(Ф 03.02 – 92)

NATIONAL AVIATION UNIVERSITY
Educational and Research Airspace Institute
Engineering Department

AGREED
Acting Director of the Educational and Research Airspace Institute
_____ S. Dmytriev
«___»_____2017

APPROVED
Vice-Rector for Academics and Educative Activity
_____T. Ivanova
«___»_____2017

Quality Management System

COURSE TRAINING PROGRAM

on

«Theory of Machines and Mechanisms»

Field of study: 27 "Transport Services"
Speciality: 272 "Aviation Transport"
Specializations: Maintenance and Repair of Aircraft and Aircraft Engines
Airports Technologies of Works and Technological Equipment

Year of study – 2nd Semester – 4th

Lectures – 32 Examination – 4th semester
Laboratory Classes – 32
Self-study – 101
Total (hours/ECTS credits) – 165/5,5
Term Paper – 4th semester

Index ECB–1– 272/16–2.12

The Course Training Program on «Theory of Machines and Mechanisms» is based on the Bachelor Extended Curriculums ECB - 1 - 272/16 for Speciality 272 «Aviation Transport» and Specializations «Maintenance and Repair of Aircraft and Aircraft Engines», «Airports Technologies of Works and Technological Equipment»; Syllabus for this Subject, Index CB–1–272/16–2.12, approved by the Rector ___.___.2017, and correspondent normative documents.

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Discussed and approved by the Engineering Department, Minutes №9 of 31.09.2017.
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Head of the Department _____ O. Tamargazin

Discussed and approved by the Graduate Department for Speciality 272 «Aviation Transport » and Specialization « Maintenance and Repair of Aircraft and Aircraft Engines» – the Aircraft Airworthiness Retaining Department, Minutes № _____ of _____2017.
Head of the Department _____ S. Dmytriev

Discussed and approved by the Scientific-Methodological-Editorial Board of Educational and Research Airspace Institute, Minutes № __ of _____2017.
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Document level – 3b
The planned term between the revisions – 1 year
Registered copy

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INTRODUCTION

The Course Training Program of the course was developed based on the Syllabus of discipline "Theory of Machines and Mechanisms" and "The guidelines for the development and execution of training programs and work training courses", enacted by order 16.06.15 №37/роз.

The rating grading system (RGS) is an integral part of working curriculum and involves determining the quality of a student performed all types of classroom and independent academic work and his level of acquired knowledge and skills evaluation in grades by the results of this work in the current, module and semester control, with subsequent transfer by multi-scale assessment to assess the national scale and scale ECTS.

RGS provides for the use of modular of ratings (current, control, final) and the examination or a test, the final semester and the final rating.

2. Subject content

2.1. Training schedule of the subject

№.	Topics	Volume of lessons (by hours)			
		All	Lectures	Labora-tory Classes	All
1	2	3	4	5	6
4 semester					
Module № 1 «Structure, kinematics and dynamics of mechanisms and machines»					
1.1	Main terms and definitions. Determination of degree of freedom of a mechanism.	10	2	2 2	4
1.2	Structural analysis of mechanisms. Determination of a mechanism structure	10	2	2 2	4
1.3	Kinematic analysis of mechanisms. Velocity diagram.	8	2	2	4
1.4	Kinematic analysis of mechanisms. Acceleration diagram.	8	2	2	4
1.5	Kinetostatics of mechanisms	8	2	2	4
1.6	Balancing of mechanisms and machines	6	2	–	4
1.7	The motion of mechanism	8	2	2	4
1.8	Module test №1	6	2	–	4
All after the module №1		**64**	**16**	**16**	**32**
Module №2 «Mechanisms with higher pairs»					
2.1	Gearings	10	2	2	6
2.2	Parameters of involute spur gear.	4	–	2	2
2.3	Modified gearings	10	2	2	6
2.4	Determination of the velocity ratio of gear trains	14	2	2 2	8
2.5	Planetary mechanisms	10	2	2	6
2.6	Analysis and synthesis of planetary gearings	3	2	–	1
2.7	Mechanisms of intermittent action	3	2	–	1
2.8	Cam mechanisms. Plotting the graphs of the follower paths	8	2	2	4
2.9	Profiling plane cam mechanisms	3	2	–	1
2.10	Module test №2	6	–	2	4

All after the module №2		**71**	**16**	**16**	**39**
Module №3"Term paper"					
3.1	Doing and defense of term paper	30	–	–	30
Total for module №3		**30**	**–**	**–**	**30**
Total for the discipline		**165**	**32**	**32**	**101**

2.1.1 Term Paper.

The term paper of discipline is performed in the fourth semester, according to the established approved methodical recommendations, in order to consolidate and extend the knowledge and skills acquired by students in the process of learning the discipline about kinematics and dynamics of mechanisms and machines, bases of mechanism diagram design according to given kinematic and dynamic parameters.

