MINISTRY OF HIGHER AND SECONDARY SPECIALIZED EDUCATION OF THE REPUBLIC OF UZBEKISTAN

ANDIJAN MACHINE-BUILDING INSTITUTE

Registered:
№ 811
"31" 08 2022 y

"APPROVED"
Vice-rector for academic affairs
"31" 08 2022 y.

"HIGHER MATHEMATICS" SCIENCE SYLLABUS

Educational area: 1000000 – Services

Education field: 1040000 – Transport services

Education directions: 61040100 – Transport logistics (by types of transport)
61040300 – Organization of traffic
61040400 – Automobile services

Education directions	Student's educational load, hours								Semesters, hours	
	Total load size	Auditors training						Independent education	Semestr	hours
		Total	Including							
			Lecture	Practice	Laboratory	Seminar	Preject kurs works			
61040100 – Transport logistics (by types of transport) 61040300 - Organization of traffic 61040400- Avtomobil services	450	210	90	120	-	-	-	240	I-II-III	4-6-4

Andijan – 2022

Cod of modul O'M1316	Academic year 2021-2022	Semester I-II-III	ECTS - credits 15(5+6+4)
Type of modul Compulsory	Language of education Uzbek		Weekly hours 4-6-4
Name	Practice traning (hours)	Independent education (hours)	Total loads (hours)
Oliy matematika	210	240	450

I. The content of science

The role of modern mathematical methods and models in technical fields are indispensable. Therefore, much more attention is paid to the subject of Calculus. Calculus is also used to describe the dynamic nature of our world. Calculus is the language of motion and change. If a quantity or system is changing, we can use the mathematical modelling of Calculus to help us analyse, optimize and predict different parameters of the system.

The tasks of teaching science – are to explain to students the complex situation that has arisen in Uzbekistan on the eve of independence and the essence of reforms in state administration, socio-economic, political and spiritual and other fields during the years of independence, to educate them in the spirit of loyalty and love for the Motherland, and is to form national pride.

PREREQUISITES

Before studying Higher Mathematics I-III, all students should complete "Higher Mathematics I" course which taught in second semester: course in which they study fundamentals of differential and integral calculus of functions of one variable. Students must be familiar with limits of functions, studying function using differentiation, integral. Sketching the graph of function using first and second derivative tests. Finding areas between curves using integral.

COURSE OBJECTIVES

This course arrangement appropriately to the different chapter's the degree of difficulty and easy exercises.

- Functions of several variables
- Partial derivatives
- Double and multiple integrals
- Power Series
- Taylor Series
- Fourier Series
- Linear differential equations

MODERN INFORMATION AND PEDAGOGICAL TECHNOLOGIES IN TEACHING SUBJECTS

Every student expects a class with full of technology from their professors. But we are all busy with traditional classes where few chairs, a board, and markers using in the classes. There should be more technology with comfortable, light, and wide classrooms.

Educational equipment or gadgets which can be used in the classes for the students:

- Well equipped large classrooms
- Interactive technology projectors
- Audio sound systems
- Wireless infrastructure
- PCs, network management and software

All these equipment and gadgets help professors to make the classes modern and attractive.

II. Science includes the following topics:

LECTURE CONTENTS

№	Lecture themes	Hours
1	Two- and three-dimensional integral and its calculation	2
2	The first and second type are curve integrals.	2
3	Complex numbers are operations on them. Complex variable functions.	2
4	Integral of complex variable functions and its calculation.	2
5	Complex sentences.	2
6	Discounts and their application.	2
7	Laplace transform.	2
8	Original and image.	2
9	Differential equations with particular derivatives and their classification.	2
10	Narrow vibration issues. The Cauchy problem for the heat diffusion equation.	2
11	Basic concepts of the science of probability theory.	2
12	Conditional probability. Probably. Bayes formula.	2
13	Bernoulli scheme. Local and integral theorems of Mouavr-Laplace.	2
14	Random quantities and their distribution laws.	
15	Numerical characteristics of random variables.	2
Total 3rd semester hours:		**30**

Lectures are held in an auditorium equipped with multimedia facilities for the flow of academic groups.

