

Ministry of Education and Science of Ukraine
Dnipro University of Technology

Department of Applied Mathematics



“APPROVED”

Head of Department

Sdvyzhkova Olena O.

_____15.09.2022

WORK PROGRAM OF THE ACADEMIC DISCIPLINE

«Higher Mathematics»

Field of study	14 Electrical engineering
Specialty	141 Electrical energetics, electrical engineering and electromechanics
Academic level	first (bachelor)
Academic program	«Electrical energetics, electrical engineering and electromechanics»
Specialization.....	-
Status	normative
Total workload.....	12,5 credits ECTS (375 hours)
Type of summative assessment	exam
Period of study	1, 2 semesters (1-4 terms)
Language of study	English

Lecturer: Prof. Babets D.V.

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

(Signature, name, date)

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

(Signature, name, date)

Dnipro
DNIPROTECH
2022

Work program of the academic discipline «Higher Mathematics» for bachelors of the educational and professional program «Electrical energetics, electrical engineering and electromechanics» of the specialty 141 Electrical energetics, electrical engineering and electromechanics / Dnipro University of Technology, Department of Applied Mathematics. – D.: DNIPROTECH, 2022 – 14 p.

Author:

– Babets Dmytro Volodymyrovych – Associate Professor, Doctor of Technical Sciences, Professor of the Department of Applied Mathematics.

The work program regulates:

- the aim of the discipline;
- the disciplinary learning outcomes generated through the transformation of the intended learning outcomes of the degree program;
- basic disciplines;
- volume and distribution by forms of organization of the educational process and types of classes;
- discipline program (thematic plan by type of training);
- algorithm for assessing the level of achievement of disciplinary learning outcomes (scales, tools, procedures and assessment criteria);
- tools, equipment and software;
- recommended sources of information.

The work program is designed to implement a competency approach in planning an education process, delivery of the academic discipline, preparing students for control activities, controlling the implementation of educational activities, internal and external quality assurance in higher education, accreditation of degree programs within the specialty.

Approved by the decision of the Scientific and Methodological Commission of the specialty 141 Electrical energetics, electrical engineering and electromechanics (protocol №21/22-07 of 14.07.2022).

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1 AIM OF THE DISCIPLINE

In the educational and professional program «Electrical energetics, electrical engineering and electromechanics» of the specialty 141 Electrical energetics, electrical engineering and electromechanics the distribution of program learning outcomes (PLO) for the organizational forms of the educational process is done. In particular, the following learning outcomes are attributed to the discipline B1 «Higher Mathematics»:

PLO07	To carry out the analysis of processes in the electric power, electrotechnical and electromechanical equipment, the corresponding complexes and systems
PLO08	To select and apply suitable methods for analysis and synthesis of electromechanical and electric power systems with specified parameters

The aim of the discipline – formation of competencies for the use of mathematical knowledge in the training of bachelors in the specialty 141 Electrical energetics, electrical engineering and electromechanics.

The implementation of the aim requires transforming program learning outcomes into the disciplinary ones as well as an adequate selection of the contents of the discipline according to this criterion.

2 INTENDED DISCIPLINARY LEARNING OUTCOMES

Disciplinary learning outcomes (DLO)		
Code PLO	Code DLO	Content
PLO07	PLO07.1-B1	Know the basics and principles of linear and vector algebra, analytical geometry, differential and integral calculus.
	PLO07.2-B1	Be able to use a mathematical apparatus for objective analysis of processes in electromechanical equipment.
PLO08	PLO08.1-B1	Know the principles of solving technical problems based on mathematical analysis, construction and solution of differential equations.

3 BASIC DISCIPLINES

The discipline is taught in the 1st semester in accordance with the curriculum, so there are no additional requirements for basic disciplines. Interdisciplinary connections: the course is based on the knowledge gained from the disciplines studied at the previous level of education.