The aim of the course work is to consolidate the knowledge obtained by students in the study subjects and practical skills of research and design mechanisms of modern aircraft. The course work is a major, the most important type of independent work.

For successful implementation of the course the student should **know** the methods for determining the forces and moments of inertia, basic parameters of gears, parameters of involute gearing, conditions of assembly of planetary gearing, to **be able** to draw velocity and acceleration diagrams, to determine the magnitude and direction of the linear and angular velocities and accelerations of mechanism links, to build gear meshing according to calculated data, to draf force diagrams and to determine forces in kinematic pairs, to determine balancing force and balancing moment.

Performance, design and defense of the term paper are carried out by a student individually according to the methodological guides

The elapsed time for doing term paper – up to 30 hours of student's individual work.

3. Basic concepts of guidance on the subject

3.1. List of references

Basic recommended sources.

3.1.1. Артоболевський И.И. Теория механизмов и машин. – М.: Наука. 1988. – 640 с.

3.1.2. Кіницький Я.Т. Теорія механізмів і машин. . – К.: Наукова думка, 2002. –660 с.

3.1.3. Воронкін М.Ф., Цимбалюк А.А. Основи теорії механізмів і машин: Конспект лекцій. –К.: КМУЦА, 2000.-208 с.

Additional recommended sources.

3.1.4. Бабенко Є.М.Теорія механізмів і машин. Розв'язання задач. Навчальний посібник/ Є.М.Бабенко, А.О.Корнієнко, О.В.Башта, А.С.Крижановський. – К.: Видавництво Національного авіаційного університету «НАУ-друк», 2009. – 124 с.

3.1.5. Theory of Mechanisms And Machines. Laboratory manual / A. Kornienko, O. Bashta, O. Tisov. – K.: NAU, 2011. – 32 p.

3.1.6. Theory of mechanisms and machines. Laboratory works / Authors: Voronkin N., Kononykhin Y., Kryzhanovsky A. – K.: NAU, 2003. – 72 p.

3.1.7. Theory of mechanisms and machines: Kinematic and force analyses of leverages Authors: Kryzhanovsky A., Kononykhin Y. – K.: NAU, 2003. – 48 p.

3.1.8. Theory of mechanisms and machines. Gear trains: A method guide / Authors: A. Kryzhanovskyi, E.Babenko, A. Kornienko. – K.: National aviation university publishing house «NAU-druk», 2009. – 44 p.

3.2. List of basic guidance materials for the subject

№	Name	Index of topics where guides are used	Amount
1	Complete set of posters for lectures and laboratory works	To all topics of lectures and laboratory works	90
2	Complete set of models of leverage mechanisms	Topics 1.2; 1.3; 1.4; 2.4; 2.5; 2.6; 2.7; 2.8; 2.9	40
3	Complete set of models of cam mechanisms	Topics 2.1; 2.3; 2.4	30
4	Complete set of gears	Topics 1.5; 1.6; 1.7; 1.8; 1.9	30
5	Complete set of gearings	Topics 1.5; 1.6; 1.7; 1.8; 1.9	40
6	Laboratory plants for cutting gears	Topics 1.5; 1.6; 1.7; 1.8; 1.9	30
7	Laboratory plants for studying of the cam mechanisms	Topics 2.1; 2.3; 2.4	15
8	Laboratory plants for balancing of turning masses	Topic 2.4	10
9	Complete set of State Standards	To all topics of lectures and laboratory works	16
10	Methodological guides for carrying out the term paper	2.1.1	40 pcs and print clone

4. Rating System of knowledge and skills assessment

4.1. Grading of different kinds of academic work performed by a student is done in accordance with Table 4.1.

Table 4.1.

