



# ORGANIZATION OF SCIENTIFIC AND INNOVATIVE ACTIVITY IN AVIATION-2. INNOVATIONS IN AVIONICS

## Work program of the discipline (Syllabus)

Details of the discipline	
Level of higher education	<i>Third (educational and scientific)</i>
Field of knowledge	<i>17 Electronics and telecommunications</i>
Specialty	<i>173 Avionics</i>
Educational program	<i>Control systems of flight vehicles and complexes engineering</i>
Discipline status	<i>Normativ</i>
Form of study	<i>full-time (day) / full-time (evening) / part-time</i>
Year of preparation, semester	<i>2nd year, spring semester</i>
The scope of discipline	<i>2 credits (60 hours)</i>
Semester control / control measures	<i>test</i>
Timetable	<i>Rozklad.kpi.ua</i>
Language of teaching	<i>English</i>
Information about course leader / teachers	<i>Lecturer: Doctor of Technical Sciences, Professor Oleksandr Vasyliovych Zbrutsky, tel. + 044-2048224, e-mail: <a href="mailto:zbrutsky@cisavd.kpi.ua">zbrutsky@cisavd.kpi.ua</a></i> <i>Practical / Seminar: doctor of technical sciences, professor Zbrutsky Olexandr Vasyliovych, tel. + 044-2048224, e-mail: <a href="mailto:zbrutsky@cisavd.kpi.ua">zbrutsky@cisavd.kpi.ua</a></i>
Course placement	<i>Sikorsky platform</i>

### Curriculum of the discipline

#### Description of the discipline, its purpose, subject of study and learning outcomes

Discipline "Organization of scientific and innovative activities in avionics" belongs to the compulsory disciplines of the cycle of general training in specialty 173 "Avionics" educational program (specialization) "Control systems for aircraft and complexes". The discipline is aimed at gaining universal competencies of the researcher.

The discipline "Organization of scientific research" forms in students of higher education theoretical and practical knowledge of students on the organization of scientific research in the field of avionics and aircraft control systems, related fields of technology, including robotic complexes of different classes and purposes.

## 1. The purpose and objectives of the discipline

1.1. The purpose of the credit module is to form students' competencies:

### **abilities:**

- to search, processing and analysis of information from various sources (ZC 2);
- initiate and implement research and innovation projects, manage projects, research activities of the unit, organize the development of creative initiative of the team (ZC 4);
- to ensure continuous self-development and self-improvement (ZC 5);
- qualitatively present the results of scientific research (ZC7);
- have a systematic scientific worldview and general cultural outlook (ZK8);
- apply classical and the latest analytical methods to obtain information about the parameters and structure of robotic technical systems and complexes, aircraft (FC 1);
- analytical assessment of the state and directions and trends of development of control systems, navigation, orientation, stabilization, guidance, aerobatic navigation systems, aircraft, robotics, etc. for traditional and new promising areas of use of modern technologies (FC 3).

1.2 The main tasks of the discipline:

After mastering the discipline, students must demonstrate the following learning outcomes:

### **knowledge-**

- advanced conceptual and methodological knowledge in avionics and on the borders of subject areas, sufficient for conducting scientific and applied research at the level of the last 6 world achievements in the relevant field, gaining new knowledge and / or implementing innovations (ZN1);
- basic legislative acts that regulate the relationship between the subjects of scientific and scientific and technical activities, including at the international level (ZN 3);

### **skills -**

- plan and perform experimental and / or theoretical research in avionics and related interdisciplinary areas using modern tools, critically analyze the results of their own research and the results of other researchers in the context of the whole complex of modern knowledge on the problem (UM 2);
- to analyze existing and synthesize new methods and models for diagnosing, maintaining and repairing avionics (UM 5);
- summarize the results of scientific research in the form of scientific and technical reports, articles, abstracts, monographs, as well as transfer their knowledge, decisions and the basis for their adoption to specialists and non-specialists in a clear and unambiguous form (UM 6);

- organize and implement international scientific and technical projects, including in a foreign language (UM 7).

**Prerequisites and post-requisites of the discipline (place in the structural and logical scheme of education according to the relevant educational program)**

To master the discipline "Organization of Scientific Research" requires knowledge and skills that students will receive during the study of disciplines of the second (master's) level of specialty 173 "Aircraft control systems and complexes": PO 1 "Aircraft control systems", ZO 1 Patent Science and Intellectual Property ", PA 2" Fundamentals of Engineering and Technology of Sustainable Development ", PA 4" Project Management in Science-intensive Mechanical Engineering ", PO 5" Scientific work on the topic of master's dissertation ", PO 7" Work on a master's thesis ".

