

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

ANDIJAN MACHINE BUILDING INSTITUTE

Registered:

No. 452  
2022 year " 30 " 08



EXPLOITABLE MATERIALS USED IN VEHICLES OF  
TRANSPORTATION

STUDY PROGRAM

Field of study: 620000  
Direction of study: 5620600

General education hour		160 hours	6th semester
That's it including :			
Lecture	–	32 hours	32 hours
Practical training	–	16 hours	16 hours
Laboratory exercises	–	32 hours	32 hours
Independent education hour	–	80 hours	80 hours

Andijan - 2022

Working curriculum of the subject by the order of the Ministry of Higher and Secondary Special Education of the Republic of Uzbekistan No. approved "Exploitable materials used in vehicles of transportation " prepared on the basis of science program .

Working curriculum of the Andijan Machine Building Institute is educational and methodological "\_\_\_" in \_\_\_\_\_ of 2022 year confirmed by statement no.

**Developers:**

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1. T. Almatayev - professor of the "Automotive Engineering" department of Andijan Machine Building Institute
2. A. Asronov - Andijan region transport department, department head.

The working curriculum of the department "Surface transport systems" in 2022 It was discussed at the \_\_\_ meeting in "\_\_\_"\_\_\_\_\_ and was recommended for discussion at the faculty council.

Chief of the educational - methodical department

2022 "\_\_\_" \_\_\_\_\_ A. Akhmedov  
(signature)

AndMI Transport and logistics faculty dean:

2022 "\_\_\_" \_\_\_\_\_ D. Sarimsakov  
(signature)

"Ground transport systems"

head of the department:

2022 "\_\_\_" \_\_\_\_\_ L. Bakirov  
(signature)

**I. Relevance of educational science and its role in higher professional education**

This program includes natural and synthetic oils; primary processing of oil; Fuels for IODs; fuel properties; Use of fuels in IODs; motor, transmission, energetic, hard and consistent lubricants, science history and development trends,

prospects, and the results of socio-economic reforms in our republic, and the impact of territorial problems on the prospects of the development of operational materials used in vehicles .

## **II . The purpose and task of educational science**

**The purpose of teaching science** - is to provide a level of up-to-date knowledge, skills and experience required by the educational standard, appropriate to the profile of the field in oils and working fluids.

**Tasks of science** - in learners:

- types of friction, wear and lubricants;
- motor oils;
- transmission oils;
- plastic oils;
- hydraulic oils;
- industrial oils;
- additives to oils;
- formation of theoretical knowledge, practical qualifications and skills, and development of social and professional competences on the technical tools of lubrication and cooling.

### **Methodological guidelines for the teaching of academic subjects.**

A bachelor in the process of mastering the subject "Operating materials used in vehicles":

- to have an idea about the*** role of lubricants and types of friction ;
- types of lubricants and their requirements ;
- additives added to lubricants and the mechanism of their action ;
- general requirements for motor oils ;
- composition of motor oils and their working conditions ;
- types of motor oils and additives added to them;
- assortment, application, interchangeability of motor oils ;
- classification of motor oils ;
- the main characteristics of transmission oils and their evaluation methods ;
- function , composition , properties , classification and marking of plastic products ;
- range of oils and areas of application ;
- function , composition , properties , classification and marking of hydraulic fluids ;
- the function , properties , classification and designation of industrial metals;

- additives added to oils ;
- the function, classification, assortment, areas of application and properties of lubricating-cooling technological means **and be able to use them**;
- determining the quality and brand of motor oils; determine the density of lubricants; have the **skills to** determine the amount of water in lubricants ;
- evaluation of properties of motor oils; evaluation of the main characteristics of transmission oils **must have qualifications**.

In the process of studying, the assigned tasks are carried out by students' active participation in lectures and practical exercises, creative approach, ability to use modern electronic teaching and communication tools, independent work with literature.

Based on these tasks, within the framework of issues implemented in the process of mastering the subject, the bachelor:

- the main problems of this science in relation to the whole system of knowledge; the nature and social importance of his future profession; **have an idea about natural and synthetic** oil and their primary processing ;
- modern technologies of primary oil processing;
- fuels for IODs;
- fuel properties;
- The use of fuels in IODs and their effect on engine performance and performance;
- motor oils, their properties and their effect on engine performance and performance;
- transmission oils;
- energy oils;
- know and be able to use the** properties of solid and consistent lubricants and their effect on engine performance and performance ;
- should have the skills to choose** fuel , oil, coolants and determine their properties .