PRACTICE CLASSES CONTENTS

Instructions and recommendations on the organization of practical training.

№	Practical training themes for III semester	Hours
1	Calculation of two-dimensional integrals, geometric and mechanical meaning.	2
2	Calculation of three-dimensional integrals.	2
3	Work on examples of applications of two-dimensional and three-dimensional integrals.	2
4	Exercises on the calculation of the first type of curve integral. Calculation of the surface using the curve integral.	2
5	Exercises on the calculation of curve integrals of the second type. Green's formula. Exercises on the application of the curve integral.	2
6	Complex numbers and operations on them. Limit and continuity of complex variable functions. A property of a complex variable function. Analytical functions. Harmonic functions.	2
7	Integral of complex variable functions. Integral taken over a closed contour. Cauchy's integral formula. Higher order derivative.	2
8	Laplace transform and its properties. Class of originals. Image class. Basic theorems of operational calculus. Methods of restoring the original image. Solving differential equations and systems of equations using operational calculus.	2
9	Canonical forms and description of second-order partial differential equations. Characteristic equation. Setting the Koshi issue.	2
10	Cauchy problem for one-dimensional wave equations. Dalamber formula.	2
11	The subject of probability theory. Basic concepts. Classical definition of probability. Relative frequency. Geometric definition of probability.	2
12	Adding probabilities. Full set of events. Multiplying probabilities. Probably. Bayes formula.	2
13	Bernoulli's formula. Poisson formula. Local and integral theorems of Laplace.	2
14	Probability distribution function. Discrete random variables. Bernoulli distribution. Poisson distribution. Continuous random variables. Density function of probability distribution.	2
15	Numerical characteristics of random variables. Mathematical expectation, variance, mean square deviation. Flat distribution. Normal and exponential distributions. Geometric and hypergeometric distributions	2
Total hours:		**30**

The timing/scheduling of topics may be varied depending on student feedback and progress.

IV. INDIVIDUAL STUDY FORMS AND CONTENTS

During the course the students have to improve their practical knowledge by doing self study hours.

Themes of individual study

№	Themes of independent education	value
	III semester	
1.	Applications of surface integrals.	4
2.	Applications of Ostrogradsky theorem.	4
3.	Second-order operations on a vector field. Performing operations with the Nabla operator.	4
4.	Representation of the Laplace operator in cylindrical and spherical coordinates. Applications of field theory.	6
5.	Hyperbolic and inverse hyperbolic functions. Integral over a closed curve.	4
6.	Maximum principle of the module. Integral of Cauchy type. Existence of higher order derivative. Higher order derivative of an analytic function.	6
7.	Expansion of functions into Laurent series. Finding the limit of a function with respect to the pole.	4
8.	Solving differential equations and systems of equations using calculus. Solving differential equations for vibrations.	6
9.	Solving the equation of narrow oscillations by the Dalamber method and the separation of variables (Four'e) method. Forced vibration of the string.	4
10.	Verification of the equations of heat propagation in a metal rod, in an unbounded rod and in space. Problems leading to the second equation of Lampas. Solving the Dirichlet problem.	4
11.	Important discrete and continuous distributions that are common in practice. Applications of normal distributions.	4
12.	Limit theorems of probability theory. The law of large numbers. Chebyshev inequality. Central limit theorem for a sum of uniformly distributed uncorrelated random variables.	4
13.	System of random quantities, their distribution laws. Two-dimensional normal distribution law and its characteristic.	4
14.	Application of probability theory in technical issues. Setting the problem in the construction of statistical estimates for unknown parameters of the distribution. Requirements for statistical evaluations: immutability, validity, effectiveness.	4
15.	Properties of the variance estimate, the corrected variance of the sample. Methods of constructing statistical estimates, confidence intervals. Statistical hypotheses and their classes. Hypothesis testing algorithm. Errors of the first and second type.	6
Total 3rd semester hours:		**68**