The knowledge and skills that graduate students acquire in the process of studying the discipline "Organization of Scientific Research" are the basis for the formation of the dissertation of Doctor of Philosophy in the specialty 173 Avionics.

**The content of the discipline**

**Table 1**

Назви розділів і тем	Number of hours				
	Total	including			
		Lectures	Practical	Laboratory	IWS
<b>Topic 1.</b> Methods and criteria for technical and economic evaluation of opportunities for the development of new avionics technologies for their implementation for use in scientific and technical organizations, industry	30	2	2	-	26
<b>Topic 2.</b> Intellectual property protection systems in research and innovation in avionics.	16	2	2	-	12
<b>Topic 3.</b> Organization of business management. The effectiveness of innovation.	14	2	-		12
<b>Total hours</b>	60	6	4		50

**Training materials and resources**

**Basic literature:**

1. Гончарова Н.П. Маркетинг інноваційного процесу. - К., 2005.- 264 с.
2. Морозов Ю.П. Инновационный менеджмент: учебник для вузов.- М.: ЮНИТИ, 2000.- С. 15-27.

**Additional literature:**

1. Лагода Т.О., Красноручький О.О. Організація підприємницької діяльності. Методичні рекомендації для підготовки до практичних заняття тестового контролю

знань студентів денної та заочної форми навчання. — Харків: ХНТУСГ — 2006. — 57 с.

2. Экономика предприятия: учебник для вузов / под ред. П.П. Табур- гДчака и В.М. Тумина.- СПб.: Химиздат, 2001.- С. 221-229.

## Educational content

### Methods of mastering the discipline (educational component)

#### Lectures

**Table 2**

№	The title of the lecture topic and a list of key issues
<b>1</b>	Lecture 1. Topic 1. Methods and criteria of technical and economic assessment of opportunities for the development of new avionics technologies for their implementation for use in scientific and technical organizations, industry. Literature: [base: 1] Tasks on IWS. Methods and criteria of technical and economic assessment of opportunities for development of new technologies of avionics subsystems: sensors; autopilots; electronic equipment; IBS; avionics radio and telecommunications systems for implementation.
<b>2</b>	Lecture 2. Topic 2. Intellectual property protection systems in research and innovation in avionics. Literature: [base: 1,2] Tasks on IWS. Intellectual property protection system in research and innovation in aviation in the United States; The European Union; China.
<b>3</b>	Lecture 3. Topic 3. Organization of business management. The effectiveness of innovation. Literature: [base: 1,2] Tasks on IWS. Comparison of the organization of business management in Ukraine and the USA; The European Union; China.

#### Practical training

The main purpose of practical classes is to master the forms and methods of organization of innovation activity presented in lectures.

**Table 3**

№	The name of the topic of the practical lesson	Hours
<b>1</b>	Classification of innovations and innovative activity <a href="https://cyberleninka.ru/article/n/suschnost-i-klassifikatsiya-innovatsiy-i-innovatsionnoy-deyatelnosti">https://cyberleninka.ru/article/n/suschnost-i-klassifikatsiya-innovatsiy-i-innovatsionnoy-deyatelnosti</a> Literature: [base: 1,2]	2
<b>2</b>	Intellectual property in research and innovation activities of corporations. Protection of intellectual rights in carrying out innovative activities at the enterprise. <a href="https://cyberleninka.ru/article/n/zaschita-intellektualnyh-prav-pri-vedenii-innovatsionnoy-deyatelnosti-na-predpriyatii">https://cyberleninka.ru/article/n/zaschita-intellektualnyh-prav-pri-vedenii-innovatsionnoy-deyatelnosti-na-predpriyatii</a> . Literature: [base 1.2]	1
<b>3</b>	Entrepreneurship in a market economy. Organizational forms of entrepreneurship in avionics. Risks of business in avionics Literature [base: 1,2; add: 2,3]	1

### Independent work of a graduate student

Independent work of a student / graduate student (IWS) is to prepare for classroom activities, acquaintance with thematic literature, performing independent work. The volume and topics of independent work of graduate students are given in Table. 2.

### Individual tasks

The individual task from the credit module "Innovations in avionics" is performed in the form of an abstract.

The main objectives of the abstract are to gain in-depth knowledge and practical experience and skills to develop long-term plans for the development of the avionics industry and modern avionics systems, development of security documents for intellectual property as part of an innovative product.