Table 1

### III . M lecture classes

No	Topics of lectures	Size of lesson hours
<b>6th semester</b>		
<b>Module 1. Enter. Obtaining fuel lubricants from oil</b>		
<b>1</b>	<p style="text-align: center;"><b>Topic 1: Introduction . Oil and its processing products</b></p> <p>1.1 Information about oil and its processing products. Oil production in the world.</p> <p>1.2 Development of oil and gas industry in our republic.</p> <p>1.3 Chemical composition and properties of petroleum products. The presence of sulfur, oxygen and nitrogen compounds in petroleum products.</p> <p>1.4 The purpose and tasks of the academic subject. Basic concepts and terms.</p> <p>1.5 Obtaining fuel lubricants. Brief information about oil. Classes of hydrocarbons included in petroleum.</p>	<b>2</b>
<b>2</b>	<p style="text-align: center;"><b>Topic 2: Extraction of fuel and oils.</b></p> <p>2.1 Physical (driving) method of oil processing. Chemical method of oil refining. Refinement of petroleum products.</p> <p>2.2 The scheme of obtaining operational materials used in vehicles from oil . Secondary processes of oil refining.</p> <p>2.3 Production characteristics of lubricants.</p> <p>2.4 Obtaining alternative motor fuels. Improving the quality of base fuels .</p>	<b>2</b>
<b>Module 2. Car fuels.</b>		
<b>3</b>	<p style="text-align: center;"><b>Topic 3: Car fuels. Car gasoline.</b></p> <p>3.1 Requirements for the quality of automobile gasoline. Physico-chemical properties indicating operational quality of automobile gasoline. Density and viscosity of gasolines. Fractional composition of fuel and its effect on engine performance.</p> <p>3.2 The combustion process in gasoline engines and the effect of gasoline properties on the combustion process. Detonation and its causes.</p> <p>3.3 Detonation tolerance properties of gasoline (octane number). Methods of determining the octane number of gasoline.</p> <p>3.4 Methods of increasing the octane number of gasoline. Anti-detonation compounds and their mechanism of action.</p> <p>3.5 Causes of tar and soot formation in engines. Formation of toxic components in combustion products. Marking of gasoline.</p>	<b>4</b>
<b>4</b>	<p style="text-align: center;"><b>Topic 4: Fuels for diesel engines.</b></p> <p>4.1 Operational requirements for diesel fuel quality. 4.2 Basic physico-</p>	<b>2</b>

	<p>chemical properties of diesel fuels (density, evaporation, viscosity properties).</p> <p>4.3 Combustion of fuel in diesels. Factors affecting the combustion process.</p> <p>4.4 Cetane number of diesel fuel and its determination.</p> <p>4.5 Propensity of diesel fuel to form particles and sediments.</p> <p>4.6 Low temperature properties of diesel fuels. Anticorrosive properties of diesel fuel.</p> <p>4.7 Marking of diesel fuels.</p>	
<b>5</b>	<p><b>Topic 5: Gaseous fuels</b></p> <p>5.1 Advantages and main disadvantages of gaseous fuels.</p> <p>5.2 Liquefied hydrocarbon gas.</p> <p>5.3 Compressed natural gases.</p> <p>5.4 Standardized quality indicators, component composition.</p> <p>5.5 Fuels that may be used in the future.</p> <p>5.6 Main properties and recommendations for use.</p>	<b>2</b>
<b>Module 3. Lubricating materials. Motor oils.</b>		
<b>6</b>	<p><b>Topic 6: Lubricants used in vehicles. Oils for internal combustion engines.</b></p> <p>6.1 The main functions of motor oils. Operational requirements for motor oils. Additives to motor oils.</p> <p>6.2 Main properties of motor oils (kinematic viscosity, viscosity index, temperature resistance). Anti-corrosion properties of motor oils.</p> <p>6.3 Classification of motor oils. The main quality indicators of motor oils used for gasoline and diesel engines.</p> <p>6.4 Classification of foreign motor oils. SAE and API classification of motor oils. Oils designed for gasoline and diesel engines used today.</p> <p>6.5 Synthetic motor oils. The main classification of synthetic oils.</p> <p>6.6 Changes in motor oils during operation. Determining the degree of contamination of used oil.</p> <p>6.7 Engine oil replacement periods.</p>	<b>4</b>
<b>Module 4. Transmission oils. Plastic oils</b>		
<b>7</b>	<p><b>Topic 7: Oils used in vehicle transmissions (Transmission oils).</b></p> <p>7.1 Function and operating conditions of transmission oils.</p> <p>7.2 Operational requirements for transmission oils.</p> <p>7.3 Main properties of transmission oils. Additives added to transmission oils.</p> <p>7.4 Types and marking of transmission oils. Oils for automatic transmission and steering mechanism.</p> <p>7.5 Classification of foreign transmission oils.</p> <p>7.6 SAE and API classification of transmission oils.</p>	<b>2</b>

