Higher Mathematics
SYLLABUS

Code and name of the specialty	185 Oil and gas engineering and technologies of oil, gas and condensate extraction	Institute / faculty	Educational and Scientific Institute of Chemical Technologies and Engineering
Name of the program	oil and gas production	Chair	rights
Program type	Educational and professional	Language of instruction	English

Teachers

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Candidate of physics and mathematics, Associate Professor. Author of more than 30 scientific and educational publications.

General information about the course

Summary	**Purpose** of the course of higher mathematics is to form a system of theoretical and practical knowledge of linear algebra, analytical geometry, mathematical analysis and differential equations.
Course objectives	The objective of the course is to teach students the basic methods of higher mathematics, which are necessary for the study of chemistry, physical chemistry, physics, and other general and special disciplines, as well as preparation for independent study of those sections of mathematics, which may be additionally required in the practical and research work of specialist chemist.
Format	Lectures, practical classes, consultations. Final control -pass
Semester	1,2

Volume (credits) / Type of course	8 / Required	Lectures (hours)	64	Practical classes (hours)	64	Independent work (hours)	112

Program competencies	GC-1, GC-4, GC-5, GC-6.

MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE

NATIONAL TECHNICAL UNIVERSITY
KHARKIV POLYTECHNIC INSTITUTE

Department _____Applied Mathematics_____
<div align="center">(name)</div>

"APPROVED"
Head of the department

_Kurpa L.V._____
(full name)   (signature)

«_____»_____20___ year

Educational Subject Syllabus

_____Higher Mathematics_____
<div align="center">(educational subject title)</div>

higher education level _____first_____
<div align="center">first (bachelor's) / second (master's)</div>

type of discipline _____general training_____
<div align="center">(general training (required / optional) / professional training (required / optional)</div>

form of education _____full-time_____
<div align="center">(full-time / part-time)</div>

Kharkiv - 2019 year

Scope of the course: 8 ECTS credits   240 hours.

Lectures: 64 hours.

Practical classes: 64 hours.

Form of control: exam.

Teaching term for Bachelor / Master degree: 1-2 semesters**.**

Teaching language: English.

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Competencies: GC-1, GC-4, GC-5, GC-6.

Learning achievements: LR-5, LR-9.

Topics covered:

Semester 1.
Content module 1. Linear algebra.
Theme 1. Matrices and determinants.
Theme 2. Systems of linear algebraic equations.
Content module 2. Analytic geometry.
Theme 1. Vector algebra.
Theme 2. Lines and surfaces.
Content module 3. The theory of limits and function continuity.
Theme 1. Limits and function continuity.
Semester 2.
Content module 4. Differential calculus of one variable function.
Theme 1. Differentiating the one variable function.
Theme 2. Application of the derivative.
Content module 5. Integral calculus of one variable function.
Theme 1. Indefinite integrals.
Theme 2. Definite integral.
 Content module 6. Differential calculus of function of several variables.
 Theme 1. Differential calculus of function of several variables.

Form and methods of teaching (description of teaching methods is provided): Higher mathematics education is provided in the form of training sessions (lectures, practical classes, consultations), as well as in the form of independent work (working out of educational material, performance and protection of the individual educational task in each semester).

Control methods (description of control methods is provided): The following types of control are used in the course of higher mathematics:
1) entrance control (control work at the beginning of the first semester);
2) current semester control (individual tasks, module tests on practice and theory at the end of each module);
3) final semester control (exam at the end of each semester).

DISTRIBUTION OF POINTS THAT STUDENTS RECEIVED AND KNOWLEDGE AND SKILLS SCALE (NATIONAL AND ECTS)

Table 1. - Points distribution for student achievement evaluation for passing

Semester	Control work	Individual tasks	Passing	Sum
1	70	10	20	100
2	70	10	20	100

Table 2. - Points distribution for student achievement evaluation for examination

Semester	Control work	Individual tasks	Examination	Sum
1	70	10	20	100
2	70	10	20	100

Criteria and system for assessing students' knowledge and skills.
According to the guidelines of ECTS, an assessment system should be understood as a set of methods (written, oral and practical tests, examinations, projects, etc.) used in assessing the achievement of the expected learning outcomes by the students.

Successful assessment of learning outcomes is a precondition for awarding credits to a person under study. Therefore, statements of learning outcomes of programme components should always be accompanied by clear and appropriate **assessment criteria** for awarding credits. This makes it possible to state that the learner has acquired the necessary knowledge, understanding, competences.

Assessment criteria are descriptions of what a person who is learning is expected to do in order to demonstrate the achievement of a learning outcome.

