«ЗАТВЕРДЖЕНО»
завідувач кафедри

Ципленков Д.В. _____

« 2 » грудня 2022 року

WORK PROGRAM OF THE ACADEMIC DISCIPLINE
« Special electric machines »

Field of study.	14 Electrical engineering
	15 Automation and instrumentation
Specialty.	141 – Electric power, electrical engineering and electromechanics
	151 – Automation and computer-integrated technologies
	152 – Metrology and information and measurement technologies
Academic degree	first (bachelor's)
Status.	selective
Total volume.	4 ECTS credits (120 hours)
Type of final assessment. .	Final test
Period of study.	5th semester
Language of study.	English

Lecture: PhD, associate professor Kolb A.A.

Prolonged: for 20 __ / 20__ academic year _____ (_____) "__" ___ 20__.

(Signature, name, date)

for 20 __ / 20__ academic year _____ (_____) "__" ___ 20__.

(Signature, name, date)

The working program of the obligatory educational discipline "Special electric machines" for bachelors of a specialty 141 – Electric power, electrical engineering and electromechanics, 151 – Automation and computer-integrated technologies, 152 – Metrology and information and measurement technologies / A.A. Kolb / Dnipro University of Technology, Department of Electrical Engineering. - DA: NTU «DP» 2022 - 12 p.

Author:

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The work program regulates:

– The discipline goals
– Results of the discipline study based on transformation the expected results of study by the educational program
– Basic disciplines
– The discipline volume and its distribution between the forms of organization of the educational process and types of classes
– The discipline program (lesson topics)
– Algorithm of the discipline study results assessment (scales, means, procedures and assessment criteria)
– Tools, equipment, and software
– Recommended sources of information.

The working program is intended to realization the competence approach at planning the educational process, teaching the discipline, preparation students for the knowledge assessment, monitoring of educational activity, internal and external monitoring of higher education quality, and accreditation of the Educational and Professional Program in frames of the specialty.

CONTENTS

1 DISCIPLINE OBJECTIVES

The objective of discipline – formation of competencies in understanding the design and principle of action of stepper motors, electromechanical encoders.

2 INTENDED DISCIPLINARY LEARNING OUTCOMES

Cipher of DLR	Discipline learning results (DLR)
	contents
DLR – 01	Understand the design and operation of stepper motors
DLR – 02	Understand the design and principle of operation of valve motors
DLR – 03	Understand the design and principle of operation of servomotors
DLR – 04	Understand the design and principle of operation of tachogenerators
DLR – 05	Understand the design and principle of operation of universal collector motors

3 BASIC DISCIPLINES

Discipline name	Obtained study results
Ф1 Electric machinces	ПР03 Know the principles of operation of electric machines, devices and automated electric drives and be able to use them to solve practical problems in professional activities
Ф4 Fundamentals of electric drives	ПР03 Know the principles of operation of electric machines, devices and automated electric drives and be able to use them to solve practical problems in professional activities
	ПР07 Carry out analysis of processes in electrical, electrical and electromechanical equipment, relevant complexes and systems.
	ПР08 Select and apply suitable methods for analysis and synthesis of electromechanical and electrical systems with specified parameters.

4 WORKLOAD DISTRIBUTION BY THE FORM OF EDUCATIONAL PROCESS ORGANIZATION AND TYPES OF CLASSES

Types of classes	Distribution between forms of educational process, hours							
	Daytime learning			evening learning		Distance learning		
	Volume	Class-room lessons	Self-study	Classroom lessons	Self-study	Volume	Class-room lessons	Self-study
lectures	80	26	54	-	-	-	-	-
practical	-	-	-	-	-	-	-	-
laboratory	40	13	27	-	-	-	-	-
seminars	-	-	-	-	-	-	-	-
Total	120	39	81	-	-	-	-	-