	7.7 Oils used for automatic transmission and steering mechanism. Transmission oil change periods.	
<b>8</b>	<b>Topic 8: Plastic lubricants used in vehicles.</b> 8.1 Function and conditions of use of plastic lubricants. Production of plastic coating oils and their composition. 8.2 Main properties of plastic lubricants. Sufficient strength, viscosity, heat resistance and cold resistance, mechanical stability properties. 8.3 Types of plastic lubricants. 8.4 Classification of anti-friction lubricants used in car units and mechanisms and their thickeners. 8.5 Designation of antifriction lubricants. 8.6 Function and conditions of use of preservative lubricating oils.	<b>2</b>
<b>5- Module. Special liquids</b>		
<b>9</b>	<b>Topic 9: Brake and shock absorber fluids.</b> 9.1 Requirements for the quality of brake and shock absorber fluids. 9.2 Function, composition, operational properties, brands and recommendations for use.	<b>2</b>
<b>10</b>	<b>Topic 10: Cooling fluids.</b> 10.1 Types of coolants. 10.2 Liquids that freeze at low temperatures. 10.3 Quality Requirements. 10.4 Function, composition, operational properties, brands and recommendations for use.	<b>2</b>
<b>6- Module. Regulation of consumption of oil products, ways of saving and ensuring safety in terms of fire.</b>		
<b>11</b>	<b>Topic 11: Moderation of consumption of oil products, ways to save.</b> 11.1 Regulation of consumption of petroleum products. Ways to save oil products. 11.2 Types of waste of petroleum products. 11.3 Waste Reduction. Accounting for oil products. 11.4 Fuel Storage Methods.	<b>2</b>
<b>Module 7. Construction materials used in vehicles.</b>		
<b>12</b>	<b>Topic 12: Plastics used in vehicles.</b> 12.1 Production, composition, properties of plastics. 12.2 Types and uses of thermoplastic plastics. 12.3 Types and uses of thermosetting plastics. 12.4 Plastic processing method. 12.5 Use of plastics in automotive industry.	<b>2</b>
<b>13</b>	<b>Topic 13: Rubber materials used in vehicles.</b> 13.1 The role of rubber materials in automotive industry. Requirements for rubber materials.	<b>2</b>

	13.3 Composition of rubber materials. Natural and synthetic rubbers. 13.4 Extraction of rubber materials. Changes in rubber properties during aging.	
<b>14</b>	<b>Topic 14: Varnish and paint materials used in vehicles.</b> 14.1 The role of varnish and paint materials in automotive industry. 14.2 Main quality indicators of lacquer-paint materials. 14.3 Composition and designation of varnish materials.	<b>2</b>
	<b>Total:</b>	<b>32nd hour</b>

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

#### **IV . Practical training**

Table 2

No	Topics of practical training	Size of lesson hours
<b>6th semester</b>		
1	Oil. Oil refining and semi modern technologies of manufacturing cleaning.	2
2	Gasoline brands, methods of obtaining them and their use.	2
3	Choosing a fuel brand for gasoline engines with different compression ratios .	2
4	Diesel fuels. Properties of diesel fuels. Assortment of diesel fuels.	2
5	Application of alternative fuels. Liquefied gases. Compressed gas and generator gas.	2
6	Motor oils. Assortment of motor oils. Synthetic oils.	2
7	Transmission oils. Selection of transmission oils for cars and tractors.	2
8	plastic water oils .	2
	<b>Total :</b>	<b>16 hours</b>

academic group in an auditorium equipped with multimedia facilities . Classes are conducted using active and interactive methods, "Case-study" technology is used, the content of the cases is determined by the teacher. Visual materials and information are transmitted using multimedia structures.