Grading of different kinds of academic work performed by a student

4 Semester				
Module №1		Module №2		Max Grade
Kind of Academic Work	Max Grade	Kind of Academic Work	Max Grade	
Performance and Defense of Laboratory classes №1.1-1.5, 1.7 (5×6)	30 (total)	Performance and Defense of Laboratory classes №2.1-2.5, 2.8 (5×6)	30 (total)	
For carrying out module test № 1, a student must receive not less than 18 values		*For carrying out module test № 2, a student must receive not less than 18 values*		
Module test №1	14	Module test №2	14	
Total for module №1	**44**	**Total for module №2**	**44**	
Examination				**12**
Total Semester Grade				**100**
4 semester				
Module №3				Max grade
Kind of Academic Work				
Doing term paper				60
Defense of term paper				40
Doing and defense of term paper				**100**

4.2. The kind of academic work, performed by a student, has been passed, if a student got positive grade according to National Scale – (see Table 4.2).

Table 4.2

Correspondence between Grade values and the National System

Grade values		National System
Performance and defense of laboratory classes	Module test	
5	13-14	excellent
4	11-12	good
3	9-10	satisfactory
under 3	under 9	failed

4.3. The grades a student has been given for the different kinds of academic work the summed up and the result constituting a Current Module Grade is entered into the Module Grade Register.

4.4. The Current Module Grade and the Module Test Grade together make up a Total Module Grade whose correspondence to the National System is shown in Table 4.3.

Table 4.3

Correspondence between Total Module Grade Values and the National System

Module №1	Module №2	National System
40-44	40-44	excellent
33-39	33-39	good
27-32	27-32	satisfactory
under 27	under 27	failed

4.5. The Total Module Grade received by a student for making and defense of a term paper in values, National Scale grades and ECTS Scale grades, is entered into the Module Grade Register.

4.6. The Semester Module Grade is calculated as the sum of the Total Module Grades. The correspondence between Semester Module Grade values and the National System is given in Table 4.4.

4.7. The Semester Module Grade and the Examination Grade together make up a Total Semester Grade whose correspondence to the National Scale and the ECTS Scale is shown in Table 4.6.

Table 4.4

Correspondence between Semester Module Grade Values and the National Scale

Semester Grade Values	National Scale
79-88	excellent
66-78	good
53-65	satisfactory
under 53	bad

Table 4.5

Correspondence between Examination Grade Values and the National Scale

Examination Grade Values	National Scale
11-12	excellent
9-10	good
7-8	satisfactory
under 7	bad

4.8. The Total Semester Grade is entered into the Examination Register and into a student's record book in values, National Scale grades, and ECTS Scale grades.

4.9. The Total Semester Grade is entered into a student's record book, for example: ***92/Ex/A, 87/Good/B, 79/Good/C, 68/Sat/D, 65/Sat./E***, etc.

Table 4.6

Correspondence of Total Semester Grades to the National Scale and the ECTS Scale

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

4.10. The Total Module Grade received by a student for making and defense of a term paper, besides the Module Grade Register, is entered into a student's record book and the Diploma Supplement, for example: ***92/Ex/A, 87/Good/B, 79/Good/C, 68/Sat/D, 65/Sat./E***, etc.

4.11. The Total Discipline Grade corresponds to the Total Semester Grade.

The Total Discipline Grade is entered in the Diploma Supplement

(Ф 03.02 – 01)

АРКУШ ПОШИРЕННЯ ДОКУМЕНТА

№ прим.	Куди передано (підрозділ)	Дата видачі	П.І.Б. отримувача	Підпис отримувача	Примітки

(Ф 03.02 – 02)

АРКУШ ОЗНАЙОМЛЕННЯ З ДОКУМЕНТОМ

№ пор.	Прізвище ім'я по батькові	Підпис ознайомленої особи	Дата ознайомлення	Примітки

(Ф 03.02 – 04)

АРКУШ РЕЄСТРАЦІЇ РЕВІЗІЇ

№ пор.	Прізвище ім'я по-батькові	Дата ревізії	Підпис	Висновок щодо адекватності

(Ф 03.02 – 03)

АРКУШ ОБЛІКУ ЗМІН

№ зміни	№ листа (сторінки)				Підпис особи, яка внесла зміну	Дата внесення зміни	Дата введення зміни
	Зміненого	Заміненого	Нового	Анульо-ваного			

(Ф 03.02 – 32)

УЗГОДЖЕННЯ ЗМІН

	Підпис	Ініціали, прізвище	Посада	Дата
Розробник				
Узгоджено				
Узгоджено				
Узгоджено				