5 DISCIPLINE PROGRAM BY TYPES OF CLASSES

Ciphers DRN	Types and topics of training sessions	Volume of components, *hours*
	LECTURES	**80**
DLR – 01	1. Stepper motors	
DLR – 02	2. Valve motors	
DLR – 03	3. Servomotors	
DLR – 04	4. Tachogenerators	
DLR – 05	5. Universal collector motors	
	PRACTICAL CLASSES	**40**
DLR – 01	1. Research of stepper motors	
DLR – 02	2. Research of valve motors	
DLR – 03	3. Research of servomotors	
DLR – 04	4. Research of tachogenerators	
DLR – 05	5. Research of universal collector motors	
	РАЗОМ	**120**

6 ASSESSMENT OF LEARNING RESULTS

Certification of students' achievement is carried out by transparent procedures based on objective criteria in accordance with the "Regulation of Dnipro University of Technology on the assessment learning results of recipients of higher education".

The achieved competences level regarding to the expected one, that is identified during the assessment procedures, displays factual students' study result on the discipline.

6.1 Scales

Assessment educational achievements of Dnipro University of Technology students' is carried out by the rating (100-point) and the converting scales. The last is needed for conversion of scores obtained by recipients of higher education of different higher educational institutions due to absence of officially approved national scale.

Scales for assessment of educational achievements
of Dnipro University of Technology students

Rating scale	Institutional scale
90…100	відмінно / Excellent
74…89	добре / Good
60…73	задовільно / Satisfactory
0…59	незадовільно / Fail

Credits of the academic discipline are certified if a student obtains the total score not less than 60 points. The less score is considered as an academic debt that must be retaken according to Regulations of Dnipro University of Technology on the Organization of the Educational Process.

6.2 Means and procedures

Content of diagnostics means is aimed to monitoring knowledges, skills, communication ability, autonomy, and responsibility of a student at representation his/her study results according to NQF toward the 6th qualification level in relation to established by the working program of academic discipline requirements.

At the assessment procedure, a student must carry out tasks aimed only to demonstration of the discipline study results (Section 2).

Diagnostic means given students at current and final monitoring procedures in the form of tasks must be formed as concretized initial data and the way of demonstration of the disciplinary study results.

Diagnostic means (control tasks) for current and final monitoring procedures are approved by a head of the department.

Types of diagnostics means and procedures of assessment for current and final monitoring the discipline are given below.

Diagnostic means and procedures of assessment

CURRENT MONITORING			FINAL MONITORING	
Type of lessons	**Means of monitoring**	**Procedures**	**Means of monitoring**	**Procedures**
Lectures	Control task for each the topic	Completing the assignment during the lecture	Integrated control work	Determination of average weighted result of current monitoring
Laboratory lessons	Verification and protection	Performance of laboratory work		Carrying out a control work during the exam

During the current monitoring, lectures are assessed by determination quality of fulfilment the concretized tasks. Laboratory work is assessed by quality of fulfillment the control or individual tasks.

When content of definite type of lessons includes several components of qualification level description, the integrated score can be determined considering the weight factors that are assigned by an instructor.

When level of current monitoring results on all lesson types is not less than 60 points, the final control is performed without a student participation by determination an average weighted score based on the obtained current scores.

Regardless of results of the current monitoring, each the student has the right to carry out the integrated control work which includes the tasks covering the key discipline study results.

Number of concretized integrated tasks should meet the time allocated for its fulfillment. Number of the integrated task options must provide the task individualization.

A score for the integrated control task is determined as an average score for the task components (i.e., the concretized tasks) and is the final

A score for the integrated control task ca be also determined considering the weight factors for the task components which are set by the department for each a component of qualification description level of the integrated control task.

6.3 Criteria

Factual results of a student's learning are identified and measured relative to the results expected at the assessment procedure with the help of criteria describing actions of a student on demonstration his/her study results.

For assessment control tasks during current control at lectures and practical lessons, the material assimilation factor, that adapts the scores to the rating scale, is used as a criterium:

$$O_i = 100 \; a/m,$$

where a – the number of proper answers or essential operations with regards to the solution standard; m – the total number of questions or essential reference operations.

Individual tasks and integrated control works are assessed using criteria characterizing the relationship between requirements to competence levels and indices by the rating scale.

Criteria content is based on competence characteristics defined by NQF for the bachelors' level of higher education which is given below.