The main conceptual statements of the student's knowledge and skills assessment system are:

1. Improving the quality of training and competitiveness of specialists by stimulating independent and systematic work of students during an academic semester, establishment of constant feedback from teachers to each student and timely correction of his/her learning activities.

2. Improving the objectivity of students' knowledge assessment takes place through monitoring during a semester with the use of a 100-point scale (Table 2). Grades are necessarily translated into the national scale (with the state semester grades "excellent", "good", "satisfactory" or "unsatisfactory") and the ECTS scale (A, B, C, D, E, FX, F).

Table 3 - Knowledge and skills assessment scale: national and ECTS rating

Rating Assessment, points	ECTS assessment and its definition	National assessment	Evaluation criteria	
			positive	negative
1	2	3	4	5
90-100	A	Excellent	- **Deep knowledge** of the educational material of the module contained in the **main and additional literature sources**; - **ability to analyze** the phenomena being studied in their relationship and development; - **ability to** perform **theoretical calculations;** - **answers** to questions **are clear, concise, logically consistent;** - **ability to solve complex practical problems.**	Answers to questions may contain **minor inaccuracies**
			- **Deep level of knowledge** in the amount of **required**	Answers to the questions

82-89	B	Good	**material** provided by the module; - ability to give **reasonable answers** to questions and perform **theoretical calculations**; - ability to solve **complex practical problems**.	contain **certain inaccuracies**;
75-81	C	Good	- **Strong knowledge** of the studied material and its **practical application**; - ability to give **reasonable answers** to questions and perform theoretical calculations; - ability to solve **practical problems**.	- Inability to use theoretical knowledge to solve **complex practical problems.**
64-74	D	Satisfactory	- **Knowledge of the basic fundamental provisions** of the studying material, and their **practical application**; - the ability to solve simple **practical problems**.	Inability to give **well-reasoned answers** to the questions; - inability to **analyse** the material presented and **perform calculations**; - Inability to solve **complex practical problems**.
60-63	E	Satisfactory	- Knowledge of **the basic fundamental provisions** of the module material, - ability to solve the simplest **practical problems.**	Ignorance of **individual (non-principled) questions** from the module material - inability to make a **coherent and well-reasoned** opinion; - inability to apply theoretical statements in solving **practical problems**

35-59	FX (потрібне додаткове вивчення)	Fail	**Additional study** of the module material can be performed **in the time provided by the educational curriculum.**	Ignorance of the **basic fundamentals** of the module - **significant errors** in answering questions; - inability to solve **simple practical problems**.
1-34	F (потрібне повторне вивчення)	Fail	-	- Complete **lack of knowledge** of a considerable part of the module's study material; - **significant mistakes** in answering the questions; -ignorance of the main fundamentals; - inability to orient while solving **simple practical tasks**

Basic Literature: (A list of literature that provides this subject)

1. Higher mathematics. Problem solving and variants of typical calculations. Edited by Dr.Sci.Tech. Kurpa L.V. – Kharkiv: NTU "KhPI", 2004. – Volume 1.
2. Higher mathematics. Problem solving and variants of typical calculations. Edited by Dr.Sci.Tech. Kurpa L.V. – Kharkiv: NTU "KhPI", 2004. – Volume 2.
3. Rudnyeva G.V. Elements of Linear Algebra and Analytic Geometry: Textbook. – Kharkiv: NTU KhPI: 2008.
4. Kurpa L.V., Shmatko T.V. Differential Calculus for One Variable Functions: Textbook. – Kharkiv: NTU KhPI: 2015.
5. L.V. Kurpa, T.V.Shmatko. Differential and integral calculus for functions with several variables: Textbook. – Kharkiv: NTU KhPI: 2012.
6. Higher mathematics. Problem solving and variants of typical calculations. Edited by Dr.Sci.Tech. Kurpa L.V. – Kharkiv: NTU "KhPI", 2004. – Volume 3.

Structural-logical scheme of education subject study

Table 3. - List of subjects

Structural-logical scheme of educational subject

The study of this subject is based directly:	The results of the study of these subjects are based directly on:
School math course	Physics Computational Mathematics and Programming Theoretical mechanics Applied mechanics Physical chemistry of dispersed systems Physics and chemistry of fossil fuels Strength of Materials Hydromechanics The physics of the oil and gas reservoir Gas hydromechanics Thermodynamics Mathematical modeling of mining processes and application of computers Systems of computer-aided design of oil and gas equipment

Lead Lecturer: __Assoc. Prof., Dr. Rudnyeva G.V._ _____

<div align="center">(position, title, full name)   (signature)</div>