

ANDIJAN MACHINE BUILDING INSTITUTE

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"APPROVED"

Institute rector

U.M. Turdialiev

2022 year



CURRICULAR PROGRAM

Direction of study: 5620600 – "Vehicle service"

Andijan 2022

Recommended by the scientific council of the Andijan Machine Building Institute, 2022 "___" is numbered "___" in _____. The scientific council approved the program of the subject "Exploitable materials used in vehicles of transportation".

The working curriculum of the subject was approved by the protocol numbered "___" dated "___" of 2022.

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The educational methodological complex of the subject was reviewed and recommended for use by the scientific-methodological council of the Andijan Machine Building Institute (2022 report No. "___" ____).

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 "Exploitable materials used in vehicles of transportation":

- 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 .

I II. The main theoretical part (lecture sessions)

Module 1. Enter. Obtaining fuel lubricants from oil

Topic 1. Sign in. Oil and its processing products

Information about oil and its processing products. Oil production in the world.

Development of oil and gas industry in our republic.

Chemical composition and properties of petroleum products. The presence of sulfur, oxygen and nitrogen compounds in petroleum products.

The purpose and tasks of educational science. Basic concepts and terms.

Obtaining fuel lubricants. Brief information about oil. Classes of hydrocarbons included in petroleum.

Topic 2. Extraction of fuel and oils

Physical (driving) method of oil processing. Chemical method of oil refining. Refinement of petroleum products.

scheme for obtaining operational materials used in vehicles from oil .

Secondary processes of oil refining. Production characteristics of lubricants.

Obtaining alternative motor fuels. Improving the quality of base fuels .

Module 2. Car fuels.

Topic 3. Car gasoline.

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.

The combustion process in gasoline engines and the effect of gasoline properties on the combustion process. Detonation and its causes.

Detonation tolerance properties of gasoline (octane number). Methods of determining the octane number of gasoline.

Methods of increasing the octane number of gasoline. Anti-detonation compounds and their mechanism of action.

Causes of tar and soot formation in engines. Formation of toxic components in combustion products. Marking of gasoline.

Topic 4. Fuel oils for diesel engines .

Operational requirements for diesel fuel quality. Basic physico-chemical properties of diesel fuels (density, evaporation, viscosity properties).

Fuel combustion in diesels. Factors affecting the combustion process. Cetane number of diesel fuel and its determination.

The tendency of diesel fuel to form soot and sediments.

Low temperature properties of diesel fuels. Anticorrosive properties of diesel fuel. Marking of diesel fuels.

Topic 5. Gaseous fuels

Advantages and disadvantages of gaseous fuels. Liquefied hydrocarbon gas. Standardized quality indicators, component composition.

Compressed natural gases. Standardized quality indicators, component composition.

Fuels that can be used in the future. Main properties and recommendations for use.

Module 3. Lubricating materials. Motor oils.

Topic 6. Oils for internal combustion engines.

The main functions of motor oils. Operational requirements for motor oils. Additives to motor oils.

Main properties of motor oils (kinematic viscosity, viscosity index, temperature resistance). Anti-corrosion properties of motor oils.

Classification of motor oils. The main quality indicators of motor oils used for gasoline and diesel engines.

Classification of foreign motor oils. SAE and API classification of motor oils. Oils designed for gasoline and diesel engines used today.

Synthetic motor oils. The main classification of synthetic oils.

Changes in motor oils during operation. Determining the degree of contamination of used oil. Engine oil replacement periods.

Module 4. Transmission oils. Plastic oils

Topic 7. Oils used in vehicle transmissions (Transmission oils).

Function and operating conditions of transmission oils. Operational requirements for transmission oils.

The main properties of transmission oils. Additives added to transmission oils.

Types and marking of transmission oils. Oils for automatic transmission and steering mechanism.

Classification of foreign transmission oils. SAE and API classification of transmission oils. Oils used for automatic transmission and steering mechanism.

Transmission oil change periods.

Topic 8. Plastic lubricants used in vehicles.

Function and conditions of use of plastic lubricants. Production of plastic coating oils and their composition.

The main properties of plastic coating oils. Sufficient strength, viscosity, heat resistance and cold resistance, mechanical stability properties.

Types of plastic coating oils.

Classification of antifriction lubricants and their thickeners used in car components and mechanisms. Designation of antifriction lubricants.

The function and conditions of use of preservative lubricating oils.

Module 5. Special liquids

Topic 9. Brake and shock absorber fluids.

Requirements for the quality of brake and shock absorber fluids.

Function, composition, operational properties, brands and recommendations for use.

Topic 10. Cooling fluids.

Types of coolants. Liquids that freeze at low temperatures.

Quality requirements. Function, composition, operational properties, brands and recommendations for use.

Module 6. Regulation of consumption of oil products, ways of saving and ensuring safety in terms of fire.

Topic 11. Moderation of consumption of oil products, ways of saving.

Regulation of consumption of oil products. Ways to save oil products.

Types of waste of oil products . Reduce wastage. Accounting for oil products. Fuel storage methods.

Module 7. Construction materials used in vehicles.

Topic 12. Plastics used in vehicles.

Production, composition, properties of plastics. Types and use of thermoplastic plastics

Types and uses of thermosetting plastics. Plastic processing method. Use of plastics in automotive industry.

Topic 13. Rubber materials used in vehicles

The role of rubber materials in automotive industry. Requirements for rubber materials.

Composition of rubber materials. Natural and synthetic rubbers. Extraction of rubber materials. Changes in rubber properties during aging.