General criteria of achievement learning results for the 6th qualification level by the NQF

Description qualification equal	Requirements to knowledge, skills/abilities, communications, responsibility, and autonomy	Score values
Knowledge		
♦ conceptual scientific and practical knowledges critical comprehending of theories, principles, methods, and concepts in the field of	The answer is excellent – correct, substantiated, comprehensive. It is characterized by availability of - conceptual knowledge - high level mastering the state of the matter - critical comprehension the main theories, principles, methods, and concepts in the field of learning and professional activity.	95-100

Description qualification equal	Requirements to knowledge, skills/abilities, communications, responsibility, and autonomy	Score values
professional activity/learning		
	The answer contains minor errors or elapses	90-94
	The answer is correct but has some inaccuracies	85-89
	The answer is correct but has some inaccuracies, and is not sufficiently substantiated and comprehensive	80-84
	The answer is correct but has some inaccuracies, is not sufficiently substantiated and comprehensive	74-79
	The answer is fragmentary	70-73
	The answer demonstrates fuzzy ideas about the object under study	65-69
	Level of knowledge is minimum satisfactory	60-64
	Level of knowledge is unsatisfactory	<60
Skills/abilities		
♦ in-depth cognitive and practical skills, mastery and innovation at the level required to solve complex specialized tasks and practical problems in the field of professional activity or training	The answer characterizes the ability to: - identify problems - formulate hypotheses - solve problems - choose adequate methods and tools - collect and logically and clearly interpret information - use innovative approaches to solving the problem	95-100
	The answer characterizes the ability / skills to apply knowledge in practice with minor errors	90-94
	The answer characterizes the ability / skills to apply knowledge in practice, but has some inaccuracies in the implementation of one requirement	85-89
	The answer characterizes the ability / skills to apply knowledge in practice, but has some inaccuracies in the implementation of the two requirements	80-84
	The answer characterizes the ability / skills to apply knowledge in practice, but has some inaccuracies in the implementation of the three requirements	74-79
	The answer characterizes the ability / skills to apply knowledge in practice, but has some inaccuracies in the implementation of the four requirements	70-73
	The answer characterizes the ability / skills to apply knowledge in practice when performing tasks on the model	65-69
	The answer characterizes the ability / skills to apply knowledge when performing tasks on the model, but with inaccuracies	60-64
	the level of skills is unsatisfactory	<60
Communication		
	Free possession of industry issues.	95-100

Description qualification equal	Requirements to knowledge, skills/abilities, communications, responsibility, and autonomy	Score values
♦ reporting to specialists and non-specialists information, ideas, problems, solutions, personal experience, and argumentation ♦ collection, interpretation, and application of data ♦ communication on professional issues, including in a foreign language, orally and in writing	Clarity of the answer (report). Language: - correct - clean - clear - accurate - logical - expressive - concise. Communication strategy: - consistent and consistent development of thought - the presence of logical own judgments - relevant reasoning and its compliance with the defended provisions - correct structure of the answer (report) - correct answers to questions - appropriate technique for answering questions - ability to draw conclusions and formulate proposals	
	Sufficient mastery of industry issues with minor flaws. Sufficient clarity of the answer (report) with minor errors. Appropriate communication strategy with minor flaws	90-94
	Good mastery of industry issues. Good clarity of the answer (report) and appropriate communication strategy (a total of three requirements are not implemented)	85-89
	Good mastery of industry issues. Good clarity of response (report) and appropriate communication strategy (four requirements not implemented in total)	80-84
	Good mastery of industry issues. Good clarity of response (report) and appropriate communication strategy (five requirements not implemented in total)	74-79
	Satisfactory mastery of industry issues. Satisfactory comprehensibility of the answer (report) and appropriate communication strategy (a total of seven requirements have not been implemented)	70-73
	Partial ownership of industry issues. Satisfactory comprehensibility of the answer (report) and communication strategy with errors (a total of nine requirements are not implemented)	65-69
	Fragmentary mastery of industry issues. Satisfactory comprehensibility of the answer (report) and communication strategy with errors (a total of 10 requirements are not implemented)	60-64
	The level of communication is unsatisfactory	<60
Responsibility and autonomy		
♦ managing complex technical or	Excellent mastery of personal management competencies focused on:	95-100