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

Type of classes	Workload hours	Distribution by forms of education, hours					
		Full-time		Part-time		Extramural	
		Classes (C)	Individual work (IW)	Classes (C)	Individual work (IW)	Classes (C)	Individual work (IW)
lecture	195	73	122	-	-	18	177
practical	180	67	113	-	-	16	164
laboratory		-	-	-	-	-	-
seminars	-	-	-	-	-	-	-
TOTAL	375	140	235	-	-	34	341

5 DISCIPLINE PROGRAM BY TYPES OF CLASSES

Code DLO	Types and topics of classes	Volume of components, hours
	LECTURES	195
PLO07.1-B1	1 Linear and vector algebra	22
	Linear algebra. Matrices. Determinants.	
	Systems of linear algebraic equations.	
	Vector algebra. General concepts of vector algebra. Product of vectors and their application.	
PLO07.1-B1	2 Analytical geometry	22
	Plane in space.	
	Straight line in space.	
	Mutual placement of the plane and the line in space.	
	Straight line on the plane	
	Second order curves.	
	The concept of the polar coordinate system.	
PLO07.2-B1	3 Complex numbers	22
	Complex numbers and operations on them	
	Elementary functions of a complex variable	
PLO07.2-B1	4 Basic concepts of Calculus	35
	Functions of one variable. Limits. Continuity of a function.	
	Derivative of a function.	
	Differentiation of a complex function, inverse function. Logarithmic differentiation.	
	The application of derivatives. Extrema values.	
	Full investigation of a function. Curve sketching.	
	Differential. Differential invariance.	
PLO07.2-B1	5 Integral calculus of a function of one variable	34
	Indefinite integral.	
	Basic methods of integration. Integration by substitution. Integration by parts.	
	Definite integral.	
	Geometrical & physical applications of definite integrals.	
	Improper integrals.	
PLO08.1-B1	6 Integral and differential calculus of a function of many variables	24
	Functions of many variables. Partial derivatives. Extreme.	
	Multiple and line integrals and their applications	
PLO08.1-B1	7 Ordinary differential equations	36
	Ordinary differential equations	
	Cauchy problem. Equations with separable variables. Homogeneous equations. Linear equations and Bernoulli equations.	
	Higher order differential equations. The order reduction.	
	Linear DE of higher order.	
	Systems of linear differential equations with constant coefficients.	

Code DLO	Types and topics of classes	Volume of components, hours
	PRACTICAL TRAINING	180
PLO07.1-B1	1 Linear and vector algebra	22
	Linear algebra. Matrices. Determinants.	
	Systems of linear algebraic equations.	
	Vector algebra. General concepts of vector algebra. Product of vectors and their application.	
	Linear algebra. Matrices. Determinants.	
PLO07.1-B1	2 Analytical geometry	22
	Plane & Straight line in 3D.	
	Mutual placement of the plane and the line in 3D.	
	Straight line in the plane (2D case)	
	Second order curves.	
	The concept of the polar coordinate system.	
PLO07.2-B1	3 Complex numbers	16
	Complex numbers and operations on them	
	Elementary functions of a complex variable	
PLO07.2-B1	4 Basic concepts of Calculus	28
	Functions of one variable. Limits. Continuity of a function.	
	Differentiation of a complex function, inverse function.	
	Logarithmic differentiation.	
	The application of derivatives. Extrema values.	
PLO07.2-B1	5 Integral calculus of a function of one variable	30
	Indefinite integral.	
	Basic methods of integration. Integration by substitution.	
	Integration by parts.	
	Definite integral.	
	Geometrical & physical applications of definite integrals.	
PLO08.1-B1	6 Integral and differential calculus of a function of many variables	30
	Functions of many variables. Partial derivatives. Extreme.	
	Multiple and line integrals and their applications	
PLO08.1-B1	7 Ordinary differential equations	34
	Ordinary differential equations	
	Cauchy problem. Equations with separable variables.	
	Homogeneous equations. Linear equations and Bernoulli equations.	
	Higher order differential equations. The order reduction.	
	Linear equations of higher order	
TOTAL		375

For the implementation of the mixed form of education of students, the electronic resources of the e-learning platform in the discipline are used:

- [Linear and Vector Algebra & Analytic Geometry \(https://do.nmu.org.ua/course/view.php?id=3382\)](https://do.nmu.org.ua/course/view.php?id=3382)
- [Differentiation of a Function \(https://do.nmu.org.ua/course/view.php?id=2634\)](https://do.nmu.org.ua/course/view.php?id=2634);

- [Indefinite integral \(En\) - Babets D.V.](https://do.nmu.org.ua/course/view.php?id=2682) (<https://do.nmu.org.ua/course/view.php?id=2682>);
- [Definite integral \(Babets D.V.\)](https://do.nmu.org.ua/course/view.php?id=3073) (<https://do.nmu.org.ua/course/view.php?id=3073>);
- [Differential Equations \(Babets D.V.\)](https://do.nmu.org.ua/course/view.php?id=3450) (<https://do.nmu.org.ua/course/view.php?id=3450>).