Topic 14. Lacquer materials used in vehicles.

The role of varnish and paint materials in automotive industry. The main quality indicators of lacquer-paint materials. Composition and designation of varnish materials.

IV . Instructions and recommendations for practical training

The following topics are recommended for practical training:

1. Oil. Oil refining and semi modern technologies of manufacturing cleaning.
2. Gasoline brands, methods of obtaining them and their use.
3. Choosing a brand of fuel for gasoline engines with different compression fillings.
4. Diesel fuels. Properties of diesel fuels. Assortment of diesel fuels.
5. Use of alternative fuels. Liquefied gases. Compressed gas and generator gas.
6. Motor oils. Assortment of motor oils. Synthetic oils.
- 7 . Transmission oils. Selection of transmission oils for cars and tractors.
- 8 . Application of plastic srukov oils.

Practical training is an academy in an auditorium equipped with multimedia installations. should be conducted by one teacher to the group. It is desirable that the classes should be conducted using active and interactive methods, appropriate pedagogical and information technologies should be used.

V. _ Instructions and recommendations for laboratory work

The following topics are recommended for laboratory work:

1. Determining the quality of gasoline according to its main properties.
2. Determining the fractional composition and octane number of gasoline.
3. Determining the quality of diesel fuel by its main properties.
4. Determining the quality of oils according to their main properties.
5. Determining the ignition temperature and contamination level of oils.
6. Determining the quality of plastic lubricants based on their main properties.
7. Determining the quality of antifreezes according to their main properties.
8. Determining the quality of brake fluids by their main properties.

9. Determination of sulfated motor oils.
10. Determination of density of fuel, lubricants.
11. Determining the fractional composition of fuels.
12. Determination of viscosity of fuel, lubricants.
13. Determination of water content in lubricants.

Laboratory work should be conducted by one teacher per academic group (maximum 16 students) in an auditorium equipped with necessary laboratory equipment and measuring instruments. If there are more than 16 students in one academic group, the group should be divided into two small groups and conducted in parallel by two teachers. It is desirable that the classes are conducted using active and interactive methods, appropriate pedagogical and information technologies are used.

VI. Independent education and independent work

Recommended topics for independent study:

1. Brief information about oil;
2. Properly drive oil;
3. Function of lubricants and types of friction;
4. Types of materials being eaten;
5. Choosing a fuel brand for various pressurized gasoline engines;
6. Alternative fuels;
7. Selection of plastic injection oil according to unit load and operating mode and operating conditions.
8. Effect of the chemical composition of fuels on the formation of a combustible mixture.
9. Physico-chemical properties of gasoline and their effect on engine operation.
10. Effect of chemical composition of gasoline on occurrence of detonation.
11. Effect of chemical composition of diesel fuel on its properties.
12. Properties of diesel fuel affecting the combustion process
13. Effect of chemical composition of diesel fuel on its properties.
14. Self-ignition ability of diesel fuel.
15. Causes of formation of soot and varnish in engines.
16. Causes and consequences of formation of tar and soot in engines.
17. Causes of detonation in engines.
18. Classification of liquids used in the engine cooling system.
19. Classification of liquids used in the engine cooling system.
20. Oils for internal combustion engines
21. API classification of motor oils.
22. SAE classification of motor oils.
23. The essence of the oxidation process of oils.

24. Importance of oil viscosity and change depending on temperature
 25. How to evaluate the temperature resistance of oils.
 26. Main properties of motor oils
 27. Importance of viscosity of oils and changes depending on temperature.
 28. Refinement of oil products.
 29. Methods of oil processing.
 30. Use of plastic lubricants in car parts.
 31. Main properties of plastic lubricants
 32. Classification of plastic lubricants.
 33. Classification of fluids used as coolant
 34. Effect of unsaturated hydrocarbons on the properties of fuels.
 35. Main properties of transmission oils
 36. Basics of economical regulation and use of fuel and lubricants.
 37. Fluids used in the brake system.
 38. Classification of antifriction lubricants.
 39. Advantages and properties of antifreezes.
 40. Plastic lubricants used in vehicles.
 41. Technical fluids used in vehicles.
 42. Used in vehicle transmissions (transmission) oils.
 43. Classification of foreign motor oils.
 44. Classification of foreign transmission oils.
- independent learning, work with the text of lectures and recommended literature, prepare for practical training, do homework, prepare abstracts and present them.

V. Results of science education (competencies to be formed)

As a result of mastering the subject, the student:

- brief information about oil; proper driving of oil; about improving the quality of base fuels *have imagination and knowledge*;
- use of extraction gasolines; to have the *skills to* determine the quality and brand of oils *need*

determine the density of lubricants; to the *qualification* of determining the fractional composition of fuels *must have*.

VI. Educational technologies and methods:

- lectures;
- interactive case studies;
- seminars (reasoning, quick questions and answers);
- work in groups;
- making presentations;

- individual projects;
- work as a team and protect.

VI.1. 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. ZX Alimova, JRQulmukhamedov. Physical and chemical analysis of petroleum products. Study guide - T.: "PUBLICATION" 2013y.
5. Z. Khalimova, JRQulmukhamedov. 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. - We will build a free and prosperous, democratic state of Uzbekistan together - 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. To cars used items . 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 is the government portal of the Republic of Uzbekistan.
2. www.lex.uz - national database of information on legal documents of the Republic of Uzbekistan.
3. <http://www.ziynet.uz> – Educational portal.
4. <http://www.edunet.uz> – UzR OO'MTV site.
5. <http://www.bilimdon.uz/uzb>