VII. Educational results/Professional competencies:

The student should know:

• To have an idea (knowledge) about linear algebra, vectors, analytical geometry, introduction to mathematical analysis, differential calculus of functions of one and many variables, solving problems of differential equations, series and probability theories, mathematical modeling;

• One should have the skills to simplify second-order line and surface equations and use their parameters, research the analytical solution of ordinary differential equations, quantitatively evaluate random events based on probability theory (skills);

• To know the cases available for mathematical models of technical and technological processes and to have mastered the methods of mathematical solution of the problems considered as examples and to have the skills of using these solutions in the construction of buildings, structures, engineering communications and road engineering need (qualification).

VIII. Educational technologies and methods:

• lectures;
• seminars (reasoning, quick questions and answers);
• write essays, theses and articles;
• solving situational tasks (case-stage);
• process oriented education;
• participation in discussions;
• work in small groups;
• performing group project work;
• performing independent work;
• preparing a presentation;
• solve tests of different levels.

IX. Requirements for obtaining loans:

Full mastery of the theoretical and methodological concepts of science, ability to accurately reflect the results of analysis, independent observation of the studied processes and completion of tasks and tasks given in the current and intermediate control forms, submission of written work for final control .
The assessment of the knowledge of students studying at the Andijan Institute of Mechanical Engineering based on the credit-module system is conditionally carried out in 2 parts, i.e. in the form of preliminary and main assessment, in the form of a

100-point system. Preliminary assessment will carry 50 marks and main main assessment will carry 50 marks.

1. Initial assessment.
- assessment of the student's knowledge gained during the lecture.
- assessment of the student's knowledge gained in practical or seminar training.
- assessment of the student's knowledge gained in the laboratory session.
- assessment of the knowledge acquired by the student during independent education.
- assessment of the student's knowledge gained during the coursework (project) and calculation-graphic work (except for subjects that are not planned for KI (KL) or HGI in the curriculum).

1.1. A student will be evaluated positively if he fulfills at least 60% of the requirements for supervision. In this:
- it is evaluated by taking interim control work during lectures (1 time if the hours allocated to the subject are 36 hours, 2 times if it is 72 hours or more).
- in practical and seminar classes, it is evaluated for the performance of assignments and active participation;

1.2. In the faculty dean's office to formalize the initial assessment A preliminary assessment report is created. The preliminary assessment report is signed by the professor who conducted the lesson (in case the lecture, practical and laboratory lessons are distributed to different professors, the lecturer signs and is responsible).

1.3. The initial assessment is evaluated on a 50-point scale. The average of the preliminary assessment is included in the final examination only if the student achieves 60% of the highest possible score (the passing score is 30 points) and above.

1.4. The share of the maximum 50 points that can be collected in the initial assessment in the assessment items is distributed as a percentage (%) according to Appendix 1.

1.5. Department heads and subject teachers are responsible for the distribution of the total 50 points in the initial evaluation and the development of its criteria. Each subject teacher develops criteria based on the nature of his subject and explains the assessment procedure and criteria to all students before the start of the subject lesson.

1.6. Basic assessment. In this case, the student submits the final control of the subject based on the established procedure. The final assessment is evaluated on a 50-point scale. In the final examination, the student must score at least 60% of the highest possible score (the passing score is 30 points).

1.7. During the whole semester, the student accumulates points according to the results of the mastery, and the results of the preliminary assessment and the main assessment points, by the teacher, according to the order of the Minister of Higher and Secondary Special Education of the Republic of Uzbekistan No. - according to the table "Comparative comparison of systems of assessment of students' mastery in higher education" approved by the list number 3069,

registered on September 26, 2016. it will be transferred to the form of grades and entered into the "**HEMIS**" electronic platform.

