SYLLABUS OF THE ACADEMIC DISCIPLINE
" *Special sections on mathematics* "

Academic degree	Bachelor
Academic program	192 Construction and Civil Engeneering
Тривалість викладання Заняття:	5-6 quarters 2020 -2021ed.year
Мова викладання	English
Кафедра, що викладає	Higher mathematics

Distance courses
https://do.nmu.org.ua/course/view.php?id=3382
https://do.nmu.org.ua/enrol/index.php?id=3073
https://do.nmu.org.ua/course/view.php?id=2682
https://do.nmu.org.ua/course/view.php?id=3450

Consultations: 11.20-13.00, every Monday (except holidays), room 5/25

Teacher information:

 	**Prof.Olena Sdvyzhkova (Lectures), Prof.** **Dmytro Babets (Practical training)**	Doctor of Technical Sciences, Professor Cand. of Technical Sciences, Professor
	Personal pages	https://sites.google.com/view/personaliyivm/%D0%B7%D0%B0%D0%B2-%D0%BA%D0%B0%D1%84%D0%B5%D0%B4%D1%80%D0%B8-%D0%BF%D1%80%D0%BE%D1%84%D0%B5%D1%81%D0%BE%D1%80-%D1%81%D0%B4%D0%B2%D0%B8%D0%B6%D0%BA%D0%BE%D0%B2%D0%B0-%D0%BE-%D0%BE?fbclid=IwAR3Fsn_W_VhD-hz03urbPudiEBZ8TW4Ce7qvgR6S8OtzZYf065u29Bu5_MI https://sites.google.com/view/personaliyivm/%D0%BF%D1%80%D0%BE%D1%84%D0%B5%D1%81%D0%BE%D1%80-%D0%B1%D0%B0%D0%B1%D0%B5%D1%86%D1%8C-%D0%B4-%D0%B2
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1. Annotation to the course

The object of professional activity of a specialist in the field of construction and civil engineering is the design, creation, operation, storage and reconstruction of engineering systems and technological processes. Effective and safe activities in this field are based on theories, principles, concepts and methods of basic and general engineering sciences. The basis of training is the methods of physical and mathematical modeling the processes and objects of engineering systems, the state of structures and materials, the interaction of soil and building structures. Modern modeling methods require knowledge of special sections of mathematics that allow mathematical reproduction of processes on the intreraction of knowledge. Therefore, in this course students will get acquainted with the basic mathematical methods of describing different physical fields.

An important element of knowledge is also the accumulation and analysis of experimental data. Part of the course is devoted to the processing of statistical data and the creation of probabilistic models, which allows predicting the behavior of engineering systems taking into account random factors.

2. The purpose and objectives of the discipline

The purpose of the discipline " ***Special sections on mathematics*** " is the formation of skills and abilities for the application of special mathematical algorithms in solving professional problems while bachelors training in the specialty 192 Construction and Civil Engineering.

Course objectives:

- mastering the principles of describing physical fields formed by scalar and vector quantities based on field theory;
- mastering the principles of collection and analysis of statistical data.
- Mastering the principles of studying the patterns of mass random events.

3. Learning outcomes:

- understanding the principles of using matrix algebra in technical problems and knowing the basics of solving systems of linear equations;
- knowing the principles of using vector algebra and analytical geometry in science problems;
- knowing the basics of mathematical analysis, differential and integral calculus;
- knowing the types and principles of solving differential equations, being able to apply them while technical problem solving.