6 KNOWLEDGE PROGRESS TESTING

Certification of student achievement is accomplished through transparent procedures based on objective criteria in accordance with the University Regulations “On Evaluation of Higher Education Applicants' Learning Outcomes”.

The level of competencies achieved in relation to the expectations, identified during the control activities, reflects the real result of the student's study of the discipline.

6.1 Grading scales

Assessment of academic achievement of students of the Dnipro University of Technology is carried out based on a rating (100-point) and institutional grading scales. The latter is necessary (in the official absence of a national scale) to convert (transfer) grades for mobile students.

The scales of assessment of learning outcomes of the DNIPROTECH students

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

Discipline credits are scored if the student has a final grade of at least 60 points. A lower grade is considered to be an academic debt that is subject to liquidation in accordance with the Regulations on the Organization of the Educational Process of DNIPROTECH.

6.2 Tools and procedures

The content of diagnostic tools is aimed at controlling the level of knowledge, proficiency/skills, communication, autonomy, and responsibility of the student according to the requirements of the National Qualifications Framework (NQF) up to the 6th qualification level during the demonstration of the learning outcomes regulated by the work program.

During the control activities, the student should perform tasks focused solely on the demonstration of disciplinary learning outcomes (Section 2).

Diagnostic tools provided to students at the control activities in the form of tasks for the formative and summative knowledge progress testing are formed by specifying the initial data and a way of demonstrating disciplinary learning outcomes.

Diagnostic tools (control tasks) for the formative and summative knowledge

progress testing are approved by the department.

Types of diagnostic tools and procedures for evaluating the formative and summative knowledge progress testing are given below.

Diagnostic and assessment procedures

FORMATIVE ASSESSMENT			SUMMATIVE ASSESSMENT	
training sessions	diagnostic tools	procedures	diagnostic tools	procedures
lectures	control tasks for each topic	task during lectures	comprehensive control work (CCW)	determining the average results of formative assessments;
practical	control tasks for each topic	tasks during practical classes		CCW performance during the differentiated test (1 sem.), exam (2 sem.) at the request of the student
	individual task	tasks during independent work		

During the formative assessment, the lectures are evaluated by determining the quality of the performance of the control specific tasks. Practical classes are assessed by the quality of the control and individual task.

If the content of a certain type of classes is subordinated to several components of the description of the qualification level according to the NQF, the integral value of the grade can be determined taking into account the weighting coefficients set by the lecturer.

Provided that the level of results of the formative assessments of all types of training at least 60 points, the summative assessment can be carried out without the student's immediate participation by determining the weighted average value of the obtained grades.

Regardless of the results of the formative assessments, every student during the summative knowledge progress testing has the right to perform the CCW, which contains tasks covering key disciplinary learning outcomes.

The number of specific tasks of the CCW should be consistent with the allotted time for completion. The number of CCW options should ensure that the task is individualized.

The value of the mark for the implementation of the CCW is determined by the average evaluation of the components (specific tasks) and is final.

The integral value of the assessment of the implementation of the CCW can be determined taking into account the weighting coefficients established by the department for each component of the description of the qualification level of the NQF.

6.3 Criteria

Actual student learning outcomes are identified and measured relative to what is expected during the control activities using criteria that describe the student's actions to demonstrate the achievement of learning outcomes.

To assess the performance of control tasks during the formative assessment on lectures and practical classes the coefficient of mastery is used as a criterion, which automatically adapts the assessment indicator to the rating scale:

$$O_i = 100 a/m,$$

where a is a number of correct answers or significant operations performed in accordance with the solution standard; m is the total number of questions or significant operations of the standard.

Individual tasks and complex control works are assessed expertly using criteria that characterize the ratio of requirements to the level of competencies and indicators of assessment on a rating scale.

The content of the criteria is based on the competency characteristics defined by the NQF for the bachelor's level of higher education (given below).

