Additional (professional) admission test is given in one of the forms (oral/written interview, test tasks, practical tasks or combined form).

Organization of additional (professional) admission test is done in accordance with the Regulations on the admission board of the National aviation university.

### SYLLABUS QUESTION LIST


by subjects that are submitted on additional (professional) Admission Test  
for Curriculum of Specialists Training  
of Master Academic Degree

#### **Questions list on the subject "Identification and modeling of technological processes"**

1. Structural and parametric identification
2. Nonparametric identification
3. Evaluation of state variables
4. Recurrent (sequential) algorithms of identification
5. Iterative identification algorithms
6. Nonparametric identification of linear stochastic systems. Wiener-Hopf equation
7. Parametric identification of systems. Least squares method
8. Generalized least squares method
9. Maximum likelihood method
10. Bayesian estimation
11. Stochastic approximation method
12. Parameter estimation using Kalman filtering
13. Method of regression analysis. Problem statement
14. Application conditions of classical regression analysis
15. Properties of the regression estimates
16. Statistical analysis in regression analysis
17. Estimation of homogeneity of data variances
18. Estimation of the correlation data
19. Regression analysis under constraints
20. Standardization and centralization
21. Regularization method
22. Regression analysis in case of heterogeneity of variance
23. Regression analysis in case of the data correlation

#### **Questions list on the subject "Automation of technological processes and production"**


1. Purpose, objectives and functions of ACS TP.
2. Human-machine interface.
3. General structure of modern ACS TP.
4. Classification of ACS TP.

	Quality Management System <b>SYLLABUS</b> of Additional Admission Test (Professional Admission Test) for Curriculum of Specialists Training of Master Academic Degree	Document code	QMS NAU S 14.01.06(2)-01-2016
		Page 3 of 7	

5. SCADA-system.
6. Typical structure of PLC system.
7. DCS – Distributed control system.
8. Most common industrial buses of ACS TP.
9. ACS TP software.
10. ACS TP functions.
11. ACS TP actuating devices.
12. Classification of technological processes.
13. Main stages of ACS TP design.
14. ACS TP control schemes.
15. General structure of SCADA-system in ACS TP.
16. Peculiarities of ACS TP creation in enterprises with high explosion hazard.
17. Alarm and archiving in distributed control systems.
18. Overview of programmable logic controllers.
19. Programming of programmable logic controllers.
20. Programming complexes of programmable logic controllers.

#### **Questions list on the subject " Flight complexes "**

1. Evaluation of piloting characteristics of aircraft as a control object. The main idea of the stability evaluating criteria and aircraft controlability.
2. Structure of a typical channel of aircraft ACS. Typical correction filters.
3. Main elements of mechanical wiring of aircraft control. Connection methods of ACS servo drives in mechanical wiring
4. Concept of control law. General view of the control law in channels with rigid, flexible and isodromic feedbacks in servo drive. What is purpose adding the derivative and the integral components of the positional signal into control laws except positional signal?
5. Dampers of the angular oscillation. Analysis of dynamic characteristics of damping circuit on the example of the pitch damper.
6. Track autostabilizer.
7. Automatic control of roll angle. Typical control laws.
8. Automatic control of pitch angle. Typical control laws.
9. Automatic control of aircraft heading. Typical control laws.
10. Automatic control of flight speed. Autothrottle.
11. Methods of automatic control. Joint control and direct flight control.
12. Trajectories and stages of landing. Categories of landing approach. Technical means of landing provision.
13. Automation control during the landing approach stage. Write down the options for control laws of automated control over longitudinal motion of the aircraft at the landing stage.
14. Automation of control during takeoff and landing.
15. How is it possible to control the helicopter turn? Write down the typical law of helicopter yaw angle stabilization.
16. Write down laws variants for the automated control of a helicopter in the stabilization mode of flight speed.
17. How is it possible to control the movement of helicopter in the horizontal plane, and to change the angles of roll and pitch?