4. The structure of the discipline

5 DISCIPLINE PROGRAM BY TYPES OF CLASSES

Year, quarter	№	Types and topics of training sessions	hours		
			class	self study	total
2-nd year, 5 quarter, 6+1 weeks		Lectures	12	16	28
	1	Elements of the scalar field. Surfaces and level lines.			
	2	Derivative by direction. Gradient.			
	3	Vector field elements. Vector lines. Potential vector field.			
	4	Calculation of the surface integral. Gauss-Ostrogradsky formula. Stokes' formula.			
	5	Differential operators of a vector field. Divergence. Rotor			
		Practical Training	12	16	28
	1	Elements of the scalar field. Surfaces and level lines.			
	2	Derivative by direction. Gradient.			
	3	Vector field elements. Vector lines. Potential vector field.			
	4	Calculation of the surface integral. Gauss-Ostrogradsky formula. Stokes' formula.			
	5	Differential operators of a vector field. Divergence. Rotor			
		Testing	4		
2-nd year, 6 quarter, 7+1 weeks		Lectures	14	14	28
	1	Basic concepts and theorems of probability theory.			
	2	Random quantities and laws of their distribution.			
	3	Statistical distribution of a quantitative feature.			
	4	Moments of statistical distribution. Determining according to the experiment.			
	5	Some theoretical laws of distribution.			
	6	Verification of statistical hypotheses.			
	7	Application of statistical methods in geotechnical problems			
		Practical Training	14	14	28
	1	Basic concepts and theorems of probability theory.			
	2	Random quantities and laws of their distribution.			
	3	Statistical distribution of a quantitative feature.			
	4	Moments of statistical distribution. Determining according to the experiment.			
	5	Some theoretical laws of distribution.			

	6	Verification of statistical hypotheses.			
	7	Application of statistical methods in geotechnical problems			
		Testing	4		
Final test, quarties		Total	56	56	112
		Lectures	28	28	56
		Practical Training	28	28	56
exam	test				
6	5	Testing	8		

5 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.

5.1 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 NTUDP students

Rating	Institutional
90 ... 100	Excellent
74 ... 89	Good
60 ... 73	Satisfactory
0 ... 59	Failed

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 NTUDP.

5.2 DIAGNOSTIC TOOLS AND EVALUATION PROCEDURES

The content of diagnostic tools is aimed at controlling the level of knowledge, skills, communication, autonomy, and responsibility of the student

according to the requirements of the National Qualifications Framework (NQF) up to the 7th 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 intermediate and final knowledge progress testing are formed by specifying the initial data and a way of demonstrating disciplinary learning outcomes.

Diagnostic tools (control tasks) for the intermediate and final knowledge progress testing are approved by the appropriate department.

Type of diagnostic tools and procedures for evaluating the intermediate and final knowledge progress testing are given below.

Diagnostic and assessment procedures

<table>
<tr><td colspan="3">INTERMEDIATE CONTROL</td><td colspan="2">FINAL ASSESSMENT</td></tr>
<tr><td>training sessions</td><td>diagnostic tools</td><td>procedures</td><td>diagnostic tools</td><td>procedures</td></tr>
<tr><td>lectures</td><td>control tasks for each topic</td><td>task during lectures</td><td rowspan="3">comprehensive reference work (CCW)</td><td rowspan="3">determining the average results of intermediate controls;

CCW performance during the examination at the request of the student</td></tr>
<tr><td rowspan="2">practical</td><td>control tasks for each topic</td><td>tasks during practical classes</td></tr>
<tr><td>or individual task</td><td>tasks during independent work</td></tr>
</table>

During the intermediate control, 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 or individual task.

If the content of a particular type of teaching activity is subordinated to several descriptors, then the integral value of the assessment may be determined by the weighting coefficients set by the lecturer.

Provided that the level of results of the intermediate controls of all types of training at least 60 points, the final control 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 intermediate control, every student during the final knowledge progress testing has the right to perform the CDF, which contains tasks covering key disciplinary learning outcomes.

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

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

The integral value of the CDF performance assessment can be determined by taking into account the weighting factors established by the department for each NLC descriptor.

5.3 EVALUATION CRITERIA

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

To evaluate the performance of the control tasks during the intermediate control of lectures and practicals the assimilation factor is used as a criterion, which automatically adapts the indicator to the rating scale:

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

where a - number of correct answers or significant operations performed according to the solution standard; m - the total number of questions or substantial operations of the standard.