***General criteria for achieving learning outcomes
for the 6th qualification level of NQF (bachelor)***

Description of qualification level	Requirements for knowledge, proficiency/skills, communication, autonomy and responsibility	Indicator evaluation
<i>Knowleges</i>		
Conceptual scientific and practical knowledge, critical understanding of theories, principles, methods and concepts in the field of professional activity and / or training	The answer is excellent - correct, reasonable, meaningful. Characterizes the presence of: - conceptual knowledge; - high degree of knowledge of the state of the art; - critical understanding of the basic theories, principles, methods and concepts in education and professional activity	95-100
	The answer contains minor errors or omissions	90-94
	The answer is correct, but has some inaccuracies	85-89
	The answer is correct, but has some inaccuracies and is insufficiently substantiated	80-84
	The answer is correct, but has some inaccuracies, insufficiently substantiated and meaningful	74-79
	The answer is fragmentary	70-73
	The answer shows the student's vague ideas about the object of study	65-69
	The level of knowledge is minimally satisfactory	60-64
	The level of knowledge is unsatisfactory	<60
<i>Proficiency/Skills</i>		
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 appropriate methods and tools; - collect and interpret information logically and clearly; - use innovative approaches to solving problems	95-100
	The answer characterizes the ability to apply knowledge in practice with minor errors	90-94

Description of qualification level	Requirements for knowledge, proficiency/skills, communication, autonomy and responsibility	Indicator evaluation
	The answer characterizes the ability to apply knowledge in practice, but has some inaccuracies in the implementation of one requirement	85-89
	The answer characterizes the ability to apply knowledge in practice, but has some inaccuracies in the implementation of the two requirements	80-84
	The answer characterizes the ability to apply knowledge in practice, but has some inaccuracies in the implementation of the three requirements	74-79
	The answer characterizes the ability to apply knowledge in practice, but has some inaccuracies in the implementation of the four requirements	70-73
	The answer characterizes the ability to apply knowledge in practice when performing tasks on the model	65-69
	The answer characterizes the ability to apply knowledge in performing tasks on the model, but with inaccuracies	60-64
	The level of skills is unsatisfactory	<60
Communication		
<ul style="list-style-type: none"> ♦ reporting to specialists and non-specialists information, ideas, problems, solutions, own experience and argumentation ♦ data collection, interpretation and application ♦ communication on professional issues, including in a foreign language, orally and in writing 	<p>Fluency in industry issues. Clarity of the answer (report). Language:</p> <ul style="list-style-type: none"> - correct; - clean; - clear; - accurate; - logical; - expressive; - concise. <p>Communication strategy:</p> <ul style="list-style-type: none"> - consistent and consistent development of thought; - the presence of logical own judgments; - appropriate 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; 	95-100
	Sufficient knowledge of industry issues with minor flaws. Sufficient clarity of the answer (report) with minor flaws. Relevant communication strategy with minor flaws.	90-94
	Good knowledge of industry issues. Good clarity of the answer (report) and appropriate communication strategy (three requirements in total are not realized)	85-89
	Good knowledge of industry issues. Good clarity of the answer (report) and appropriate communication strategy (four requirements not implemented in total)	80-84
	Good knowledge of industry issues.	74-79

Description of qualification level	Requirements for knowledge, proficiency/skills, communication, autonomy and responsibility	Indicator evaluation
	Good clarity of the answer (report) and appropriate communication strategy (five requirements not implemented in total)	
	Satisfactory knowledge of industry issues. Satisfactory clarity of the answer (report) and appropriate communication strategy (a total of seven requirements have not been implemented)	70-73
	Partial knowledge of industry issues. Satisfactory clarity of the answer (report) and communication strategy with errors (a total of nine requirements are not implemented)	65-69
	Partial knowledge of industry issues. Satisfactory clarity 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
<i>Autonomy and responsibility</i>		
<ul style="list-style-type: none"> ♦ managing complex technical or professional activities or projects ♦ ability to take responsibility for making and making decisions in unpredictable work and / or learning contexts ♦ formation of judgments that take into account 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 	<p>Excellent command of personal management competencies focused on:</p> <p>1) management of complex projects, which involves:</p> <ul style="list-style-type: none"> - research nature of educational activities, marked by the ability to independently assess various life situations, phenomena, facts, identify and defend a personal position; - ability to work in a team; - control of own actions; <p>2) responsibility for decision-making in unpredictable conditions, including:</p> <ul style="list-style-type: none"> - justification of own decisions by the provisions of the regulatory framework of the industry and state levels; - independence in the performance of tasks; - initiative in discussing problems; - responsibility for relationships; <p>3) responsibility for the professional development of individuals and/or groups of individuals, which involves</p> <ul style="list-style-type: none"> - use of professionally oriented skills; - use of evidence with independent and correct argumentation; - mastery of all types of learning activities; <p>4) the ability to continue learning with a high level of autonomy, which includes</p> <ul style="list-style-type: none"> - the degree of mastery of fundamental knowledge; - independence of evaluative judgments; - a high level of general learning skills; - independent search and analysis of information sources 	95-100
	Good mastery of personality management competencies (two requirements not met)	90-94
	Good mastery of personality management competencies (three requirements not met)	85-89