## V. Laboratory activities i

Table 3

No	Topics of laboratory exercises	Size of lesson hours
<b>6th semester</b>		
1.	Determining the quality of gasoline according to its main properties.	2
2.	Determining the fractional composition and octane number of gasoline.	2
3.	Determining the quality of diesel fuel by its main properties.	2
4.	Determining the quality of oils according to their main properties.	4
5.	Determination of ignition temperature and degree of contamination of oils.	4
6.	Determining the quality of plastic lubricants based on their main properties.	2
7	Determining the quality of antifreezes by their main properties.	2
8	Determination of the quality of brake fluids by their main properties.	2
9	Determination of sulphation of motor oils	2
10	Determination of the density of fuel, lubricants.	2
11	Determining the fractional composition of fuels.	2
12	Determination of viscosity of fuel, lubricants.	2
13	Determination of water content in lubricants.	4
	<b>Total :</b>	<b>32 hours</b>

Laboratory During the training , they will learn to carry out tests on safety techniques, environmental and anti-fire measures, as well as to determine the density and fractional composition of lubricants.

## V I. \_ Independent education

Table 4

No	Independent study topics	Size of lesson hours
<b>6th semester</b>		
1.	Brief information about oil ;	2
2.	Proper driving of oil;	2
3.	Function of lubricants and types of friction;	2

4.	Types of materials used;	2
5.	Choosing a fuel brand for various pressurized gasoline engines;	2
6.	Alternative fuels;	2
7.	Selection of plastic injection oil according to unit load and operating mode and operating conditions.	2
8.	The effect of the chemical composition of fuels on the formation of a combustible mixture.	2
9.	Physicochemical properties of gasoline and their effect on engine performance.	2
10.	The effect of the chemical composition of gasoline on the occurrence of detonation.	2
11.	The effect of the chemical composition of diesel fuel on its properties.	2
12.	Properties of diesel fuels affecting the combustion process	2
13.	The effect of the chemical composition of diesel fuel on its properties.	2
14.	Spontaneous ignition of diesel fuels.	2
15.	Causes of soot and varnish formation in engines.	2
16.	Causes and consequences of tar and soot formation in engines.	2
17.	Causes of detonation in engines.	2
18.	Classification of fluids used in the engine cooling system.	2
19.	Classification of fluids used in the engine cooling system.	2
20.	Oils for internal combustion engines	2
21.	API classification of motor oils.	2
22.	SAE classification of motor oils.	2
23.	The essence of the oxidation process of oils.	2
24.	Importance of viscosity of oils and changes depending on temperature	2
25.	How to evaluate the temperature resistance of oils.	2
26.	The main properties of motor oils	2
27.	Importance of viscosity of oils and changes depending on temperature.	2
28.	petroleum products.	2
29.	Oil refining methods.	2
30.	Use of plastic lubricants in car parts.	2
31.	The main properties of plastic coating oils	2
32.	Classification of plastic lubricants.	2

33.	Classification of fluids used as coolant	2
34.	Effects of unsaturated hydrocarbons on the properties of fuels.	2
35.	The main properties of transmission oils	2
36.	Basics of cost-effective fuel and lubricant regulation and use.	2
37.	Fluids used in the brake system.	1
38.	Classification of antifriction lubricants.	1
39.	Advantages and properties of antifreeze.	1
40.	Plastic lubricants used in vehicles.	1
41.	Technical fluids used in vehicles.	1
42.	Used in vehicle transmissions (transmission) oils.	1
43.	Classification of foreign motor oils.	1
44.	Classification of foreign transmission oils.	1
45.	<b>Total :</b>	<b>80 hours</b>

It is recommended to prepare abstracts and present them by students on subjects to be mastered independently.

**science coursework .**

**By science h calculation-graphic work is not available .**

## **VII . STUDENTS ' KNOWLEDGE ASSESSMENT AND CONTROL CRITERIA .**

' knowledge of subjects at the Andijan Institute of Mechanical Engineering in accordance with the Decree of the President of the Republic of Uzbekistan dated June 5, 2018 No. Order of the Minister of Higher and Secondary Special Education of the Republic of Uzbekistan dated August 9, 2018 No. 19-2018 It is carried out on the basis of the "Regulation on the control and evaluation system of students ' knowledge in higher education institutions" approved by the Ministry of Justice of the Republic of Uzbekistan on September 26, 2018 with No. 3069 .