	Quality Management System <b>SYLLABUS</b> of Additional Admission Test (Professional Admission Test) for Curriculum of Specialists Training of Master Academic Degree	Document code	QMS NAU S 14.01.06(2)-01-2016
		Page 4 of 7	

**References**  
for self-study to pass  
Additional (Professional) Admission Test

*Main references*


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3. Синеглазов В.М., Філяшкін М.К. Автоматизовані системи управління повітряних суден. – К., НАУ. 2002.- 465 с.

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V. Sineglazov

	Quality Management System <b>SYLLABUS</b> of Additional Admission Test (Professional Admission Test) for Curriculum of Specialists Training of Master Academic Degree	Document code	QMS NAU S 14.01.06(2)-01-2016
		Page 5 of 7	

Ministry of Education and Science of Ukraine  
National Aviation University

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Department of aviation computer integrated complexes  
Academic Degree - Master

Speciality "Automation and computer integrated technologies"  
Specialization "Computer-integrated technological processes and production"

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Additional (professional) admittance test

Examination card № 1

Task 1. Structural and parametric identification

Task 2. Purpose, objectives and functions of ACS TP.

Task 3. Evaluation of piloting characteristics of aircraft as a control object. The main idea of the stability evaluating criteria and aircraft controlability.

Approved at the meeting of department of aviation computer integrated complexes

Record No \_\_\_\_\_, « \_\_\_\_ » \_\_\_\_\_ 2016

Head of ACIC department \_\_\_\_\_ V. Sineglazov  
signature

	Quality Management System <b>SYLLABUS</b> of Additional Admission Test (Professional Admission Test) for Curriculum of Specialists Training of Master Academic Degree	Document code	QMS NAU S 14.01.06(2)-01-2016
		Page 6 of 7	


**Rating grades of completing individual tasks on  
additional (professional) admittance test**

Type of academic work	Maximum rating grades(points)
Completing task № 1	30
Completing task № 2	30
Completing task № 3	40
<b>Total:</b>	<b>100</b>

**Values of rating grades in points for tasks completing on  
admission tests and their criteria\***

Grades in points for completing individual tasks		Criterion of grades
27 – 30	36 - 40	Excellent performance with a few mistakes
25 – 26	33 – 35	Completing at above average level with several mistakes
23 – 24	30 - 32	Generally correct completing with a number of significant mistakes
20 – 22	27 – 29	Good completing, but with significant number of drawbacks
18 – 19	24 - 26	Completing satisfies the minimum criteria
Less than 18	Less than 24	Completing does not satisfy the minimum criteria
<b><i>Attention!</i></b> <b><i>Grades which are less than 18 or 24 points are not taken into account during ranking</i></b>		

\* Value of grades in points and their criteria correspond to ECTS requirements

	Quality Management System <b>SYLLABUS</b> of Additional Admission Test (Professional Admission Test) for Curriculum of Specialists Training of Master Academic Degree	Document code	QMS NAU S 14.01.06(2)-01-2016
		Page 7 of 7	

### Correspondence of Rating Grades to the National Scale and to ECTS System

Rating grades	National Scale	ECTS System	
		ECTS Grade	Explanation
<b>90-100</b>	<b>Excellent</b>	<b>A</b>	<b>Excellent</b> (excellent performance with insignificant shortcomings)
<b>82-89</b>	<b>Good</b>	<b>B</b>	<b>Very Good</b> (performance above the average standard with a few mistakes)
<b>75-81</b>		<b>C</b>	<b>Good</b> (good performance altogether with a certain number of significant mistakes)
<b>67-74</b>	<b>Satisfactory</b>	<b>D</b>	<b>Satisfactory</b> (performance meets the average standards)
<b>60-66</b>		<b>E</b>	<b>Sufficient</b> (performance meets the minimal criteria)
<b>35-59</b>	<b>Bad</b>	<b>FX</b>	<b>Bad</b> (bad performance; a second testing is required)
<b>1-34</b>		<b>F</b>	<b>Bad</b> (very bad performance; a student shall retake the course)