Description of qualification level	Requirements for knowledge, proficiency/skills, communication, autonomy and responsibility	Indicator evaluation
	Good mastery of personality management competencies (four requirements not met)	80-84
	Good mastery of personality management competencies (six requirements not met)	74-79
	Satisfactory mastery of personality management competencies (seven requirements not met)	70-73
	Satisfactory mastery of personality management competencies (eight requirements not met)	65-69
	The level of responsibility and autonomy is fragmentary	60-64
	The level of autonomy and responsibility is unsatisfactory	<60

7 TOOLS, EQUIPMENT AND SOFTWARE

Technical teaching aids. A laptop and a projector are used to teach lectures in the classroom. The mixed form of training uses the MOODLE platform, the MS Teams corporate platform, and the Zoom video conferencing program.

MS Excel packages and the following online resources are used during the practical classes: <https://www.desmos.com/calculator?lang=en>; <https://www.geogebra.org/3d>

8 RECOMMENDED BIBLIOGRAPHY

8.1 Basic

1. Є.С. Сінайський, Л.В. Новікова, Л.І. Заславська. Вища математика (частина 1): навч. посібник. – Дніпропетровськ: НГУ, 2004. – 389 с.
2. Derivatives and their application = Похідні та їх застосування: Textbook (англійською мовою) / О. Sdvyzhkova, S. Tymchenko, D. Babets, Yu. Olevska, D. Klymenko, P. Shcherbakov; / The Ministry of Education and Science of Ukraine, Dnipro University of Technology. – Dnipro: «Dniprotech», 2020. – 70 с.
3. Indefite Integral (англійською мовою) [Текст]: навч. посіб. для студ. вищ. навч. закл / Бабець Д.В, Сдвижкова О.О.; Тимченко С.Є.; Щербаків П.М/ М-во освіти і науки України, Нац. техн. ун-т «Дніпровська політехніка». – Дніпро: НТУ «ДП», 2018. – 65 с.
4. Звичайні диференціальні рівняння (англійською мовою) [Текст]: навч. посіб. для студ. гірн. спец. вищ. навч. закл. / Е.А.Сдвижкова, Л.І. Коротка, Д.В.Бабець, Ю.Б. Олевська; М-во освіти і науки України, Нац. гірн. ун-т. – [Нове вид.]. – Д. : НГУ, 2015. – 60 с. – ISBN 978-966-350-587-9.
5. Вища математика із застосуванням інформаційних технологій. Підручник/ Іващенко В.І., Швачич Г.Г., Коноваленков В.С., Заборова Т.М., Христян В.І. – Запоріжжя: Дике Поле, 2013. – 426 с.
6. K Weltner, W. J. Weber, J. Grosjean P. Schuster: Mathematics for Physicists and Engineers. Springer, 2009
7. Стислий курс вищої математики. Т.1: Аналітична геометрія та елементи лінійної алгебри/ Г.М.Тимченко, О.В.Одинцова, О.С.Мазур, Н.О.Кирилова.: навч. посібн. – К.: Кондор-Видавництво, 2016.- 176 с.
8. Вища математика в прикладах і задачах: у 2 т. Т.1: Аналітична геометрія та лінійна алгебра. Диференціальне та інтегральне числення функцій однієї змінної: навч. посібник / Л.В.Курпа, Ж.Б.Кашуба, Г.Б.Лінник [та ін.]; за ред. Л.В.Курпи. – Харків: НТУ «ХПІ», 2009. – 532с.
9. Вища математика в прикладах і задачах: у 2 т. Т.2: Диференціальне числення функцій багатьох змінних. Диференціальні рівняння та ряди: навч. посібник / Л.В.Курпа,