### Course policy (educational component)

*Grading policy (missed classes, passing of passes): each grade is given in accordance with the criteria developed by the teacher and announced in advance to graduate students, and is motivated individually at the request of the graduate student; in case the graduate student does not complete all the planned classes, he is not allowed to take the exam; missed classes must be completed. The form and time of work are coordinated by the graduate student and the teacher.*

*Policy of academic behavior and integrity (plagiarism, behavior in the audience): conflict situations should be openly discussed in academic groups with the teacher, it is necessary to be mutually tolerant, to respect the opinion of others. Plagiarism and other forms of dishonest work are not allowed. Inadmissible tips and write-offs during seminars, tests, exams.*

*Norms of academic ethics: discipline; observance of subordination; honesty; responsibility; work in the classroom with disconnected mobile phones.*

### Types of control and rating system for evaluation of learning outcomes (RSE)

*The following methods and forms of control are used to effectively check the level of mastering by students of higher education of knowledge, skills and abilities in the discipline:*

- method of oral control: main questions, additional, auxiliary; questions in the form of a problem; individual, face-to-face and combined surveys;*
- method of written control;*
- test control method;*
- practical control.*

*Current control is carried out at each practical lesson in accordance with the specific objectives of the topic in order to check the degree and quality of learning. All classes use objective control of theoretical training and practical skills. In the process of current control, the student's independent work on the completeness of tasks, the level of assimilation of educational materials, mastering practical skills of analytical, research work, etc. is evaluated.*

*The results of the current control are entered into the Igor Sikorsky KPI Campus System.*

*Final control - control of educational achievements of higher education students in order to assess the quality of their mastery of the curriculum, which is conducted during the semester certification in the form of an exam. The purpose of the final control is to identify mastering the discipline in general, understanding the educational material, the relationship of the content of educational material, the logic of its assimilation, etc.*

*The final control is carried out in the form of an examination in accordance with the educational program, the individual plan of the applicant for higher education and the working curriculum, developed on the basis of the ONP specialty. At this stage the result of studying and mastering of discipline, skills of use of the received knowledge is summed up.*

*The final control in the form of an exam is carried out according to the schedule of the credit-examination session.*

*The results of the final control are entered into the Igor Sikorsky KPI Campus System.*

*Postgraduate students who have completed the curriculum and scored at least the minimum number of points are admitted to the final control. A graduate student who, for a good reason, had missed classes, adjustments are made to the individual curriculum and are allowed to work off academic debt until a certain date.*

*Final control is carried out in a mixed form - written and oral and includes control of theoretical and practical training.*

*The rating of the applicant for higher education in the discipline is calculated based on a 100-point scale, of which 56 points is the starting scale. The starting rating (during the semester) consists of points that the student receives for:*

- work in practical classes;*
- performance of settlement work.*

*Scoring criteria:*

*Work on practical classes:*

- active creative work - 3 points;*
- fruitful work - 2 points;*
- passive work - 0 points.*

*Execution of settlement work:*

- the work is written flawlessly - 50 points;*
- the work was performed with minor shortcomings - 45 points;*
- the work was done with certain errors - 35 points;*
- the work is not credited (the task is not completed or there are gross errors) - 0 points.*

*At the exam, applicants for higher education perform a written test. Each task contains one theoretical question (task) and one practical one. Each question (task) is evaluated in 23 points according to the following criteria:*

- "excellent", complete answer, not less than 90% of the required information, performed in accordance with the requirements for the level of "skills" (complete, error-free problem solving) - 21-23 points;*
- "good", a sufficiently complete answer, not less than 75% of the required information, performed in accordance with the requirements for the level of skills or there are minor inaccuracies (complete solution of the problem with minor inaccuracies) - 17-20 points;*

- "satisfactory", incomplete answer, not less than 60% of the required information, performed in accordance with the requirements for the "stereotypical" level and some errors (the task is performed with certain shortcomings) - 13-16 points;

- "unsatisfactory", the answer does not meet the conditions for "satisfactory" - 0 points.

The sum of starting points and points for credit test work is transferred to according to the table:

Table 4 correspondence of rating points to grades on the university scale:

Scores	Rating
100-95	Perfectly
94-85	Very good
84-75	goode
74-65	satisfactory
64-60	Enough
Less 60	Unsatisfactorily
Admission conditions are not met	Not allowed

#### **Additional information on the discipline (educational component)**

*Since this discipline belongs to the modern ones, in order to increase the efficiency of its teaching, materials in the form of presentations of the leading enterprises of Ukraine in the field of navigation systems and robotic systems are used along with traditional teaching methods.*

#### **Work program of the discipline (syllabus):**

**Compiled** by Professor, D.T.S. Zbrutsky Olexandr Vasyliovich

**Approved by** the Department of CSFV (protocol № 16 of 12.05. 2021)

**Approved by** the Methodical Commission of IAT (protoco № \_ of \_\_. \_\_.2021)