Grading criteria of the student's knowledge based on the total points:

№	Value for lecture	For practical and laboratory training	Independent education	HGI (if available)
1	25%	25%	50%	-
2	25%	25%	25%	25%

INFORMATIONAL-METHODICAL SUPPORT OF THE COURSE

Definition: Additional information about the course (Lecture and Practice). Additional information can include: extra books, articles, animation programs and online courses, etc.

LITERATURES:

1. Thomas' Calculus in SI Units, Joel R. Hass, Christopher E. Heil, Maurice D. Weir, Pearson Education, 13th edition, 2016
2. Claudio Canuto, Anita Tabacco, " Mathematical Analysis I", Springer, 2008
3. M. Hart 2 nd edition, "Guide to Analysis"
4. Handouts of class materials
5. Claudio Canuto, Anita Tabacco. Mathematical Analysis I. Springer-Verlag Italia, Milan 2008.
6. Д. Писменный. «Конспект лекции по высшей математике», 1, 2, 3 часть. - М.: Айрис Пресс, 2008.
7. Ю.Ф. Сенчук. Математический анализ для инженеров. 1, 2часть-Харков: НТУ «ХПИ», 2003.-408 с.
8. Axmedov A.B., Shodmonov G., Esonov E.E., Abdukarimov A.A., Shamsiyev D.N.: Oliy matematikadan individual topshiriqlar. Toshkent, O'zbekiston ensiklopediyasi. 2014.
9. Xurramov Sh.R. Oliy matematika. Misol va masalalar, nazorat topshiriqlari. 1.2.3-qismlar. Toshkent: Fan va texnologiyalar, 2015.
10. Xolmurodov E. Yusupov A.I. Aliqulov T.A. Oliy matematika. 1,2,3-qismlar.- Toshkent: "NEXT MEDIA GROUP", 2017.
11. В.Е.Гмурман. Руководство к решению задач по теории вероятностей и математическая статистика. – М., Высшей школа, 2004.

12. П. Минорский. Сборник задач по высшей математике, ФИЗМАТЛИТ 2010 г.
13. Jo'rayev T. J., Hudoyberganov R.X., Vorisov A.K., Mansurov X. Oliy matematika asoslari. 1 va 2 qism. T. O'zbekiston, 1995, 1999.- 290 b.
14. X. A. Axmedova, O'. P. Arziqulov, A. Tilavov. Matematika masala va misollar to'plami.-T. NISIM, 2016

Web sites:

1. www.gov.uz- O'zbekiston Respublikasi hukumat portali.
2. www.catback.ru- научные статьи и учебные материалы.
3. www. ziyo.net;
4. www. gaap.ru;
5. www. cip.com;
6. www. aicpa.ord;
7. www.bilim.uz

The Educational work program of the subject was approved by the protocol of the Educational and Methodological Council of Andijan Machine-Building Institute by № _____ _____.

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N. Umrzaqov — Dots. of chair of the department "Mathematics" of Andijan University.

The science syllabus was discussed at the meeting of the Department of "Higher Mathematics" of the Faculty of Transport and Logistics and recommended to the Council of the Faculty (report No.1 20 of 2022).

Head of the department: **S. Xakimov**
Secretary: **M. Valiyeva**

The science syllabus was discussed at the meeting of the Council of the "Transport and Logistics" faculty and was recommended to the Educational and Methodological Council of the institute (report No. _____ of 2022)

Chairman of the Faculty Council: **D. Sarimsaqov**
Secretary: **A. Rahimov**

The science syllabus was reviewed and approved by the Educational and Methodological Council of the Andijan Institute of Mechanical Engineering (report No. _____ of 2022)

Chairman of the educational and methodological council : **S. R. Aliyev**

Secretary: **F. U. Arabbayeva**