- Н.О.Кириллова, Г.Б.Лінник [та ін.]; за ред. Л.В.Курпи. – Харків: НТУ «ХП», 2009. – 432с.
10. Вища математика. Розв'язання задач та варіанти типових розрахунків. Т.1.: Навч. Посібник / За ред. Л.В.Курпа. — Харків: НТУ “ХП”, 2002 – 316 с.
- 8.2 Additional
1. K.F. Riley, M.P. Hobson and S. J. Bence: Mathematical Methods for Physics and Engineering. Cambridge University Press, 2006.
 2. Вища математика: Інтегральне числення у прикладах і задачах. Частина 2.: навч. посібник /Л.Я.Фомичова, В.М.Почепов, В.В.Фомичов. – Дніпро: ТОВ «ЛізуновПрес», 2016. – 200 с.
 3. Математика 1. Конспект лекцій. Частина 1. / Л.Я.Фомичова– Дніпро: ТОВ «Лізунов Прес», 2017. – 72 с.
 4. Практикум з інтегрування функцій однієї змінної: навч. посібник. / Н.П. Уланова, В.В. Приходько. – Дніпропетровськ: НГУ, 2014. – 80 с.
 5. Практикум з початків математичного аналізу: навч. посібник / Новикова Л.В., Уланова Н.П., Приходько В.В. – Дніпропетровськ: НГУ, 2006. – 109 с.
 6. «Диференціальні рівняння в прикладах та задачах: навч. посібник / Новикова Л.В., Сдвижкова О.О., Бугрим О.В., Бугрим Є.Д. – Дніпропетровськ: НГУ, 2007. – 95 с.
 7. Практикум з вищої математики. Невизначений Інтеграл: нав. посібник. / Замкова Л.Д. – Дніпропетровськ: НГУ, 2007. – 129 с.
 8. Методичні вказівки до розв'язання прикладних задач з вищої математики. / Т.С.Кагадій. – Дніпропетровськ: НГУ, 2005. – 29 с.
 9. Методичні вказівки до виконання розрахункових завдань і контрольних модульних робіт з лінійної і векторної алгебри. / Л.Й.Бойко, А.Г.Шпорта. – Дніпропетровськ: НГУ, 2006. – 32 с.
 10. Функція. Границя. Похідна та її застосування [Текст]: методичні вказівки / Сдвижкова О.О., Бабець Д.В., Тимченко С.Є., Подольська С.Н. / Д: Державний ВНЗ «НГУ» – 2013. – 126 с.
 11. Застосування методів диференціального та інтегрального числення до розв'язання задач технічного змісту. Методичні вказівки для самостійної роботи студентів / Л.Й. Бойко, В.І. Павліщев. – Дніпропетровськ: НГУ, 2012. – 46с.

9. INFORMATION RESOURCES

1. Література на сайті кафедри прикладної математики:
<https://vm.nmu.org.ua/lib.html>;
2. **Linear and Vector Algebra & Analytic Geometry**
(<https://do.nmu.org.ua/course/view.php?id=3382>)
3. **Differentiation of a Function** (<https://do.nmu.org.ua/course/view.php?id=2634>);
4. **Indefinite integral (En) - Babets D.V.**
(<https://do.nmu.org.ua/course/view.php?id=2682>);
5. **Definite integral (Babets D.V.)** (<https://do.nmu.org.ua/course/view.php?id=3073>);
6. **Differential Equations (Babets D.V.)** (<https://do.nmu.org.ua/course/view.php?id=3450>);
7. Учбово-методичні посібники кафедри прикладної математики «ХП»: <http://web.kpi.kharkov.ua/apm/navchal-na-diyal-nist/navchal-no-metodichni-posibniki/>

WORK PROGRAM OF THE ACADEMIC DISCIPLINE

«Higher Mathematics» for bachelors of the educational and professional program
«Electrical energetics, electrical engineering and electromechanics» of the specialty
141 Electrical energetics, electrical engineering and electromechanics

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