Description qualification equal	Requirements to knowledge, skills/abilities, communications, responsibility, and autonomy	Score values
professional activities or projects ♦ ability to take responsibility for making and approvement decisions in unpredictable work and / or learning contexts ♦ formation of judgments that consider social, scientific and ethical aspects ♦ organization and management of professional development of individuals and groups ♦ ability to continue studies with a significant degree of autonomy	1) management of complex projects, which provides: - research nature of educational activities, marked by the ability to independently assess various life situations, phenomena, facts, to identify and defend a personal position - ability to work in a team - control of own actions 2) responsibility for making decisions in unpredictable conditions, including: - substantiation of own decisions by provisions of normative base of branch and state levels - independence in performing tasks - initiative in discussing problems - responsibility for the relationship 3) responsibility for professional development of individuals and / or groups of persons, which includes: - use of professional-oriented skills - use of evidence with independent and correct argumentation - mastery of all types of educational activities 4) the ability to further study with a high level of autonomy, which includes: - degree of possession of fundamental knowledge - independence of evaluative judgments - high level of formation of general educational skills and abilities - independent search and analysis of information sources	
	Confident mastery of personal management competencies (two requirements are not met)	90-94
	Good mastery of personal management competencies (three requirements are not met)	85-89
	Good mastery of personal management competencies (four requirements not met)	80-84
	Good mastery of personal management competencies (six requirements not met)	74-79
	Satisfactory mastery of personal management competencies (seven requirements not met)	70-73
	Satisfactory mastery of personal management competencies (eight requirements not met)	65-69
	The level of responsibility and autonomy is fragmentary	60-64
	The level of responsibility and autonomy is unsatisfactory	<60

7 TOOLS, EQUIPMENT, AND SOFTWARE

№ works (code)	Lab title	Tools, equipment and software used in the work

1.	Research of stepper motors	Personal computer - 9 pcs Software - Multisim 12, or later, MatLab 6.5
2.	Research of valve motors	Personal computer - 9 pcs Software - Multisim 12, or later, MatLab 6.5
3.	Research of servomotors	Personal computer - 9 pcs Software - Multisim 12, or later, MatLab 6.5
4.	Research of tachogenerators	Personal computer - 9 pcs Software - Multisim 12, or later, MatLab 6.5
5.	Research of universal collector motors	Personal computer - 9 pcs Software - Multisim 12, or later, MatLab 6.5

8 RECOMMENDED BIBLIOGRAPHY

1. Pivnyak GG, Dovgan VP, Shkrabets FP Electric machines: A textbook. - Dnepropetrovsk: National Mining University, 2003. - 327 p.

2. Belikova L.Ya., Shevchenko VP Electric machines: A textbook. - Odessa: Science and Technology, 2012. - 480 p.

3. Yatsun Ya.A. Electric machines: Textbook. - Lviv: Lviv Polytechnic Publishing House, 2011. - 464 p.

4. Tsiplenkov DV, Ivanov OB, Bobrov OV Design of electric machines: Textbook. manual / D.V. Tsiplenkov, О.Б. Ivanov, OV Bobrov and others. - D: NTU "DP", 2020. - 408 p.

5. Ivanov, OB, Shkrabets, FP, Zawilak, Jan. (2011). "Electrical generators driven by renewable energy systems", Wroclaw University of Technology, Wroclaw - 169 p.

6. Electric machines and transformers: textbook. Manual / M.O. Ostashevsky, O.Yureva.; for order. Dr. Tech. Sciences, Professor VI Cute. - Kyiv: Karavela, 2018. - 452 p.

7. Collection of methodical materials for laboratory work on discipline "Special electric machines" for students studying specialty 141 "Electrical Power Engineering, Electrical Engineering and Electromechanics" / Kolb AA; Dnipro University of Technology – D.: DniproTech, 2021. – 19 p.