**Table 1**

<b>Evaluation methods</b>	Oral survey, test, interview, supervision, homework check, written work, presentations and other such forms		
<b>B population criteria</b>	<p><b>5 - "A " grade</b>            - The student makes independent conclusions and decisions ;            - I can think about something ;            - m conducts independent observation ;            - can apply the acquired knowledge in practice ;            - understands, knows, can express, tell the essence of the science (topic) and when it is considered that he has an idea about the science (topic) - he is evaluated with 5 (excellent) grade.</p> <p><b>4 - "Good" b aho</b>            - The student observes independently;            - can apply the acquired knowledge in practice;            - understands, knows, can express, tell the essence of science (topic) and when it is considered that he has an idea about science (topic) - he is evaluated with 4 ( good ) marks.</p> <p><b>3 - "Satisfactory" grade</b>            - The student can apply the acquired knowledge in practice;            - understands, knows, can express, tell the essence of science (topic) and when it is considered that he has an idea about science (topic) - he is evaluated with 3 ( satisfactory ) marks.</p> <p><b>2 - "Unsatisfactory" grade</b>            - <b>When it is</b> considered that the student has not mastered the science program, does not understand the essence of the science (subject) and does not have an idea about the science (subject) - <b>he</b> is evaluated with a grade of 2 ( unsatisfactory ).</p>		
	<b>B population types</b>	<b>Max. score</b>	<b>Transfer time</b>
	Intermediate control (conducting the ON type and evaluating the student's knowledge in this type of control is carried out by the professor who conducted the subject training). Mid-term supervision is conducted during the course of the semester in order to assess the knowledge and practical skills of the student after the	5	9-16 _ week

	<p>completion of the relevant section of the work science program. The type of intermediate control can be conducted up to 2 times for each subject, depending on the nature of the subject, and the form and duration of the examination are determined by the department based on the nature of the subject and the hours allocated to the subject. When evaluating a student according to the type of midterm control, the grades he received during the training sessions are taken into account. A student who has not passed the intermediate control type and has been evaluated with a "2" (unsatisfactory) grade for this control type will not be included in the final control type.</p>		
	<p><b>Final control</b>          Conducting the final control type and evaluating the student's knowledge on this type of control is carried out by a professor who did not conduct the training.          conducting the final inspection is determined based on the nature of the subject, hours allocated to the subject.</p>	<b>5</b>	18-19 weeks
	Written work, oral, test , etc	5	

## **VI II . Basic and additional educational literature and information sources**

### **Basic literature**

1. Leffler, William L. Petroleum Refining in Nontechnical Language — 4th ed. Printed in the United States of America, New York, 2011.
2. Z. Khalimova Operational materials used in vehicles. Textbook, - T .: -2018 u .
3. Z. Khalimova Operational materials used in vehicles. Study guide - T .: "Science and technology", 2014.

4. Z. Alimova, J. Qulmukhamedov. Physical and chemical analysis of petroleum products. Study guide - T.: "PUBLICATION" 2013y.
5. Z. Khalimova, J. Qulmukhamedov. Analysis of production, use and quality of oil products. - T.: "Science and technology", 2016.
6. Kirichenko N.B. Automotive exploitation material Educational posobie - M.: Iz. Center "Academy", 2015.

#### **Additional literature**

1. Shavkat Mirziyoyev . - Free and prosperous , democratic Uzbekistan \_\_ state together set up we deliver - Tashkent .: " UZBEKISTAN " , - 2016.
2. Shavkat Mirziyoyev. - We will build our great future together with our brave and noble people - Tashkent.: "UZBEKISTAN", - 2017.
3. Sinelnikov A.F, Balabanov V.I, Automotive fuels, problems and operational fluids. Kratki spravochnik. - M.: ZAO "KJI "Za rulem ", 2003.
4. Matkarimov K. E. \_ Materials used for cars.Tashkent. "Interpretation" - 2008.
5. KBaltenas P, Safonov A., A.I. Ushakov, V. Shergapis Motornye masla, Alfa-Luib Moscow-St. Petersburg, 2004g.
6. Gureev A.A., Fuchs I.G., Lashkhi V.L. Chemotology. M. Chemistry, 1986. 368s.
7. Manusadjyants O.I., Smal F.V. "Automotive operational material". M., Transport, 1989.

#### **Information sources**

1. [www.gov.uz](http://www.gov.uz) is the government portal of the Republic of Uzbekistan.
2. [www.lex.uz](http://www.lex.uz) - national database of information on legal documents of the Republic of Uzbekistan.
3. <http://www.ziyonet.uz> – Educational portal.
4. <http://www.edunet.uz> – UzR OO'MTV site.