Individual tasks and complex control works are expertly evaluated using criteria that characterize the ratio of competency requirements and evaluation indicators to a rating scale.

6. Course policy

6.1. Academic Integrity Policy. Academic integrity of students is an important condition for mastering the results of training in the discipline and obtaining a satisfactory grade on the current and final tests. Academic integrity is based on condemnation of the practices of copying (writing with external sources other than those allowed for use), plagiarism (reproduction of published texts by other authors without indication of authorship), fabrication (fabrication of data or facts used in the educational process). The policy on academic integrity is regulated by the Regulation "Regulations on the system of prevention and detection of plagiarism at the Dnipro University of Technology (http://www.nmu.org.ua/ua/content/activity/ us_documents / System_of_prevention_and_detection_of_plagiarism.pdf.)

In case of violation of academic integrity by a student (copying, plagiarism, fabrication), the work is evaluated unsatisfactorily and must be repeated. The teacher reserves the right to change the topic of the task.

6**.2. Communication policy**.

Students must have activated university mail.

It is the student's responsibility to check the mailbox at Office365 once a week (every Sunday).

All written questions to teachers regarding the course should be sent to the university e-mail.

6.3. Reassembly policy.

Works that are submitted in violation of deadlines without good reason are evaluated at a lower grade. Relocation takes place with the permission of the dean's office if there are good reasons (for example, sick leave).

6.4. Attending classes.

Full-time students are required to attend classes. Good reasons for not attending classes are illness, participation in university events, business trips, which must be confirmed by documents in case of prolonged (two weeks) absence. The student must inform the teacher either in person or through the headmaster about the absence from class and the reasons for absence. If a student is ill, we recommend staying home and studying with a distance platform. Students whose health is unsatisfactory and may affect the health of other students will be encouraged to leave the class (such absence will be considered an absence due to illness). Practical classes are not repeated, these assessments cannot be obtained during the consultation. For objective reasons (for example, international mobility), learning can take place remotely - online, in agreement with the teacher.

6.5 **Evaluation Appeal Policy**. If the student does not agree with the assessment of his knowledge, he may appeal the assessment made by the teacher in the prescribed manner.

6.6. **Bonuses.** Students who regularly attended lectures (have no more than two passes without good reason) and have a written syllabus of lectures receive an additional 2 points to the results of the assessment to the final grade.

6.7. **Participation in the survey**. At the end of the course and before the session, students will be asked to fill out anonymously questionnaires (Microsoft Forms Office 365), which will be sent to your university mailboxes. Completing the questionnaires is an important component of your learning activity, which will allow you to assess the effectiveness of the teaching methods used and take into account your suggestions for improving the content of the discipline **"*Special sections on mathematics* ".**

7 RECOMMENDED BIBLIOGRAPHY

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2. Indefite Integral: навч. посіб. для студ. вищ. навч. закл /Бабець Д.В, Сдвижкова О.О.; Тимченко С.Є.; Щербаков П.М/ М-во освіти і

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3. Вища математика. Частина 2: навч. посіб. для студ.гірн. спец. вищ. навч. закл. / Є.С. Сінайський, Л.В. Новікова, Л.І. Заславська Дніпропетровськ. М-во освіти і науки України, Нац. гірн. ун-т. –Д. : НГУ, 2013. – 399 с.
4. K.F. Riley, M.P. Hobson and S. J. Bence: Mathematical Methods for Physics and Engineering. – Cambridge University Press, 2006
5. K Weltner, W. J. Weber, J. Grosjean P. Schuster: Mathematics for Physicists and Engineers. – Springer, 2009
6. Елементи теорії ймовірностей та математичної статистики в гірництві: навч. посібник. / Сдвижкова О.О., Бугрим О.В., Бабець Д.В., Іванов О.С. – Дніпропетровськ: НГУ, 2015 – 102 с.
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8. Jessica M.Utts.Seeng through statistics (revised edition) / Jessica M.Utts – Publisher: Brooks Cole, 2014.- 656 p.